GREEN-DUWAMISH POLLUTANT LOADING ASSESSMENT

TECHNICAL ADVISORY COMMITTEE

February 19, 2015

Meeting 2

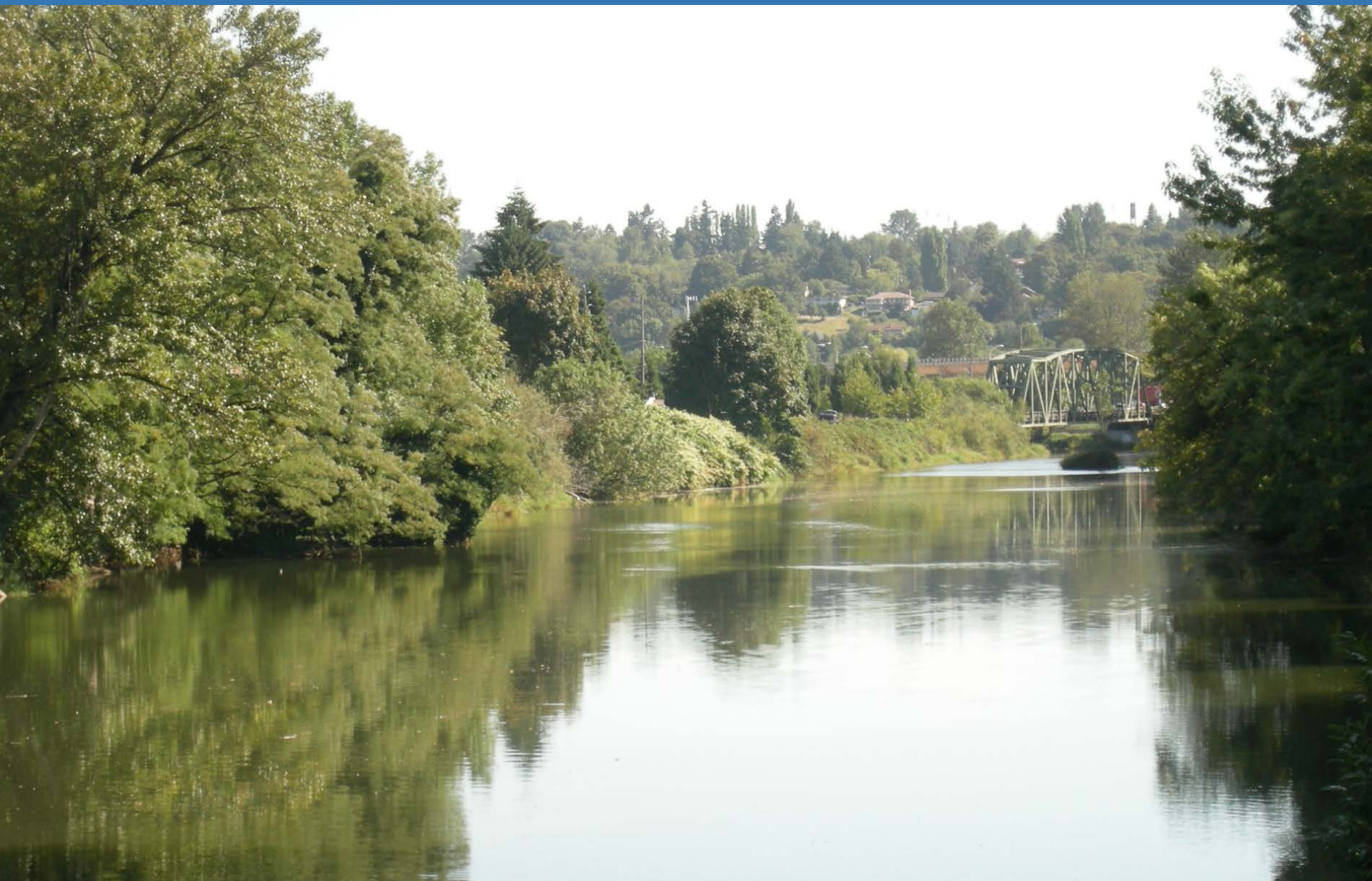
DEPARTMENT OF ECOLOGY
State of Washington

EPA

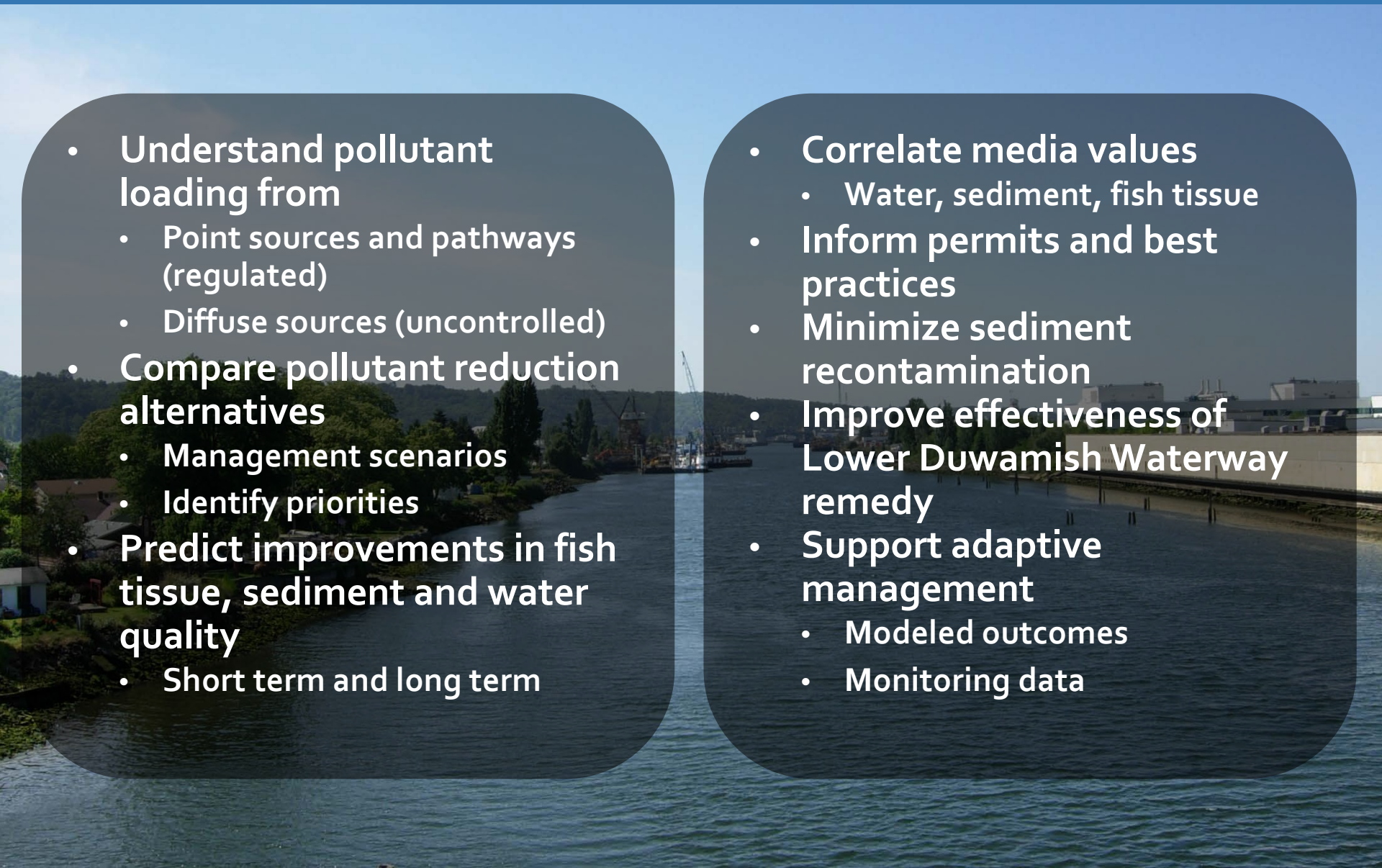
TAC Meeting 2 Agenda

Time	Topic
9:00 am	Welcome & introductions
9:10 am	Review, refine, confirm PLA objectives
9:50 am	PLA work plan
10:20 am	Break
10:35 am	Next steps in PLA work plan
10:55 am	Data and model evaluation memo
11:40 am	Comments from audience
11:55 am	Next steps
12:00 pm	Adjourn

Review, refine, confirm PLA objectives



Watershed Management Needs



- Understand pollutant loading from
  - Point sources and pathways (regulated)
  - Diffuse sources (uncontrolled)
- Compare pollutant reduction alternatives
  - Management scenarios
  - Identify priorities
- Predict improvements in fish tissue, sediment and water quality
  - Short term and long term

- Correlate media values
  - Water, sediment, fish tissue
- Inform permits and best practices
- Minimize sediment recontamination
- Improve effectiveness of Lower Duwamish Waterway remedy
- Support adaptive management
  - Modeled outcomes
  - Monitoring data

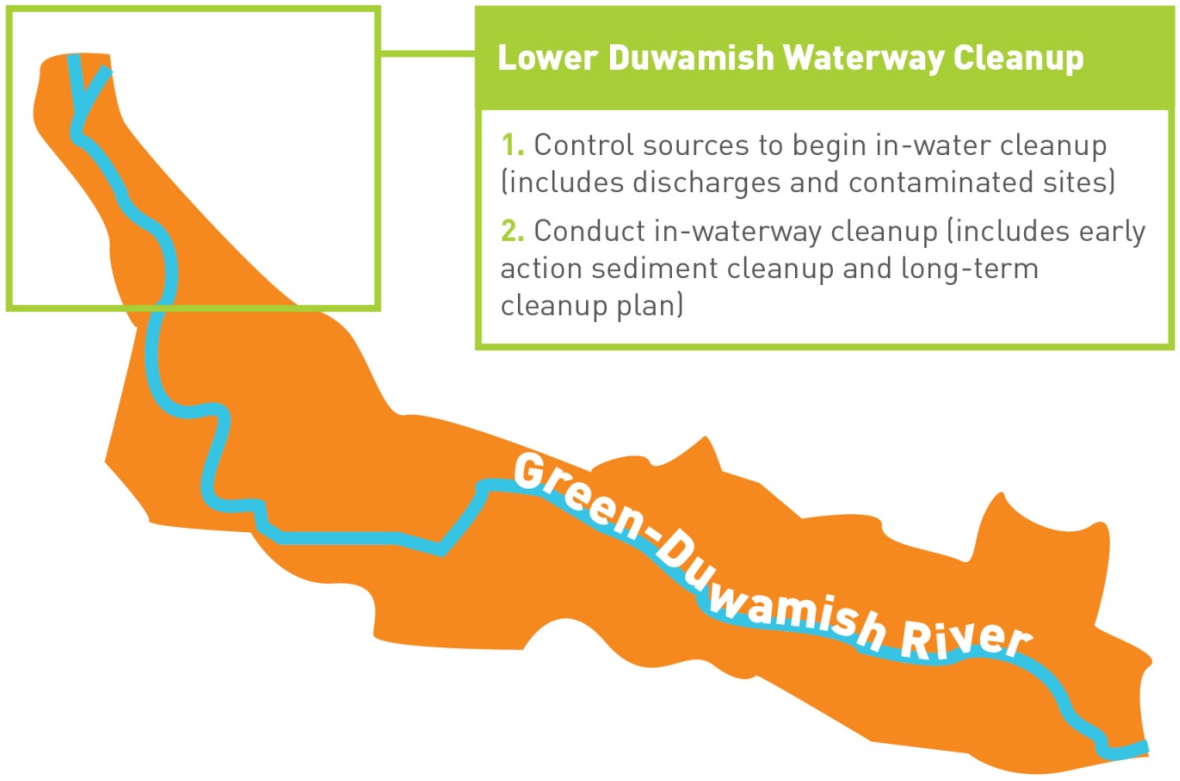
Why Develop a PLA Modeling Tool?

Towards Protecting Human Health & the Environment

Green-Duwamish River Watershed

Pollutant Loading Assessment Modeling Tool

1. Identify pollution sources throughout the watershed
2. Develop source reduction targets and strategies (including for diffuse unregulated sources)

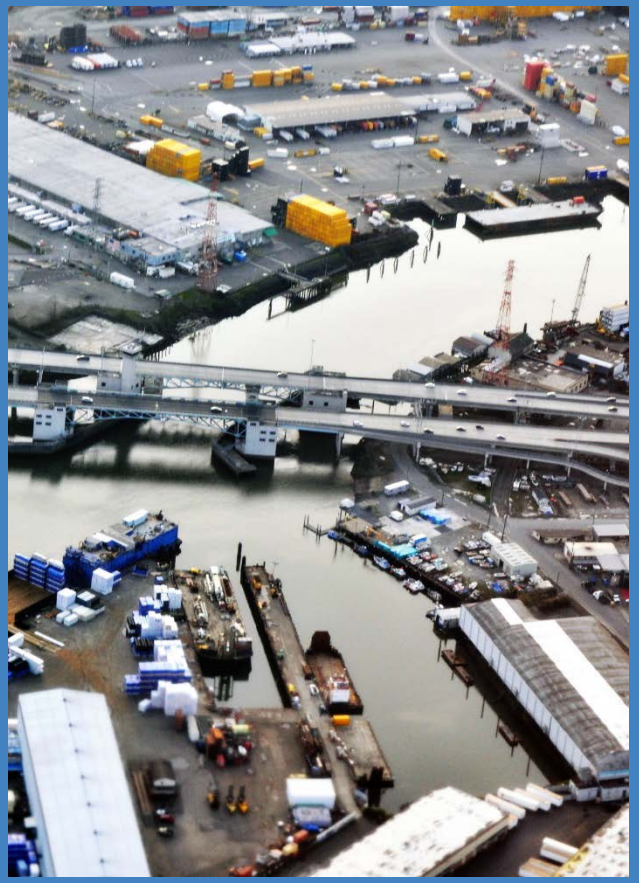


Lower Duwamish Waterway Cleanup

1. Control sources to begin in-water cleanup (includes discharges and contaminated sites)
2. Conduct in-waterway cleanup (includes early action sediment cleanup and long-term cleanup plan)

PLA Objectives: Fulfill Regulatory Obligations

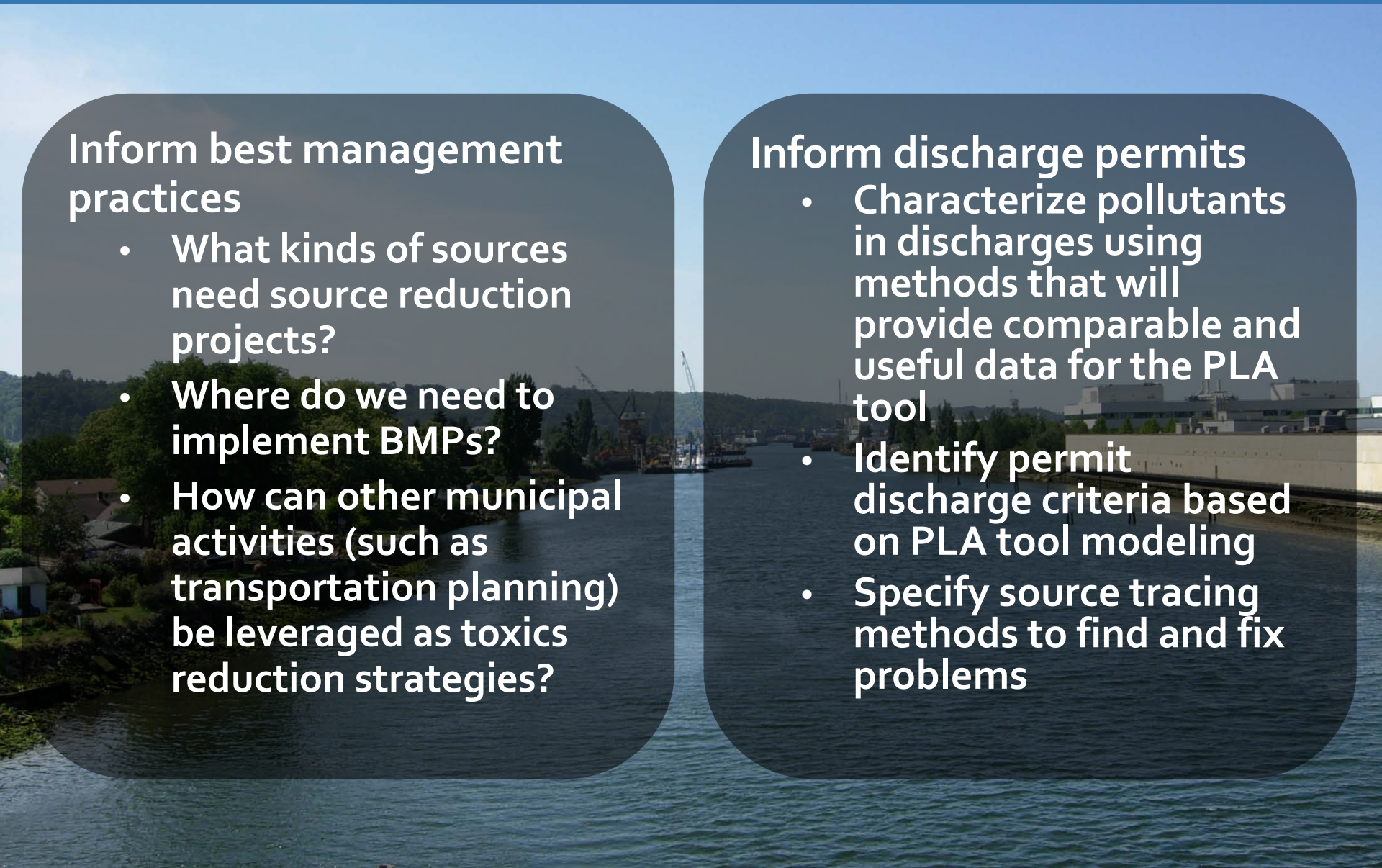
- Clean Water Act & Water Pollution Control Act:
  Meet water quality standards for toxics to support designated uses (consumption of fish and shellfish)
- Superfund & Model Toxics Control Act:
  Minimize Lower Duwamish Waterway sediment recontamination and improve effectiveness of natural recovery



PLA Objectives: Answer Questions

- If I implement a project aimed at producing a specific concentration in sediments, what concentration in water or fish tissue would that correlate to?
  - Correlate media values (water, sediment, fish tissue) so actions in one media can be translated to expected results in a different media.
- How much of the pollutant loading comes from diffuse uncontrolled sources?
- How much of the pollutant loading comes from air deposition?
- How much of the pollutant loading comes from the stormwater pathway?
  - What fraction of this load is from air deposition?
- Where in the watershed should I focus parameter-specific source tracing and correction activities to ensure cost-effective progress is made?
- If we reduce stormwater volumes alone, what are the expected improvements in fish tissue, sediment and water quality?
- If we reduce contaminant concentrations in specific geographic areas, what are the expected improvements in fish tissue, sediment and water quality?
- Does the model, updated with sediment, surface water and fish tissue data collected during LDW cleanup post-construction monitoring, suggest water quality standards will be achieved?
  - If not, why not?

PLA Objectives: Potential Outcomes



Inform best management practices

- What kinds of sources need source reduction projects?
- Where do we need to implement BMPs?
- How can other municipal activities (such as transportation planning) be leveraged as toxics reduction strategies?

Inform discharge permits

- Characterize pollutants in discharges using methods that will provide comparable and useful data for the PLA tool
- Identify permit discharge criteria based on PLA tool modeling
- Specify source tracing methods to find and fix problems

How are toxics addressed in other areas of the country?

Five sites with similar questions:

- How much?
- What's the impact?
- Where is it coming from?
- How can we reduce?

Unique approaches for finding the answers

San Francisco Bay PCBs

- San Francisco Estuary Institute
- Monitoring & research
- Box model & spreadsheet model
- PCBs linked to urban development
- Net flux from sediment to air

Spokane River Regional Task Force

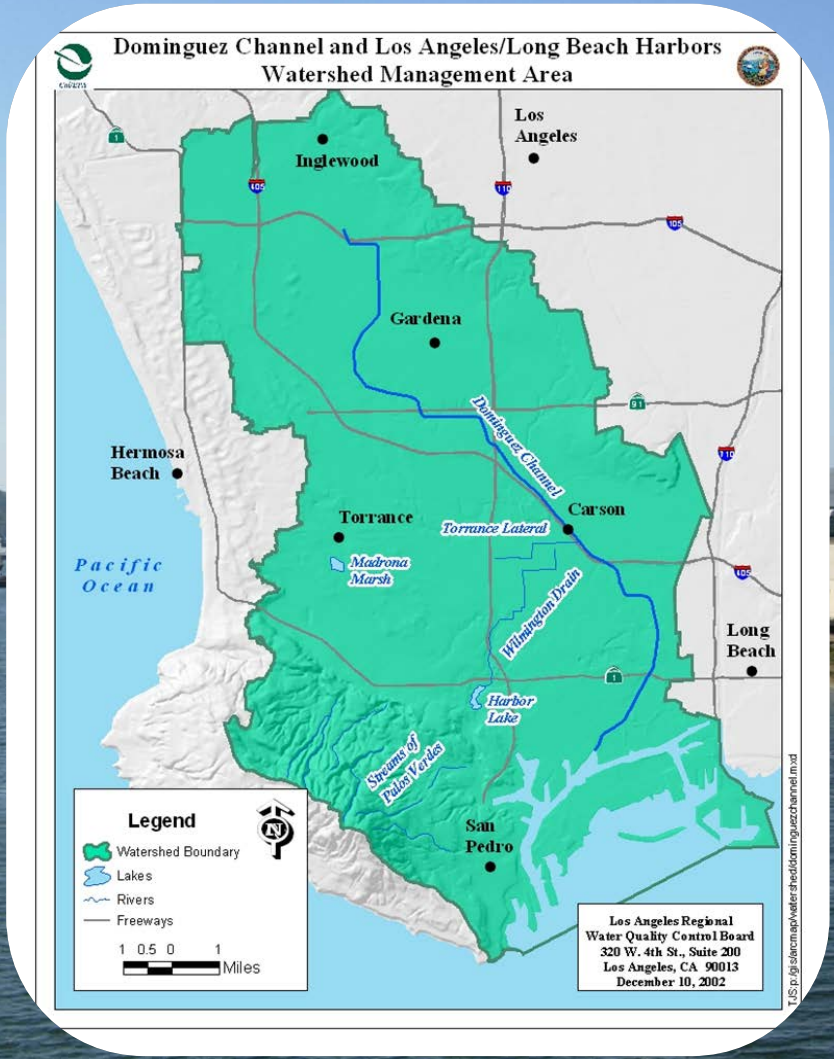
- PCBs
- MOU: identify sources & actions
- Assess "*measurable progress*"
- Consumer product research

Delaware River Estuary

- Delaware River Basin Commission (1961)
  - Toxics Advisory Committee
- Penta-PCB surrogate for total PCBs
- Hydrodynamic Model (DYNHYD5) and water quality model (TOX15)
- Zones
- Sediment removal actions

Los Angeles & Long Beach Harbor, Dominguez Channel

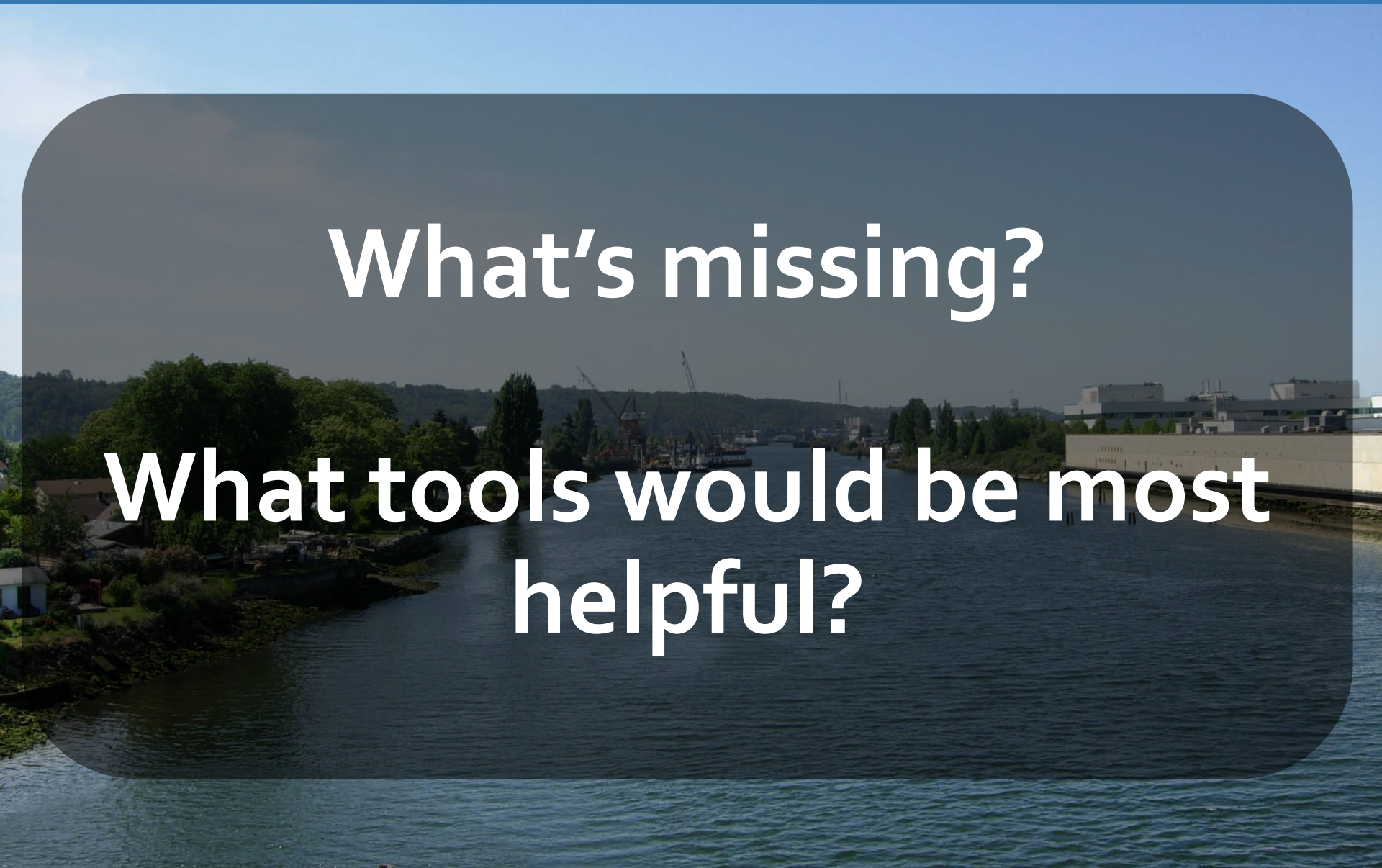
- Metals, chlordane, dieldrin, toxaphene, PAHs, DDT and PCBs
- LSPC and EFDC
- Sediment clean-up after TMDL development
- LA MS4 & Montrose CERCLA site



Chesapeake Bay

- Bay Watershed Model:
  - HSPF (1984-2005), Sparrow, Water Quality & Sediment Transport model, Airshed model.
  - BAY Tracking & Accounting System (TAS)
- Chesapeake Bay Watershed Agreement (2014)
  - Toxics Reduction Workgroup & research subgroup (11/2014)

Watershed Management Needs

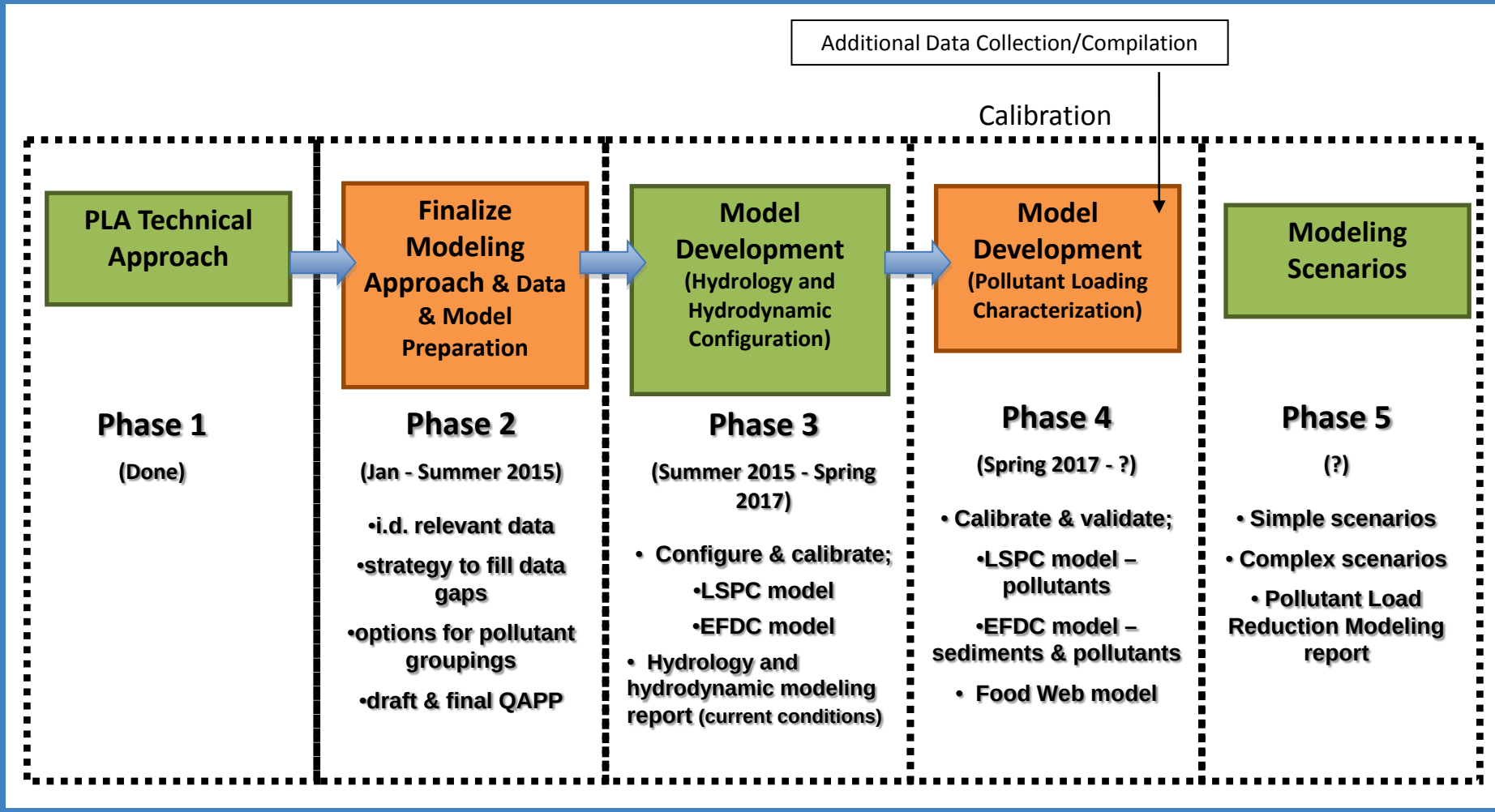


What's missing?

What tools would be most helpful?

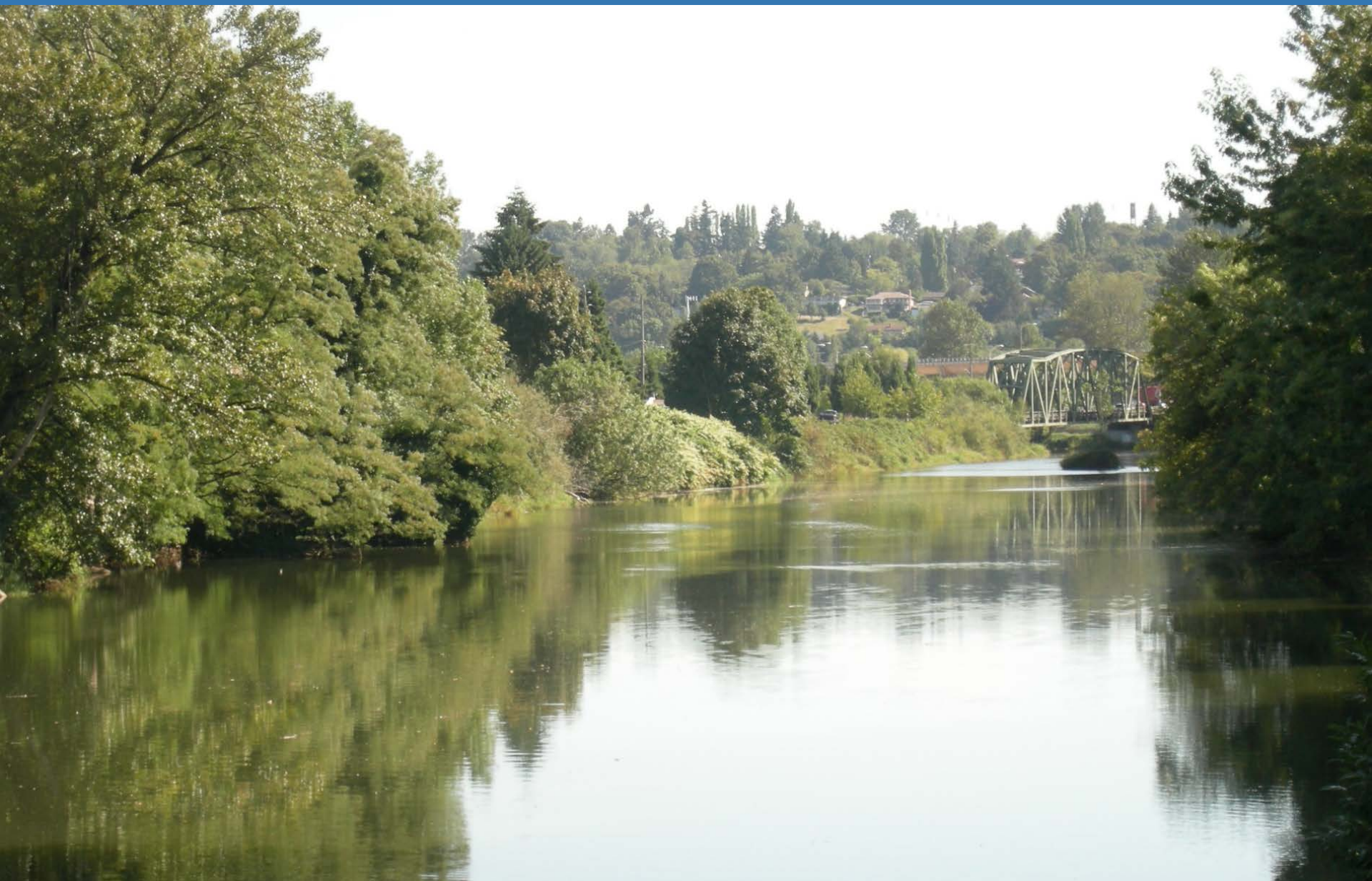
PLA work plan

PLA: Proposed Phasing & Schedule



PLA: Proposed Phasing & Schedule

PLA work plan: Next steps



Current 6-month technical scope of work

Duwamish Data & Model Assessment (Phase 2)
Technical Direction (TD)

Title: Duwamish Phase 2: Finalize Technical Approach and Initiate Watershed Model Development

Purpose & Task Overview:
The Contractor will work with U.S. Environmental Protection Agency (EPA) and Washington Department of Ecology (Ecology) staff in the CERCLA/MTCA and Water programs to update and finalize the draft *Water Quality Assessment Technical Approach* (TT, May 2013), prepare for and attend meetings of the Technical Advisory Committee, and initiate development of a water quality model (i.e., review & evaluate data, develop a modeling QAPP for the watershed and estuary). This is Phase 2 of the Green/Duwamish Study.

Background, Tasks, Schedule and Deliverables:

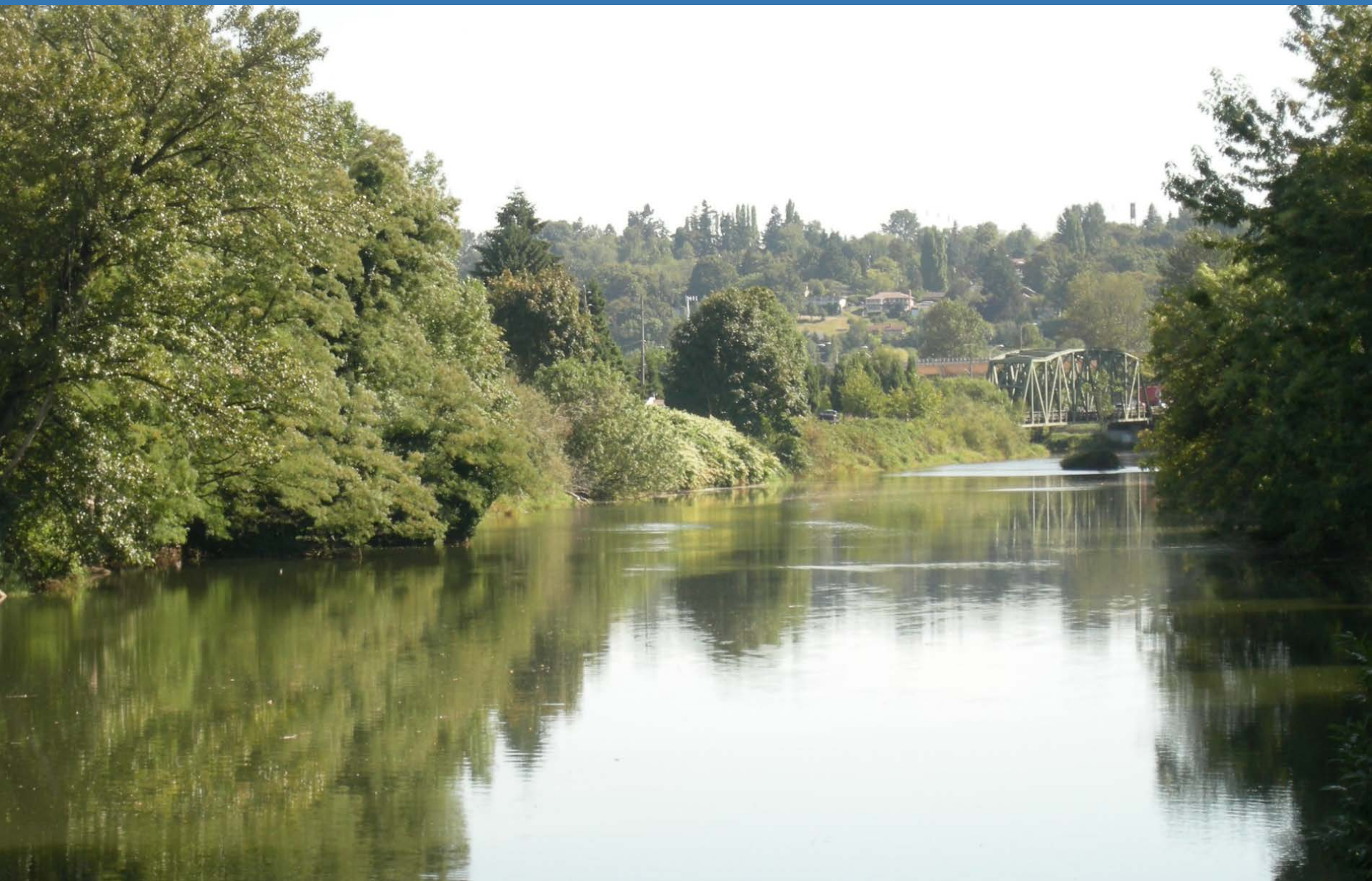
Background
The Green/Duwamish River watershed is identified on Washington's 303(d) list as being impaired by over 50 different pollutants. Portions of the Green/Duwamish River watershed are also on the National Priorities List and are in various stages of sediment cleanup under the Superfund and Washington State Model Toxics Control Act (MTCA) programs.

Ecology and EPA entered into an order in December 2000 with King County, Port of Seattle (the Port), City of Seattle, and The Boeing Company, to perform a CERCLA Remedial Investigation (RI) and Feasibility Study (FS) of sediment contamination in the lower 5.5 miles of the

PLA TAC work plan

Goals	Agenda Topics
Meeting 1— December 10, 2014	
• Kick off the TAC • Introduce PLA and technical approach • Review existing data and models	• Overview of PLA process • Project context • Technical approach overview • Data/models introduction
Meeting 2— February 19, 2015	
• Review and confirm objectives and priorities for the PLA • Review 2-3 year work plan and 6-month technical scope of work • Discuss data and model evaluation memo	• Review, refine, confirm PLA objectives • Review PLA long-term work plan • 6 month technical scope of work • Data and model evaluation memo
Meeting 3 — March 19, 2015	
• Review data and model evaluation	• Review proposed changes to data and model evaluation
Meeting 4 — April 16, 2015	
• Discuss data gaps and parameter selection • Further refine model parameters	• Discuss data gaps • Discuss parameter groupings • Identify data gaps that could be filled • Identify model resolution/scale
Meeting 5 — May 21, 2015	
• Review data gaps and parameter selection • Parameter refinement • Introduce QAPP • Begin QAPP development	• Review data gaps • Refine parameters groupings • Final refinement of model parameters • Review purpose of QAPP • Begin discussion of drafting QAPP using previously identified parameters • Logistics of QAPP drafting and review
Meeting 6 — June 18, 2015	
• Review and refine QAPP • Timeline and process for finalizing QAPP	• Review first draft of QAPP • Discuss potential changes to the QAPP • Discuss timeline and process for finalizing QAPP • Review steps for PLA and TAC process

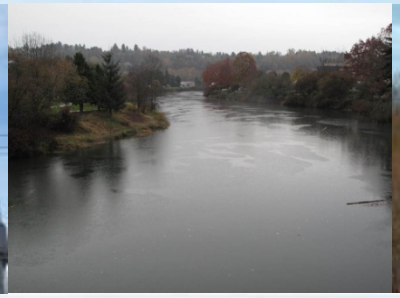
Data and model evaluation memo



Questions for TAC Consideration: Data and Model Evaluation

1. Should we address conventional pollutants as well as toxics in the model?
2. What are the best geographic Model Domains for each component of the PLA Tool?
3. How should the variability of stormwater be represented?
4. How should the variability of air deposition be represented?
5. How should CSOs be represented?
6. What time frame should be modeled?
7. What is a reasonable amount of time for the model to run a simulation?

Green/Duwamish River Watershed



Pollutant Loading Assessment

Technical Advisory Committee Meeting
February 19, 2015

DEPARTMENT OF ECOLOGY
State of Washington

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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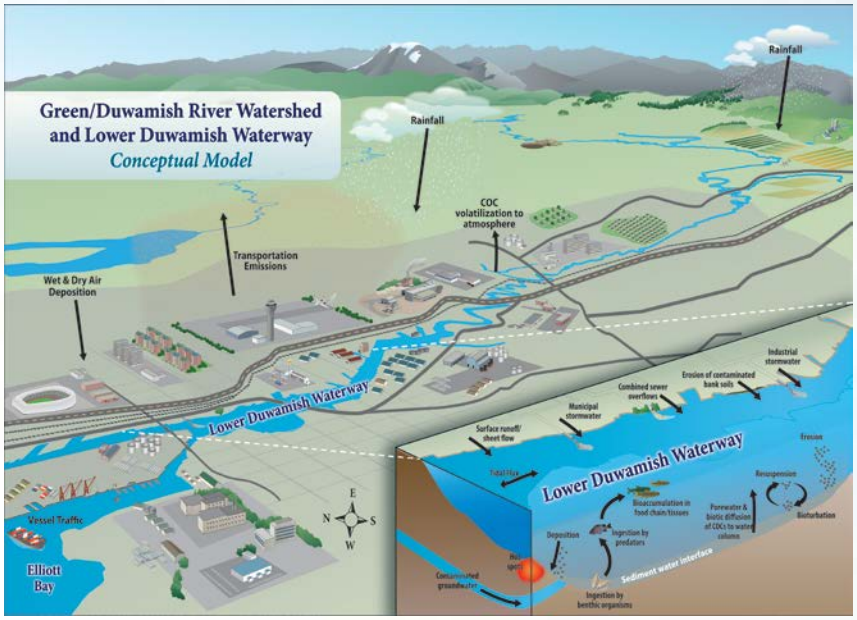
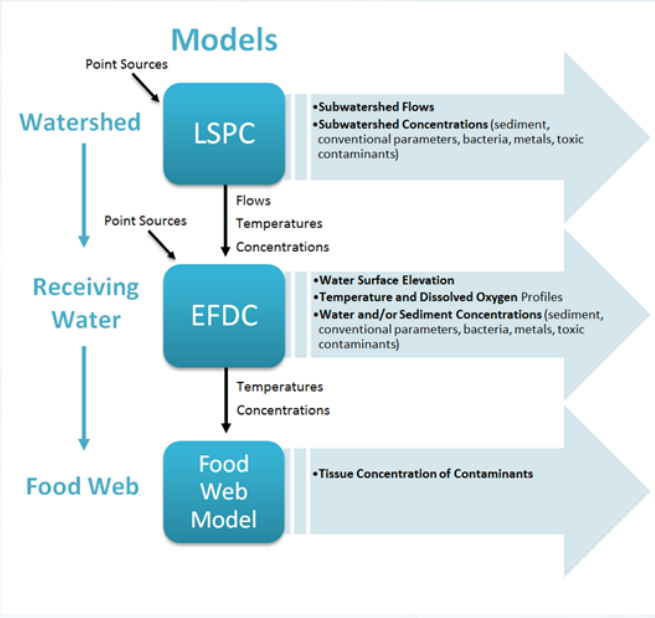
Last TAC Meeting

- Presented Technical Approach
- Conceptual model
- Proposed modeling framework
- Discussed data needs generally
- Reviewed initial data assessment





Outline of the Data and Model Evaluation Memo

- Modeling domains
- Supporting data and parameter selection
- Data for LSPC configuration and calibration
- Data for EFDC configuration and calibration
- Data for Food Web Model configuration and calibration
- Ongoing data collection

Large Number of Parameters: What data do we have?

- **PCBs** – total PCBs and 209 congeners
- **PAHs** – 19 in total
- **Phthlates** – 4 in total
- **Other SVOCs** - Phenol, 4-Methylphenol, Benzoic Acid, Dibenzofuran, Hexachlorobenzene (Meridian Lake only)
- **Metals** - Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Silver, Zinc
- **Pesticides** - 4,4'-DDD, 4.4'-DDE, 4.4'-DDT, Alpha-BHC, Dieldrin, Total Chlordane (Meridian Lake only), Toxaphene (Meridian Lake only)
- **Dioxin** - 2,3,7,8-TCDD
- **Conventional** – Nutrients (Amm-N, TP), DO, Temperature, pH, Bacteria
- PLUS affiliated parameters needed for simulating the above (e.g., TSS/sediment, other nutrients, chlorophyll a, BOD)

Let's Review the Existing Models

- Green/Duwamish Watershed
  - King County HSPF modeling
- Lower Duwamish Waterway
  - King County and LDWG – EFDC and FWM

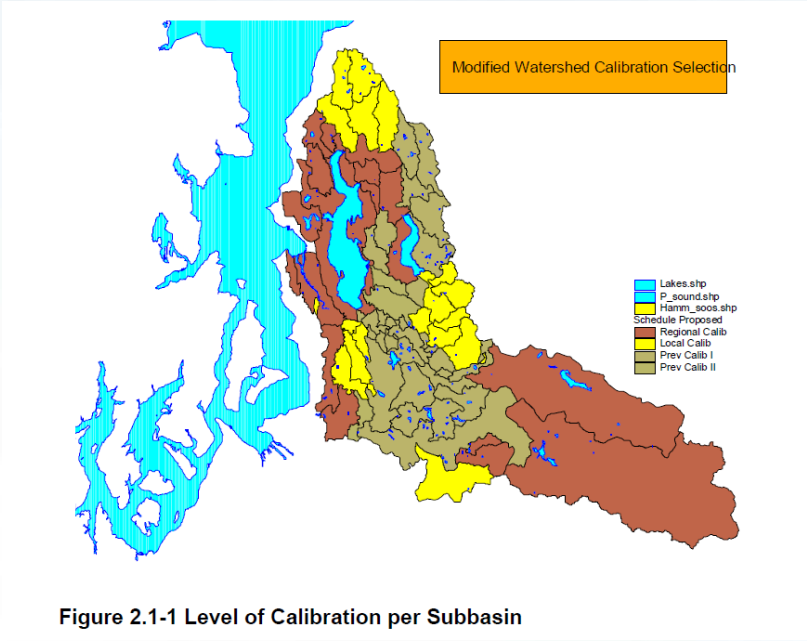
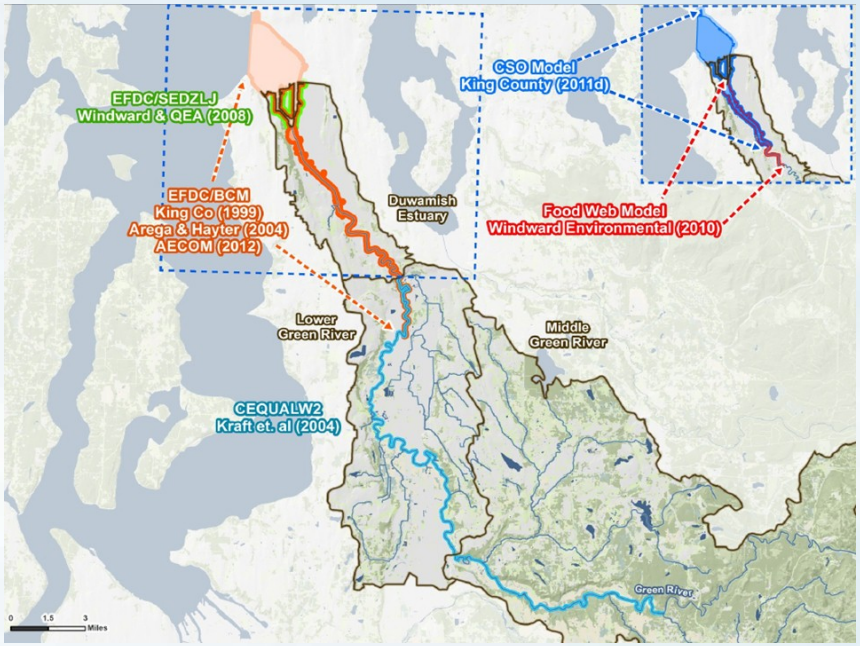
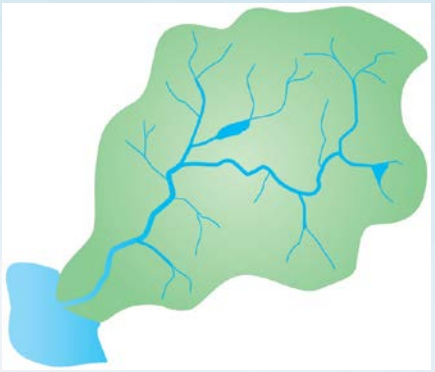


Figure 2.1-1 Level of Calibration per Subbasin

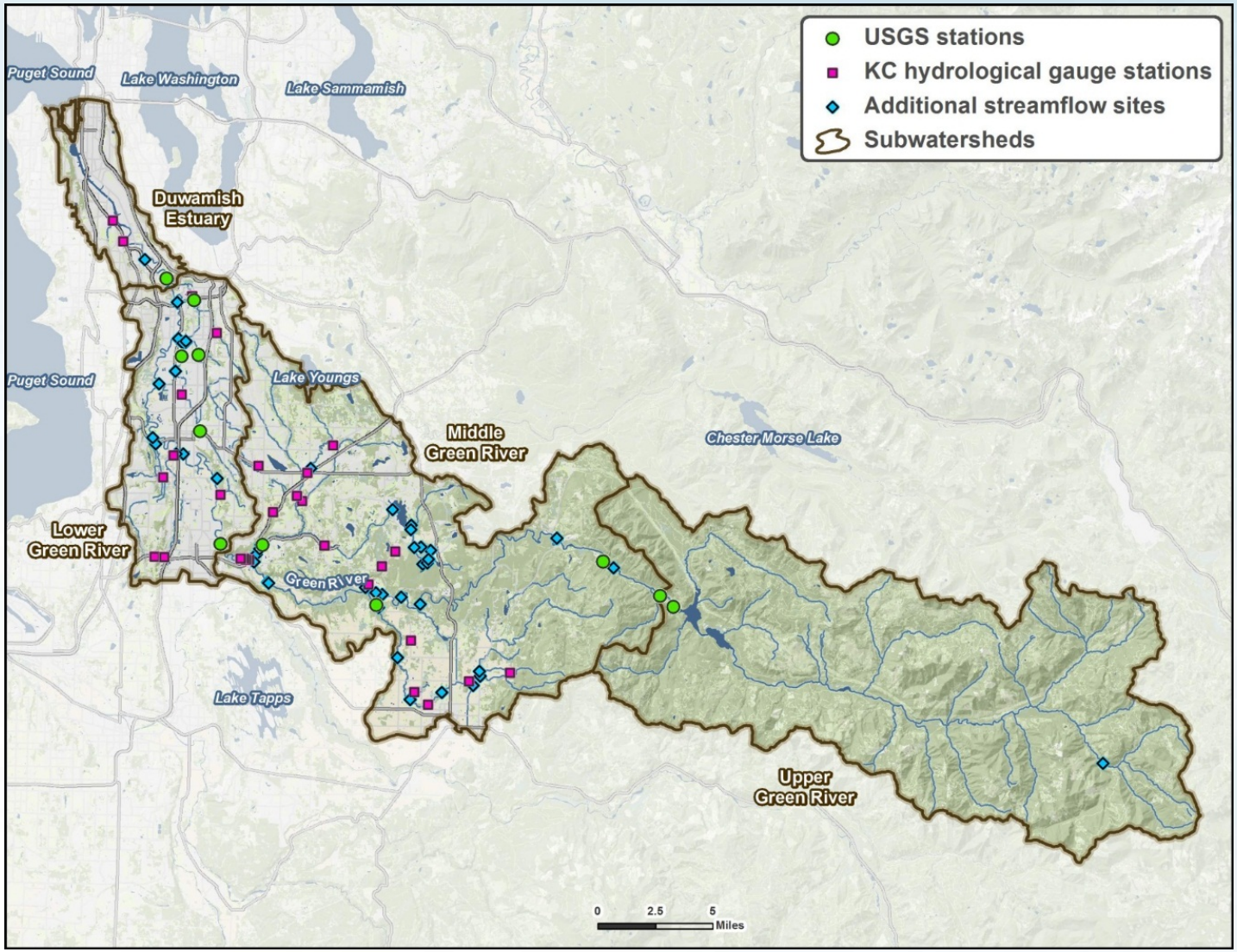


Watershed Model

- Purpose – model rainfall-runoff, pollutant generation and transport in the watershed, and provide loading to EFDC
- Domain: Green/Duwamish
- Parameters: sediment and other pollutants
- Build off existing HSPF models
- Data
  - Background data – DEM, land use/land cover, soils, etc. (The HRU concept)
  - Forcing functions – meteorological, inflows
  - Calibration/validation data – instream data (flow, water temperature, sediment, and wq)
  - Point sources – stormwater



Watershed Model – Calibration Data: Hydrology



Watershed Model – Calibration Data: Water Quality

Recent Green River ambient data for use in LSPC calibration		Stations	Samples	Begin Date	End Date
TSS	TSS	7	124	2001	2012
Dioxin/Furan	2,3,7,8-TCDD	-	-	-	-
Arsenic	Arsenic	16	224	2001	2012
Metals	Cadmium	10	102	1995	2007
	Chromium	10	102	1995	2007
	Copper	11	523	1995	2009
	Lead	9	97	2002	2007
	Mercury	10	102	2002	2007
	Silver	9	97	2002	2007
	Zinc	12	313	1995	2007
SVOCs	4-Methylphenol	-	-	-	-
	Benzoic Acid	-	-	-	-
	Dibenzofuran	-	-	-	-
	Phenol	-	-	-	-
PAHs	PAHs	7	65	2007	2012
PCBs	PCBs	6	54	2005	2012

Recent Green River ambient data for use in LSPC calibration		Stations	Samples	Begin Date	End Date
Pesticides	4,4'-DDD	-	-	-	-
	4,4'-DDE	-	-	-	-
	4,4'-DDT	-	-	-	-
	alpha-BHC	-	-	-	-
	Dieldrin	1	4	1996	2007
Phthalates	Phthalates	-	-	-	-
Bacteria	Bacteria	41	860	1999	2011
Conventional	Ammonia-N	2	14	2000	2008
	Nitrate/nitrite	45	1060	1995	2011
	Organic Nitrogen	Not summarized			
	Orthophosphate	45	890	1995	2011
	Organic Phosphorus	2	43	1995	2007
	Organic Carbon	41	430	2004	2012
	Dissolved Oxygen	46	5724	1995	2012
	pH	46	5870	1995	2012

Receiving Water Model - EFDC

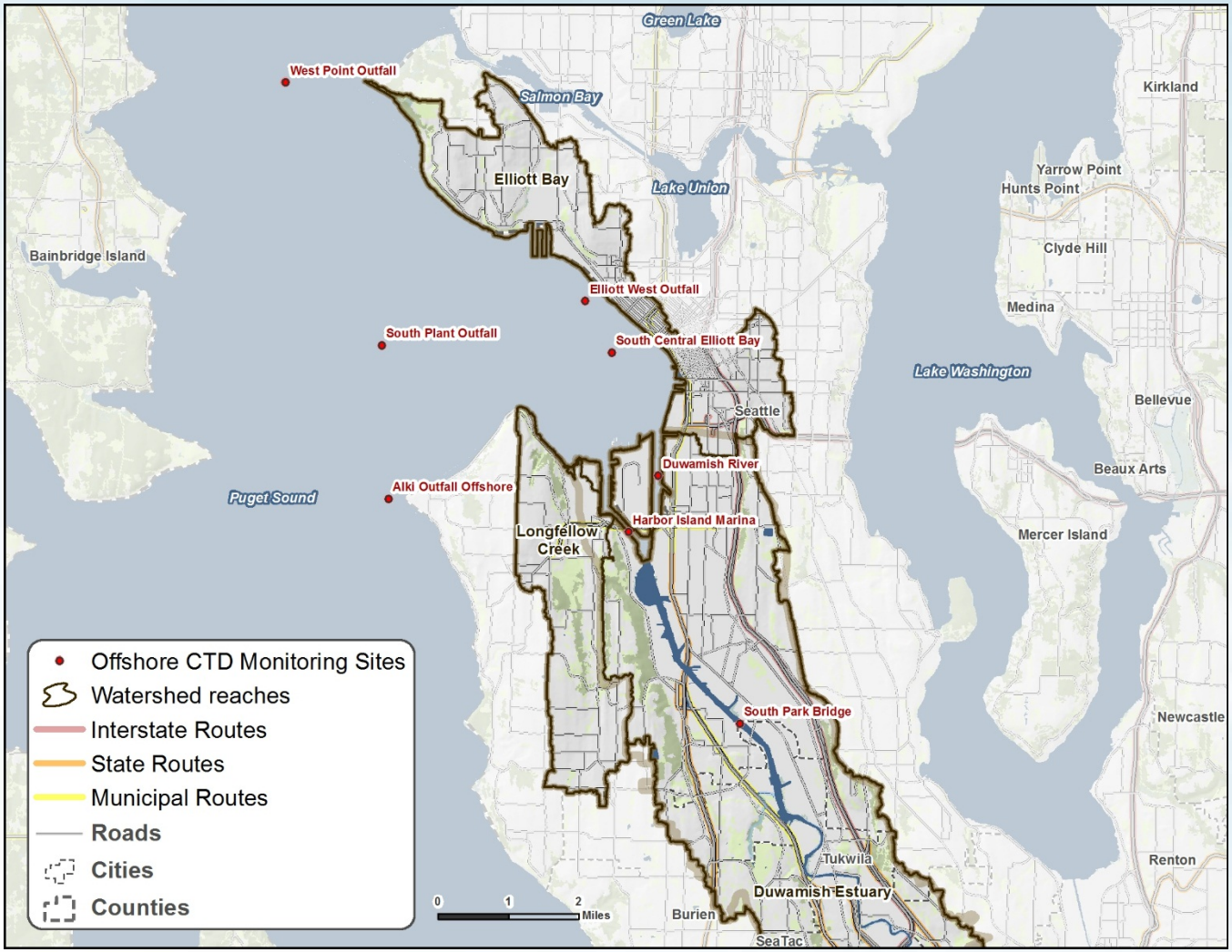
- Purpose – model circulation and fate and transport of sediment and toxicants; provide information to FWM
- Proposed domain – River and estuary beginning @ Green-Black confluence; extend to Elliott Bay
- Build off existing EFDC models

Data to Support EFDC Configuration and Calibration

- Background data – bathymetry, and hydraulic structures
- Forcing functions – meteorological, inflows, watershed model loading, tide
- Calibration/validation data – water surface elevation, salinity, temperature, water quality & sediment quality
- Point sources – direct to EFDC domain
- CSO
  - LSPC is not a CSO model.
  - CSO data, existing CSO model need to be reviewed in detail
  - Develop an approach to link LSPC and CSO

EFDC Model – Calibration Data: Hydrodynamics

- Water surface elevation
- Salinity
- Water temperature



EFDC Model – Calibration Data: Water Quality

Recent Duwamish Estuary ambient water data for calibration		Stations	Samples	Begin Date	End Date
TSS	TSS	1	21	2001	2012
Dioxin/Furan	2,3,7,8-TCDD	-	-	-	-
Arsenic	Arsenic	1	21	2001	2012
Metals	Cadmium	-	-	-	-
	Chromium	-	-	-	-
	Copper	-	-	-	-
	Lead	-	-	-	-
	Mercury	-	-	-	-
	Silver	-	-	-	-
	Zinc	-	-	-	-
SVOCs	4-Methylphenol	-	-	-	-
	Benzoic Acid	-	-	-	-
	Dibenzofuran	-	-	-	-
	Phenol	-	-	-	-
PAHs	PAHs	2	33	2007	2012
PCBs	PCBs	12	43	2005	2012

Recent Duwamish Estuary ambient water data for calibration		Stations	Samples	Begin Date	End Date
Pesticides	4,4'-DDD	1	2	2007	2007
	4,4'-DDE	2	89	1996	2007
	4,4'-DDT	1	2	2007	2007
	alpha-BHC	1	2	2007	2007
	Dieldrin	2	89	1996	2007
Phthalates	Phthalates	-	-	-	-
Bacteria	Bacteria	13	428	1999	2011
Conventiona	Ammonia-N	2	39	2000	2008
	Nitrate/nitrite	7	209	1995	2011
	Organic Nitrogen	Not summarized			
	Orthophosphate	5	162	1995	2011
	Organic Phosphorus	0	0	1995	2007
	Organic Carbon	9	115	2004	2012
	Dissolved Oxygen	13	537	1995	2012
	pH	46	5870	1995	2012

EFDC Model – Calibration Data: Sediment Quality

Recent Duwamish Estuary ambient sediment data for calibration		Stations	Samples	Begin Date	End Date
TSS	TSS	58	409	1999	2011
Dioxin/Furan	2,3,7,8-TCDD	295	633	2004	2012
Arsenic	Arsenic	891	1205	1995	2012
Metals	Cadmium	815	1118	1995	2012
	Chromium	815	1135	1995	2012
	Copper	879	1216	1995	2012
	Lead	880	1214	1995	2012
	Mercury	909	1237	1995	2012
	Silver	780	1056	1995	2012
	Zinc	879	1200	1995	2012
SVOCs	4-Methylphenol	771	1027	2003	2012
	Benzoic Acid	782	1046	2003	2012
	Dibenzofuran	862	1153	2003	2012
	Phenol	782	1046	2003	2012
PAHs	PAHs	926	1295	2003	2012
PCBs	PCBs	1252	1914	2003	2012

Recent Duwamish Estuary ambient sediment data for calibration		Stations	Samples	Begin Date	End Date
Pesticides	4,4'-DDD	277	343	2003	2012
	4,4'-DDE	280	346	2003	2012
	4,4'-DDT	280	346	2003	2012
	alpha-BHC	232	279	2003	2012
	Dieldrin	284	350	2003	2012
Phthalates	Phthalates	782	1078	2003	2012
Bacteria	Bacteria	-	-	-	-
Conventional	Ammonia-N	333	390	2003	2012
	Nitrate/nitrite	-	-	-	-
	Organic Nitrogen	Not summarized			
	Orthophosphate	-	-	-	-
	Organic Phosphorus	-	-	-	-
	Organic Carbon	903	1796	1995	2010
	Dissolved Oxygen	2	112	1995	2012
	pH	1	1	2008	2012

Food Web Model - LDW

- Purpose – bioaccumulation of toxicants in tissue of aquatic life
- Domain – Same as or a subset of EFDC
- Parameters: Tissue concentrations of toxicants
- Build off of existing FWM: Arnot and Gobas
- Data

Parameters on 303(d)	Impaired Media	All Tissue Quality Data	Recent Tissue Quality Data
2,3,7,8-TCDD	5T	17	13
Arsenic	5T	464	328
PAHs	5T	453	296
PCB	5T	934	466
4,4'-DDD	5T	554	311
4,4'-DDE	5T	557	311
4,4'-DDT	5T	548	311
Alpha-BHC	5T	504	312
Dieldrin	5T	535	312
Phthalates	5T	422	304

Ongoing Data Collection

- Watershed
  - USGS and Ecology
  - King County
  - Large suite of parameters incl. PCBs, PAHs, metals, etc.
- LDW
  - Army Corps of Engineers
  - PCB sampling and modeling



Next Steps (Data Gaps & Pollutant Groupings Memo – April 2015)

- What are the most significant data gaps, and how can we go about addressing them?
- What toxic pollutants should be modeled in detail?
- Which toxic pollutants can be represented by indicator pollutants or surrogates?
- What type of PCB and dioxin data do we want for modeling (congener data?)

Questions and Discussion