

TAG Water Quality Minutes

2 August 2013

BOPRC- Te Wai Ariki Room

1125 Arawa St.

Chair: Andy Bruere (BOPRC)

Present:

- NIWA: Kit Rutherford, Clive Howard-Williams, Max Gibbs, Chris Palliser
 - GNS: Paul White,
 - BOPRC: Rob Donald, Alastair Mac Cormack, Anna Grayling, Sarah Omundsen, Gloria Zamora
 - Scion: Trevor Stuthridge
 - EMTS: Andy Woolhouse
 - UoW: David Hamilton, Warwick Silvester, Chris McBride
 - Lochmoigh: John McIntosh
 - Dairy NZ: David Burger
 - RDC: Mark Buckley, Allison Lowe, Peter Dine
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Item 1: Welcome: Andy Bruere

Item 2: Apologies: Piet Verburg, NIWA

Item 3: Matters arising from minutes

- Add Kit Rutherford to attendance list for last meeting
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Item 4: Lake Targets and Nutrient Achievements – John McIntosh (refer to spreadsheet)

- Covers most of the remedial actions...the objective is to come up with the best method of estimating the load removed from the lake for planning reporting purposes.

QUESTION: How do we calculate gains made from various method/actions?

- First column, regard alum 4% rather than 4.2% due to flushing tank with water
- Discussion: Dosing the streams at Rotorua is an efficient means of applying alum there is always a ready source of phosphate. P: Al ratio of 1:5 could be expected in these circumstances.

QUESTION: Riparian fencing, is all you take out the animal dung?

- Overseer- coefficients used to estimate nutrient removal.
- Take area that has been retired, LUC.
- Fencing, remove cattle, riparian buffer model. If farm has used changed practice, use all 3 factors
- AB - we do want to stick with being conservative. Don't assume its retired land.

QUESTION: What are the losses to land with riparian strips?

- AM - through Overseer very minimal. Dependent on soil testing/farming. Overseer measures what's leaving the block not what's entering waterway.
- JM – Use overseer coefficients for retired area and treat as a LUC.
- AB - Suggest we decide which methods we are we happy with and which need more work? We will get more information, and bring it back to TAG

AGREED: Ratio on Alum 1:7 P:Al to be used

- Discussion on mitigation measures to reduce nutrients from farm. DH stated presentation was made to parliament; however MfE has not yet agreed to release whole report on mitigation methods.

ACTION:

- ~ Clive to ask MfE if certain parts of the report be released in the interim
- ~ Await MfE release of the report then TAG to incorporate into mitigation methods.
- ~ Create a fact sheet with assumptions & research JM

- AG- Floating Wetlands - need to be based on available nutrients....need to make sure that effectiveness is not decreasing as time goes forward, because lake is getting cleaner. Cleaner lake = less nutrients. Make sure that figures are not treated as a goose that lays a golden egg.
- DH - include Rebecca Eivers figures for floating wetlands.

AGREED/ACTION: Caveats needed on each method. John to update spreadsheet to include a fact sheet for each method, outlining the assumptions and the available sources of research and information. Then method for calculation is identified.

Item 5: Algal Monitoring

- Reviewing algal monitoring, specifically summer & seasonal monitoring, no conclusion has been reached yet, but will report back to the TAG.
- DH- cyanobacteria banding allows lakes to be categorized as A, B, C, or D's
 - Lots of lakes that were sitting in D's, now to B or A category in regards to cyano-bacteria
 - Rotoehu, Rotorua, Rotoiti, Kaituna now A or B

QUESTION: Where's the linkage back to Government policy?

- DH - linking into national scale is currently a work in progress
- Cyanobacteria- 2 yr. average. Wendy Paul's paper showed what can be achieved in regards to cyanobacteria and total N & total P concentrations.

ACTION: Rob Donald to circulate summary paper to TAG

ACTION: Alastair S to report back to next TAG on algal monitoring review.

- Discussion of weed issues

- DH- Believes Lake SPI is a tried & trusted methodology. As you deal with algal problem, weeds may become an acute problem. We may deal with that in Rotoehu.
- RD- maybe we monitor Rotoehu (for Lakes SPI) annually rather than every 2 years.

ACTION: TAG needs to make a recommendation on the interaction between changes in algae and weeds as lake water clarity improves. Discussion at next TAG.

Item 6: TERAX Presentation -Peter Dine & Trevor Stuthridge (refer to TERAX .ppt)

- A solution in dealing with Organic Waste
- Currently in trial
- 38% P ends up in the ash from the plant
- Processes about 11,050 t waste per year.

Item 7: STAG UPDATE Rotoehu De-stratification Chris McBride/David Hamilton

- Only 2 aerators in Rotoehu
- Some evidence mixing adjacent to the aerator machine but not widespread over the lake area.
- To affect widespread temperature change in the lake the project would need a lot more infrastructure (maybe 10 machines or more).
- Aeration is not likely to be an effective strategy for Lake Rotorua. Doesn't make sense \$ wise as you would need more than 100 aerator machines on Rotorua.
- Will continue with 2 machines trial on Rotoehu till next summer
- Problem with blockage of intake screens- fixing this will improve flows from machines.
- Each machine affects the current to about 100 m radius within the lake.
- Aeration principle was for cold water to circulate and displace warmer surface water; however trial is showing that it is flowing back down to the thermocline and then spreading out. The effect of aeration is not widespread enough to demonstrate widespread success in breaking stratification.
- DB raised option of hypolimnetic circulation. Consider this could be a future trial using lake bed diffusers and utilising the aeration equipment already within the lake.

Action: Andy to put up case to get funding from council to continue with Trial, Chris and David to provide cost for monitoring required.

Item 8: MODEL UPDATES- David Hamilton

- Rerewhakaaitu
 - DH will be meeting with Deniz
 - Concept: is P limitation more relevant on this lake than any other?
 - Have farming actions had impact on P?

- AM: Although there is an active farmers group within this catchment, only 30% of all farmers within catchment regularly attend the meetings. All farmers have participated in nutrient benchmarking through the project.
- DH believes that the actual catchment area of Lake Rerewhakaaitu is much smaller than the total surface catchment.

ACTION: Memo on P reductions to be completed, DH will circulate model to TAG in a few weeks.

- Rotokakahi
 - Applied 1D model, Hannah Jones.
 - To model kakahi & their impact on water quality a 3D model is being used. Proving difficult to get a good match.
 - DH will have more info on this at next TAG
 - Potential that lake is 2 basins
 - Concerns: major water quality decline. We can discount that waste water discharge is not a factor based on GNS report last year. Groundwater divide is further up. Forestry harvesting may be responsible for high P load. Lots of logging in that catchment.
 - Lake bottom, waters now becoming fully de-oxygenated, this was not the case in 1995/96 so lake water quality declining.
- Max mentioned NIWA study on Cossie Dam wrt forest harvesting.

ACTION: Max will send document on logging/carbon effected water quality for circulation.

- Lake Tikitapu
 - CM report nearly complete.
 - Looking at silica control.

ACTION: Silica control & diatoms, report will be circulated in a few weeks CM

- Ōkaro
 - There has been a modelling delay.
 - Ryan Mallett, MSc student, is now lined up to do it
 - Modelling will include interventions.

QUESTION: What would TLI had looked like had we not done anything?

- Proposed detainment bund discussion: would be great to get benefits of bund combined with having all water into lake go through wetland as well
- CM presented the memo on the detainment bund, outlining why there is a need to provide further P reductions reaching the lake.

ACTION: TAG agreed that there is a need for further P reductions and that the detainment bund for Ōkaro was vital.

Action: BOPRC staff to progress detainment bund for 2014 summer installation to improve wetland performance.

Request to TAG: Chris McBride Memo:

“Given the need to manage external P loads to Ōkaro as effectively as possible, an in consideration of the points raised above, please comment on a suggested strategy:

- **Measure directly the wetland bypass flow through several rainfall events over coming months.**
- **Use these measurements to validate current estimations of bypass flow in order to better determine ideal choked bund outlet flow capacity, in order to optimize performance of the present bund design.**
- **Commission construction of the bund, based on the refined design.**

Item 9: TLI Update - Rob Donald presentation. See attached notes.

- Ōkaro- still above TLI
- Rotorua- right on target- P started to creep up on this lake as alum dosing reduced.
 - MG commented that the gyre effect in the lake has a good influence on mixing for alum
- Rotoehu - Right on target
- Rotoiti - right on meets target-

ACTION: Need to check bottom oxygen request by DH

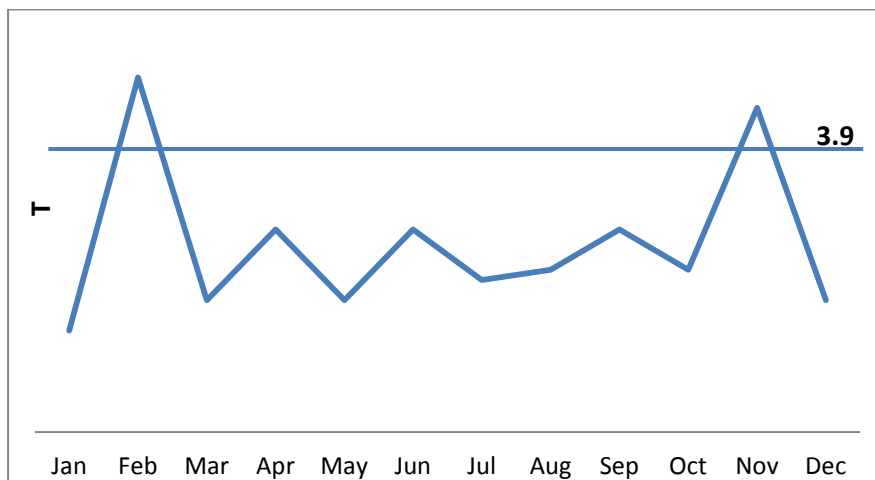
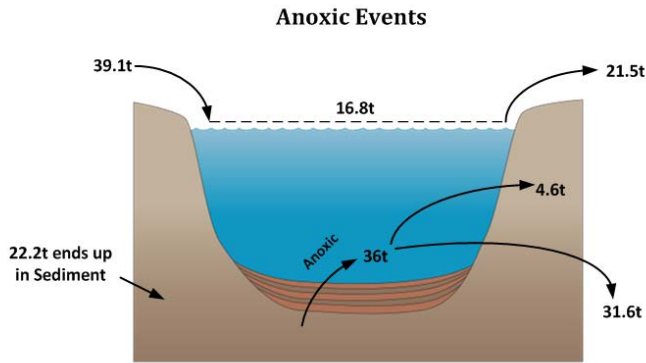
- Rotomahana - sitting on target
- Rerewhakaaitu - on target
- Rotokakahi - just above target
- Tikitapu - just on target
- Ōkātina - above target, but huge increase
- Tarawera - still above TLI
- Rotomā - just above TLI
- Ōkāreka - just above target

Item 10: NIWA BOP Lakes Internal Loads Report (Clive Howard-Williams)

Discussion ensued regarding the last sentence of last paragraph of page 30 in Draft Report. Clive presented concerns regarding the importance of nutrient recycle and whether that should be considered in the nutrient budget as gross or net recycled nutrient load.

Clive explained that there is a load into the lake, a gross load recycled and a load going out of the lake. Net recycling from internal loading could be interpreted as the difference between the external load to the lake and the load going out of the lake.

- A lot of N and P ends up being recycled
- Assumption 36 t out, adds to problem in lake
- Sustainable load at 37 t P per year
- Need to consider whether to base figures on net load not gross load
- 2 graphs used to explain



- 2 graph- peaks are frequency of algal blooms which are what the public are concerned about.
- Public concerns need to be taken into account as an important factor

QUESTION: If the peaks of the graph (second graph) do most damage, are peaks more important than the average?

ACTION: TAG needs to decide net load vs gross load for use in lake nutrient budgets. Need a statement from TAG re how to assess this for each lake budget and whether internal recycling should be net or gross?

ACTION: NIWA and University to refine the numbers of nutrient inputs and recycling in Lake Rotorua and provide a succinct report summarising recommendation to TAG as to how the gross and net nutrient numbers should be handled in lake nutrient budgets.

- pH levels got too high releasing P from Al in shallow water; hence the worst algal blooms occurred over summer/autumn.
- Discussion & strategy: keep pH low by reducing P and preventing algal bloom and address high inflows by targeting alum dose directly after storm inflow.
- DH - Cyanobacteria bloom cycle increases the pH leading to P release from bottom sediments in epilimnion, reinforcing blooms. As most bloom species in the lake are N fixers, the bloom can be self-sustaining with respect to N also.
- **Presentation on strategy by John McIntosh**
 - Efficacy of alum or products above 8.5 to be controlled by pH
 - At pH > 9, P released from Fe and Mn
 - High cyanobloom → high pH
 - Look to dose alum while pH < 8
 - Remove phosphate from water column
 - If we remove P, algal bloom doesn't develop
 - Adding alum when pH is above 8.5 does not produce an instantaneous phosphate reduction.
 - DH: dose alum in the spring phase to get pH down to stop cyanobacteria bloom
 - Otherwise perfect conditions in spring for cyanobloom:
 - Limitless phosphate
 - pH rises as bloom develops
 - Additional phosphate released from sediment as algae blooms and pH increases
 - DH: focus on P in surface water
 - CB: A pH meter will be put on lake
 - Aim to dose after rainfall event and pH < 8.5
 - Allow monitoring of pH for dosing 5 tonne of alum for three events in August, September and October.

Item 11: Groundwater Boundaries for Rotorua Catchment- Paul White (.ppt)

- SO: BOPRC needs advice on Rotorua GW boundaries as it is about to debate how to allocate load to individual farmers. Currently a problem with uncertainty around the catchment boundary.
- Discussion revolved around the certainty of the GW catchment for Rotorua. It was agreed that the scientists should advise the GW area where they were confident that the GW was within the Lake Catchment. There is about 60 km² area extra required to balance water flows in the catchment. It is unlikely that the scientists will be able to provide the location of this full 60 km² to the level of certainty required to set a rule on land use and allocation. It was accepted that the additional GW catchment may be considerably less than the 60 km² depending on the scientists' confidence in specifying areas highly likely to be in the catchment. Plan rules and allocation will need to have regard for the level of certainty provided by the science advice.

AGREED: Outer Boundary is unclear, encapsulating GW area.

ACTION: NIWA/BOPRC needs to choose which model to use for surface boundary

AGREED: to use LIDAR boundary rather than ROTAN

ACTION: NIWA/BOPRC/GNS need to identify location & area of groundwater catchment

ACTION: NIWA & Paul to decide on catchment boundary line with regard to the level of certainty

Item 12: Rotorua Modelling- Andy Bruere See attached notes.

- Two main questions”
 - Assess the impact of alum on the lake TLI, and
 - What combinations of P and N can still get the lake to the target TLI (ie higher or lower than 435 T N etc).
 - **Scenarios tested:**
 - Changes from Overseer version from 5 to 6 has altered N leaching rates significantly,
 - Claims by the farming community of reduced N and P loads going to the land have not been substantiated,
 - The scenarios have looked at % increase as well as % decrease from 2010 numbers, to allow for the claims of reduced N and P loading.
- ROTAN runs have been completed. Take into account the most recent high rainfall to feed into the lake model.

Action: Model results to be presented at next TAG meeting (including ROTAN and DYCD).

Item 13: Alum Dosing Protocol- John McIntosh/Alastair MacCormick See JJM presentation

- Rotorua- Puarenga operation stopped due to fault for 6 weeks
- Currently using fixed dosing & reaching target, rather than proportional dosing
- No flow meter output at Rotoehu, need to calibrate the dose pump.

ACTION: Alastair to arrange calibration of the dose pump

- Rotoehu alum dosing protocol.
 - Total P trending down
 - Dosing at 20 l/hr, and P trending downward
 - AB suggested P range is too tight on control chart. (0.014-.017 g/m³) (Alum protocol ok in this range). Group agreed range is OK as it is the same magnitude as Rotorua.
 - Change it up or down by 5 litres as the range is exceeded, see protocol chart.
- AM likes 25% change....overall objective is with land use management will reduce P
- DH suggested that for the lakes with alum dosing a decision tree/ statement providing advice from the TAG would be helpful for the politicians to see the options in the short and long term if alum dosing was to be discontinued.
- Need to check if VHOD has changed.

ACTION: Protocol approved, and back for review by TAG in 6 months.

ACTION: Subgroup to provide a statement for next TAG on decisions around alternatives if alum use is to be discontinued. Need to consider options if LUC funding not provided, or alum consents not renewed, for example.

- Rotoehu may be slower to react to alum dose changes due to lower currents and the dose point relatively further from the monitoring point than Rotorua.

ACTION: Provide long-term advice with alum dosing?

Provide statement from TAG on criteria around alum dosing, including the results of research locally and internationally on the intervention safety and success.

Item 14: Rotorua Sewerage Update- Mark B and Andy Bruere

- TAG subgroup has resolved concerns with RDC wastewater resource consent application.
- With harvesting we will see increase of nitrogen coming through stream.

Item 15: Whakarewarewa Update- David Hamilton

- Student (Wang Me) has been using SWAT, modelling Puarenga
 - Great results
- Next to simulate impact with or without irrigated wastewater
- Need to consider isotope measurements of nitrate to evaluate relative contributions of upstream and downstream of forest wastewater application.

ACTION: Draft application will be given to BOPRC next week

Meeting finished at 4:30.