## TECHNICAL ADVISORY COMMITTEE MEETING #5

12424 42nd Ave South, Tukwila, WA 98168
June 18, 2015

## TAC PARTICIPANTS

- Kevin Buckley, Seattle Public Utilities
- Mike Mactutis, City of Kent
- Dale Norton, Ecology Environmental Assessment Program
- James Rasmussen, Duwamish River Cleanup Coalition
- Pete Rude, Seattle Public Utilities
- Jeff Stern, King County DNR/WTD
- Ron Straka, City of Renton
- Heather Trim, Duwamish River Cleanup Coalition

## ADDITIONAL MEETING PARTICIPANTS

- Mahbub Alam, Ecology Toxics Cleanup Program
- Sen Bai, Tetra Tech
- Jon Butcher, Tetra Tech (via phone)
- Becky Chu, USEPA CERCLA
- Ben Cope, EPA
- Curtis DeGasperi, King County DNR/WTD
- Kelly Foley, EnviroIssues
- Dave Garland, Ecology Water Quality Program
- Alex Horner-Devine, University of Washington
- Marty Jacobson, EPA
- Bo Li, Ecology Water Quality Program
- Rachel McCrea, Ecology Water Quality Program
- Roger McGinnis, Hart Crowser
- Maggie McKeon, University of Washington
- Teresa Michelsen, Avocet Consulting
- Mike Milne, Brown and Caldwell
- Erika Morgan, City of Black Diamond
- Joan Nolan, Ecology Water Quality Program
- Rick Schaefer, Tetra Tech
- Angie Thomson, EnviroIssues

## WELCOME AND INTRODUCTIONS

Angie Thomson, facilitator, welcomed everyone and led the group in a round of introductions. Angie provided a brief overview of the agenda, noting that the focus of the meeting was to review the outcomes of the interested parties meeting and the data gaps and pollutant groupings memo. She made note that during the previous meeting, TAC members heard a data presentation from King County and an overview of the data gaps and pollutant groupings memo. TAC members also refined preliminary parameters, now referred to as candidate parameters, which would be discussed again at this meeting within the context of the data gaps and pollutant groupings memo.

## RECAP INTERESTED PARTIES MEETING

Rachel McCrea, Department of Ecology, gave a presentation that highlighted the purpose, format, and outcome of the May 28 interested parties meeting. She noted that approximately 65 people attended the meeting with a diversity of backgrounds and familiarity with the project. Attendees included the project team, WRIA 9 members, consultants, citizens, and other state and federal agency personnel. She explained that the format of the meeting included presentations, a panel discussion, and small group discussion on the status of toxics in the Green-Duwamish Watershed and the goals of the Pollutant Loading Assessment (PLA). Rachel went over key feedback from the meeting and explained that this feedback would be used to inform next steps and the process for developing the PLA.

TAC members asked the following question following the overview of the interested parties meeting:

- Is Governor Inslee interested in banning phthalates?
  - Ecology and EPA noted that there was a proposal related to toxics reductions, but it was not specific to phthalates.

## CANDIDATE PARAMETERS

Rachel McCrea provided an overview of the criteria used to identify candidate parameters. She explained that the goals of the PLA are largely driven by regulatory requirements in the Clean Water Act (CWA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). As a result, the tier 1 evaluation criteria for the candidate parameters are largely based on water quality impairments as found in 303(d) list and CERCLA risk drivers. She further explained that tier 2 criteria are more qualitative in nature and relates to development of the PLA model.

TAC members had the following questions and comments about the criteria used to evaluate the parameters:

- It would be helpful to outline the connection between the goals and objectives of the PLA to selection of the criteria for each parameter. How are the evaluation criteria linked to the goal of avoiding recontamination in the Duwamish?
  - Ecology and EPA noted that CWA 303(d) listings and CERCLA risk drivers were incorporated as part of the tier 1 criteria and the recontamination concern was incorporated in the tier 2 criteria.
- It would be helpful to add another column to the candidate parameter list which indicates whether or not the parameters were added based on tier 1 or tier 2 criteria.

Sen Bai, Tetra Tech, presented recommendations for which candidate parameters to model, based on Table 3 in the data gaps and pollutant groupings memo. A summary of the questions and comments from the TAC and answers from Ecology and EPA are provided below as added to Table 3.

**Table 3. Summary of knowledge gaps and options for candidate pollutants**

| Knowledge Gap | Options and Recommendations | TAC Feedback |
|---|---|---|
| There is a lack of paired filtered/unfiltered data for site-specific determination of partition coefficients for PCBs, PAHs, dioxin/furans, and phthalates in both the water column and the sediments. | Options:<br>1. Use literature values that may not reflect local conditions.<br>2. Collect paired data to evaluate coefficients and improve accuracy<br>Recommendation: Team should consider Option 2. | • Toxicity equivalence Quotients (TEQs) are used in CERCLA human health risk assessment. Did you consider TEQs are they relate to the parameters being modeled?<br>○ TEQs will be considered in modeling and analysis since they relate to equivalent toxicity for human health risk assessment as done in LDW RI/FS, but we need to remember, CWA water quality standards are not based on TEQs. TEQs themselves are not model state variables but are derived from the concentrations of individual chemical forms. |
| No data are currently available to directly constrain rates of exchange from the sediment into the water column of non-polar organic pollutants (PCBs, dioxin/furans, PAHs, phthalates), which may be enhanced above typical diffusion rates by biological action. | Options:<br>1. Treat exchange rates as calibration parameter.<br>2. Constrain rates based on field evidence.<br>Recommendation: Ongoing work by MIT for USACE may provide field data for the LDW, enabling use of Option 2. | • No TAC feedback. |
| Data for PCBs reported as Aroclors is problematic for comparison to congeners and homologs due to changes in composition from differential weathering. This creates uncertainty in estimating total PCBs as well as the concentration of individual congeners with high TEFs. | Options:<br>1. Use Aroclor data only, providing a consistent basis for analysis.<br>2. Assume unaltered Aroclors to interpret congener concentrations and total PCBs from Aroclors; combine with congener data.<br>3. Use samples analyzed for both Aroclors and congeners to evaluate site-specific relationships between environmentally altered Aroclors and congeners in the LDW.<br>Recommendation: Option 3 is preferable for accurate analysis of PCBs. This takes advantage of available data and allows better specification of kinetic parameters. | • Geographic analysis should also be considered because data availability may vary greatly by geographic region.<br>• Can both Aroclors and PCB congeners be modeled?<br>○ Both Aroclors and PCBs could be modeled. Aroclors are mixtures of congeners that are gradually altered by weathering in the environment; however, approximate translations between congeners and Aroclor equivalents can be developed. The goal of the modeling will drive which parameter to model, and what tool will be used for data analysis. |
| Dioxin/furan data are limited, with few water column and biological samples available at this time. | Options:<br>1. Simulate behavior of selected dioxins/furans using available data and literature coefficients.<br>2. Delay simulation of dioxins/furans until ongoing data collection efforts produce sufficient information to calibrate a model.<br>Recommendation: Option 2. The same simulation framework employed for PCBs can be used for dioxins/furans once additional monitoring data are available. | • Dioxins should be modeled regardless of current data availability as more data becomes available.<br>○ Ecology noted that it may be possible to model dioxins (2,3,7,8 TCDD) using PCBs as a surrogate because both PCBs and 2,3,7,8 TCDD exhibit similar behavior provided a stable relationship between the PCBs and 2,3,7,8 TCDD exists which may not be likely. In addition, modelling dioxins may not be useful because 2,3,7,8 TCDD is not often detected in sediments or the water column, and is only found in fish tissue, making calibration difficult. |
| For mercury, there is a lack of methylmercury data as well as information on factors that influence methylation (redox, sulfate balance). | Options:<br>1. Simulate total mercury only.<br>2. Attempt to simulate mercury methylation using literature values.<br>3. Collect methylmercury data to support modeling.<br>Recommendation: Option 3 is preferable if mercury is to be modeled; however, lack of data suggests that mercury should not be modeled at this time (see below). | • No TAC feedback. |
| For copper, zinc, and arsenic, the information on competing common ions and chemical conditions appears insufficient for a full analysis of solid and aqueous speciation incomplete to support redox chemistry. | Options:<br>1. Simulate ionic metals as general quality constituents that can deposit to or erode from the sediment but are otherwise conservative.<br>2. Represent ionic metals partitioning to solids and solubility using the method recommended by USEPA (1996); modify EFDC and LSPC model codes to represent this behavior.<br>3. Collect additional data and develop a detailed geochemical simulation.<br>Recommendation: Option 2 appears to be the most feasible alternative for copper and zinc. Option 1 should be sufficient for arsenic. | • Is modeling copper and zinc useful as it relates to the goals of the PLA?<br>○ Copper is related to Endangered Species Act (ESA) impacts, while zinc is related to the built environment. It is helpful to include these parameters, but we will be thoughtful as to whether or not it would be useful to collect new data. In addition, there are 303 (d) listings of Cu in water column of the watershed. |

## LDW EFDC MODEL

Sen Bai, Tetra Tech, provided a summary of the LDW EFDC Model, outlining previous modeling efforts, known data sets, data gaps, knowledge gaps, and recommendations based on this information. A summary of these data and knowledge gaps, recommendations, and TAC feedback is provided below as added to Table 15.

**TABLE 15. SUMMARY OF DATA, KNOWLEDGE GAPS AND OPTIONS FOR EFDC MODEL**

| Data and Knowledge Gap | Options and Recommendations | TAC Feedback |
|---|---|---|
| In general, data are available but limited in some media. Data gaps and knowledge gaps exist for initial, boundary, and calibration data. | Options:<br>1. Use all available information including data and previous models to develop a model now of recent historic conditions.<br>2. Collect additional data and delay modeling to the future. Data collection needs to be coordinated to obtain initial, boundary, and calibration data sets in all media.<br>Recommendation: Start developing and calibrating the model with available data and use model to guide needs for new data collection. | • There are data available for water quality and surface sediments in the east and west waterways, and CSO data across the City of Seattle and King County that could be used to support calibration of the model.<br>• There are dynamic flow issues between the east and west waterways.<br>o In the model, the main waterway is divided into segments that represent the east and west waterway to account for these differences.<br>• There are air deposition data available that could be used to support model development. |
| Limited data for assigning initial conditions in the water column for all toxics | Options:<br>1. Assign low levels of initial toxics and equilibrate with sediment using a model spin-up period.<br>2. Collect data if the modeling period is in the future.<br>Recommendation: Use model spin-up combined with existing data; test sensitivity of model results to this assignment. We anticipate low sensitivity to initial conditions in the water column. | • No TAC feedback. |
| Data for sediment initial conditions (depending on the modeling period) and need to account for remedial actions over time. | Options:<br>1. Rely on existing data and use previous model results if modeling a historical period.<br>2. Collect new data if the modeling period is in the future.<br>Recommendation: It is unlikely that the massive characterization effort for sediment conditions undertaken in the RI can be repeated. The PLA model should thus rely on existing sediment data, but also needs to account for interim remedial actions over time. Applying the model to multiple years can be used to test simulated responses to remedial actions. In addition, use long model spin-up time and conduct multiple model tests. | • No TAC feedback. |
| SSC and toxic loadings from upstream | Options:<br>1. Use watershed model results for modeling a historical period.<br>2. Continue collection of comprehensive toxics data from the watershed and develop the model in the future.<br>Recommendation: Existing HSPF models are calibrated for flow and sediment. Develop the upstream loading with a combination of these models and existing data; continue collection of new data to fill knowledge gaps for LSPC simulation. | • No TAC feedback. |
| SSC and toxics loadings from CSOs | Options:<br>1. Use existing CSO monitoring data and event volume modeling combined with best estimates of pollutant concentrations.<br>2. Combine CSO model and monitoring data with watershed model simulations of surface stormwater-derived loads.<br>Recommendation: Use CSO model to develop time series of mixing ratios and estimate CSO concentrations based on fractions of stormwater and sanitary sewage. Use HSPF/LSPC to estimate stormwater concentrations and monitoring data for sanitary sewage concentrations. Confirm model performance relative to CSO outfall monitoring. | • Are you modelling the CSOs as controlled?<br>o For the LDW EFDC model we will want to use the actual historic CSO data if available. In modelling future scenarios, CSOs would be represented with appropriate controls.<br>• When modeling CSO inputs, will storm drains be considered a separate event in the model? How will the 200+ stormwater outfalls be accounted for in the model?<br>o For the drainage areas where surface runoff flows into CSO pipes, the CSO model will simulate them. For the drainage areas where runoff will enter the stormwater pipes or directly enters the Duwamish, LSPC will be used. Individual drains will be aggregated so that the total flow and contaminant loadings can be allocated to EFDC cells. It will be dependent on subcatchment delineations in the watershed model. |
| Limited toxics data in the water column; lack of information to do site-specific evaluation of some kinetic parameters such as partition coefficients. | Options:<br>1. Use available data and literature to approximate kinetic parameters.<br>2. Collect new field data to gain knowledge.<br>3. Conduct laboratory experiments to fill knowledge gaps.<br>4. Conduct literature review to fill knowledge gaps.<br>5. Conduct model sensitivity and uncertainty analyses to fill knowledge gaps.<br>6. Collect synoptic data for a modeling period in the future and delay model implementation.<br>Recommendation: Develop model beginning with available data. Options 1 to 5 can all be potentially used to further constrain the data and knowledge gaps the model based on resource availability. Initial model development will greatly assist in determining the cost:benefit ratio of specific types of data collection. | • Will the partition coefficients be dependent on salinity or temperature?<br>o Organic carbon content of the sediment is the most important factor affecting partitioning of PCBs and other non-polar organics. The effective partition coefficients can be represented as temperature dependent. Dependence on salinity is less well-established but could be considered if evidence is available. |

## LDW FOOD WEB MODEL

Jon Butcher, Tetra Tech, presented on the proposed food web model, including an overview of existing food web model efforts, existing data, data and knowledge gaps, and recommendations based on this information. A summary of the data and knowledge gaps, recommendations, and TAC feedback is provided below as added to Table 16.

**TABLE 16. SUMMARY OF KNOWLEDGE GAPS AND OPTIONS FOR FOOD WEB MODEL**

| Knowledge Gap | Options and Recommendations | TAC Feedback |
|---|---|---|
| Lack of contemporaneous data in all media and biota | Options:<br>1. Conduct comprehensive new round of synoptic data in all compartments<br>2. Use models to estimate temporal changes in stores<br>Recommendation: Option 2 is recommended despite being suboptimal due to the large cost of new comprehensive surveys. | • New fish tissue and sediment data may be available in the next five years as a result of sediment cleanup design efforts.<br>• Consider using the existing Food Web Model as it was built using the best available data and has been peer reviewed.<br>    ○ The existing model is a great starting point since it was built upon for PCBs, but it might not work for other parameters. Sensitivity analyses were conducted on this model and it was determined that additional efforts could reduce uncertainty levels.<br>• Phthalates are rapidly metabolized in fish. Occasional high tissue concentrations reflect recent exposure to hotspots. Given these observations, it may not be necessary to address phthalates in the food web model. |
| Limited information on dietary sources of individual species | Options:<br>1. Conduct gut content surveys<br>2. Rely on existing data<br>Recommendation: Rely on existing data (2), but supplement prior FWM effort by soliciting additional information from wildlife and university sources. | • No TAC feedback. |
| Limited tissue and exposure data for dioxins/furans | Options:<br>1. Collect additional data<br>2. Perform modeling based on limited extant data<br>3. Do not model dioxins/furans at this time<br>Recommendation: Based on the contaminant-specific analyses, do not apply FWM to dioxins/furans at this time. | • No TAC feedback. |
| Lack of environmental exposure data for methylmercury | Options:<br>1. Collect additional data to characterize methylmercury exposure<br>2. Simulate based on approximations from total mercury<br>Recommendation: Do not pursue FWM simulation of mercury at this time. | • No TAC feedback. |
| Limited modeling tools for evaluating bioaccumulation of arsenic, copper, and zinc; limited data on factors controlling bioavailability | Options:<br>1. Do not model bioaccumulation of metals<br>2. Use DYMBAM model for bioaccumulation of metals<br>Recommendation: Base analysis for these constituents on ambient WQS for protection of aquatic life rather than bioaccumulation models. Do not implement DYMBAM. | • Consider using bioavailability in addition to bioaccumulation in the context of metals.<br>• The food web is benthic driven, not water column driven. As a result, exposure to metals is a greater concern than bioaccumulation.<br>• Phthalates are rapidly metabolized in fish. Occasional high tissue concentrations reflect recent exposure to hotspots. It is recommended that phthalates not be included in the food web model.<br>• The model should be considered a benthic toxicity model.<br>    ○ It is premature to dismiss water column accumulation pathways. The model can be used to test sensitivity to this component. |

## WATERSHED MODEL

Jon Butcher, Tetra Tech, presented on the watershed model. He provided an overview of existing studies and data gathering efforts, data and knowledge gaps, and recommendations based on this information. A summary of known data and knowledge gaps, recommendations, and TAC feedback is provided below.

**TABLE 24. SUMMARY OF KNOWLEDGE GAPS AND OPTIONS FOR WATERSHED MODEL**

| Knowledge Gap | Options and Recommendations | TAC Feedback |
|---|---|---|
| Limited data for dioxins/furans in general | Options:<br>1. Do not model dioxins/furans in the watershed<br>2. Pursue additional data collection prior to modeling<br>3. Use model to develop a preliminary analysis of key dioxins/furans<br>Recommendation: A combination of options 2 and 3 should be pursued. The watershed model should be used to develop a preliminary scoping analysis of dioxins/furans (focusing on 2,3,7,8-TCDD as a surrogate) using an approach similar to PCBs. This scoping model can be used to conduct sensitivity analyses to guide additional data collection needs for an eventual comprehensive model of these constituents. | • No TAC feedback. |
| Limited data for copper, zinc, mercury, and DEHP in the Upper Green River* | Options:<br>1. Collect additional data prior to modeling<br>2. Assume loads are driven by geology and/or atmospheric deposition and proceed with modeling.<br>Recommendation: Option 2 is recommended because loads are expected to be small from this relatively undeveloped area. Sensitivity analyses with the model can be used to determine the value of additional information. | • No TAC feedback. |
| Poor status of existing TSS calibrations in certain sub-basins | Options:<br>1. Use existing calibrated parameters<br>2. Expend effort to improve calibration<br>Recommendation: Because movement of sediment is key to the movement of sediment/solids-sorbed pollutants, effort should be expended to improve the existing TSS calibration. | • It is important to remember that sediment transport is an integral part of the model and also impacts conditions in the LDW.<br>  ○ Agreed. Performance of the model relative to sediment transport should be carefully examined. |
| Need for further instream watershed data for parameters in general to support model validation | Options:<br>1. Collect additional data prior to modeling<br>2. Proceed with model calibration and collect additional data to support further validation in the future<br>Recommendation: Option 2 is recommended. While data are deemed sufficient for initial model configuration and calibration, the data sets to support instream calibration do not span long periods of time. Sensitivity analyses with the model can be used to inform additional data collection. | • How does the model account for land use change in the future?<br>  ○ The model is based on Hydrologic Response Units (HRUs) that combine land use and soil characteristics. These are simulated on a unit-area basis, then multiplied by area occurring in each subbasin. It is an easy matter to alter the model table of areas in each HRU to reflect land use changes over time.<br>• It is recommended that a separate data gaps and knowledge analysis be conducted on direct stormwater inputs to the LDW as it is not clear how the stormwater system will be handled in any of the proposed models. There are one or more models of direct stormwater drainage in the Seattle portion of the watershed.<br>  ○ Seattle stormwater models have not been obtained and reviewed at this time. We agree that further work is needed on this component. |

*The upper Green River refers to the Green River above the Howard Hanson dam.

After reviewing the data gaps and pollutant groupings memo, TAC members provided some general feedback for the PLA modeling effort:

- There are existing data that have not been included in the data gaps and pollutant groupings memo. TAC members will work with Ecology and EPA to provide any additional data.
- It is requested that additional data gathering efforts be as robust as possible. It is recommended that PLA data gathering efforts be coupled with current data gathering efforts based on common goals.
- The role of stormwater in each of the models is not clear at this point. It was requested that the representation of stormwater be better described for each of the models.

Ecology and EPA thanked the TAC members for their feedback on the models, noting that there is always room for improvement when conducting a large scale modelling effort like this and that any information to improve the model is welcome.

## COMMENTS FROM THE AUDIENCE

- It is strongly recommended that a total TEQ approach be used when evaluating dioxins because most existing studies follow this approach.
- How are data being collected as part of NPDES permit programs being used?
  - Ecology and EPA intend to use this information, but have not yet determined how.
- Does the EFDC model need to be recalibrated to make sediment transport more robust?
  - Ecology and EPA have not yet decided on the model simulation period. We will make this determination after we decide on the model simulation period.

## NEXT STEPS

At the next TAC meeting, TAC members will continue their discussion about the data gaps and pollutant groupings memo. Other discussion topics will include HRUs and QAPP development. TAC members will also be given the opportunity to provide feedback on the PLA development process so far and make suggestions for improvement.

<u>Action items:</u>

- Add a column to the candidate parameter list to indicate whether the parameter was chosen based on tier 1 or tier 2 criteria.
- Coordinate with TAC members regarding existing data sets that were not included in the data gaps and pollutant groupings memo.
- Better describe the way that stormwater is addressed in each of the proposed models.

<u>TAC homework:</u>

- Alert Ecology or EPA to any existing data sets that were not included in the data gaps and pollutant groupings memo.
- Review the meeting #5 summary and provide edits before July 16, 2015.