MEMORANDUM

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| To: | Andy Bruere |  |
| Lake Operations Manager |
| From: | Paul Scholes | Date: 1 August 2013 |
| Environmental Scientist |
| File Ref: | A1654375 | |
| Copy To: | Rob Donald | |
| Subject: | Rotorua Lakes 2012/2013 TLI report | |

Long Line

The following summarises the TLI data for the Rotorua Lakes for the period July 2012 to June 2013.

**Ōkaro**

The 2012/13 TLI declined slightly compared to the previous year (Table 1, Figure 1) due to a decrease in N and P. A sustained early summer cyano-bacteria bloom resulted in higher annual average chlorophyll-*a* and decreased annual average secchi depth.

**Rotorua**

The 2012/13 TLI increased slightly compared to the previous year, and is now slightly above the RWLP objective of 4.2. Increased N, P and chlorophyll-*a* were recorded compared to 2011/12 and there was a decrease in secchi depth. There was a strong winter increase in nitrate in 2012 possibly due to increased P-limitation.

**Rotoehu**

Rotoehu is now close to its TLI objective of 3.9 with an annual average in 2012/13 of 3.95. There was a marked decrease in N and P, the lowest annual levels since 1990. There has also been a continued reduction in chlorophyll-*a* since 2007/08 and this is reflected in a slight decrease in secchi depth compared to the two previous years.

**Rotomahana**

The TLI for Rotomahana remains very stable. Improvements in all TLI parameters in 2012/13 have resulted in a slightly lower annual TLI than the previous two years.

**Rotoiti**

There was a marked improvement in the annual average TLI from 3.77 in 2011/12 to 3.44 in 2012/13 (Figure 2). The objective TLI for the lake is 3.5. Decreased hypolimnetic oxygen demand has resulted in smaller internal nutrient loading reducing the overall N and P concentrations in the lake. The biggest change from last year was an increase in the annual average secchi depth of more than 1 metre.

**Rerewhakaaitu**

The annual TLI for Rerewhakaaitu has continued to decline and at 3.5 in 2012/13 is now below the TLI objective level of 3.6. Nitrogen has been decreasing over the past six years and secchi depth has increased by over half a metre from the previous year. This may also have been driven by decreasing phosphorus levels over the past five years.

**Okareka**

The TLI for Lake Okareka remained stable in 2012/13 at approximately 0.2 units above the objective TLI of 3.0. All TLI parameters showed an improvement compared to 2011/12 and the hypolimnetic oxygen demand shows an improving trend since 1993.

**Tikitapu**

A decrease in annual average phosphorus in 2012/13 is associated with an improvement in water clarity of more than 1 metre compared to the previous year. The TLI in 2012/13 was 2.75, close to the objective TLI level of 2.7 (Figure 3).

**Ōkataina**

The annual average TLI in Lake Ōkataina in 2012/13 was lower than the previous year but still above the objective TLI of 2.6. Improvements occurred in all TLI parameters with the nitrogen levels for 2012/13 being lower than previously recorded.

**Tarawera**

While Lake Tarawera continues to have elevated phosphorous levels a reduction in nitrogen has driven a slight improvement in the 2012/13 TLI compared to the previous year. Water clarity in 2012/13 was lower than the previous year and has shown a decrease over the last four years.

**Rotomā**

There was a slight reduction in the annual TLI in Lake Rotomā in 2012/13 and the lake has been close to the objective TLI of 2.3 for the last five years. Small improvements occurred in all TLI parameters in 2012/13 and there has been a declining trend in nitrogen in the lake since around 2007.

**Rotokakahi**

Lake Rotokakahi (as measured at the outflow) continues to show improvement since the severe algal blooms of 2009. The annual TLI is much improved from 3.9 in 2011/12 to 3.69 in 2012/13. The greatest improvement has been in nitrogen and chlorophyll-*a*, with only a slight decline in phosphorus.

Table 1 Three-yearly average TLI values, 2012/2013 annual TLI, trophic status and LakeSPI condition for the Rotorua Lakes.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Lake  *Regional Water & Land Plan Objective*  *TLI units* | 3-yearly average TLI to 2010  *TLI units* | 3-yearly average TLI to 2011  *TLI units* | 3-yearly average TLI to 2012  *TLI units* | 3-yearly average TLI to 2013  *TLI units* | **2012/2013 Annual TLI**  ***TLI units*** | Lake Type  *based on Trophic Status* | LakeSPI Condition  2012/2013 |
| Ōkaro  **5.0** | 5.1 | 5.1 | 5.1 | 5.4 | **5.42** | Supertrophic | Moderate |
| Rotorua  **4.2** | 4.7 | 4.6 | 4.4 | 4.2 | **4.24** | Eutrophic | Moderate |
| Rotoehu  **3.9** | 4.5 | 4.4 | 4.3 | 4.1 | **3.95** | Eutrophic | Poor |
| Rotomahana  **3.9** | 4.0 | 4.0 | 4.0 | 4.0 | **3.93** | Mesotrophic | Moderate |
| Rotoiti  **3.5** | 3.9 | 3.9 | 3.8 | 3.7 | **3.44** | Mesotrophic | Moderate |
| Rerewhakaaitu  **3.6** | 3.8 | 3.8 | 3.8 | 3.6 | **3.50** | Mesotrophic | Moderate |
| Okareka  **3.0** | 3.2 | 3.3 | 3.3 | 3.2 | **3.15** | Mesotrophic | Moderate |
| Tikitapu  **2.7** | 3.1 | 3.0 | 2.9 | 2.8 | **2.75** | Oligotrophic | Moderate |
| Ōkataina  **2.6** | 2.8 | 2.8 | 2.9 | 2.9 | **2.77** | Oligotrophic | Moderate |
| Tarawera  **2.6** | 2.8 | 2.8 | 2.9 | 3.0 | **2.94** | Oligotrophic | Moderate |
| Rotoma  **2.3** | 2.4 | 2.3 | 2.3 | 2.4 | **2.36** | Oligotrophic | High |
| *Rotokakahi\**  ***3.1*** | *4.3* | *4.2* | *4.2* | *3.8* | ***3.69*** | Mesotrophic | Moderate |

Italicised figures are based on Te Wairoa Stream monitoring and a 3-parameter TLI (no secchi disk).

Figure 1 Eutrophic lakes annual average TLI and three-yearly average TLI compared against the RWLP TLI objectives.

Figure 2 Mesotrophic lakes annual average TLI and three-yearly average TLI compared against the RWLP TLI objectives.

Figure 3 Oligotrophic lakes annual average TLI and three-yearly average TLI compared against the RWLP TLI objectives.