TANK Collaborative Stakeholder Group

Meeting Thirty-One Record

When: Thursday, 17 August 2017, 9:00am – 4:30pm

Where: Te Taiwhenua o Heretaunga Orchard Road Hastings

- Note: this meeting record is not minutes per se. It is not intended to capture everything that was said; rather it is a summary of the proceedings with key comments noted. *Text in italics indicates a response from HBRC to questions posed during the meeting.*
- *Where additional information has become available subsequent to the meeting (such as answers to questions unable to be answered in the meeting), this is included in red italics*

Meeting Objectives

- Desired flow management targets for lowland streams
  - Specified flows to protect values
- Whether flow augmentation can be used to manage groundwater depletion effects on the specified flows.
- The management of surface water takes (lowland streams)
  - Options for flow augmentation and flow triggers for restriction of takes.
- The management of Ngaruroro flows (the effect of ground water takes)
  - Mitigation of the effect
  - Longer term strategy
- Management of groundwater levels
  - Allocation limit in relation to current equilibrium

AGENDA ITEMS

1. Welcome and karakia

Robyn Wynne-Lewis welcomed everyone and the Karakia was offered by all present.

2. Agenda, early discussion and introductions

- Housekeeping matters covered.
- Apologies were confirmed (see attendance table above).
- The meeting agenda and objectives were outlined.
- Ground rules for observers confirmed.
- Engagement etiquette was covered.
- Open floor for TANK members for notices and announcements.

3. Item # 1: Notices

No notices today.

4. Item # 2 – Meeting Record 30 and Action points

Meeting #30 Record
It was noted that in questions from Gary Clode's presentation the 300m^3 of gravel should have been 300,000m^3.

Questions were asked regarding the information box on page 6. What was the process in which the management directions were "agreed" to as recorded and what status to the additional suggestions from the Group have? After lunch, the Group agreed to replace "agreed by the Group" with "as presented to the Group" and to elevate the additional suggestions by inserting them into the same text box as the other recs. Following this change the meeting record was adopted as fair and accurate.

From Action Points

30.1 It was agreed that Iain Maxwell would replace James Palmer as the default spokesperson for the Group.

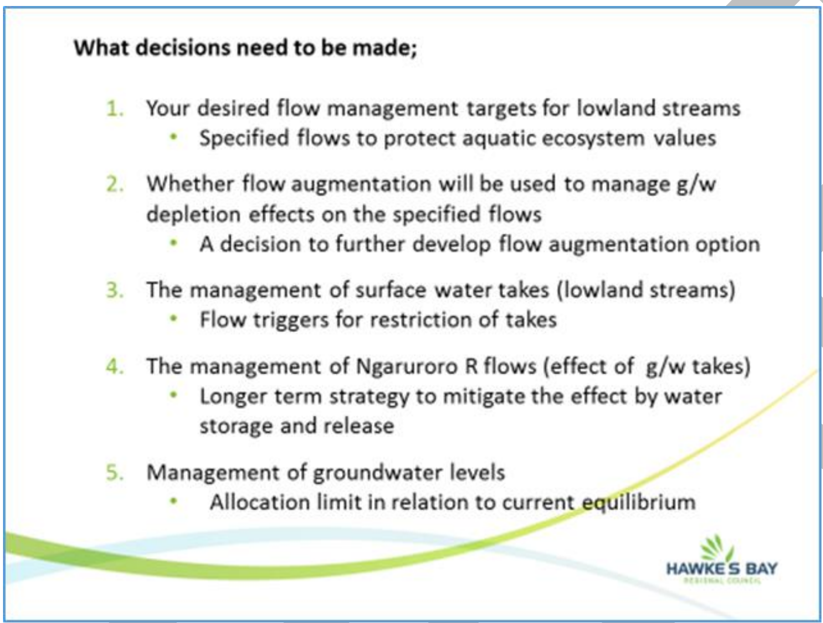
30.2 The Water Augmentation WG members have been invited to attend a presentation on Managed Aquifer Recharge at HBRC on Friday, 18 August 2017. *[Post meeting update - the first meeting of the Water Augmentation Working group has been scheduled for 8:30am on 12 September at the BNZ partners in Hastings]*

30.3 The draft WCO process statement was emailed to the Group directly after the last meeting.

5. Item #3 – Overview of today

Mary-Anne Baker gave an overview of what we're going to cover today and the decisions that need to be made. She noted that all the topics in today's presentations are inter-related and need to be agreed before we can move on to setting flows in the Ngaruroro River, which will be covered in the next meeting using scenario modelling results from SOURCE.

There were five challenges/decisions to be covered and all to be covered in the presentations. Mary-Anne outlined the five challenges and associated decisions (as per slide below).



6. Item # 4 – CHALLENGE 1 – MANAGING FLOWS IN LOWLAND STREAMS

Issue: There is a cumulative impact on flows in lowland streams from GW takes but we need to understand the requirements for flow regimes before we can manage the effects of those takes by a flow augmentation scheme.

Objective: To agree on the flows in lowland streams that will meet the needs of ecosystem health, mauri and other instream values.

6.1. Flow thresholds to protect fish in lowland streams

Thomas Wilding gave his presentation on flow thresholds to protect fish in the lowland streams using oxygen-flow models at 3 sites – Raupare, Irongate and the Awanui- as examples. These streams depend on spring flows from the aquifer. He explained the relationship between flow and oxygen in the stream – less flow less oxygen. He presented a graph that plotted actual data for 2013 and 2014 at the Raupare in relation to the three indicators on which to set flows to show what was achievable. He did the same for the Awanui.

Oxygen attribute	**60%**	**40%**	**(velocity 0.04 m/s)**
Indicator	invertebrate MCI*	Health of adult native fish	Fish survival / aquatic plant health

*MCI scores are one indicator on ecosystem health, based on pollution tolerance.

He gave possible flows for each site using the most relevant of the three oxygen-flow indicators for that site (i.e. based on observed data to show what is achievable). The decision of 40% oxygen, 60% oxygen or 0.04m/s is one that the group will have to make.

Site	60% oxygen	40% oxygen	0.04 m/s	Confidence	MALF** L/s (existing)	Possible trigger flow	Rationale	Alternative higher trigger
Irongate Riverslea Rd	1300	370	92	low	170	100	40% oxygen upper reach, velocity trigger lower reach	160 (existing min. flow)
Louisa Te Aute Rd	340	77	22	moderate	36	**22**	**Velocity trigger**	30 (existing min. flow)
Tutaekuri-Waimate Goods	1800	540	140	moderate	1860	1200	Existing minimum flow	1200 (existing min. flow)
Raupare Ormond Rd	510	240	100	high	402	300	Multi-scenario exceed 40%	300 (multi-scenario support)
Mangateretere Napier Rd	350	60	17	moderate	48	60	40% oxygen	100 (existing min. flow)
Awanui flume	800	270	110	high	90	110	Velocity trigger	120 (existing min. flow)
Karewarewa Pakipaki	640	170	45	moderate	25	45	Velocity trigger	75 (existing min. flow)
Karamu floodgates	4900	1600	380	low	970	1000	Exceeds 30% oxygen	1100 (existing min. flow)

**80 or 90% of MALF is the default minimum flow in the NPSFM, in the absence of any science, for streams of less than 5cumecs.

<u>**Matters raised by TANK members**</u>

What is the correlation between flow (litres/second) and velocity (metres/second)? *As you increase the flow you increase the velocity but how much you need to increase the flow to achieve that velocity differs between streams. The flatter the gradient of the stream, the more flow you are going to need to achieve that velocity.*

Was this information pre augmentation of the Raupare stream by the Twyford Irrigators group? *Yes it was.*

At what point is augmentation triggered in the Raupare? *300l/s*

Why is the Ruahapia not in this study? Have reported massive eel kills in the stream. *There are real problems with the health of this stream, as well as fish kills, it also has sewage fungus (the stream smells). The problems are more to do with discharges than excessive water use causing flow depletion. There are other methods of managing that.*

Did you look at modelling reducing water use in the Raupare? *If you use the model predictions under the volumes abstracted back in the 80s it will give you flows, and hence the oxygen levels under a scenario of less water use.*

Based on existing levels of use if we drive in some efficiencies could we get back to those sort of volumes? *Probably not. That would be in the order of a 50% reduction of water use across the plains. A huge reduction of total water use.*

To get back to 60% oxygen you have to go back to a flow of 450l/s? *More like 500l/s. Or the option can be to augment.*

What is being delivered in terms of ecosystem health at these different levels? *The ecological response, in this approach, includes trying to avoid collapse of the ecosystem, if you adopt the 0.04 m/s velocity trigger, or maintaining a diverse and healthy fish community if adopting 40% oxygen. The 60% oxygen level would pursue better invertebrate MCI scores.*

In cases where you say that requires a velocity trigger is that because we cannot achieve oxygen level? *Yes, it is about what is achievable in different streams. We need to set a flow that can be reached.*

Should we aim for a target of maintaining what we have without augmenting, but if you augment that would allow for increased water takes and enhancement?

Dr Jeff Smith endeavoured to explain the situation to the group. One of the key things to consider is the Mean Annual Low Flor (MALF) every second year the rivers will go lower than that. The Draft National Environmental Standard [note; the National Policy Statement for freshwater management was incorrectly referred to] gives guidance on how to set minimum flows, in the absence of any science, and, depending on objectives for the river, that is 80 or 90% of MALF for streams of less than 5cumecs. 80 or 90% of MALF as the default minimum flow. We can aspire to get 60% oxygen in all our streams, and that's good but we would have to stop all pumping across the plains and all abstraction and that wouldn't happen, so that would require a massive investment in augmentation schemes and that is not what we are trying to do here. We are trying to set limits and we can look at variables. The proposals are based on something other than the default values suggested by the NES.

James Palmer stepped in at this point and made the point to the group that these waterbodies come under stress with ecological impacts without abstraction and human interaction. This is an environment that gets very dry in summer. Waterbodies would have been under stress, dried up, oxygen would have gone very low and fish would have died pre human occupation. So we have to be sure not to set unrealistic goals. Some of what we might be aspiring to in terms of management targets wouldn't occur naturally. Using augmentation to get to that higher level comes at a big cost. There is some concern that the expectation is that if we manage abstraction adequately suddenly we get perfect ecological function, it doesn't actually happen in nature that way.

"What is the natural state?" 60% is a great target but if you dropped below 60% for one month or two weeks does that have an ecological effect? How long do you need to be in a stressed state to have a negative outcome? This is unclear at this point. *The MALF in the presentation is not naturalised MALF i.e MALF with current abstractions. Naturally, there is a reliance on the models to make predictions to see where the MALF would have been, and we do not have those numbers yet.*

What percentage of improvement in oxygen levels could be achieved if one side of the stream was planted and shaded? *Shade has an effect on how low the oxygen gets at night. About 10% more oxygen. The big gain from riparian planting is reducing the temperature of the water, if you reduce the temperature you reduce how much oxygen that the fish need to survive. Very tightly linked - if you can keep those streams cool, the fish are much better able to tolerate the lower oxygen levels.*

Can you model the effects of shade and the riparian planting? The benefits of planting as opposed to augmentation. *In terms of the effect of shade on oxygen it is about 10%. In terms of the temperature modelling could be done.*

In relation to the term trigger, does that imply that nothing happens until the flows reaches that point? *Trigger is the action point for augmentation. When the pumps need to be turned on.*

To what extent do the trigger flows protect the drying sections (such as the Paritua)? *We don't know the answer to that yet.*

Break out groups to discuss the possible trigger flow
It was decided that it was too early to make any decisions as the information to be supplied throughout the day was required for decision making. It was agreed to hear all presentations and then come back to the decisions.

> **Action Item**
>
> 31.1 HBRC Scientists to consider whether modelling can be done on the effect of temperature on oxygen levels

Announcement from James Palmer, regarding halting groundwater consents

At this point, James Palmer fore-shadowed the discussion to come later in the day and made an observation/announcement that HBRC is unlikely to issue further resource consents for groundwater takes from the Heretaunga aquifer based on the groundwater modelling that the Group has been privy to over the last few months. Their work has demonstrated that everything is connected to everything and evidence of unacceptable levels of effect in surface flows in many of the streams if not all of the streams across the Heretaunga Plains. So we know that the current level of abstraction and the current hydrodynamics of the system are delivering a set of outcomes which require a management intervention over and above what we have been doing up until now. The conclusion that should be reached is that current water allocation in total across the Heretaunga zone is either at or above full allocation.

As a consequence augmentation is going to be important if there is going to be any more water taken from the resource. He also noted the difference between the level of actual use and the allocated volume with actual use being around half of the allocated amount. Management of this would need to be addressed and would be a policy matter for the TANK to consider further.

7. Item # 5 – CHALLENGE 2 – MANAGING FLOWS IN LOWLAND STREAMS

Issue: There is a cumulative impact on flows in lowland streams from stream-depleting GW takes but neither;

- restricting individual takes nor
- restricting takes in specified areas/zones

is likely to be cost effective for achieving recovery of flows to desired levels in a timely manner.

Options:

1. Restricting groundwater takes on the basis of;
    - Location; area or zone of effect
    - Level of impact of individual take
2. Reducing overall allocation and use (more information on this option is being presented later today)

3. GW - stream flow augmentation scheme

7.1. Combined Stream Augmentation Modelling

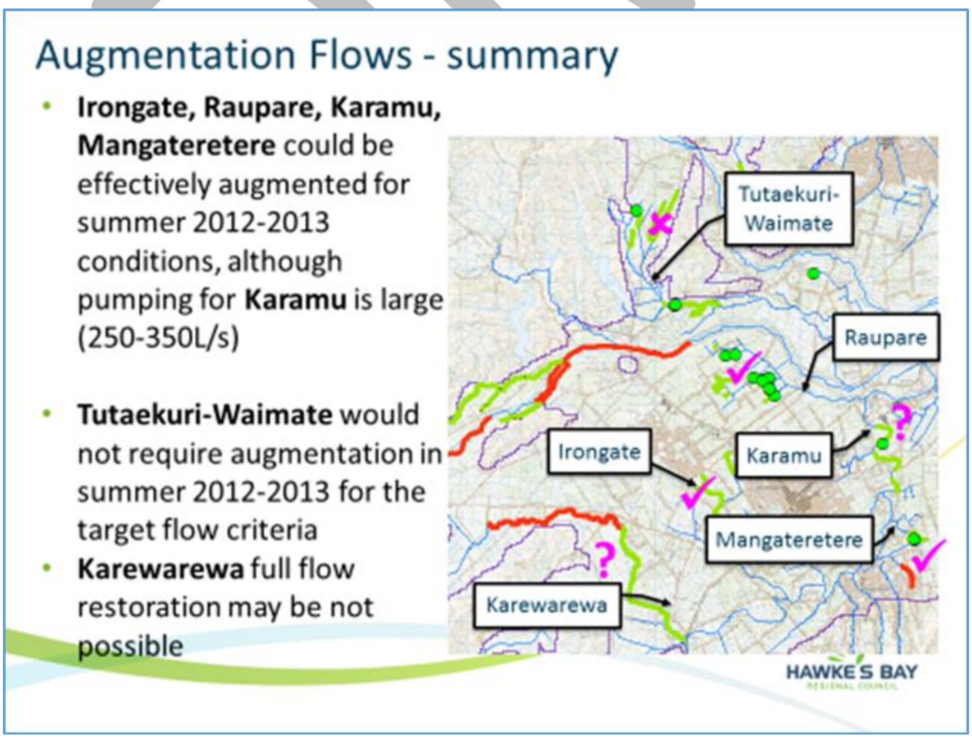
Pawel presentation included a:

1. recap on previous work
2. summary of his findings (including his methodology)
3. locations of augmentation takes
4. observed flow simulations

The purpose of this assessment is to establish if augmenting several streams at the same time is feasible in-principle, i.e. pumping groundwater to lowland streams during dry periods. He showed the volume of water required for various streams and the effect on flow giving best and worst case scenarios.

In summary, his findings were:

- Augmentation from groundwater is technically feasible for mitigating current stream depletion in lowland streams
- Augmentation will have some negative impacts on groundwater levels and Ngaruroro flows
- Augmentation may not be feasible for increased pumping (such scenario was not tested)
- Would require abstraction equivalent to 3-6% of current groundwater use
- Mitigation of Ngaruroro stream depletion via augmentation from groundwater is likely to be impractical



Costs and benefits were:

Costs	Augmentation scheme capital and operational costs	bore drilling (where necessary)
		pumping costs
		on-going administration and operational costs
	Does not address impact on Ngaruroro R low flow	
	Negative impact on groundwater levels and Ngaruroro flows	
Benefits	Stream flows maintained a desired levels	
	No restrictions on GW abstraction takes during periods of low flow	
	[Post-meeting update: improvements to temperature and oxygen]	

Summing up by Mary-Anne

The issue being addressed is the cumulative impact on lowland stream flows from the groundwater takes in the Heretaunga Plains and we already know from previous presentations that restricting individual takes or restricting by location isn't going to mitigate the effects in a timely or potentially cost effective manner.

We haven't looked at reducing the overall use/allocation yet but Pawel is going to cover this later.

The next management option looks at how well a groundwater stream flow augmentation scheme would work to mitigate the effects of the groundwater takes. Mary-Anne emphasized that, it is not a groundwater scheme to improve things beyond the effect that the groundwater abstraction has, but mitigates the effects of the groundwater takes. Anything beyond that becomes an additional cost and probably a much bigger scheme.

The other thing that we might be able to do or think about in terms of managing this is to calculate the overall impact of the groundwater takes as a total and then through the further development of this scheme find a way of maximising the benefit of that total amount of water in the various streams across the catchment. So Karewarewa didn't look like it would respond really well to an augmentation scheme but we might be able to use that total water more effectively with a little bit more work with Pawel's modelling to optimise the scheme benefits.

So what we are suggesting is that we develop Option 3a bit further. We need to be thinking about implementation at the same time because that is also potentially challenging. We won't have a scheme in place when permits are being renewed but we may be able to impose a financial requirement for mitigation that's calculated relative or consistent with the formula that Pawel talked about previously as well – i.e. it will be relative to the effect of each groundwater take in the plains.

Further development of this will be the first job of the Water Augmentation Group.

<u>**Matters raised by TANK members**</u>

Question about Calculation Augmentation Flows *(Page 23 of handout.)* *These numbers are based on Thomas' work. These are the numbers that would trigger augmentation. Numbers used were just a starting point. Augmentation would be to get back to the target rate.*

When you talk about using augmentation as a preferred option one of the alternatives would be reducing overall pumping out of the aquifer by 6%? *It probably wouldn't have the same effect. Because if you use augmentation you can keep your stream much higher. Pawel has another presentation on the increased allocation or use.*

10% efficiency would not need augmentation. *We know how much minimum flows would change as a result of reduced allocation and they would change but the change wouldn't be enough to give you the same effect as augmentation. Because augmentation kicks in when it is needed and you would run it for two weeks when it is really low and it keeps the flow up, so it is not an equivalent option.*

But if you were saving 6 – 10% year round would that not give a lot more volume than keeping abstracting from the stream. *The effect is the instantaneous flow which will overwhelm any effect due to small reduction of pumping, if you reduce the allocation that is going to help with the groundwater level.*

There will be a presentation on the effect of reducing overall allocation later in the day.

Will there be any work done on specific extractions that have a material effect on stream level flows? We have heard that there are particular extractions that cause problems. *Pawel explained that his work was focussed on bigger picture.*

But the bigger picture doesn't take into account localised effects. *Very difficult to solve or try to model. Trying to manage the cumulative effect of takes that are difficult to monitor.*

There are takes that have a significant effect on streams. *Those takes that are really close to streams and have an almost immediate effect on the stream flows, they can be dealt with through the consent process on an individual basis. What we are talking about are the takes that are further away that combined have a cumulative effect. 100s and 100s of them that cannot be managed through restrictions. What we are trying to do is manage the cumulative effects of the takes that cannot be managed in other ways.*

We have just been told that the aquifer is over allocated and here we are looking at extracting 6% more. *It is 3 – 6% more. The plan will be written so it enable this as a response. So it is part of the management response to the Heretaunga Plains groundwater. It is over allocated in terms of the effect on streams but not on the effect on the aquifer. It is how you measure over allocation itself.*

Do the tables and graphs assume that augmentation is happening everywhere, not just in isolation? *Yes augmentation would be happening simultaneously everywhere.*

If the groundwater level has changed in the bores could this have an effect on domestic supplies? *Modelling indicates that augmentation pumping could produce additional water level decline of between 15 and 25 cm, distributed quite uniformly in the aquifer. We do not know what exact effect this decline would have on domestic supplies, because this depends on construction details of individual bores (such as depth of pumps etc.) and HBRC do not have detail on private bores or any detail of their pumps etc. All we can say is that there would be some effect, as there are areas in the aquifer where there were reported problems with access to groundwater during dry summers. Modelling indicates that augmentation would lead to additional decline, but this decline is expected to be modest. This effect could be larger local. There are communities that are sensitive to groundwater level declines, Bridge Pa, Pakipaki. Users that are aware of their own pump and well setup could have a feel for what that impact could mean for them.*

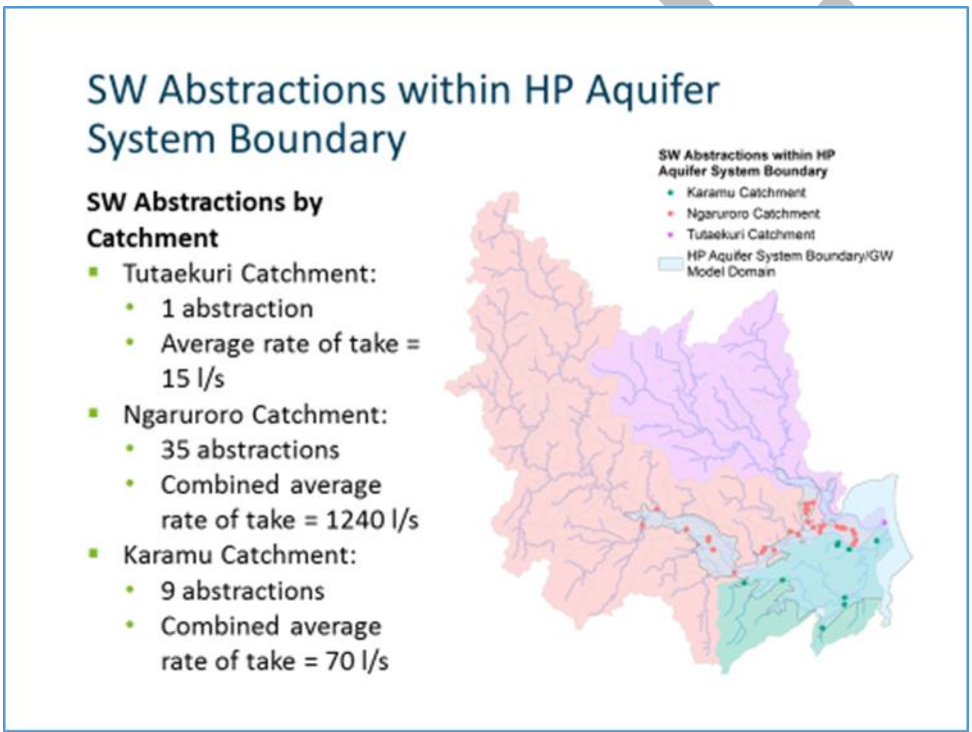
The group broke for morning tea.

8. Item # 6 – CHALLENGE 3 – MANAGING FLOWS IN LOWLAND STREAMS – DIRECT TAKES

Issue: There are a number of direct surface water takes within the HP model boundary that also	**3a.**	**Options**: Allocation limit 1. Cap allocation to existing use or 2. Cap allocation at total of existing consented allocations

have impacts on stream flows. Some of these streams are subject to a GW flow augmentation management option.		The difference between these two is that option 2 potentially results in lower security of supply for permit holders.
	3b.	**Options:** <u>Managing effects</u> **–** 3. In the Karamu catchment, where g/w flow augmentation scheme is proposed: • S/w takes are included in g/w flow augmentation scheme (one for one contributions) In the Ngaruroro and Tutaekuri-Waimate catchments where g/w flow augmentation schemes are not proposed: • S/w takes will be managed by s/w restriction regime (tbc) 4. All s/w takes managed by s/w restriction regime (tbc) • Reduced number of flow management sites have been proposed Note: Option 3 adds to the size of the augmentation scheme. S/w takes currently managed by s/w restriction regime Proposal: Options 1 and 4 to be developed further

Mary-Anne spoke of Challenge 3 Managing flows in lowland streams; direct takes. Rob Waldron presented a summary of surface water takes. He gave a recap on previous presentations giving totals of current abstractions. In summary these are:



<u>**Matters raised by TANK members**</u>

In the Karamu catchment they have a 9 abstractions minimum flow as part of their consent? Would most of the abstractions be stopped before the augmentation started? *It all depends on which flow you choose to start augmenting. If the augmentation was to kick at the current minimum flow, the surface water abstractions would stop.*

Are these allocation calculations. *Yes*

At 70l/s how long would Mike's dam last? *It would probably last the summer.*

Are we putting aside water storage options? *Is probably still a good option. This is looking at ground water takes on the lowland streams, we have yet to look at the impact of all of these groundwater takes on the Ngaruroro river, and so your questions around water storage schemes is probably more relevant to managing impact on the main stem.*

It looks like in the Karewarewa and the Irongate, it wouldn't be hard for water storage, so is this a live option, or do we want to make these decision without. *It is probably still a live option because there are choices about where the water goes. In terms of the groundwater as well as the water storage option.*

If there was storage would this override the need for augmentation. *Practicalities need to be thought through. Not discounting using some sort of storage above ground.*

Do we know what these surface water takes are for? *Surface water takes are primarily irrigation.*

9. Item # 7 CHALLENGE 4 – MANAGING THE FLOW DEPLETING EFFECT ON NGARURORO RIVER FROM GW TAKES

Mary-Anne explained the challenge: The cumulative effect from the groundwater takes in the Heretaunga Plain, on the flows of the Ngaruroro River is about 1200l/s. That includes any groundwater flow augmentation. But again we know that restricting individual takes or restricting in specified zones isn't going to be likely to be cost effective or timely in mitigating the cumulative effects of all those groundwater takes.

Mary-Anne went on to explain the options for Challenge 4.

Options:

1. "Live with impact" on Ngaruroro from GW takes in plains and include in SW allocation
2. Reduce total allocations below current levels (at permit renewal – or by review)
3. Ban/restrict all/some takes in all zones at specified flow
4. Develop mitigation option (i.e. water storage and release or ?) and incentivise or require contribution.
   - e.g. progressively reduce GW allocations at specified times if mitigation option not developed (through rules and consent conditions) or any other measure?

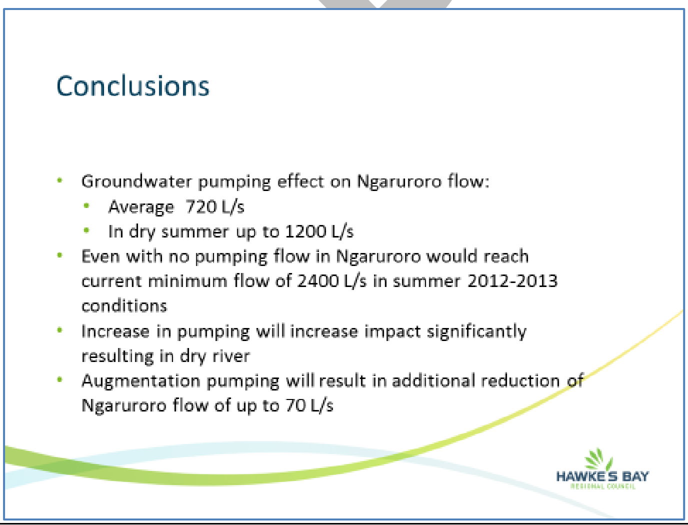
Proposal: Further develop option 4

9.1. Effect of groundwater abstraction on Ngaruroro River Flow

Pawel gave his presentation on the effect of GW takes on Ngaruroro River. He explained the aim of the modelling was:

- To estimate the impact on pumping on Ngaruroro River flow
- Total impact of pumping
- Impact of augmentation pumping

His conclusions were:



Matters raised by TANK members

Is there a multiplier effect when the flows in the Ngaruroro River are so low that there is no recharge? *The model is not very good in estimating that. If you go higher and higher with abstraction it would actually exceed the capacity of the river to produce water. Will basically run the river dry. The model is good at showing if you keep increasing you will get a dry river at some point.*

The previous presentation estimated the rate of take at 1200l/s, where would the effect of that be, on what reach of the river? *This effect includes the section of the river down to just above confluence with Tutaekuri/Waimate. This is the section that has variable flow, so it is losing or gaining. Below that you get in flow from Tutakuri-Waimate which is quite high so the river is no longer so sensitive to abstraction, even below it gets tidal so there is no point in measuring the effects, the biggest, largest extent.*

What is not understood is, is there an additive effect there, you tell us that there is a 1200l/s loss in the summer here and there is also a 1200l/s loss from direct surface water flows, so if you wanted to totally restore levels you would have to deal with both of those. *Yes*

The numbers that you showed us before being the flow curves were they with the surface water takes already been taken out? *No this is just groundwater on its own.*

So when you said that in 2012/13 the river got down to 2400*l/s*, if the groundwater takes had been turned off, it would have been 2400l/s rather than the 1300l/s that it got down to. *Yes that is right. Surface takes were not looked at.*

In March ban scenario turned off all pumps for 60 days, there would only be a 20% increase, but this is quite different to that? *If you turn everything off it will not come back immediately, by 1200l/s there will be a delay.*

Gathering broke for lunch.

After lunch, James Palmer gave a brief recap so everyone was on the same page. The cumulative effect of groundwater takes across the plains on the Ngaruroro flow is significant and has a detrimental effect on the water level in the river, particularly in drier times. In 2012/13, the Ngaruroro River was down to 1300l/s which significantly impacts species habitat (in comparison the WCO application proposes 90% species protection at 4200l/s). There is a significant effect that needs to be managed. Any increase in use is going to have an effect. Based on current impact and prospective impact we are at a point where cumulatively the view would be that there is no more room for further extraction in the groundwater resource.

Effect of augmentation is relatively minor in the scheme of things on the low flow, and the benefit received of the augmentation probably exceeds the impact or the cost, in terms of flow in the Ngaruroro. So if we are thinking about a management regime going forward to get the best outcomes for the streams on the plains and in the river, we are better off to use augmentation rather than trying to pump a whole bunch of water through storage or removing those surface takes from the main stem of the Ngaruroro to try and drive water down and eventually get greater upward pressure in the springs. That is a very indirect and inefficient way of doing things. May want to put more water back into the river for more flow for the main stem flow reasons but not for replenishment of springs.

It was thought that the linkage between the last two presentations was not clear enough. Given that we have 35 takes that are having a 1200l/s impact in the main stem's flow and then we have an equivalent impact in the main stem arising from all the groundwater takes, why wouldn't we put our focus on the 35 surface water takes? We didn't ask anything of those 35 takes in the last discussion. *And that may well be coming through further decision making.*

James continued. The surface water takes are having a very direct impact on the flow, at say Fernhill, groundwater takes have got a less direct impact. Management options for surface water takes is still to be covered. In relation to the spring fed streams, the main management option is {likely to be} augmentation. In addition, the cumulative effect of those groundwater takes on the flow in the main stem is significant and we need to do something about it - i.e. no more allocation. We also need to consider whether we should be reducing the ground water allocation. That may bring some benefit. A lot of reduction in the groundwater allocation with a reasonably small impact in the main stem. It is not a linear relationship, what we are seeing is that as we go up in the abstraction of the groundwater, the impacts get greater and greater on the main stem flow in the Ngaruroro, conversely as you come down the other way you get diminishing returns in terms of the benefit of reducing the groundwater take.

Mary-Anne's understanding of question above was - since there is a small number of takes with a really big impact on the Ngaruroro is it more cost effective to mitigate or enhance the in-stream flows for aquatic ecosystems by focussing on those 35 rather than imposing costs on a greater number in the bigger areas involved in the groundwater takes? We could because they do have a direct impact but they are also controlled by restrictions, i.e. we have a direct management response to deal with those. We could adjust the effect of that by increasing the flow triggers, however, the downside is the security of supply is less. This will be investigated further.

James continued… There are diminishing returns in terms of the benefit we can bring to the flows in the main stem from reducing allocation of groundwater across the plains. We are at a point now where we don't want to make it any worse and need to have a conversation about the benefits of reducing current takes. In terms of augmentation we are better off taking it from groundwater and augmenting streams rather than trying to force more water through the system for a much bigger increase in the flow regimes in the main stem of the river. It is more sensible and more rational to do it that way.

Whether augmentation is cost effective is probably marginal. *Will be explored in greater detail when costs and benefits are brought back to group.*

Effects that we are trying to deal with are very temporal they do not happen all year round.

James Palmer spoke to Option 4 of Challenge 4. i.e. water storage and other options

He reiterated that we must make sure we are not locked into a solution (similar to Ruataniwha and PC6) where we are dependent come what may on a storage solution, which may or may not come to pass. We can explore the mitigation options, particularly water storage, but we are still going to need a set of rules that will cap, in the first instance allocation, and potentially a progressive claw back. But that goes to the outcomes that you want to achieve in the stream. That is where we are going to go in this next session. It is whether just capping current use is good enough.

10. Item # 7 – CHALLENGE 5 - MANAGING EFFECT OF PUMPING ON GROUNDWATER LEVELS.

Issue: GW level is currently at a dynamic equilibrium at current levels of abstraction.

- Increasing GW abstraction will have further negative effects on lowland stream flow, and Ngaruroro River low flows (effects on aquatic ecosystem, mauri and other instream values and other flow-on impacts)and will further impact on GW levels
- Reducing GW abstraction will have positive effects on lowland stream flow and Ngaruroro River flows (effects on aquatic ecosystem, mauri and other instream values) and on GW levels
- Reducing GW abstraction will have negative impacts on existing users (economic effects on users and other flow-on impacts)

Options:

1. Allow pumping to increase (to new allocation limit) but still maintain specified flows in lowland streams by flow augmentation.
    - What happens to groundwater levels across the plains with increased pumping?
    - What happens to Ngaruroro R flows?
    - Where might this affect existing access to groundwater and what solutions exist to address this?

2. Reduce total allocations
3. Cap allocation at total of existing consented allocations
4. Cap allocation to existing use
5. Commitment to further investigate option 1

Proposal: Option 4 is the recommended approach.
Option 5 could also be considered (further investigate costs and benefits for some increased pumping).

10.1. Groundwater levels

Pawel presented on "Long term groundwater trends investigation: summary and further findings". He demonstrated the sensitivity of aquifer levels and stream flows to groundwater pumping.

His main findings were:

- Aquifer groundwater levels and streams flow have declined as a result of increasing groundwater pumping over past decades
- Aquifer response is fast and if pumping stabilizes, aquifer will remain in a new dynamic equilibrium without any significant further decline (no groundwater mining)
- Increasing aquifer abstractions will result in further decline of water levels and spring flows, eventually leading to drying out of some streams and saline intrusion
- **Caveats:** this assessment focuses on long term overall trend; local stresses, extreme weather may cause water levels and streams flows to reach lower levels at times in some locations, despite no long term decline

Conclusions:

- Clear effect even for small increase in pumping for water levels and stream flows
- Very significant effect for large increase with significantly lower flows and dry streams.

Matters raised by TANK members

Is it reasonable to assume that municipal and industrial is half of the pumping so a 10% change in pumping can only be affected by a 20% change in irrigation takes? Before Pawel could answer, it was stated that there are huge efficiencies to be achieved in municipal pumping so that would not be true. *The simulations assume uniform increase/decrease for every user.*

You have been saying that a small increase in pumping has an effect on stream flows. *Yes*. **So if there is a decrease in pumping it should have a similar effect.** *Yes*. **That is not what you have been putting forward for some time now where you have been saying that there is no effect if you decrease, you have to stop pumping altogether to get an effect.** *No that is not quite what I have been saying. I think you are talking about irrigation bans, and the effect of these on stream flow. So it's not that there is no effect but when you stop pumping from a very little limited area there is very little effect but when you stop everyone, there is a significant effect, and it also takes time for this effect to manifest itself.*

If there is a sinking lid for everybody as the consents come up and get renewed, you will get an effect over time from the decrease in pumping over a wide area. *Yes that is correct.*

There was a discussion about irrigation demand and whether the Group were interested in forecasts given the advice from the scientists that we probably don't want to give out any more water than we have. The scenarios presented to date have been based on allocating groundwater takes at the current rate of consenting. It was noted that the Irrigation New Zealand website states there is about 6000 hectares available for irrigation.

It was felt that we can't do a proper job without considering future demand as we are building a plan for the next ten years. It was also noted that if we go to the capital expense of augmentation for environmental flows we should also investigate co-benefits i.e. making the scheme a little bit bigger to extract a little bit more for economic development and well-being. Upside and downsides need to be looked at. It was also noted that if we are going to do some more work on future demand we need to also look at increasing productivity with existing takes. Both are valid.

> **Action Item**
>
> 31.2 Water Augmentation group to bring back future irrigation demand to the TANK Group for consideration.
>
> 31.3 Water Augmentation group to consider possible options to address water augmentation needs

Break out groups deliberated for a short time and then voted on the following proposals.

<table>
<tr><th>CHALLENGE</th><th>ISSUE AND OPTION SUMMARY</th><th>PROPOSAL</th><th>OUTCOME AND QUESTIONS</th></tr>
<tr>
<td>Challenge 1 –Managing flows in lowland streams</td>
<td>Issue: There is a cumulative impact on flows in lowland streams from GW takes but we need to understand the requirements for flow regimes before we can manage the effects of those takes by a flow augmentation scheme.

Options – stream flow triggers for augmentation</td>
<td><table>
<tr><th></th><th>Prop.</th><th>Alt.</th></tr>
<tr><td>Raupare</td><td>300</td><td>300</td></tr>
<tr><td>Irongate</td><td>100</td><td>160</td></tr>
<tr><td>Karamu</td><td>1000</td><td>1100</td></tr>
<tr><td>Karewarewa</td><td>45</td><td>75</td></tr>
<tr><td>Mangateretere</td><td>60</td><td>100</td></tr>
<tr><td>Louisa</td><td>22</td><td>30</td></tr>
<tr><td>Awanui</td><td>110</td><td>120</td></tr>
<tr><td>Tutakekuri-Waimate</td><td>1200</td><td>1200</td></tr>
</table></td>
<td>Proposed flows – 8 votes
Alternative flows – 7 votes
Abstentions - 3

Can you augment from the water that goes out to sea. Not possible to model. If you took water close to the coast you are still decreasing pressure in the aquifer.

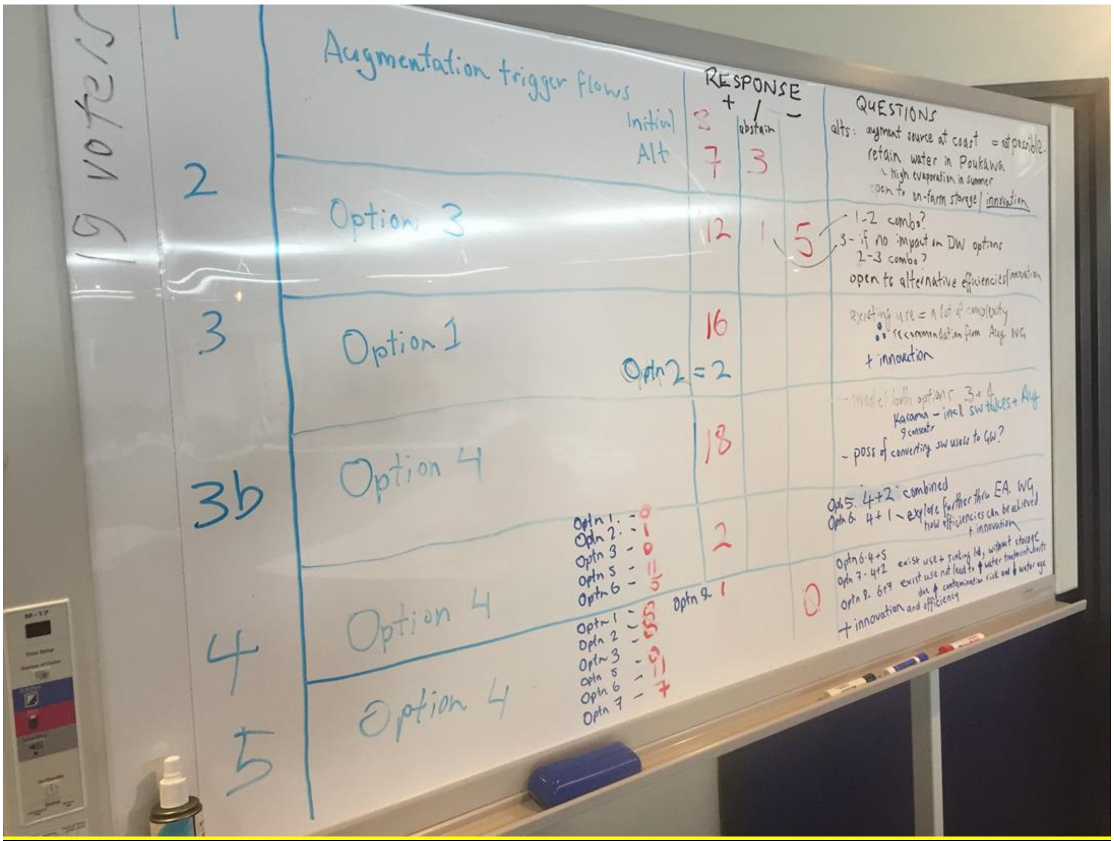
What would happen if you slowed down the water flow out of Lake Poukawa, would that help with the flows? The recession of flood flows would be longer. Losing more water to evaporation.

Concerned if only looking at augmentation, individual might want to look at their own storage or change when they crop. A lot of innovation gets squashed. We need to be a bit more open minded about other options.
Not sure how on farm storage would solve groundwater problems.

We need to be aware of innovation. We are open to all sorts of options we will try to model. Trying to mitigate the cumulative effects from a whole group of resource consent holders.</td>
</tr>
</table>

			Suggested that we have a caveat for all challenges that picks up this suggestion.
Challenge 2 – Managing flows in lowland streams	**Issue**: There is a cumulative impact on flows in lowland streams from stream-depleting GW. **Options**: 1. Restricting groundwater takes on the basis of; • Location; • Level of impact of individual take 2. Reducing overall allocation 3. G/w stream flow augmentation scheme	Option 3	Option 3 – 12 votes Alternative – 5 votes Option 1 – 2 – Combo Option 3 - only if it doesn't have an impact on drinking water takes. **If you reduced overall allocation by 5%, would the costs of augmentation costs reduce?**
Challenge 3a – Managing flows in lowland streams; direct takes	**Issue**: There are a number of direct surface water takes within the HP model boundary that also have impacts on stream flows. Some of these streams are subject to a g/w flow augmentation management option. **Options: Allocation limit** 1. Cap allocation to existing use or 2. Cap allocation at total of existing consented allocations The difference between these two is that option 2 potentially results in lower security of supply for permit holders.	Option 1	Option 1 – 16 votes Option 2 – 2 votes Agreed that the Augmentation Working Group will report back with a recommendation of how to measure existing use.
3b.	**Options; Managing effects –** 3. Karamu catchment; Include surface takes in g/w flow augmentation scheme Ngaruroro and Tutaekuri-Waimate; S/w takes will be managed by s/w restriction regime (tbc) 4. All s/w takes managed by s/w restriction regime Option 3 significantly adds to the size of the augmentation scheme. S/w takes currently managed by s/w restriction regime	Option 4	Option 4 -18 votes Investigation of Option 3 **Wouldn't expect to see any environmental benefit of Option 4?** *The restriction regime with a range of different options still to be modelled. Staged reductions. Option three is a mitigation of effect approach not an improvement.* **Request for more information on environments effect of both options.**

Challenge 4 – Managing the flow depleting effect on Ngaruroro River from GW takes	**Issue:** Cumulative effect of stream-depleting groundwater takes is up to 1200 l/s on Ngaruroro flow (including flow augmentations). **Options:** 1. "Live with impact" on Ngaruroro from GW takes in plains and include in SW allocation 2. Reduce total allocations below current levels (at permit renewal) 3. Ban/restrict all/some takes in all zones at specified flow 4. Develop mitigation option (i.e. water storage and release or ?) and incentivise or require contribution	Option 4	Option 2 - 1 vote Option 2 & 4 combined - 11 votes Option 4 - 2 votes Option 4 & 1 - 5 votes **1 & 4 we need to look into water storage. To what extent do we require that augmentation to be fitted into current usage? Need for further exploration as to how efficiencies can be achieved.** **Innovation - what would happen if you allowed someone to keep taking their current allocation but they had to produce and oxygenator to improve oxygen further down the stream? Having only flow as an option is very narrow minded.** *Any rule will be based on existing use measured at previous times. To stop any potential "gold rush".*
Challenge 5 – Managing effect of pumping on groundwater levels	**Issue**: GW level is currently at a dynamic equilibrium at current levels of abstraction. **Options:** 1. Allow pumping to increase (to new allocation limit) but still maintain specified flows in lowland streams by flow augmentation. • What happens to groundwater levels across the plains with increased pumping? • What happens to Ngaruroro R flows? • Where might this affect existing access to groundwater and what solutions exist to address this? 2. Reduce total allocations 3. Cap allocation at total of existing consented allocations 4. Cap allocation to existing use 5. Commitment to further investigate option 1	Option 4 (And maybe option 5)	Option 1 - 0 votes Option 2 - 0 votes Option 3 - 0 votes Option 4 - 0 votes Option 5 - 0 votes Option 6 = 4 & 5 – 11 votes Option 7 = 4 & 2 - 7 votes Option 8 = 6 & 7 – 1 votes **What about takes at high flows for storage?**



11. Item # 8 - HBRC media release on "Heretaunga Aquifer at its limit"

James Palmer outlined what he intended to say in a media release about the decision to halt consenting groundwater takes, that he foreshadowed earlier (see p6 of the meeting record). The proposed content was 100% supported by TANK members via a show of hands. Key messages noted by members included the mismatch between usage and allocation, the definition of existing use, potential efficiencies, and to prevent any kind of gold rush on the resource. It was also noted that we do not want to encourage a gold rush of water storage consent applications.

[Post meeting update: link to the media release http://www.hbrc.govt.nz/our-council/news/latest-news/media-releases/article/337] Key point from the media release:

"Hawke's Bay Regional Council Chairman Rex Graham says the latest advice shows the current annual volume of groundwater taken is considered to be at its maximum acceptable level and allocating further water appears to be no longer acceptable.

He says there is currently significantly more water allocated through existing resource consents than is typically used and so constraining water takes to their current actual level of use will likely lead to a reduction in volumes consented to existing consent holders".

12. Item # 9 - Farmer Reference Group Report back

Feedback from a member representing the Farmers Reference Group. He noted that farmers found timeframes challenging to get up to speed with science. Some farmers had issues with modelling. Broad support for site specific management aligned by catchment collectives. Strawman proposal will be presented at next meeting.

13. Item #9 - WCO process submission

It was agreed that there would be no TANK submission to the WCO. Individuals/representative groups were encouraged to submit by a member. James Palmer outlined what would be in the Council's WCO submission, particularly the primacy of this TANK process in regard to integrated catchment management.

14. Item #10 - Next meeting - 7 September 2017

Mary-Anne noted that the work of the TANK Group will require at least another three meetings in the New Year and there is potential for the WCO process to divert attention.

A request was made for an update from Iain Maxwell on the recent TAG meeting.

Action Item

31.4 Iain Maxwell to give a verbal update on recent TAG meeting

15. Closing Karakia

The closing Karakia was spoken together.

Summary of Action Points

ID	Action item
31.1	HBRC Scientists to consider whether modelling can be done on the effect of temperature on oxygen levels
31.2	Water Augmentation group to bring back future irrigation demand to the TANK Group for consideration.
31.3	Water Augmentation group to consider possible options to address water augmentation needs
31.4	Iain Maxwell to give a verbal update on recent TAG meeting at next TANK Group meeting