Do you have any comments on the overall approach to assessing and managing microbial risk in source water outlined in section 5.3?

The Water Services Association of Australia (WSAA) welcomes the opportunity to provide a submission to the National Health and Medical Research Council (NHMRC) on its draft of Chapter 5 of the Australian Drinking Water Guidelines – *Microbial Quality of Drinking Water*.

WSAA is the peak body that supports the Australian urban water industry. Our members provide water and sewerage services to over 20 million customers in Australia and New Zealand, and many of Australia's largest industrial and commercial enterprises. WSAA facilitates collaboration, knowledge sharing, networking and cooperation within the urban water industry. The collegiate approach of its members has led to industry-wide advances to national water issues.

WSAA recognises the important role that the ADWG fulfils in providing guidance on good-practice management of drinking water quality and welcomes the inclusion of microbial Health Based Targets (HBTs) into the Guidelines. The water industry acknowledges the importance of microbial HBTs in the delivery of safe drinking water, as well as the value of the HBT methodology in demonstrating how drinking water safety has been achieved.

This has been demonstrated through WSAA working with the government owned water corporations and state and territory regulatory agencies to develop the *WSAA Health Based Targets Manual.* Given the pivotal role that the ADWG has as a definitive reference document for the Australian water industry it is important that the WSAA Health Base Targets Manual and associated work be incorporated, more directly and clearly, in the updated guidelines.

The HBT Manual was developed over a number of years to provide a pathway and support for the implementation to the HBTs by the Australian water industry and it will be a significant loss if that work is not utilised.

More specifically with reference to the approach outlined in Section 5.3 of the draft text, our members request clarification around several items, these are outlined below. In addition, our have outlined several suggestions which would enable and support the practical application and implementation of microbial HBTs.

1. *The outlined approach to validation is unclear.*
   The draft text does not provide enough direction in the following areas:
   - How a log removal value (LRV) for a process is to be determined. It is not clear if a single value, an average, or the worst case is used?
   - How does the LRV account for the variability of a process caused by operational variables, such as changes to source water quality?
   - Does the proposed approach to validation require the measurement of pathogen removal, or acceptable surrogates, directly at each plant, and for this measurement to be used as the basis for the plant's log removal rating? If so, this replaces the internationally accepted approach of assigning log credits to individual or component parts of the water treatment chain, based on operating these components within a specified operational envelope.

2. *The validation approach is not practical to implement*
   The validation of operational water treatment plants is impractical and uneconomical for the following reasons:

- Validation is reliant on the presence of adequate concentrations of surrogates or pathogens to demonstrate the log reduction value and to be able to link it directly to operational parameters. However, source water for drinking water will not have adequate concentrations for this to be achieved. To address this spiking of surrogates or pathogens is required.
- The spiking of source water with pathogens (or surrogates), to numbers adequate for log removal verification, will result in their presence in the final water. Under these conditions produce water will not be able to be supplied to customers. Subsequent disposal and cessation of supply will need to be managed.
- While out of spec product water can go back to head of a plant, how long this can occur is dependent on the amount of storage in a system. This could range from hours to several days. In many situations, there may not be adequate storage in a system for validation studies to be undertaken and ensure adequate recovery time for the plant.
- Due to the change in risk profile of the source water, operation of a filter post surrogate or pathogen challenge will require increased monitoring of the product water to ensure the safety of the final product.

All these result in additional operational costs above the cost of undertaking a validation study, without necessarily providing greater assurance. There exists enough economically viable alternatives to in-situ validation to ensure that the operational parameters can be clearly defined. Examples are desk top or pilot plant scale validation. A rough estimate of costs is $20M for in-situ validation when a plant cannot supply to $2M for a pilot plant.

These assumptions are based on the validation of the entire plant in-situ. In some situations, filters can be taken off line and individually validated. While this does not result in the complete cessation of supply, it does result in a reduction in the amount of water supplied and the additional post validation monitoring requirements.

As economic alternatives to in-situ validation exist, full in-situ validation allows a utility to provide additional evidence to the regulator that the plant can achieve much greater log removal values than the conservative, desk top default values provided in the WSAA manual. In some scenarios this option may be more economically viable than adding to a treatment train.

WSAA recommends:

- Acknowledgment and reference to the *WSAA Health Based Targets Manual* as a recognised and legitimate source of advice for achieving the required LRVs, as detailed in draft Table 5.6 of the draft text.
  - The description of the operational management of water treatment processes to achieve microbial HBTs provided in the WSAA HBT Manual is far more detailed than that of the draft text, and will provide suitable support material to the ADWG. In addition, the corresponding LRVs are more specific e.g. filtration LRVs based on clearly defined filtration performance targets.
- Reviewing the implication and suggestion for in-situ full-scale testing of drinking water treatment plants for pathogen reduction.
- Providing clear guidance on the process for assessing the inherent capability of the water treatment process

- Clearly defining the validation requirements for LRVs attributable to treatment barriers, in line with the existing text on validation that appears in Chapter 9 of the ADWG.
- More guidance or references on interpreting/evaluating data. Effective source water categorisation is key to this approach to microbial HBTs and ensuring that the required level of treatment is achieved.
- Providing clearer guidance on whether the microbial HBTs can be met through desktop analysis (the two inferred methods in the draft text differ).
- Stating clearly that improvement associated with the microbial HBTs be integrated with the continuous improvement paradigm established in the ADWG Risk Management Framework, as described in Chapter 3 of the ADWG (which is consistent with the 'water safety continuum' concept).
- The finalised chapter be edited to accurately reflect contemporary microbiological and public health concepts.
- The finalised chapter better highlight that the use of site-specific QMRA is preferable to, and should override the use of, the generic LRVs required (as set out in draft Table 5.6), where sufficient data of suitable quality is available to the utility.

3. In addition, WSAA believes the microbial HBT guidance material would be strengthened by an outline of the procedure for its implementation, such as a high-level overview or flow chart

WSAA notes that there is no Table 5.5. This appears to be a numbering error.

The treatment targets as log reduction values (LRVs) in table 5.6 were derived using Australian data and the assumptions are outlined in the technical appendix. Do you have any specific comments on these values and /or how they were derived?

Page 22
Section 5.4.2 Contamination Of source waters & enteric pathogens
Treatment targets for protozoa, bacteria and viruses in relation to the source water category classification (provided in draft Table 5.6) differ from the values provided in the WSAA HBT Manual (see Table 3 of Section 3.1.6 of the WSAA HBT Manual – *Recommended minimum pathogen log reduction requirements*). The basis for the derivation of these requirements are outlined in Appendix B of the WSAA HBT Manual.

Importantly, there is an additional 0.5 log protozoa removal requirement for Category 2 and 3 sources in the draft text for Chapter 5, compared to the WSAA recommendations. The basis for the Log Reduction Values (LRVs) in the WSAA HBT Manual is outlined in Appendix A of the HBT Manual and is summarised in Section 5.4.3.2 – *Treatment targets.*

The LRV targets specified in the WSAA HBT Manual are supported by a significant body of evidence, which is referenced within the WSAA HBT Manual. WSAA members support and recommend that LRV targets in the ADWG be aligned with the LRV targets in WSAA HBT Manual, as these are adequate and sufficiently conservative to meet the microbial HBT target of 1µDALY/person/year.

Is the approach as articulated in the technical appendix clear? If not, how could it be made clearer?

WSAA questions the blanket 1-log reduction and basis by which the default LRVs have been derived. Clarity is sought.

The mathematical notation style adopted in the Appendix does not lend itself to easy interpretation by water industry practitioners, and adds little value to the ADWG.

Please provide any other feedback on the chapter and technical appendix

It should be noted that the proposed amendments to Chapter 5 will create the need to undertake a series of consequential amendment to the existing text in Chapters 2 and 3, and Appendix I of the ADWG, to ensure consistency and alignment across the whole document.

Page 2 Paragraph 1
Section 5.2 Microorganisms in drinking water

WSAA members seek clarification on the "reference virus" described in Section 5.2. The wording suggests an agglomeration of different viruses/characteristics, but there is no detail on how these characteristics have been blended into a single reference virus.

Page 5 paragraph 1
Section 5.2 Microorganisms in drinking water

WSAA questions the reference to '*42 outbreaks in recreational water*' and its relevance in a document focused on the provision of safe drinking water. While it is recognised that the reference illustrates that water-related outbreaks in Australia are almost never recorded in public drinking water supplies, the inclusion of this information sends a mixed signal and is of questionable relevance.

Page 6
Section 5.4 Enteric pathogens
Table 5.1

WSAA questions the relevance of the reference to the consumption of contaminated food under Hepatitis in Table 5.1 and suggests removing it. The Hepatitis risk only arises if pigs consume recycled water derived treated sewage, not treated drinking water.

Page 7 Paragraph 4
Section 5.4.2 Contamination of source waters with enteric pathogens

WSAA acknowledges that the breakdown of barriers can lead to waterborne disease outbreaks, but recommends, for the purposes of clarity, the inclusion of a statement that the scale and nature of the breakdown have a significant bearing on whether an outbreak occurs.

Page 17
Section 5.4.2.2 Groundwater

WSAA seek more detail and guidance around this requirement. Specifically:

- the criteria and standard of the evidence required to demonstrate the determination of 'protected' groundwater, particularly in light of the findings of the Inquiry into the Havelock North waterborne disease outbreak in New Zealand
- how a water business can demonstrate aquifer security to the satisfaction of the health authority or other regulator .

Page 18
Section 5.4.3.1 Source water protection

Regarding the statement "*effective catchment management practices should provide the potential for the source classification to be reduced*"- further guidance on how this could be achieved should be provided. It should be aligned with the guidance provided in the WSAA HBT Manual.

Page 20
Section 5.4.3.2 Treatment Targets

The last paragraph on page 20 discusses the decision to down-rate the LRV for *Cryptosporidium*. For the derivation of LRV requirements, *Cryptosporidium* data from a Water Research Australia project, authored by Dan Deere, Susan Petterson *et. al*. was used. They cite average *Cryptosporidium* concentrations. Was the use of averages considered when calculating the new default LRVs listed in the draft Table 5.6? If this is the case then using the average rather than the maximum would remove some of the conservatism of the LRVs.

It should also be noted that the text on page 20 is not consistent with the default LRVs presented in the August 2016 draft released by NHMRC. Specifically, the LRVs for *Cryptosporidium* have gone up for Categories 2 and 3, while there has been a decrease in the *Cryptosporidium* LRV for Category 4.

Page 21

The text states:

"If the source water categorisation and required LRV is considered by the water supplier to be too high for a specific site, it must be discussed with the relevant party (e.g. a health authority or other regulator) who will be the ultimate decision maker when deciding whether a lower category is sufficient to achieve safety. This should be undertaken with a more detailed site-specific assessment and may include application of QMRA including direct analysis of pathogen data (Box 5.4)".

Will more information be provided on the detailed site-specific assessment and QMRA analysis, including pathogen data? Could this assessment and analysis be undertaken to provide a more robust support for the microbial HBT assessment? Is this similar, or equivalent, to the Tier 2 assessment from the previous draft text that was released in August 2016?

It is worth noting that the technical guidance provided in the current draft is difficult to follow and its derivation is harder to understand, compared to the information on QMRA and its application as provided in the August 2016 draft text.

Applying QMRA through system-specific pathogen monitoring to establish source water quality is a direct method for determining treatment requirements. However, this approach is not always practical. Further guidance on examples of when QMRA is useful would be helpful

---

Pages 22-25 Table 5.6/5.7
Section 5.4.2 Contamination of source waters with enteric pathogens
Clarification is sought on where membrane filtration fits in relation to the Indicative Specific Treatment Technologies column in Table 5.6

Regarding the headers on Table 5.6 (page 22) and Table 5.7 (page 25) – members would find reading of the table easier with the listing of pathogen groups in the same order in both Tables (preferred order would be protozoa, viruses, bacteria)

Page 25
Section 5.4.2 Contamination of source waters with enteric pathogens
Table 5.7. Indicative pathogen LRV potentially attributable to treatment barriers

The two columns of LRVs listed in Table 5.7 are confusing. There needs to be a clear explanation about what is meant by *achievable* versus *validated* to clarify which column one should choose from. It is assumed that *validated* is the only relevant column, as, unless new validation information is produced the

achievable value can never be accepted.

Table 5.7 should also include a row for direct filtration.

Sections 5.2 and Appendix D of the WSAA HBT Manual outline a number of treatment processes and 'default' LRVs that can be used based on performance criteria for that treatment barrier e.g. turbidity and time criteria for media filtration processes. WSAA members consider that this is an appropriate approach and sufficiently conservative to meet the 1µDALY/person/year criteria, and the ADWG should align with this methodology.

In addition, members consider that the USEPA C.*t* values for free chlorine and chloramine be adopted for the respective LRV values for chemical disinfection. The USEPA C.*t* values are internationally-referenced and used in many regulatory jurisdictions. They are quoted extensively elsewhere in the existing ADWG. The current reference to a C.*t* of ≥ 15 mg.min/L for 4 log virus inactivation at a specific pH and temperature range is overly conservative when compared to the USEPA values.

WSAA therefore recommended that:

- Table 5.7 in the draft text of Chapter 5 be replaced with Tables A5.4.1 and A5.4.2 from 2016 draft HBT draft (in that way, water utilities know what they must do to achieve the required LRVs)
- Add the following two dot points below into the list of dot points above Table 5.7:
    - The LRVs associated with pre-validated treatment units, particularly in the case of pre-validated UV units, can be accepted as representing the default LRVs, if the operational parameters to claim the pre-validated LRVs
    - For other treatment processes, LRVs that are published by recognised sources can be used if the operational conditions under which those LRVs have been proven can be consistently achieved.

Page 26
Section 5.5 Opportunistic pathogens
Table 5.8

The last line in section 5.2 states that pathogen risk caused by pathways other than ingestion will not be discussed further. Table 5.8 revisits this topic in last column of the table. It is suggested that amendments be made to improve consistency across the draft.

This submission is a collation of comments from very experienced and senior water quality professionals across the country. These industry experts are responsible for the management, treatment and delivery of safe drinking water to Australia's urban community. This submission reflects a consensus view.