

Science and Technical Advisory Group Meeting

Minutes

Dates and Location: Thursday 29 November 10am-4.30pm, Room 1A (Matairangi), Ministry for the Environment, 23 Kate Sheppard Place, Thorndon.

STAG Members present: Bryce Cooper, Chris Daughney, Clive Howard-Williams, Bev Clarkson, Graham Sevicke-Jones, Ian Hawes, Jon Roygard, Ken Taylor, Marc Schallenberg, Mike Joy, Russell Death, Joanne Clapcott, Ra Smith, Tanira Kingi, Mahina-a-rangi Baker, Jenny Webster-Brown (in the afternoon, by phone), Adam Canning (by Skype). **MfE staff:** Jen Price, Oscar Montes de Oca Munguia, Isaac Bain, Vicki Addison, Dan Elder, Helli Ward, Nik Andic, Jo Burton, Lucy Bolton, Carl Howarth.

Apologies: Dan Hikuroa, Jamie Ataria

Additional papers tabled at meeting:

1. Adam Canning – comments on periphyton note
 2. Lucy Bolton – timetable of advisory group agendas and topics
 3. Kirsten Forsyth – flow statistics
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Items:

1. Previous meeting minutes and actions arising, Terms of Reference, apologies, conflict of interest (Ken Taylor)
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Ken outlined the agenda and mentioned time constraints; this means that some topics will be discussed only briefly at this session with a more detailed discussion to come. For example, today will include a brief discussion on nitrate to scope future discussions.

Marc gave the Group a briefing on the Freshwater Leaders Group meeting. Issues discussed:

- Some group members indicated the importance of economic analysis of policy options, this has been clarified with the Minister, who said we shouldn't be inhibiting our thinking with economic considerations, but these can be considered.
- At Risk catchments: the best approach was discussed – working in key catchments or nationally.
- Presentations about wetlands, high risk activities, good management practice
- Minutes will be shared on the web portal; all documents can be viewed by all three groups.

Mahina-a-rangi and Tanira gave an outline of the proceedings of the Kahui Wai Māori meeting. Topics discussed included work being undertaken in respect of the National Policy Statement for Freshwater Management (NPS-FM) and the proposed National Environment Standard (NES) as part of the Essential Freshwater work programme. Also discussed were At-Risk Catchments, the Three Waters review, and land use regulation and good farming practice.

There was discussion on the importance of considering social and economic contexts. The position of Māori is that biophysical and social aspects should be considered together and all factors taken into account.

Ken indicated that the level of detail in the minutes is appropriate and helpful. The Group gave feedback and comments on the draft minutes from 18 and 19 October, and these were incorporated.

In the minutes of the discussion of the Ecosystem Health Framework on 19 October, an additional caveat was added to group's statement, that the methods of defining reference conditions still need to be resolved. Russell Death requested that a related report be circulated among the group.

Actions:	To be completed by:
Circulate a copy of: Boothroyd I.K.G., Harding J.S. & Death R.G. (2002) Guide to the Selection of Reference Sites for Environmental Monitoring of New Zealand Rivers and Streams. (Ed M.F.T. Environment), p. 32. Ministry for the Environment, Wellington.	Completed – on portal

1. A) Indicative work programme, milestones, timing of meetings, topics for discussion (Lucy Bolton)

Lucy presented the indicative timetable for the advisory group network with timing of decisions by ministers, and outlined the plan for the joint Advisory Group meeting on 7 December.

It was noted that the Group needs to have enough time to consider proposals and provide feedback.

Discussion points included:

- Why isn't phosphorus also being discussed along with nitrate? The group discussed this and agreed this should be a discussion about nutrients.
- How will the discussion at the workshop on the 7th December proceed around allocation, in relation to Maori rights and interests? It was mentioned that there is work being done on this topic at the moment. It is important to consider and acknowledge the genealogical relationship between tangata whenua and the land. Ken reminded the group of their responsibility to keep Māori rights and interests in their minds – this will be an important discussion on 7 December.

10.50am Adam Canning joined the meeting by Skype.

2. State and trends (Ton Snelder)

Ton gave a presentation on state and trends in NZ freshwaters, based on Land Air Water Aotearoa (LAWA) data. Topics included:

- A description of the river monitoring site network
- An analysis of the state of river water quality across New Zealand
- Trends (including some new statistical approaches to trend analyses)
- Cautions about the way trend results are interpreted

Discussion points:

- In relation to the declining trends in Macroinvertebrate Community Index (MCI) in natural catchments, the trend analysis uses “dominant” land cover – could this potentially mask patterns if for example, there was a small amount of intensive land use in an otherwise natural catchment? Ton replied that he has checked for the existence of such confounding patterns, but as yet hasn’t been able to draw any inferences in this regard..
- The rates of change in natural systems are important, and need to be understood when comparing results to reference state.
- Periphyton can take up nitrogen from the water column and can therefore influence water quality results, which can affect the conclusions drawn when variables are examined in isolation.
- The time period over which a trend is calculated can influence its direction due to underlying climatic influences.
- Communities might place more value on exceedances and the frequency of high magnitude events rather than median conditions, e.g. how many times can I not swim in my river?
- Trends can signal requirements for further intervention.

11.30am MfE staff Oscar and Dan left.

3. Maintaining/improving water quality (Carl Howarth)

Carl presented a paper on how the issue of maintaining and improving water quality is dealt with in the National Policy Statement for Freshwater Management (NPS-FM), and outlined options to better manage the “bands test” for Appendix 2 attributes.

Discussion points:

- The lake attributes allow for a large shift in state within bands. For example, the phytoplankton “A” band encompasses oligotrophic to mesotrophic conditions.
- The group agreed with Carl’s statement that a decline within a band “might constitute a material (i.e. more than minor or significant) decline in ecosystem health, for at least some existing attributes”.
- The NPS-FM states that “this national policy statement allows some variability in terms of freshwater quality, as long as the overall freshwater quality is maintained within a freshwater management unit”. This definition was decided on by Cabinet.
- The group was asked to identify the most problematic bands. Responses included:
 - All of them
 - The “A” band for lakes is a very wide band that would permit deterioration in some of our most pristine lakes
 - Nitrate toxicity; bands go from affecting 5% to 20% of species
 - *E. coli*
- If a single site was used as the unit of measurement, comparison against a band would be more straightforward.
- Rates of change at sites of interest could be compared to natural rates of change at reference sites if this information was available.
- It would be appropriate to use measures that are not as variable over time and are more accurate.
- “Maintain or improve” is most useful for defining future-focussed planning objectives.

The group considered Options A and B presented by Carl: Option A: Maintain precise attribute state, remove the bands test, or Option B: Reassess the problematic bands and adjust them accordingly.

Discussion included:

- Introducing more bands would cause more issues. A paper recently written by Graham McBride of NIWA provides a statistical approach for defining maintenance of water quality (it is currently under review and will be published soon).
- Ken summarised that the group did not appear to be advocating strongly for more bands.
- The use of bands is separate from the use of trends.
- Natural rates of change, variability and “noise” in the data need to be understood.
- Bands are a useful tool for setting community objectives and communicating to the public and councils; however they can cause some detail to be lost.
- For communities, “maintaining” water quality often means “not getting worse”. It’s difficult to talk about single variables with the community; a more holistic/ecosystem health based approach is needed, and the overall picture needs to be communicated.
- Ken summarised that the message from the group was that we need to integrate attributes to have more resonance with the community.
- Te Mana o te Wai is an important concept to consider here, as tangata whenua may hold a different view. For example, decline within a band is not acceptable to Ngāti Kahungunu ki Wairarapa.
- Ken commented that this view was consistent with that expressed by the group members. He summarised that the general message from the group was that the issue can’t be addressed solely by disaggregating bands.
- Worked examples would be helpful in considering this issue.
- More bands could be useful in conjunction with a statistical measure to define “maintain”.
- Could narratives be used to define bands more precisely? More detail could be provided within bands, e.g. A1, A2, A3, with accompanying explanations.
- An advantage of the current bands is that they are easy to understand, but they are only part of the bigger picture.
- The current approach is that attributes come into the conversation with communities after a discussion on the state of the waterbody. Then, the bands are used as a tool for defining state – they do not steer the conversation.
- Options discussed included to have an increased number of bands for some variables recognising that there could be a reduction, (say 3 bands) for others.
- Ken’s summary of the discussion (provided afterwards): The main purpose of the option to include more bands would be facilitating communication, not defining state.

Actions:	To be completed by:
Provide a worked example of the situations outlined in the paper.	Carl

12.10pm *Ra Smith left.*

4. Sediment (Stephen Fragaszy)

Stephen presented a paper seeking advice on two themes:

1. Sediment attribute components – metrics and exceedance criteria for potential attributes
2. Policy principles to guide bottom-line attribute development

Proposed environmental classification systems for the attributes and the exceptions criteria will be discussed at a later meeting. Stephen mentioned that the proposed attribute tables for suspended and deposited sediment from the Stage 2 report will change due to current ongoing work.

The group considered the question: Does the evidence in the reports support the decision to base attributes on rolling medium-term (~2 years) measures of central tendency? Discussion points:

- A worked example would be useful to help the group consider whether to support the decision to base attributes on rolling medium-term (~2 years) measures of central tendency.
- Important considerations would be how to sample monthly when conditions are sometimes unsuitable, and how to use continuous monitoring results (if available), as the information gained from continuous monitoring (e.g. for suspended sediment via turbidity measurements) is far more detailed and comprehensive than a monthly grab sample.
- Can a macroinvertebrate measure such as %EPT (Ephemeroptera, Plecoptera, Trichoptera¹) be used? Recently developed macroinvertebrate indicators can be used that are more specific to the effects of sediment than the existing metrics such as %EPT. These could be used to demonstrate an ecological response to increased sediment but will not be used to define new attributes. These can be calculated from standard MCI sampling results and do not require the collection of separate samples.
- Isn't the impact greatest when the sediment is first deposited? This question has been explored by looking into results from the Quorer method. Quorer results are correlated with measures of deposited sediment on the surface, which are much more widely used.
- It would be useful to check how continuous suspended sediment data compares to monthly sampling, across several rivers.
- Yearly sediment loads can be used to allocate limits on land use in a relatively straightforward way; this is more complicated for variables such as clarity. The previous sediment study built an analytical framework linking annual sediment load to environmental state variables in attribute tables. It would be helpful to see a worked example of the analytical framework.
- Narrative effects of suspended sediment are explained in the narrative sections of the attribute tables in terms of effects on fish and macroinvertebrates. These are based more on habitat, rather than toxicity effects. The thresholds for the proposed bands were formulated by gathering all sediment and ecological information, then using landscape gradients to examine responses to changes in sediment. The resulting gradients were used to define the A, B, C and D bands.
- Could deposited sediment be used on its own rather than having attributes for both? Attribute tables have been formulated for both suspended and deposited sediment. It was pointed out that models were more robust for suspended sediment, suspended sediment can be more widely measured, and turbidity also affects swimmability and therefore has additional value as an attribute.
- The attribute tables are based on 2-year rolling medians based on a rule of thumb and also on analysis of deposited sediment data. It was pointed out that a 2-year median may cause the median to jump around, and that a 2-year median may be problematic if there was an extreme event.
- Ken's summary was that there is more analysis and justification needed on the 2-year time period for the attribute tables.
- More work is needed on time series data of water clarity in lakes.

The group examined the question: Suspended sediment: What is your opinion on the attribute indicators chosen and the possibility of their interconversion? Discussion points:

- This is practical, there was agreement among the group on this.

¹ The percentage of the sensitive groups mayflies, stoneflies, and caddisflies in the sample.

- Other factors can affect clarity in addition to suspended sediment, the relationship is river specific. There are exceptions in the attribute tables, e.g. for glacial-fed rivers and tannin staining.

The group examined the question: Deposited sediment: What is your opinion on the attribute indicator and monitoring method? Discussion points:

- Measuring deposited sediment throughout the year will be difficult, which may lead to a data availability issue. It would be helpful to have guidance on how to deal with limited samples, e.g., if entering the water was not practical or unsafe it could be possible to use bankside measures of deposited sediment and correlate these with other measures.

Additional discussion:

- Bands will be determined by the deviation from the reference state. There is a linear relationship between pressures and state – it comes down to how much deviation is acceptable.
- What is the process for combining attributes? We need to have a discussion about this.
- The attributes measure certain effects of sediment, but what about the resulting changes in geomorphology? Geomorphology is addressed through the classification system which takes climate, topography and geography into account.

Actions:	To be completed by:
Provide a worked example to help the group consider whether to support the decision to base attributes on rolling medium-term (~2 years) measures of central tendency.	Stephen
Comparison of how continuous suspended sediment data compare to monthly sampling, across several rivers.	Stephen
Worked example of the analytical framework relating annual sediment load to environmental state variables in attribute tables	Stephen
Provide more information or analysis on the 2-year period for medians	Stephen

1.20pm Jenny Webster-Brown joined the meeting by phone.

The group considered “Policy principles for development of NPS-FM ecosystem health attribute bottom lines”. Discussion points included:

- Principle 3 needs to be altered to account for cultural differences in the way ecological health is described. Te Mana o te Wai allows for the relationship between humans and water; people can be part of a healthy and functioning ecosystem. Managing in the complete absence of human intervention is not consistent with this concept. This could be captured by changing the wording, e.g. change “free from alterations resulting from human activity” to “free from adverse impacts”.
- Te Mana o te Wai encompasses the relationship between people and water and includes the requirement to maintain and restore mauri. A commonly referenced value is mahinga kai, but the relationship between humans and water is not just about food gathering. Rather, food is a connector between people and the land.
- Scientific targets sometimes do not match community aspirations and ideas relating to water quality, and may not adequately define the mauri of the water. For example, Lake Rotorua has a Trophic Level Index target of 4, corresponding to the equivalent water quality measured in the 1960s. But communities that live near the lake have a different

understanding of what water quality was in the 1960s, and therefore have a different understanding of lake health.

- Ken summarised that it is key to have provision for, and meaningful recognition of, Te Mana o te Wai in the Principles.
- Bottom lines need to be measurable and related to the purpose or outcomes being sought.
- Researchers need to make clear which option they have chosen under (4): *“Base bottom lines on the least acceptable state of ecosystem health and/or the state prior to irreversible degradation occurring (the former is a normative and subjective judgment, the latter, given adequate information, is not)”*.
- The interventions we want to trigger need to inform where bottom lines are set. In terms of risk management, Māori may not be interested in the effects or threshold approach but an approach can be more informed by kaupapa, where you would need to intervene any time the objectives are not being met. A less technocratic way of defining risk would help with community buy in.
- Stephen commented that both natural state and ecological effects can be taken into account when formulating bottom lines. The key purpose for bottom lines is a regulatory back stop, essentially informing communities “you can’t aim for water quality to be worse than this”
- Communities also hold values that aren’t communicated in attributes.

1.50pm Stephen left.

5. Wetlands (Helli Ward)

Helli’s wetlands paper was discussed. It was pointed out that we are starting from the premise of halting wetland loss and decline of all wetlands, not just those that are regionally significant.

Noted that the Biodiversity Collaborative Group (BCG) has also provided wetland policies in the draft NPS Indigenous Biodiversity (NPS-IB) and officials are working closely to work out how and where policies fit and ensure there are no gaps.

Wetland Identification and Delineation

The wetland identification and delineation process provided by the BCG for the NPS- IB was discussed. Having a nationally consistent approach to delineating a wetland would remove an avenue for appeal.

- Bev talked about the process and where it came from based on a method developed by the United States Army Corps of Engineers.
- Talked about the tension between translating technical processes into a form suitable for policy and the iterative experience with the Periphyton note.
- STAG generally agreed with the concept but it was noted that some of the process was incorrectly written.

Action: Helli to supply Bev with word version of the process for comment, and continue to work together to refine it.

Water level changes

Discussed the Draft NES Ecological Flows 2008 provisions for wetland water level.

- It was confirmed that the indicative change in median levels were in relation to reference condition but unclear what time frame the median was in relation to.
- The table of methods signals to councils the amount of effort required to investigate water levels in wetlands depending on the degree of hydrological alteration and significance of the wetland and their management.

Setbacks

Setbacks for activities around wetlands were discussed.

- It was generally agreed that these were a good idea indicating a clear management zone. They signal social change of what is acceptable around these water bodies but needs to be backed up with education etc.
- It was agreed that a one size fits all wetlands approach for all wetlands was acceptable (i.e. certain setback for certain activity for all wetland types).
- There was a concern that setbacks could inhibit temporary activities that were intended for the good of the wetland and care would be needed to avoid restoration etc. in the wording of this.

Wetland size

Wetland size in regulation and national maps was discussed. Currently national maps identify wetlands to approximately >0.5 – 1 ha. Smaller wetlands collectively make up a significant amount and can fly under the planning radar.

- There was a general acceptance that a stipulation of size would be good to capture small wetlands but there was nervousness around a strict one size fits all to regulations.
- Could use a stipulated size and include provisions based on rarity or significance.
- It was noted that Sentinel 1 satellite has a resolution of 10x10m.

National Targets/ Wetland condition Index

National targets for increasing wetland aerial extent were discussed.

- It was noted that this recommendation was based on the idea behind national targets for swimming.
- There was an acceptance from the group that increasing wetlands was a good idea but we need to think through the best way to achieve this.
- In the first instance the priority is to protect the wetlands we have got and then improve area.
- Discussion on aspirational goals, which could include a central government-led programme with multiple outcomes (i.e. climate change, flood mitigation, sediment). The Billion Trees programme is an example of such a programme.

The wetland condition index (WCI) was briefly discussed.

- Several components have recently been updated and the WCI is also currently under review at council level to achieve better scoring consistency
- It was noted that wetland extent has a strong correlation with condition and the observed over expected attribute for wetland area based on historic extent could be a good proxy.

- A strength of the wetland condition index is that it indicates where management and restoration are needed.

Action: Helli to look into wetland extent attribute.

Actions:	To be completed by:
Helli to supply Bev with word version of the process for comment, and continue to work together to refine it.	Helli
Helli to look into wetland extent attribute.	Helli

6. Updates/shorter sessions: indicators of health from a Māori perspective, nitrate, copper and zinc, dissolved oxygen

Note: flows and dissolved oxygen were scheduled but not discussed due to time constraints

Indicators of health from a Māori perspective

Jo outlined that work is under way on this topic and MfE will report back to the group when the work is progressed further.

Mahina-a-rangi outlined the common measures of health from Māori perspective. Those that typically overlap with Western science include:

- measures of habitat and fish life
- measures relating to ecotoxicology
- other measures such as *E. coli*, algae, temperature and sediment, viewed in terms of their effect on mahinga kai.

Other types of measures include:

- economies of food sovereignty, and considerations of how communities rely on water for food
- catchment decision making and who influences this
- emotional and social wellbeing of communities and connectivity (there is a lot of information in Pakeha science relating to connectivity in the recreational fishing literature).

Tanira spoke about factors that should be considered in relation to data collection, such as who does the data collection, and how does it connect to policy making? Mātauranga Māori is a source of information that is often held closely to communities and is not standardised across the country.

Health in its widest sense includes an examination of how decisions are influenced. If this was considered, it would lead to a broader set of objectives including social matters.

Incorporation of cultural and historical information can lead to a better outcome; resources are required to achieve this. Consideration is needed of the mechanisms to support true engagement and involvement, rather than “consultation”.

Discussion points:

- How does the Cultural Health Index fit in this discussion? This index can be adapted to different communities. Cultural health indices are currently used in an ad-hoc way, but need

to be embedded in policy to function like state of the environment monitoring. The policy would need to allow for local differences in who does the monitoring, and what is monitored.

- Ken noted that it was not the role of the group to consider the details around indicators of health from a Māori perspective as this would be done by Māori. But it is useful for scientists to signal willingness to work in an integrated way and to provide for Te Ao Māori in their thinking..
- It is key to provide the right frameworks to integrate a wider perspective of health while maintaining the integrity of the different systems.

3.09pm Tanira Kingi left.

Nitrate

Addendum to nitrogen paper provided by MfE: the 2014 publication “A guide to attributes in appendix 2 of the National Policy Statement for Freshwater Management 2014” also contains detail on the periphyton attribute for rivers, including how the attribute is defined, using the attribute to set freshwater objectives, defining management actions to achieve freshwater objectives, and sampling and statistical considerations.

Clive Howard-Williams outlined the processes set out in the 2018 MfE report “A draft technical guide to the Periphyton Attribute Note”. The approach takes into account that there are many influences on periphyton, not just dissolved inorganic nitrogen and dissolved reactive phosphorus. The current NPS-FM requires councils to take downstream receiving environments into account as well. The draft technical guide also has a process for converting loads to amounts of algae in lakes and periphyton in estuaries. Phosphorus can also influence periphyton growth and there is a need to deal with both nitrogen and phosphorus in our discussions.

Discussion points:

- Some members of the group would like to see attribute tables in the National Objectives Framework for the trophic state effects of nitrogen and phosphorus in rivers. Such tables have been put forward by Fish & Game in their amended NPS-FM. The numbers in the tables relate back to Russell Death’s work and Russell would be happy to present to the group on how these were derived.
- Adam has provided a commentary on “A draft technical guide to the Periphyton Attribute Note” for the members to consider for the next meeting.
- Nitrate can fluctuate diurnally, particularly where there is a lot of periphyton which presents a challenge for monitoring. Environment Southland is testing probes for measuring nitrate. Continuous data can be useful for determining how many spot measurements are needed.
- There is a need to give attention to nitrogen in groundwater as this influences concentration in groundwater-fed streams. Groundwater also requires ecosystem health attributes as there are none at the moment.
- There are two separate issues to discuss: 1) what is the relationship between nutrients and periphyton, and 2) how do we achieve nutrient objectives in catchments?
- The Attribute Tables in Appendix 2 of the NPS separate out those associated with Ecosystem health from Human Health. Then under Ecosystem Health attributes are separated by trophic state and toxicity, e.g. if you look at the attribute tables for (say) lake phytoplankton or periphyton you will see the attribute name includes the words ‘Trophic state’.

- Trophic state wasn't really an end point, it was recognition that this is one component of ecosystem health (as is the presence of toxic compounds). We now need to look more broadly than just trophic state and toxicity.

Actions:	To be completed by:
Circulate "A draft technical guide to the Periphyton Attribute Note" and Adam Canning's comments on it	Completed – on portal
Arrange half-day discussion on nutrients for next meeting	MfE

3.50pm Russell Death left.

Copper and zinc

Nik presented a paper with questions. Discussion points included:

- There are other contaminants of concern, e.g. aluminium, arsenic. We need to understand better the range of contaminants affecting urban and rural areas.
- Mahinga kai values may be affected by a range of contaminants.

4pm End of meeting

Released under the provisions of the OIA