



April 24, 2017

***Via Electronic Mail***

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SUBJECT: CVCWA Comments on Draft Field-Based Methods for Developing Aquatic Life Criteria for Specific Conductivity (Docket ID No. EPA-HQ-OW-2016-0353)

Dear Ms. Flaherty:

The Central Valley Clean Water Association (CVCWA) and the California Association of Sanitation Agencies (CASA) appreciate the opportunity to provide comments on the U.S. Environmental Protection Agency's (USEPA) *Draft Field-Based Methods for Developing Aquatic Life Criteria for Specific Conductivity* (Draft Methods).<sup>1</sup> CVCWA is a nonprofit association of publicly owned treatment works (POTWs) throughout the Central Valley of California whose primary mission is to represent wastewater agencies in regulatory matters while balancing environmental and economic interests. CVCWA members have a strong commitment to the protection of aquatic life in Central Valley waters. CASA is an association of local agencies engaged in advancing the recycling of wastewater into usable water and the generation of renewable energy and other valuable resources. Through these efforts we help create a clean and sustainable environment for Californians. Many of CVCWA's and CASA's members will be directly affected by the Draft Methods and therefore have a significant interest in their development and implementation.

USEPA states that the Draft Methods provide flexible approaches for states and tribes to develop region-specific science-based aquatic life criteria for specific conductivity (SC). The Draft Methods underwent two rounds of peer review in 2014 and 2015 and were released for public comment on December 23, 2016, with a 122-day comment period ending on April 24, 2017.

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<sup>1</sup> USEPA, 2016. Draft Field-Based Methods for Developing Aquatic Life Criteria for Specific Conductivity. December 23, 2016. [EPA-822-R-07-010](https://www.epa.gov/822-r-07-010).

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CVCWA and CASA appreciate USEPA's significant efforts in developing the Draft Methods and are in overall support of the approach to use a field-based method to develop aquatic life criteria, since it is more directly correlated to actual beneficial use protection. However, both CVCWA and CASA have a number of reservations about the validity of the methods—especially when applied to regions with minimal existing data, unique or unknown aquatic taxa, and seasonably variable SC concentrations—and therefore recommend that USEPA address these issues before finalizing the Draft Methods.

## 1. **Applicability of the Background-to-Criterion Model Method**

CVCWA and CASA understand that the Draft Methods include two primary methods which can be applied to a region to develop a SC aquatic life criteria. The extirpation concentration distribution (XCD) is used when there are adequate paired measurements of SC and biologic macroinvertebrate genera. When a region lacks adequate coverage of paired SC-biological samples, the background-to-criterion (B-C) model method is applied instead. The B-C method was developed by using XCDs from 24 Level III ecoregions to create a log-transformed regression between SC and macroinvertebrate genera. This relationship is then applied to areas that only have SC data to predict expected aquatic life criteria. The 24 Level III ecoregions used to develop the B-C model are located throughout the United States with background SC values ranging from 22 to 626 micro-Siemens per centimeter ( $\mu\text{S}/\text{cm}$ ).

### A. The Level III Ecoregions Used to Develop the B-C Method Are Not Representative of the Western United States

The Central Valley is a region which does not have an extensive paired SC-biologic sample set to allow application of the XCD, therefore it is presumed that a B-C method would be used to develop aquatic life criteria for this area. However, the 24 Level III ecoregions used to develop the B-C Method lack any representative sites from California. In fact, only five of the 24 sites are from the western United States and all five of those sites occur in mountainous regions which receive significant orographic rainfall.<sup>2</sup> As has been extensively reported in the USEPA-funded Arid West Water Quality Research Project (AWWQRP),<sup>3</sup> arid or semi-arid western regions have unique hydrologic regimes from the rest of the country, receiving annual precipitation of less than 10 or 20 inches, respectively, and typically experiencing strong seasonality. Therefore, it is inappropriate to assume that a model built entirely on data from areas receiving more than 20 inches of annual precipitation applies to the more unique climatic regions of the arid western United States, especially California's Central Valley. The Central Valley has elevated SC in part due to strong seasonally-extended drought conditions, and the

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<sup>2</sup> i.e., The Northern and Middle Rockies, Idaho Batholith, Wasatch and Uinta Mountains, and Arizona/New Mexico Mountains

<sup>3</sup> Arid West Water Quality Research Program (AWWQRP) <http://webcms.pima.gov/cms/one.aspx?pagelid=86054>

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underlying geology, which includes sedimentary deposits from when the Central Valley was part of an ancient inland sea. In the Sacramento/San-Joaquin Delta, tidal influence also impacts SC. Because of this high background SC and unique climate, it is unclear if the benthic genera from the California Central Valley are similar and share the same sensitivity to SC as the other Level III ecoregions used to construct the B-C model.

B. The Draft Methods do not Demonstrate Applicability to Ephemeral and/or Intermittent Streams or Channels

The California Central Valley includes many intermittent and ephemeral streams which are dry large portions of the year. The Draft Methods state that all stream types and sizes can be assessed by these methods and discuss the issue in greater detail on pages 3-33: “[A]lthough the field data used in the case studies were only collected from perennial streams, available information from the open literature indicates that many of the macroinvertebrate taxa persist in intermittent and perennial channels, albeit at different densities and for varying amount of time.” The Draft Methods go on to cite a reference that showed that many of the taxa found in perennial streams were also found in temporary channels;<sup>4</sup> however, this study looked at only ten stream channels in the humid and forested Cumberland Plateau of the Kentucky River Basin. Four other studies were cited to justify applicability of the Draft Methods to intermittent and ephemeral streams and not a single study came from the arid western United States or an arid region in general. This topic was further addressed in the 2014 peer review of the Draft Methods, Charge Question 12, where one reviewer stated that temporal/ephemeral streams may be “over-protected” by Draft Method criteria based only on data from perennial streams, and another stated that “biological confirmation” would be needed to verify the presence of limit-defining taxa within ephemeral streams. Neither of these important concerns were included in the Draft Methods document.

Furthermore, a critical reason cited by USEPA to apply the methods to ephemeral streams is “in order to ensure protection of aquatic communities in downstream intermittent or perennial waters.” While CVCWA and CASA agree it is important to protect aquatic communities, USEPA must first establish that the Draft Methods are in fact scientifically applicable to ephemeral and intermittent streams.<sup>5</sup>

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<sup>4</sup> Grubbs, S.A. *Aquat Ecol* (2011) 45: 185. doi:10.1007/s10452-010-9345-5

<sup>5</sup> Sources and study sites cited in section 3.6.2 of Draft Methods: Datry 2012 – Albarine River, France; De Jong and Carton 2013 – West Virginia headwater streams; Feminella 1996 – Alabama upland streams; Stout and Wallace 2003 – headwater streams in Appalachia.

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While few in number, there are studies that have assessed taxa in arid ephemeral streams, including the USEPA-funded AWWQRP mentioned earlier.<sup>6</sup> This study concluded that: “[C]learly, the resident taxa list for ephemeral streams ... differs from the national database ... this finding suggests that standards for ephemeral streams would probably be substantially different from national, state, and even site-specific standards for site with perennial flow.” The study goes on to comment on the lack of existing studies on ephemeral streams and the need for more research.

Based on the omission of this study and the poor geographic coverage of the references included, CVCWA and CASA find the support for the applicability of the Draft Methods to arid ephemeral and/or intermittent streams wholly inadequate. USEPA should not state that these Draft Methods are applicable to all stream types until it has done a robust assessment to find that (1) the sensitive taxa are indeed found in arid intermittent and ephemeral streams and (2) that those taxa have a similar extirpation response to SC as found in other perennial streams.

C. The B-C Method Should Only Be Used in Regions that Have Data Meeting Minimum Requirements as Identified in the Science Advisory Board’s Reviews and Should Follow the Same Considerations Identified for the XCD Method

As mentioned previously, the Draft Methods went through two rounds of peer review. In the 2014 peer review, experts were asked to weigh in on the transferability of the method to other regions. Pages 3-36 of the Draft Methods reference the Science Advisory Board’s (SAB)<sup>7</sup> 2011 review of the USEPA Benchmark Report,<sup>8</sup> which was used as the basis for the Draft Methods, and states that “*In general, the SAB concluded that the numeric benchmark was applicable to the regions where the field data were collected and could be applicable to other areas where sufficient data allow for evaluation of applicability of the benchmark.*”

A review of the SAB 2011 review found that while reviewers agreed the method could be applied to other regions, the SAB presented nine conditions which would need to be met before applying the method to a new region. These conditions are listed in section 3.1.1.2 of the Draft Methods, except for the ninth condition which, for some reason, was omitted from the Draft Methods and should be included.<sup>9</sup> For example, background SC levels and ionic

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<sup>6</sup> AWWCRP, 2006. Aquatic Communities of Ephemeral Stream Ecosystems: Executive Summary. [http://webcms.pima.gov/UserFiles/Servers/Server\\_6/File/Government/Wastewater%20Reclamation/AWWQRP/EpStream-ExecSum.pdf](http://webcms.pima.gov/UserFiles/Servers/Server_6/File/Government/Wastewater%20Reclamation/AWWQRP/EpStream-ExecSum.pdf)

<sup>7</sup> SAB, 2011. Review of Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams. [EPA-SAB-11-006](#) pp 25-28.

<sup>8</sup> USEPA, 2011. Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams (USEPA Benchmark Report). [EPA/600/R-10/023F](#).

<sup>9</sup> SAB 2011 condition “9) *The benchmark should not be extrapolated beyond the geographic bounds of the data set unless sufficient data are available for validation.*”

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concentrations should be similar across all reference sites in the new region, fauna in the region should reflect a common regional generic pool, there should be good prior knowledge and understanding of the environmental requirements of the regional pool of genera, potential confounding factors for the region should be understood and addressed, and the benchmark should not be extrapolated beyond the geographic bounds of the data set unless sufficient data are available for validation. Additionally, a number of SAB reviewers of the Draft Methods emphasized the need for biological confirmation that an area where the B-C is applied is actually responsive to the same SC sensitivity seen in other B-C Level III ecoregions.

CVCWA and CASA are concerned that these important SAB observations and conditions have only been applied to regions using the XCD method, while they are equally important for regions using the B-C method. The Draft Methods should be amended to clarify that these requirements apply to regions using either method to develop aquatic life criteria.

Finally, in order to confirm the applicability of the method to a site in the arid western United States, CVCWA and CASA recommend performing an additional case study in the Central Valley of California using the B-C method and working through the nine recommended SAB 2011 conditions. Such a case study would ensure that this method is applicable to arid regions. This would also allow stakeholders to see how USEPA intends to assign criteria to a unique and diverse Level III ecoregion that will likely require multiple criteria on a seasonal as well as a geographic basis due to varying SC regimes from the northern, tidally-influenced, and southern portions of the Valley. A case study would also help address the geographic and precipitation bias that currently exists in the underlying sample sites and case studies of the Draft Methods which heavily favor the eastern United States and/or high precipitation (>20 inches/year) regions.

#### Recommendations:

- The 24 sites used to develop B-C Model should be expanded to include sites that are representative of more diverse Level III ecoregions such as those that may occur in California's Central Valley or other western Level III ecoregions with elevated SC.
- Applicability of the Draft Methods to arid ephemeral or intermittent streams has not been properly demonstrated. The Draft Methods should be amended to state that they do not apply to western arid regions, **or** the document should be amended to include a robust analysis demonstrating, with field data, that these methods are applicable and representative of western arid regions with ephemeral and intermittent streams.
- The B-C Method should only be applied to areas that meet the minimum requirements recommended by the 2011 and 2014 Science Advisory Board reviews discussed above and listed in section 3.1.1.2 of the Draft Methods.

- The bulleted list in Section 3.1.1.2 of the Draft Methods should be amended to include the final 2011 SAB condition regarding extrapolating data as described above and quoted in footnote 9.
- The minimum requirements needed to be met before applying either XCD *or* B-C method to a new area, as originally stated by the 2011 SAB, should be clearly explained in the Draft Methods, particularly that these requirements apply to both methods.
- A case study should be included of an arid western Level III ecoregion such as California's Central Valley, which would include an assessment of the nine SAB 2011 conditions.

## 2. Appendix D Background SC Value Is Incorrect

Appendix D of the Draft Methods includes the calculation of the criterion continuous concentration (CCC), the primary aquatic-life chronic-endpoint, using the B-C Method for 62 Level III ecoregions, including the California Central Valley. The first step in applying the B-C Method to a region is establishing the background SC concentration, which is generally estimated as either the 25<sup>th</sup> percentile of the total SC dataset or the 75<sup>th</sup> percentile of the reference site SC concentration. In the Appendix D, the background SC concentration is calculated as the 25<sup>th</sup> percentile of the total dataset estimated from a geophysical model.<sup>10</sup> After a background SC concentration is determined the hazard concentration 5<sup>th</sup> percentile (HC<sub>05</sub>) is calculated using the B-C regression model. The HC<sub>05</sub> value is defined as the level at which 5 percent of the macroinvertebrate genera are extirpated and is the primary chronic-endpoint used to develop the CCC, which should not be exceeded as an annual geometric mean in order for a waterbody to be protective of aquatic life.

Using this framework, background concentrations for the California Central Valley were calculated to be 99  $\mu\text{S}/\text{cm}$  and a HC<sub>05</sub> was calculated as 205  $\mu\text{S}/\text{cm}$ . These values are grossly underestimated and over-conservative and are likely a result of a calculation error. A background SC of 99  $\mu\text{S}/\text{cm}$  does not match with a visual inspection of USEPA's own predicted natural SC base-flow produced in the model and shown in Figure D-6 of the Draft Methods, which appears to support a value closer to 800  $\mu\text{S}/\text{cm}$  (where the Central Valley Level III ecoregion is largely shown in the red color scale correlating to 600-1000  $\mu\text{S}/\text{cm}$ ). Furthermore, Table D-6 reports the background SC for Southern California/Northern Baja Coast—an ecoregion with a very similar climate and SC conditions to the Central Valley—as having a background SC of 566  $\mu\text{S}/\text{cm}$ . Because of the incorrect background SC, the associated HC<sub>05</sub> of 205  $\mu\text{S}/\text{cm}$  is also incorrect and artificially low. From our many years of experience managing waters in the California Central Valley, we note that SC values typically range from ~250 up to ~4000  $\mu\text{S}/\text{cm}$  in

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<sup>10</sup> Olsen and Hawkins, 2012. Predicting natural base-flow stream water chemistry in the western United States. Water Resour. Res. 48: W02504.

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some waterbodies. The SC range also differs depending upon the location of the waterbody within the Central Valley, indicating that a single SC criterion for the entire Central Valley would not be representative of SC conditions seen at various points within the Valley. Therefore, assigning a background SC of 99  $\mu\text{S}/\text{cm}$  and a  $\text{HC}_{05}$  of 205  $\mu\text{S}/\text{cm}$  based on what appears to be incorrect data would cause significant hardship on clean water agency stakeholders within the Central Valley. If this data is not corrected, CVCWA is concerned that this erroneous background concentration will result in inaccurate and unattainable criteria and create unnecessary costs for local governments and POTWs.

Furthermore, in making these calculations, USEPA did not follow the advice of the 2011 SAB mentioned earlier regarding the applicability of this method to other regions and listed in section 3.1.1.2 of the Draft Methods. Specifically, USEPA did not undertake the recommended steps to generally understand the ecology and chemistry of the region before applying a criterion throughout the entire Level III ecoregion, nor did it analyze whether a single criterion was appropriate for such a large Level III ecoregion. The Central Valley is a large, elongated region with a variety of different waterbodies with varying background SC concentrations, flow rates, and flow patterns. Therefore, the application of a single background SC and  $\text{HC}_{05}$  value is not scientifically defensible. One of the conditions of the 2011 SAB report stated *“the benchmark should not be extrapolated beyond the geographic bounds of the data set unless sufficient data are available for validation.”*<sup>11</sup> No validation for a single criterion was given, and a correct assessment of the Central Valley would reveal that the Level III ecoregion would need to be segmented based on varying hydrologic regimes and given multiple criteria in order to properly protect aquatic life.

CVCWA and CASA are concerned that these errors could be compounded if local regulators use the values reported in Appendix D without revisiting the calculations using correct data and ensuring that the criterion meet the section 3.1.1.2 minimum requirements. CVCWA requests that USEPA consider the significant impact these calculations will have on local stakeholders in Level III ecoregions, and either correct the errors and include a careful validation of all of the requirements listed by the 2011 SAB reviewers for each of the 62 Level III ecoregions, or remove these calculations from the document. Removing the calculations in Table D-3, D-4, and D-5 will not affect the intent of the Draft Method and will encourage local regulators to work through the process of calculating the background SC concentration and CCC themselves, which is what the Draft Methods were originally designed to do.

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<sup>11</sup> SAB, 2011. Review of Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams. [EPA-SAB-11-006](#) pp 28.

Recommendations:

- The Appendix D B-C modeled HC<sub>05</sub> values did not follow the stated requirements of the 2011 SAB and therefore should not be included, or should be reviewed and assessed to ensure that they meet the minimum recommended requirements.
- The Central Valley California Background SC of 99 µS/cm listed in Appendix D is incorrect and should be removed.
- Because of the incorrect background SC calculated in Appendix D, the associated HC<sub>05</sub> of 205 µS/cm is also incorrect and should be recalculated.
- A single background SC and HC<sub>05</sub> value is not scientifically representative of such a large and diverse Level III ecoregion such as the Central Valley, and therefore a single value should not be included in Appendix D, *or* a full assessment of the of the 2011 SAB recommendations should be performed to produce a separate background SC and HC<sub>05</sub> for each distinct SC-waterbody regime.
- Either the calculated background SC and HC<sub>05</sub> endpoints reported in tables D-3, D-4, and D-5 should be removed, *or* an assessment of the 3.1.1.2 minimum requirements to ensure assumptions are met for each of the 62 Level III ecoregions should be performed.

### 3. Consideration of Confounding Factors in the Methodology

CVCWA and CASA are also concerned that the B-C Method has not been adequately evaluated for confounding factors such as seasonality. The California Central Valley experiences significant wet and dry seasons such that the SC values can more than double when transitioning from the wet to the dry season.<sup>12</sup> While the Draft Methods did consider the effect of seasonality for the two XCD case studies in the Central Appalachians and Western Allegheny Plateau, the Draft Report concluded that seasonality weighting was not needed in *those two cases*. Unlike those two regions, the Central Valley is affected by dramatic seasonal changes, which in turn affect SC values. Therefore, the Draft Methods should state that confounding variables such as seasonality should be evaluated on a case-by-case basis and that sampling plans should take into account seasonal effects. A number of reviewers in the 2014 SAB peer review (Charge Question 3) did raise this issue and stated that each dataset should be carefully evaluated and seasonal weighting should be considered. However, because it was stated that seasonality did not affect the two case examples presented, it is possible that local regulators will conclude that seasonality will not affect their regions either. CVCWA requests that USEPA consider broadening the discussion of seasonality effects and include a case

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<sup>12</sup> SC monitoring in the Central Valley has shown that SC at one station has ranged between 500-1200 µS/cm within one year.



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example of a region where it is considered an important factor. CVCWA anticipates that seasonality will have a strong impact on the Central Valley such that separate wet and dry criteria should be developed in addition to waterbody specific criteria, due to variable background SC values.

Seasonality is just one possible confounding factor, but many others could exist (including high surface water temperatures, low stream flow, poor mixing conditions, stream order, vegetative cover, substrate composition, etc.). These confounding factors hinder EPA's ability to definitively demonstrate a causal effect of specific conductivity on macroinvertebrate species tolerance. While the Draft Report does include a discussion of confounding factor analysis in Appendices A and B, there is minimal discussion of confounding variables in the application of the B-C Method to other regions. In order to truly demonstrate that extirpation is caused by SC and not some other factor leading to the application of an incorrect criterion, it is essential that a robust confounding variable analysis also be required for Level III ecoregions assessed with the B-C Method.

Recommendations:

- Include a broader discussion of the possible effects of seasonality on criteria development and include a case study of a region that has strong seasonal effects such as would more likely occur in the arid western U.S.
- Require a confounding variables assessment be applied to any region assessed with the B-C Method in addition to sites assessed using the XCD method.

CVCWA and CASA appreciate the opportunity to provide comments on the Draft Field-Based Methods for Developing Aquatic Life Criteria for Specific Conductivity. If you have any questions, or if CVCWA can be of any further assistance, please contact CVCWA at (530) 268-1338 or [eofficer@cvcwa.org](mailto:eofficer@cvcwa.org) or CASA at (916) 446-0388 or [alink@casaweb.org](mailto:alink@casaweb.org)

Sincerely,



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