

Science and Technical Advisory Group Meeting

Minutes

Dates and Location: Tuesday 16 April 2019 9.30am-4.00pm, Terrace Centre Centre, 114 The Terrace, Wellington

STAG Members present: Ian Hawes, Clive Howard-Williams, Jenny Webster-Brown, Ken Taylor, Bev Clarkson, Bryce Cooper, Jon Roygard, Russell Death (tentative), Adam Canning, Marc Schallenberg, Chris Daughney, Mike Joy, Ra Smith. **MfE staff:** Jen Price, Jo Burton, Claire Graeme (agriculture discussion), Irene Parminter (agriculture discussion), Stephen Fragaszy (agriculture and sediment discussions), Claire Conwell (agriculture and sediment discussions)

Apologies: Joanne Clapcott, Graham Sevicke-Jones

Items:

1. Previous meeting minutes and actions arising, apologies, feedback from other advisory groups

The chair noted the importance of members clearly stating their agreement or otherwise, and reasons for their position. He reiterated the STAG's role in providing science advice rather than designing policy.

Relating to the minutes of the previous meeting:

- Page 18 – One of the group asked for clarification on timeframes in relation to what is being included in this round of advice. The minutes mention a second tranche of work. MfE staff provided clarification that the NPSFM is always being updated and MfE's best guess is that the next update will happen in the next 18-24 months. Copper and zinc will be an example of attributes that will require further work and would fall into the next round of changes. The current round of changes will be in force in May next year.
- Copper and zinc – group members were surprised that work had been slowed down on this attribute and suggested that other attributes also had challenges with councils being able to control sources of diffuse contaminants. It might be possible to introduce copper and zinc measures as a compulsory measurement metric rather than an attribute. If councils monitored some of these emerging contaminants, it would improve our knowledge and enable management of these contaminants in the future. STAG recommends that more information is required on several contaminants.
- The chair suggested that time should be made to have a brainstorming session in the future to prioritise future work. Monitoring should be on the agenda.
- Page 9 – It was pointed out that there are questions around the sediment attribute and the STAG does not unanimously support sediment bottom lines, it was suggested that a statement mentioning STAG support should be modified to reflect this.
- In the ecosystem health metrics section there is a suggestion that attributes should match up/be harmonised. Clarification was sought on this point. It means there should be a common approach for developing attributes and ensuring that the narrative descriptions match up. The approach for defining bands should be consistent.

Action	For
Update minutes from previous meeting	MfE
In the agenda for the next meeting, include a brainstorming session to prioritise future work	MfE

2. Nitrogen leaching

MfE staff introduced the proposed nitrogen leaching cap approach, as outlined in the Ag Package briefing paper.

Discussion points included:

- STAG members asked what would be achieved by this approach, and what the implications would be for nitrogen loading to rivers. There is a risk that this policy will be seen as the only solution being progressed, and that the intent of the policy will not be understood.
- The proposed approach is to collect data on nitrogen leaching using Overseer and then specify a percentile of uses that need to be reduced.
- STAG members suggested that input controls would be more effective than output controls.
- A member asked which dataset would be used to set targets? Regional Councils would need to collect data from farmers and set targets based on data collected.
- It was recommended that when collecting data, the average loss rate per hectare per farm should be used, rather than average loss rate per farm.
- It was suggested that a different approach would be needed for horticulture – input controls would be needed. The initial cohort for the policy would be irrigated sheep and beef and dairy.
- One of the STAG members found it strange that neighbouring farms in different catchments might have very different rules to comply with.
- It was pointed out that there is existing analysis on identifying the high nitrogen impacted catchments.
- MfE staff outlined that other options would be to have a hybrid input/output approach, or an input approach. Feedback has been received that Overseer is widely used and the data can easily be incorporated. Just looking at inputs would not take into account on-farm mitigations that would reduce N outputs.
- One of the group members pointed out the intensification section of the briefing mentions regulation of specific activities and input controls – this is not consistent with the N cap approach. Manaaki Whenua Landcare Research has produced a N leaching map.
- MfE staff clarified that the Manaaki Whenua Landcare Research data is based on a theoretical understanding of farming practise, the current proposal is to collect actual data.
- STAG asked, what advice has been sought from agricultural or soil scientists? MfE staff responded that the current approach is being designed to meet tight time frames based on existing science.
- It was recommended that groundwater concentrations should also be considered in developing this policy. Is the percentile approach being applied on the leaching rate, or does it take into account the area over which the land use (i.e. the load)? Response: Yes this is why the policy is being targeted towards dairy and sheep and beef. There is a debate whether vegetable growing should be included.
- Another STAG member pointed out that groundwater also has relevance for drinking water supply. They supported the consideration of groundwater as an at risk water body.
- One member asked, how will the enforcement capability and will of councils be measured? Response: the action required is tied to farm environment plans and related consents. This gives the councils the ability to take enforcement actions. The additional resourcing required by councils has been noted.

- It was noted that a positive effect of this policy would be to give councils the push to collect data on land use.
- This is a stop gap measure for catchments without rules. How do we incentivise catchments to manage N? This policy would give councils incentive to collect the information that they need.
- MfE staff asked the group if they had any thoughts on identifying highly impacted catchments? STAG members recommended using the NIWA nitrogen model and considering whether this process overlaps with the At-Risk Catchments project.

3. Rural package

MfE staff outlined the proposed package, which is targeted at holding the line. Longer term change will be addressed through the allocation workstream.

Discussion points included:

- It was asked what has been the science input into these policies. Response: Risky activities were identified based on existing science showing impacts.
- It was asked what the justification was for recommending a five metre setback. Response: there are many publications giving approaches for calculating setbacks. For national policy, a simplified approach is needed. Farmers could apply for a consent during the farm environment plan process if they wanted to use a different setback to the one specified.
- The current proposal is that everyone must exclude stock. The time frames are different for different land slopes.
- One of the STAG members mentioned that critical source areas are important to identify and exclude stock from. The package represents a massive step forward.
- One of the group had feedback on wetland policies. Most wetlands have a drain around their border – how should setbacks be calculated? Wetlands should have a staged approach where larger wetlands should be fenced sooner than the blanket policy of fencing in 3 years.
- How will inanga spawning habitat be provided for? Response: Regional plans will need to be more stringent than the agricultural package and will identify these areas.
- One of the group members suggested that viewing resources in terms of scarcity can be a helpful way of framing things.
- Another group member pointed out that it is necessary to be realistic about the likely outcomes of this package. It won't make rivers swimmable because you're not dealing with the inputs from smaller and ephemeral streams which may not be fenced.

4. Sediment

MfE summarised the questions put to STAG.

The following discussion points related to the suggestion to include deposited sediment in the NPSFM as a monitoring requirement, similar to MCI, with a threshold that would trigger the requirement for a management plan.

- One member pointed out that in the NPS process, there is often the case where you can't link a particular metric with a specific management action. Periphyton is an example. How is deposited sediment any different?
- It was noted that regional councils have models linking land use to suspended sediment concentration.
- MfE staff noted that for deposited sediment, research has shown that in many cases it's not possible to link the suspended sediment load to deposited fine sediment. There is a stronger

relationship between the hydrograph and deposited sediment so there are different management actions. For deposited sediment, you can't prove that a particular management action will lead to a particular deposited sediment level.

- A group member expressed concern about whether there is enough of a requirement for councils to make a plan to address high sediment levels.
- Another group member noted that we know that deposited sediment is crucial for ecosystem health and that it is related to suspended sediment.
- MfE staff outlined to the group that it would be possible to present two options for deposited sediment (an attribute and monitoring requirement), but MfE has received advice from scientists that it is not possible to conduct impact testing for deposited sediment. Ability to impact test something is one of the key requirements of the policy process. We also need to consider the capacity of councils to set limits, and how much of their resources will need to be devoted to this task. These are the reasons why the current suggestion is to have a monitoring requirement for deposited sediment rather than an attribute.
- One of the members asked to clarify the map in the notes. The map shows catchment boundaries. Across the whole catchment, you will need up to 20% (or whatever percentage) suspended sediment load reductions, in order to meet the annual median turbidity bottom line. There is science available to impact test this work.
- One member suggested that we know that suspended sediment is linked to deposited sediment, and that this should be sufficient information to make deposited sediment an attribute.
- It was noted that instances of high suspended and deposited sediment do not coincide as much as you might expect. But one of the issues is that deposited fine sediment hasn't been monitored as well.
- MfE staff clarified that the monitoring requirement would contain a threshold, similar to the way MCI is currently included in the NPSFM.

Differences between attributes and monitoring requirements:

- The differences between monitoring requirements and attributes were discussed. The policy requirements are not vastly different, but there may be a difference in public perception. Both options need to have plans in place by 2025.
- The management levers would be very similar for a monitoring plan, but you might be able to fine tune the responses to a particular catchment. If it's an attribute and you can't achieve it, there is a requirement to formally register it as an exception. If it was a monitoring plan, there wouldn't be a requirement to formally register the exception.
- It was noted that there would be the same monitoring requirements for a monitoring regime, compared to an attribute.
- The length of time you take to achieve the necessary improvements is flexible for both approaches. An attribute table has bands and the community sets objectives, a monitoring requirement does not have these things.
- One member noted that it's important to distinguish attributes that have clear links to management actions, and metrics that are useful to measure but where the management actions may not be as well defined.

General discussion:

- One member noted that it's not this group's job to consider economic implications, and supported wider ranging policies to create a step change. Council funding might need to change to support such changes.
- MfE staff outlined the impact testing process which will test whether the proposed bottom lines can be feasibly reached using land use change. The derivation methods of the attribute, or the monitoring measures, may change in response to the analysis.

- There was a discussion on the relative merits of using suspended sediment and turbidity as a metric. It was noted that suspended sediment concentrations are easier to relate to land use, however there is not sufficient information on suspended sediment concentrations to be able to assess the ecological impact. Turbidity is easier to measure and this is calculated back to suspended sediment concentrations to determine management actions. STAG members were keen to see research continuing on suspended sediment as a measure.
- We need to monitor what is happening on land so that we can understand the linkages between land use and water quality. This was discussed in the “maintain or improve” sub-group and Nik has asked for feedback on what land use activities might be monitored.

Outcomes

The chair gave a summary: The science connecting land use and river water quality is strong. The view around the table is that somewhere in the regulatory structure, there needs to be bottom lines for both suspended sediment and deposited sediment. Our thinking will develop over time and we may need to revisit the measure we are using for sediment. There is a high degree of consensus about having numbers in place for deposited and suspended sediment. There is a gap in our knowledge about ecological thresholds for sediment- but in the previous meeting there was support for the approach presented.

Some members of the STAG (4 or so) felt strongly that both suspended and deposited sediment should be attributes because our experience tells us that attributes are more effective.

The group is comfortable with continuing with the turbidity thresholds that were agreed to last month. Eleven members agreed with this proposal, and none were against it. One member agreed based on councils testing the thresholds.

For deposited fine sediment, six members were comfortable with deposited sediment continuing as a monitoring requirement with a bottom line. Reasons for this were deposited sediment is clearly of concern but doesn't meet the requirements of evidence for an attribute. STAG supports having the same bottom lines as would be required for an attribute.

Six members supported having an attribute table for deposited sediment with bands and a bottom line. The reasons for this were that we have enough science evidence. An attribute is a more proactive approach and this is the reason why an attribute is more suitable.

The group members all agreed on the need for a threshold value for deposited sediment, whether in an attribute table or monitoring requirement.

5. Wetlands

MfE staff gave an update of the proposed policies for wetlands.

Discussion points included:

- Stock access to wetlands is still an issue. It will be important to define wetlands properly. Fencing of wetlands will be in the agriculture policy package, the definition needs to be applied to those policies and rules too.
- One of the members mentioned an example where a habitat didn't look like a wetland but had several hundred black mudfish – investigated as part of the Carterton wastewater treatment plant. This suggests that a wider definition of wetlands is needed.

- There are wetland delineation tools based on soils, hydrology and plants, these will be incorporated in the policy.
- There are wetlands associated with existing hydropower stations – e.g. wetland at Lake Arapuni provides important habitat for birds. There are quite large variations in water level. These wetlands will be exempt from the water level regulations.

MfE staff gave an update of the proposed research on wetland water levels.

Discussion points included:

- It's important to have a range of wetland types in the reference and impact sites. HBRC has 10 transducers in Tukituki catchment, WRC has also installed some.
- It's important to include wetlands that dry out, some animals such as tadpole shrimps and mudfish rely on seasonal drying to exclude predators.
- What about discharge of stormwater into wetlands, and using for flood control? This is an area for future discussion.
- Wetlands provide an opportunity to mitigate impacts on lakes or rivers and can be a more appropriate tool than hard engineering structures. We should be encouraging the use of wetlands as infrastructure.
- Would stopping drainage of wetlands include groundwater extraction, would there be direction in this policy to regulate this? Yes, this is in the water level regulations.

MfE staff gave an update of the proposed research on wetland drainage setbacks.

Discussion points included:

- It would be important to take into account the four wetland types and have about five examples of each (recommended the 'medium' approach).
- There would be opportunities to build on the water level work.
- It was pointed out that in some areas the drains have been in place for over 100 years, these are highly modified systems, how would the research account for this?
- You need to take into account the full range of human impact, from reference to completely modified.
- Tile drains can shift the point at which water accumulates and can deliver nutrients.
- Looking at the vegetation levels would be important, this is only in the 'high' scenario at present.

MfE will also be progressing a wetland mapping project to assist with high resolution, repeatable mapping. In Northland there is a radiometric survey being done at the moment. LiDAR is being rolled out throughout the country, there is another project under way looking at using this data for wetland identification.

How to restore and reconstruct wetlands is another area where more advice is needed.

6. Nutrients

The group considered the MfE analysis of relationships between macroinvertebrate data and water quality.

Discussion points included:

- Issues brought up by STAG members include lack of consistency in council monitoring, and assumptions of linear modelling not being met in analyses of macroinvertebrate relationships with water quality.

- It was noted that there is a need to keep the existing periphyton attribute, this was made clear by the analysis. What is the temptation for planners to take the easiest option when setting nutrient limits (i.e. not do periphyton process). It's important that the most stringent would apply.
- In cases where modelling was difficult, councils might default to Russell's numbers – this is a risk
- There was discussion about the need for MfE to ensure that objectives and limits are set properly.
- There was discussion about the possibility to use a median and 95th percentile. The challenge with the percentile approach is that it's difficult to determine the 95th percentile.
- Derivation methods were discussed; why go for a trend line rather than 80% prediction interval? Using a trend line has a degree of uncertainty associated with it and may draw criticism. The response was that a percentile approach has been used along with quantile regression.
- It would be informative to see how the proposed attributes line up with the updated Australia and New Zealand Guidelines for Fresh and Marine Water Quality (formerly ANZECC).
- It was pointed out that the A/B band boundary for nitrate toxicity is similar to the proposed bottom line for nitrogen for ecosystem health. It was proposed that the proposed N attribute for ecosystem health should be presented as a change to the nitrate toxicity attribute, and that the mechanism for protecting ecosystem health is via avoidance of toxicity. There was much discussion on this topic. At least one STAG member was strongly not in favour of this proposal. Others pointed out that toxicity attributes are based on lab studies and may not reflect real world conditions. The conclusion reached by the group was that it was useful to point out that the proposed N bottom line relates to the bottom of the nitrate toxicity A band (and therefore avoids toxicity effects), but that it was important to introduce the proposed attributes in terms of multiple lines of evidence, not just the avoidance of toxicity.

Adam Canning presented three options for deriving bands and bottom lines for N and P to provide for ecosystem health. The tables presented are for TN and TP. Option 1 is closest to the original numbers that were presented by Russell Death. Option 3 uses the most sensitive ecosystem health component to derive each band.

There was discussion about which metrics to use:

- There was a discussion about whether the attributes should be expressed as nitrate, dissolved inorganic nitrogen or total nitrogen.
- If the table is expressed as nitrate, the existing nitrate toxicity attribute would not be needed. If the table is expressed as dissolved inorganic nitrogen, this measure also includes ammonia and therefore the ammonia toxicity attribute would not be needed.

The following framework was developed to assist our thinking and help present the proposed attribute tables to others:

Ammonia toxicity	Periphyton	Nitrate toxicity	Russell Death's numbers
Applies everywhere Mostly useful for determining effects of point sources	-Councils set objectives for DIN and DRP -Keep the same approach and consider Adam's comments to Draft Guide to Periphyton Note -Ton's table as guidance	-Has the most effect in soft-bottomed waterways not captured by periphyton attribute	-Will have the most effect in soft-bottomed waterways not captured by periphyton attribute

General discussion points:

- The most stringent metric should apply.
- The nitrate toxicity attribute should be replaced with a nitrogen attribute for ecosystem health. An option would be to keep the ammonia toxicity attribute and to develop the copper and zinc attributes in the future.
- One of the group members expressed reservations about applying the proposed attributes to all groundwaters and recommended that more thought and discussion was needed on whether these numbers are appropriate for groundwater. It may be possible to limit the numbers to apply to oxic groundwaters, or groundwaters connected to rivers.
- There was discussion about whether it would be appropriate to add a value for 95th percentile, this will be presented to the group for consideration.
- Further discussion is required on the possibility that: if the ammonia toxicity attribute is retained, ammonia may be high due to a point source discharge and this may be acceptable based on comparison with the ammonia toxicity attribute. This would be inconsistent with the suggested N table for ecosystem health.

Agreed statements

- The group supports nutrient tables to provide for ecosystem health.
- The group supports a single set of tables to be applied nationally.
- DRP and either DIN or nitrate will be progressed; further consideration required
- If the table is expressed as nitrate, the existing nitrate toxicity attribute would not be needed. If the table is expressed as dissolved inorganic nitrogen, this measure also includes ammonia and therefore the ammonia toxicity attribute would not be needed.
- There was support for pointing out that the A/B band for nitrogen toxicity is similar to the proposed N bottom line for ecosystem health. It was agreed that toxicity is a part of ecosystem health.
- These tables will apply to rivers only.

One of the members wished to record that they did not agree with Russell's numbers and recommended that the nitrate toxicity table should be modified so that the bottom of the A band is now the C/D band.

Action	For
Develop tables based on DRP, DIN and nitrate, median and 95th percentile, recirculate to group	Adam
Circulate ANZ guidelines for comparison	MfE

7. Ecosystem health metrics

MfE staff outlined that advice going to Ministers this week will include a general description of new metrics for ecosystem health. These can be finalised by STAG on 1 May.

Macroinvertebrates

The Average Score per Metric was introduced. A score of 0.3 is equivalent to an MCI of 90. Joanne Clapcott has recommended adopting Average Score per Metric (b) (see comments in Appendix)

Discussion points included:

- One of the group members was in favour of using QMCI, and suggested that by averaging scores (in the Average Score per Metric) you might lose some detail. This metric has been developed and used in the Waikato and might need further testing. Percent EPT abundance is useful, particularly for showing effects of sediment. Percent EPT taxa is less useful.
- The importance of standardising sampling was pointed out.
- It was clarified that these metrics can be calculated using standard macroinvertebrate 200-count data.
- There have also been discussions between MfE and researchers about doing more work on the O/E approach.
- It's agreed that we definitely need macroinvertebrates in the NPSFM, the discussion is just talking about different metrics. This will not change the sample processing for most samples, but some councils are using the SQMCI and so would need to change to 200- or full counts.
- One of the members suggested that the narrative in the ASPM was more suitable, and that the wording for MCI needs to be revised.
- One of the members asked whether the group is committing to an attribute? The chair summarised that we want a decent indicator of macroinvertebrates with numbers we can back. For an attribute, we need to specify what cause-effect relationships and indicate level of confidence. We need to make sure we communicate the level of uncertainty.
- One of the members supported introducing an attribute table for macroinvertebrates, and noted that we are confident in the MCI, it's been around since the 1980s. It probably has the most support and confidence around the numbers.

Outcome: The Chair summarised that we are committed to a recommendation on macroinvertebrates, there is further discussion needed. STAG is keen to develop attribute tables and maps of distribution of scores.

Action	For
Produce maps showing distribution of scores of different metrics	
Address wording of narratives	STAG

Periphyton

Adam has amended the table from the NPSFM to remove the productive river class. The onus would be on councils to show that the exceedance would have occurred based on natural conditions at that site.

Discussion points included:

- Often there are blooms only a couple of times a year so it doesn't make sense to exclude 17% of samples.

- Often, sites will exceed the criteria once every 5 years or so. There was discussion about whether lack of oxygen for a short time was acceptable.
- One of the members noted that there is potential for councils to game the system. There is a problem with allowing exceedances that could cause lethal effects.
- It was suggested that the allowance for any exceedances could be removed.
- One of the members pointed out that the table wording seems wrong because the numbers are concentrations and the narrative describes exceedances.

Summary: The chair summarised that this table allows for periodic exceedances, and there are vulnerabilities with the table as it is at the moment. The note and sampling considerations should remain.

Lake dissolved oxygen

This will be discussed on 1 May.

8. Flows

MfE staff outlined that the problem with the status quo is that the councils are not articulating what they are trying to achieve. Technical guidance is needed to help councils to set objectives that will be protective for different ecosystem types.

Adam Canning provided STAG with a proposed attribute tables for flows, by email. This is based on a deviation from natural flows.

MfE staff have received advice that it was not feasible to set a nationally applicable flows attribute based on a rule-of-thumb approach. Such an approach would be protective in some rivers by not others. MfE is proposing to develop full technical guidance to assist with flow allocation.

Comments from STAG members included that there was a need to set ecological bookends in the form of numerical thresholds, and that strict requirements were required to make sure the process is protective enough. Minimum standards are needed to protect habitat. It would be helpful to bring in a flow expert to discuss the matter further with STAG.

It was agreed that the current proposal from MfE doesn't adequately protect ecosystem health, even when considered together with other ecosystem health metrics being proposed.

It was noted that flows are a fundamental issue and we need to ensure advice from the group is robust. There is an issue here about the amount of resource being allocated to this topic.

MfE staff noted that the proposed changes are not an end in themselves and will add additional pressure to make further improvements to the way flows are managed.

Outcome: There was a desire from STAG to discuss this matter further and to receive more technical advice and information to inform the discussion.

Appendix 1: comments from Joanne Clapcott

Kia ora koutou

I am not able to join the next meeting so wanted to share my thoughts before going on annual leave.

Suspended sediment. Wow this is another layer of testing I wasn't aware of... if we can't meet the bottomlines then they are too stringent?!

Deposited sediment. Should a sentence read "Our research on deposited sediment management shows that suspended sediment is *an important but not statistically significant predictor* of deposited sediment". The fact that we are currently unable to quantify the relationship between deposited sediment and land use (via suspended sediment) does not negate the fact that the primary management intervention is to limit the amount of sediment entering waterways. I am disappointed that this is not progressing as an attribute given that deposited sediment is a major stressor in freshwater systems (probably more important than nutrients in many rivers) and increased deposited sediment beyond natural levels is a direct result of land use change. However, I would support including it as a monitoring tool if that means we get councils collecting the robust data we need to one day quantify the relative effect of management interventions.

Impact testing. Why does the map on suspended sediment have a required load reduction of 0 for the Waipatu River, which has the largest sediment load as a direct result of land clearance? Or is a small part of the headwaters classified as 0.8?

Sediment attribute implementation. Without seeing the maps, I think a blanket grading (option 1) is most transparent. I see no reason why different classes should be afforded different grades (option 2) and the percentage allocation (option 3) is just confusing, in my opinion.

Wetlands. Agree with general approach and no further comment.

Nutrients. A good analysis by Adam demonstrates the benefit of introducing NO₃N and DRP attributes for ecosystem health to protect soft-bottom streams in particular from enrichment. I think this has addressed most of our questions and I support the recommendation of the proposed attribute states (his Table 1) and agree the most stringent (current NOF vs proposed EH) should apply. Did I miss the analysis/discussion around whether TN and TP are more appropriate than NO₃N and DRP?

EH attributes. Periphyton – no comment. Macroinvertebrates – ASPM(b). I prefer the normalised nature of these metrics which helps correct for spatial variation in reference state, compared to fixed MCI bands. Previous analysis (e.g. Collier et al 2014 for MfE) suggests 3-yr rolling mean would be sufficient. Fish – I'm not sure. Ecosystem metabolism – looks good in a table!, but probably needs more testing before application.

I hope you have a productive meeting.

Kind regards | Ngā mihi

Joanne