

How Do We Decide What Pollutants to Model?

Green Duwamish Pollutant Loading
Assessment

Technical Advisory Committee

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Chemicals

- Clean Water Act

Over 40 individual chemicals across media in Category 5 (conventionals, metals and organics)

- CERCLA

Human Health (11)

Risk Drivers- arsenic (inorganic), PCBs, cPAHs (7), and dioxin/furans
other- naphthalene

Ecological Risk (47)

SMS Chemicals (metals and organics)

Why Should We Reduce the List of Chemicals for Modeling?

- More chemicals require more data to support modeling
- Complexity of model increases as you add more chemicals
- Time to run model and compile information increases with more chemicals
- More chemicals = higher cost
- Can run more iterations with fewer chemicals
- Not all chemicals bioaccumulate

Criteria Used to Reduce the List of Chemicals

Tier 1

- Focus on Toxics
- CWA impairments
- CERCLA human health and ecological risk drivers
- Does the chemical bioaccumulate ($K_{ow} > 5$)
- Chemical linked to fish tissue consumption advisory

Tier 2

- Chemical linked to endangered species concerns
- Is there a sediment recontamination concern
- Do we have data to support modeling
- Can the chemical be simulated with the proposed models
- Can the chemical represent similar chemicals in terms of sources and pathways

Pollutant Matrix

First Tier

Second Tier

Parameter/Suite	Category Type	Pollutant is on the 303d list (Category 5)			Pollutant is a CERCLA Human Health Risk Driver	Pollutant is a CERCLA Ecological Risk Driver	Bioaccumulative Pollutant (log Kow >5)	Fish Tissue Advisory in Place	Total Points	Pollutant is expected to pose a sediment recontamination problem	Pollutant linked to Endangered Species survival	Existing data is available in LDW to support modeling	Existing data is available in watersheds to support modeling	Can Pollutant be simulated with proposed models?
		Water	Sediment	Tissue										
Sediment Bioassay	Bioassay		1					1						
Ammonia-N	Conventional	1						1						
Temperature	Conventional	1						1						
Dissolved Oxygen	Conventional	1						1						
Bacteria	Conventional	1						1						
pH	Conventional	1						1						
2,3,7,8-TCDD	Dioxin/Furan		1	1	1		1	4						
Arsenic	Metals		1	1	1			4						
Mercury	Metals		1		1		1	3						
Cadmium	Metals		1		1			2						
Chromium	Metals		1		1			2						
Copper	Metals		1		1			2	Y	Y				
Lead	Metals		1		1			2						
Silver	Metals		1		1			2						
Zinc	Metals		1		1			2	Y	Y				
Pentachlorophenol	Other SVOCs				1		1	2						
Dibenzofuran	Other SVOCs		1		1			2						
Hexachlorobenzene	Other SVOCs				1		1	2						
Phenol	Other SVOCs		1		1			2						
1,2,4-Trichlorobenzene	Other SVOCs				1			1						
1,2-Dichlorobenzene	Other SVOCs				1			1						
1,4-Dichlorobenzene	Other SVOCs				1			1						
2,4-Dimethylphenol	Other SVOCs				1			1						
2-Methylphenol	Other SVOCs							0						
4-Methylphenol	Other SVOCs				1			1						
Benzoic Acid	Other SVOCs		1					1						
Benzyl Alcohol	Other SVOCs							1						
n-Nitrosodiphenylamine	Other SVOCs				1			1						
Hexachlorobutadiene	Other SVOCs							0						
PAHs	PAHs		1					2		Y				
Naphthalene	PAHs		1		1			3		Y				
Acenaphthylene	PAHs							0						
Acenaphthene	PAHs		1					2						
Fluorene	PAHs		1		1			2		Y				
Phenanthrene	PAHs		1		1			2		Y				
Anthracene	PAHs		1		1			2		Y				
2-Methylnaphthalene	PAHs		1		1			2		Y				
HPAHs	PAHs		1		1			3			Y			
Fluoranthene	PAHs		1		1			3	Y		Y			
Pyrene	PAHs		1		1			3			Y			
Benzo[a]anthracene*	PAHs		1	1	1			5	Y		Y			
Chrysene*	PAHs		1	1	1			5	Y		Y			
Benzo[b]fluoranthene*	PAHs		1	1	1			4						
Benzo[k]fluoranthene*	PAHs		1	1	1			4						
Total benzofluoranthenes	PAHs		1	1	1			5	Y		Y			
Benzo[a]pyrene*	PAHs		1	1	1			5	Y		Y			
Indeno[1,2,3-cd]pyrene*	PAHs		1	1	1			4	Y		Y			
Dibenzo[a,h]anthracene*	PAHs		1	1	1			5	Y		Y			
Benzo[ghi]perylene	PAHs		1		1			3	Y		Y			
PCB	PCBs		1	1	1			6	Y					
4,4'-DDD	Pesticides						1	1						
4,4'-DDE	Pesticides							1						
4,4'-DDT	Pesticides							1						
Alpha-BHC	Pesticides			1				1						
Dieldrin	Pesticides						1	1						
Total Chlorodane	Pesticides							1						
Toxaphene	Pesticides							1						
Bis(2-Ethylhexyl) Phthalate	Phthalates		1				1	3	Y					
Butyl benzyl phthalate	Phthalates						1	2						
Dibutyl phthalate	Phthalates						1	2						
Dimethyl phthalate	Phthalates						1	2						
Di-N-Octyl Phthalate	Phthalates		1					2						
Diethyl phthalate	Phthalates						1	0						

Preliminary List of Chemicals for Modeling

Parameter	Fate and Transport	Food Web	Justification
PCBs	Y	Y	High concern to both WQ and CERCLA, accumulate in biota, fish consumption advisory, recontamination potential
cPAHs (listed below)	Y	Y	High concern to both WQ (most 303d listings) and CERCLA, accumulate in biota, ecological concern, recontamination potential
Dioxins/Furans (2,3,7,8 TCDD)	Y	Y	High concern to both WQ (most 303d listings) and CERCLA, accumulate in biota, ecological concern, recontamination potential
Arsenic (inorganic?)	Y	N	Concern for both WQ and CERCLA- natural background issue
Phthalates (Bis-2EH phthalate)	Y	Y	Primarily concern for CERCLA, recontamination potential, accumulates in biota- surrogate for other phthalates
Copper	Y	N	Aquatic toxicity concern for ESA species- indicator for built environment
Zinc	Y	N	Aquatic toxicity concern for ESA species- indicator for built environment
Mercury	Y	?	Limited 303d listings, concern for CERCLA, fish consumption advisory- Not sure this parameter can be modeled on same platform

cPAHs= benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h) anthracene, and indeno(1,2,3-cd) pyrene

Discussion of Approach and Chemicals