TAG Water Quality Minutes

19 February 2014

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: Paul Scholes, Sarah Omundsen, Niroy Sumeran, Gloria Zamora
- Scion: Robert Lei (left at lunch)
- EMTS: Andy Woolhouse (Part of Meeting)
- UoW: David Hamilton, Warwick Silvester, Chris McBride
- Lochmoigh: John McIntosh
- Dairy NZ: David Burger
- RDC: Allison Lowe (left 3pm), Peter Dine

Apologies: Piet Verburg, Trevor Struthridge, Peter Dine, Rob Donald, & Hera Smith

Action Summary

- Item 2 (b) Hamilton: to develop presentation on status of aquatic weeds (Work with Clive and John Clayton to prepare summary for next meeting, Andy to also get info from APTAG).
- Item 2 (c) Scholes: Presentation on Lake SPI - to next WQTAG meeting.
- Item 2(c) Bruere: To get high-frequency buoy in Lake Rerewhakaaitu.
- Item 2 (c) Bruere: to get sediment anoxia effect work undertaken by NIWA
- Item 2 (c) David Burger to bring report to next WQTAG meeting on Rerewhakaaitu farmers projects.
- Item 2 (c): Bruere to meet the farmers working group and find progress on action plan and report back to TAG.
- Item 2 (d): Bruere: Circulate memo on P reductions in Lake Rerewhakaaitu
- Item 2 (d): Paul White to work with Chris on improvements to Tikitapu model.
- Item 2 (e): Hamilton & Howard-Williams to work together to provide a summary approach to net and gross nutrient loads for next WQTAG meeting (Verburg report).
- Item 2 (f): Scholes and McBride to compare buoy phycocyanin results with shore monitoring for cyanos for next meeting
- Item 3 (a): McIntosh to create a control chart for 2015
- Item 3 (a): SAG to consider success of alum dosing for Okawa Bay and Ōkaro, and review need for investigation into alternatives including Aqual P and new ideas such as peroxide.
- Item 3 (b) Bruere: Ask SAG about monitoring aluminium in sediment for Rotoehu.
- Item 4(b): Joe Butterworth to be contacted to report if he has any observations on the effect of the removal of these fallen trees.

- Item 4(c): Scholes: to follow up with GIS team at BOPRC to get details of how much info is available of logging areas from aerial photos
- Item 4(d): Bruere: circulate Chris McBride memo to WQTAG regarding the bund assessment.
- Item 9 (a) All: Send comments on Science Plan to Gloria/Andy in next 2 weeks
- Item 10 (d) Bruere: Andy to speak to comms staff about possible showcasing of the science and people around the programme.
- Item 10 (g) Suren: Cyanobacteria update from Alastair Suren to be covered at next meeting
- Item 10 Bruere: add to next meeting agenda (Richard Mallinson) to speak on aquatic plants/biosecurity
- Item 10 Zamora: put link to Hamilton MFE report on RTALP website
- Item 10 UoW: to furnish hard copies of student theses to BOPRC for library

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Item 1: Welcome & Apologies Andy Bruere

Item 2: Matters arising from last meeting

a) Lake Targets and Nutrient Achievements Completed - Sumeran/Bruere
   - Spreadsheet made by John McIntosh- Conversion Factors to estimate nutrient load reduction spreadsheet
   - Lake Target Calculations used the 1:7 ratio for P:Al uptake as decided in last WQTAG meeting
   - Updated spreadsheets to come back to TAG at least annually for information.

b) Weed issue Discussion
   - Weed spraying controlled by LINZ, but BOPRC has some liaison to approve areas.
   - There was interest in Okawa Bay spraying over last spring/summer to see if any possible impact on the algal bloom. *Note after meeting, Andy checked and no spraying took place in spring or summer of 2013/14.*
   - **ACTION:** David Hamilton - to develop presentation on status of aquatic weeds (Work with Clive and John Clayton to prepare summary for next meeting, Andy to also get info from APTAG).

c) **ACTION:** Presentation on Lake SPI - Paul Scholes to next WQTAG meeting.

d) **ACTION:** Bruere: Circulate memo on P reductions in Lake Rerewhakaaitu.

ACTION: To defer to next meeting. David to prepare

a. Dairy farming is the predominant land use in the catchment
b. Questions for WQTAG
   i. Do we need to quantify the hydrology more accurately than what is known at present?

1. Need to consider the Tarawera groundwater flow model and the Upper Rangitāiki- catchment
2. Summary report has been completed on these projects catchment flows as measured by NIWA & EBOP, need to look at Rotomahana
3. Low flow gauging this summer- Glenn Ellery

ii. Should we monitor DO (and stratification) continuously?
iii. Should 'we' focus on (i.e. have targets for) P and simply have best practice for N?
iv. Should we look at the sensitivity of lake sediments to anoxia?

ACTION: Bruere: To put high-frequency buoy in Lake Rerewhakaaitu.

v. Should a focus be put on P?
    1. If so, need to avoid farmers being given uncertain targets without clarification.
vi. Should we look at sensitivity of lake sediments to anoxia? Group agreed that there is a risk that if the lake goes anoxic then there is likely to be a major P release. This needs to be understood. NIWA has the equipment ready to go to do the lab tests.

ACTION: Bruere: to get sediment anoxia effect work undertaken by NIWA.

vii. Currently no BOPRC action plan on this lake
    1. Farmers doing their own action plan
    2. Farmer objectives may be different from WQTAG
    3. Lake hasn't met criteria for an action plan
        a. Needs to exceed target TLI by 0.2 for 2 year average
viii. Lake SPI, native species are being out competed as invasive weed is taking over

ACTION: David Burger to bring report next WQTAG meeting

ACTION: Andy to meet the farmers working group and find progress on action plan and report back to TAG.

e) Tikitapu Report-McBride Presentation
    a. Report is not finalized
    b. Stratification has been consistent
    c. Model can be improved with additional calibration
        i. Max- Believed emphasis should be on 2007 as 2006 was an unusual year.
    d. Professor Hamilton commented he doesn't expect numbers to improve vastly as there are always people in the lake and possible associated contaminants.

e. Intention to re-run scenarios
f. Chlorophyll maximum sits about 18-19 metres

ACTION: Paul White to work with Chris on improvements to model.

f) NIWA BOPRC Lake Internal loads report update - Clive Howard-Williams
   a. Report at next meeting

ACTION: Hamilton & Howard-Williams to work together to provide a summary approach to net and gross nutrient loads for next WQTAG meeting.

g) Comparison between monitoring buoy and cyano-bacteria monitoring - Paul Scholes
   a. There is concern about health warnings put on lakes; current regime seems to be very conservative and health warnings are continuing without any apparent monitoring to support the warning.
   b. Lake Ōkaro warning last year went from winter right through to summer with no specific monitoring to TAG knowledge.
   c. There is a need to calibrate buoy phycocyanin with lake shore monitoring to assess the value of the buoys in assisting with assessing health risk.

ACTION: Scholes and McBride to compare buoy phycocyanin results with shore monitoring for cyanos for next meeting.

   d. Amber is supposed to trigger increasing the monitoring frequency
      i. Okawa Bay monitoring is more frequent at the moment; weekly
      ii. It is Toi Te Ora responsibility to communicate warnings to the community.

Item 3: SAG (Sediment AG update)

- Lake Ōkaro Alum Dosing- McIntosh
- 15 t of alum/year is allowed with the current resource consent
- 2013 decision made to dose three times in 5 t portions
- If pH is above 8, preclude dosing
- Have dosed 10 t at the moment for the year until 31 August 2014.
- **Question:** should we be planning for next year?

ACTION: McIntosh to create a control chart for 2015

- **Question:** What is keeping pH up when chlorophyll is down?
  - Answer: Still sufficient algae to cause this effect.
- Hamilton stated his reservations on approach - concerns around responding rapidly when bloom may die down in a few days.

- There is some pH risk, need to monitor pH before and after application.
- If flocculation works primarily on non-algal material it has the potential to clarify the water column and encourage *Anabaena* bloom.
    - McIntosh stated that we have never measured big change in pH with an alum application. We have measured pH during dosing events. One event is recorded by the monitoring buoy in Okaro.
- Hamilton mentioned some other options:
    - Acoustics can kill cyanobacteria with sonic/ultra sound equipment but only on smaller ponds, Ōkaro too big,
    - Hydrogen peroxide may be an option when bloom is at surface,Algal skimmers can be used on buoyant blooms with but most of the blooms we see are not very buoyant and the skimmer only works when you have a concentrated mass.
        - David Burger suggested the use of zeolite (Aqual P) might be more active at flocculating algae, and sink to lake bed.Okawa Bay Zeolite- Is clay going to be effective at high pH?Answer: Max stated the action of modified zeolite to lock up P is by the addition of aluminium, so at high pH the P is also released.

ACTION: SAG to consider success of alum dosing for Okawa Bay and Ōkaro, and review need for investigation into alternatives including Aqual P and new ideas such as peroxide.

TAKE NOTE: ***Agreed to change STAG - Sediment Advisory Group – to SAG to avoid confusion with StAG.***

b) Rotoehu De-stratification Project- Andy Woolhouse
    - Woolhouse gave update on repair and operation of machines in Rotoehu for the spring and summer period.
    - Monitoring in place with UoW & Ian Kusabs
        - Hamilton will be combining monitoring reports with Gibbs NIWA data
        - Phosphorus levels similar to Lake Rotorua
        - We are not seeing the variations as we did in early 2000
        - Rotoehu is stratifying on a weekly basis.
        - Trial will be finishing this autumn.
        - The first two summers of monitoring were contrasting cold and warm, which confounds the results somewhat.

ACTION: Ask SAG about monitoring aluminium in sediment for Rotoehu.

Item 4: Model Updates

a) Rerewhakaaitu- covered in previous item

b) Rotokakahi - Hamilton
- Has proven to be a very difficult lake to model
- **QUESTION:** Do we have good enough bathymetric map on that lake?
    - **ANSWER:** Would like something better in future
- Hamilton to check timing of logging and variation in logging
- Lots of logging has occurred around the lake and this complicates the modelling effort as it confounds sediment and nutrient inflows. Also some complication with WRT thinning vs clear logging.
- Note: added after meeting: at time of logging it was reported some fallen trees were removed from the lake.
- **Action**: Joe Butterworth to be contacted to report if he has any observations on the effect of the removal of these fallen trees.
- Video shown from 2000 to 2013 identified logging areas from satellite images
- At moment relatively little logging in catchment
- Douglas Fir in catchment before; now native pongas
- Logging occurred concurrently with deteriorating water quality
- Joe Butterworth report
    - Secchi depth
    - Chlorophyll huge events
    - There is a huge increase in P in 2011/12
- Now reverting back to reduction of P

c) Tikitapu- covered in earlier item by Chris McBride

ACTION – Scholes: to follow up with GIS team at BOPRC to get details of how much info is available of logging areas from aerial photos

d) Ōkaro
- Need to do catchment modelling plus use NIWA Tanner information on wetland to get wetland attenuation.
- Inca model being used now by Masters student (Ryan Mallet)
    - Has modules for N & P
    - Looking into impacts of alum on lake
    - Great progress has been made

ACTION: Circulate Chris McBride memo to WQTAG regarding the bund assessment.

e) Others Model update
- Rotoehu – to examine the De-stratification effectiveness.
- Ōkataina-
    - Student currently working on model

- Sediment gives clues on effect of volcanic eruptions
- Introduction of trout may have an effect
- Focus is on wallabies and other introduced species effect on the understory
- Provide context and relate it to TLI.

- Rotomā
  - Has discussed with Bruere on what is required
  - Major pine plantations harvesting over next 8 years, need to plan programme of monitoring, to check if any
  - Low phosphorus in lake
  - N at moderate levels
- Rotoiti 3D model
  - To what extent the Kaituna outflow is managed for rafting could affect the lake.
  - Monthly monitoring has shown that there is increasingly residual oxygen in lake bottom waters,

f) Paul Scholes Rotoiti oxygen before and after the wall
- Longer to reach zero DO in bottom waters - - from 240 - 300 days
- HVOD reduced in last few years

g) Overseer 6 model and potential effect on catchment loads- Bruere
- Advice from staff is OS 6 N leaching is likely to be much higher than OS 5
- Presentation showed possible scenarios of nitrogen increase and asked what happens to in-lake targets if modelled nutrient leaching increases.
- Previous versions of OS drainage in the model was driven by rainfall that has now changed to being driven by soil physical characteristics and rainfall.
- **QUESTION:** Did the 435 t/yr target ever depend on Overseer?
  - **ANSWER:** 435 target was developed without reference to Overseer.
  - Rutherford: 435 is independent of Overseer, so therefore Overseer does not change it.
- If Overseer version 5 is wrong and the true loads were higher than ROTAN needs to be recalibrated. Need to re-consider attenuation factor.
- TAG concerned that AgResearch needs to explain why N losses have increased in OV 6
- Need to go back into ROTAN and put in 6 losses and tweak attenuation.
- Need to match model to observations. If Overseer 6 increases, we have to increase attenuation.
- TAG agreed 435 t nitrogen still the long term sustainable target.
- Plan is to run through OS 6 work, then discuss how to re-work ROTAN
- Attenuation much more a positive thing due to greater ability to manage it

- General comment: AgResearch should tell where (or in what process) N losses have occurred in the model if the N leaching output has increased.

Item 5: Groundwater boundaries for Rotorua Catchment- White

a) GNS leading project with NIWA supporting flow calculations.
b) BOPRC has provided 3 Lidar lines of the surface catchment.
c) The catchment line will be finalized end of March.

Item 6: Alum Dosing Protocol- Slide

a) Progress on Rotorua and Rotoehu alum dosing
    - Agreed no need to alter protocol at present as we are still assessing the impact on P levels and meeting the in-lake P target.
    - **Question:** How long does it take alum dosing to take effect?
        - **Answer:** Appears to have an effect within a 3 month period
    - Max confirmed lake currents are likely to take alum around the lake, circulating around Mokoia Island
    - The dosing is providing a positive feedback loop by reducing algal growth and therefore reducing algae deposition on the lake bed.
    - Stratification events have reduced in duration and frequency, which is likely to be reducing the level of P release.
    - De-oxygenation rate has changed as shown by Paul Scholes, the HVOD is reducing

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Item 7: Rotorua Sewage Update: Lowes

a) RDC now within consent limits for forest irrigation consent
    - District realizes it needs community support on future schemes
    - Has formed steering groups for Rotorua and Rotoiti/Rotomā sewage planning
    - For Rotorua looking at options that get it away from forest irrigation area,
    - Silvester: Undertaking nitrogen isotope tracing study for RDC, Isotopic ratio different now than it was in past survey work. Has shifted from N12 to N17.
b) SWAT (Soil and Water Assessment Tool) project on Whakarewarewa forest irrigation area and catchment presented by David.
    - Aim was to deliver result at end of last month; but running behind ensuring project outcome is robust.
    - A lot of parameters in SWAT model
    - Looking to run 6-7 scenarios

- The SWAT modelling and the N isotope work could be used to confirm conclusions on the impact of the irrigation area on nitrogen outputs from the area.

Item 8: Rotorua Modelling Project for N & P

a) David presented the Rotorua modelling.
   - The lake may have switched to mostly P limited as a result of the alum dosing programme, with higher soluble N levels at times as a result,
   - Showed a high P data point in 2010, indicating alum most likely taking P out of the water but not capping the sediment to any major degree.
   - David presented to farmers at Ngongotahā. There are questions from farmers in particular about do we need to address N as well, since the P removal is working with alum dosing.
   - Comment that we are unlikely to achieve P limitation by land use change work, and we need to consider the potential negative effects of a long term alum dosing programme. That is a community decision that needs to be based on an understanding of the risks.
   - Would the sewerage load have been dissipated out of lake during the model calibration period 2002-2007?
     - We still have to adjust the internal load.
     - Research suggests that the variations were not much during that time.

Item 9: Science Plan - Bruere

a) Andy provided overview of reason for the plan and the process.

ACTION: Send comments to Gloria/Andy in next 2 weeks

- **QUESTION:** If there is concern on Overseer should we be looking at other models to calculate N & P?
- Information GAPS in current knowledge- should WQTAG review these
  - Need to create template with clearly defined framework of information needs and feasibility.
- Change wording in plan around:
  - The use of the word ‘spectacular’- needs to be careful about the wording with only short term changes that have taken place. Perhaps need to tone down.
- Suggestion to add comms section to science plan, Andy, informed group that programme has a comms plan and this should be included there.

Item 10: General Business

a) Staff (Shane and Richard) to present to WQTAG on Aquatic Plants/Biosecurity at next WQTAG meeting.

ACTION: Bruere: add to next meeting agenda (Richard Mallinson/Shane Grayling) to speak on aquatic plants/biosecurity

b) November 1-7 21st Century Watershed Technology Conference and Workshop
c) Andy Presented on Lake actions, risks and other options:
    - Potential Issue- eg alum success in Lake Rotorua, community used to it. Risk is what happens if something goes wrong in alum dosing?
    - Good idea for document to go to the community about our science plan
    - Lack of understanding by the media often gets misinterpreted, eg alum dosing on Okawa Bay was thought to be a poison to control algae.
d) WS raised that information in the press was often wrong or oversimplified. Suggest: Community wants to know WQTAG information
    - Where does it go?
    - How does it get disseminated?

   ACTION: Andy speak to comms staff about possible showcasing of the science and people around the programme.
e) MFE report on mitigation - D Hamilton
    - Completed for MfE a long time ago, but was only recently released to public
    - Link needs to be put on RTALP website: ACTION.
f) **QUESTION:** What are major opportunities to mitigate impact of farm nutrients?
    - **ANSWER:** Need an assessment of strategies to mitigate the impact or loss of nutrients from agricultural land to fresh waters.
g) **QUESTION:** Thesis' from UoW, does BOPRC want to be furnished with hard copies for library
    - **ANSWER-** Yes

ACTION: Cyanobacteria update from Alastair Suren to be covered at next meeting

Meeting finished at 4:45

Additional note for further consideration at future TAG meeting:

Questions which were not put forward at the last TAG but are relevant here. "For what regional planning purposes are models appropriate mechanisms to assist decision making."

"What scientific methods would be appropriate to support a numerical standard in a rule?"