Draft Meeting Minutes
Rotorua RPSC
Technical Advisory Group Meeting #7

Date:	Thursday, 28 May 2015
Time:	10am – 4.05pm

Venue:	Bay of Plenty Regional Council Office
Chairperson:	Jim Bradley (JB) – MWH
Attendees:	Andy Bruere - BOPRC, Greg Manzano (GM)- RLC, Alison Lowe (AL) – RLC, Kepa Morgan (KM) – Mahi Maioro Professionals – by phone/skype, Chris McBride(CM) – University of Waikato, Arturo Pingol (AP) - RLC, Antoine Coffin (AC) – Te Arawa Consultants, Warren Webber (WW) – Chair RPSC, Kevan Brian (KB) – Mott MacDonald, Greg Manzano (GM) – RLC, Sarah Pauli - Minute taker
Apologies:	David Hamilton (DH) – University of Waikato, Andy Bell - RLC

PLEASE NOTE: these draft minutes are substantially verbatim as per the recording made by Sarah Pauli

JB - welcomed all attendees and gave a special welcome to Warren Webber and Kevan Brian. JB noted that KM is being linked by phone/video.

Antoinne Coffin opened the meeting with a Karakia.

1. **BRIEF VERBAL REPORT ON RPSC MEETING – 20 MAY 2015 AND OTHER ACTIVITIES**

   Our next meeting is on 25 June and we hope to workshop the three reports that we are going to be considering today. The topics for that workshop will be engineering options, the discharge location and the Terax report. We anticipate that our next meeting will be on 17 July. David Hamilton is available for that date and we will workshop the discharge location impacts reported. We anticipate these will be tabled on 16 June, next TAG meeting. Our last meeting was not particularly technical.

   JB advised that as TAG is aware, myself, Alison and Greg, as at every meeting, give some technical updates of where we are and cover some of the technical questions, being the Group A and Group B questions. The slides we presented last week are now on the secure website.

   Jim thanked Andy for the use of the Regional Council boardroom and also thanked Hilda King and Sarah Pauli for setting up the secure website.

   There are some technical matters coming out of RPSC that are on the agenda today.

   As Antoinne needs to leave the meeting at 1.00 p.m., Jim asked Antoinne if he would like to give a brief cultural update now, particularly on technical related matters Antoinne and his group are waiting on. Following, Kevan Brian will give his presentation. The technical related matters Antoinne will speak on will help Kevan focus on those in his topics today.

2. **DRAFT TAG NO.6 MINUTES – 8 APRIL 2015**

Andy Bruere has already given comments to Sarah that were editorial being word type matters.
JB had asked Antoinne for any comments on the minutes. He seemed to be happy with his input.

Discussion

GM – Page 15 (third to last paragraph) – change "caption" x 2 to "catchment."

KM wanted to speak with Antoinne on some on some of the meeting notes however, Antoinne had left the meeting. KM referred to the record where it had noted that Antoinne had mentioned that he was collating a coherent list of potential mitigations, avoidance measures, remedies and things that could happen as a result of the project. Was he collating that for us, or something else?

JB sent out a check list out of the Minutes to Antoinne recently thinking he was not going to be at our TAG meeting, which was going to be last Friday, as he was in Australia. Antoinne is still working on the check list which included those matters that were relevant to TAG's consideration, not the whole cultural thing, but it was the one that had technical interaction. That is on his list from myself as TAG Chair.

KM – Page 7 – Paragraph 10
Sarah Pauli contributed here what AC aimed to KM.

KM – Page 7 – Paragraph 13
The paragraph starts off as "It's the" should read "If it is the…"

KM to forward through the minutes to SP to make the corrections.

JB referred to page 15 (paragraph 2), the strong comment made by Kepa about Fonterra. Did Kepa want this to remain in the record. This was verbatim.

KM – I take these are TAG's minutes and not for distribution outside.

JB – No, under Local Government Procedures, they can be sought once they are in the system.

KM – If what we were informed of Fonterra's position was true because what that relates to is the fact that they are taking water out of the Waikato and using that in their plant at Te Rapa. They seem to be making quite severe constraints on what you can do with treated waste water and treated solids. I have read the Fonterra letters that we have been provided and they don't seem to be as severe constraints as we were lead to believe.

JM asked Kepa to hold on this last comment. We will deal with this later in the meeting, where we are with Fonterra correspondence. Jim asked Kepa if he was happy to stand with that comment on page. 15.

KM – That is what I said, but if you think it would be useful to take out, that's fine.

WW – I think a little bit of politic would be better.

KM – Agreed to reword as follows "The position does not appear to be based on science."

Moved:

That the Minutes of the meeting held on 8 April 2015 be accepted as a true and correct record subject to the above changes being made.

Moved: J. Bradley / G. Manzano

CARRIED

JB – In respect to the Fonterra matter, I searched out the check with Sue Bennett of our organisation on their current position and those are the two letters I sent with a hand written note. One on their Californian Title 22 and the other on their advice note they suggested goes on all consents. We have in these Minutes an action that TAG asks Rotorua Lakes Council to write to Fonterra asking for an update on their position. We have not actioned that yet, but MWH, with their contacts have been to Fonterra to check those two letters that I sent are the latest. That is still the current position but we have been told by email they are going to review it later in this year. The question is, where we are as a project now, do we still ask/help/assist Rotorua Lakes Council to write a letter to Fonterra. We now have the correct person. We have MWH indicated in the email that they would like to see correspondence from Rotorua Lakes Council. Do we still write to Fonterra?

KM – We need to know if they are going to make the constraints more stringent or less when they revise at the end of the year.

JB – That would be a fair question. The fact that they have at least told us in an email they will be revisiting them later in the year.

ACTION: JB to work with GM on the letter to Fonterra.

KM – It does make a difference if they are going to make more severe constraints, it would be good to know. I think there is still the aspect that in this letter from Fonterra being the advice note, it seems to me to relate to a lower of level of treatment than we are even talking about.

JB – In respect to your comments that those letters showed it wasn't as restrictive or as bad as we were lead to believe. I think the only person who has been put in the Fonterra position is myself and I don't think I have varied from that point of view was is in those letters and if I have, I shouldn't have.

KM – My reading of this is it isn't a matter that you can't do it at all, by any means. I was getting the impression that no farmer was being allowed for this to happen within the catchment. I think it was actually to do with the RSSC TAG.

3. CULTURAL ASSESSMENT SUB-COMMITTEE UPDATE WITH TECHNICAL REQUIREMENTS

There has been one CAS meeting since the last time we met and it focused on just making sure how we were going to format the inputs on the various Iwi into the project. We have had confirmation from Ngati Hura Terangi, which is the Iwi that are on the wastewater treatment area. Ngati Hura Terangi are preparing a Cultural Impact Assessment which will be the lead assessment from the Iwi of that area and they have asked me to help them put that together . They have provided me with some copies of cultural assessments they have done for other projects in the area, so that has been quite useful, trying to use in a similar format and cover off a lot of the historical issues that they have already covered. I have spent most of my time focusing on wastewater treatment plant, discharge points. Also looking on how we collate the other Iwi inputs. Most of the other Iwi have provided their Iwi Management Plans where they had one, which had policies in regards to wastewater treatment discharges in the lake, so I am just lining up all of that information, which should be ready in the next week or so. We have been starting some conversations, particularly after the last steering group meeting, about potential discharge points. Obviously, the preference is for a land disposal discharge however, there were a number of options put forward at the last RPSC meeting in regards to potential discharge points of the river, Puarenga Stream and also into the lake and around the lake edge. I think it is safe to say that there was not a lot of comfort or acceptance of those two discharge points to the north on the lake edge, because of their proximity to some waiheta____, with one of those points going up towards Owhata (that is 4 and 5.)

AL – is that because of the pipe line or where it inter_____ or if that was to be actually in a lake discharge to go down it.

AC – I think partly influenced by the distance from the treatment plant in comparison to those other discharge points. It's in counter intuitive to a number of the members but then also the proximity of the pipe at that lake edge. The people at Owhata have not been active to be part of this process so that will provide quite a lot of new consultation at the engagement and I think the members said let's not go there if possible and lets really focus on the ones that will probably have more potential. Notwithstanding that, there will be issues with the other ones but we are really focused on 1, 2 and 3.

JB – Of the 1, 2 and 3, are they to be equally being considered at the moment?

AC – There was an equal dislike of the options, but of those the ones that was least disliked was probably the one that was very close to the Wastewater Treatment Plant (No.2.)

Still been talking about the different options that have been put forward in the plant. I think there are a lot of comfort with the different types of technologies and methods being looked at but we probably like yourselves are not quite sure what combinations are going to work. It didn't seem like a "pick them off the shelf, it's more how do they work together. Everyone was really focused on what is the best outcome with the mix and match and technologies. Osmosis, certainly members acknowledged the cost and it is probably out of the reach of Rotorua Lakes Council at the present time, but they certainly saw a need to make sure that it is in the thinking of the future and the new plant will allow for new technologies to be included rather than we end up with a plant that might be here for 35 years and then in 25-27 years' time people are looking at the plant, and say "gee I wish we had or wish we had allowed." We are hoping that we can answer those questions now and actually provide for those ongoing upgrades and maintenance. That was something we talked about at the last meeting.

We had that slide with the graph showing the different types of technologies and their ability to take out different contaminants and reverse osmosis was at one end. There was a number of other optional filtration. Members expressed an interest to have a look at the other ones.

There has not been an issue that we have been only just been talking about it and I am wanting to explore it more with the members.

AL – Do you think that they understand that that is solely filtration?

AC – Yes however, we haven't really talked much about the removal of the solids or the solid mixture that is going to landfill and talking about Terax and I think that is becoming more apparent to the members, that we are talking about all of the wastewater, not just the part that is being discharged because we are really focused on the discharge to a river or lake or land, but there is that other component that we are starting to have conversation about. I think it is going to be an interesting one because we have very much focused on discharge and while it has gone to the landfill, a little bit like flush and forget, its gone somewhere else, we don't have to worry about it, but actually it is a bit contrary to the principles of the _____ so that is something I really want the members to grapple with and I know some of the members are going to find it quite difficult because it is too hard, you are making it too hard for us but that is a place that we will have to go and I think that we have got a place where Terax is really an important part of the mix of the technology, being able to reuse and recycle some of this waste to help the process. That is all coming in the next few weeks.

Questions

WW – I am starting to get a number of queries from various sources about, considering going back into the forest or staying at Whakarewarewa. I am aware there had been some discussions. Would you care to comment a little on this.

AC answered Warren and members requested this discussion not be recorded in the minutes.

KM – At the last meeting in April, we discussed at length the process of the cultural sub-committee is going through. I think that process seems a little bit convoluted in that there is reluctance to share the qualitative information

relevant to the different options. I made a suggestion that perhaps each of the hapu might want to do their own Mauri Model assessment on their own surfaces, to get some understanding of the relevance of the qualitative perspectives alongside the physical because you might recall that the main issue I have at the moment is that if we are going to wait and get to the point to _____ by the physical data there is danger of ending up in a position and having a preferred option that is then trumped on cultural grounds and we have to go back to the start again. I know there are still trust issues to overcome, in terms of raising what these qualitative constraints will be around solutions suitability, but I still think these still has to be de-dressed and I have suggested that the hapu might consider doing their own Mauri Model assessment. Have you followed up on that?

AC – I did at the last meeting. I shared with them some of your concerns and also some of the recommendations that you made. I think they were well received by the committee members and certainly some of the hapu were quite keen to do an evaluated process as part of their input into the cultural assessment work including Ngati Hura Terangi (?), so we are hoping that we will have a section that will look at a valued assessment using Mauri Model.

KM – Sorry, that is not quite what I was asking. Are they going to do their own assessment in Mauri Model?

AL – you mean each group?

KM – I am perceiving from the feedback that Anton gave us last time, that there is a need to build up trust and there is a lack of trust or process, if there is a lack of trust ensuring the qualitative information that is relevant to this project. My suggestion was that the iwi hapu grouping do their own Mauri Model assessment, for their own purposes supported by Rotorua Lakes Council funding so that they can actually decide what qualitative information they can share with us earlier because that would be a big help for us. At the moment most of the qualitative information is, I understand, _____ table and we are blind as far as that goes. If there is some consideration of what information we can work with, then that will be an improvement.

AC – There are two answers to your question. Some of the hapu expressed a wish to do their own Mauri Model assessment and in terms of the trust and sharing information, particularly up wahi tapu sites and places of specific significance, I am confident we will get there by mid-June, but I think there is still reluctance to share information about those places. It will be a little bit interim as we go along.

KM – How is that being facilitated?

AC – Effectively, the CAS (Cultural Assessment Sub-committee) is the forum where that is being facilitated. They are quite comfortable sharing that information. They have been actively sharing it amongst themselves for at least the last 2.5 meetings that have been occurring, so we have got a really good understanding of places that are very significant and sensitive and the types of issues that are most sensitive from a cultural perspective and now it is just working through how much of that information they will be happy to share with a wider group and potentially, it being public and that information will need to be translated in the way that it will still has the same effect and impact, but not having to divulge all of their secrets.

KM - The thing I am raising is if they are going to do Mauri Model assessments themselves, how is that being supported?

AC – The Council has offered resources for the groups to be able to either participate in the project and/or prepare their own assessments, so those groups have made their own decisions about the level of input participation they want to have and a few of them have said that they want to use the Mauri Model, so I am waiting on them to be able to articulate that to me so then I can help facilitate drawing up contracts and briefs etc. and get that signed off by Council.

KM – Who is providing the expertise around helping them use the Mauri Model?

AC – That is a good question. I do not have the answer to that one at the moment.

JB – I guess that is a matter that would come from you back through Greg as Project Manager and Rotorua Lakes Council.

Do you have any further points Kepa as I really want to maximise this technical time at the moment.

KM – I think this is a fairly important issue. I think the intent is good but actually need to understand the process because if we have the intent and nothing actually happens and I think it is a lost opportunity.

AL – Is it something that we need to decide now, given that the hapu and the CAS have not decided exactly what they want and how they want to proceed with the evaluation. Are we pre-empting something. Do we have another meeting before any decisions are made before any assessments are actually carried out that can be discussed in the future?

KM – My point Alison is that some of them have indicated that they want to do their Mauri Model assessment. I am asking how we will be actually helping them to do that.

JB – This is a project question not specifically a TAG question.

AC – That is something I am working through. You will appreciate this Kepa. Some of our Iwi are very self-determining and independent. They really strongly expressed their independence in lots of different ways including technical and certainly the offer of assistance has been made and whoever that may be to help them and we are just working through that.

JB asked if there any further questions for Antoinne.

As there were no further question Jim thanked Antoinne for his update.

JB advised that the siting information is valuable in terms of that agenda item that we have later today.

AC – One more comment. I had expressed, not necessarily concern, but there is an opportunity for us not to necessarily have to wait till mid June when we get all the reports. There could be an interim process. I certainly appreciate the minds being quite open and as things are discussed and formulated, we could share those, so we get to mid-June and as Kepa said, don't wait that long for their surprise, or "I wish I had known that two weeks ago."

JB – At the last committee meeting, we wondered about handing over the land application site options without all the details.

JB suggested we change the order of the agenda and do the Alternative Land Treatment Sites first, as this will have the widest discussion, probably because the second report, the strategy one, may get into a lot of engineering detail.

JB asked Kevan to refer to which slide he is up to for Kepa. Once Kevan has completed showing the slides, we will get Kepa back up on the screen.

4. ALTERNATIVE LAND TREATMENT SITES – DRAFT REPOR

- Presentation given by Kevan Brian

(Presentation attached)

KB spoke on the presentation.

It was to identify potential sites for treated wastewater in the catchment. In the catchment is quite important because obviously there may be sites outside the lakes catchment. We established the likely size and the nutrient removal performance of the different sites that we identified and what the existing land use is of each of the sites. Also, the discharge methodology, what sort of device for putting the waste water onto the land and what type of sprinkler pivot. Also looked at how to actually get the water from the treatment plant to the site, so that is a bit of engineering as far as sizing up the pipe and worked out energy as far as pumping was concerned. Looked at some site layout details then work out from the above a capital cost, an operating cost and an NPB and on top of that, then looked at identifying some high level risks that are pretty much consistent with the headings we had in the last options, so around construction, commissioning and what further investigation would be required.

JB – So no significant consideration of consenting issues or land purchase/security of land use?

KB – No, we have not identified land owners at this stage. We have just said these are from a screening perspective, these are the likely sites.

Basically we looked at two alternatives. Option 4 is a dual discharge, with 1/3 of the total flow from the site stream MBR going to water with the remaining flow being discharged to land treatment system and option 5 being a total discharge. So all water going from the treatment plant to a land treatment site. For both options, the total mass of nutrients we were looking at was 30 tonnes of nitrogen and 3 tonnes of phosphorous. That is the nett amount that potentially leaks from the land and on Option 4, adding on the load from the MBR Plant.

JB – Just stating the obvious for everyone, 4 and 5 are the last two of our five short listed options on our graphic. Option 4 shows the split discharge, so it is using the same option numbers.

KM – Can I clarify one thing please Kevan, the 30 tonnes of nitrogen plus 3 tonnes of phosphorous, does it mean there is no difference including the discharge from the MBR as well, and it is just a hydraulic constraint?

KB – Not sure I understand the question.

AL – The discharge units are total discharge so it is the discharge from the MBR plus the discharge from the land.

KB – Basically what we have said is, if we put 2/3rds of the wastewater onto the land, then if x amount came off plus y amount from the MBR, those two numbers have to be less than 30 tonnes and 3 tonnes.

KM – That is after it has made its way through?

KB – Yes, correct.

One thing you will pick up here is it is very high level and there is a lot of work to do to figure out exactly where those nutrients went, but that was the basis of the assessment.

Just to recap on the treated wastewater quality at the moment, there has been a bit of mention in some of the meetings around other land disposal or land treatment systems, so I have put some information up about that.

Kevan then spoke on the following slides:

<u>Slide 3: Treated Wastewater Quality</u>

One of the goals of the treatment process is to remove ammonia and organic nitrogen, so the levels are relatively low. There are relatively high levels of nitrate, 40-60%, sometimes higher and one of the things outside this study, but that nitrate is quite mobile in the soil and moves the soil water so I think that is potentially one of the issues based on the current LTS and to put into perspective, the wastewater composition is very different in other schemes such as Taupo, whereas the goal is to remove all nitrogen via the land. In this situation, you are looking at just the

last little bit basically, so it is quite hard to compare those two. The limiting factor has been assumed how much water can be applied to land rather than how much nitrogen because usually these things, when you are doing this assessment, either the nitrogen is limiting or the phosphorous and/or hydraulics, so in this case we have assumed that the hydraulics are the limiting factor.

Slide 4: Land Area Requirements:

For option 4, for the dual discharge, the average flow from the plant is about 16.5 thousand cubic meters per day, at an application rate of 5mm per day, which we think is suitable for the general soil types in the area, this gives us 360 hectares requirement of land and for Option 5, where we have 23,800 cubic meters per day. The land area is approx. 500 hectares. Those are basically just worked out on the hydraulic application rate.

JB – So there are no buffers in there, that is nett area?

KB – Correct.

AL – To put that into perspective, we currently irrigate about double that hydraulic load at the moment.

KB – Because it is an interactive process, it is quite hard to set criteria, but a specific before you have actually figured out where things might be.

Then we looked at the nitrogen loading just to make sure we were not making a wild assumption about the nitrogen loading rate. Based on the latest data that Alison provided me with a few weeks ago, the nitrogen and the combined wastewaters, basically 6 milligrams per litre per year and over 500 hectares, that is a loading rate of 105 kilograms per hectare per year. To put that into perspective compared to other ones, Taupo is the closest. There is a cut and carry. Their consented rate is 650 kg per hectare per year, so you can see that obviously in this case the hydraulics are the limiting factor. Most of the end removal work has been done at the treatment plant but in saying that, lots still significant phosphorous removal is still required by land treatment, so that is probably the bigger function if you like of land treatment rather than nitrogen removal.

JB – To put in a national perspective, although all soils are different etc. in climates, that 105, there is a lot of regional plans and guidelines around New Zealand that have a 150.

KB – We used to use 300 as a guideline in this area. I don't know if that has changed. I cannot remember that far back as to where it actually came from.

So what we did with that high level analysis of how much land we might need, we then used GIS and worked through the GIS system with some constraint criteria. We agreed these with Greg and his team and then we used the GIS system to start narrowing down what potential sites there might be. We looked at the slope less the 20%. We thought this was very steep land wasn't useful. Well to _____ drained, obviously we want to make sure we maintain at least 5mm per day. For the flood return periods, we wanted to make sure it was outside of the flood return intervals for the lake and also on the land side of SH30. We didn't look at anything on the strip between SH30 and the lake. From rivers and streams, just the major ones that we could pick up on the GIS. Flood class 1-3, so that is less than 1 and 20 year return period. In regard to the distance from the wastewater treatment plant, we had initially set a criteria of 10km and we excluded urban areas. So we didn't look at putting in things like drippers, gardens and road medians.

KM – 10km's seems quite small.

KB – The initial rule of thumb that we came up with was that from a purely engineering point of view, we said if it takes 500-600mm diameter pipe at x amount to lay it, it sets a bit of a framework to say that is x amount of capital versus the other options that are on the table. We thought that if it goes 20km away and its costs $50M to get it

there, it doesn't seem sensible to draw the criteria that far out, given that the other options are in the $15M-$20M range.

JB – MWH have done a number of similar exercises particularly in the Waikato in the last year or two and coincidentally, they have all been smaller communities, e.g. Cambridge, but we have established about ten as well. Maybe for a larger community, economics might allow you to go further, but that is the kind of range we have been working on other projects.

KB – Our rule of thumb for the pipe is depending on the ground, somewhere between $1,200-$1,500 a meter laid for that size pipe.

KM – I think the 10km limit actually cuts out some options that I would have thought they should have been on the table and the community size is a big issue. By setting out 10km I think you may effectively be cutting land treatment out of the options for consideration just by limiting it to that distance.

KB – In saying that, when we get further into the slides, you will see we actually thought about that and we have identified a site that is slightly further than 10km away and you will see when we get on a bit further what the sensitivity is of both elevation and distance from the plant as far as costing and energy to get the water from one point to another.

Slide 7: Selected Land Options:

We agreed in our scope to come up with the three following options:

Site A Over towards SH5 – the one that is actually further than 10km
Site B South west of the existing LTS
Site C On the other side of the lake, towards the turnoff to Whakatane

Slide 8 and 9: Option A with Slope Classes
(Over towards SH 5)

- Outside the 10km
- There Is a lot of land there, just over 1000 hectares
- 300 hectares meets the initial design criteria - Option 4 requires 350 and Option 5 requires 50 hectares
- There is a bit more detail that needs to be done if this was a viable site. We know from the GIS and from looking at the site, there is a lot of volcanic mound formations which would make the site difficult because of it's river valleys there and it is also relatively steep.
- Currently used for livestock farming/forestry and some patches of significant natural forest.

So this one Kepa is 17km away from the site.

Option 4 – With Slope Classes:

We have basically put some GIS layers on and identified the slope classes so you can see there are some quite steep land being the orange patches and we have identified within those the green patches being the optimal sites. The blue is the next category, the maybes.

JB – Kevan, do you recall what the New Zealand land collective guidelines give for a slope, is it as high as 20?

KB – Not sure but what it does mean is that as you will see what sort of irrigation can be used here. It does rule out things like centre pivot, which is not suitable. There are too many mounds in the way and the land is generally too steep. Centre pivot is what is used at Taupo.

Slide 10: Option B – With Slope Classes

(South West of the existing LTS (closest to the current LTS))

Note: In the criteria, we took out the existing LTS as one of our criteria as well because that came out as a possible.

- From the Treatment Plant – about 10km away.
- About 1400 hectares.
- Meets the initial design criteria
- Mixed use at the moment – livestock farming, some dairying, quite a lot of forestry and scrub
- Relatively close to the Wastewater Treatment Plant and the current LTS
- We haven't looked at this in our costing but a potential advantage of this site is, there is some potential reuse of existing infrastructure with this option because there is a pipeline going close to that site.

AL – Are the black lines different land pockets?

KB – Yes they are, those should be the property parcels. We haven't looked at individual parcels. We looked at them next to each other rather than spread out all over the place. We have no idea as far as ownership etc. is concerned.

JB – Just to explain the colours again referring to the scale:
B is 4-7 degrees
C is 8-15 degrees
D is 16-20 degrees

The blues are getting as far as you want to go at 20. Our experience is pretty high, pretty steep so you are looking at the B's and C's.

KB – Given there is 1400 hectares, we think there is sufficient land available.

KM – What are the orange dots?

AP confirmed that these are archaeological sites.

Slide 11: Option C with slope classes:

Site out towards turnoff to Whakatane (towards Airport)

- Total land area is 676 ha
- Meets the initial design criteria
- Relatively flat
- Close to WWTP
- Livestock farming, pine tree nursery, life style blocks – the lifestyle blocks include the whole area

KM – How much water does the nursery use?

KB – not sure.

JB – You have a significant proportion of it in the low slope categories?

KB – Yes we do. This is the site that is most suitable for centre pivot irrigation because it is relatively flat except for the blue area in the back again. The orange dots are archaeological sites that are noted on the GIS.

Referring to the top left hand corner of this slide, this is the nursery, (north east.) Again, have not looked at any ownership.

Slide 12: Nutrient Removal Assessment

- For Option 4, we need to remove nitrogen, just over 12 tonnes per year.
- 15.5 tonnes of phosphorous to meet those numbers.
- Option 5 – slightly higher because all the water is going onto the land. You can see there that phosphorous needs the most additional treatment. Within our scope, we didn't do a detailed analysis on science based analysis on the fate of the different nutrients in the soil because we did not have enough detail on soil information etc., or ground water levels, but we assumed 100% removal of any Ammonia Cal Nitrogen that is left in the wastewater, 100% of particulate because soils are a good filter and some of the soluble organic nitrogen. We haven't assumed any of the nitrate be removed to meet those numbers. This is something that needs to be investigated, which may or may not be the case.

For phosphorous, again, 100% of particulate matter and we need to get just on 90% of soluble organic p. That again needs some more investigation as to how suitable the soils are. In saying that, if the soil was not quite good enough to remove that phosphorous, there is the option of offsetting a hybrid option where you can offset some of the phosphorous at the plant with chemical dosing. You can use the land for 100% of that 23 tonnes or a sliding scale down, depending on how much chemical you put in at the plant to improve treatment.

AL – where did you get the 60% from. It is hard to tell because you don't know the origin of the soluble organic nitrogen.

KB – That is worked out backwards by saying no nitrate removal, all the ammonia nitrogen, all the particulate, what is left over to meet the numbers of 60%. We thought it didn't seem too over the top but it does need some more investigation. We don't know what origin that is and what it is actually made up of.

JB – So 4 and 5, N & P tonnes, you require to remove by the land treatment system and therefore the assumptions you have made in the next row are assumptions that would get down from the treated wastewater at the end of the plant to those levels.

KB – Correct. The robustness of those need to be challenged but we think the ammonia in particular should be relatively robust and the soluble. Seems likely, but I don't know.

JB – I think I asked the question on the way through, you haven't looked at the soil type relative to phosphorous breaking through in some many years' time?

KB – No, and hence the comment that if that is an issue, then you can have an offset type where you remove some of the plant, some on land.

AL – But you did have phosphorous retention, moderate to high phosphorous retention on the soils.

WW – does that assume that we have 30 tonnes about to be leached subsequent from land system?

KB – No, that means that for Option 5 it does, for Option 4, it means what leaches out of there plus what the MBR will discharge.

WW – If Option 5, that assumes that you go up to 47.35 tonnes applied?

KB – Yes.

KM – Do you know what the application rates are at the moment for the fertiliser?

KB – No.

KM – That would be an interesting consideration. If the farming users are already applying fertiliser, we also want to take that into account.

KB – The scope was to identify the land use but not to work out any offset from the land use. You will see on each option that we have said what the land use is. However, that could be investigated further if necessary.

JB – Just taking that question a bit further Kepa, also if there is stock on there, what is the application. There has been work done elsewhere on. This is the current land use with stock and fertiliser verse, what is the options?

KB – There are some numbers on page 17, table 4.4, of the report. There are nitrogen leaching rates for various land use activities, so it wouldn't take a lot to have a look at the land use categories and use that table to have an estimate, if required.

KM – I think that's useful for understanding the overall situation.

KB – Could well be, we weren't asked to do that, so we didn't.

KB then referred to the table that had come from the Waikato Regional Plan.

Those are there but they have not been used to say, e.g. if you have got a dairy farm we haven't said "well you will save x amount of an offset, that has not been taken into account."

JB – So that is the next stage, depending on where you are going?

KM – Yes, whether it is worth investigating further or not.

JB – And those numbers very briefly, after talking to Andy, they are very similar somewhat to the Rotan Report.

<u>Slide 13: Infrastructure Requirements</u>

KB referred to the second pumping head column in the table advising that this is a typo and to ignore.

<u>Option A – State Highway 5:</u>

You can see the effect of the pumping head and the distance of the rising main, just over 17km of pipe and approx. 200m of pumping head to get it from the treatment plant to the site and it does not include any pumping head internally to the site either, basically getting into holding ponds. I do not know what the layout might be.

- Option B
- 133m, much the same
- About 10km away
- 2 pumping stations required
- Same size holding ponds for same amount of water
- Those first two sites, because of their slope class, we think fixed sprinkler similar to what you have got at the moment is the most suitable.

Site C – flat area out to other side of the lake:

- Pivot irrigation there.
- Looks suitable as relatively flat.
- Not a lot of elevation between the treatment plant and that site, so the pumping head is quite low and we think you would only need one pumping station to get it there at about 9km.

WW – Any consideration of sub-surface irrigation on those flat sites?

KB – No, looking at studies that we have done before for Taupo District and other sites, on the flat sites, the pivot is the economical.

JB – That is confirmed. We have just done a big one at Rolleston and doing one at Te Anau pivots.

WW – Site B which is out by the dump basically, isn't it? There might be come considerable sensitivity about leaching back into the Puarenga.

KB – That was basically infrastructure requirements. I think the double up on the column, the other column that was in there, was the diameter of the pipe, about 500-600mm ID pipe, so reasonably big.

JB – Just by comparison, the pumping head of 202 and 195, they are huge. What are you doing now. Isn't it about an 80m static lift to the current LTS and about 120 total head. Taupo I think is about a 70m static and that is an ongoing energy cost for ever.

KB – Would be very similar to Option B.

AB – In terms of some of the risks too, I think the proximity to other smaller lifestyle blocks is quite a concern in some of those areas, particularly Option C. Not sure about Option B. Probably a bit more remote isn't it and A also quite remote?

KB – Yes, we should put that on the risks, definitely.

AB - If you were thinking about centre pivot in Area C, think about what a centre pivot operates , is it strong wind, could have quite a few issues.

KB – Yes that issue has been brought up at other Taupo LDS and there was a debate about UV disinfection. That may or may not be something that you would have to look at.

ACTION: KB to put a comment in the report along those lines saying a risk to lifestyle blocks and maybe drift.

JB – The aerosol thing is alive and well. Taupo is seen as one of the cases that is guiding New Zealand. The ESR have just presented a paper on centre pivots and aerosol risk.

KB – It is reasonably remote farmland there and there is a reasonably good buffer, except that there is a road that is relatively close.

JB – Droppers right down low as they have got at Taupo and not having big guns on the end.

Slide 14: Summary Table

KB – These costs include an estimate for the land cost. I would need to check the details of where the land agents actually asked. For an indicative type of land we can say where these things were and what sort of rate per hectare, we just applied that as a capital cost. This includes the mains to get the water to the sites. The land itself

and the gear to get the water onto the land, i.e. the pivots or the sprinklers. You can see that Option A (elevated site) the OPEX cost is very high because there is a lot of pumping energy to put that up there.

KB asked what the total OPEX is at the moment for the plant.

GM – About $1M without the land treatment.

JB – The land system is about $1.8.

KB – Option B, because of the elevation again and the head loss it is still reasonably high OPEX due to the head. Obviously when you pump more water, there is more energy cost, hence why all the Option 5's are slightly high and then the flattest site, or the least elevation to get the water from A to B, is obviously the least OPEX cost. The MPV's are relatively high. The cheapest one being Option 4 and Site C, which is the flatter area with a dual discharge being about $56M. The highest MPV being Site A, Option 5 at $119-$120. Key risks, there are some GEOTECH challenges. There is a high number of streams, hilly and complex irrigation arrangement in the Option A and B at least. Sandy soils on Option C, a proximity to lake and as Andy mentioned, proximity to people as well and higher land value there also because it is relatively flat land.

There is a sliding land value. I think the one out by the current LTS may have been the cheapest hectare rate and C was the highest. That is in the CAPEX.

AB – So the CAPEX covers the main line out there, the pump stations and the land price. Does it include the network or pivot systems?

KB – Yes.

JB – Just on that, I asked about buffer zones. Is the land cost just the nett x the land value or did you add a buffer that you would have to purchase too?

KB – No, it is the nett.

JB – So if it was a 20% buffer, depending on the thing, you would be adding up to 3 or 4 million on some of those CAPEX.

GM – Shall we include it?

JB – I think we need to.

KB – One of the difficult bits with the buffer is we haven't identified exactly on some of the sites where things might be.

WW - It looks to me as though Site C has got a lot of Ngati Whakaue land in there, Wharenui ex dairy farm, so you probably would not be able to buy it, it could be a lease arrangement.

KM – Looking at the table on page 22 and your report Kevan, you mentioned that there is some potential to use the transfer main that already exists for Option B and for both of Option B you have about $11M plus transfer main, so that would significantly affect the competitiveness of different options. I think what would be useful for us is if you do a sensitivity analysis picking up on some of those things like the cost to convert their transfer main to this alternative site. Also, you started out with the assumption right at the beginning that the maximum application rate is 5mm per day, that is very low. Because it is hydraulically limited, you could probably push that to 20mls per day. If you went up to that , that actually brings the land prices down quite significantly and it would be good to see what a sensitivity analysis was on that, depending on what application rate you are assuming and when I talk about that, I think it is important to take into the account the suitability of the land, depending on the slope and we haven't taken

that into account at all. So we have assumed regardless of the slope, the application rate will be the same as 5mm. I don't think that really, in terms of the opportunity to increase the application rate on the flatter ground.

AL – Kepa, are you thinking if we weren't actually using the land for anything, we have got an opportunity to increase it?

KM – I assume the 5mm maximum you are stocking at a maximum rate. But what if you just took the stock off and you just loaded it up as basically a discharge site. 5mm a day is pretty much nothing.

AL – Do you know what the Taupo irrigation is, I thought it was 5?

KB – Not off hand. I think that is a bit difficult because it is controlled by Nitrogen so the application rate is an effect of nitrogen rather than the other way around.

AL – I don't think there are any that go over 5 other than our current one that are that slow irrigation where you have got another land use on it unless you were to move away from actually having something else on that land and getting towards more rapid infiltration. So, our current site is 9-10mm a day.

KM – As these are free straining soils, to my understanding, having a 5mm rate that is normally assumed because of the nutrients, are we taking that as a hydraulic limit and is probably not a valid assumption.

AL – Except our current one is 9-10mm a day and we regard that as a bit wet, too wet for trees and any other use.

KB – In soil profiles, there are a lot of layers. Some are really good, some not so good.

AL – I think it is an important point, because if we were to dismiss what we are using the land for and to just concentrate on just getting rid of water, going to rapid infiltration and getting that land size down, that is something that the scope did not include.

AB – So we haven't looked at rapid infiltration?

ALL - Yes, we have, at one specific location though.

WW – But wouldn't rapid infiltration increase your residual leaching?

KB – I think phosphorous you would have to base removal of it all in the plant. Nitrogen, maybe not quite as much reliance on removal at the plant, but almost.

JB – On the assumption MOTT's made in the December report, rapid infiltration had a Capex of 41, for that site. That was a fairly conservative soil type wasn't it, for rapid.

KB – Yes, we had to choose a site to make any sense out of our study.

JB – The question Kepa raised about table 5.2, should a sensitivity exercise be done taking into account use of the existing infrastructure, particularly the main up to the LTS and the buffer zone addition, which should be done anyway on the base case and the variability of application rate. JB asked GM how he saw this as a client and how far do you want Kepa to go?

GM – If this is a requirement, let's do it.

ACTION: Greg to discuss the above further with Kevan.

KM – What size is the main that comes in from Mourea?

GM – I think about 300.

KM – What if you reverse the flow in the pipe for a period each day.

KB – I think the pumping costs would go up because of the velocity. I think engineering wise, might be difficult.

GM – and also operational wise.

JB – You would have a lot of potential for "rubbish" in the pipe. How would you get rid of that before you reverse it?

KM – You have got holding ponds up in your distribution and your area, all you would do is back flush to the plant and then pump through. You could probably work it out, it is just whether it is viable in terms of the pipe size.

KB – Given that the pipe size is between 5-600mm, my initial guess it would be difficult.

KM – ok.

Slide – Additional Risks

KB – What we haven't looked at is access to lay pipes. Could be a lot of easement etc. to look at. We have just gone the most convenient route rather than working out whether there is any no go zones etc. There is another risk, but is not in the report, that the scheme may need to cater for all flows, even dual discharge because of redundancy issues and I don't know whether that is a significant risk. There is some risk that if you had to take some capacity of the MBR offline for a period of time, you would still need to be able to put it somewhere. You would probably end up, I would have thought, having the same size land disposal.

KM – What would you do if the MBR comes off finding you haven't got the back-up option?

KB – That is basically what I am saying. If you are engineering up an option where you are relying on the MBR completely, then you engineer in enough redundancy into it, make sure that is not a problem.

AL – At the moment Kepa, if the MBR goes offline, we do have the Bardenpho.

KB – If we didn't have that option, then you would have to put the water somewhere.

AL – So we need to build in some flexibilities.

KB – Yes possibly, or a bit more redundancy in the MBR.

KM – That might reflect a saving in the design requirements for the MBR.

KB – It's probably the other way around. I think it will be more expensive.

KM – But didn't you just say that if you didn't have the land disposal option as backup, you would have to make the MBR bigger.

AL – Would you need more land to allow for that hydraulic from the MBR for when it was down, potentially?

KB – What I am saying is you might end up with about the same land area with all options because of redundancy. That is something to think about.

KM – I don't totally follow that because you haven't got a backup for your MBR when you haven't got a land disposal option. Maybe creating problems that don't really exist.

KB – It was just a comment, just a risk in my mind that I think would exist, not necessarily that it does. The other risk obviously is purchasing land if that is what you want to do.

JB – I think maybe that last slide should have something about consenting risks.

AL – How feasible would it be taking Kepa's comment about the infiltration rate and irrigation rate to the extreme, the rapid infiltration. I think if we look at 40 hectares for the rapid infiltration, which is around 10% of what you are looking at for this site and given that had issues with the dispersion of the water, so you could find better sites basically than that, like maybe for half of the area, which would mean you would only be looking at a twentieth of the area of the land, which would cut that cost significantly and reduce the constraints because you could probably find sites that are a twentieth of that land area and then increase the treatment of the plant. To what extent do we need to look at now, specific rapid infiltration sites.

JB – Your December report Kevan had a 10 hectare rapid infiltration based on that.

KB – I think you have got one end of the boundary already, we have got both extremes, because you have got options for approved treatment costed which would be one side of the boundary then you have got full land treatment, which is the other end. You would also have sensitivity in the middle, so it would probably swing a bit either way, but it might not actually make a lot of difference.

AL – If we could get that rapid infiltration site, could be improved by about half, maybe then look at a five hectare block for rapid infiltration. Is that feasible do you think?

KB – It may be.

WW – Arturo, how big is the rapid infiltration, rock bed or whatever it is that is adjacent to the Wastewater Treatment Plant on the discharge location?

AL – It was ten hectares.

JB – No, the rapid infiltration beds that MOTT's looked at in December was 10 hectares. Are you talking about the discharge point to that, not determined but a few meters, absolutely minimal, not rapid infiltration, it is just a diffuse discharge mechanism of that concept.

AL – How much of that cost would be reduced if we were able to find a site that we could half, for example, of that area. Would there be much of a reduction in cost?

GM – The cost would be mostly on the transfer main pipes.

KB – I don't think it is that sensitive because you could bring the land down but the pipes are going to cost exactly the same to buy and then to offset the land by the treatment number, so I think it would balance out.

JB – They are all in the report.

AL – But we could do a distance size couldn't we.

KB – You could put different things together which hasn't been done.

GM – What you could do is take the flow coming from an improved treatment plant transferring points A, B and C at the reduced area and see what the cost is. All of them are there anyway, it is just a matter of including them in the table.

KB – On an OPEX basis, you have got to pay for everything to treat better and then to pump it somewhere.

AL – I was thinking about the need to put it through the land, how little that area of land could we go and how much would we reduce the price?

JB –That would bring the 40 down to about 28 if you had half the area on Kevan's figures. So they had 40 top for 10 hectares and the rapid infiltration was 26. If it was pro rata on size it would be 13 off 41. The mains cost is still in there.

JB asked for a discussion now with the team and see if as a TAG we can get to some concluding point at this stage of the study to take back to the Warrens committee in terms of how we see the options, notwithstanding we can't make calls on affordability to any great degree but from a technical point of view, how we see the land and particularly these three alternative sites.

AB – First thing I think we need to be discussing, and it did come up at our last meeting, is that obviously Kevan has been asked to look at 3 and 30. We discussed that's not what we are assuming now so we need to be careful that we are actually presenting to the community or to the steering group what is comparable with what they are getting now. I am not sure that it is that bad because looking at Kevan's costs there, if that means doing more Alum Dosing to get that, so be it. I think Alum's cost is probably twice as much as what we are paying so there is actually scope to move in there. I think we have to be very careful that we don't portray to the group that this is equivalent to what we are getting now because it isn't and another 1.5 tonnes of phosphorous is really significant.

AL - If you can remove the dissolve phosphorous by adding more alum you can remove the particulate by either land or tertiary filtration. Aren't they all comparable?

AB – According to achieving to whatever we want to achieve, what I am concerned about is if we go to the community and say we are going to meet 3 and 30 and that's to what we are doing now, that is not correct, because we are achieving about 1.5 and 30 and that 1.5 extra phosphorous is really important to the make and I think we need to ensure we are covering that off and Kevan, when you were out of the room, I was suggesting to get that phosphorous is not that big a cost and my suspicion is we have gone very conservative in the alum cost.

GM – I think it is a significant jump from 3 to 1.5.

KB – It is a lot more risky from a practicality point of view. It is a small drop concentration wise but a big jump in risk and operations.

AL – Risk to achieving it, but if the limit is set at 3, that's our target like it is now, what are the chances of being able to operate, not continuously, because you say there is a risk, but there is a possibility that even if you set that at 3 that we could operate potentially lower than that with some of the options. But you wouldn't want to set a limit. So what we are saying is we could achieve the limit of 3 but we could actually operate lower than that?

GM – What we are saying is, in terms of the legal consent, we still want it at 3 but aspire for a better phosphorous level than what we said. Because we don't want to go back again with the same exercise, we accept 3 and we go back to where we came from, then we are not meeting our consent.

KB – The other thing is as well Andy is that without the growth in there you are actually achieving the same concentration less mass because there is just not the flow there either. Our future numbers are all based on 24

tonnes pa and you have been around 19-20 forever. If you look at that first report, it hasn't changed. There is some fat in there as well.

AL – What I am assuming is that when you say built one of these plants and you are operating within an objective of beating 3, then you are going to be somewhere below that, you have to comply. Where do think you will be?

KB – That will come next. To me this mass would assume that you hit it 50% of the time with your average flow to get the yearly mass.

AL – Is it a qualitative statement around the risks. We know that if we are using settling tanks to try and do that, depending on how good your tertiary filtration is, whether all the way to a land treatment system, you know that at each step any improvement in tertiary filtration is reducing risk associated with non-compliance.

GM - This will all be part of an optimisation process.

KB – Some of it comes down to OPEX optimisation as well because you can throw loads of chemicals to get down to that number but you will have to pay for it.

AL – But you could in some of the configurations we are looking at. We are Alum Dosing and the secondary's and we have got a lot of area in the treatment plant to Alum Dose. We could optimise it as well as capture it with filtration but some of them we are looking at maybe if we have got a restricted area of Alum Dosing, that's a little bit more risky. Some of the options that we look at I think we don't have as much room to play with chemical removal. I think it is a good point.

JB – That is where we are with the Palmerston North project in the phosphorous DRP in particular and filtration and optimising particularly chemical dose. You can get extremely low with decent optimise control chemical dose but it costs and that's back to Kevan's slide of the offset.

AL – So there are two things we need to make sure we have got, filtration and good ability to chemically remove phosphorous.

JB – And maybe that can come back to the land application. Back to Andy's point, from my point of view, I think this is partly an output of the effects assessment.

KM – I think that these estimates that Kevan has provided do not rule out land disposal at all. I think that there is actually room to sharpen the pencil on some of the land application schemes elements. One of the things that should be clear is that after 20 years, the nett present value estimate of the option, if we are actually buying land and land still has a value after 20 years and that is one of the assumptions I think in the comparison. Now where a treatment plant has a use _____ and then you may be able to recover it but it is more likely to be a liability. If you bought land and after 20 years that land is probably accrued in value so there are a few things about the land disposal option that I do not think we have teased out fully and those I will summarise.

1. Application rates – they are very conservative and there is a need to do a sensitivity analysis on that.
2. The infiltration idea that was suggested by Alison, we need to look at that and maybe a combination of infiltration and higher application rates where you continue to have some sort of land use on part of it.
3. The reuse of the transfer main that is there for the Waipa Forest discharge.
4. That you do end up with a residual value in terms of the land that you have bought.

Those are the main points and I think that when Andy was saying we want to be careful what goes out from this report. At this stage, I do agree with that. I think at this stage the prices that we have got will give a certain impression around what the viability of these options is which is probably negative in terms of what they really are because there are assumptions that have been made that make it I think more expensive.

JB – thanked Kepa for his valued input so far and the points Kepa made on the land.

If we round those up, do you think there are a number of considerations before a reasonably confirmed position of TAG can be made.

KM – I think that until we take into account those issues about application rates and suitability of the site, because remember I also raised that there is a slope and the infiltration rates. At the moment it is very coarse in saying that a 5mm is applied across all of the sites. I think there is the opportunity to maybe be a bit more sophisticated with that. It is not a criticism, I think it makes quite a big difference in terms of what the end points are and cost and I think that when it goes back to the Standing Committee, they are going to take quite a lot of attention to the cost.

KM left the meeting at 11.51 p.m. to teach for an hour.
Referring to the next presentation, Kepa advised that he will feed back his comments after the fact, when he returns.

JB – Let us continue the discussion on how we see the land application, the activity of the sites and the overall picture.

WW – My suggestion is that instead of referring to, as per the report, the selection of the best plant treatment which has been made, based on the revised effluent discharge criteria of 30 tonnes of hydrogen and 3 tonnes of p, that we go, it does not exceed 30 tonnes, because that is effectively what we are trying to do isn't it.

As you go through the more detail work and assessments, we are going to get a better understanding of what that really means, which is what you will need to get back to Warrens committee and back through the resource consent process.

WW asked AC if they were having a CAS Committee meeting sometime before the 25th.

AC – I just came off a phone call getting an update on the Whakarewarewa Forest.

WW - I guess my gut feeling around it is hearing comments from people like Wally Lee about the site out by the dump, he said, "don't go there." If there is any infiltration in Puarenga Stream, I think we will have an issue here.

AL – Except the alternative we are looking at is a direct discharge to Puarenga.

WW – I am talking about the upper catchments.

AL – Going past the village.

AB – In terms of the costings it's the best alternative so far.

WW – The Wharenui site is good if you can get your land area down, but again, because pretty close to stumps there, I wonder if that land would be available.

JB – That is Site C?

AL – If we could get as low as 5 hectares, it was considered in the _____?

JB – So that is really only a land contact isn't it. It is not a nutrient removal. It is the large end of a boulder bed.

AL – and the cost for the $28M, what are those costs? The cost of the land Jim, you said you could get it down to $28M, where are the costs in that?

GM – If you going to discharge from the treatment plant to Site C by rapid infiltration, you have to put in a bigger pipeline from treatment plant to the site. There may be lesser land requirement and cost but would be greater cost in pump and pipeline cost.

AB - Why would you pipe that far?

GM – Because he wants to go to Site C.

AL – No, to the point gravity from somewhere off our existing line that goes to the forest to a site. So we have already got the existing pipe going up to the forest, come down from that and could we get away with not doing tertiary filtration as part of the upgrade at the treatment plant?

AC – Probably yes, because the soil would do it.

AL – So, do we need to look at making it the cheapest way. We could do that by using the exiting main, smallest size land, land that is mainly in that area so you don't have to buy it and not doing tertiary filtration.

JB – If you are going to do rapid infiltration and build a 5 or 10 hectare rapid infiltration base, but where does it go after it has been in that bed. Unless it is on the side of a lake or stream, your restriction is your parent material.

AL – That is why you don't go on somewhere flat, you come down off the main pipeline that goes to the forest into an area that is sloped and goes down to the stream so it can move away.

JB – So, in fact, you may even have overlap flow downgrading, if your parent soils cannot take it.

AL - Those parent soils can take 100ml an hour, they can take a lot water, so really it is where it comes out. But that site was looked at initially up at the forest as potentially being able to take that hydraulic load. I wonder if we should pull that into here.

JB – Greg, is this an additional assessment that has got to come into the next draft, that links the earlier report with rapid infiltration in that area?

KB – I think so. With the costing of the RI is it is really difficult to do it without knowing where you are doing it, what the soils are like etc., because you can't and it is very difficult to come up with costs.

AL – That's why I was wondering if we could use that site.

GM – That is still within the existing land disposal system. It is still within the area, so it will be a problem. The initial _____ was based on a rapid infiltration just below the existing trunk main and regulatory plant and by gravity, you could go by rapid infiltration.

AL – Is that something that we could assess in just internally and put to the CAS group to see whether this is something that could be possible in that land area. It is not a land treatment system but it is maybe just 3 or 4 hectares isn't it.

GM – It is still within the land treatment system. Use an existing facility, an existing trunk main and existing pump station and holding pond and from there you gravity into an area of downstream of the Katore Road Ponds and pump station.

KB – What Alison is saying is you dose Alum but you let the soil do the filtering.

AL – So it is like option one without UV.

JB – Maybe, maybe not, because you would have medium term maintenance problem.

So what we are hearing is in terms of the alternative basket is some degree of treatment, particularly additional agree of treatment in alum and a rapid infiltration and on a nominated site that is within the LTS and that the agreement, it was to get out of the LTS. In terms of an alternative assessment and an RMA defensive approach that seems to be a sensible thing to button down one way or another but it opens up a reuse of a small proportion of the LTS that has an agreement with Council on. The question for TAG is, if we as TAG have identified it as a possibility in the alternatives basket that has a significant land component still with it, in terms of land contact and not just touching, TAG identified that notwithstanding the agreement does TAG say, this we believe in terms of a defensive audit trail and where the various reports are coming to. Should be looked at, is it possibility under the agreement to even look at and that needs to go CAS, or can we go straight to CAS as TAG, does it go through Warren or does it have to go through Rotorua Lakes Council.

WW – As I see it, we were trying to get the cultural filter across the actual group. It's the concept we want, so that you are not going down a no go road.

GM – Reusing the existing rising main and then reusing the existing pump station and from there gravitating into an area of possibly 5-10 hectares within the immediate vicinity of the Katore Road pump station.

AB – How far away would that option be from that place.

GM – It is possibly another 2-3km away. We could include this in Kevan's report.

JB – In terms of CAS, where does TAG stand on that.

WW – I think the job of the TAG is to assess the technical options, put those on the table and refer to CAS for the cultural assessment.

JB – Can we come to any interim comment conclusion other than the three areas and how do we see areas (a), (b) and (c) and how do we see the overall feasibility and note of course the high cost, particularly those with high operating.

WW – Do we get into too much detail given that the Whakarewarewa discussion is still on the table as I understand it Antoinne, and I am picking that we will get a fairly direct feedback from CAS on the three sites that we have talked about today in terms of sensitive relative sensitivities. Until we have got that, is there any point of doing any more work onto those sites.

JM – Taking that the next step as TAG, are we in a position to release the three general areas (a), (b) and (c) and the point that we are expanding that work by rapid infiltration on the forest. Is there any difficulty in releasing the three areas pros and cons from a technical point of view to CAS so they keep moving before our next meeting and before Warren's next meeting?

GM – Do we need to do the sensitivity analysis that was suggested by Kepa, including the Rapid Infiltration option. You can put that into a table.

JM – And then maybe via the email on the site we give TAG a couple of days for any comment back on that and then it can be released confidentially still as a draft to CAS.

AL – As it is, that table that you had with all the costs, option 4 looks like it is cheaper.

GM – In Option 4 Kevan, did you allow for a cost of MBR discharge into a discharge point. I think we need to do this and price it up?

AL – And if you put the RI in we would need it to be a total price as well.

KB – Which one would we add onto the MBR, because there are six options?

GM – Can you put a range there.

AL – You could do the cost with RI with or without filtration at the treatment plant like with or without aluminium going onto the site. That would cover Kepa's point.

KB – I will evolve RI and put a range on the other study onto the MBR to add onto this.

GM – Yes, option 4.

KB – I think that sensitivity, because what we can do is take out the land cost completely, put it in the treatment cost and see how it swings it.

Andy left the meeting at 12.12 p.m.

JB thanked Andy for the use of the room at the Regional Council.

Can we round off the land application and thank you Kevan. You took us through that very well and we can see the ties of the previous report. JB asked Greg to sum up as he sees it on where we are next following what we have just said that from a TAG point of view, where do you see us.

GM – All the options are there plus the result of the sensitivity analysis that was suggested by Kepa and then we can investigate the RI options as well. Hopefully by 16 June we are at a stage where we could go to the workshop with the RPSC with a recommendation of a shortlist of options, taking into consideration technical consideration subject to cultural advice and result of effects study.

KB – I believe at the moment we have enough at the high level to say that those three sites as "traditional" land treatment systems are more expensive than the other options. If you are going to go for them, they have to be something smaller and then what you look at is narrow the funnel down a bit and say if they are smaller, what is the best balance technically from a land, smaller land, or treatment and how does that balance work out. I don't think that is a major step than what we have done already.

JB – And what those two comments are highlighting, but I think will become more evident with Kevan's next report is that bringing the treatment and the land and water options together of where that whole environmental cost balance is. Going back to our options 1, 2 and 3, we are going to have to bring together before as a working paper for the 16th TAG so coming out of that, bearing in mind the 16th TAG is a key one for the effects assessment. That is the major item on the table. So if we can pull together a working paper going back to TAG on treatment options that you are going to take us through now matching those with land and bringing together the total estimates and the rapid Infiltration there, that should give us a pretty strong direction.

KB – Might be some sort of graph we can draw Greg, because at some point as you shrink the LTS, you are going to have to deal with nitrogen in the treatment plant as well, which then pushes it all into treatment plant again.

GM – Would be good if we can get direction from the CAS straight away.

JB asked for any further land comment.

WW – Is there any potential in a large enough area somewhere adjacent to the Wastewater Treatment Plant that lends itself to rapid infiltration?

GM – None

KB – Jim, do you have any contacts at Queenstown because that Delta RI system might be the best one for us to compare things to. That plant is about the same size and they are doing an RI on Delta itself. This would be a good comparison?

JB to follow up and get some information on this.

5. MOTT MACDONALD WASTEWATER STRATEGY DRAFT REPORT - includes TERAX interaction with Wastewater Treatment Plant

JB advised that this is incomplete, draft and confidential to TAG as is the Land Application. From your point of view Greg, the TERAX decision is a big one for Council, a Council decision and TAG to be mindful of interactions with the liquid stream and as Antoinne said at the start of course, we should be looking at the thing elastically and integrated and that is very much the way of Maori as we see that that whole listic approach with the link between nature and human nature, so you need to bring that RLC position in Greg.

GM – The first round of reports was done by Mott MacDonald in December 2014. The three identified options, 1,2 and 3 considers Terax going into the waste treatment plant and there was a point where we were getting concerns with the recent issues and risks related to the integration of the Waipa with Terax and so we formed a project group consisting of RLC, Scion, Mott MacDonald and Worley Parsons and PDP, an independent advisor. We identified two issues which we said could be sorted out, but would have some significant costings. From there we commissioned PDP to review the business case of Terax, with the treatment plant upgrade considering with or without Terax and review the costings. Another question that we wanted to answer was, what if Terax is not part of the considerations, how would we configure the upgrade of the plant. This is the study that was done by Mott MacDonald. Obviously this still has to be reviewed and Kevan is aware of this. This is still a preliminary report and decisions on these will be based on the decision and whether we will proceed with Terax. This is a decision that will be made by the RLC hierarchy.

KB spoke on the presentation.

This study as Greg identified is obviously coming from a slightly different angle than the one I was speaking about which identified the most appropriate. It probably frames quite a lot of what we have done, the most appropriate treatment process for the treatment plant to meet the future limits of 30 tonnes and 3 tonnes in the discharge.

So the study is based on identifying a treatment process that will meet the nutrient lines without any assumption of using Terax or anything else, which is basically from scratch what we could do and we wanted to do in there as well as compare to other processes of plants to validate likely performance, so there are some reference plants and look at CAPEX, OPEX and NPV of whatever solution we came up with.

What I tried to do here was start off with trying to identify what the drivers are and then look what particular bits of the process need to be modified, changed, something new in modules around the plant, to meet the drivers. Really the drivers are the ability to mass discharge from the plants, so how reliable might that be and what sort of plant might that be, starting from scratch. There was a caveat on this. When we looked at whatever options starting with a clean slate, but also considered the best use of existing infrastructure that is already there.

Slide 2 – Progress Drivers:

30 tonnes requires 3.5 milligrams per litre on average.

KB suggested that TAG need to explore and get some guidance and think very carefully about whether you are talking averages, percentiles or whatever, because that is what this whole thing hinges on, in my opinion, which we will come to later, because things are very sensitive as to whether you talk in medians, percentiles, averages and make sure that is absolutely locked in stone.

AL - I think we have had a bit of guidance on that. From the lakes perspective and I guess this will come from Dave and Chris. My understanding is there would no reason to go any shorter than a one year average load. Is that the general feeling from the Water Quality TAG. So I think we are fine looking at the medians.

JB – Your mass load now is annual average.

AL – We are still looking at an annual average.

KB – The reason I said that a bit more strongly is Andy's comments about not to exceed.

Referring to point 3, as far as bio solids which is another driver obviously the sludge residuals that are left over, there is no clear drivers, we take away Terax assumptions, there are no clear drivers about where or what the final disposal area path might be but we have used the normal ones from the treatment plant. If you like, we can try and get maximum dryness when you dewater and get a minimum body down the end, so wherever it goes that tends to be the general drivers. At this stage there is no disinfection strategy, but it might be important that it is probably a likely requirement, The final effluent is discharged to surface water, depending on where it is in the surface water, is it in the middle of the lake or at the side for example. There is no definite drivers yet, but that may come into it.

GM – In terms of this report what you are saying, you have not allowed for UV or _____.

KB – No because there is no number that anyone has given me to say we think you need to disinfect to this level. That is only about no clear driver. What I am trying to do here is screen and say what the main things are that you need to consider, and really from a consent point of view, it's a liquid stream and obviously there is a solid stream indication to that as well.

JB – Earlier in the first presentation if we can look at ammonium nitrogen you have got 1.24 in the MBR and much less as you would expect in .33 in the Bardenpho. You had a slide earlier about almost total nitrogen ammonia removal and the last little bit was going to be done in the soil. If you were going to more MBR, does the high ammonia nitrogen become an issue?

KB – No, what identified in the report is that MBR is capable of very good ammonia removal but it has had periods where it has been unstable. You can see there, there are some issues with the numbers as far as how many samples you have taken as well, because if you had all those numbers up, they don't add up properly. But you see the Mean ammonia versus the most, the Median is quite different. There have been a few times, for whatever reason Alison, I do not know why, has been terrible.

AL – Because the liquor concentration can get quite high in an MBR because you can run it high and if you have problems with aeration, we are borderline on having enough space in that tank to fully nitrifies. We are not losing them, we are just not getting enough oxygen to them.

KB – All those numbers show though is that the MBR on a Mean and Median is not too far off the numbers you already need on nitrogen and the Bardenpho has got a bit to go, but that is mainly because of solid.

JB – That is reflecting that bar chart I did on that wall that day that took your fancy, Warren.

<u>Slide 4: Option Selection – Phosphorus Removal</u>

KB – Looking at phosphorus removal, based on the _____ Plant, but a we while now, we have had periods where there has been really good nitrogen removal and really good phosphorus removal. Those two things can be achieved and that is what the plant was designed for originally. It has never really been consistent at the same time. When we were playing around earlier on, maybe 5-6 years ago, we had periods where you could get extremely good phosphorus removal or extremely good end, but could never quite get it stable enough to get both. Also, there is a competition there where you need nitrogen and phosphorus, mostly carbon, so you need quite a lot and the wastewater, even the raw wastewater which that ratio refers to is not ideal so, to get around that issue, I am not having enough food basically for the bugs to do their job is why at the moment you dose carbon and you could do it in the future to remove more phosphorus by biological means, which is definitely possible, or you could dose Alum and to put small chemicals in i.e. more carbon, we did an analysis looking at additional carbon versus putting Alum and see the gases which is the best stuff to use for biological p removal. I think it is about twice the cost of Alum. There doesn't really seem from that point of view any point in dosing more carbon to get more phosphorus out. The conclusion there, it is better from an engineering point of view and cost point of view to use chemicals and it should say Alum to remove phosphorus rather than biological means.

Slide 5: Open Selection – Filtration

As I talked about it before and is coming up in the other reports, there was options 1-3, that the Bardenpho has quite high suspended solids on an average of about 20, 25. Does vary a bit and those solids contain nitrogen and phosphorus. Normal activated sludge is between 7 and 10% N and about 2% P, so just from the solids, that is 10 tonnes of nitrogen and 3.6 tonnes of phosphorus just from solid loss. Really to have any chance of meeting the limits, you can't get there without some sort of filtering. I don't think filtering is essential for based on what you have got and also, if you change and put heaps more clarifiers in, you are never going to get perfect solids removal, so there is always going to be a bit of residual. You could get over the problem potentially by building more clarifiers. I think removing more solids is essential if targets are going to be met and the best way to do that is by filtration because you get the most solids removed and the best filter is by membranes. You will see in the report that we did last year, the Options Study, I didn't put it in this presentation, it is pretty clear that the membrane filtering option removes all the solids and gives you the best filtration, by far, so if you need filtration, it is essential, then some sort of membrane will give you the highest TSS removal because it has got the smallest hole.

JB – Just a refresher on that, the original we had option 2 was filtration based plus filtration. 2a was the disc filter, 2b was the sand filter and 2c was the membrane. We took that membrane back to the committee last week and said it was in the UF ultra filtration range.

Slide 6 – Option Selection – Nitrogen Removal

KB – As far as removing nitrogen, there are lots of different ways to do this. To get the limits we need to remove about over 90% of the nitrogen that comes into the plant (there is detail around this in the report), so very high efficiency.

Now it gets very technical. Having one process, it is more risky to try and get that process towards 100% than it is to have processes that work less than 100%. In the report, I think I said that if you have one at 80 and one at 60, that gives you 90 something percent. So managing those two processes is easier than trying to hammer one, but less risk involved in the tertiary system. The question I asked there is can you remove the amount of N you need to without having tertiary treatment other than filtration, or do you need two processes, whatever those processes might be in series.

Going off the slides, we have found some literature from the USA on high N removal and P removal. It was based on 22 or 25 plants, which got the highest N standards and P standards in the USA and it's clear that the ones that performed the best have got multiple stages and at the lower end of the scale have got one stage.

For the question of, can you remove all the nitrogen without tertiary treatment is that if you have got secondary treatment already, if you can make that better, then that would probably give you a cost advantage rather than building lots more stuff.

The committee broke for lunch at 12.40 p.m.

JB thanked Antoinne for his input.

The meeting reconvened at 1.00 p.m.

The committee commenced the conference call with KM (simultaneously with the slide show.

KB gave an update on the Strategy Report.

Slide 8

Options selection nitrogen removal. There is information from WERF, USA, that we have been using to baseline some performance. It looks at 22 plants across the USA. That has the tightest N and P standards, looking at their performance and reliability and this is referenced throughout the report. From the report, the three closest plants to Rotorua, have a similar configuration to the current plant and with similar flows but quite a lot bigger (more people.) One plant is about the same size from 78ML to 22ML. The table shows what sort of treatment plants they are and what performance they have. With activated sludge and tertiary filtration this particular plant can reach a medium of 3mg per litre. The eastern water reclamation facility in Florida, a Bardenpho and tertiary filters, is reading 3.6. The Pathway Plant 4 stage Bardenpho with no filters is reaching 3.4. The percent removal on the right hand column varies between 86% - 90%, and we are looking at 93%. There is a question mark around the configuration of the plant here. Similar size plants with 1 stage. One nutrient removal and filtration rather than 2 stages can be shown to meet the limits that this project requires. The conclusion is that a single stage plant or process can meet the limits proposed. However, the data in the WERF, based on the median of 50% of the time performance, but if a higher performance was needed, 90% of the samples are less than a certain number then a tertiary process is needed. It is important in setting the limits of consent that yearly averages or medians are considered, not percentiles. A single stage process, without a tertiary N removal stage, is suitable to meet the limits of N and P.

KM – The 50% noncompliance, is the main influence on that seasonal variation?

KB - No, at this plant there is very little seasonal variation.

KM – At the Rotorua plant?

KB – Yes, as far as temperature is concerned it's more or less the same throughout the year with no seasonal variation.

KM – What is the cause of the seasonal variation?

KB – Biological process.

KM – And we don't understand that any further?

AL – The bug populations can slowly vary – grows more of some less of another.

JB – That is the fundamental reason why (lead by Graham McBride.) We went away from maximums in wastewater consenting in New Zealand and went to percentiles that have various background information. Biological processes tend to follow a bell curve in performance.

KM – Given that maybe there are options on the table that involve discharge into the lake through filters (gabion baskets), I would tend to have a better idea when the noncompliance is occurring.

AL – This would not be noncompliant –the maximum would be less than 3 tonnes per year.

KM – If you had to have lower percentage removal of N and a higher P end values for a period that would raise the likelihood of algae blooms (health hazard) more likely during the summer. It would be good to know about that first.

CM – That would be possible particularly if the discharge for a prevailing current were held. It is a matter of the scale of the peak events and the duration, but it is not encompassed by the effects study and the present methodology.

KB – When we say there is not much seasonal variation, there is on average less water in the summer than in the winter. As far as biological performance goes, the result at either time of the year is about the same. The multiplier effect of the flow is more significant in the winter than in the summer.

CM – The magnitude of the peak events is probably not substantial enough in the context of the overall load to the lake.

AL – If you consider the variation of the peaks and lows in the streams on a temporal basis, it varies a lot more than our discharge.

KM – What we have is the performance based on 50% of the data?

AL – When you do an average, 50% of the time it is higher and 50% lower.

KM – How much higher can we get in confidence before going to tertiary?

KB – If you want more confidence than 50th percentile, which you are not basing the performance on a long term average or median, then to get more confidence you need more treatment – and it will cost more.

KM – We can only get to this level of performance with mean values.

KB – That's what the criteria are, a mean consultation and a mean flow to give you the annual average mass.

KM – When that is communicated to the tangata whenua that needs to be made very clear.

JB – The driver here is the effects assessment of what is going into the water environment. Unless it was an extremely high peak at the wrong time and there was an algae question it is over time, hence it is the annual average situation which is enshrined in the current consents. It needs to be driven by Chris and David and the current position. The current consent does not have a lot of status when you go to a new consent. It is an effects driven process.

AL – Kepa, would the tangata whenua be interested in this from the potential health risk?

KM – The thinking so far from what Antoinne has told us, the physical indicators are going to give them a basic level of confidence around the quality of the effluent. Then they are going to look at the trade-offs between the qualitative aspects and look at the options that way. If they have a perception of the physical performance and it doesn't match the actual, when the realisation occurs, that this is based on averages, this may turn the whole process around again.

AL – Should we provide a range as well?

KM – I think we should.

KB – We can put some confidence around that. A 3.5 mean or median = 90, 90% of the time it will mean less than 5.

CM – This is important in terms of nitrate toxicity, if we start having 6 or 7. So if there were medians around 3.5 then that is good to plan for? 13.15

KB – That analysis has been done.

JB - Nitrate toxicity is new in the freshwater policy statement and its gathering ground. In terms of bugs, the median will be in the 90%-95% percentile (common for recreational view). We will need to look at it contaminant by contaminant and the nutrients aren't the key concern for tangata whenua, they are taking that as read. It is the other contaminants which are a concern..

KB – I can put some level of confidence around 90% -95% of the time to what we think is achievable.
Selecting the process, the availability of CODs is essential to getting low N in a denitrifying plant. The current setup of the plant is that there is primary sedimentation, followed by activated sludge. About 40% of the COD is removed in the primary treatment and leaves the site by dewatering. TERAX will try to get value out of the 40%, make some other product to offset the ethanol consumption. My question was why remove the COD in the first place. What are the implications of taking primary treatment out of the process train, making the most use out of the free CODs to reduce ethanol and to look at the effect of whether it reduces or increases sludge production. This is quite a key thing, this is it where it gets at the cross over between this project and the TERAX project, gets a bit complicated. If the primaries you could reduce ethanol by about 700ltr per day, there are some costs in the report about this, about 700,000 per year; reduce sludge production by about 40%. The downside is that there would be more solids in the system and the current clarifiers, perform okay, but not be good enough to meet quality. More clarifiers could be added but what are the alternatives to putting more clarifiers on the end.

JB – Consider more clarifiers, but of course you have taken the primaries out, so you do have tankage on site. They need a whole lot of retrofitting and the wrong shape.

KB – Before the side streaming MBR came along, we looked at putting more clarifiers on and we through the risk, geotechnically, was too high.

If P removal is by a chemical, i.e. alum, filtration is essential. A single stage process can achieve the standards, can you make better use of the carbon, but this means the clarifiers are overloaded in the Bardenpho. Also the disinfection is likely to be a driver, not necessarily, but likely. Where does that lead you?

The process you come up with is a bypassing primary tanks, converting of the Bardenpho to an MBR. Treating everything through membranes; modify some aerations; change dewatering via centrifuge and either take that offsite as a cake to go wherever (have not looked at this) or another alternative is you could destroy those solids by Terax. However, in its current form TERAX doesn't fit. There is no driver for it at all, no driver except for destroying solids.

Costs have been prepared on the basis of building new membrane tank for membranes. The existing empty tanks could not be used, the clarifier part is too small for the membranes. Pricing of a new membrane tank has been prepared, because we did not think it was possible to take part of that plant off for a long period of time out and still expect it to run properly, i.e. taking a clarifier off to fit it out with membranes could be a disaster. There may be a way around this and there are some significant costs though, $5M-$5 worth.

GM – What you could do is build another MBR using the old doner just to comply. Then retro fit the clarifiers, use the two MBRs plus your main plant while you are building the clarifier. That would be a way to go.

JB – You have a tonne of tankage on that site if the primaries are gone.

KB – This has been sized on the most conservative at this stage which is building a new membrane tank. Disinfection standards are not known but UF as we have been talking about with the 0.04 micron pore size will remove bacteria as well. The plant has been measuring these over the last 12 -18 months. The median faecal coliforms are 0, 95% of the time is less than14, and e-coli which is another indicator organism, basically the same 0 median and 95% of the time less than 6. The disinfection is very good.

JB – That faecal coliform median of 14 is recreational shellfish standard.

KM – How do you get a median of 0, but that is not really telling us anything. What is the average?

KB – It must be less than 14.

KM - I don't think the median e-coli or the median faecal coliform tells us anything.

KB – Most standards I have come across are either in medians or 95% percentiles for water quality. You can have means. We don't measure virus, it is not known, but you are likely to get 4–5 live removals, that is 99.99%-99.999% virus removal as well. I am not sore of the actual performance. Those numbers are typical over that sort of range.

JB – It also depends on what the actual virus is and the particle size and when you look at the chart that we have got with the UF put on it, it is only the very small viruses that are getting through.

KB – I have not put UV into the pricing because I think you get good disinfection already but notwithstanding that, it does not exclude that if it is necessary.

KM – I have a concern about the median values misleading because this could be turned around the other way and if you look at the median faecal coliform as 0, this means that just less than ½ of the samples that were taken could have had faecal coliform present and less than ½ of the samples taken could have had e-coli present. There is no way of arguing against that. It means that ½ of the time there is faecal coliform and e-coli present. I don't think this is a great look. I would rather know if it is a 0 recording for both and it's 80% of the time, that is a much better way of reporting it and half the time we know there aren't any.

KB – Those numbers there are extremely good compared with normal UV. They are almost all as a magnitude lower than you would get with a UV.

JB – I have not seen better in New Zealand.

AL – But we could look at that. What percentage of the time is e-coils 0 because it probably is 80% of the time.

KB – The pore size of the membrane is smaller than the bacteria. It is usually post and sample contamination which is more of a problem than the membranes. The system was designed for 1000, which was our process guarantee from the supplier. They said they can do better than that, so you can probably do better than those numbers as well. We have priced on the same membrane system that you have at the moment, it could be any one but we could use that because we had the prices for it. We need 40 cassettes, so currently you have got 8 for trains. The plant has 4 sections with 2 membranes in each. With the 40 cassettes this would give the Bardenpho a peak flow of just over 800ltrs per sec with the whole lot working, or 600ltrs per sec with one train out for maintenance. When you add the side stream and take the peak flow up to 935ltrs or 735ltrs with one train out. I think the peak flow is about 800ltrs – 850ltrs per sec as the maximum spontaneous flow into the plant before it comes out elsewhere. Hence the proposed size is one that could take everything that comes into the plant under all storm conditions. If you are going to go water you cannot have any bypass.

JB – With 1/3 MBR and 1/3 Bardenpho. If I go 3x8 means 24 cassettes with the proposal wanting 40 cassettes is that a redundancy thing?

KB – No, when we die the side stream MBR, we cut the capex down by lowering the peak flow that it does, so those numbers of a 1/3, 2/3 are on average, on peak it gets quite out of skew. There will be 48 in total. You can fit another four cassettes into the existing plant if wanted. Capex cost wise, including dewatering and alum dosing it is $21.5M without contingency and with contingency and non-works costs $31M. Non-works costs are on the same basis as the other reports, just to make them comparable, whether those are real numbers or not. In the scope for significant savings if the clarifiers could be converted, $5m has been allowed for tankage, just for the structure, walkways, pipe works etc. are on top of that. This doesn't allow for piling.

JB – The $5m could come off if you could retrofit, or most of it could come off, Greg.

KB – Opex around $3m a year, that is at future flows or 0.40cents per cube. That includes all the dewatering, membrane air, alum, additional polymer for dewatering, sludge disposal to the landfill, we use $130/tonne in the business case for Terax, that is where that number comes from.

AL – Is that Opex cost over and above the current Opex?

KB – No, it is total Opex for the plant plus aeration. So there is the Bardenpho aeration has not been taken into account in that.

JB – LTS?

KB – No.

KB – That Opex is for the whole solution rather than bits of it as we have been presenting in the reports. I can itemise out what each of those are.

Going back the CAD drawing, on the left hand side there, at the ends of the Bardenpho, we would put on that area there. That is an ideal layout. There is some issues with existing infrastructure and there is a drain through there also that would need to be looked at but that is how we thought it might look. That is the $5M tank.

JB – Warren, that is the full MBR plant that has been on the agenda and we are telling the committees now on the agenda.

GM – When everything is completed, what will we do with this Bardenpho.

KB – Nothing. You just keep using. Basically this bit of the Bardenpho where the biology is, is reused, this tank is only to put the membranes in. This will be used in the existing Bardenpho.

AL – That is like the outer ring of our current MBR and this is the inner ring.

KB – All of this gets reused. There is some potential rejigging to do with diffusers etc. but I think reasonably minor.

GM – Can you refit the MBR's on the clarifier?

KB – I have not looked at that, possibly. When you look at the size relative, that is the scale, which it should be, then I would think so. You will spend $5M but then you would have to pay some to put some structures into the clarifier obviously as well.

AL – We thought that if you were to do flow-bound as well as then you have got some of that you can take the peak off, could you just run the MBR, the Bardenpho and one clarifier, run the plant like that, while you retrofitted clarifiers one at a time.

KB – Possibly.

GM – Comparatively speaking with the other option, in terms of cost, almost similar to Option 3. This will be a better plant to run.

AL queried calculations on a table. KB agreed they were incorrect.

JB – Referring to the same table, if you add the LTS, the ethanol, say 200-300, the 1.1 plus 40% less sludge at the same moisture content, you are probably on a nett win.

JB asked the following questions:

1. Taking the primaries out, there is no problem with the MBR's with stuff that would come out in the primaries fine fibre of toilet paper or something in MBR's?

   KB – No, half of the flow to the current MBR is raw and supply was happy with that.

   AL – So the screens would be upgraded on the whole plant.

   KB – Yes, there is provision in those costs for new screens. What has been priced is the channel that is here, in putting full duty standby channels, so screening the whole lot.

2. Referring to the CAD drawing, Alum Dosing, where would that go, where would it be dosed in the process?

   KB – Into the activator sludge, maybe a top up dose here (KB referred to the CAD drawing.)

   JB – No problem therefore with alum and membranes?

   KB – There is likely to be some more cleaning requirement, more acid. This is what we have found at other plants, but we would have to go to the supplier to quantify that. The existing MBR was designed to have alum dosing and the supplier was happy to stand by in their guarantees, whether there was alum. there or not.

   AL – Is there any advantages running through the clarifiers to get most of the solids out?

   KB – No, the membranes are limited by the amount of solids however, the less solids you have you can filter more but there is a fine line number of holes where you can suck the water through, the more water, the more membranes, so it doesn't really make any difference.

   AL – In terms of cleaning?

   KB – No, I don't think so.

   JB – Coming back to alum. So the fact that we have got membranes and we are taking out particulate phosphorous means we can do less alum. dosing for DRP conversion.

   KB – Yes, but I have not taken that into account, I have just used the same amount.

AL – You could do less or looking at it conversely, there is opportunity there to get it very low by removing particulates.

JB – So that is an optimisation cost, environmental effect, consent, it is flexible.

KB – If you look at the current data, we don't even measure total phosphorous because there is no difference between DRP and TP in the MBR.

AL – Compared to the other options that we have for filtration, like the disc filter, those ones that you costed, were they still Alum Dosing in the Bardenpho.

KB – You could dose straight onto the sand filter as well as anywhere else you want to. There is more flexibility with that option. You can dose primary Bardenpho and tertiary, if wanted, rather than just in one place.

AL – Were any of them not dosing alum in the secondary?

KB – No, he Terax yes, but that was in a different project.

AL – So if we have Terax in it, we are confined to alum. dosing in with filtration, post-secondary basically.

KB – The concern there was that alum would fail the Terax Plant.

AL – Basically, the advantages of this is because we are alum dosing in the secondary's. We have got more control over alum dosing than if we were to alum dose just on tertiaries.

JB – And if we have Terax with that, and no UV, apart from visual discolouration, there is not an issue because we have not got the discolouration in UV, because we have not got UV.

KB – There is a big issue with lime. The Opex cost of Terax would go significantly high if you took time out.

JB – Because of the MBR?

KB – The current Terax situation is to put all the Terax liquor into the Bardenpho because of the membrane failing potentially.

JB – Does that not knock Terax right out then?

AL – You could change just sodium hydroxide instead of lime and another $750,000 operational a year.

JB – Then you have lost the carbon source, which you didn't need all of anyway, because you got it from the primary.

KB – You wouldn't have Terax in its current form in that plant because it would not do the same thing.

GM – With the plant you don't need Terax. Same cost.

KB – In saying that, the only driver for Terax would be putting it on the end to get rid of all the solids.

JB – With this, because we are working the bugs in a secondary phase and getting into respiration, eating themselves up, so 40% less sludge mass than the plant now. So if we dewater to the same degree to what we are dewatering now, you have got 40% less to cart away to the worm farm, that is a big one.

KB – Essentially, you are taking the stuff out in the primaries, chucking away, putting ethanol in and growing the same bugs as you would have anyway.

JB – Staying on the solids stream with this 40% less, still nothing to stop Council in the future or even initially doing further dewatering like some partial drying, is there. That would be a cost, break even.

Have you ever looked at geothermal heat partial drying.

GM – At what level of solids are you bringing down to.

KB – About 18.

JB – Going back to your committee Warren, we have in the last two meetings put up on the slides in the business case the further work. Getting rid of the primaries to save the carbon and a full MBR Plant. This brings them both together.

Depending if all the add-ons are all there, between 21 and 31, potentially less the best part of 5 for tankage, caps and ops., it looks like potentially a nett gain.

KB – Procurement is probably more efficient as well because we have done it before.

KM – I think one of the assumptions is the destination to the solids. I can see a costing allocated there but knowing that the solids are probably the most sensitive process, the destination needs to be thought through. Does Greg know what the intention is with the standing arrangements that exist at the moment?

AL – We are on a rolling one month contract at the moment. We were anticipating that at some point in the future, we might be changing process. We are looking at a longer term contract, but with an out option should we change the process. Destination is still the same. It goes adjacent to the Pulp and Paper Mill at Kawerau and the solids are combined with the pulp fibres. It has got a good _____ ratioing, good water and vermi-composted, sat on site for a year, then it goes out to consented sites that it is discharged to. Those sites are where they grow maize as fodicrops and they offset the fertiliser requirement with the use of the compost. What they have found is they are putting on less fertiliser and they are actually getting full growth of the maize because there is less water stress. They are finding it very beneficial and there is more demand than there is supply. Those sites are not going to run out of capacity.

KM – Is that because there is relatively a lower industrial waste load in our effluent in Rotorua.

AL – Yes, because we don't have high heavy metals. We are border line for copper and zinc as any municipal solids with all the plumbing but they are only an issue potentially for the soil micro-organisms, not for any human health.

KM – Maybe one of the argued improvements on our current process is if we identified the capacity to do the same thing within the Rotorua catchment and use those same ideas of offsetting fertiliser application. I think the Kaumatua have already raised that the destination of the solids is an issue. Maybe that is a separate thing to what Kevan has done here, but I certainly think it needs to be considered in terms of the scope of the solution.

JB – We have had so much trouble in New Zealand with sludge and bio-solids, including Rotorua, where it used to go to compost, then went to the landfill. The vermi-culture story in the Waikato and this region is New Zealand's success story at the moment. Hamilton now go the vermin-culture plant as well. One question that cropped up on another one of my projects on Monday was, alum. sludge and vermin-culture and I was reminded that the Kawerau Plant that we looked at for Rotoma/Rotoiti, that is a total alum., high level of alum because

there is no dilution with other stuff and that is vermin-cultured successfully. I don't think the alum addition with the mixing of the industrial wastes they use will be a problem. That would be something to check however.

AL – There is quite a bit of work happening on that at the moment. With that going with Michael??, but the ESR Bio-solids Research Programme is looking at the effect of alum on worms. I don't think there is an issue with the concentration of alum going to land, it is really only whether the worms can take it. They appear to be because in practice they are. I don't think it is an issue but we need to confirm this.

KB - A process like this does not preclude you from using biological treatment if you wanted to as well, if it could work. It doesn't stop that from happening.

WW – It would be useful to have this in the context of the previous presentation that you gave Jim. There is the 100% MBR Plant, which is basically what this is, although I do have a question as you are still doing some Bardenpho in there.

KB – Bardenpho relates to the process configurations, so how the tanks are put together.

WW – But everything goes through the MBR.

KB – Bardenpho means how the aeration and non-aeration is put together, not anything else.

WW – From what I am hearing, it sounds like a pretty good option. The politics of Terax are interesting, but is there any particular resistance to dropping Terax if this works without it.

GM – This is a question that needs to be answered before the next workshop. This all depends on whether Kevan can come back with comments on the PDP report and also Scion. This report is in a very initial stage. The overall project, meaning the Terax and the treatment project, with or without Terax. There is a report that has been issued initially to Mott MacDonald, Scion, Rotorua Lakes Council and Parsons. We need to sit down together and ask, "what is our conclusion in this report." That conclusion will guide Council's hierarchy to decide on what to do. If the decision is to exclude Terax from this project, then I think the best solution is the alternative solution.

AL – Kevan, did you have a look at that at all on incorporating the fermentation stage, the first Terax stage before our secondary treatment. Could you do a pre-fermentation and make even more of that primary, so primary solids are available.

KB – One of the problems I think is a conversion, particular into the VFA. I think the efficiency to get a need is outside a cold fermenter. You would have to heat it and it would cost you more than it would have been worth just to chuck the ethanol in in the first place.

One of the good things about Terax is that it generates heat, so you get that heating source as a bi-product.

JB – Kevan, you have not included UV. You have given your reasons why. In the December report for the membrane, you did include UV, but said it may not be needed, as long as the plant was plumbed right in terms of future flexibility. You could always put in a new UV in the future, subject to head, plumbings etc.

KB – Or you could use other add-ons like that if you wanted.

WW – I was surprised to see 99.9% of viruses being eliminated by the MBR and I think we still have to get a question about which ones are slipping through and how dangerous are they from a public health perspective. A little more information is required here on those small viruses.

JB to liaise with Peter on this.

WW – An add-on with UV is always an alternative.

GM – You are looking at an upgrade of $20M which wold be comparable with the quality of Option 3. Realistically, that is the upper bracket, $22M is the upper bracket for this option. There is potential to save around $5-$6M. You are looking at about $16M.

JB – Just comparing it, it would mean forgetting Option 3 category and we modify the base case without UV and doing a major in the filtration, in terms of if we are sticking with 2C and then taking out primaries and part of Bardenpho. There are some unders and overs. There are a whole bunch of overs betterment in terms of the particle side and the disinfection.

WW – This is not requiring any change in pore signs in membranes?

KB – No, exactly the same as what we have got.

WW – This meeting with the Project Team Greg, is that likely to happen soon so that we would have information for 25 June.

GM –Hope to hear back from Mott MacDonald etc. within the next two weeks.

JB – We have got Kevan booked for that, for both reports. I think also Kevan, that we might just work on a couple of the pros and cons.

CM – Do we have final effluent loads from this full MBR.

KB to give this information to CM and also the confident levels around this as well. KB to also give some stats around the variability. They give an idea of the variability of the future based on what has already happened.

KM – Pg 16 of the report, Section 3.131, there is a comment about secondary process is 80% sufficient, tertiary is 60% efficient, therefore the overall efficiency is 92%. Is that based on everything going through both stages?

KB – What I was trying to say there is, if you took the current plant as it is at the moment, if that removed 80% of nitrogen, then you have 20% left. If you then remove 60% of the 20% you have got left, the overall effect is 92%. All I was trying to illustrate was that by using more things in series, you get a multiplier effect.

KM – Which is my question. So everything would go through both plants?

KB – Yes. Not necessarily though, but it could.

KM – When you are combining efficiencies like that, how are the performance ratings worked out. This relates back to the other question around the median not being that useful. When you have 93% removal on average, how is that average determined. Is it on actual mass removed or actually on the times it is being removed?

KB - Mass, or concentration.

KM – So it is a real value rather than a relative one.

KB – Yes, if it is saying it comes in it at 50 and goes out at 3.5, then that is where it comes from.

KM – Also, I noticed you have a bit more detail around those plants and their performance and then you have got a figure called 4.3, which has nitrogen removal from the first stage (page 24). It doesn't quite hit 90% at eight cycles.

KB – I didn't put into the presentation because I thought it may have been too technical. I think there is a little confusion on what I mean by stages. A secondary stage is the whole thing, whether it is in four or five tanks, it is really still one stage. The MLE and a Bardenpho are just different ways of putting the tanks together. The MLE isn't an option because it doesn't get the performance you need. If it is a simpler and cheaper way of putting the tanks together than doing a four stage plant.

GM – Looking at the relative comparison of this option. I understand that for this option you are taking the whole maximum wet weather flow. Option 3, is that the same?

KB – I think it is, it should be. I will check this.

WW – The question we are bound to get and I think I have got this right, we are basically taking Bardenpho process out of the system. What impact is that going to have on the degradation of endogrim disrupters?

AL – We are not taking the Bardenpho process out, just the clarifiers, swapping the clarifiers with membranes.

JB – It will make it better. Remember when we presented that, there are two mechanisms with all those micro-pollutants. One mechanism is absorption onto solid and we are taking out more solid. The rest is in the biological transformation and that still happens, so better.

AL – Option 2C and 3A were $22M Capex, so essentially we are looking at the same price.

KB – Those are inclusive of contingency whereas the comparative price is $30M.

JB – But it will come back if there is tankage saving.

GM – It will be around $16M.

JB thanked Kevan for his information.

ACTION: KB to work further with GM to take his report further because it gets all those other reviews outside of TAG.

6. "ADD-ONS" - UPDATE

JB – At Warren's committee last week, we reported that there was no update on Add-ons, however, there is now a brief update.

Jim, you refer to a handout here, which I don't seem to have

(i) AL - They (who is Alison referring to here) approached RLC at some point and advised that we can do something to help improve and reduce phosphorous predominantly in our treated wastewater. They took some samples of our wastewater away and they combined a litre of wastewater in a plastic container. They have some pre-prepared treatment reagents. I am not sure if the agents are liquid because I thought in the discussion with them it was a material. But they are natural, they are not alum and there may be some earth in it (minerals.) They shook that for 24 hours, decant it and measured the amount of phosphorous and what was in our effluent was about 1 milligram a litre of dissolved phosphorous, 2.5 total phosphorous. There are

four replicates there so they have removed total phosphorous down to around .03 to .15 milligrams a litre. In essence they are saying that they haven't costed anything, they haven't given us indication on how you can improve and incorporate what they have done, their reagents into our process but they have demonstrated that they have a material that is used as basically something that will bind and hold the phosphorous and remove it because they have decanted it. Similar to what we do with chemical dosing and a filtration. They have suggested that they can add other natural reagents to remove nitrogen as well.

These are their suggestions as the next steps.

When they say co-operation is being requested from the Steering Committee to carry out these tests I think they mean another $1500 for some further analysis although subsequent to that, he said that they are proceeding with dong the testing anyway. Their extra testing now is extra reagent to remove nitrogen, so it is not going to answer any questions or demonstrate to us in any way how you could incorporate this into the process.

Where to from here with this?

WW - We haven't got independent testing associated with this in their testing?

AL – that would be fine, they have just mixed it with some sort of flocculating materials.

WW – This guy has been on my case and I keep side stepping and saying this is a technical question.

AL – They have got a material and they can demonstrate phosphorous material to lower concentrations that we are saying but there are lots of ways of doing this, but I guess what it is showing us is that there are other materials that can be used for removing phosphorous naturally other than doing it chemically but the big question is the price and whether it can be incorporated into our process or subsequent to our process.

AB – The other thing around this is really want the security of anything going to is not just some sort of black box. You need to understand the processes and to do that, we discussed this last time. You go through the financial agreement and we will sign up to using your product if it is something rare and amazing but otherwise it might just be alum. in there, who knows.

AL – Do we want to progress. Do we find out what it is, we see if it can be an alternative to alum. within our process and we consider that.

GM – Do we have the time?

JB – No, we don't have the luxury time. We are going to put in place somehow that regardless of what comes out and the consent is based on that there could be periodic reviews and if they get it up and running by then, it makes sense and it does not waste a whole lot of capital you have already spent, you could look at it then. The question here is of continuing to let them go the track, their story is very much around the approval and co-operation and everything, so they are drawing the committee and council in more and more the way they have written this. The further you go with them the more they are getting you drawn in. You just have to be careful on that aspect.

AL – I guess it is similar to the Water Quality TAG looking at zear light and modified zear light and doing a lot of bench scale testing. You have the material and somebody says like the modified zear light, you have got a material but how are you actually use it and are we prepared.

WW – In comparison, I would say that the Work Quality TAG is much more ground breaking than what I would expect this TAG to do because there are hundreds of thousands of plants around the world and we should be relying on people like Jim and Kevin to alert us.

GM - Referring to 2-3 meetings ago, what shall we do with these tag-ons. Are we going to continue receiving them and looking at them or shall we say we are not in the business of doing research but to look at options for the best solution for the Treatment Plant and if there will be jobs in the future, then we can look at it then, but concentrate on what is proven technology that will bring us to the point that we will be able to do the work in terms of improvement.

AL – So it is a whole proven treatment technology, it is the engineering around it as well, not just a material that we are wanting them to demonstrate, that we have got a material or a substance.

GM – But it is still on the research stage. We need to look at applying proven technology to a problem that we have now.

WW – I think it needs a letter from the TAG Chair outlining the things that we expect and we are not a research and development organisation, we are a funding organisation, for them to do their own research. I have lost complete confidence in these guys. They came and saw us in September last year and promised the moon, that they could take nitrogen down to nothing. They collected 20 litres of water, I think at New Year this year and it has taken them until now for us to get a result. I am wondering about the credibility of these people.

AL – There is no doubt that they have something that you could use to remove nitrogen and phosphorous.

WW – Why has it taken them so long. They are not presenting themselves professionally.

GM – I think it is because they are still in the research stage. Going back to my last point, we are not tasked to find new solutions but to apply proven technology.

ACTION: Agreed a draft letter from Alison on RLC letterhead. The letter to say that we will facilitate providing samples for you for your ongoing work but we have got to make practical engineered process proven decisions and those are going to be made in the next few months. Another letter from Andy Bell or Greg Manzano.

(ii) Floating Wetland

AL - Floating wetland came about when we first drafting up options and we had wetlands as an option, as a discharge option. Floating wetland was mentioned but not progressed and we were approached by floating wetland people, Carrie Park and asked if we were still looking at wetlands. At that point we had not discarded anything. Then, his suggestion was that what they could do was retrofit one of our ponds with their layers floating wetland material and that could be a cultural treatment effectively, where the water was to pass through that prior to discharging to the stream. The price is $609,000.00, and $10,000.00 operating per year.

CM – Whangarei have lime burners.

JB – That wetland was the first kind of a cultural aesthetic and do something one we had of any size in New Zealand. Tauranga, Temunga that we went to modelled on that one. They have now put the floating wetlands in. I don't know about you Kevin, but we have had a number of clients who have had proposals from these people. Of course they have done the floating one in Rotorua. WE have, with respect, been wanting hard data and we are having trouble getting it. Central Hawkes Bay District Council with Waipawa, Waipukurau, where the whole driver is nutrient. For some reason when with these and they are not doing the job. You may have heard this in the media a few months ago and in the Matata Environment Court Case, the Judge kept telling us that treatment plant do not work, see what happened over there.

How do we handle this.

AL – Are we recommending discharge cultural options or are we just providing the information.

JB – They are in the basket. Kevin brought them up, I brought them up twice. WE may ask for more information about wetlands. There hasn't been much support to wetlands. DO they go back to the committee to say that this was presented to us.

CM – Can you not comment on technical grounds from previous experiences shown that there is little to no nutrient removal.

JB – If there was seen to be a cultural aesthetic component.

AL – Do I provide a table to the Steering Group on the options.

JB – This is not an add on, this is a discharge option that is already in Kevin's report. There is no final decision made so I we have an obligation to take it back. It has come forward. If not, we might end up in a hearing and someone says, Bradley, or whoever, what happened to that wetland proposal.

AL asked KB if he had put a price in his report for wetlands.

JB – You had from half a hectare through to 38 hectares and they were from .79 about the same, through to $25M.

AL – To retrofit a pond as a floating wetlands is just over half a million.

JB – So we need to bring that forward.

7. ADVANCE TREATMENT OPTIONS – ULTRAFILTRATION, REVERSE OSMOSIS (UF/RO) AND ACTIVATED CARBON – update of activities with RPSC and technical information

JB – It was the committee that brought up their interest and continue to bring up their interest in RO. We rightly or wrongly gave them an MWH Australian figure of around $90M and they have not let go yet. We tend to think that some of them might of got the impression I was making a bit much comment on the concentrate and the difficulties with that. We don't know how much further to take RO, if at all, but they still see it there, other than a potential process in the future and there is the question of activated carbon and what would that do over and above this.

JB asked for a couple of questions on this so TAG know where we are and what to go back with to the committee.

KB – We talked about RO this morning. I have not done any work on it, but my initial take on it is that 90M may not have been the number but the brine is a massive issue. Traditionally we have RO or decalination, you put the brine back into the sea but because it is full of brine in the first place however, we are a long way away from anywhere to put it and it is horrible stuff. You can take all the stuff if it doesn't disappear.

WW – That is basically what we told the committee last time, that if we were next to the sea, could be an option.

JB – If there is a solution to that sometime in the future, we leave it in that future review basket, that we will build into some condition.

WW – The $90M was a big incentive as well and the fact that I think that we were given some stats. About how many plants had been moth-balled and not functioning properly.

JB and KB to reconfirm where we went to.

KB - I haven't done any more work on activated carbon because I was unsure about how it fitted into some of the options. As a general comment, there are obviously different ways you can configure it, depending on what you want to take out. Micro-pollutants could be quite good mixed with something else and it also improved disinfection. There is a process with peroxide and activated carbon which would give you disinfection as well as micro pollutant removal. I haven't really looked at it in any detail.

JB – We put all those up in diagrams.

WW – The main interest around activated carbon was if we had Terax going in, we want to deal with colour.

GM – Activated carbon is being dealt with by PDP. It is being costed for the Terax only.

AL – But there was interest in it as an add-on.,

JB – There was interest in it for the total from a colour improvement and a micro-pollutant improvement, so we still haven't really buttoned that down. What we were saying is, it is probably compatible with our Option 2B - sand filter or 3A - de-night filter, but the compatibility with this arrangement you have presented to us, I am not sure. It is a separate add-on.

GM – Because you won't have any UVD's with this because you don't need to improve the colour.

WW – Colour will be an issue to this group but if we haven't got Terax coming into it then colour should be less than an issue. Is that correct?

GM - Yes.

AL – It will be the same colour as the MBR permeate.

The committee seemed to be happy on this discussion.

8. DISCHARGE TO WATER – NEXT CUT DISCHARGE SITES LOCATIONS

- Refer Table 1 – Potential discharge sites and location map attached to agenda. Prepared by AP and reviewed by GM.

JB thought it would be useful if we could get some direction out of TAG and we have had some indicative early indications from Antoinne how the cultural sub-committee is going. Alison and I recently had a look at the five sites.

GM referred to his presentation – there were five locations and this was presented to the Project Steering Committee two meetings ago. This was just an initial look at where it could possibly go within the immediate vicinity looking at engineering and construction. After the presentation was given to the committee, Jim and Alison went and looked at the sites and came up with ideas on what is acceptable and what is not. Now we have comments from Antoinne informing us of what they liked and disliked.

Greg advised that he would like TAG to agree, as a Tech. Group, on what is not acceptable and what is practical.

GM pointed out the location spots on the presentation.

- Site 1 – Straight out from the plant

This is the one that Antoinne mentioned as being the least disliked.

JB – Of those three sites, that to me was far the pick. The concept would be to do gabion baskets from diffuser system along this bank and you would have to get some vegetation specialists. This work should be advanced to see that this would be acceptable. What you would have is, apart from the track, a nature diffuse discharge. We worked out it could be as long as 60-70 meters. Not too dissimilar to what we saw at TePuke accept it wouldn't be totally buried because you would probably see it trickling out the bottom. That of the three, Puarenga was my pick, by far.

- Site 2

After much discussion and a comment made by Alison, Jim asked Alison if she was recommending TAG not consider this site any further.

AL – Unless you wanted to channel back into Puarenga.

AB – what we need is some sort of matrix that has all of the above information on different discharge locations, costings, different technical aspects and compares them with land too.

GM – We need a table that shows all the options, what they can do and how much they cost etc.

- Site 3 (just below the bridge)

GM – With this site you can use the existing pipe and use it as a discharge point. The issue with this site is it is visual from the State Highway and it is a very public location.

AL – I don't think we should reject this one yet. This one offers the opportunity to not integrate it naturally back into the environment but visually back into the environment.

JB – From my point of view of the three sites, without the cultural considerations, site 1 is clearly the one that offers the most opportunity to integrate back through nature and in a location that makes sense.

Do we have a consensus here, Is it 1 or is it 1 with 3 having some other opportunities.

AB – I cannot make a decision about these things until you integrate them into the whole picture, what happens if you put in the treatment system requirement and what are the pros and cons of that.

GM – If you look at it from a totally discharge perspective everything equal, what would you look at?

AB – From a practical point of view, No.1.

GM – Sites 4 and 5 offers the opportunity for a submerged pipeline. Depending what Chris comes up with, whether 10 or 20 meters.

JB requested the following comment made by Alison be recorded.

AL – If you are looking at where you take water from the environment and where you are returning it to the environment, is there any opportunity to return the bulk of the water closer to where we have removed it, but downstream? I refer to the Utuhina, the upper catchment, most of the water comes from that stream, not from the Puarenga Stream, so do we want to return it more in that area. However, there are so many different reasons why it wouldn't work. It is a residential area etc, so we thought not to look at this other than to say that we have thought about it and didn't want to go there.

WW - We need some sound technical reasons to do things here, there will be questions from the committee.

AL – But we have a responsibility to look at all options and the reasoning is we have looked at it, but the reason is not going with it, we have dismissed it.

To simplify the above, the question was, are there any other reasons or rationale for looking anywhere else in our catchment for a discharge and the only other reason I could think why we might need to and would we want to consider that. This was just a thought. The rationale as well was it flows because one of the reasons you are restricted on your take for a water supply is the impact of the flow down the stream, so it is a way of recharging.

JB – As requested, this has been recorded but we won't take any further.

GM – Referring back to sites 4 and 5 I think they are a no go. In terms of the effects, you have to look at a discharge into the lake. If that is a no go, we will have to find an alternative route for a pipeline.

JB – Are we are sure we can be that strong, they were definitely not preferred, or they were the least preferred.

GM – They have concerns about significant sites.

KB – Is there an option for consideration to pipe it further down either of those sites.

GM – Yes, depending where on your modelling you would assume the discharge point would be.

WW – If we are going to go to a discharge location somewhere about Mokoia Island, or wherever, we are going to have to have a pipe from there to there.

AB – This could come as a question that if you put up three options, then people are going to ask about the effect of going out to here.

JB - The consensus is, TAG agreed that there is little favour with site 2. A preference for site 1 but acknowledge that site 3 also offers some features that could be enhanced. Committee also agreed to leave in 4 and 5, in the Effects Study.

9. EFFECTS STUDY UPDATE FOR DISCHARGE OPTIONS TO WATER

JB advised that he had received a memo from Chris that Jim misread as it was available to TAG, I thought it was internal only to the Effects Team. I will send this through immediately. This will also by on the RLC website.

CM showed a video. This has now been incorporated into the draft Environmental Effects Study Report at TAG #8 meeting on 16 June 2015.

CM – Everyone is probably familiar that any ratings of an effects study within lakes effects of a discharge locations and any changes to nutrient load under the various proposed options and that we contracted the services of Ecofish Research specifically. Our main contact there is John Nagle.

In broad terms, the scope is to run a hydrodynamic ecological lake models simulating the in lake effects of these various nutrient loads and discharge locations. We approached areas two-fold first being relatively longer term i.e. multi-annual simulations using a one dimensional model, horizontally integrated lake model and then over shorter terms simulations roughly a month at a time using a 3 dimensional hydrodynamic model to examine circulation patterns to get some insight of the circulation of that effluent stream, discharge stream within the lake over

representative summer and winter months. In that regard, a lot of the work has been completed by John and Ecofish in terms of setting up those models. We have those models and they do run.

What we are hoping to get out of it today is to answer a few remaining questions in terms of how those models are set up and driven and to get the information we need to finalise the set of scenarios, in terms of effluent loads and discharge locations we want to simulate.

What I do have from John is some representative outputs to give everyone an idea of what we might be getting from these simulations.

Referring to the presentation, dimensional model results over those simulation periods of 2007-2014. There is a lot of complexities around this modelling which we have spent a long time getting in to but basically the lake common consensus at the moment seems to be that the in-lake dynamics nutrient concentration is _____ . Production in this area is strongly influenced by the dosing of Alum in the Puarenga and the Utuhina Streams. That presents some challenges, both in terms of calibrating the model, because that dosing process and the dosing rate is not explicitly considered by the model. We have to represent that in general terms by modifying various rank _____ that determine process rates. Also, in terms of the future considerations for scenario i.e. simulating long term, do we assume Alan Dosing continues indefinitely or do we look at both options whereby it might cease in the future.

Referring to a slide, an indicative example for a directive discharge to the Puarenga Stream. The model is not a perfect fit to the observations in the lake although in gallons over that multi-year period it does quite a good job. David Hamilton and myself published last year around the variability of Alum Dosing lake and the effect it has through time in the lake processes, specifically the internal nutrient load for the sediments.

To clarify this slide, the green dot is the direct discharge to the Puarenga Stream. (An undefined point up stream.) Doesn't matter to the model.

AL – Subtracting, what would not be coming out?

CM – This is a point for discussion and clarification.

You can see from there is a provisional simulation that change in the lake is very small in terms of the shift and overall simulation period. That follows fairly logically in the change in load to the lake, likewise very small and the context of the lake receding roughly 660 tonnes per annum is its nutrient load and change of a few tens of tonnes is not particularly substantial and it looks like a no result, but I guess in a lot of ways is just as important.

There are some issues around adding this discharge, so we directly discharge into the Puarenga Stream. At present and over this historic period, we have had additional load to the Waipa coming in. That load is not going to vanish the moment we start discharging into the stream. How we handle that is something that John, David and I have discussed and gone into quite a bit of detail, but ultimately decided that because of the relative insensitivity of the model to the additional blow, it is probably not worth considering that too much in detail and is an alternative. Perhaps just run with that without that legacy mode of the present LTS. I think that may be one of the following questions on John's list, whether TAG on the whole is happy with that. As opposed to whether we actually include as an appendix to that email I sent you Jim is a description of an expediential decay going forward to my letter sent to LTS. The point we have got to is to bin that approach and do it without. But definitely worth considering because we are talking about reducing the wastewater load and if you don't consider removal the current LTS load, you are effectively doubling that discharge because you are not using 30 you are 60. That won't be the case forever if you are decommissioning LTS.

CM asked the committee if the above warranted any further explanation.

Answering Jim's question, Lake Rotorua has a TLI target of 4.2.

JB – That is enshrined in the Policy Statement isn't it?

CM – Yes. The reason this isn't quite at 4.2 is because the model does not explicitly simulate clarity.

The other aspect is 3 dimension simulations. As I mentioned, this is more about looking at how that water gets distributed through the lake.

CM showed a presentation of a discharge to Sulphur Bay. An in-earth tracer was added to the presentation to the Puarenga Stream. From the tracer, you can see how that water propagates through the lake. The time scale is a one month simulation. The tracer has a concentration of 10 and the scale viewed goes to 0.5. What is being presented is a vertically integrated average of the water, from surface to bottom. The way the model is set up is a 3 dimensional grid with 50m x 50m horizontal resolution however, I am not sure what the vertical resolution has been used.

JB – Will that give us dilutions?

CM – Yes. You can do various things with this like set decay rates on the tracer.

JB – If we had 14 f_____ median and ignoring die-off in the lake, you could pick up on there in the bays what that meant?

So, we left David and yourself with a choice of appropriate offshore position.

CM – I think John is set up at the moment going 5km due north to the deepest point of the lake. Doesn't necessarily have to stay there. The difference you might get is that the deeper you go the more you might drop the waste water stream and cause less disturbance and maximum immersion. Obviously there are trade-offs there on how far you are willing to lay the pipe. If anyone has any strong opinions on where that deep water discharge should be now is the time to discuss.

GM – Constructability, anything can be done, it is just the cost.

CM – All you can do is look at the contour and say, find the shortest path to greater than 10 meters.

JB – Do we just want the comparison and what it means. Try and keep it within 2km, 10m depth, or something like that.

WW – We would need to watch the shallow lake edges.

JB – We trench through that or micro drill. In construction, you won't have to worry about the surf. See what depth you can get within say 2km.

CM referred to John's questions , as follows:

<u>Questions</u>

Q.1. When comparing the options against the base line period 2007-2014 before all of our scenarios include aluminium. Specifically they include and account for the new lake processes of alum. which is great suppress the internal load of _____. We have proposed to examine the effects of removing alum. from the model setup for one scenario. Does TAG have any views?

Are you happy to simulate only one additional scenario where the Alum Dosing is removed from the lake as opposed to running every different potential load, with the alum and without the alum effects.

AL – I think we should go with option 3.

Q.2. What are the oxygen saturation concentrations of the effluent?

A. About the same as 95% of normal tables. Instead of being 9.07 and 20 degrees is more like 9. Typically slightly below saturation. This does not vary much over time. The MBR will come out relatively high, 3-4 milligrams per litre. Mostly others (Bardenpho) will come out at 0.3.

JB – if we said that 2/3rds was 0 and 1/3 was 3. If you mix that, its 1.

Q.3. Do we have any actual time series data?

AL – It would be interesting to know the impact that it would have if it was anoxic. The opportunity as well, if it could have up to 3. Is there an opportunity to add some at the point where it might get released.

CM – 3mg is still very low, 30% saturation.

Q.4. Temperature of the effluent. John is presently set it to the ambient Puarenga Stream temperature. More of a curve between 16 and 18.
CM to get John to modify to 16.

Q.5. Simulation with and without LTS inputs, short and long term impacts. We are not attempting to gradual nutrient decline following LTS closure. Does TAG have any views on this.

WW – We are going to get some questions about this. We haven't highlighted this to the group because we have got the potential of 30-60.

AL – But given that it is not really making much of a difference to the lake.

WW – I can see that, but I think we will have to address it, the increased load in the median.

AL – Are you pre-empting issues. You can't change discharge locations from land to an immediate discharge and add them up and still expect the consent to apply. The precedent was set that you can allow for a temporary change in the RMA that allows for it.

JB – Once you stop discharging that consent and you surrender that consent that is the end of the consent, there is no compliance needed with that consent because you are not exercising it, you surrender. I think where it will come in in the RMA is a definition of effects has cumulative effects so you need to take what is coming into the overall environment. This is the most difficult thing in the RMA. This really is an RMA question also a question of planners and lawyers.

Actions:

1. **Chris to give a list to Kevin on what he requires in terms of more up to date data.**
2. **We need through Chris to come back about Puarenga about concentration. Need to cover base with ANZAC and MPS Fresh Water parameters.**
3. **KB to dialogue with KM on the new MBR.**
4. **JB to circulate to the committee the email sent from Chris.**

JB thanked Chris and also asked for Chris to pass on his thanks to John and David.

10. RPSC QUESTIONS AND ANSWERS (Q & A)

I refer to question B's from the last meeting. There are still two questions alive. One is the health aspects. David Hamilton advised that he had some information that he would bring to the next workshop.

The other one Andy and Alison was the one we put on hold, asking for information on the water quality in the lake deep springs (the water supply) so that they can compare them. I was given some information, Alison was also going to get some. I have held back on this, I would like us now to compile something of background information for Warren's next committee.

ACTION: Jim and Alison wo work further on this.

WW – Alison and I thought it was getting far too complicated for the Steering Committee. There was about ten slides on the presentation.

JB – We agree we simplify something. Do not want to trip up Chris and the team.

11. PROGRAMME UPDATE AND MATTERS

GM gave an update on the following.

(i) Alternative Land Treatment Investigation

We received the report today with a few sensitivity analysis and some more work. We could possibly turn it around for a week from now. This will be a subject to the workshop on 25 July, Project Steering Committee. We had some discussion on the site location discharge and depending on the input from the CAS, this will be submitted to the Project Steering Committee for the workshop again.

(ii) Terax and Wastewater Treatment Plant

We had a presentation today on the possible option which is total MBR which is dependent on the position of Terax. I am looking at approaching the team, possibly late next week, to agree on the business case review by PDP and then submit to the hierarchy of RLC. RLC will decide the way forward. This will also be presented at the Projects Steering Committee on the 25th workshop.

(ii) Effects Study

This will be presented by Chris and David at the 16 June TAG meeting and will possibly be the major item for the day. There will also be another workshop on 17 July.

There will be two workshops with the Project Steering Committee, 17 and 25 June. Andy has suggested a table be prepared looking at all the options that we went through and hopefully at the conclusion of the workshops, this TAG could come to a point where we could recommend a preferred option and submit to the Project Steering Committee. Obviously it will have to be done in conjunction with the CAS. We are looking at possibly a December decision for the preferred option. I believe we are still on track if we can get a decision by December, and then we public.

WW – Chris how is your team feeling about the effect of the impact study being ready to workshop by mid-July.

CM had no concerns with this. CM was hoping for some good feedback by 16 June. John seems to be freely available to work on this project.

WW – Referring to the Terax decision and the presentation for the report going to the workshop on the 25th we should not pre-judge what we are going to do beyond that. We may have to have another meeting where we collate everything after we have made a decision.

JB – That communicable graphic including the whole treated water quality against others is what we have been doing.

WW – You will end up with two tables. One with disposable options and what treatment you need.

GM – What do we do with Reverse Osmosis?

WW – The impression I get from CAS is that they now are recognising this , although it might be too expensive, and I think they have taken on board the brine problem. I think we have got to put the information out there.

AL – They did specifically want to know how salty it was and what the impacts were.

WW asked Kevin to put this on his list for the 25h workshop.

12. SUMMARY

JB summarised the meeting for Kepa.

1. Chris updated us on the Effects Study and showed us a couple of models that are coming out and had five questions on parameters and discharge points and technical water quality data.

   Chris advised that this will be addressed in a couple of weeks' time. A draft report will be tabled at the June 16 TAG meeting and await feedback.

   JB advised that Chris had sent him a memo on progress. Chris is currently updating this. This will be put up on the RLC website at a later date.

2. Discharge Locations to water
   TAG considered sites 1, 2 and 3 into the Puarenga were considered. Site 2 which is the furthest one at Sulphur Point. TAG has in effect, very little interest in that and sees that as probably a no go. The least not preferred was site 2, straight out from the Treatment Plant, a riparian strip next to the track where that pipe crosses the Puarenga and site 3 does offer some options in terms of location, because use of existing infrastructure. 1 and 3 are staying from a TAG perspective, 2 not preferred at all. In terms of 4 and 5 at the side of the lake, they are staying in the modelling and they also provide launching points to discharge out into the lake. We have given Chris a brief to go back with, preferably somewhere off shore within 2km's and hopefully the 10 meters of water.

3. Add-ons
   AL – WE had some results from Everse where they have some of their material. They shook it with some of our final effluent and demonstrated that they could remove phosphorous from it. Our thought is that a developed technology, so TAG is going back with a letter to them stating our position that we are considering at this point just true proven methodologies.

4. Floating Wetland
   We received a proposal from the floating wetland people which would be to fit out one of our two final effluent ponds with floating wetland material, as a cultural treatment, prior to discharging into the Puarenga. The price

for that was just over half a million in line with what Kevan had mentioned in the feasibility study as a discharge option.

Referring to the water clean floating wetland proposal, in terms of commercial and confidence, which them mention on their pricing schedule. Do we put this on the TAG secure website without the price, in terms of commercial matters.

GM advised to remove.

The last two items we are going to bring together for the next committee meeting of Warren's. Some simplified background water quality data that the committee has been asking for for springs and in the lake etc., checking with Chris on units so that when Chris and David's work come through, there is no confusion in different types of units etc. We have got to keep that simple. Andy has made a very valid comment that we package this up for communication and our finalisation is tagged through to Warren's committee, we need some clear charts/matrixes showing the options on what they achieve, water quality, what the discharge options are, adding up the costs of treatment and discharge, pros and cons and of course, compare with background water qualities. That is along the lines with talking to Warren's committee, particularly from the water quality point of view, but we need to bring it all together as best we can.

GM then ran through the programme, as follows.

At the 16 June TAG meeting, David and Chris will present the effects study. That is the major item and advancing the others and in particular, bringing up Kevan's next run of the reports. I am working with Council and the various Terax parties trying to get as far as we can for a decision there prior to Warren's workshop and meeting on 25 June. Following that, David and Chris present on the Effects Study at the next major workshop of Warren's committee on 17 July.

JM asked Kepa if he would like to add anything further.

KM advised that he appreciates the work that Kevan has put in. Those two reports were really useful. They provide an advance on where we have been previously however, we do need to be careful about some of those averages and medians and that they are clear about what we are actually talking about.

Kepa requested a report of Chris's presentation that he gave, or even the slides.

Meeting concluded at 4.05 p.m. with a Karakia by Kepa

Next Meeting: 16 June 2015

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