East Waterway Anthropogenic Background

Small Group Meeting #3
Anthropogenic Background

Data Summing, Screening, and Weighting

East Waterway Group

November 20, 2020

Meeting Agenda

Purpose: come to an agreement on the dataset for AB calculation

Topics

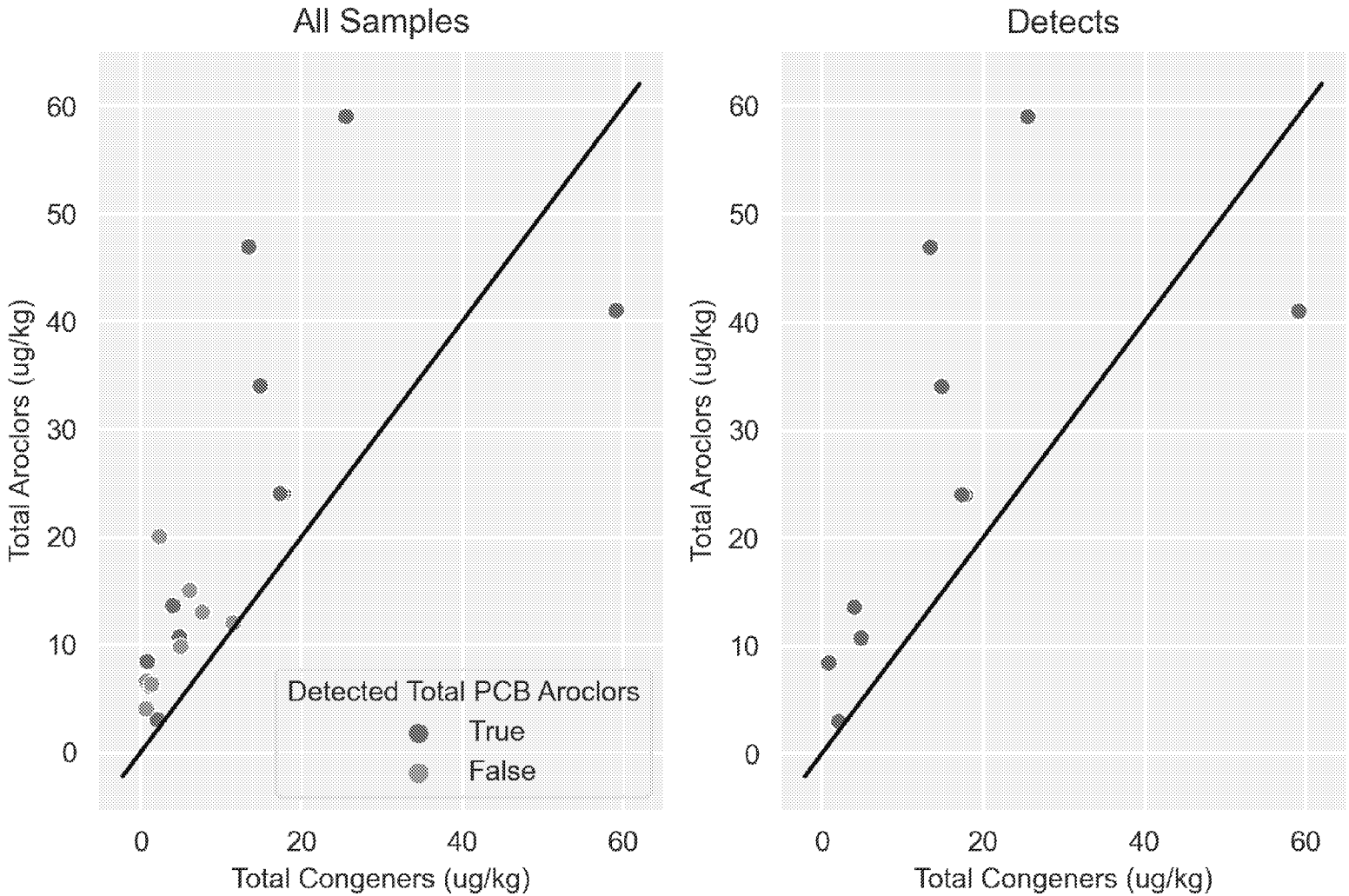
- PCB Aroclors
- Fines Normalization
- Sediment Traps
- Weighting
- Dioxins/Furans
- Work products for Meeting #4

Meeting Schedule

- Sensitivity analyses *(Dec. 4, 10-11:30)*
- Memorandum annotated outline and key tables and figures *(Dec. 9, 10-11:30)*
- Large group meeting *(Jan. 13, 10-12)*

PCB Aroclors

Comparison of PCBs Total Aroclors and Total Congeners - Replicate Samples



Fines Normalization

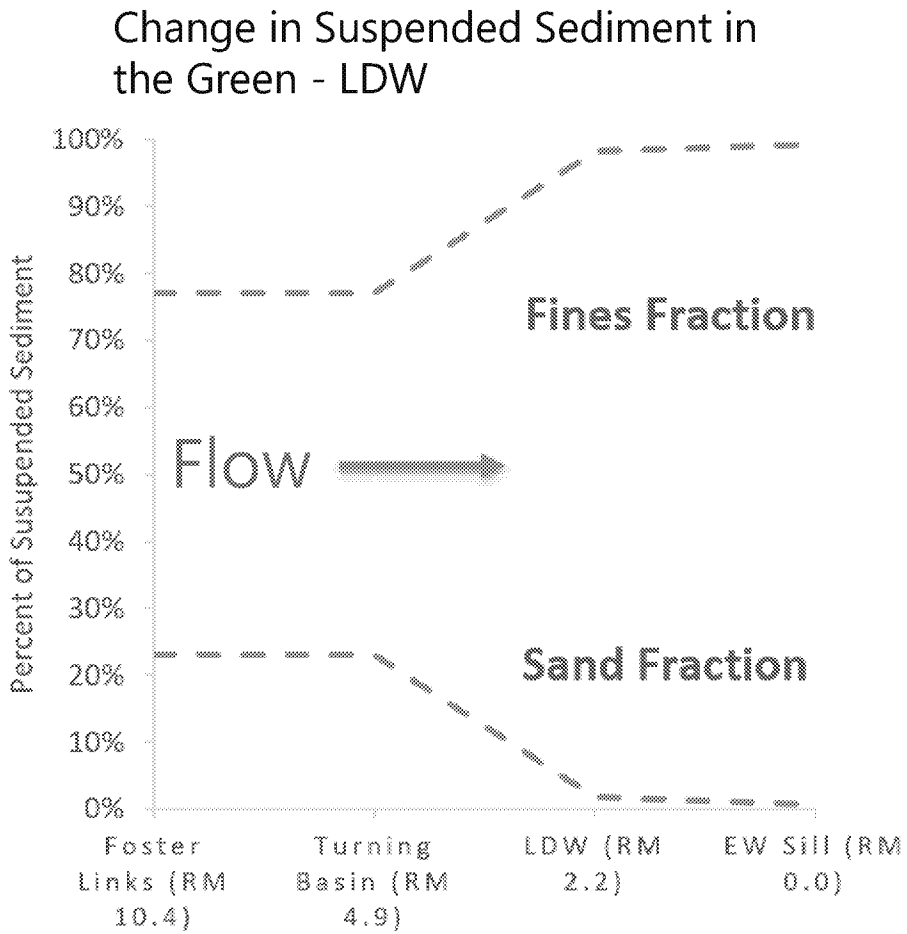
ED_006289_00001405-00006

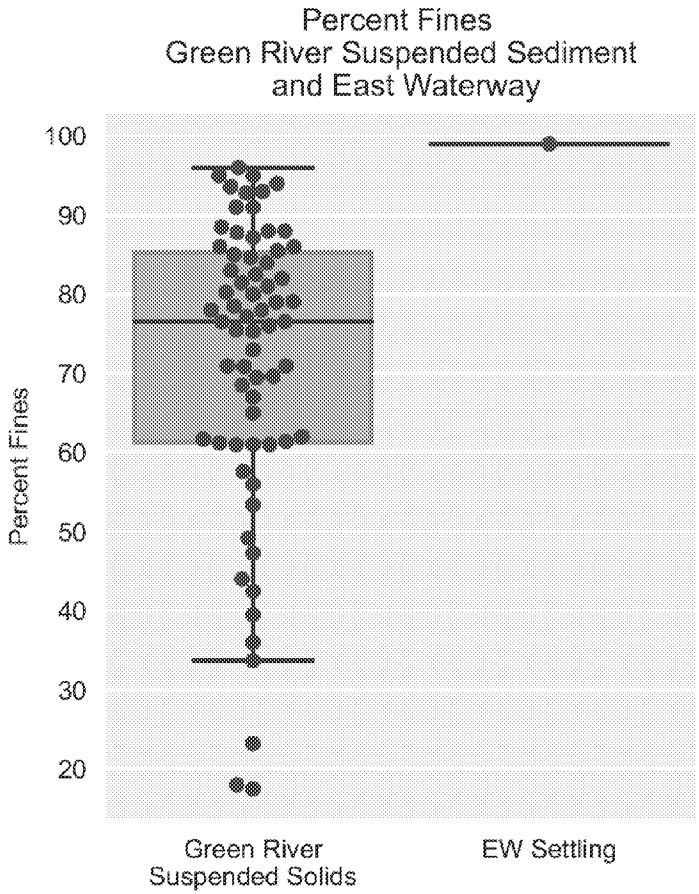
Summary Statistics

Chemical	Samples	n	Mean	UCL 95
Total PCBs (ug/kg)	Include Sediment Traps	65	15.5	19.9
	Exclude Sediment Traps	56	16.6	21.5
	Fines-normalize (All Samples)	65	20.7	26.1
	Screen Samples < 60% Fines	52	17.8	23.1
Total Dioxin/furan (ng/kg) [new]	Include Sediment Traps	59	1,258	1,550
	Exclude Sediment Traps	54	1,331	1,637
	Fines-normalize (All Samples)	59	1,677	2,043
	Screen Samples < 60% Fines	49	1,387	1,716
Dioxin/furan TEQ (ng/kg)	Include Sediment Traps	59	5.8	7.0
	Exclude Sediment Traps	54	6.1	7.4
	Fines-normalize (All Samples)	59	7.6	9.2
	Screen Samples < 60% Fines	49	6.4	7.8
Arsenic (mg/kg)	Include Sediment Traps	61	16.2	18.0
	Exclude Sediment Traps	52	17.2	19.3
	Fines-normalize (All Samples)	61	23.2	25.7
	Screen Samples < 60% Fines	49	17.4	19.5

- Fines-normalized Concentration = Concentration / (Percent Fines /100)

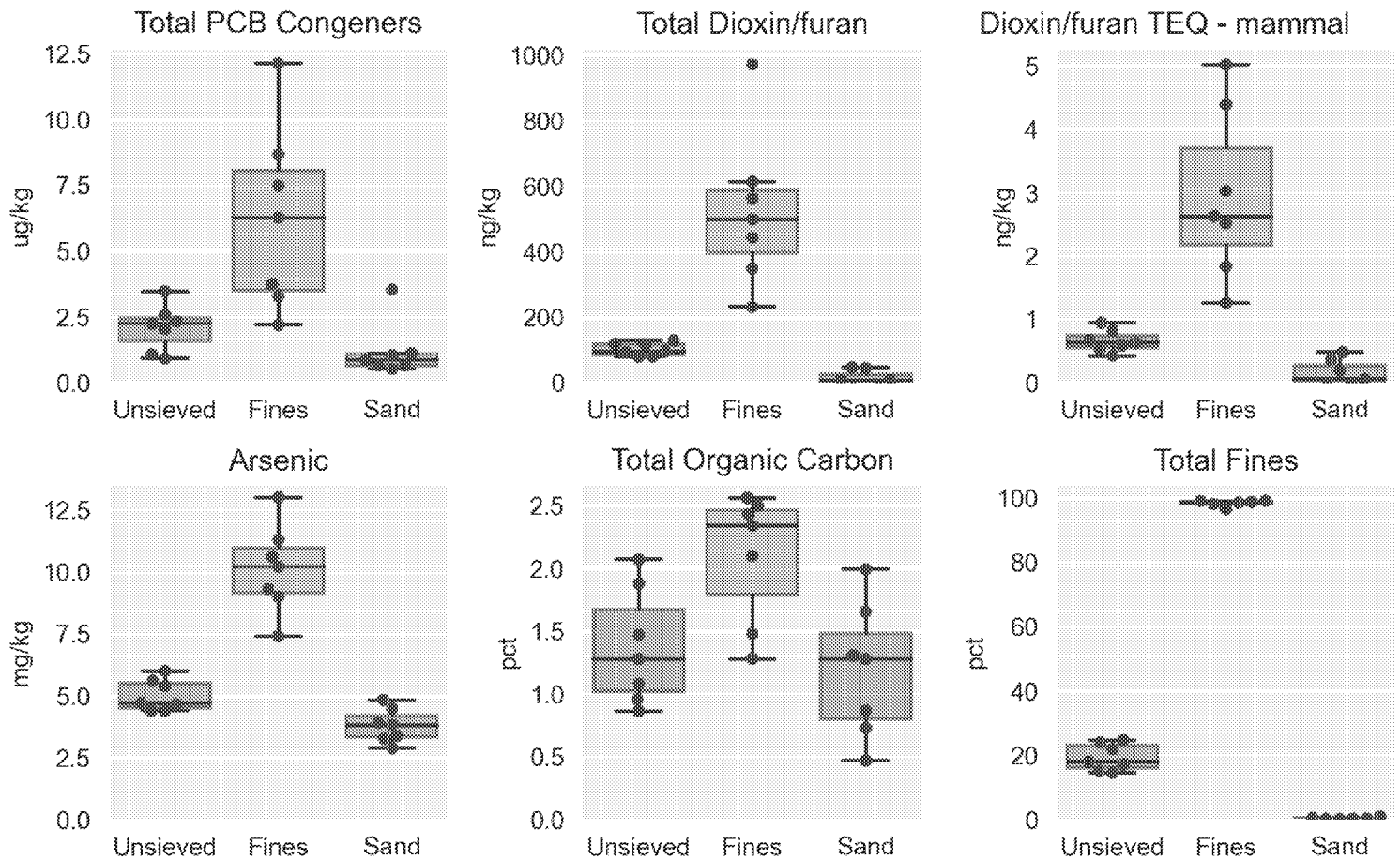
Percent Fines Entering the EW





From Suspended Sediment and LDW STM data

Comparison of Concentrations in Sand and Fines Components in Foster Links Bedded Sediment (USGS Study)



- Unsieved and sieved (fines) samples analyzed
- Sand component calculated (mass balance equation)

EWG Recommendation

- Use fines-normalized concentrations
  - Contaminants are associated with fine-grained particles
  - Only fine-grained particles make it to the EW
  - Corrects sediment trap data

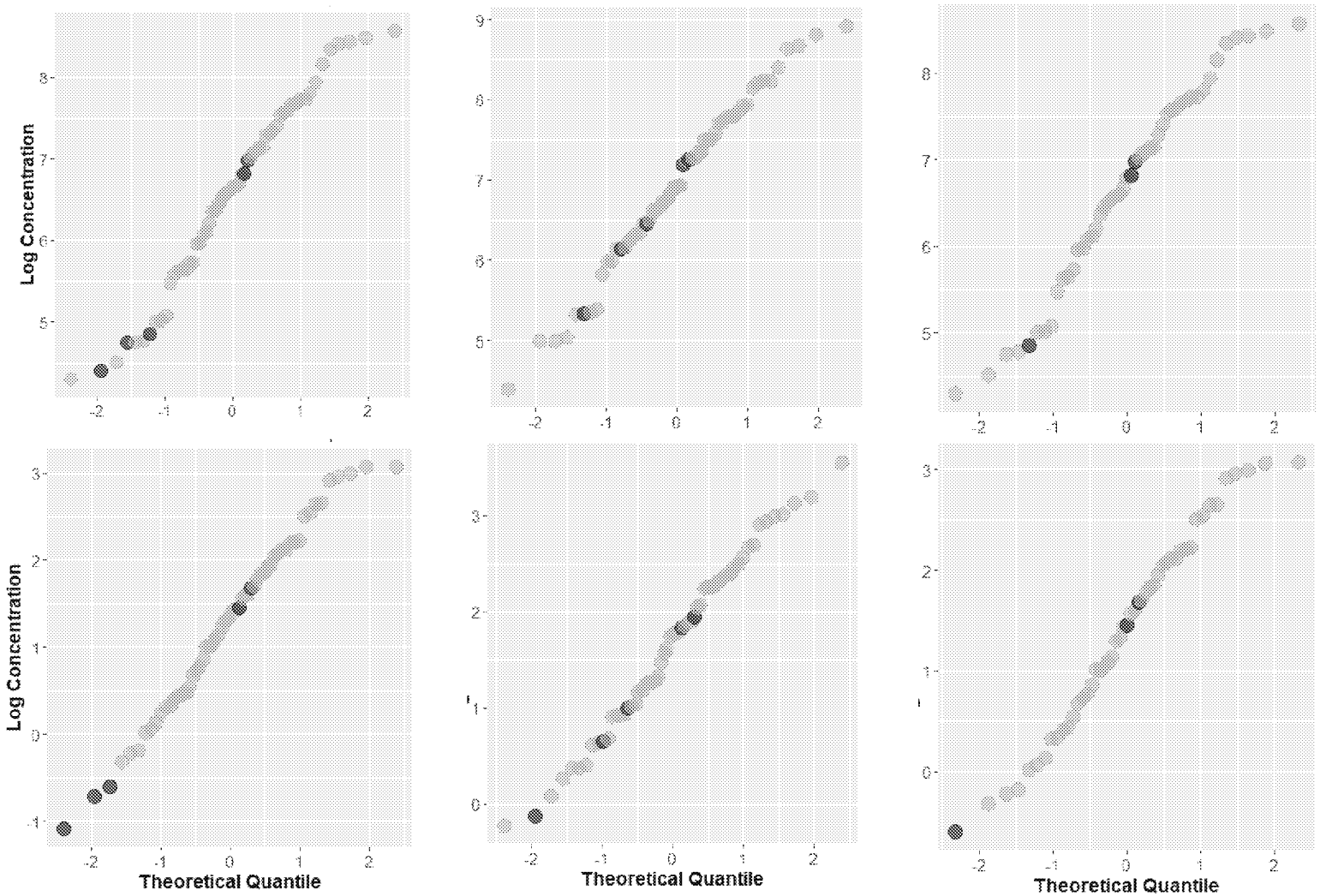
Sediment Traps

Sediment Trap Log QQ Plots for Total Dioxin/Furan

All Suspended Solids | Fines Normalized | >60% Fines

Total Dioxin/ Furan (ng/kg) [new]

Dioxin/ Furan TEQ (ng/kg)



Green = Centrifuge or Filter Solids

Blue = Sediment Trap

Summary Statistics

Chemical	Samples	n	Mean	UCL 95
Total PCBs (ug/kg)	Include Sediment Traps	65	15.5	19.9
	Exclude Sediment Traps	56	16.6	21.5
	Fines-normalize (All Samples)	65	20.7	26.1
	Screen Samples < 60% Fines	52	17.8	23.1
Total Dioxin/furan (ng/kg) [new]	Include Sediment Traps	59	1,258	1,550
	Exclude Sediment Traps	54	1,331	1,637
	Fines-normalize (All Samples)	59	1,677	2,043
	Screen Samples < 60% Fines	49	1,387	1,716
Dioxin/furan TEQ (ng/kg)	Include Sediment Traps	59	5.8	7.0
	Exclude Sediment Traps	54	6.1	7.4
	Fines-normalize (All Samples)	59	7.6	9.2
	Screen Samples < 60% Fines	49	6.4	7.8
Arsenic (mg/kg)	Include Sediment Traps	61	16.2	18.0
	Exclude Sediment Traps	52	17.2	19.3
	Fines-normalize (All Samples)	61	23.2	25.7
	Screen Samples < 60% Fines	49	17.4	19.5

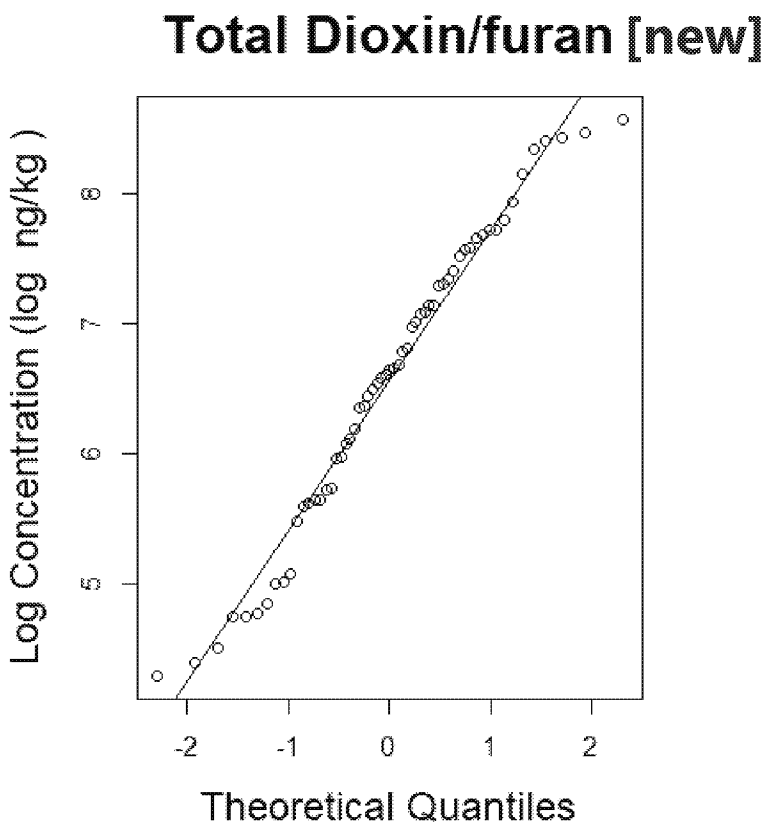
- Fines-normalized Concentration = Concentration / (Percent Fines /100)

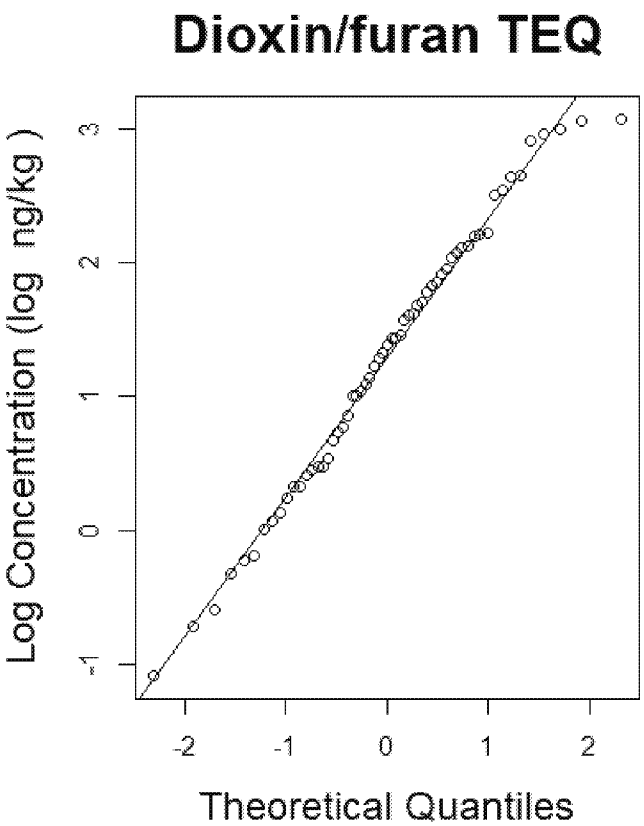
EWG Recommendation

- Include sediment traps in population statistics and averages when fines-normalizing
- Remove sediment trap data from weighted approach

Initial Outlier Analysis

Total Dioxin/ Furan Concentration Distribution

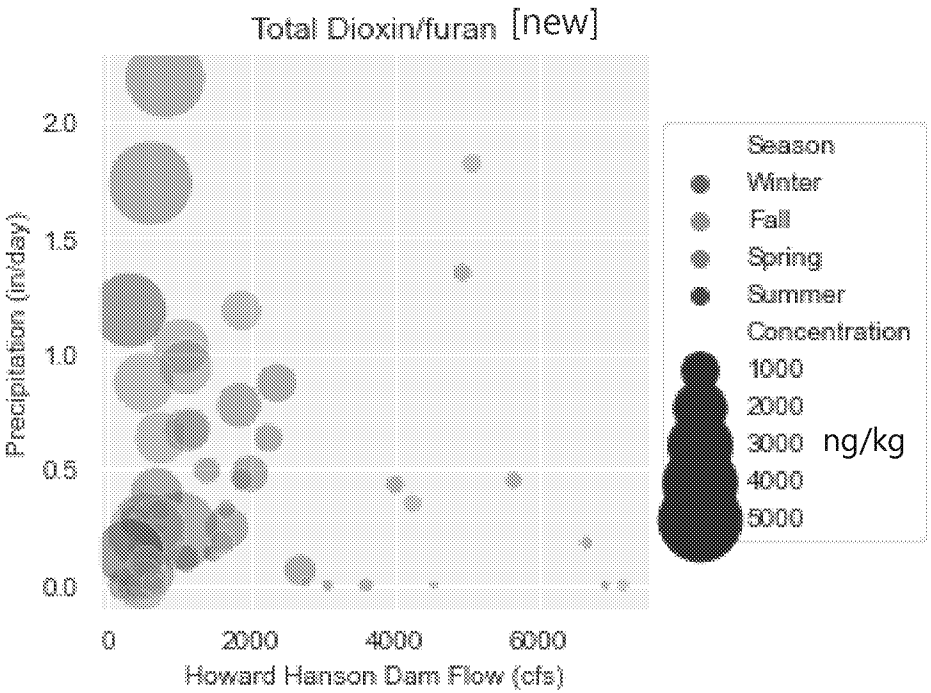


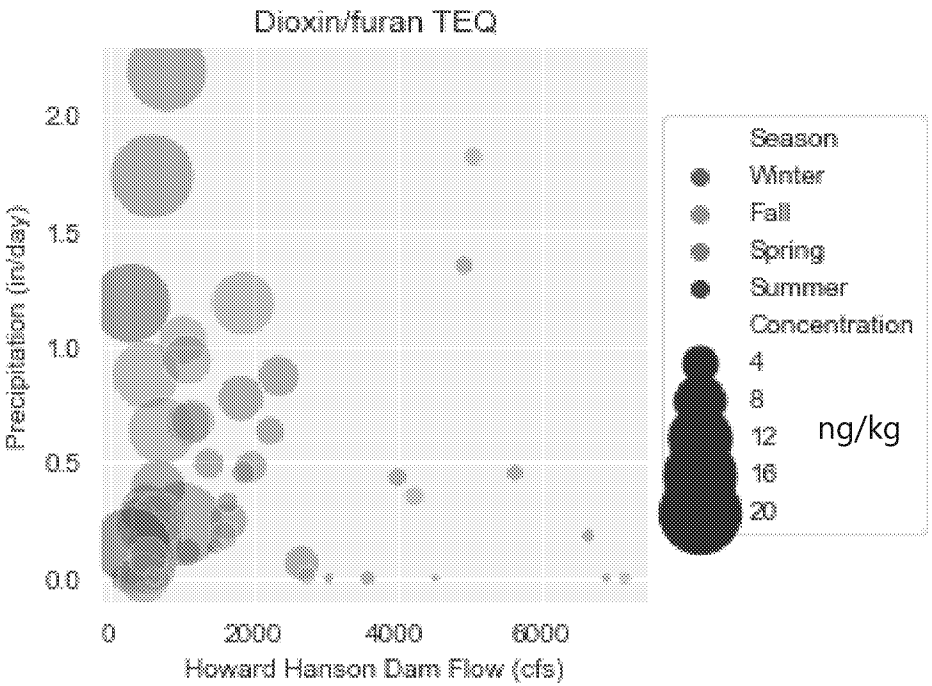


- Distributions include sediment trap data

River Conditions

Bubble Plots for Total Dioxin/ Furan





Five Highest Samples for Each Constituent

Chemical	Concentration	Month	Season	Flow Below the Howard Hanson (cfs)	Flow Below the Howard Hanson (pctl)	Precipitation (in/day)	Precipitation (pctl)	Event Type
Total PCB (ug/kg)	99.8	October 2015	Fall	468	32	0.91	98	Storm
	84.1	July 2014	Summer	310	16	1.19	99	Storm - Dry Anteced
	71.7	October 2014	Fall	1031	69	1.03	98	Storm
	59.1	February 2013	Winter	1012	68	0.23	84	Storm - Dry Anteced
	56.0	August 2008	Summer	323	18	0.14	77	Storm
Total Dioxin/furan (ug/kg) [new]	5,321	January 2017	Winter	604	44	1.73	100	Storm
	4,806	February 2017	Winter	808	58	2.19	100	Storm
	4,610	February 2013	Winter	1012	68	0.23	84	Storm - Dry Anteced
	4,491	October 2016	Fall	556	40	0.23	84	Storm
	4,209	July 2014	Summer	310	16	1.19	99	Storm - Dry Anteced
Dioxin/ Furan TEQ (ng/kg)	21.7	January 2017	Winter	604	44	1.73	100	Storm
	21.5	February 2013	Winter	1012	68	0.23	84	Storm - Dry Anteced
	20.0	February 2017	Winter	808	58	2.19	100	Storm
	19.3	July 2014	Summer	310	16	1.19	99	Storm - Dry Anteced
	18.5	August 2008	Summer	323	18	0.14	77	Storm
Arsenic (mg/kg)	50.8	September 2015	Fall	357	23	0.00	27	Baseflow
	36.9	June 2015	Summer	228	3	0.00	27	Baseflow - Dry Anteced
	32.0	August 2013	Summer	327	19	0.00	27	Baseflow - Dry Anteced
	28.0	October 2014	Fall	536	38	0.00	27	Baseflow
	27.1	September 2016	Summer	393	26	0.28	86	Storm

- Flow and precipitation percentiles based on the 2001 – 2019 dataset
- Dry antecedent designation based on the 2 weeks before the sampling event (with a 1-day buffer added prior to sampling) that is <20th percentile of two-week precipitation (<0.015/day).

Review of High Values

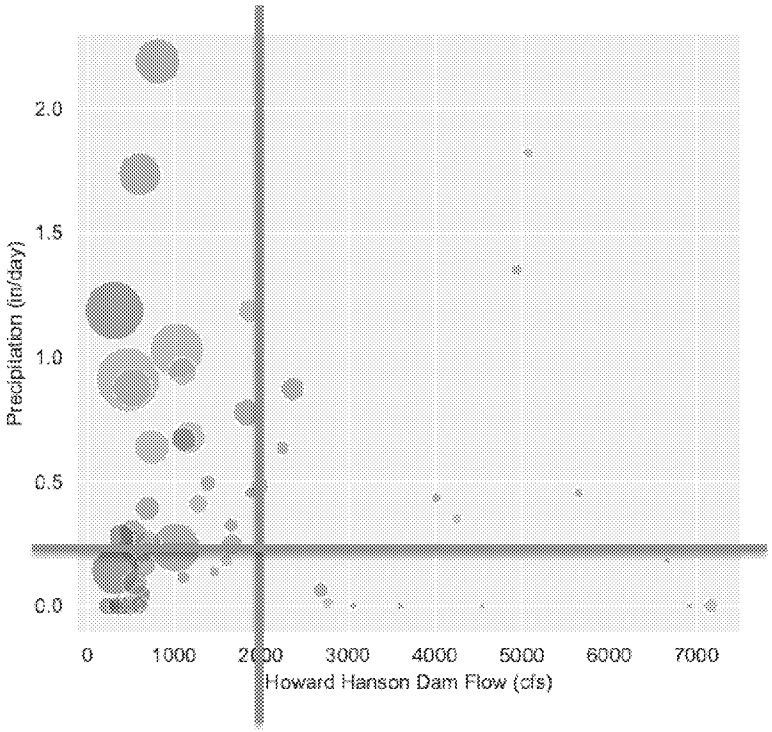
Chemical	n	Mean	Median	90th Percentile	UCL 95
Total PCBs (ug/kg)	65	15.5	8.3	41.7	19.7
	64 (1 excluded)	14.2	8.0	34.5	18.0
	63 (2 excluded)	13.1	7.7	30.8	16.4
Total Dioxin/furan (ng/kg) [new]	59	1,258	776	2,941	1,541
	58 (1 excluded)	1,188	761	2,544	1,456
	57 (2 excluded)	1,124	746	2,342	1,376
Dioxin/furan TEQ (ng/kg)	59	5.8	4.0	14.2	7.0
	58 (1 excluded)	5.5	3.9	13.2	6.7
	57 (2 excluded)	5.2	3.8	12.5	6.3
Arsenic (mg/kg)	61	16.2	13.7	26.0	18.0
	60 (1 excluded)	15.6	13.6	25.9	17.2
	59 (2 excluded)	15.2	13.5	25.7	16.7

- Not fines-normalized or screened for low fines

Weighting

Mechanics of the Weighting Approach

- Bin into four bins based on the CSM
  - HH Dam Flow > or < 2000 cfs
  - Precipitation > or < 0.25 in/day
- Calculate the percent of time the river is in each of the four bins (2001-2019 dataset)



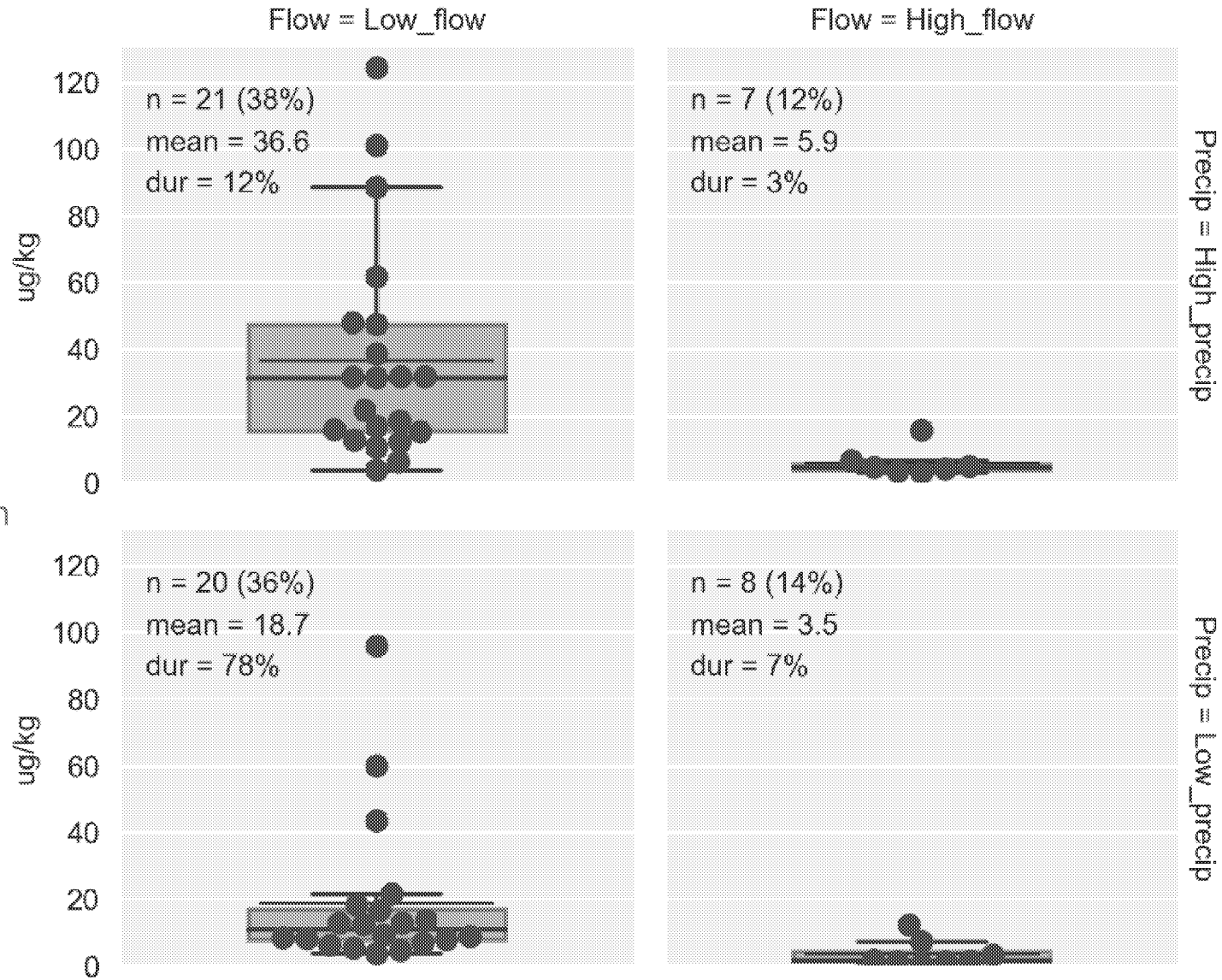
- Calculate summary statistics for samples within each bin
- Time-weighted average concentration = % time * average concentration

Notes on the Weighting Approach

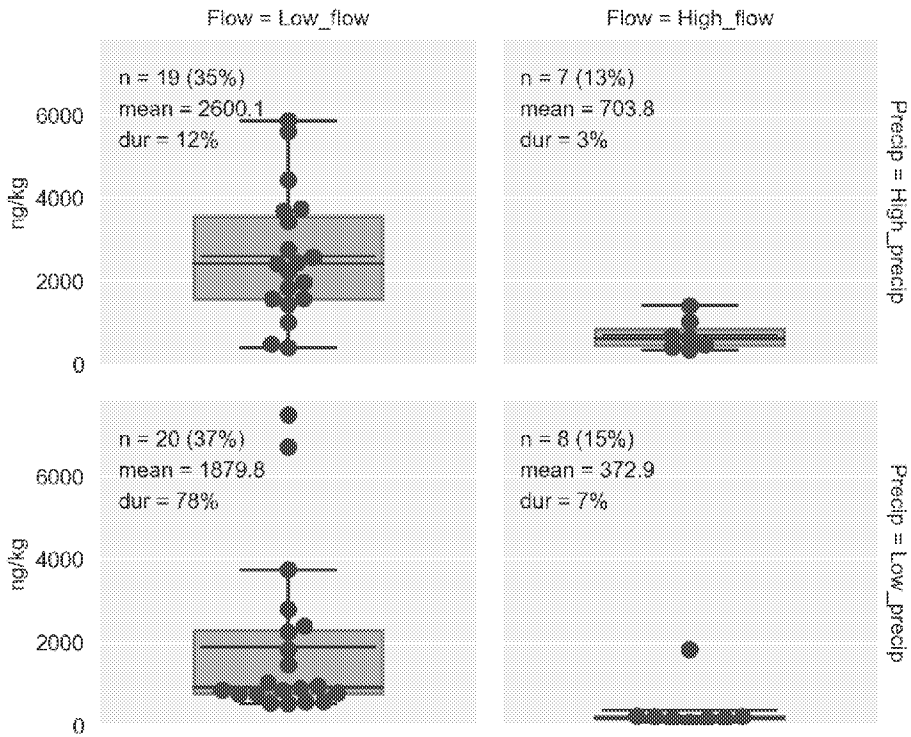
- Purpose
  - Group samples based on flow conditions
  - Weight samples based on the frequency of each flow condition
- Potential statistical limitations
- Time-weighting is consistent with EW physical CSM
- Line of evidence to support overall analysis

Total PCBs

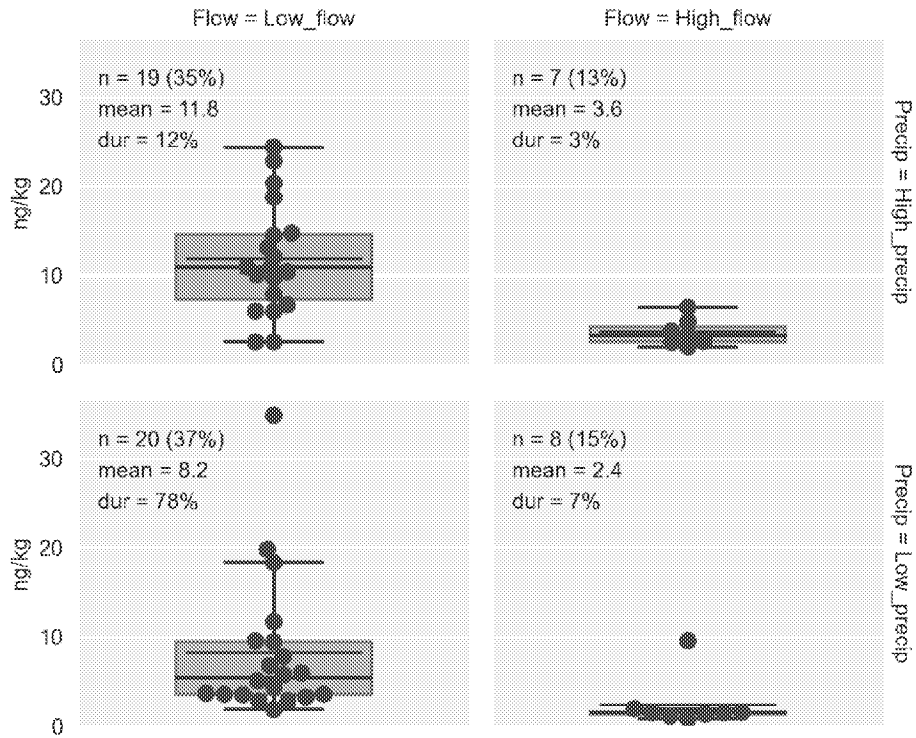
- **n** = samples
- **mean** = average of samples
- **dur** = percent of time for condition
- Fines-normalized
- Includes Ecy Aroclors
- Centrifuge and filter solids



Total Dioxin/ Furan



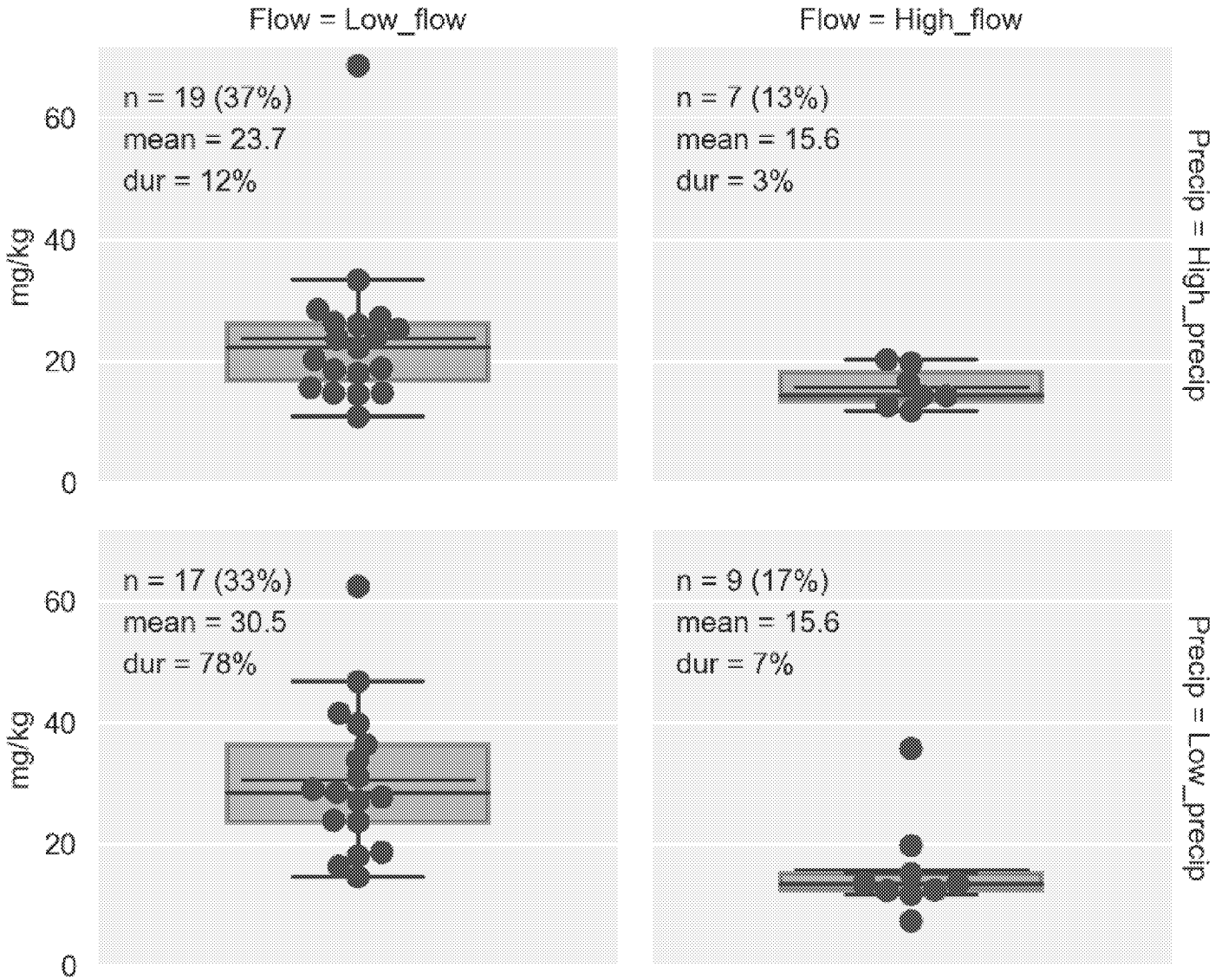
Dioxin/Furan TEQ



- **n** = samples
- **mean** = average of samples
- **dur** = percent of time for condition
- Fines-normalized
- Centrifuge and filter solids

Arsenic

- **n** = samples
- **mean** = average of samples
- **dur** = percent of time for condition
- Fines-normalized
- Centrifuge and filter solids



Summary of Average Concentrations

Calculation			Total PCBs (ug/kg)	Total Dioxin/furan (ng/kg)	Dioxin/furan TEQ (ng/kg)	Arsenic (mg/kg)
Mean	Suspended Sediment Samples (including Ecy Aroclors, sed. traps)	Dry-weight	15.5	1,258	5.8	16.2
		Fines Normalized	20.7	1677	7.6	23.2
Weighted Mean	Centrifuge and Filter Samples, Binned by Howard Hanson Dam Flow (2000 cfs) and Precipitation (0.25 in/day)	Dry-weight	15	1,368	6.2	22
		Fines Normalized	20	1,832	8.1	28

Work Products for Meeting #4