TAG Water Quality Minutes

12 June 2014

BOPRC- Te Wai Ariki Room

1125 Arawa Street, Rotorua

Chair: Andy Bruere (BOPRC)

Present:

- NIWA: Clive Howard-Williams, Max Gibbs, Chris Palliser, Rohan Wells
- GNS: Paul White,
- BOPRC: Alastair McCormack (left at lunch), Penny McCormack (left at lunch), Sarah Omundsen, Niroy Sumeran, Sharon Pimlott, Alastair Suren,
- UoW: David Hamilton, Warwick Silvester, Chris McBride
- Lochmoigh: John McIntosh
- RDC: Allison Lowe
- Peter Dine

Apologies: Piet Verburg, Trevor Struthridge, Rob Donald, Hera Smith, Marie Dennis, Kit Rutherford, Paul Scholes, David Burger

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Action Summary for this meeting (To be completed)

- Item 2(a) Bruere: Add to next agenda: Chris and Paul W. to discuss possible updates to Tikitapu model.
- Item 2(b) Howard- Williams: Complete internal loads report in view of clarification on Rerewhakaaitu sediment loads with Piet, David and Chris.
- Item 3 (a) Howard- Williams: to provide information on rates of breakdown of weed
- Item 3(a) McBride: Report back to next TAG with completed report on Rotoehu De-stratification (Grant Tempero lead).
- Item 3(a) Bruere: Refer advice to land management officers that spraying in Okawa Bay is likely to lead to nutrient releases that could trigger algal blooms
- Item 3(a) Hamilton: Run Rotoiti model to determine the effect of weed spraying in Okawa Bay
- Item 3(a) Gibbs: Provide details on combined effects of capping materials in mesocosms. And advise and of potential impacts to the programme.
- Item 3(a) Hamilton: Advise on opportunity for mesocosm trials in University of Waikato campus lakes.
- Item 3 (a) Hamilton /McBride: model information on weed at Okawa and Rotoehu
- Item 3(b) White: Send report to Andy of the outlines of GW monitoring.
- Item 3(b) Bruere: Circulate the GNS outlines of the GW monitoring to group to WQTAG
- Item 4(d) Hamilton: Prepare statement on nutrient loading to Lake Rotomā and the need to deal with nutrients from septic tanks.

- Item 4(d) Hamilton: Reassess statement on N and P from TAG 2007 and ensure it is still applicable to lakes.
- Item 4(d) Bruere: Circulate statement to TAG for ratification for all lakes including Rotomā. (Relating to N vs P and removing loads from septic tanks) to WQTAG
- Item 4(d) McIntosh/Bruere: get BOPRC Investigations Section and Environmental Data Services to look at nutrient analyses for N and determine if an inter-lab comparison is required to determine if apparent changes in nutrient concentrations can be in part attributable to changes in analytical techniques.
- Item 4(e) White: Undertake simple GW work to establish GW catchment boundaries for Rotomā.
- Item 4(f) Bruere: Recommend development of methodology for establishing P loads from land use. Take to Land TAG and talk to Sandy Elliott.
- Item5.2 White: Repeat the NIWA monitoring work and install a shallow water bore at Steep Street for ongoing monitoring.
- Item 8 (a) Bruere: Organize smaller target group to look into the question raised how do we go about describing sustainable N load with John Mac, Clive and David.
- Item 11(b) Howard- Williams: Send info on weed nutrient releases for TAG circulation.
- Item 11 (d)Bruere: Get a position paper written on weed issues for next meeting, with the objective of briefing the Lakes Programme on weed issues and potential avenues for solutions.
- Item 12/13 Bruere: Add agenda items 12 and 13 to next meeting agenda
- Item 14 (a) Peterson: Re-calibrate detainment bunds verification based on an area basis over the range of catchment areas used to determine performance.

Item 1: Welcome and Apologies: Andy Bruere

Item 2: Matters arising from last meeting

a) Tikitapu update to model (Chris McBride and Paul White)

Update delayed initially due to late arrival of Paul. Unfortunately time did not allow a return to this.

- **ACTION:** (Andy) add to next meeting agenda: Chris and Paul White to discuss possible updates to Tikitapu model.

b) NIWA BOP Lake internal loads report update (Howard-Williams and Hamilton)

- **ACTION:** Howard- Williams to complete internal loads report in view of clarification on Rerewhakaaitu sediment loads, together with Verburg, Hamilton and McBride.

Item 3: SAG (Sediment AG update)

a) SAG meeting notes (Bruere/Hamilton)

- Andy walked through highlights of sediment advisory group report

- Alum dosing for Lake Ōkaro: BOPRC are allowed to dose 15 t alum per year into Ōkaro between 1 Aug – 31 July. Last meeting this group provided a recommendation that we dose the remaining 5 t available. This was completed last week while the lake remained stratified.
- David noted DO of epilimnion was about 50% so substantially reduced.
- Next part of the recommendation was to do a second and third dose in early August and September which will be about 10 t in total. The remaining 5 t can be dosed in April 2015 if necessary.

ACTION: Hamilton and McBride to model information on weed at Okawa and Rotoehu

i. DH – need to run model in Okawa Bay to see the impact of weed spraying.

ii. AB - surprised to learn that spraying seems to be continuing in Okawa Bay. We had thought that spraying had stopped but as at October 2013, was still being done

iii. Clive to provide information on rates of breakdown of weed.

iv. Recommendation from group that spraying stop in the bay should be discontinued.

ACTION: Clive to provide information on rates of breakdown of weed,

ACTION: David to run Rotoiti model to determine the effect of weed spraying in Okawa Bay,

ACTION: Andy to refer advice to land management officers that spraying in Okawa Bay is likely to lead to nutrient releases that could trigger algal blooms.

- Rotoehu aeration – McBride close to reporting back on 2 years of work. Grant Tempero doing last sampling today and will then write report. Gibbs to incorporate flow monitoring work into the report.
- Bruere - Given investment into the project, believe worth running for another year.

ACTION: McBride: Report back to next TAG with comprehensive report.

- Other products for sediment P control
  i. Use of alum lime mix – positive information coming out of some work McIntosh showed us from Canada.
  ii. Gibbs advised looking at combined effects of capping materials in mesocosms

ACTION: Gibbs to come back to group with more details on combined effects of capping materials in mesocosms. Advise if any support council can give and also of potential impacts on our programme.

i. McIntosh - looks like work they had done in Canada was not clear as to what mechanism was controlling weeds but believe might have progressed since that report.

ACTION: Hamilton to advise on opportunity for mesocosm trials in University of Waikato campus lakes.

(a) Sediment work Rotorua and Rerewhakaaitu (Max)

Presentation from Max

Max presented a Power point on the sediment anoxia work from Rerewhakaaitu and Rotorua. This work has highlighted the risk with potential sediment P release in Lake Rerewhakaaitu. The main mechanism for P retention in Rerewhakaaitu is from iron adsorption. As the lake loses oxygen then P is released. The Lake Rerewhakaaitu sediment P load is now about 2/3rds the P levels measured in Rotorua and Ōkaro.

i. The presentation from Max also highlighted some interesting bathymetry for the lake. In preparation for the lake buoy deployment Chris wanted to get the best location for the buoy that is now being constructed for Rerewhakaaitu. It was agreed that the Raepuka basin is area most likely to go anoxic. Group agreed the location should be in the same area as the EDS monitoring site, in a depth of about 15 m

ii. How does lake get more eutrophic? What do you need to do to stop it going anoxic?

iii. Max advised only way of causing this is through the transport of fine sediment into lake and the decomposition of organic material which would overwhelm the oxygen demand. If you get a decent algal bloom the lake could go anoxic.

iv. McBride: How close has lake got to anoxia?

   a. Hamilton: based on monthly sampling there have been 3 events less than 2 mg/L in the last 10 years, at 12 metres.

v. Bruere: are there other actions we should be taking at the moment? The Monitoring buoy is going in and we will talk about it later.

vi. Hamilton: surface inflows typically 10,000-20,000 m^3 a day.

vii. Silvester commented that it is P limited lake and that there is a risk of algal blooms if it goes anoxic.

viii. Bruere: McIntosh suggested that possibility that with weed harvester we can take out some of the weed from Homestead Bay.

ix. McIntosh: Area is full of surface reaching weed – it's a small area which would be ideal for a harvester to work on.

x. Gibbs: since weeds themselves will be taking up nitrogen, is there perhaps an option of mowing them?

xi. Rohan: Need to be careful as lake doesn't currently have hornwort weed.

xii. Bruere: is it worthwhile doing it, do we support weed harvesting on proviso that biosecurity team deem it safe?

xiii. **Advice:** TAG advise that the risk of transfer of hornwort is critical and agree to not support weed harvesting using the weed harvester in that location.

xiv. Paul W commented on the perched lake situation, and that the main flow of water from the surrounding farms goes to other water courses.

- Bruere: Do we have a report Paul that we could circulate which will clarify groundwater flows?

ACTION: (Paul W) Send report to Andy review that outlines the GW monitoring. Andy to circulate to group.

Paul commented that this lake has highest GW nitrate concentrations at depth for any NZ catchment, indicating GW not in the perched basin of the lake surface catchment.

Item 4: Model Updates

a) Rerewhakaaitu – Hamilton
   - Presented part of a report University is preparing on Rerewhakaaitu model.
   - Builds on Paul W work and John Mac observations,
   - Hope to have report complete within 2 months, and to get some input from Paul White,
   - Currently showing low phosphorus inflow concentrations
   - Nitrogen - 0.4 or 0.5 mg /l. Lot of nitrogen coming in from this dairy catchment.
   - Monitoring in the 2 inflows shows concentrations are close to half of what they were in phosphorus in the 90s. Change likely due to land use practices changing
   - Believe model doing good job and with a few tweaks can refine outputs.

b) Rotokakahi - Hamilton
   - Modelling report nearly complete,
   - Shows some wind thermocline tilting effect,
   - Riparian forest harvesting has had an effect at the time of harvest which highlights the potential inputs from forest harvest cycles, especially in smaller lake catchments where a large proportion of the harvest occurs in just a few years,
   - Bruere advised BOPRC now have good engagement with the environmental committee (J Butterworth & I Kusabs) and they have agreed for BOPRC to get on with writing an action plan. Will bring in the 2 iwi groups that have access to the lake to a hui later on.
   - Hamilton: Would like to bring in Joe Butterworth to do some double checking on nutrient values in report
     Not overly satisfied with results and think there is a whole lot more that should be done in the catchment before modelling could become more definitive.
   - Think this is a 1-2 year study which may include a wind station as well.

c) Ōkaro catchment modelling (David/ Ryan M)

   - Bruere: when alum dosing last week, noticed there was an algal bloom starting to appear in the lake shore vegetation. Algae identified as a blue-green: *Woroninchinia* sp.,

- Hamilton: Masters student (Ryan Mallett) working on Ōkaro and he has been attempting to simulate runoff and nutrient concentrations.
- Will connect with our lake models and also enable us to do scenarios. Will seek some advice at some stage. Will include the wetland.
- Ryan using a model called INCA. Impressed with model in terms of predictions.
- Due to finish in February next year and well on track

d) Rotomā nutrient load update (David/Chris)

- Bruere: David, Chris and Andy currently going through the Rotomā Sewerage Working Group And Sewerage Technical Advisory Group to evaluate sewage at Rotomā. This has brought into question the Rotomā Action Plan lake input estimates, where house occupancy levels have been overestimated and the phosphorus loading from land use is at a very low level.
- Chris has recalculated septic tank loads on the new occupancy estimates and undertaken recalculation of land use loads. The land use P loads have increased significantly.
- Chris has undertaken recalculation of lake loads using Vollenweider model, and suggests increasing the lake retention factor from 0.7 to 0.75. This has the effect of increasing the required nutrient inputs from the catchment, especially significant for P.
- Chris suggested P load may be closer to literature mid-point value of 1 kg/ha/yr.
- Any increase in P load estimates to the lake are consistent with the increasing P observed in in-lake monitoring, from 4 to 7 ppb over the past 5 years or so.
- N:P ratio is moving lower, close to 7:1 currently,
- TAG agreed that land use P may be closer to 1. John Mac stated that earlier estimates were based on an expectation that the lagoons on the eastern shore would intercept much of the P.

TAG agreed that 1kg/ha is the best estimate based on the available data and Vollenweider steady state model.

- Concern raised that the model output and monitoring implies we need to go back to reconsider action plan recommendations,
- Bruere: TAG support what Chris has done here.
- Hamilton: suggest time for TAG to re-issue Rotorua/Rotoiti statement and refine for Lake Rotomā as it behaves differently being P-Limited and P is still increasing. Although land use load estimates have increased the mechanisms for P loss from land, capturing P more challenging and this indicates that removing P from sewage is now even more critical as the load has increased and meeting the sustainable lake target will be even more difficult.
- Bruere: quite a big change to where we were. Over 400 kg P coming from land use (doubled) and half the sewerage. Not difficult to argue as we had the numbers wrong before in terms of residents.
- McBride: attenuation is implicit in terms of the numbers from land use,
- Hamilton: designed to be the input to the lake after land attenuation. Extensive debate on this in last couple of years

- McIntosh: Regional Council had septic monitoring programme. From 600 data points, used those with highest bacterial loads and medium N:P ratio - worked out at about 10:I and used Max's Taupō study, using the 10:1 ratio. Possibility could be worse than that at say 5:1. So P estimates could be higher P in the area, but not able to confirm.
- McBride: anyone have any ideas as to why P going up and N going down so dramatically?
- Lowe: could that have been from septic tank drain fields now becoming overloaded?
- Hamilton: Concerned about measurements of total nitrogen. Lab changed in about 2010 and there seems to be a lot less variability in results since then. Paul Scholes has information on this.
- McBride: We need to have confidence in the TN readings and there seems to be some uncertainty around those.
- Hamilton: concerned that there could potentially be a false trend into the dataset.
- Agreed that this group needs to issue a statement with regard to Rotomā. Hamilton suggested it should be similar to the N *vs* P statement issued 10 years ago. Needs to be all encompassing and enduring.
- McBride: think it's worth looking into the TN numbers before releasing a statement. Need something a bit more statistically robust but can say roughly doubled.

ACTION: Hamilton to prepare statement on nutrient loading to Lake Rotomā and the need to deal with nutrients from septic tanks. Also to reassess statement on N and P from TAG 2007 and ensure it is still applicable to lakes. Bruere to circulate statement to TAG for ratification for all lakes including Rotomā. (Relating to N vs P and removing loads from septic tanks)
ACTION: (McIntosh/Bruere) get BOPRC Investigations Section and Environmental Data Services to look at nutrient analyses for N and determine if an inter-lab comparison is required to determine if apparent changes in nutrient concentrations can be in part attributable to changes in analytical techniques.

e) Rotomā catchment boundary (Penny) Basin and the north west boundary.

Penny presented info on the uncertainty of the flow direction from the basin area in the north eastern part of Lake Rotomā. Seeking TAG direction on where the water flows and catchment boundary. Presented two Geoview images of the catchment and the smaller basin catchment.

- MacIntosh: There are large springs north of the 100 ha basin area. Flow north.
- White: most of water moves north. Rotomā moves to Waitahanui catchment and could possibly move to east to Rangitaiki catchment.
  Assume as there is so much water disappearing from lake, that it is actually to east but suspect most going to north as Waitahanui is a base flow running to north.
  i. Any springs there could also be sourced from Rotoehu.
  ii. Rotoehu loses 2 m^3 a sec, Rotomā 1.5 m^3
  iii. Rotoehu probably also goes to Paengaroa

- White: Suggest a relatively simple study in terms of where springs are. Do some simple measurements on where springs are and rainfall and see if that geographic area can support the flows from spring.
- Bruere: modelling work on nutrient inputs from McBride show that the potential inputs from the 100 ha basin are not very significant and inclusion of the basin within the catchment does not make a large difference to the overall P load reaching the lake.

ACTION: White: undertake simple GW work to establish GW catchment boundaries for Rotomā.

(f) Rotoiti catchment land use output from Overseer 6 (Penny McCormack)

Penny presented on Rotoiti catchment nutrient loads from land use- Action Plan vs Rule 11 database

- Finished benchmarking Rotoiti down to 10 hectares. Those not benchmarked are mostly residential and lifestyle areas.
- Noted that in order to compare results from benchmarking they had to manipulate to match the action plan catchment area. This included:
  i. 285 hectares taken out of native forest (into Ōkataina catchment)
  ii. Assumed nitrogen discharge of 3 kg/ha for native and 2.5 kg/ha for forestry to match up with coefficients in R11 database
- Bruere: Pastoral difference between Action Plan & benchmarking db is nearly 30% - Significant
- Penny reminded group this data is still 10 years out of date. Rule 11 db figures are based on 2001-04 figures.
- Leaching rates all came from overseer v 6.11
- Significant difference in leaching figures between Action Plan and R11 db
- Bruere: action plan numbers were never modelled, just taken as leaching coefficients
- Dairy area has stayed the same (1 farm Te Waerenga)
- McBride: need a method for prescribing values to this land
- Bruere: do we look at a standard methodology for working out P loads from land use?

ACTION: (Bruere) Recommend development of methodology for establishing P loads from land use. Take to Land TAG and talk to Sandy Elliott.

Item 5: Groundwater

5.1 Ground water boundaries for Rotorua catchment (Paul W)

Paul White presented a progress update on boundaries for Rotorua catchment with a Power point.

- Issue in Rotorua catchment bigger than surface water

- R11 is non-prescriptive as to where that boundary is. Policy describes land within Rotorua catchment and not prescriptive as to whether surface water or ground water
- Last TAG had a session on this and a recommendation for this work came out of that. It is necessary to support planning framework for new rules in the Lake Rotorua catchment.
- Differences between the surface and GW catchment mainly on Mamaku plateau and Waiohewa
- Lake Rotokawau catchment - pretty evident part of Rotorua catchment.
- Report deals mainly with the Mamaku plateau
- Used largely LIDAR dataset in this project
- Finalised GW boundary report will comprise three reports - two from Kit Rutherford (NIWA) and one from Paul (GNS). Paul is now waiting for work from Kit before completing his assessment. Kit has had some hold ups and not certain when these will be resolved.

5.2 GW monitoring for Ōkāreka

Memo from Paul Scholes recommends repeating NIWA monitoring around the lake shore adjacent to the residential area and install a shallow water bore at Steep Street.

- Looking at some monitoring on Steep Street but Paul's suggestion is that we replace the bore.

ACTION: Paul repeat the NIWA monitoring work and install a shallow water bore at Steep Street for ongoing monitoring.

Item 6: Alum Dosing Protocol Update (Niroy)

Progress on Rotorua and Rotoehu alum dosing was presented by Niroy.

- Rotoehu - Dosing rate has increased from 20 l/hr to 35 l/hr in March and then to 40 l/hr in April as per trigger protocol.
- Rotorua P levels well within the 17-20 ppb target. Dosing at 140 l/hr.

Bruere: Started this dosing in 2010. We had algal bloom in Rotoehu this summer (2013/14) -first time in 4 or 5 years. Note that we didn't get a very good weed harvest done last season. So will be interesting to see what happens next season after harvesting with new weed harvester.

No recommended change to the dosing protocol.

Item 7: Rotorua Sewage Update:

a) RDC Sewerage Steering Committees (Andy/ Alison)
    - A Rotorua sewage steering group has been established and has met 4 times with reps from different stakeholders and iwi groups. There is an associated Sewage TAG group who have met twice.
    - Rotorua sewage now required to be removed from the forest by 2019, so some urgency,

- Have a long list of alternative options that includes everything possible at this point in time. Have set minimum requirements in terms of technical and legal. Sewage TAG will come up with a short list and go back to the Steering Committee – hopefully by end of year.
- One area we need to bring to this TAG group is; are there more effective locations for discharge? If the discharge was closer to the Ōhau Channel could that improve the impact on Lake Rotorua?
- McBride, once wall removed then that would direct more effect potentially on Lake Rotoiti and may have negative impact,
- Lowe: we need to treat this water to a point that can support life and reduce as many nutrients as possible so general feeling is that doesn't matter really where we discharge.
- Bruere: still has an N concentration of about 5 ppm. Unlikely in long run that they will ever be able to meet the 30t of N. Point to be aware of there is no statutory requirement for the council to meet that. Council needs to be clear in comms to community that they are never going to get that. The Steering Group commented that there also needs to be provision for expansion of Rotorua City in the future so some provision in any limit needs to consider that,
- Lowe: Another option is possible re-injection into geothermal aquifer? Does it pose any problem for the aquifer?
- Paul W: GNS has expertise that could advise on that option and long term impacts of cooling or forcing geothermally sourced nutrients out in other locations.

Rotomā/Rotoiti Sewerage Steering Committee

- Treatment of nutrients from septic tanks at south-east end of Rotoiti and Rotomā
- 3 main options:
    a) Reticulate back to Rotorua
    b) Combined or separate satellite plants for each
    c) And then other technologies in terms of reducing at source

- Bruere noted this is more urgent than Rotorua as Rotomā relies on a $4.46 m subsidy by MOH which requires a decision by September this year otherwise funding disappears.
- Sewage TAG provides technical advice to both committees
- Some interactions with item on nutrient loads and GW for Rotomā above.

b) SWAT (Soil and Water Assessment Tool) project on Whakarewarewa forest irrigation area

Hamilton gave update on work Wang Me has been doing on forest irrigation area.

- Basis of project is to look at what can be done with current wastewater application in Puarenga catchment. This set of scenarios has been developed:

    - Removing wastewater
    - Halving nutrient loads
    - Doubling nutrient loads
    - Changing vegetation type

- Report will be completed and circulated to the TAG in the near future.
- Interesting results showing forest operations have impact on nutrient outputs

c) Sewerage TAG
   Covered above
d) N isotope work (Warwick)
   Warwick S described the N-isotope work being undertaken with RDC on the sewage reticulation area. Stated that past monitoring showed about an increase of about 12 pp thousand from natural state in the ratio of N_{14} :N_{15}. This showed about 87% of N coming from the sewage application in the past. The isotopic signature has shifted from 12 to 17 so cannot assume equilibrium. Suggesting about 80% N from sewage now, but this needs to be confirmed with more sampling to check if N-isotope is at equilibrium yet.

Item 8: Rotorua Modelling Project for N and P

Three documents were circulated that had come from John M raising questions about the lake model and the impact of that on setting a sustainable N load for Lake Rotorua. In terms of the model assumptions this matter was resolved before the TAG meeting with a response from David and Chris.

The second issue that was raised by John relates to the lower N levels in Lake Rotorua and that the 435 is a the lower end of the range of the sustainable lake load target.

a) John presented report on Sustainable N load for Rotorua
   - RPS policy – need a science opinion on what the sustainable load is for Lake Rotorua **QUESTION:** How do we go about describing sustainable N load?
   - Hamilton: assumption is no internal loads currently and also not considering impact of alum - not just its ability to lock up P but possible to flocculate algae and N.
   - Bruere: we have never really accounted for flocculation in past so why haven't we? Should we be accounting for it now?
   - McIntosh: prediction was that removing sewage lake would go down to TP of 20 and that nitrogen would be affected the same to predicted level
   - Hamilton: At least as much N and P coming in from the catchments as ever, it has not been reduced,
   - Bruere: turning off alum dosing would allow us to see if N affected, but could upset community if algae blooms reappear,
   - Hamilton: would need to have off at least 3 months
   - Chris M: Alum is breaking the N-cycle effect, so cannot simply say because we have lower N levels that we can accept a higher catchment load,
   - Bruere: this matter requires more detailed consideration that cannot be completed at meeting, suggest smaller team of experts address the question from John,

   ACTION: Bruere to convene smaller target group to look into the question raised by John. Subcommittee of: John Mac, Clive and David.

- Lowe: should we not be concerned that we look at prioritising actions to reduce P as well as N. We're telling farmers to reduce N but surely should be encouraging them to look at actions that reduce N & P? Clive agreed
- **Note added later: The message to the community comes from lakes programme partners. This matter can be addressed to the programme steering group for their information and advice that there is concern at the TAG about addressing only N.**

Item 9: Science Plan - Bruere

The science plan is completed and available for external groups. It lays a foundation as to how science will be researched for the programme. It is reviewed annually, providing a 3 to 5 year horizon.

Item 10: Nano Bubble Trial

David presented on the work Gang Pan is trialling at Waikato University. Gang is from the Chinese Academy of Sciences and has developed the nano-bubble and local soils technique to oxidise lake sediments and remove algae.

He will start a trial that will run until Sept testing the applicability to the Rotorua Lakes. If the trial shows promise for our lakes further scale up of the technique will be considered in the future.

Item 11: Aquatic weeds and Lake SPI

(a) Presentation on aquatic plants and biosecurity (Hamish Lass BOPRC)

Hamish presented on BOPRC Biosecurity programme

- Large pest awareness programme in place
- Surveillance programme – pre and post summer. Covers 8 lakes – those with least amounts of pests already.
- Recognition given from NIWA that BOPRC are the pioneers in this space nationally (Rohan Wells). Thanks to their trial work 6 sites where hornwort was identified in the South Island have now been eradicated.

(b) Nutrient loads from weed removal (Clive/Paul memo) Item not presented as Clive had to depart before time to present.
ACTION: Clive to send in info on weed nutrient releases for TAG circulation.

(c) Presentation on Lake SPI (Paul Scholes). Memo circulated but not presented on. It summarises the nutrient gains from weed harvesting at Lake Rotoehu.

(d) New weed harvester, performance and RDC weed removal (Richard Mallinson)

Richard provided an overview of weed harvesting programme and the operation of the new harvester. Commented that it could do 6 t in about 6 mins. More efficient. Has possible application in other lakes.

Rohan: commented that weed growth is not always related to eutrophication and water clarity.

ACTION: (Bruere) get a position paper written on weed issues for next meeting, with the objective of briefing the Lakes Programme on weed issues and potential avenues for solutions.
In particular the position paper needs to cover:

- Invasive weeds
- Native aquatic species and their values
- Does nutrient concentration/water clarity etc. alter growth patterns?
- The risks associated with these invasive weeds spreading?
- Possible control measures/options/experience (eg in our region and elsewhere) and typical costs and challenges, (include value of cordons),
- BOPRC monitoring programmes
    - Lakes SPI; what does this mean? How do we compare with other regions?
    - Incursion monitoring and the history of spreading weeds,
- Agencies involved and their current actions. Options to improve efficiency of these options or new ones.

Item 12/13:

ACTION: Add agenda items 12 and 13 to next meeting agenda

Item 14: Detainment Bunds verification (John Paterson/ David Hamilton)

John Paterson walked through a presentation on the detainment bunds and work done to date.

- Seeking ratification from TAG on P removal performance in order for programme to continue
- BOPRC management require an estimate
- Have come up with a figure of 1.53 kg P/yr x 16 detainment bunds = 24 kg per year.
- Memo from Dylan Clarke included in TAG pack. Reviewed by David Hamilton.

TAG supports findings here of memo but that the size and P retention should be calculated on a per hectare basis within the range size that they have.

ACTION: (Paterson) Re-calibrate based on an area basis over the range of catchment areas used to determine performance.

Alison: what are the DRP levels they remove?

David: not high, mainly acting on particulate P removal, that potentially becomes available some time later as it is mineralised.

Warwick: possible automatic alum dosing to intercept DRP. Similar to the alum dosing used on earthwork sites in Auckland region to floc colloidal sediment.

Some discussion on the effect of the alum on the productive capacity of the land area.

Meeting finished at 4.45pm