Submission to National Water Reform 2026 Interim Update 1

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This submission contends that the safety of drinking water in Australia needs to be clearly defined, from which the requirements for its monitoring and measurement clearly follow for any jurisdiction. Suitable ways to report on drinking water safety for different purposes are also proposed. The (safety) benefit to cost ratio is suggested as a criterion for prioritizing improvements to drinking water safety.

What is meant by "safe" drinking water?

It has become common globally to aspire to provide access to "safe" drinking water without adequately defining what is meant by that term. Interim Update 1 of the National Water Reform 2026 Inquiry ("the Update") is a case in point. On p17, it states:

"Participants in this inquiry have noted ongoing concerns around the quality-of-service outcomes in regional and remote communities.[1] The high priority of addressing these concerns aligns with Outcome 1A of Objective 1 of the draft NWA:

Water services provide Australians, including regional and remote communities, with reliable access to clean, safe, accessible and affordable water for drinking and sanitation (DCCEEW 2024, p. 3)."

Again, on p22, the Update states:

"At a minimum, the PC has previously indicated that a BLOS [Basic Level of Service] should include measures for safe and reliable drinking water (PC 2021b, p. 24)."

However, it goes no further in specifying criteria by which drinking water can be judged safe to consume. It can perhaps be inferred from the Update's excellent overview of reporting on water quality (Section 4 p27ff) that compliance with the Australian Drinking Water Guidelines – ADWG (NHMRC 2011) should be used as such criteria. Many water providers claim such compliance (or report their exceedance) in their annual reports.

The problem with this definition of safety is that the ADWG includes guidelines that should not be exceeded for over two hundred individual microbiological, chemical and radiological substances. However, the advice within NHMRC (2011) clearly distinguishes between health-based and aesthetic Guidelines. This submission contends that only health-based Guidelines should initially be used as criteria for judging safety of drinking water. The unpalatability due to exceedances of aesthetic

[1] ATSE, sub. 3, p. 2; CEG, sub. 17, pp. 8–9; CLC, sub. 54, p. 17; DEG, sub. 21, p. 1; NFF, sub. 31, p. 5; WSAA, sub. 53, p. 22.

guidelines may be of concern but should be regarded as of lower priority for improvement.

This definition of safety would establish consistency of objectives between health and drinking water, as in the Update's Information Request 5: Basic level of services (BLOS):

"governments should address key barriers to establishing a BLOS, including coordination or consistency of objectives between health, water, infrastructure, housing, energy and/or central agencies"

How should safety of drinking water be reported?

The same Request was also interested in barriers to collection, collation and transparent reporting of accurate data on service outcomes. It further requested information on what service outcomes should be included in the definition of a national or jurisdictional BLOS and which existing indicators and data sources could be used to measure those service outcomes (for example, from the urban National Performance Report).

The Update suggested that the indicators in the NPR could be used as appropriate indicators of service outcomes nationally and jurisdictionally (p24). In relation to drinking water safety, these are inadequate. Even the larger water providers (>10,000 connections) report their water's compliance with the Guidelines for only a small fraction of the total number of health-based Guidelines. Consequently, it is misleading for these water providers to say that they comply with NHMRC (2011) without stating the substances which they have monitored and compared with their respective Guidelines. As noted by the Update (p28), this is a particular limitation of the NPR, which uses a single indicator (H4) of full compliance with NHMRC (2011) for all monitored health-based chemical/ radiological substances, reported as a proportion of population served by each larger provider. At the least, the number of substances monitored should be included to show how comprehensive the health-based monitoring is. A separate indicator (H3) for compliance with the *E. coli* Guideline is also similarly reported, in keeping with the NHMRC (2011) advice that microbial pathogens constitute the greatest immediate (acute) risk to health from drinking water supplies.

It should be emphasised that water providers of less that 10,000 connections are not required to provide any information on compliance with NHMRC (2011) Guidelines. For the first time, they were required to report for 2024-25, whether they use "water quality risk management guidelines" (indicator H1) but no indicator of specific compliance was required. Although only partially adequate to judge safety, the data required from larger providers should also be required from smaller ones.

Even when the criteria for safety are restricted to compliance with the health-based Guidelines, there are more than one hundred substances to be considered, which is

clearly unrealistic for any water provider to monitor. The Framework of NHMRC (2011) resolves this issue by requiring a hazard identification and risk assessment (section 3.2.3) to identify those substances that pose a significant risk to human health. Presumably these substances should then be included in a monitoring program and any exceedances of their respective Guidelines reported annually. The hazard identification and assessment should be published as a justification of the restriction of substances to be monitored and to establish public confidence that all likely significant risks have been considered. Perhaps undertaking a biennial review of this assessment should be an indicator for the NPR, in addition to the ill-defined H1, the only water safety indicator introduced for smaller providers in the 2024-25 Report.

In the year of a review, performance from the old monitoring program could be reported. If any health-based substances are found to comply with their respective Guidelines for the previous four years, then they could be dropped from the monitoring program. Any substances newly identified as of significant health risk would be added to the program. The only exception would be monitoring for *E. coli*, which is an acute rather than a chronic health risk indicator, so that it should always be monitored and reported.

The inevitable outcome of each water provider conducting such an analysis is that the resulting monitoring programs would include a range of substances with health-based Guidelines which differed from program to program. This is in direct conflict with the notion of a nationally (or even jurisdictionally) consistent set of substances that are monitored and reported for the purpose of judging the safety of any drinking water. One exception is the monitoring and reporting of *E. coli* because it is the single parameter recommended by the NHMRC (2011) advice for characterising acute risk to consumers due to enteric pathogens. As noted in the Update (p28), this is already required for the large water providers in the urban NPR, but is not yet required for smaller ones.

This submission contends that annual assessment of exceedances of disinfection by-products (DBPs – trihalomethanes and haloacetic acids for chlorinated supplies) should also be mandatory because they are a result of achieving adequate disinfection in the distribution system (i.e. meeting the *E. coli* Guideline). Achieving compliance with their Guidelines should be given higher priority than other "background" chemical substances because they are due to chemicals introduced by water utilities. This is particularly necessary in Australia because the Guidelines for trihalomethanes are currently more than twice as high as those set in other comparable jurisdictions (US, EU, Canada and WHO). They have not been revised since 1996 when they were first included in the ADWG, yet there have been numerous epidemiological and animal studies since that support setting a much lower Guideline.

Instead of creating nationally or jurisdictionally consistent sets of health-based parameters to be monitored, a consistent means of evaluating safety of water supplied to consumers is needed, based on the combination of Guideline exceedances of any

set of health-based parameters. The simplest of these are already included in the NPR for larger water providers (H3 and H4 described above), but they need to be required for all water supplies to provide a basis for ongoing assessment of improvement in achieving safety in particular communities and jurisdictions, or nationally.

A particularly pressing need for such assessments is the lack of an indicator for Target 9b, regarding essential services, in the Annual Reports for the National Agreement on Closing the Gap, which are based on the Productivity Commission's annual dashboard update. This is the only one of eighteen socio-economic outcomes that does not have such an indicator half way through the life of the Agreement. This submission contends that it is unhelpful, perhaps misleading, to attempt to roll provision of all essential services into a single indicator. Instead, Fisher et al. (2025) – Attachment 1 – suggested that a combination of H3 and H4 should be adopted immediately as the drinking water safety indicator for Target 9b. This could be updated annually using data similar to that recently released publicly as the Australian Drinking Water Record (Water Justice Hub 2026). However, this Record currently does not include data from NSW and QLD, preventing a fully national analysis of drinking water safety to be made.

It is unlikely to improve for NSW as the view of the NSW government is that local water utilities own drinking water quality data that they have collected and have no obligation to make it public (NSW DCCEEW correspondence MF23/2928 16 Jan 2024). As well as being inconsistent with most other jurisdictions, this seems to conflict with the requirements of national consumer law which requires services to be of acceptable quality and fit-for-purpose. How can consumers decide whether their drinking water meets either of these criteria unless they have access to the list of substances that are monitored and the latest measured values of each (annual maximum or 95th percentile)?

What criteria are needed for prioritizing improvements to safety?

The Update was also seeking information establishing the variable and incremental costs of efficiently meeting a BLOS.

Information on the combined severity of the failure to comply with one or more health-based Guidelines is needed if improvements to safety are to be prioritized. Indicators H3 and H4 of the NPR do not provide any such information. Fisher et al. (2025) proposed a method to account for the combined severity of exceedances based on the concept of a (chronic) "health risk index" (HRI). The HRI is the number of times that the measured concentration of a substance exceeds its respective Guideline value. As the HRI for each substance is zero unless the Guideline is exceeded, HRIs for any number of substances can be combined by simple addition to obtain an appropriate measure of combined health risk to an individual from consuming that water. A separate "acute HRI" was defined and calculated for the case of *E. coli* because it is measured as

presence/absence rather than concentration. The precise mathematical definitions of these HRIs are detailed in the paper (Attachment 1).

A community HRI can then be derived by weighting the combined HRI for an individual by the population receiving water of differing quality within that community. Then the combined community HRIs provide an appropriate basis for comparing safety across different communities/supplies. This type of population weighting is already used in the NPR indicators H3 and H4. Similar population weighting across a State/Territory jurisdiction or nationally provides a consistent basis for comparing levels of safety across jurisdictions and nations. Again, the precise mathematical definitions of the HRIs at different community/jurisdictional/national levels are given in Fisher et al. (2025).

These HRIs were calculated nationally (WA, SA, QLD and NT) from the earlier version of the Australian Drinking Water Record (Wyrwoll et al. 2022) for drinking water supplied to remote Aboriginal communities (Fisher et al. 2025). Water supplies were ranked according to combined community HRI values for *E. Coli* (Group A) and other health-based substances (Group B) separately. Following the NHMRC (2011) advice that enteric pathogens are the greatest safety risk, it was proposed that Group A supplies should be remediated first, followed by those in Group B, according to their rank.

That proposal assumes that improving safety must be prioritized regardless of cost. In a world of limited financial resources, the (economic) benefit-cost ratio has been used widely to prioritize many types of projects. Fisher et al. (2024 – Attachment 2) proposed a similar ratio for prioritizing improvements to safety, with the measurement of benefits in terms of the decrease in HRIs due to the net present value of the costs involved. This prioritization would lead to the greatest improvement in safety nationally for the limited financial resources available.

About the Author

Dr Ian Fisher was Principal Scientist – Drinking Water for Sydney Water Corporation (SWC) for over 15 years, initially with responsibility for its drinking water quality surveillance. This included designing and implementing SWC's first trace contaminant monitoring program. He was subsequently foundation Coordinator for the distribution system research program of the national CRC for Water Quality and Treatment, within which he led the development, validation and publication of mathematical models of chlorine reactions in bulk water and with pipe walls.

Ian has also been a Professor of Engineering (Research) at CDU and an Adjunct Professor at WSU. He is currently Director of Watervale Systems, a small company that has continued the modelling development and now provides consulting services to water utilities to achieve chlorine residuals in distribution systems sufficient to control microbiological agents, while keeping disinfection by-products below regulated limits.

References

Fisher, I., Kastl, G., and Sathasivan, A. (2024). A national strategy to achieve safe drinking water in regional and remote communities. Voices from the Bush Conference, Mparntwe (Alice Springs), 10-11 Sep 2024.

Fisher, I., Kastl, G., and Sathasivan, A. (2025) Measuring progress to achieve safe drinking water for first nations people. Water e-Journal 11(2), 005. doi.org/10.21139/wej.2025.005.

National Health and Medical Research Council (NHMRC) (2011 updated 2025). Australian Drinking Water Guidelines 6 version 4.0. https://www.nhmrc.gov. au/about-us/publications/australian-drinking water-guidelines.

Wyrwoll, P., Manero, A., Taylor, K., Rose, E., and Grafton, R. (2022). Measuring the gaps in drinking water quality and policy across regional and remote Australia. npj Clean Water (2022) 5:32 ; https://doi. org/10.1038/s41545-022-00174-1.