Agenda for Water Quality TAG meeting

25 May 2022 at 9 am – 3:30pm

BOPRC Office Fenton Street Rotorua and by Zoom connect

https://boplass.zoom.us/j/8848810006?pwd=RE1NZWRiVzJ0N0F6RUFTakZyK1lQUT09 .

(Note there is some parking as marked at our old office in Arawa Street; First in first served).

Meeting Agenda

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1. 9:00 am - Welcome and Apologies
2. Actions from Last meeting July 2021 (Zoom)

ACTION: Andy to summarise objectives of the review and circulate for comment. Also, circulate Michelle Lee memo on the setting of the TLI targets.

See final TLI specifications appendix 1.

JD: Community desired outcomes will be available end of August. Need load reduction targets by year end. (James any update on this?).

ACTION: Identify someone to undertake the review assessment. (Andy) Keith Hamill progressing.

ACTION: 3 Step review (James report progress).

i. Review TLI and components, (Andy and James to discuss),

ii. Assess internal lake loads (Piet, in contract),

iii. Load reduction targets for NPS work (Piet & Chris).

ACTION: Andy to invite Piet, Grant and Dean to the Zoom. Final brief on climate change (DH proposal) will come back to TAG. (Andy)

ACTION: Andy to circulate key points on nano bubbles (Cawthron) and get comments from members. (Andy). Key points in meeting notes and Cawthron Report attached. Any other comment needed?

ACTION: Piet to send paper on nutrient limitation for 7 lakes for circulation to group.

ACTION keep dosing Lake Rotoehu at 10L/hr to address stream P, and work with Max to develop in-lake dosing protocol. (Andy/Justine)

ACTION: Cut down Lake Rotoehu monitoring of inflows to quarterly except keep Waitangi Soda stream at monthly, James to action.

ACTION: James to review stream flow and nutrient correlation (Lake Rotoehu).

ACTION: set up zoom meeting for initial PC 10 Science Review group, discuss process and steps in next review at separate workshop. (Andy) See agenda item below.

ACTION: Andy to refer to Alison Lowe to see if anything known on this from RLC WW disposal site. (Concern that u/s sampling site seems to have increasing P and group interested if RLC has any data from land disposal site on this).

Nicki Wilson is using this data to develop a catchment water balance and nitrate interactive tool. Presentation to TAG 10-15 mins.

ACTION: Paul to look at available data for Lake Rotorua to see if any relationships emerge in relationship to DO events in the lake. (See agenda item below).

3. Okaro model do we have final version to submit (Deniz)
4. Update on PC 10 Science Review (Andy)
5. Lakes and Freshwater Chair: Research themes? (Deniz)
6. Catchment water balance and nitrate interactive tool (Nicki Wilson) (Aim for time between 10am and 12 noon)
7. Lake Load reduction Report (Chris M) Talk with Chris, Internal loads???
8. Lake Rotorua Nutrient limitation and Al toxicity (Grant),
9. Alum dosing Rotorua and Rotoehu, and algal blooms (Justine, James)
10. TLI review (Keith) and NPS-FM update (Andy/James)
11. Consent progress (Rotorua, Rotoehu and Ōkaro) (Andy)
12. Rotoehu weed harvest update (Andy/Justine) also Okawa Bay weed issues.
13. Lake Rotorua presentation on water quality relationships with DO. (Paul W),
14. Tarawera geology, ground water and geothermal review (Paul W),
15. Other matters
16. 4:00 pm meeting close.

Appendix 1.

Detailed Project Scope: TLI Review.

Thank you for inviting my input to a science review of the Science Review of the TLI targets NRRPlan. I have read through the scope provided (below) and used this as a basis for a method.

1. **Collate all long term data for each lake (TLI component data and annual TLI).**
   a. Data will be collated from BOPRC and Waikato University. The historical dataset compiled by Waikato University for Lake Rotorua and some other lakes has already been cleaned and this will be used to provide a consistent basis of analysis. The focus will be on variables of TN, TP, chlorophyll-a, Secchi depth and TLI from the "top" water sample (i.e. no analysis of bottom water samples).

   b. Adjusting for laboratory changes. Laboratory changes occurred around 2008 /2009 have influenced the results of TP and TN from the BOPRC laboratory. For a period of about August 2010 to October 2019, phosphorus analysis were elevated in many lakes due to interference of the analysis by silica and arsenic. Corrections factors have been developed to adjust the data and these were used in reporting of TLI results in 2020 (Scholes 2020). A new BOPRC method started in October 2019 but the trial of the new method began in October 2018 which can also be used.

      The report will summarise the issues with laboratory analysis as previously reported. The data will be adjusted for Si and As using the previously derived formulas. A step change decline in TN also occurred in the BOPRC dataset around 2008/2010 (reduction by about 25ppb - 75ppb). If possible we will use the Tarawera lake dataset (NIWA at outlet vs BOPRC lake surface) to examine this change and discuss with BOPRC science staff whether an adjustment is justified. The effect of the lab change on TLI scores will be discussed.

2. **Undertake analysis of water quality trend for each lake (TLI component and annual TLI).**
   The TLI and its components (TL n, TL p, TL chl-a and TL Secchi) will be calculated for each (monthly) sampling event at each of the 12 Rotorua lakes (surface samples). The time series will be graphed and a seasonal kendall trend analysis undertaken for the full data record since 1991.

   The trend analysis will build upon previous trend analysis reports.

3. **Undertake an analysis of water quality and TLI variability for each lake.**
   The variability of TLI and TLI components (TN, TP, Chl-a and Secchi) will be compared for each lake by:

   a. Comparing inter-annual variability between lakes – this will include a correlation (e.g. spearman rank) between lakes for each variable.
   b. Comparing inter-annual variability of each lake with climatic variables, including: annual rainfall, water deficit, water levels (e.g. using Rotomā as a proxy sites), and southern oscillation index (SOI) (see https://www.stats.govt.nz/indicators/el-nino-southern-oscillation).

c. Comparing seasonal variability in the TLI including analysis using seasonally test and seasonal variation plots.
d. Comparison between annual TLI and NPS_FM grading using TP, TN and Chl-a for over the last 10 years.

In addition, the annual average TLI (and TLI components) will be calculated and graphed. BOPRC has used the annual average data to calculate TLI values for reporting purposes, this is consistent with the method in Burns (2000), but because it provides only a single values per year it is not as powerful for trend analysis purposes. A comparison will be made of TLI values calculated using the different approaches for different time periods (e.g. one year, three year, five year).

The limiting variable will be discussed for each lake.

4. **Compare the above analysis with the current target TLI for each lake.**
The report will compare, for each lake:
A: The water quality state in early data records with the current TLI target; and
B: The variability in TLI results due to laboratory changes, alternative ways to calculate TLI values, seasonal variability and interannual variability.

In light of the analysis, the report will discuss ways to express the current target that reduces sensitivity to natural variability. This might be a longer averaging period (e.g. five year average compared to a three year average), adjusting for climatic factors (e.g. rainfall or groundwater levels), or expressing the target a 'fuzzy' boundary.

The discussion will include a comparison of lake targets with lake reference conditions for TP, TN and TLI as modelled by Abell (2018) and Abell et al. (2020) (contingent on access to lake specific data from authors)