Response to public submissions on draft default guideline values for boron in freshwater

July 2021

Draft default guideline values (DGVs) for boron in freshwater were published on the Water Quality Guidelines website for a 4-month public consultation period. During this period, comments for the draft DGVs for boron in freshwater were received via public submission.

Responses to comments and any associated edits to the draft DGV technical brief are outlined in this report, de-identified for public record. The responses and revisions have been approved by the jurisdictional technical and policy oversight groups and noted by the National Water Reform Committee.

The default guideline values for boron in freshwater are now published as final. For additional information on the publication process, please refer to the pathway for toxicant default guideline value publication.

The Water Quality Guidelines Improvement Program thanks all submissions for their valuable contribution to the development of default guideline values for the protection of aquatic ecosystems.

Comment	Response	Action taken
The technical document is well written, easy to follow, transparent, and contains the relevant important information for understanding and using the boron DGV. The DGV seems of high quality, using many toxicity endpoints (n=22) in a preferred SSD of good fit.	Noted. Thank you.	No action taken for DGVs technical brief.
We are glad to see that CCME (2009) boron CWQG was referenced and presumably used as a source of toxicity data.	Noted. Thank you.	No action taken for DGVs technical brief.
Assuming the CCME (2009) boron WQG was consulted in this review, we would be interested in knowing why some endpoints were deemed unacceptable for use. The CCME (2009) guideline uses 28 endpoints while the DGV uses only 22. Some are explained in text and some are included in the appendices but not all. It would be useful to have a table of unacceptable endpoints (like what was done for Zinc) and that would ideally include all endpoints that were not used from CCME (2009). ○ E.g., why was *Elodea canadensis* (American Waterweed) not used? It is a low NOEC value (1 mg/L) and the lowest endpoint in the CCME guideline for boron published in 2009.	While some DGVs include a table of endpoints that were not included in the derivation, this was not a requirement for the DGVs. Although it can be useful to include such a table, resources were very limited and the inclusion of such a table was the exception rather than the rule. Nevertheless, and as specified in the DGV derivation methodology (Warne et al. 2018), there is a requirement to ensure that all key data selection decisions involving professional judgement are documented, either in the technical brief itself or in the supporting spreadsheets. Reasons for the exclusion in the draft DGVs of data used for the CCME (2009) boron GVs are provided below: *Opercularia bimarginata* – Value appears to be from a difficult to access, non-peer-reviewed conference proceedings (Guhl 1992a). CCME (2009) referenced this study as "Cited in Dyer 2001" and, thus appear not to have sighted the original reference. *Entosiphon sulcatum* – Value appears to be from a difficult to access, non-peer-reviewed conference proceedings (Guhl 1992a). CCME (2009) referenced this study as "Cited in Dyer 2001" and, thus appear not to have sighted the original reference. *Chironomus decorus* – The reported NOEC value is from a 96-h exposure (Maier & Knight 1991), which is classified as acute under the ANZG derivation methodology. As the boron DGVs are based on only chronic toxicity data, the *C. decorus* value was not used. As this is a straightforward decision based on the	The following sentence has been added to the 5th paragraph in section 4.1: "Some toxicity data used by other jurisdictions to derive boron guideline values (e.g., CCME, 2009) were not included for various reasons (e.g., source reference was not available, data did not pass quality assessment, test conditions were sub-optimal, source references could not be accessed or were not in English and data quality could not be determined)." Some additional minor edits have been made to this paragraph and in section 2.2.

Comment	Response	Action taken
	rules within the derivation method, there is no requirement to document such a decision within the technical brief. *Paramecium caudatum* – Value appears to be from a difficult to access, non-peer-reviewed conference proceedings (Guhl 1992a). CCME (2009) referenced this study as "Cited in Dyer 2001" and, thus appear not to have sighted the original reference. *Bufo americanus* – Justification for exclusion of data for this species is provided in the data quality spreadsheet (Row 135). *Ambystoma jeffersonianum* – Justification for exclusion of data for this species is provided in the data quality spreadsheet (Row 132). *Ambystoma maculatum* – Justification for exclusion of data for this species is provided in the data quality spreadsheet (Row 134). *Rana sylvatica* – Justification for exclusion of data for this species is provided in the data quality spreadsheet (Row 133). *Elodea canadensis* –Value is from a publication written in German (Nobel et al. 1983). Although the derivation method allows the use of data from existing overseas GV derivations (e.g., from Canada, EU, US) the source reference needs to be available and checked before a value is used. It is not possible to assess and verify the acceptability of the data for this species. *Spirodella polyrrhiza* – Justification for exclusion of data for this species is provided in the technical brief (section 4.1) and data entry spreadsheet (Rows 100-101). *Chlorella pyrenoidosa* – Justification for exclusion of data for this species is provided in the data quality spreadsheet (Rows 28-29). *Phragmites australis* – Published information on boron toxicity to this species could not be found. *Chlorella vulgaris* – Justification for exclusion of data for this species is provided in the data quality spreadsheet (Rows 30-33) *Scenedesmus subpicatus* – Value appears to be from a difficult to access publication in German (Guhl 1992b)). CCME (2009) referenced this study as	

Comment	Response	Action taken
	"Cited in Dyer 2001" and, thus appear not to have sighted the original reference. *Myriophyllum spicatum* – Published information on boron toxicity to this species could not be found. *Anacystis nidulans* – The study (Martinez et al. 1986*) for this species was not assessed during the derivation. As this appears to be a non-bloom-forming species, it could potentially be included in the dataset. However, the study is based on nominal concentrations, with no apparent ability to verify actual concentrations. The DGV derivation only included data based on nominal concentrations where "…methods to validate boron concentrations were included in the study, (e.g., measurement of boron in stock solution…"). As this is not the case for Martinez et al (1986), it is unlikely that this study will be added to the dataset. * Note that CCME (2009) actually lists the incorrect reference for this species; see correct reference in *References*, below) *Lemna minor* – Justification for exclusion of data for this species is provided in the data entry spreadsheet (Rows 91-93).	
It is not clear why some rejected endpoints were included in Appendix A spreadsheet. If the spreadsheet is supposed to only contain acceptable endpoints, then why include those that are rejected (for reasons other than there is a more preferred endpoint in the dataset)? For example, The *S.polyrrhiza* was rejected because the pH was too low and *L.gibba* was rejected because control contained boric acid. Should these not be labelled "unacceptable" or are these reasons not captured in the quality assessment?	It is possible for data to pass the data quality assessment only to then be rejected on some other grounds as further data screening is undertaken. Such data will appear in the data entry spreadsheet (Appendix A as you have referred to it), with notes as to why they were subsequently rejected. Issues such as low pH or sample contamination will lower the quality assessment score but not necessarily enough to result in the toxicity value failing the quality assessment. However, the use of professional judgement then allows for such data to be subsequently rejected. Documentation of the justification for such professional judgement decisions is always required.	No action taken for DGVs technical brief.
Suggest making the appendices more user friendly. I believe there is a lot of great information there, but	We agree that the spreadsheets contain a lot of information and can be somewhat difficult to navigate. Responses to the two bullet points, as follows:	Filters were added to the columns in the supporting spreadsheets for all the DGVs (where they were not already present).

Comment	Response	Action taken
they are quite overwhelming and hard to use at times. For example, ○ It would be helpful to add references (at least shortened) to appendix A (not just data source ID). It is not immediately clear what the sources of the endpoints are. Once you do locate the data source ID you have to then go back to the document to find the reference. ○ I was not immediately able to filter columns for Appendix A-I had to highlight the columns/rows and then re-filter for it to work.	○ This is a useful suggestion; however, it is unlikely that there are sufficient resources available to revise all existing spreadsheets. The data quality assessment spreadsheet does contain the source reference (Column T, titled "Citation") and these can be matched to the source ID, and vice versa. ○ Filtering can be added to the spreadsheet columns.	

References

CCME 2009. Canadian Water Quality Guidelines for the Protection of Aquatic Life, Boron. In: Canadian environmental quality guidelines, 2009, Canadian Council of Ministers of the Environment, Winnipeg, 9.

Dyer, SD 2001. Determination of the aquatic PNEC0.05 for boron. Chemosphere, 44(3), 369–376.

Guhl, W., 1992a. Laboratory river models and their relevance to the real environment. Presentation at Joint Meeting of SETAC-Europe, Potsdam, Germany, 22±24 June 1992.

Guhl W 1992b. Ökologischesspekte von bor. SÖFW J. 118 (18/92), 1159-1168.

Maier, K.J. and Knight, A.W. 1991. The toxicity of waterborne boron to Daphnia magna and Chironomus decorus and the effects of water hardness and sulfate on boron Toxicity. Arch. Environ. Contam. Toxicol. 20: 282-287.

Martinez, F., P. Matio, 1. Bonilla, and E. Fernandez-Valiente. 1986. Cellular changes due to boron toxicity in the blue-green alga Anacystis nidulans. Phyton 46:145-152.

Nobel, W., Mayer, T., Kohler, A., 1983. Submerse wasserp- flanzen als testorganismen fur belasrungsstoffe. Z. Wasser Abwasser Forsch. 16, 87–90.

Warne MStJ, Batley GE, van Dam RA, Chapman JC, Fox DR, Hickey CW & Stauber JL 2018. Revised Method for Deriving Australian and New Zealand Water Quality Guideline Values for Toxicants – update of 2015 version. Prepared for the revision of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra, 48 pp.