

28 April 2017

**To:**

Clean Water Consultation 2017  
Water Reform Directorate  
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Ministry for the Environment

**From:**

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**NIWA Submission on New Zealand Government's 'Clean Water' consultation (February 2017)**

(As per the notice from the Ministry for the Environment on 27<sup>th</sup> April, this submission excludes comments on the swimmable proposals which we will provide within the extended timeframe).

**NIWA's Credentials**

1. NIWA's Statement of Core Purpose defines us as the lead CRI for research and knowledge on aquatic resources and environments with an expectation that our expertise contribute to the Government outcomes of increased economic growth through the sustainable management of aquatic resources and enhanced stewardship of New Zealand's freshwater ecosystems and biodiversity. NIWA has approximately 200 staff with expertise in freshwater, conducting research and providing science advice to end-users of that research.
2. The Operating Principles in our Statement of Core Purpose require us to 'provide advice on matters of its expertise to the Crown'.
3. This NIWA submission has drawn upon the freshwater research and associated expertise within NIWA, in particular Clive Howard-Williams, John Quinn, Scott Larned, Graham McBride, Juliet Milne and myself.
4. NIWA staff have been actively involved in providing technical input into the Land and Water Forum and the National Objectives Framework since their inceptions and in working with Regional Councils on their implementation. NIWA staff are amongst the Theme and Programme Leaders in the Our Land and Water National Science Challenge and have been involved in the freshwater domain reporting under the Environmental Reporting Act and in the recent paper from the Prime Minister's Chief Science Advisor Sir Peter Gluckman "New Zealand Freshwaters: Values, state trends and human impacts"
5. NIWA has made previous submissions on the development of the National Policy Statement on Freshwater Management, the development of the National Objectives Framework and in 2016 we provided comment on the *Next Steps* consultation process. NIWA is supportive of the freshwater reforms that are on-going and welcome this opportunity to provide further input to the reforms.

**Comments on overall approach**

Our comments on the overall approach (excluding the swimmability component) are:

- The addition of MCI as a monitoring measure is welcomed as an **interim measure** of ecosystem health, but we note it lacks a bottom line and/or a measure of trend to trigger action. We note that current MFE-funded work on the use of macroinvertebrate information to assess ecosystem health may lead to advances and this should be allowed for.
- The additional note relating to setting nutrient concentrations in objectives to manage periphyton which appropriately recognises the current difficulty of doing this at national or regional scales.
- The explanation of ‘maintain or improve’ which we contend has the potential to lead to unintended consequences (e.g., significant and noticeable declines in water quality) and lacks guidance on how to assess. We comment further on this in our submission, and propose that the current draft guidance be updated with statistical protocols for determining both current state (and its variability) and change. Indeed, there are a number of matters that we raise that we consider will be best addressed through a significant updating of the draft attribute guidance so as to avoid multiple interpretations and statistical approaches being taken.
- We note the stock exclusion proposals, which are generally in line with NIWA’s research findings, lack a specific mention of management of the effects of the country’s 30 million sheep (c.f. cattle, dairy cows, deer and pigs) in the regulations proposed in the document. Based on prior science, we contend that sheep will need to be included in order to meet the swimmability objectives of the *Clean Water* proposals. We expand on this point in our submission

In general, NIWA considers that the *Clean Water* consultation process will further advance science-informed freshwater management in New Zealand and look forward to the changes to the NPS following consideration of the submissions.

#### **Specific comments on the numbered sections in the document:**

Note that some of our comments relating to Sections 1 and 2 below also apply to later sections of the *Clean Water* document, including Annex 1.

#### **Section 1. 90% of rivers and lakes swimmable by 2040**

(Excluded from this submission – will be submitted on within the extended timeframe offered by MfE).

#### **Section 2. Better information on water quality for swimming**

(Excluded from this submission – will be submitted on within the extended timeframe offered by MfE).

#### **Section 3. Amending the Policy Statement for Freshwater Management 2014**

##### **3.1 Swimming and recreational values**

(Excluded from this submission – will be submitted on within the extended timeframe offered by MfE).

### 3.2 Monitoring macroinvertebrates

In our previous submission on the 2016 *Next Steps* consultation document, NIWA supported the proposal to use the MCI as a 'performance measure', but only as an interim approach until a science-based consensus was reached on an appropriate macroinvertebrate attribute for Ecosystem Health. We are aware that current MFE-funded work on macroinvertebrate metrics of ecosystem health may lead to improved metrics beyond MCI and incorporating such advances into future amendments of the NPS should be expected and allowed for. We also recommended that the Government work with the Land and Water Forum to further evaluate whether river invertebrate monitoring should be mandatory (but not as a NOF attribute). We understand the Forum has recommended separately to the Government on this matter and that they supported the use of MCI as a mandatory monitoring measure.

We are, therefore, supportive in principle of the use of MCI as an interim monitoring measure as stated in the *Clean Water* document. However we do not believe this goes far enough because there is no trigger value below which Regional Councils will be required to take action. We agree with the Land and Water Forum's recommendation for a mandatory "*trigger for action if there was a downward trend in MCI, or if it was below 80*". The key points in the monitoring process, as recommended by the forum, are:

- i. *If the natural state is below 80, then the requirement is to maintain MCI at that level.*
- ii. *If the MCI score in a waterbody is below 80 for human-induced reasons, then the requirement is to develop an action plan to improve the MCI score.*
- iii. *If there is a downward trend in MCI in a waterbody, then the requirement is to develop an action plan to reverse the trend.*

### 3.3 Maintain or improve overall water quality

NIWA supports the proposal to limit the concept of 'maintain or improve' to within a freshwater management unit. However, we note that the proposal that 'water quality is at least maintained if: freshwater objectives are set within the same attribute band as current water quality' would allow for significant declines in water quality to occur in some waters, which is contrary to the overall intent of the policy as described in the *Clean Water* document 'Preamble to Annex 1' that requires that freshwater quality within a freshwater management unit "be maintained at its current level"

In our submission to the *Next Steps* consultation in 2016, NIWA pointed out our concerns over the potential for water quality to decline significantly to the bottom of a band if current state is well above the bottom of a band. For example, a lake with a chlorophyll median of 5.1 mg/m<sup>3</sup> (top of the C band) could more than double its chlorophyll to a median of 12 mg/m<sup>3</sup> (bottom of the C band) and yet still be regarded as being 'maintained' when the colour, clarity and amenity value of that lake would be noticeably changed. Other attributes show the same issues.

Therefore, NIWA recommends that there be a clearer definition of the current state of a water body (and the variability of the current state) to assist communities in placing a water body in a band and enabling future determinations as to whether it has changed (improved or declined within a band or shifted band). This definition and determination of change needs to include the statistical protocols to apply and should be included in an update to the MfE *Draft Guide to Attributes* (<http://www.mfe.govt.nz/publications/fresh-water/draft-guide-attributes-appendix-2-national-policy-statement-freshwater>). Without clarity in the definition of 'current state', there could be significant differences between Councils as to how current state is defined and changes from current state are assessed.

### 3.4 Managing nitrogen and phosphorus

NIWA agrees in principle with the addition of the footnote regarding nitrogen and phosphorus at the bottom of the Attribute table for “Periphyton (Trophic State)” (Appendix 2, page 34). However, we recommend some changes to this footnote:

- The first sentence of the footnote does not make sense as written. It should be changed to:  
“The attribute for nitrate toxicity is not applicable for controlling periphyton in rivers”.
- In the next sentence we note that the use of the term ‘maximum’ is incorrect and the wording should be changed to:  
“Before using this attribute to set an objective for periphyton, annual medians or other appropriate statistics for dissolved inorganic nitrogen and dissolved reactive phosphorus will need to be set. It may be necessary to set these values for individual Freshwater Management Units and consideration will need to be given to the sensitivity of downstream ecosystems”.

NIWA is currently carrying out research needed to define cause and effect relationships between nutrients and periphyton, while accounting for the effects of climate, geology, flow and shade. It is currently not possible to derive nationally (or even regionally) applicable relationships and we recognize that nutrient-periphyton relationships will need to be derived at spatial scales of FMUs or smaller.

To assist councils in the development of appropriate concentration and load limits for dissolved inorganic nitrogen and dissolved reactive phosphorus to control periphyton, we suggest that, as a start the following NIWA documents be consulted:

- Biggs, B.J.R.; Kilroy, C. (2000). *Stream Periphyton Monitoring Manual*. Prepared for New Zealand Ministry for the Environment. 226 p.
- Biggs, B.J.F. (2000). Eutrophication of streams and rivers: dissolved nutrient chlorophyll relationships for benthic algae. *Journal of the North American Benthological Society* 19: 17–31.
- Matheson, F. et al. (2012) *Review of the New Zealand instream plant and nutrient guidelines and development of an extended decision making framework: Phases 1 and 2 final report*. Prepared for MBIE Envirolink Fund. August 2012, 127p.
- Matheson, F. et al. (2016) *Instream Plant and Nutrient Guidelines: Review and development of an extended decision-making framework, Phase 3*. Prepared for MBIE Envirolink Fund. January 2016. 117p.

Furthermore, in order to assist Councils in establishing in-stream objectives for concentrations of DIN and DRP when managing for periphyton, NIWA recommends the continuation of work by science providers in collaboration with Regional Councils to further refine the existing information and to assist in updating the *Draft Guide to Attributes* (<http://www.mfe.govt.nz/publications/freshwater/draft-guide-attributes-appendix-2-national-policy-statement-freshwater>)

### 3.5 Coastal lakes and lagoons

- In NIWA’s submission on the 2016 *Next Steps* consultation we recommended using the same trophic state bands for ICOLLS as for lakes. NIWA therefore supports the footnotes in the proposed NOF Attribute Tables (pages 31 to 33) for lakes in the *Clean Water* document (Phytoplankton, Total Nitrogen and Total Phosphorus) that specify the inclusion of ICOLLS. However, we are unsure if the monitoring guidance in the footnote to the attribute tables is

helpful given that some ICOLLS remain open or closed for extended periods of time. We suggest monitoring guidance is needed but would be better provided in an updated *Draft Guide to Attributes*.

- We note that the proposed changes to the narrative wording (i.e., insertion of “or additional phytoplankton and macroalgae”) in the C bands for the lake attributes are redundant and do not make sense. The wording needs to be: “Lake ecological communities are moderately impacted by additional algal and/or plant growth”.

## Section 5. Keeping stock out of our waterways

NIWA supports the introduction of regulations on livestock exclusion from lakes, wetlands, rivers and streams and practical methods for enforcing these, due to the proven effectiveness of such an approach to help achieve the water quality benefits that the *NPSFM 2014* intends. We note the targeting of dairy and beef cattle, deer and pigs for controlling stream bank damage and associated sediment and faecal input to streams, on the basis that these heavier livestock classes are known to have strong affinities for streams, particularly during summer.

However, we also note that sheep are not mentioned and by their omission we infer they are not included in the regulations. Sheep are by far the most abundant livestock on New Zealand farms (30 M, c.f. 10.4 M cattle, 1 M deer and 0.3 M pigs in 2014) and have been associated with significant levels of pathogen contamination and recent public health events (e.g., in Darfield and Havelock North). The national microbiological study (Till et al. 2008) found that sheep-dominated sites had the highest percentage of samples containing more than 100 *Campylobacter* per 100 ml (13.6 %) and similar levels of *E. coli* to dairy dominated sites. Furthermore, the *E. coli* threshold for >1% *Campylobacter* infection risk was lower in sheep-dominated catchments (175 /100mL) than in dairy-dominated catchments (371/100mL) (McBride et al. 2002). Further evidence that sheep exclusion from streams is needed comes from stream *E. coli* levels in a treatment in the Whatawhata study (rolling to steep hill country in the Waikato) involving exclusion of cattle but not sheep from riparian areas and streams. This treatment did not meet the primary contact (*NPSFM 2014*) current recreation minimum acceptable state and was nominally red grade by all the criteria proposed in the *Clean Water* document (NIWA/AgResearch unpublished data from a year of monthly sampling). We therefore contend that the intended outcomes of these proposed regulations will be unlikely to be achieved in those catchments across the country where sheep farming is a significant land use.

Till D., McBride G., Ball A., Taylor K., Pyle E. 2008. Large-scale freshwater microbiological study: Rationale, results and risks. *Journal of Water Health* 6: 443-460.

McBride G.B., Till D., Ryan T., Ball A., Lewis G., Palmer S., Weinstein P. 2002. Freshwater Microbiology Research Programme. Pathogen occurrence and human health risk assessment analysis. Ministry for the Environment 93 p.

## Annex 1: Proposed amendments to the National Policy Statement for Freshwater Management 2014

**Preamble:** Should NIWA’s comments above on managing nutrients to meet the periphyton attribute be taken up then there may need to be changes to this preamble (Note: our supplementary submission on swimmability will likely suggest changes to this preamble as well).

**Policy C1a:** NIWA supports the changed wording and the need for councils to ‘recognise’ the interactions between freshwater, land and the coastal environment. We have long advocated for limit setting to include consideration of coastal water bodies as receiving waters and the need to

manage contaminant inputs to achieve the environmental objectives set for the most sensitive water body in a catchment.

#### **APPENDIX 1: National values and uses of freshwater**

NIWA supports the clearer and more comprehensive description of the value 'Te Hauora o te Taiao' (Natural form and character). The seven points that make up this Value are all relevant and the value is strengthened by this new description.

#### **APPENDIX 2: Attribute Tables**

- NIWA supports the footnote in the Lakes Attributes that relates to lakes and lagoons that are intermittently open to the sea (ICOLLS) but suggests the monitoring guidance is better provided in a revised Draft Guide to Attributes.
- NIWA supports the footnote on the periphyton attribute. However there needs to be changes to this footnote as it is not correct as written. We have suggested appropriate wording under Section 3.4 above.
- NIWA suggests an additional footnote under the Nitrate (Toxicity) Attribute. The wording should state :

“This attribute applies to rivers only. The A-Band toxicity concentrations for nitrate-N is higher than the TN bottom line for lakes. Hence nitrate toxicity will not arise in lakes if they are correctly managed for TN”.

Alternatively, this note could be inserted into the *Draft Guide to Attributes in Appendix 2 of the National Policy Statement for Freshwater Management 2014*

- Dissolved oxygen. Dissolved oxygen is a fundamental requirement for ecosystem health in rivers. Consequently, we recommend that the DO classes apply in all rivers, not just below point source discharges.

#### **Final statement**

In general, NIWA supports the science-informed reforms outlined in the *Clean Water* document. We have noted above several areas where the reforms could be strengthened to better align with the science or better guidance given to those implementing them. We will make further comment on the swimmability measures in our supplementary submission.

NIWA has a national freshwater research leadership obligation, through its Statement of Core Purpose, to provide the underpinning science needed for the reforms and their implementation and we look forward to continuing to make that contribution.

Yours sincerely



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NIWA