



# Department of Pesticide Regulation



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## MEMORANDUM

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FROM: Marshall Lee  
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*Original signed by*

DATE: September 15, 2006

SUBJECT: REVIEW OF PHASE II REPORT ON METHODOLOGIES FOR DERIVING  
WATER QUALITY CRITERIA: EXECUTIVE SUMMARY AND CHAPTERS 1-3

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Thank you for the opportunity to review the draft report, *Methodology for Derivation of Pesticide Water Quality Criteria for the Protection of Aquatic Life in the Sacramento and San Joaquin River Basins, Phase I: Methodology Development and Derivation of Chlorpyrifos Criteria*. When Dr. Patti TenBrook, University of California, Davis, requested my review, she asked me to respond to specific questions related to the draft report and to submit separate comments for the Executive Summary and Chapters 1 through 3 and for Chapter 4. My comments on the Executive Summary and Chapters 1 through 3 are presented below.

*1. Accuracy and completeness of the information presented: Are any important methodologies, references or other information missing?*

General Comment: The information is complete and appropriately referenced, particularly when the Phase I and Phase II reports are considered together.

Specific Comments on Section 2-2.5.2: This section describes how ecotoxicity data are evaluated for inclusion in subsequent criteria setting procedures. The section references ECOTOX (2006), which provides directions for quantitatively scoring the completeness of the data's accompanying documentation. (Table 1 [Documentation Code Scoring for Aquatic and Terrestrial Laboratory/Field Data] in ECOTOX [2006] provides a scoring scheme for documentation). The section also notes that the data's acceptability and relevance need to be evaluated as well, but is unclear how to do so. "Weighting of scores for acceptability is based upon test acceptability criteria as stated in standard methods," but such methods are not references or further described. Similarly, the section notes that "... elements for judging relevance ... can be weighed and rated in a similar fashion," but the reference is unclear. Also,



the system for scoring relevance needs to weigh “critical factors,” but the report does not provide guidance on how this should be done. Additional explanation is needed for a reader to independently understand scoring criteria for acceptability and relevance and how they are applied.

The third paragraph in the section describes how reliability scores (the average of the documentation scores and acceptability scores) and relevance scores are used to select ecotoxicity data that will be used to calculate water quality criteria. As proposed, the selection process depends on how a data score compares to other scores (i.e., in the 75th or higher percentile of all scores), not whether a score meets a predetermined measure of quality. This may inappropriately exclude *high* quality data that may not qualify—compared to other data—as *top* quality data. A study’s reliability and appropriateness for criteria setting should be judged on its own merits, not how it compares to other toxicity studies. The authors should more fully explain why they prefer their proposed measure of quality to a more absolute measure of quality. Is there precedence for distinguishing data quality in this way? If so, references would be helpful. In addition, the report does not provide a compelling defense for using the 75th percentile as a cutoff for data to be used in the final derivation.

Lastly, note that the citation for ECOTOX (2006) on page 2-12 appears misplaced on page 3-25.

*2. Appropriateness of the approach used to compare and assess methodologies.*

The authors gave a logical, well-researched, and well-referenced approach for comparing, assessing, and recommending methodologies for criteria development. The Phase I report offers an excellent complement to the Phase II report in this regard and provides essential information for understanding how the methodology was selected.

*3. Evaluation and interpretation: Are the key features of the methodologies evaluated thoroughly and correctly? Are strengths and weaknesses identified? Are conclusions supported?*

Except where noted in this review, the authors thoroughly and correctly evaluated and presented the key features of the methodology, particularly when the Phase 2 report is read with the Phase 1 report as a resource.

One of the key features of the methodology is the selection of the distribution used to characterize the toxicity data set. As the report—and the Phase 1 report—makes clear, several distributions have been used worldwide and all of them (log-normal, log-logistic, log-triangular, and the Burr Type III distributions) typically show a good fit for the data and provide for the derivation of protective criteria. The authors’ preference for the Burr Type III distribution is based on its performance when a “goodness of fit” comparison was made among the log-normal, log-triangular, and Burr Type III distributions, and on its capability to deal with data sets that

violate assumptions of log-normality. Because the fits of the log-normal and Burr Type III distributions were apparently very close and because the toxicity data sets that provide the basis for these comparisons can change through time, it would not be surprising if—with the addition of additional toxicity values—the outcomes of fitness comparisons were different. Given these apparent conditions, would it be more appropriate to derive the criteria based on which distribution fits the data best on a case-by-case basis? This approach is apparently similar to that used by the Dutch and the Danish, as stated in Section 7.2.2.1. of the Phase I report.

*4. Are there any scientific issues that should have been addressed in the report, but were not included?*

The report should acknowledge that the proposed methodology is sensitive to the assortment of species that represents each of the five taxonomic categories. For example, the final acute toxicity data set for chlorpyrifos presented in Table 4.1 includes 96 hour LC/EC50s for channel catfish (*Ictalurus punctatus*; 806 µg/L) and bluegill (*Lepomis macrochirus*; 10 µg/L). Each could represent the “warm water fish” requirement; each has very different sensitivity to chlorpyrifos. If, hypothetically, the warm water fish requirement were satisfied only by bluegill or only by channel catfish, the resulting criteria could be quite different, particularly if the rest of the data set representing the other four categories were small. It appears that the only way to counter this effect is for agencies to have the flexibility to revise criteria at reasonable intervals to account for new toxicity data and expanded data sets.

*5. Taken as a whole, is the analysis in the report based upon sound scientific knowledge, methods, and practices?*

Yes. The report was well researched, and the references were objectively reviewed.

As an additional comment, the Department of Pesticide Regulation (DPR) appreciates how difficult this project is and that water quality criteria and objectives derived from an improved methodology could potentially be a cornerstone of efforts addressing pesticide use and water quality for years. DPR relies on current criteria and objectives to justify its actions related to protecting water quality, and it anticipates that it will respond similarly when new or revised criteria and objectives are exceeded. Thus, DPR has an understandable interest in assuring that a new methodology and water quality criteria and objectives based on it are as defensible as possible.

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Most of the proposed methodology has underlying statistical principles that are undoubtedly full of nuance. I do not know the expertise of your academic peer reviewers, but I trust that you sought out experienced applied statisticians who could effectively comment on the method's statistical underpinnings. I recommend that you help assure that someone with a lot of experience with applied statistics has an opportunity to review the proposed methodology.

Thank you for your consideration of these comments—I hope they are helpful. Please feel free to contact me if you have any questions.