From:	Robert Law
To:	LaPoma, Jennifer
Cc:	Willard Potter; John Toll; Mike Johns
Subject:	Re: Question regarding Bioaccumulation Tissue Calculations
Date:	Thursday, July 21, 2016 2:30:51 PM

Jennifer:
To help further discussion of the bioaccumulation model-predicted BSAFs of benthic invertebrates, it is useful to go over the evaluation methods discussed to date:

Comparison of LPRSA model-predicted BSAFs to Lab Worm Data (Windward 2009 Bioaccumulation Tissue report)
Lab worm data were not originally intended for use in model evaluations or calibration, but this comparison of model-predicted and empirical data was presented as part of the model uncertainty analysis for informational purposes. The following presents various reasons why the modeled data should not be expected to match the empirical data to the extent that Region 2's bioaccumulation modeling reviewers have assumed:

- Sediment samples used for worm bioaccumulation tests were not analogous to modeled sediment
    - Sediment samples from RM 0 - 6 used for estuarine worms, RM 6 - 16 for freshwater worms. Your team compared the tissue concentrations achieved under laboratory exposure to these sediments to predicted tissue concentrations in benthic macroinvertebrates exposed to a site-wide surface-weighted average sediment concentration (SWAC).
    - The sediments used in bioaccumulation tests were not meant to be representative of site-wide or sub-area mean contaminant or organic carbon concentrations, so use in model evaluation inappropriate
    - The co-located sediment data for lab worms has been provided previously and can be provided again upon request
- Lab exposure are not representative of field conditions. For example, in the lab, overlying water was changed daily
- Lab worm data are for two species, while the bioaccumulation model predicts concentrations for groups of benthic invertebrates, not just these two individual species). The two lab worm species are the following:
    - *Neresis virens* - an estuarine worm that falls into the "Carnivore/Omnivore" modeling compartment
    - *Lumbriculus variegatus* - a freshwater worm that falls into the "Deposit Feeder" modeling compartment
- The evaluation in your attached document mistakenly compares *Neresis virens* lab data to Deposit Feeder model predictions (see table 4-4 of LPR Bioaccumulation Model Calibration Report for reference). *N. virens* is a carnivore/omnivore.
- The attached evaluation also mistakenly compares *N.virens* lab data to site-wide model predictions. The species is limited to the lower reaches of the LPRSA by salinity conditions.
- Despite the inherent limitations in comparing model-predicted invertebrate data to

the worm bioaccumulation test data, our model-predicted deposit feeder BSAFs fell within the range of empirical BSAFs that your team generated.

Comparison of LPRSA model-predicted BSAFs to Inner and Outer Bay BSAFs from the Hydroqual 2007 Modeling Report

- Environmental differences between these locations and the LPRSA make comparison of BSAFs inappropriate; differences in BSAFs across sites are expected

- BSAFs from the Hydroqual report are for polychaetes, which is not representative of any one LPRSA bioaccumulation modeling compartment

- Hydroqual modeling report mentions "co-location issues." As such, the quality and relevance of the Hydroqual BSAFs is uncertain and should be examined for consistency with EPA's guidance for BSAF calculation.

- Contaminant concentrations, organic carbon content, and lipid content in Hydroqual sediment/tissue samples significantly different than bioaccumulation model inputs. These are important parameters affecting and the differences should be addressed.

- CPG made an initial effort to address differences in organic carbon and lipid. When these differences are accounted for, the LPRSA bioaccumulation model-predicted Deposit Feeder BSAFs are within the range of the Hydroqual BSAFs

Comparison of LPRSA model-predicted BSAFs to available literature BSAFs

- Addressed in 6-29-16 meeting with Region 2

- Summary table presented in this meeting showed that LPRSA model-predicted BSAFs are within the range of the available literature values

In closing, it is important to note that the bioaccumulation model inputs will be changing, due to refinements in up-the-chain models, implementation of the 15 cm exposure depth, and moving the calibration period to WY 2009-2010, and the calibration of the model will change based on these changes as well as in response to Region 2 comments, so the bioaccumulation model-predicted BSAFs will almost certainly change as well.

Please contact us with any questions or comments.

Thank you.

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>>> "LaPoma, Jennifer" <LaPoma.Jennifer@epa.gov> 7/15/2016 2:52 PM >>>
Rob,

Could the CPG please clarify the derived BSAF for "bioaccumulation samples" in the Lower Passaic. Our simple calculations (attached) suggest that, compared to these "bioaccumulation samples," the model is over predicting deposit feeders by a factor of > 10 for 2378-TCDD and by a factor of 1.7 to 5.5 for TPCB. To derive these estimates we compared the bioaccumulation model results with the "bioaccumulation tissue" samples data cited in Appendix F of the document and which come from the document *2009 BIOACCUMULATION TISSUE CHEMISTRY DATA FOR THE LOWER PASSAIC RIVER STUDY AREA.* Are there more synoptic sediment samples to compare with these bioaccumulation tissue chemistry results? From what I understand it may they have been suggested that the model is only overpredicting by a factor of 2 compared to these samples.

Thanks,
Jennifer LaPoma