Annual Report

2018/2019

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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.

Contents

Part 1:
Purpose

The purpose of this document is to report against the 2018/19 Annual Work Plan of the Rotorua Te Arawa Lakes Programme. This report is in accordance with Clause 5.3 and 5.4 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.

Part 2:
Overview

Work progresses on all lakes but with a continued heavy resource weighting towards Lake Rotorua. An update on each lake is provided below, in accordance with the 2018/19 Annual Work Plan.

Lake Rotorua

RLC and BOPRC Annual Plan Budget 2018/19 ($000)	Actual year to date expenditure ($000)	Approved Crown Funding ($000)	Crown Funding received to date ($000)	Crown Funding applied to date ($000)
10,730	2,171	5,365	2,278	1,085

Proposed Plan Change 10 (PPC10) is currently moving through the Schedule 1 Resource Management Act, Environment Court process. The Court Hearing versus the Natural Capital Group finished in March and we are awaiting the Court's decision.

Reworking of the previously finalised Nutrient Management Plans continues to be undertaken, to provide identification of Critical Source Areas for phosphorus and identifying mitigation measures, both included as new provisions of the Plan Change following the decision of Commissioners at the Council hearings in 2017. Advice and Support staff continue to work closely with Landowners to provide information on their obligations under PPC10. Twenty seven consents have been granted for properties over 40 ha with further applications being processed. In total, 144 Landowners have engaged with the Advice and Support service. Overseer Legacy has been replaced with Overseer FM. The new software enables Landowners to publish files directly to Council.

To date, a total of 214.6 ha of gorse has been removed from the catchment. Staff continue to work with Landowners on gorse conversion but the remaining areas in the catchment are small, patchy lots.

The Low Nitrogen Land Use Fund attracted 19 Expressions of Interest with 16 applicants invited to submit a full application. Ten applications were received and eight projects were put forward and approved by the Rotorua Te Arawa Lakes Programme Steering Group totalling $1.26M. Contract negotiations are ongoing including a hemp trial contract totalling up to $179,000.

The Incentives Scheme has secured 21.5 t of nitrogen. The Lake Rotorua Incentives Committee undertook their Strategic Review as required by the Terms of Reference. The findings were presented to Council in August 2019.

In September, the Programme Steering Group approved the close out of the Tikitere Zeolite Plant Project. Due to increasing build and ongoing operational costs, the project was no longer viable. Workshops have been held to investigate engineering solutions within the catchment to achieve nitrogen reductions. The focus has now shifted to an investment in projects which will result in assets to the community, in addition to in-lake nitrogen removal, these may include: enhancement and protection of existing wetlands, development of new wetlands and removal of nitrogen fixing species.

Rotorua Lakes Council lodged their resource consent application for the Rotorua Wastewater Treatment Plant Alternative Disposal Site. The application was directly referred to the Environment Court and publically notified. The application is unlikely to be heard until 2020. Staff from both councils continue to work together to progress individual property sewerage reticulation in the Rotokawa/Brunswick area.

Biosecurity surveillance undertaken discovered Brown Bullhead Catfish by Mokoia Island in Lake Rotorua. This is the first time catfish have been found in this lake. Surveillance and netting over the 2018/19 period saw a total of 170 catfish caught in Lake Rotorua.

As part of the Communication Summer Campaign, Regional Council staff, contractors and members of the public, featured in a short video that highlights the work being undertaken to improve water quality in the Rotorua Te Arawa Lakes.

Lake Rotoehu

RLC and BOPRC Annual Plan Budget 2018/19 ($000)	Actual year to date expenditure ($000)	Approved Crown Funding ($000)	Crown Funding received to date ($000)	Crown Funding applied to date ($000)
385	146	193	96	73

Lake algal blooms started early in the season with a public health warning issued for Lake Rotoehu. As a result of the algal blooms short term intervention, weed harvesting was unable to be undertaken. Another short term intervention, phosphorus locking, has been put on hold due to inefficiencies. A water quality workshop was held with scientists and as a result, changes are being made to the phosphorus locking plant, to make it more effective at locking phosphorus coming to the lake. Consent renewal for the plant is currently being sought, including additional locations within Lake Rotoehu to improve alum dosing efficiency.

Lake Okareka

RLC and BOPRC Annual Plan Budget 2018/19 ($000)	Actual year to date expenditure ($000)	Approved Crown Funding ($000)	Crown Funding received to date ($000)	Crown Funding applied to date ($000)
320	114	160	80	57

Staff have brokered a Land Use Change Agreement for 53 ha of gorse and pasture to be planted in mānuka. An audit of the catchment Land Use to assess compliance with the Rule 11 Benchmark was undertaken in 2017/18. As a result of the audit, the one property owner found to be well in excess of their benchmark has agreed to work with an agricultural consultant to come into compliance.

Stage one of the erosion protection works at Waitangi Stream have been undertaken to minimise the considerable risk of accelerated erosion, as a result of the higher stream flows since June 2017. Stage two is being undertaken during 2019/20.

Lake Rotoiti

RLC and BOPRC Annual Plan Budget 2018/19 ($000)	Actual year to date expenditure ($000)	Approved Crown Funding ($000)	Crown Funding received to date ($000)	Crown Funding applied to date ($000)
11,445	11,021	5,723	2,736	5,511

Sewerage reticulation between Curtis Road and Hinehopu is largely complete with the plant and reticulation expected to be operational by late August.

A condition inspection was carried out on the Ohau Wall to confirm corrosion rates. The inspection identified the first signs of holes in the wall since inspections started. The installation of stiffening components will be undertaken in 2019/20.

Catfish incursion management continued during 2018/19 with 28,060 catfish netted, which is an 18% decrease on the 2017/18 season. A coordinator for the community response to the catfish incursion was recruited by Te Arawa Lakes Trust. The position has been funded by Bay of Plenty Regional Council (BOPRC) for a period of three years.

Summary of Trophic Level Index Results

For the second year none of twelve Rotorua - Te Arawa Lakes met their Regional Natural Resources Plan (RNRP) Trophic Level Index (TLI) objective when compared to the annual average TLI for 2018/2019. Comparison of the three yearly annual average with the RNRP TLI objective showed only Lake Rotorua to match its objective TLI.

Trophic status has been impacted by climate, with record increases in lake level occurring in the previous year, which may help explain a rise in annual average TLI for many lakes.

Blue-green algae (cyanobacteria) blooms resulted in health warnings being issued by Toi Te Ora for Lakes Rotoehu and Ōkaro. Lake Rotoiti at Okawa Bay experienced blooms in late autumn resulting in a health warning. Tarawera and Rotorua remained in green surveillance level over the 2018/2019 season.

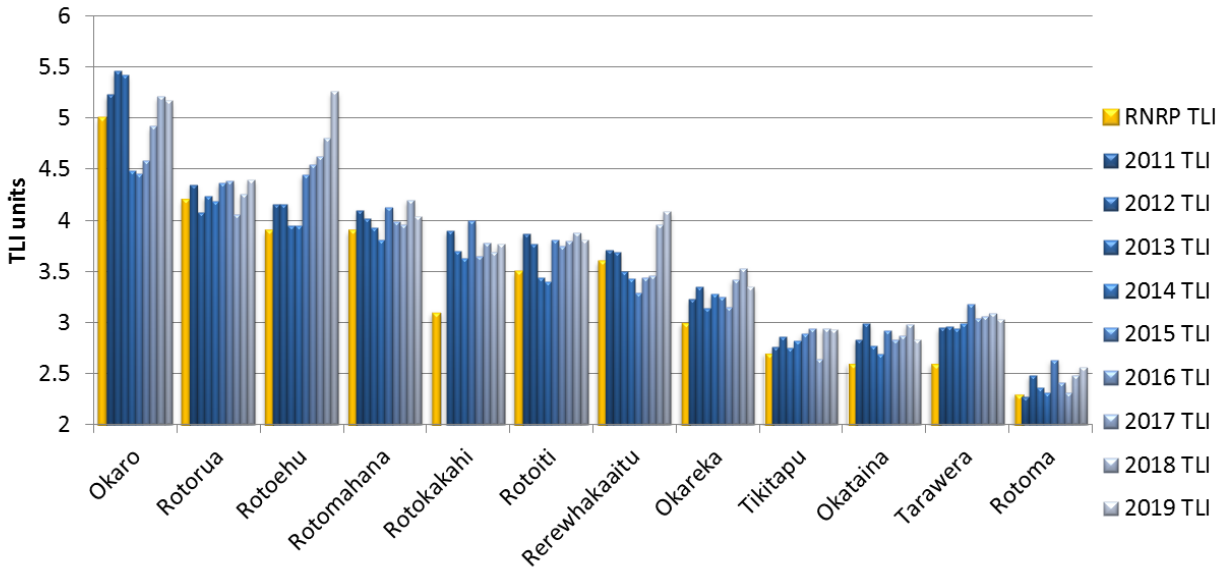

Figure 1 Regional Natural Resources Plan (RNRP) TLI Objectives and average annual TLI results, 2011 to 2019.

Part 3:
Key achievements

An overview of key achievements for 2018/19 are shown in the table below. Deed funded projects are highlighted in **bold**.

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

Lake operations

Lake operations as shown in 2018/19 Annual Work Plan	Lake operations achievements 2018/19
Continue Lake Rotoehu Weed Harvesting	**Due to insufficient weed growth as a result of algae blooms, the weed harvester was not operational during 2018/19.**
Investigate further engineering solutions to achieve remaining 50 t Nitrogen (N)	**A working group has been established to investigate engineering solutions within the catchment to achieve the remaining 50 t N. The preference moving forward is to see investment in projects which will be assets to the community, in addition to in-lake nitrogen removal, these may include: fencing off seeps, enhancement and protection of existing wetlands, development of new wetland and removal of nitrogen fixing species. Further sewerage reticulation may also be a possibility. There are challenges in achieving this target; staff will continue to look for possible solutions.**

Lake operations as shown in 2018/19 Annual Work Plan	Lake operations achievements 2018/19
Continue phosphorous locking to maintain water quality (Lakes Rotoehu and Rotorua)	**The phosphorus locking plant on the Puarenga Stream is out of commission due to the bulk tank not meeting national containment standards. A replacement tank is expected to be commissioned before the end of 2019.** **The phosphorus locking plant at Lake Rotoehu was turned off in August 2018 due to high lake level and poor efficacy of dosing. A water quality workshop was held with scientists in October, which made recommendations to manage issues with the operation of the plant. Changes are being made in an attempt to operate the plant more effectively. Bay of Plenty Regional Council is planning on applying for resource consent to alum dose in multiple locations, to improve efficacy of phosphorus removal in Lake Rotoehu.**
Continue to pursue resource consents, prepare site and review engineering and cost feasibility of Tikitere Zeolite Plant, in time for scheduled 2018-2019 construction	**Creep in the project capital costs through the trial and design process impacted negatively on the project viability. The early capital cost was estimated at $4.6M which has escalated to more than $9.6M with operating costs of $750,000 a year. A project close out report was approved by PSG September 2018. Construction of this plant is no longer considered a viable option to achieve nitrogen removal from Lake Rotorua.**
Undertake reconsenting of phosphorous locking on Lakes Rotorua and Rotoehu	**The resource consent application for Lake Rotorua has been applied for and dosing continues while the Regional Council makes a consent decision. A cultural impact assessment is being undertaken. Consultants are preparing the resource consent application for Lake Rotoehu dosing. The dosing methodology is being reviewed to improve dosing efficiency for phosphorus uptake.**
Manage the corrosion of the Ohau Wall as per the Structural Management Plan	A condition inspection was undertaken on the Ohau Wall to confirm corrosion rates. The inspection has identified the first signs of holes in the wall since inspections started. The protection method developed in the Structural Management Plan is the preferred option and installation of the stiffening components to strengthen the wall will be undertaken in 2019/20.
Install monitoring buoys at Lakes Rotoiti and Ōkāreka	This project is currently on hold until the management of the Lake Buoys Programme has been clarified. This programme has transitioned from a research project since about 2006 to a programme monitoring tool and so annual costs of monitoring need to be accounted for within our annual budgets.

Lake operations as shown in 2018/19 Annual Work Plan	Lake operations achievements 2018/19
Continue Lake Ōkāreka streamworks to protect assets from erosion	Stage one, erosion protection work on the Waitangi Stream erosion is now complete. These repairs have been necessary to protect streambanks from the higher flows in response to exceptionally high lake levels in Lake Ōkāreka. Stage two, erosion protection works will take place during 2019/20 financial year.
Responsive weed management as required for amenity purposes across all lakes	Weed can be a problem over the summer months in recreational areas. Budget is available to deal with this as required over late summer.
Finalise and present Tarawera Catchment nutrient modelling	Nutrient modelling to review nitrogen and phosphorus loads within the Tarawera Catchment has been complicated by difficulties in historical nutrient analytical technique changes. This issue has been resolved sufficiently to allow completion of the modelling in the near future.
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. Technical Advisory Group 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. A major undertaking for 2018/19 was the completion of the Plan Change 10 Science Review. Twelve module reports have been prepared on each of the reporting topics and a final summary report was completed that brings together the review findings in one volume. The Memorandum of Understanding with the University for the Chair of Lake and Freshwater Science and the associated research programme has been renegotiated and approved for funding in December 2018, by the Regional Council through to 2024.
Land Technical Advisory Group to provide technical support for land use and land management decisions	No land use research workshops were held during the reporting period.

Lake operations as shown in 2018/19 Annual Work Plan	Lake operations achievements 2018/19
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	The trout barrier has experienced some issues with algae growth. We are considering the long term application of the barrier and whether it can be altered or removed.
Continue to monitor forest harvest impact on groundwater and Lake Rotomā – a four year project - Year 4	Monitoring of forest harvest impacts are being undertaken. The results indicate high levels of nitrogen are leaching in the years after harvesting. A detailed report is expected December 2019.
Continue koura monitoring programme on all twelve lakes	The Rotorua Te Arawa Lake Programme has, for a long time, relied on TLI and submerged plant index (SPI) reporting to show trends in the health of our Rotorua Lakes. Programme staff recognised that a more encompassing measure of lake health was necessary and so ongoing kakahi and koura monitoring was established in 2014. The focus of this work is to provide long term kakahi and koura population statistics on two native animal species living within our lakes. The reports are available on the Rotorua Lakes Programme website and have provided interesting data about species distribution and density in our lakes. Each lake is reported on over a five year rotation and this work will, in time, provide a powerful data set of changes in these native species over time. Improvements in water quality for Lake Rotorua are clearly benefitting the survival of these native fauna.
Continue catfish surveillance and potential management	In December 2018, Brown Bullhead Catfish were discovered at Mokoia Island in Lake Rotorua. This was the first time the pest fish had been discovered in the lake. The 2018/19 season saw a total of 28,060 catfish netted, which is an 18% decrease on the 2017/18 season (34,117). The majority of the pest fish are being caught in Lake Rotoiti with low numbers in Lake Rotorua (170). An acoustic tracking trial is being undertaken in Lake Rotoiti, along with spawning distribution surveys. Research into eDNA to further develop this water monitoring was undertaken by the University of Waikato.

Land management

Land management as shown in 2018/19 Annual Work Plan	Land management achievements 2018/19
Continue to implement the Lake Rotorua Gorse Programme, including signing up new agreements and implementing existing ones	The total area of land that has pending agreement or has a gorse agreement on it is 214.6 ha. This includes an agreement to convert 93.3 ha.
Seek Expressions of Interest for low nitrogen land use trials. Commence trials on three properties. Continue addressing gaps in research for housing and tourism opportunities in the catchment	The Low Nitrogen Land Use Fund attracted 19 Expressions of Interest with 16 applicants invited to submit a full application. Ten applications were received and eight projects were put forward and approved by the Rotorua Te Arawa Lakes Steering Group in April, totalling $1.26M.
Continue to implement the Lake Rotorua Incentives Scheme, including signing up new agreements and implementing existing ones	To date, 21.5 t of Nitrogen has been secured through the incentives scheme.
Continue to implement the Advice and Support Service for Landowners affected by Plan Change 10	To date, 144 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 reworked to incorporate a greater emphasis on "on-farm" phosphorous mitigations, as a result of the Commissioners' decisions on Plan Change 10 released in 2017. Further rework may be required depending on the Environment Court decision on the appeal into the allocation methodology.
Progress further land use change in Lake Ōkāreka Land Use Project to reduce nutrient loss	An agreement has been signed for 60 ha of gorse and pasture to be planted in mānuka. Feasibility of a further large land use change agreement in the Lake Ōkāreka Catchment is being considered.

Land management as shown in 2018/19 Annual Work Plan	Land management achievements 2018/19
Continue Tarawera Catchment acacia control on land adjacent to Isthmus Track	Acacia control was undertaken over 137 ha of land throughout the 2018 winter period. The 2019 winter control commenced June 2019.
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 project was completed during the reporting period and completes actions 2 and 4 of the Tarawera Lakes Restoration Plan. The local farmer group - Project Rerewhakaaitu, Beef and Lamb New Zealand, Fonterra and the Bay of Plenty Regional Council worked together to develop 48 customised Farm Environment Plans for farms in the inner and outer catchments of Lake Tarawera. This represents most farms in these catchments, with only a few farms opting not to participate, which is a fantastic outcome. These plans will help farmers minimise nitrogen and phosphorus losses to waterways. This 18 month project involved farmers in the catchments of Lakes Rotomahana, Okareka, Okaro, Rotokakahi, Rerewhakaaitu and Tarawera, plus some adjoining farms in the Rangitaiki and Waikato River catchments. Each Farm Plan was supported by an Overseer file which modelled the nutrient footprint of the farm enterprise. While the plans and Overseer files remain confidential to each Landowner, a summary report was compiled for each sector by each of the industry groups and presented back to the community in December 2018. These summary reports will provide valuable input to the Lake Tarawera Catchment modelling currently being undertaken. The Land Management Team continues to work with Landowners to implement the mitigations identified in the individual Farm Environment Plans.

Policy, planning, communications and information technology

Policy, planning, communications and information technology as shown in 2018/2019 Annual Work Plan	Policy, planning, communications and information technology achievements 2018/19
Continue Schedule 1 RMA (1991) process for Lake Rotorua Nutrient Management rules being made operative	Plan Change 10 is currently moving through the Schedule 1 Resource Management Act (RMA), Environment Court process. The Court Hearing versus the Natural Capital Group finished in March and we are awaiting the Court's decision.
Identify timeframes for rules to be developed for the 'Non-Rule 11' lakes	The Rotorua Water Management Area (RWMA) plan change (PC15) will implement the National Policy Statement for Freshwater Management (NPSFM). This will cover the remaining lakes not included within Plan Change 10 or Rule 11 of the Operative RNRP. Notification of PC15 is expected in 2022.
Continue to embed Te Tuapapa o ngā wai o Te Arawa within the Programme	A key focus for Te Arawa Lakes Trust has been continuing to engage hapū and iwi with the Rotorua Te Arawa Lakes Programmes in a number of projects, and ensuring Te Arawa values are maintained. A wananga was held with Regional Council staff on Te Tuapapa, to ensure staff understand how to apply Te Tuapapa within the Programme and work across the lakes.
Continue implementation of the revised Communications Plan for the Programme	A key recommendation from the 2018 Independent Quality Assurance Review was to align the Communications Plan with the foundational Vision and Strategy Document and milestones of key projects to ensure consistency in communications. The Plan has since been updated to reflect the recommendations. The programme also hosted a stall at the Rotorua Home Show from 13 to 15 July 2018, where staff were able to engage with members of the public. The distribution email list was increased from roughly 400 to 700 in this time. New collateral and brochures were produced for this. A Summer advertising campaign was run during 2018/2019 which included: • Four sponsored stories were run through New Zealand Media and Entertainment (NZME), which talk about the programme as a whole and

Policy, planning, communications and information technology as shown in 2018/2019 Annual Work Plan	Policy, planning, communications and information technology achievements 2018/19
	what is being done to achieve targets, how Landowners can help and engage and how the general public can help. • Radio messaging has been targeted at rural land owners through Radio Sport and News Talk ZB farming segments for parts of the programme, including land use changes and gorse conversion. • Targeted messaging has been placed on bus backs for general public, with images captured from real staff and people in the community who are working towards cleaner lakes. • A video which simply outlines what the programme does was produced and played at cinemas across the summer months. • An animation was produced to explain how excess nutrients in Lake Rotorua are a problem. This has been used on social media and in local cinema advertising. • The Lakes Programme website has been rebuilt and was launched in December. The website focuses on each of the Te Arawa akes and why we are working towards improving their water quality. Facebook and Instagram numbers have grown significantly over the last year with 2,327 Facebook and 486 Instagram followers.
Progress Phase Two of the Nutrient Discharge Management System	Phase two was completed at the end of December. This will deliver an automated process for transfers, agreements and NMP committed actions. Development of Phase three is underway.
Complete cultural mapping for all lakes	Regional Council have a contract with Te Arawa Lakes Trust to deliver cultural mapping. Reports for Lakes Rotorua, Rotoehu, Rotomā, Tarawera and Okareka have been completed.

Policy, planning, communications and information technology as shown in 2018/2019 Annual Work Plan	Policy, planning, communications and information technology achievements 2018/19
Assist Te Arawa Lakes Trust to establish an Iwi Engagement Forum for lakes matters	In January 2019, Te Arawa Lakes Trust provided a proposal to establish this forum. This is currently being considered with the aim of establishing the forum in the first quarter of 2019/20.

Sewerage

Sewerage as shown in 2018/2019 Annual Work Plan	Sewerage achievements 2018/19
Commence a project to connect the remaining unconnected properties in the Lake Rotorua Catchment to sewerage reticulation	**Staff from both councils are working together to get unconnected properties connected to sewerage reticulation.**
Complete construction of the Rotomā/Rotoiti wastewater treatment plant, land disposal system and reticulation	**Construction of the wastewater treatment plant is nearing completion. The reticulation system and wastewater plant are expected to be operational by late August.**
Seeking approval for the Rotorua Wastewater Treatment Plan alternative disposal site	The resource consent application has been lodged and most likely will be heard by the Environment Court in 2020, as part of the Direct Referral Process under the RMA.
Continue community engagement at Rotoehu in relation to sewerage, with the aim of agreeing on preferred options	Engagement with the community regarding sewerage reticulation options is currently on hold pending the completion of the Rotomā/Rotoiti sewerage scheme.
Assist the community to decide whether sewerage reticulation is a feasible response to declining water quality on Lake Tarawera	The Tarawera Sewerage Steering Committee have adopted a preferred option for sewerage reticulation, using grinder pumps and reticulation down Tarawera Road back to the Lake Rotorua Wastewater Treatment Plant. This option is to be confirmed through the development of a Cultural Impact Assessment.

Part 4
Rotorua Te Arawa Lakes annual water quality results

Introduction

The Regional Natural Resources Plan includes policies designed to manage the water quality of the 12 Rotorua Te Arawa lakes. Each of these lakes has an objective 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 physico-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 (TP), Total Nitrogen (TN), Chlorophyll-a and Secchi depth (water clarity). For further information on the lakes water quality monitoring programme and methods, refer to Scholes and Hamill (2016): https://cdn.boprc.govt.nz/media/566926/rotorua-lakes-report-2014_2015.pdf

The table below summarises the TLI data for the Rotorua Lakes for the period July 2018 to June 2019.

Table 1 Three-yearly average TLI values, annual TLI, trophic status category and LakeSPI condition for the Rotorua Lakes.

Lake *Regional Natural Resources Plan Objective* *TLI units*	2014/15 Annual TLI *TLI units*	2015/16 Annual TLI *TLI units*	2016/17 Annual TLI *TLI units*	2017/18 Annual TLI *TLI units*	**2018/19 Annual TLI**	**2018/19 3 yearly annual average TLI**	**Lake Type** *based on Trophic Status*	**LakeSPI Condition** 2018[1]
Ōkaro **5.0**	**4.6**	**4.6**	**4.9**	5.2	5.2	5.1	Super-trophic	Moderate
Rotorua **4.2**	4.4	4.4	**4.1**	4.3	4.4	**4.2**	Eutrophic	Moderate
Rotoehu **3.9**	4.5	4.6	4.6	4.8	5.3	4.9	Eutrophic/ Super-trophic	Poor
Rotomahana **3.9**	4.0	4.0	4.0	4.2	4.0	4.1	Mesotrophic/ Eutrophic	High

[1] NIWA (2018). Assessment of the Rotorua Te Arawa lakes using LakeSPI – 2018.

Lake *Regional Natural Resources Plan Objective TLI units*	2014/15 Annual TLI *TLI units*	2015/16 Annual TLI *TLI units*	2016/17 Annual TLI *TLI units*	2017/18 Annual TLI *TLI units*	**2018/19 Annual TLI**	**2018/19 3 yearly annual average TLI**	**Lake Type** *based on Trophic Status*	**LakeSPI Condition** 2018[2]
Rotoiti **3.5**	3.7	3.8	3.8	3.9	3.8	3.8	Mesotrophic	Poor
Rerewhakaaitu **3.6**	**3.3**	**3.4**	**3.5**	4.0	4.1	3.8	Mesotrophic	Moderate
Okareka **3.0**	3.3	3.2	3.4	3.5	3.4	3.4	Mesotrophic	Moderate
Tikitapu **2.7**	2.9	2.9	**2.6**	2.9	2.9	2.8	Oligotrophic	Moderate
Ōkataina **2.6**	2.8	2.8	2.9	3.0	2.8	2.9	Oligotrophic	Moderate
Tarawera **2.6**	3.1	3.0	3.1	3.1	3.0	3.1	Oligotrophic	Moderate
Rotoma **2.3**	2.5	2.4	**2.3**	2.5	2.6	2.5	Oligotrophic	High
*Rotokakahi** ***3.1***	*4.0*	*3.7*	*3.8*	*3.7*	*3.8*	*3.7*	Mesotrophic	Moderate

**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 remained above its target TLI for the second year, due to increased TP and TN.
- The TLI for Lake Rotorua remains just above its RNRP objective; however, cyanobacteria activity remained at a low level.
- Lake Rotoehu experienced prolonged and severe cyanobacteria blooms exacerbated by sustained stratification. Its annual average TLI moved into super-trophic classification (TLI of 5.3), the first time since the early 1990s.
- Lake Rotoiti TLI remains stable, but still exceeds its target TLI by 0.3 TLI units. Okawa Bay did, however, experience cyanobacteria bloom in late autumn resulting in a health warning. The lake has remained resilient to further degradation since the installation of the Ohau Channel diversion wall, as indicated by stable hypolimnetic oxygen concentrations and dissolved nutrients.
- After the multiple rain events of the previous year resulted in increased phosphorus levels and rising lake levels, Lake Ōkāreka's annual average TLI decreased compared to last year's (three year annual average remained the same). Nitrogen remains stable but there is an increasing phosphorus trend.
- Lake Rerewhakaaitu's annual average TLI has risen over the past two years, driven by sustained stratification events due to climatic conditions.

[2] NIWA (2018). Assessment of the Rotorua Te Arawa Lakes using LakeSPI – 2018.

- Lake Tikitapu remains at a TLI of 2.9, 0.3 TLI units above its objective. Although phosphorus levels decreased, there was a significant decline in water clarity, which may be an artefact of the previous year intensive rainfall events and a rise in lake level.

- Lake Rotomahana displayed a decrease in annual average TLI. Nitrate-nitrite-nitrogen is observed to have increased in the past two years.

- Lakes Ōkataina and Tarawera's TLI have been stable over the last five 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 with TLI results being stable over the past few years, but exceeding its TLI target.

Lake Rotorua

The three year average TLI sits at the objective TLI (4.2 TLI units), although the annual average TLI remains above the objective, at 4.4 TLI units. Chlorophyll-a and TN concentrations remain steady, but TP concentrations were the highest in five years. This is in part explained by Dissolved Reactive Phosphorous (DRP) increases in late summer/autumn, coinciding with stratification events and alum dosing to the Puarenga Stream being turned off at the end of 2018, the alum bulk tank was out of survey.

Two strong stratification events occurred, one in January and another on March. The most significant seems to have been over late March, lasting around a week.

Cyanobacteria levels remained relatively low, similar to the previous summer. All of the sites within Lake Rotorua remained in the green surveillance level during the course of this season.

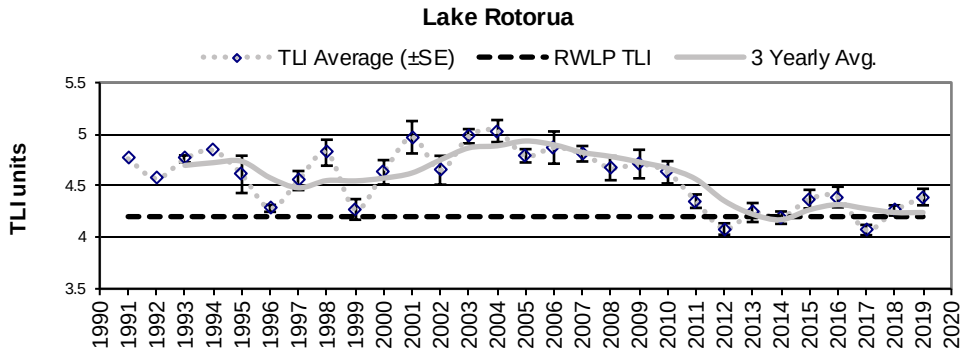

Figure 2 Lake Rotorua annual average and three year average TLI results, compared to the RRP Objective TLI.

Lake Rotoehu

Lake Rotoheu's year has been marked by persistent cyanobacteria blooms for most of the year. This has seen the TLI annual and three yearly average rise to 5.3 and 4.9 respectively. TN and TP concentrations have spiked over the summer with the onset of stratification. Chlorophyll-a concentrations were some of the highest in recorded history which has led to an ongoing recent decline in water clarity.

There has been an increase in nitrate concentrations over the past few winters. While this may in part be explained as conversion of ammonia released from sediment during stratification, there may be also additional input released form soils due to recent forest harvesting.

Both sites in Lake Rotoehu started and ended the monitoring season in an alert status. On 21 November 2018, Kennedy Bay was in amber alert level and Ōtautū Bay was in the red action mode. Kennedy Bay joined Otautu Bay in the red action level on 5 December 2018 and for the majority of the season they were both in red action level with intermittent decreases to amber and green level biovolumes on occasion. These occasional drops in cyanobacteria biovolume did not remain low for long enough to remove the red alert status, until Kennedy Bay reached an amber alert status in the middle of May 2019. A health warning remains for the lake due to ongoing cyanobacterial blooms.

The very high annual TLI also has occurred in a year when the Waitangi Soda Stream alum dosing has been turned off, due to high lake levels contributing to poor phosphorus removal efficacy.

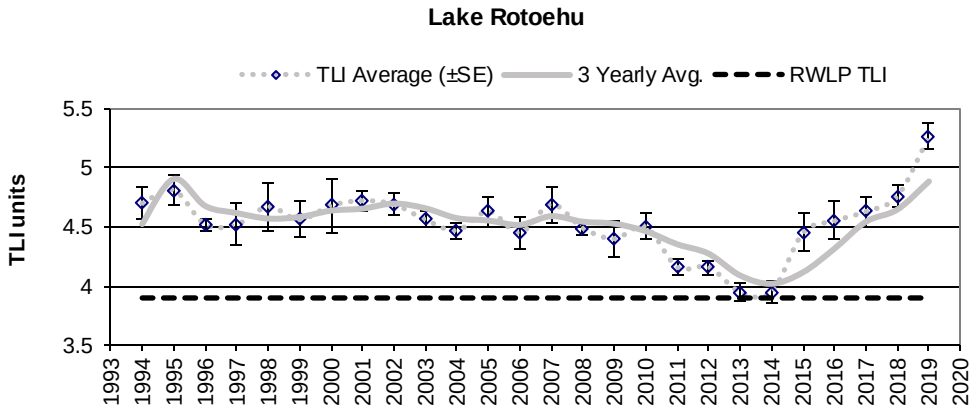

Figure 3 *Lake Rotoehu annual average and three year average TLI results, compared to the RNRP Objective TLI.*

Lake Rotoiti

Lake Rotoiti's annual average TLI decreased slightly compared to last year at 3.8, but remains above its objective TLI of 3.5. The three-year average TLI is 3.8. Annual average TP concentration was the lowest in the last five years, while TN remains steady. An elevated spike in chlorophyll-a concentration occurred in autumn probably due to lake turnover.

Dissolved nutrients remain stable, as does hypolimnetic oxygen demand.

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. Red alert levels were reached in May resulting a health warning being imposed.

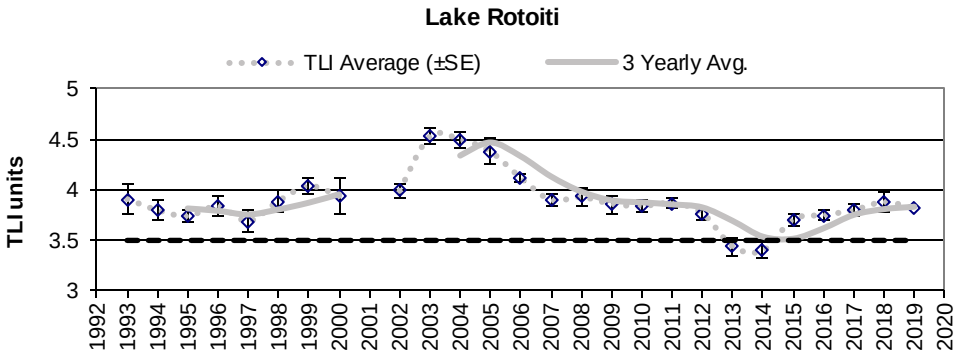

Figure 4 *Lake Rotoiti annual average and three year average TLI results, compared to the RNRP Objective TLI.*

Lake Ōkāreka

Lake Ōkāreka's annual average TLI decreased slightly from 3.5 last year to 3.4 for 2018/2019. The three year annual average remains steady at 3.4 TLI units. Total Nitrogen (TN) has remained stable over the past 10 years with a decrease on average compared to last year, and the annual average TP showed a reduction compared to last year but displays a longer term increasing trend.

Hypolimnetic oxygen levels remain similar to the last two years; however, ammoniacal-nitrogen concentrations did increase in the hypoliminion over the stratification period for the last two years. Dissolved reactive phosphorus and nitrate-nitrite-nitrogen remain relatively unchanged. Increased lake level two years ago had some influence on nutrient concentrations and may still have some legacy effect. Increased lake levels can result in longer stratification periods due to increased energy requirement to achieve mixing, which might also explain elevated ammoniacal-nitrogen concentrations.

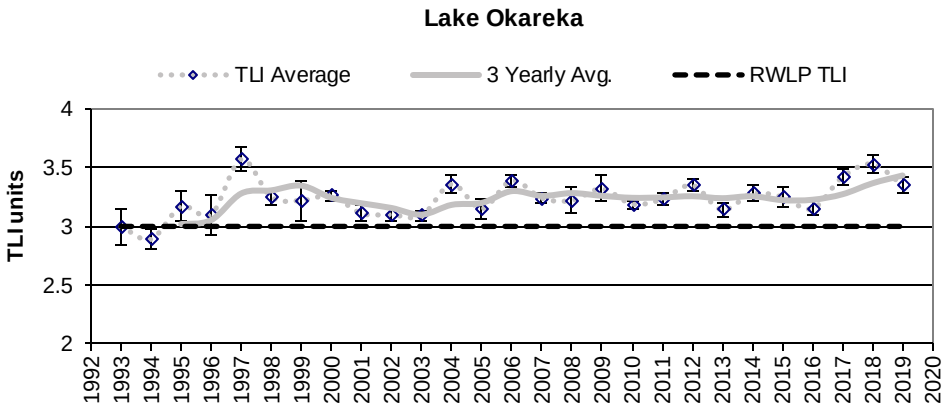

Figure 5 *Lake Okareka annual average and three year average TLI results, compared to the RNRP Objective TLI.*

Lake Tarawera

The annual average TLI in Lake Tarawera remains similar to last year at 3.0. The TLI remains almost 0.5 above the RNRP objective of 2.6, with the three year average steady at 3.1.

Chlorophyll-a annual average concentration decreased compared to last year, consistent with other annual average TLI parameters. Both TN and TP were at their lowest concentrations in five years, but Secchi depth was slightly lower than the previous four years.

Nitrate-nitrite-nitrogen remains stable in the hypolimnion but decreased in the eplimnion compared to the previous two years. DRP has decreased compared to the previous five years, consistent with TP.

No reported cyanobacteria blooms occurred over the 2018/2019 season.

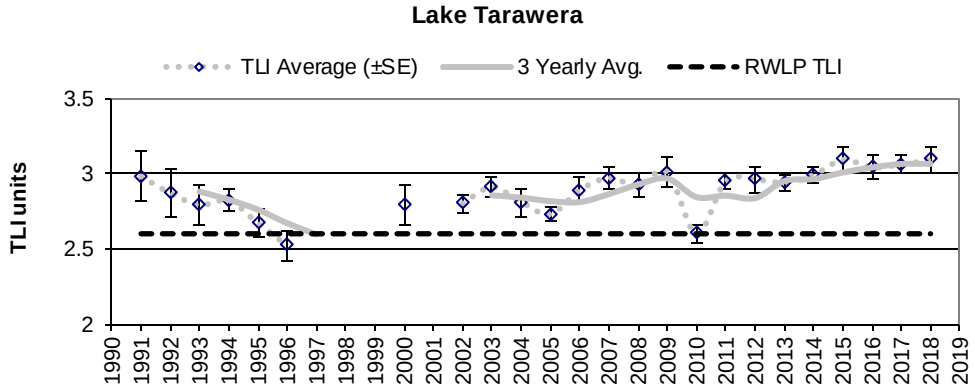

Figure 6 Lake Tarawera annual average and three year average TLI results, compared to the RNRP Objective TLI.

Lake Ōkaro

Lake Okaro remains just above its target TLI of 5.0. The annual average TLI improved slightly on last year in part due to lower chlorophyll-a concentrations in late spring/early summer. Both TN and TP annual average concentrations were elevated compared to the last five years, although productivity (as indicated by chlorophyll-a) did not increase compared to the previous year). Lower algal biomass in late summer 2019 saw an improvement in water clarity, and reduced TN and TP concentrations. Dissolved reactive phosphorus (DRP) in the hypolimnion was elevated compared to the previous five years.

Cyanobacteria were present at red action levels when summer monitoring began in November 2018, continuing into early January. Cyanobacteria biovolumes dropped off after this and remained in green surveillance level for the remainder of the season.

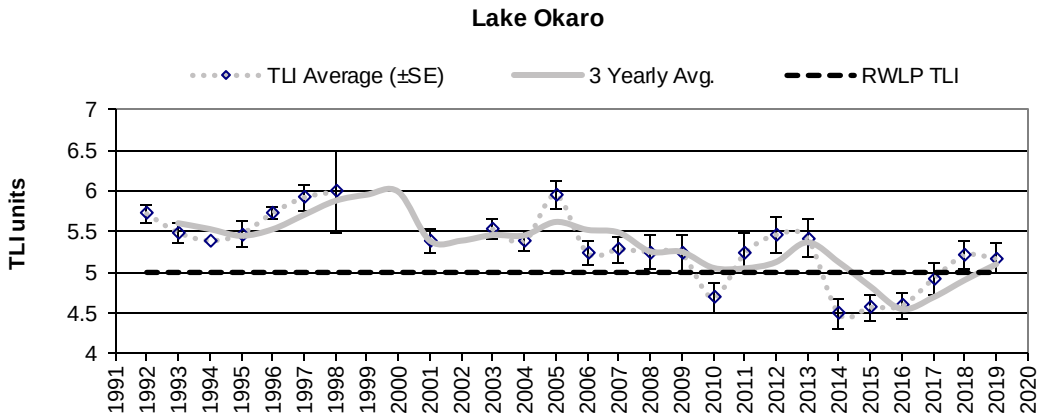

Figure 7 *Lake Okaro annual average and three year average TLI results, compared to the RNRP Objective TLI.*

Lake Rotomahana

Lake Rotomahana's annual average TLI dropped back down after an increase last year, moving from 4.2 to 4.0. The annual average TLI remains above the RNRP objective of 3.9, and the three yearly average remains relatively steady at 4.1.

There was an improvement in water clarity and chlorophyll-a concentrations compared to last year. Total Nitrogen concentrations have increased in the past two years, with TP reasonably stable over the past five years.

Dissolved reactive phosphorus concentrations showed a slight increase as did ammoniacal-nitrogen. There was a more sustained increase in nitrate-nitrite-nitrogen concentrations over the 2018/2019 winter making for the highest annual average observed for this lake since observations begun. This has impacted total nitrogen with the highest total nitrogen in 10 years observed.

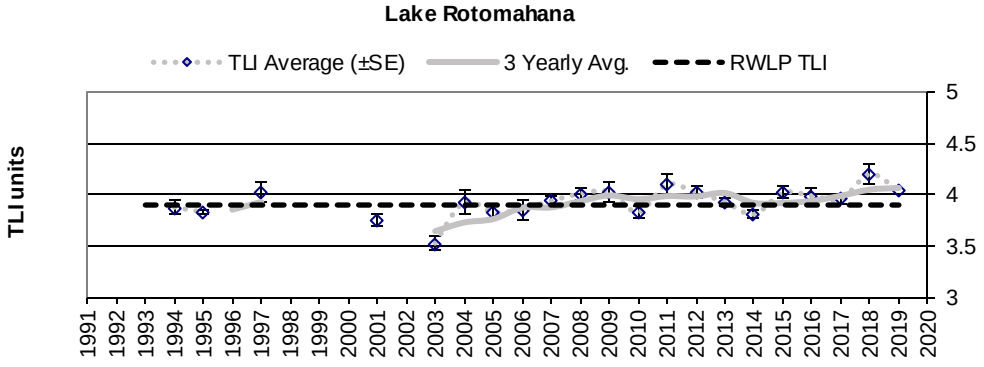

Figure 8 *Lake Rotomahana annual average and three year average TLI results, compared to the RNRP Objective TLI.*

Lake Rerewhakaaitu

Lake Rerewhakaaitu's annual average TLI continues to rise above the RNRP objective of 3.6, at 4.1 for 2018/2019. The three year average increased to 3.8 TLI units. Strong stratification events and high lake levels, a result of intensive rainfall events, have led to increased TN and TP concentrations. Chlorophyll-a concentrations have been increasing over the past couple of years, and correspondingly Secchi depth (water clarity) has been decreasing. Secchi depth has shown some improvement in 2019.

Nitrate-nitrite-nitrogen levels remain elevated explaining the increase in TN. Concentrations peaked over the past two winters as did lake levels. Ammoniacal-nitrogen increased over the stratification period as a result of oxygen depletion leading to nutrient sediment release. Ammoniacal-nitrogen is converted to nitrate-nitrite-nitrogen under conditions right for denitrification explaining the increase in nitrate-nitrite-nitrogen. However, there may have been additional inputs from sub-surface leaching from surrounding lands.

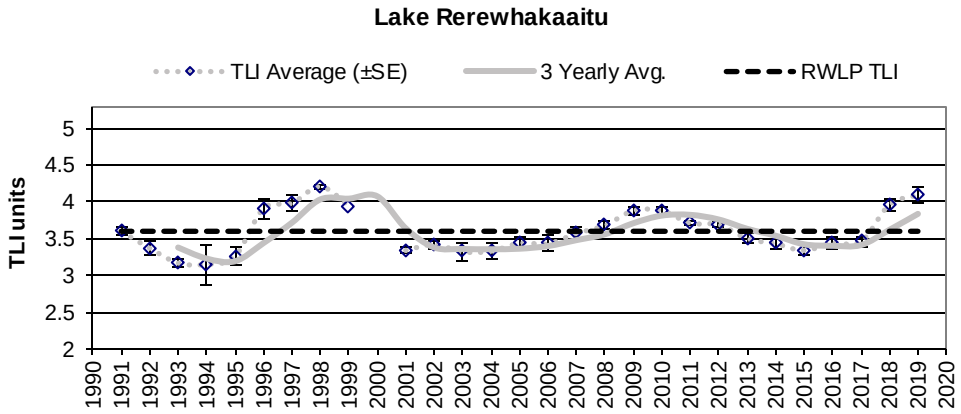

Figure 9 *Lake Rerewhakaaitu annual average and three year average TLI results, compared to the RNRP Objective TLI.*

Lake Tikitapu

Lake Tikitapu's annual average TLI remains at 2.9 above the 2.6 TLI objective. The three-year average TLI also remains at 2.8 for 2018/2019 year.

Chlorophyll-a average annual concentrations decreased compared to a high level in the previous year, but did have a sustained winter/spring peak after winter turnover. Total Nitrogen has remained at steady concentrations, and phosphorus decreased to lowest levels in over ten years, similar to those experienced in 2011/2012 (also a time of increased lake level). Water clarity (Secchi depth) did show a significant decrease over winter/spring leading to an annual average drop over 1 m.

Ammoniacal-nitrogen concentrations increased in the hypoliminion over the stratification period, with dissolved reactive phosphorus and nitrate-nitrite-nitrogen remaining at low levels.

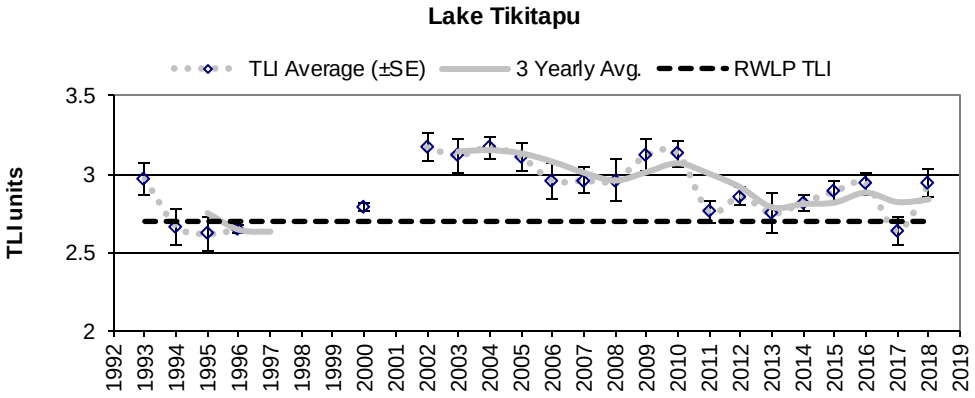

Figure 10 *Lake Tikitapu annual average and three year average TLI results, compared to the RNRP Objective TLI.*

Lake Ōkataina

Lake Ōkataina's annual average TLI decreased from the previous two years sitting at 2.8 compared with 3.0 last year. The three-yearly average TLI remained at 2.9.

Average annual chlorophyll-a concentrations dropped compared to the last three years, but continues to display strong seasonal patterns (winter high, summer low). Both TP and TN remain relatively stable. A low water Secchi depth reading was taken in early summer holding the annual average value down.

The oxygen depletion rate decreased compared to the previous five years. Nitrate-nitrite-nitrogen did show an increase in the hypolimnion, which may be an artefact of ammonical-nitrogen build up during stratification.

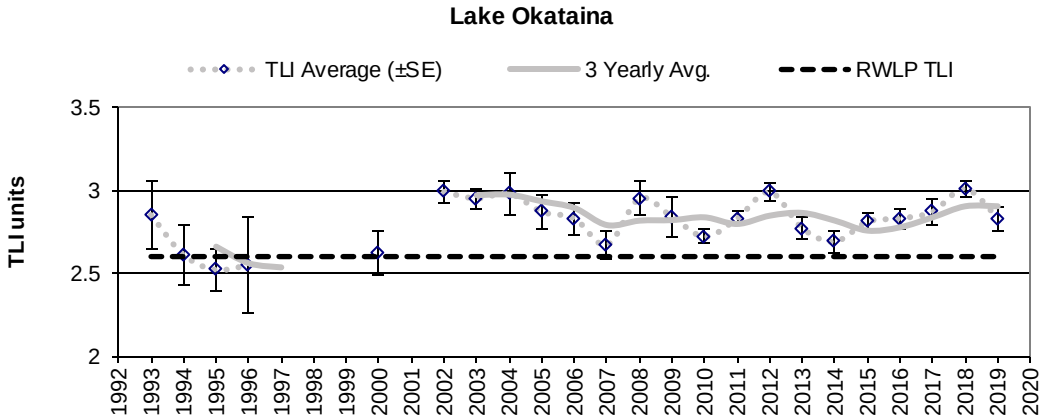

Figure 11 *Lake Okataina annual average and three year average TLI results, compared to the RNRP Objective TLI.*

Lake Rotomā

Lake Rotomā's annual average TLI increased compared to last year to be 0.3 TLI units above its RNRP objective of 2.3, sitting at 2.6. The three-year average TLI for 2018/2019 is 2.5.

The increase in TLI was driven by primarily by some low Secchi results (water clarity) and a small increase in annual average TN concentration. Low water clarity readings are not well supported by the Vertical Light Extinction Co-efficient results (a measure of the photosynthetic Available Radiation (sunlight) through the epilimnion). Phosphorus and chlorophyll-*a* levels remain stable.

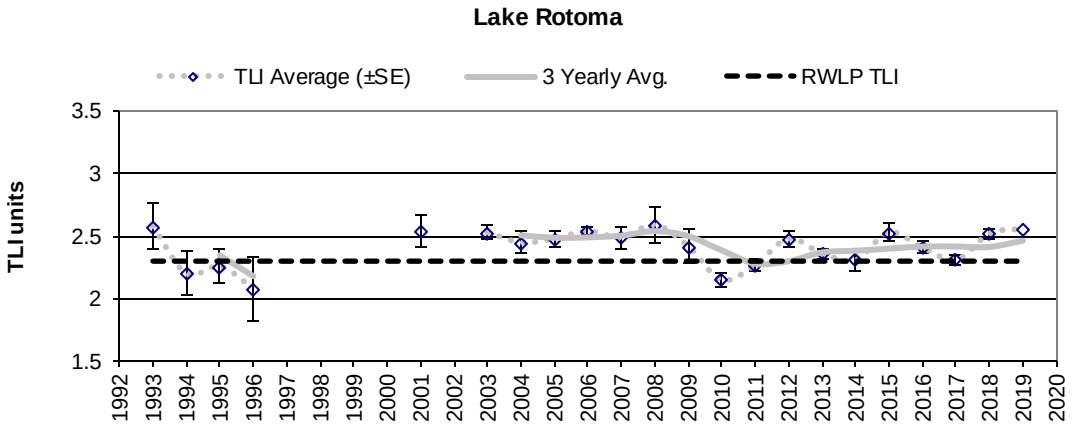

Figure 12 Lake Rotomā annual average and three year average TLI results, compared to the RNRP Objective TLI.

Lake Rotokakahi

The 2018/2019 TLI measured at Lake Rotokakahi (at the outflow) remains steady at 3.8, slightly increased from last year's result of 3.7. The TLI still remains well above its RNRP objective of 3.1. The three year average TLI for 2018/2019 (as measured by TP, TN and chlorophyll-a) remains at 3.7.

Chlorophyll-a and nitrogen concentrations remain stable, however, phosphorus concentrations increased marginally compared to last year.

No cyanobacteria blooms were observed over the summer months.

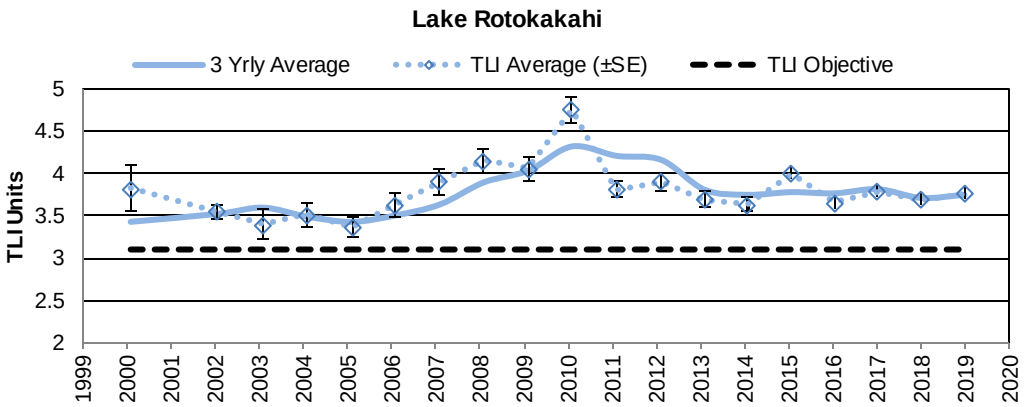

Figure 13 *Lake Rotokakahi annual average and three year average TLI results, compared to the RNRP Objective TLI.*

Part 5
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 t annually. This limit is set in the Bay of Plenty RPS.

Planned and completed activities – Lake Rotorua

Project	Deed funded	At lake target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Lake Rotorua Gorse Conversion Project	Yes	365.5 ha	200 ha	214.6 ha (total)	A total of 214.6 ha of gorse has been removed from the catchment. The remaining gorse areas in the catchment are small, patchy lots. Staff are continuing to work with Landowners of these lots to develop individual strategies to support conversion.	**Budget** $221 **Spend** $561	
Rotorua Wastewater Treatment Plant – Alternative Disposal Site	No	N/A	N/A	N/A	A resource consent application was lodged with the Regional Council and has been publically notified. The application is unlikely to be heard in the Environment Court until 2020.	**Budget** $0	
Connection of currently unreticulated properties	Yes	N/A	N/A	N/A	There are a number of properties in the Lake Rotorua Catchment that are not connected to sewerage reticulation. Staff from both Councils are working together to progress connecting properties.	**Budget** $180 **Spend** $0	
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 0.8 t P	Previously completed, reductions achieved annually.	**Budget** $0	N/A

Project	Deed funded	At lake target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Incentives	Yes	100 t N (Reduction of nitrogen entering the lake)	35 t N	1.7 t N	The Incentives Scheme has secured deals of around 21.5 t of Nitrogen. The Lake Rotorua Incentives Committee undertook their Strategic Review as required by the Terms of Reference. The findings are being presented to Council in August.	**Budget** $7,558 **Spend** $782	
Tikitere Zeolite Plant	Yes	20-25 t N 0.0 t P	N/A	N/A	Creep in the project capital costs through the trial and design process impacted negatively on the project viability. The early capital cost was estimated at $4.6M which has escalated to more than $9.6M with operating costs of $750,000 a year. A project close out report was approved by PSG September 2018. Preference moving forward is to see investment in projects which will be assets to the community, in addition to in-lake nitrogen removal. Recent advice now indicates protection and enhancement of existing wetlands and development of new wetlands are likely to be a more cost effective solution. There may also be opportunities in weed harvesting.	**Budget** $500 **Spend** $111	

Project	Deed funded	At lake target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Further engineering solutions	Yes	15 t N 0.0 t P	N/A	N/A	A working group has been established to investigate engineering solutions within the catchment to achieve the remaining 50 t N. The preference moving forward is to see investment in projects which will be assets to the community including in-lake nitrogen removal, enhancement and protection of existing wetlands, fencing off seeps, development of new wetlands and removal of nitrogen fixing species. A project is underway to remove alders (nitrogen fixing plants) along the Puarenga Stream. Staff are liaising with interested Landowners regarding wetland restoration and enhancement. Other projects are possible but will take more time to establish.	**Budget** $500 **Spend** $0	

Project	Deed funded	At lake target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Advice and Support Service	Yes	N/A	N/A	N/A	To date, 144 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 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 in 2017. When completed, Landowners are able to use their NMP to support their application for resource consent. Twenty seven resource consents have been granted to date, with a number of others being processed. Overseer Legacy has been replaced with Overseer FM. The new software is easier for Landowners to use and enables the Landowner to publish files directly to Council.	**Advice and Support Budget** $500 **Spend** $197	

Project	Deed funded	At lake target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Low Nitrogen Land Use Fund	Yes	N/A	N/A	N/A	The Land Use Innovation Series was run during August by the Te Arawa Primary Sector with funding and support from the Programme. A series of workshops and field trips were held to showcase possible alternative low nitrogen land uses for the Lake Rotorua Catchment. The Low Nitrogen Land Use Fund attracted 19 Expressions of Interest with 16 applicants invited to submit a full application. Ten applications were received and eight projects were put forward and approved by the Rotorua Te Arawa Lakes Steering Group in April, totalling $1.26M. Several contract negotiation meetings have been held, including PSG approval to enter into hemp trial contract negotiators totalling up to $179,000.	**Budget** $500 **Spend** $129	
Phosphorous Locking (Utuhina and Puarenga)	Yes	As required	As required	4.78 t P	The two phosphorus locking plants on the Puarenga and Utuhina streams continue to control in-lake phosphorus levels to the long term target. As a result, the lake had a TLI of 4.3 units for 2017/18 year, which is close to the target and no algal blooms were reported. Staff have been trialling low dose setting over the past 12 months to establish critical response to dose rate and potentially improve cost benefit ratio.	**Budget** $665 **Spend** $392	

Project	Deed funded	At lake target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Lake Rotorua Regional Water and Land Plan – Proposed Plan Change	No	140 t N (Reduction of nitrogen entering the lake)	N/A	N/A	Plan Change 10 is currently moving through the Environment Court process. Expert Conferencing was completed and the Court hearing versus the Natural Capital Group finished in March 2019. We are awaiting the Court's decision. No date has been set for the commencement of Stage 2 appeals.	**Budget** $0	
Nutrient Agreements (not Incentives Scheme)	No	N/A	3.9 t N 0.07 t P	t N t P	These are historical agreements to reduce nitrogen discharge from land - in effect, nutrient reductions realised annually.	**Budget** $0	N/A
Reconsenting of Phosphorus Locking on Lakes Rotorua and Rotoehu	Yes	N/A	N/A	N/A	Resource consent application has been made to renew the Lake Rotorua consents and Council is continuing to finalise consultation in relation to the application. Council has approval to continue Lake Rotorua operation of the alum dosing until such time as a decision on the application is made. Staff are working with consultants to make consent application for a range of dosing locations in Lake Rotoehu by October 2019. This approach has been workshopped with science advisors and is expected to improve the alum dosing efficiency on that Lake.	**Budget** $105 **Spend** Figures included in P locking	
					Total budget 2018/19 **Total expenditure 2018/19**	$10,729 $2,171	

Lake Rotoehu

To meet community expectations for water quality in Lake Rotoehu, a reduction of 8.9 t of nitrogen and 0.708 t of phosphorus is required.

Planned and completed activities – Lake Rotoehu

Project	Deed funded	At lake 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 Root Zone	8.45 t N 0.8 t P	8.45 t N 0.8 t P	The land use change target for the Lake was completed a number of years ago now. The benefits of the reduction in nutrient entering the catchment is realised annually.	**Budget** $0	N/A
Weed harvesting	Yes	N/A	N/A	N/A	In the past three years weed has not been available for harvest due to high algae growth, so we have been unable to remove any nitrogen or phosphorus with this intervention.	**Budget** $50 **Spend** $28	
Phosphorus locking	Yes	As required	As required	0 t N 0 t P	A recent workshop with scientists regarding the water quality of Lake Rotoehu has revealed some issues with the operation of the phosphorus locking plant and the natural chemical processes within the lake. Changes are being made to attempt to operate this plant to more effectively lock phosphorus and improve water quality. These changes focus mainly on achieving application of alum in the area where it is most likely to be effective.	**Budget** $335 **Spend** $118	

Project	Deed funded	At lake target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Rotoehu sewerage reticulation	No	N/A	N/A	N/A	Engagement with the community regarding sewerage reticulation options is currently on hold pending the completion of the Rotomā/Rotoiti Sewerage Scheme. Subsidy funding for sewerage reticulation is being explored.	**Budget** $0	
					Total budget 2018/19 **Total expenditure 2018/19**	**$385** **$146**	

Lake Rotoiti

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

Planned and completed activities – Lake Rotoiti

Project	Deed funded	At lake target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Sewerage Scheme 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 sewerage scheme is largely complete. Pre-commissioning of the wastewater plant is underway. The reticulation system and wastewater plant are expected to be operational by late August.	**Budget** $11,445 **Spend** $11,021	

Ohau Diversion Wall	No	150 t N 15 t P	150 t N 15 t P	150 t N 15 t P	A condition inspection was undertaken on the Ohau Wall to confirm corrosion rates. The inspection has identified the first signs of holes in the wall since inspections started. The protection method developed in the Structural Management Plan is the preferred option and installation of the stiffening components to strengthen the wall will be undertaken in 2019/20.	**Budget** $0	
Completed reticulation	Yes	5.9 t N 0.21 t P	5.9 t N 0.21 t P	5.8 t N 0.48 t P	Completed reticulation – reduction ongoing annually.	**Budget** $0	
Install monitoring buoy	No	N/A	N/A	N/A	This project is on hold until such time as BOPRC has a clear understanding of the costs associated with managing the multiple lake buoys. A proposal to manage all buoys is being sought from contractor.	**Budget** $36 **Spend** $0	
					Total Budget 2018/19 **Total Expenditure 2018/19**	**$11,445,036** **$11,021**	

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.

Completed activities – Lake Ōkāreka

Project	Deed funded	At lake target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Further land use change project	Yes	NA	100 ha	53 ha	Ōkāreka benchmark auditing was carried out in 2017/18 with one farm to be found in excess of their Rule 11 Benchmark. The non-compliant Landowner has agreed to work with an agricultural consultant to come into compliance and staff are currently facilitating this. Fifty three hectares of land use change from gorse and pasture to mānuka was legally secured in the 2018/19 year. Gorse spraying has been undertaken and planting will occur in 2020.	**Budget** $320 **Spend** $114	
Install monitoring buoy	No	NA	NA	NA	This project is on hold until such time as BOPRC has a clear understanding of the costs associated with managing the multiple lake buoys. A proposal to manage all buoys is being sought from contractor.	**Budget** $36 **Spend** $0	
Lake Ōkāreka outlet streamworks	No	NA	NA	NA	Stage one, erosion protection work on the Waitangi Stream erosion is now complete. These repairs have been necessary to protect streambanks from the higher flows in response to exceptionally high lake levels in Lake Ōkāreka. Stage two, erosion protection works will take place during 2019/20 financial year.	**Budget** $150 **Spend** $580	

Project	Deed funded	At lake target	12 month target	Annual reduction achieved	Update	Budget $000	Project status
Sewerage Scheme	Yes	1.9 t N 0.02 t P	1.9 t N 0.02 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	1.26 t N 0.37 t P	Land use change complete, nutrient reductions recognised annually. Reductions at root zone.	**Budget** $0	N/A
					Total budget 2018/19 **Total expenditure 2018/19**	**$506** **$694**	

Part 6
Annual Plan of Interventions – Non Deed funded

Tarawera Lakes Catchments

The actions outlined in the table below are all actions in the Tarawera Lakes Restoration Plan which encompasses the seven lake catchments feeding and including Lake Tarawera. All actions within the restoration plan, which was developed in consultation with the community, are now either complete or underway with updates outlined here.

Te Arawa Lakes Trust are leading the next steps for action on Lake Tarawera, primarily working with the Nature Conservancy.

Lake Tarawera	Lake Tarawera achievement 2018/19
Farm Environment Plans for the inner and outer Tarawera Catchments	This project was completed during the reporting period and completes actions 2 and 4 of the Tarawera Lakes Restoration Plan. The local farmer group - Project Rerewhakaaitu, Beef and Lamb New Zealand, Fonterra and BOPRC worked together to develop 48 customised Farm Environment Plans for farms in the inner and outer catchments of Lake Tarawera. This represents most farms in these catchments, with only a few farms opting not to participate. These plans will help farmers minimise nitrogen and phosphorus losses to waterways. This 18 month project involved farmers in the catchments of lakes Rotomahana, Okareka, Okaro, Rotokakahi, Rerewhakaaitu and Tarawera, plus some adjoining farms in the Rangitaiki and Waikato River catchments. Each farm plan was supported by an Overseer file which modelled the nutrient footprint of the farm enterprise. While the plans and Overseer files remain confidential to each Landowner, a summary report was compiled for each sector by each of the industry groups and presented back to the community in December 2018. These summary reports will provide valuable input to the Lake Tarawera Catchment modelling currently being undertaken.

Lake Tarawera	Lake Tarawera achievement 2018/19
	The Land Management Team continues to work with Landowners to implement the mitigations identified in the individual Farm Environment Plans.
Sewerage reticulation	The Tarawera Sewerage Steering Committee have adopted a preferred option for sewerage reticulation at Lake Tarawera. This includes grinder pumps and reticulation down Tarawera Road back to the Lake Rotorua wastewater treatment plant. This option is to be confirmed through the development of a Cultural Impact Assessment.
Tarawera cultural health assessment	This action, led by Te Arawa Lakes Trust has been completed.
Nutrient modelling	Nutrient modelling to review nitrogen and phosphorus loads within the Tarawera Catchment has been complicated by difficulties in historical nutrient analytical technique changes. This issue has been resolved sufficiently to allow completion of the modelling in the near future.
Acacia control	Acacia control was undertaken over 137 ha of land throughout the 2018 winter period. The 2019 winter control started in June 2019. A trial of two different herbicides for acacia control was undertaken but unfortunately proved ineffective. The contractors will continue using Glyphosate.

Lake Rotomā

Lake Rotomā	Lake Rotomā achievement 2018/19
Forest Harvesting Effects Investigation	Monitoring on forest harvest impacts are being undertaken. The results indicate high levels of nitrogen are leaching in the years after harvesting. A detailed report is expected December 2019.
Sewerage reticulation	Construction of the sewerage scheme is largely complete. Pre-commissioning of the wastewater plant is underway. The reticulation system and wastewater plant are expected to be operational by late August.

Catfish incursion management

In December 2018, brown bullhead catfish were discovered by Mokoia Island in Lake Rotorua. This was the first time the pest fish had been discovered in the lake.

The 2018/19 season saw a total of 28,060 catfish netted, which is an 18% decrease on the 2017/18 season (34,117). The majority of the pest fish are being caught in Lake Rotoiti with low numbers in Lake Rotorua (170).

A coordinator for the Community Response to the Catfish Incursion was recruited by Te Arawa Lakes Trust. The position has been funded by BOPRC for a period of three years. Volunteers have netted approximately 3,125 catfish and have undertaken surveillance in the wider Rotorua Lakes. The volunteer programme has provided valuable information to the Regional Council while also engaging with the public.

An acoustic tracking trial is currently being undertaken, with 30 catfish tagged in Lake Rotoiti, along with spawning disruption surveys undertaken by the National Institute of Water and Atmospheric Research (NIWA), which aims to investigate and disturb spawning sites of catfish.

Research into the eDNA surveillance tool was undertaken by the University of Waikato to further develop the water monitoring tools to determine catfish presence. Trials were also undertaken using pheromone bait from NIWA which proved successful in catching more catfish than regular bait, although this is not yet a cost effective tool. The National Institute of Water and Atmospheric Research and BOPRC are currently refining the pheromone bait to point where it is cost effective.

A comprehensive communications campaign was run over the busy summer and autumn period targeting both local and out of town lake users. Communications included: signage, radio and online advertising, social media and a wide range of collateral distributed to stakeholders.

Part 7
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 2018/19 for both Rotorua Lakes Council and Bay of Plenty Regional Council.

Rotorua Te Arawa Lakes Programme - Report B

Draft - Financial Progress Statement - Quarter 4 Report 2018/19 (July to June 2019)

	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
Interventions	**(A) Council Annual Plan Budget**	**(B) Actual year to date expenditure**	**(B - A) Variance to date over/(under) spend**	**Intervention Project progress indicator**	**Financial status to date**	**(D) Council funding excluding Crown grants (50% of B)**	**(E) Approved Crown funding 2018/19**	**(F) Crown funding received to date**	**(G) = (B - D) 50% Crown funding applied to date**	**(H) Reserve interest accrued**	**(I) Other funding sources**
Lake Rotoehu	**$000**	**$000**	**$000**			**$000**	**$000**	**$000**	**$000**	**$000**	**$000**
Weed Harvesting	50	28	(22)		At risk	14	25	13	14	0	0
Phosphorus Locking Soda Springs	335	118	(217)		At risk	59	168	84	59	0	0
Total Lake Rotoehu	**385**	**146**	**(239)**			**73**	**193**	**96**	**73**	**0**	**0**
Lake Ōkāreka											
Land Management Change	320	114	(206)		At risk	57	160	80	57	0	0
Total Lake Ōkāreka	**320**	**114**	**(206)**			**57**	**160**	**80**	**57**	**0**	**0**
Lake Rotorua											
Advice and Support	500	197	(303)		At risk	98	250	125	98	0	0
Phosphorus Locking	770	392	(378)		At risk	196	385	193	196	0	0
Tikitere Diversions	500	111	(389)		At risk	55	250	125	55	0	0
Gorse	221	561	340		Moderate risk	280	111	55	280	0	0
Land Incentive Payments	7,000	641	(6,359)		At risk	320	3,500	1,391	320	0	0
Land Incentive Board Administration	559	141	(418)		At risk	70	279	140	70	0	0
Low Nitrogen Land Use Fund	500	129	(371)		At risk	64	250	125	64	0	0
Lakes Engineering Solutions	500	0	(500)		At risk	0	250	125	0	0	0
Sewerage Reticulation	180	0	(180)		At risk	0	90	0	0	0	0
Total Lake Rotorua	**10,730**	**2,171**	**(8,559)**			**1,085**	**5,365**	**2,278**	**1,085**	**0**	**0**
Lake Rotoiti											
Sewerage Reticulation	11,445	11,021	(424)		On track	5,511	5,723	2,736	5,511	0	0
	11,445	**11,021**	**(424)**			**5,511**	**5,723**	**2,736**	**5,511**	**0**	**0**
Total Lake Rotoiti	**11,445**	**11,021**	**(424)**			**5,511**	**5,723**	**2,736**	**5,511**	**0**	**0**
Total Programme by Council											
Rotorua Lakes Council	11,625	11,021	(604)			5,511	5,813	2,736	5,511	18	0
Bay of Plenty Regional Council	11,255	2,430	(8,504)			1,215	5,627	2,455	1,215	43	0
	22,880	**13,451**	**(9,108)**			**6,726**	**11,440**	**5,191**	**6,726**	**61**	**0**
Total Programme Expenditure	**22,880**	**13,451**	**(9,108)**			**6,726**	**11,440**	**5,191**	**6,726**	**61**	**0**

Programme reserve account interest accrued

5.4.2 (a) Note 1: Funding detail - Council

Rotorua Te Arawa Lakes Programme - Report B

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		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
Interventions	**(A) Council Annual Plan Budget**	**(B) Actual year to date expenditure**	**(B - A) Variance to date over/(under) spend**	**Intervention Project progress indicator**	**Financial status to date**	**(D) Council funding excluding Crown grants (50% of B)**	**(E) Approved Crown funding 2018/19**	**(F) Crown funding received to date**	**(G) = (B - D) 50% Crown funding applied to date**	**(H) Reserve interest accrued**	**(I) Other funding sources**
RLC general funding			5,511								
RLC reserve			5,511								
BoPRC reserves			1,215								
BoPRC targeted rates			608								
BoPRC general funding			608								
Total funding detail - Council			**13,451**								
5.4.2 (b) Note 2: Funding detail - any other source			0								
Miscellaneous income			**0**								
Total funding from any other source											

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