Green/Duwamish River Watershed Pollutant Loading Assessment Technical Approach

Appendices

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Appendix A. Data Assessment Details

A.1 Water Quality

A.1.1 Ambient Surface Water Quality Data

Table A-1. Ambient Surface Water Quality Data

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Data Source: EIM				
Continuous Stream Monitoring	8	7/23/2001	9/29/2010	833
Ecology's Freshwater Ambient Biological Assessment Program	6	9/29/1994	8/18/1999	7
Extensive Riparian Status and Trends Stream Temperature Monitoring	7	8/21/2008	6/28/2010	2,941
Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	28	6/21/2006	9/27/2006	5,760
King County Routine Ambient and Wet Weather Streams Monitoring	23	1/14/2004	8/11/2009	1,017
King County Routine Marine Ambient Monitoring	34	1/26/2004	12/16/2008	128
King County Swimming Beach Monitoring Program	1	6/10/2008	9/16/2008	15
Lake Mini-Monitoring	2	8/1/2010	8/1/2010	2
Lake Sawyer TMDL	17	2/27/1989	4/3/1990	1,427
Lakes Bacteria Sampling	24	6/23/2003	9/29/2003	79
Loading of Contaminants Associated with Suspended Sediment in the Green River to the Lower Duwamish Waterway	2	7/15/2008	1/21/2009	40
Long term marine waters monitoring data for water year 1973	7	8/22/1973	9/19/1973	19
Long term marine waters monitoring data for water year 1974	7	10/24/1973	9/18/1974	65
Long term marine waters monitoring data for water year 1975	7	10/16/1974	9/17/1975	60
Long term marine waters monitoring data for water year 1980	2	7/9/1980	9/15/1980	12
Long term marine waters monitoring data for water year 1981	2	10/21/1980	9/14/1981	28
Long term marine waters monitoring data for water year 1982	2	10/21/1981	9/28/1982	30
Long term marine waters monitoring data for water year 1983	2	10/25/1982	9/26/1983	28
Long term marine waters monitoring data for water year 1984	2	10/10/1983	9/17/1984	32
Long term marine waters monitoring data for water year 1985	2	10/16/1984	9/25/1985	30
Long term marine waters monitoring data for water year 1986	2	10/7/1985	9/15/1986	28
Long term marine waters monitoring data for water year 1987	2	10/13/1986	9/21/1987	24
Long term marine waters monitoring data for water year 1988	3	10/12/1987	11/18/1987	8
Long term marine waters monitoring data for water year 1992	1	10/28/1991	9/15/1992	24
Long term marine waters monitoring data for water year 1993	1	10/26/1992	9/8/1993	33
Long term marine waters monitoring data for water year 1994	1	10/6/1993	9/13/1994	36
Long term marine waters monitoring data for water year 1995	2	10/25/1994	9/14/1995	36
Long term marine waters monitoring data for water year 1996	1	10/18/1995	9/9/1996	33
Long term marine waters monitoring data for water year 1997	1	10/1/1996	9/22/1997	30
Long term marine waters monitoring data for water year 1998	2	10/27/1997	9/22/1998	33
Long term marine waters monitoring data for water year 1999	2	10/19/1998	11/23/1999	30

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Long term marine waters monitoring data for year 2000	2	1/19/2000	12/11/2000	36
Long term marine waters monitoring data for year 2001	2	1/8/2001	12/17/2001	30
Long term marine waters monitoring data for year 2002	2	1/14/2002	10/28/2002	29
Long term marine waters monitoring data for year 2003	2	1/7/2003	10/23/2003	20
Long term marine waters monitoring data for year 2004	2	2/23/2004	10/21/2004	18
Lower Duwamish Waterway Remedial Action Grant. Slip 4 Early Action Area.	23	6/22/2006	6/23/2006	6
Measured Streamflow 1998-99	1	10/22/1998	4/22/1999	4
Mercury Trends in Fresh Water Fish 2006	1	9/19/2006	9/19/2006	2
PBT Monitoring: Measuring PBDE Levels in Washington Rivers and Lakes	2	9/2/2005	4/13/2006	5
PBT Trend Monitoring: Measuring Lead in Suspended Particulate Matter from Washington State Rivers and Lakes, 2010 Results.	1	4/28/2010	10/5/2010	4
PBT Trend Monitoring: Lead in Suspended Particulate Matter, 2009	1	4/28/2009	10/1/2009	4
Screening Survey of Mercury Levels in Fish Tissue	4	10/1/2002	10/1/2002	3
Sediment Profile Imaging Feasibility Study - Lower Duwamish Waterway	30	8/9/2006	8/11/2006	22
South Puget Sound Dissolved Oxygen Study, Phase 2	8	8/24/2006	10/11/2007	28
Statewide Lake Monitoring	1	5/2/1992	10/1/1999	136
Statewide Metals in Selected Rivers & Creeks	1	7/24/2001	5/15/2002	7
Statewide River and Stream Ambient Monitoring-1980 to 1988	6	1/28/1980	9/21/1988	412
Statewide River and Stream Ambient Monitoring-Pre 1980	13	7/4/1959	12/10/1979	694
Statewide River and Stream Ambient Monitoring-WY 2000 through WY 2009	9	10/18/1999	9/21/2009	271
Statewide River and Stream Ambient Monitoring-WY1989 through WY1999	11	10/17/1988	9/22/1999	429
Statewide River and Stream Ambient Monitoring-WY2010 to present-2 (Transitional data that has not yet been QA'd. For previous data see User Study ID AMS001, and AMS001B-E.	4	10/21/2009	3/23/2011	41
WA State BEACH (Beach Environmental Assessment, Communication, and Health) Program	28	6/1/2004	8/31/2009	231
Washington State Department of Ecology's Status and Trends Habitat Monitoring Project 2009	2	10/7/2009	10/7/2009	1
Washington State Toxics Monitoring Program (WSTMP), Semipermeable Membrane Devices (SPMDs) Trends Monitoring.	1	4/30/2007	10/9/2008	12
Washington State Toxics Monitoring Program: Exploratory Monitoring 2001	1	12/21/2001	12/21/2001	1
Water & Sediment Quality in Ten Metals Mining Districts II	2	10/2/2000	4/4/2001	4
WSPMP 1996 Pesticides in Surface Water	3	4/15/1996	8/12/1996	9
Zinc and Copper Concentrations in an Industrial Area Creek during Storm Events.	1	8/28/2005	12/20/2005	158
Zinc, Copper, Lead, and Cadmium in four WA rivers	2	7/27/1992	5/24/1993	34
Data Source: EPA				
Slip 4 Early Action Removal	2	10/4/2011	1/25/2012	222
Data Source: King County				
KC GreenRiverWshedSurfaceH20Report	6	9/6/2011	12/3/2012	68
Data Source: NAWQA				
NAWQA	12	10/1/1991	10/16/2011	33,402

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Data Source: Remedial Investigation Data				
KC 2005 SW	3	1/24/2005	12/19/2005	73
KC 2007 SW	2	3/7/2007	12/12/2007	23
KC 2008 SW	2	2/6/2008	8/20/2008	28
KC Arsenic SW	2	4/30/2001	11/7/2006	117
KC WQA	19	10/30/1996	6/26/1997	458
KC_Fall2007	2	10/10/2007	12/12/2007	11
Data Source: STORET				
Environmental Monitoring and Assessment Program	1	7/18/2000	7/18/2000	3
EPA National Aquatic Resource Survey Data	1	8/17/2000	9/10/2004	4
EPA National Aquatic Resources Survey	1	7/2/2003	7/2/2003	2

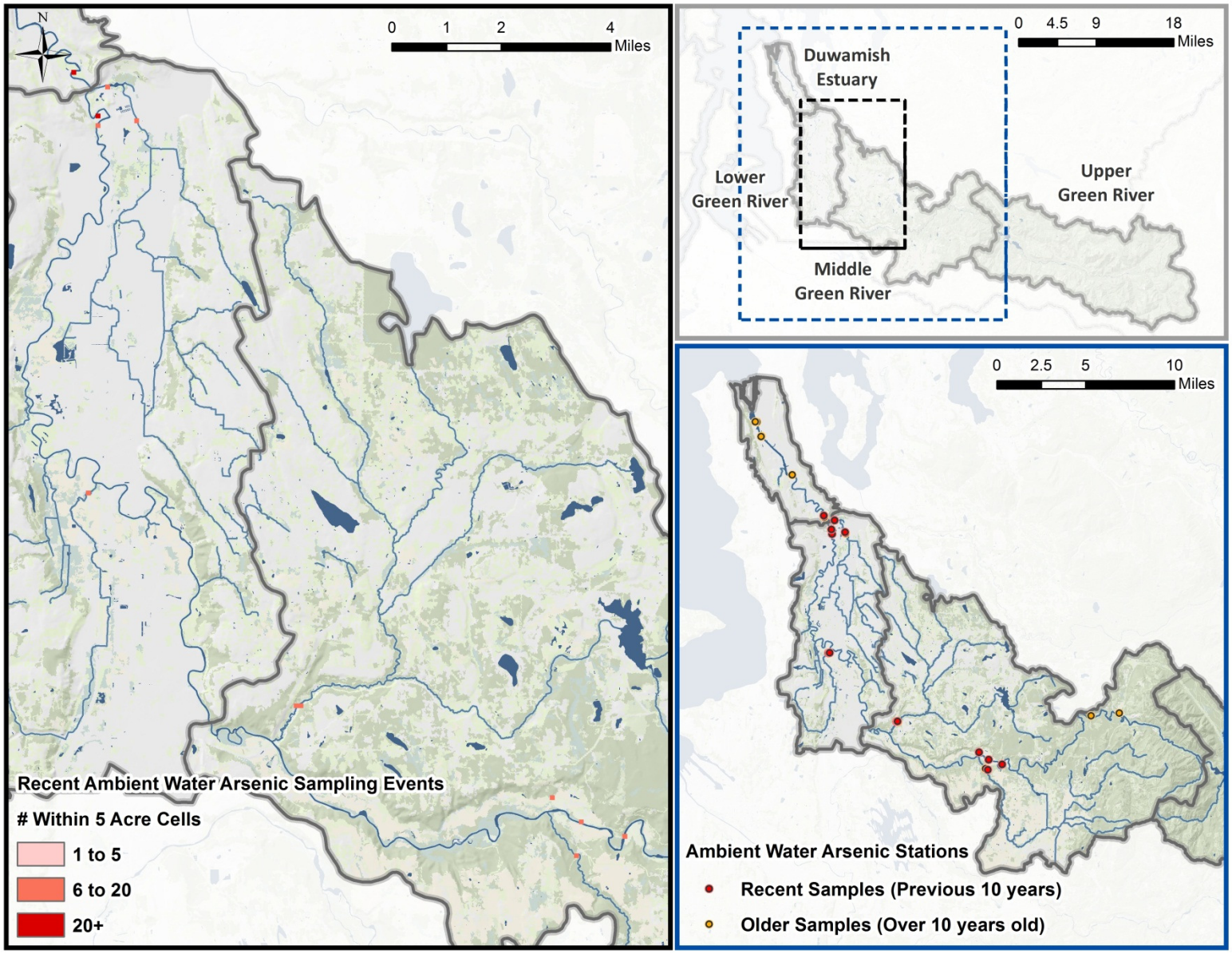

Figure A-1. Ambient surface water quality sample locations for arsenic

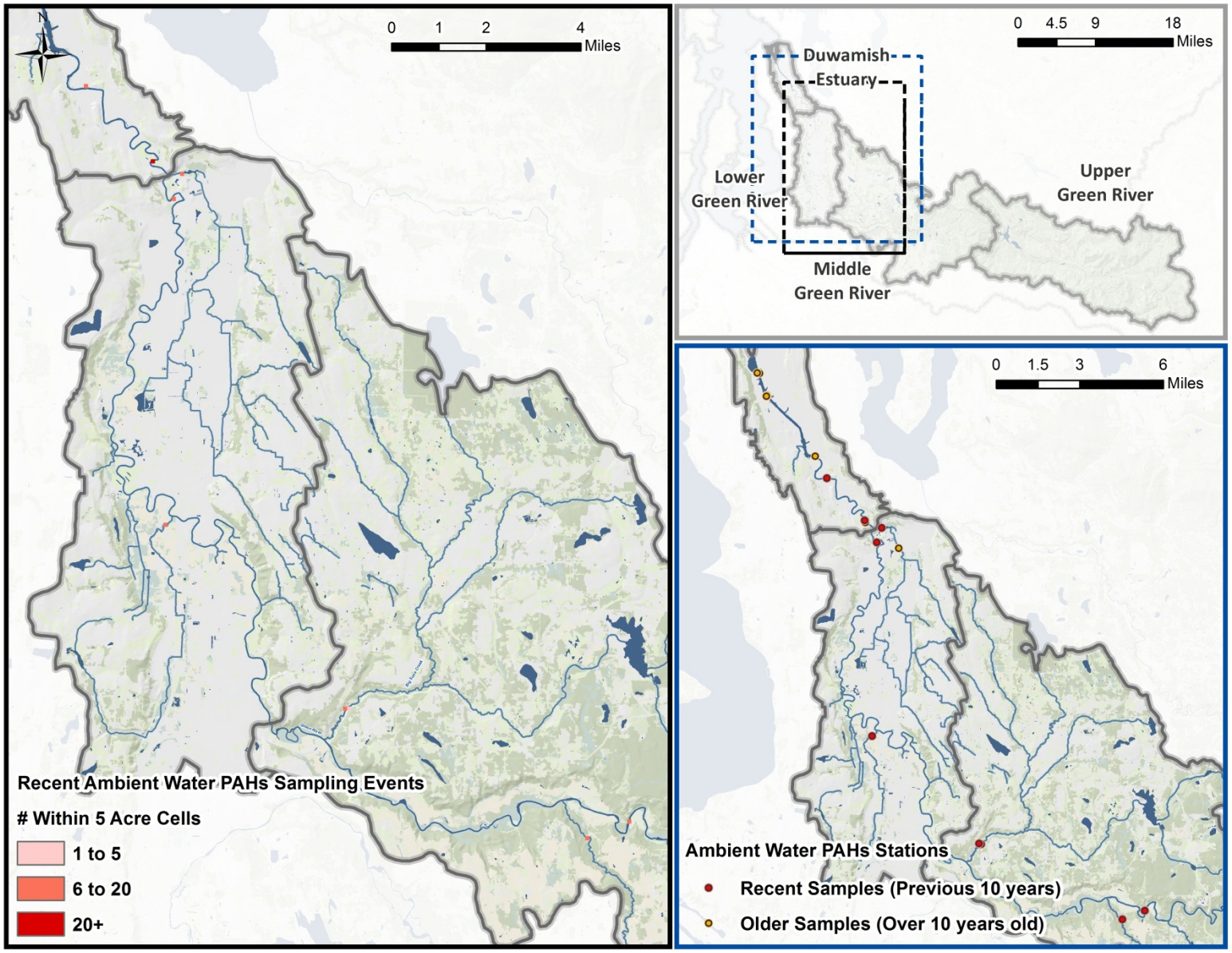

Figure A-2. Ambient surface water quality sample locations for PAHs

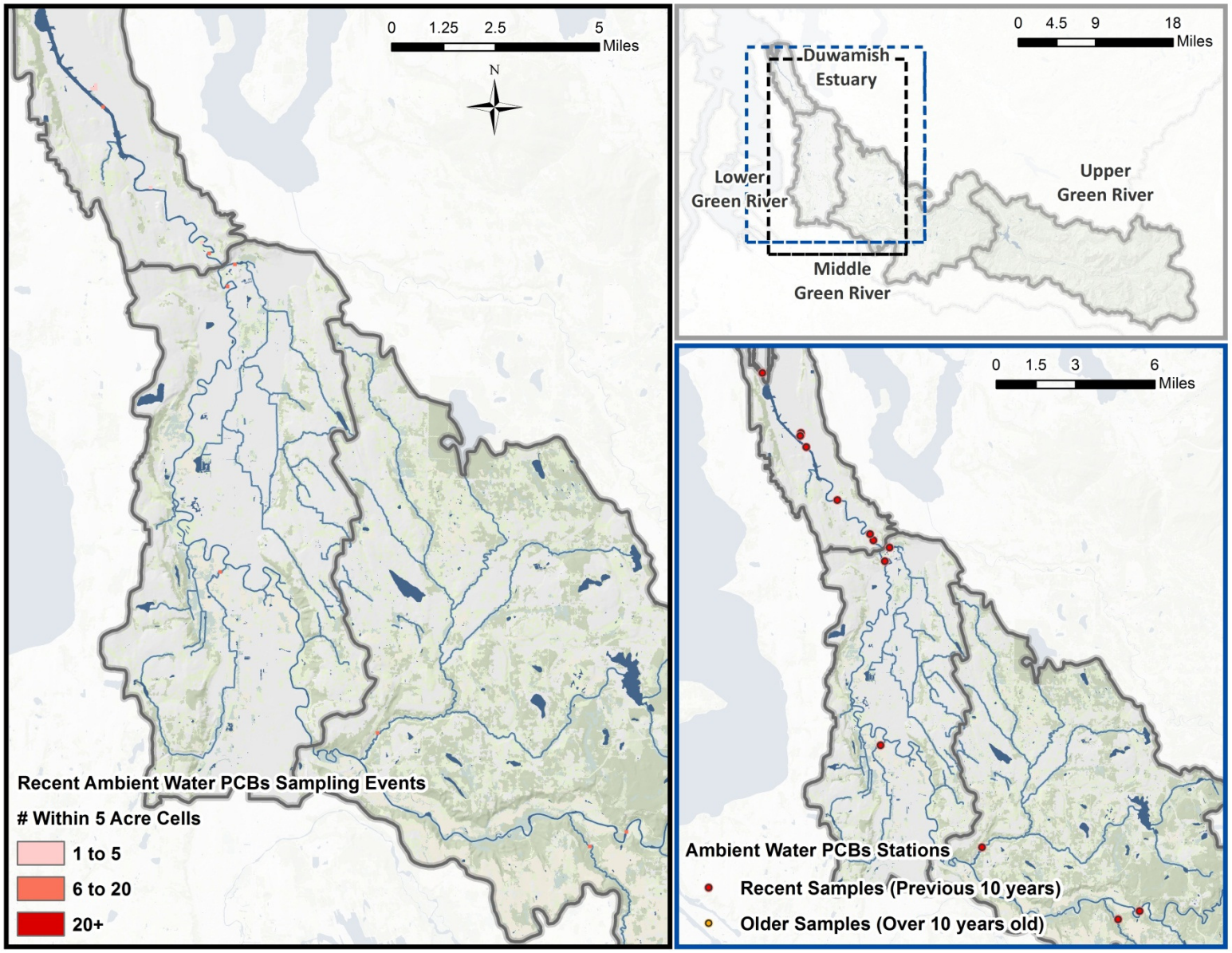

Figure A-3. Ambient surface water quality sample locations for PCBs

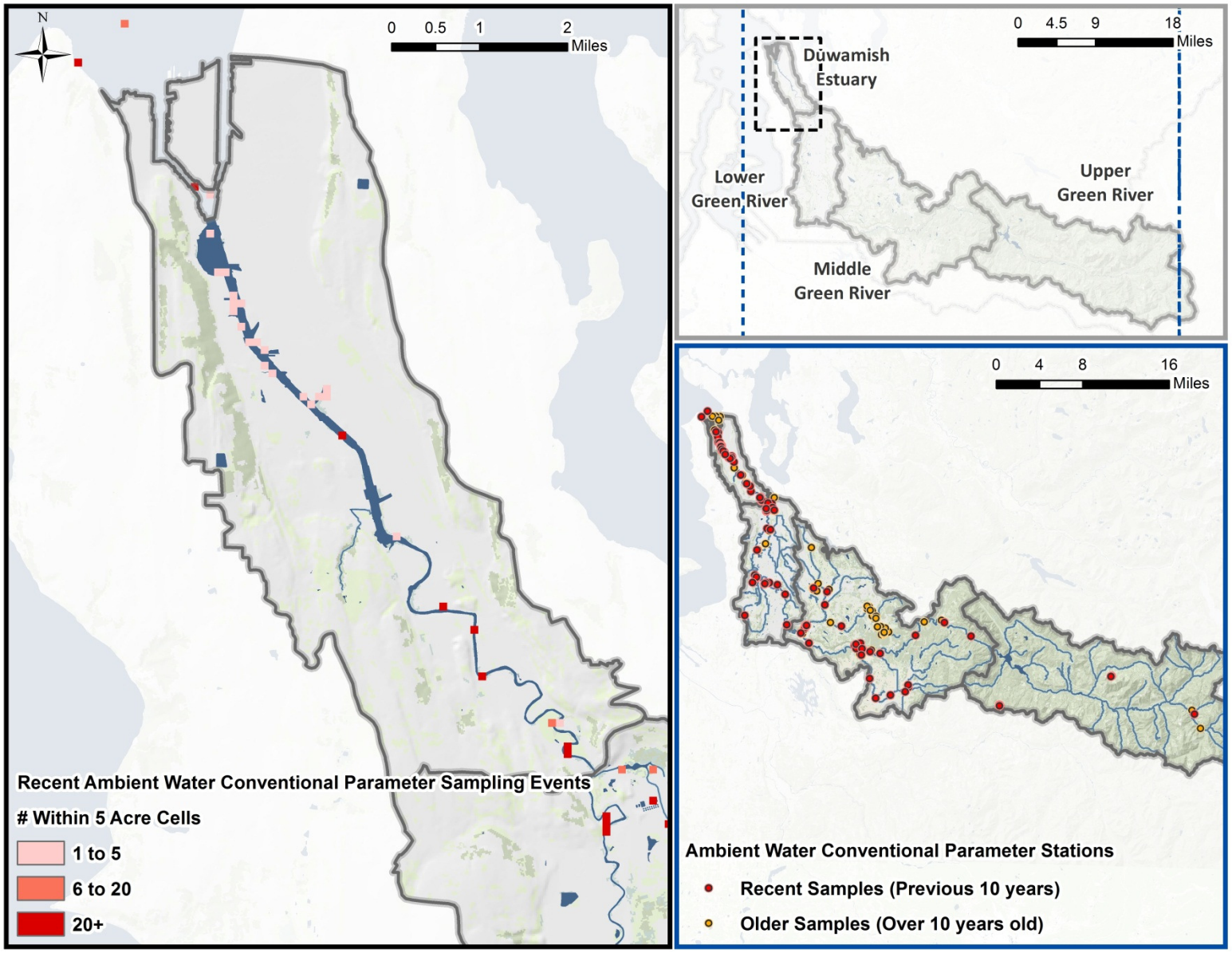

Figure A-4a. Ambient surface water quality sample locations for conventional pollutants (Duwamish Estuary subwatershed)

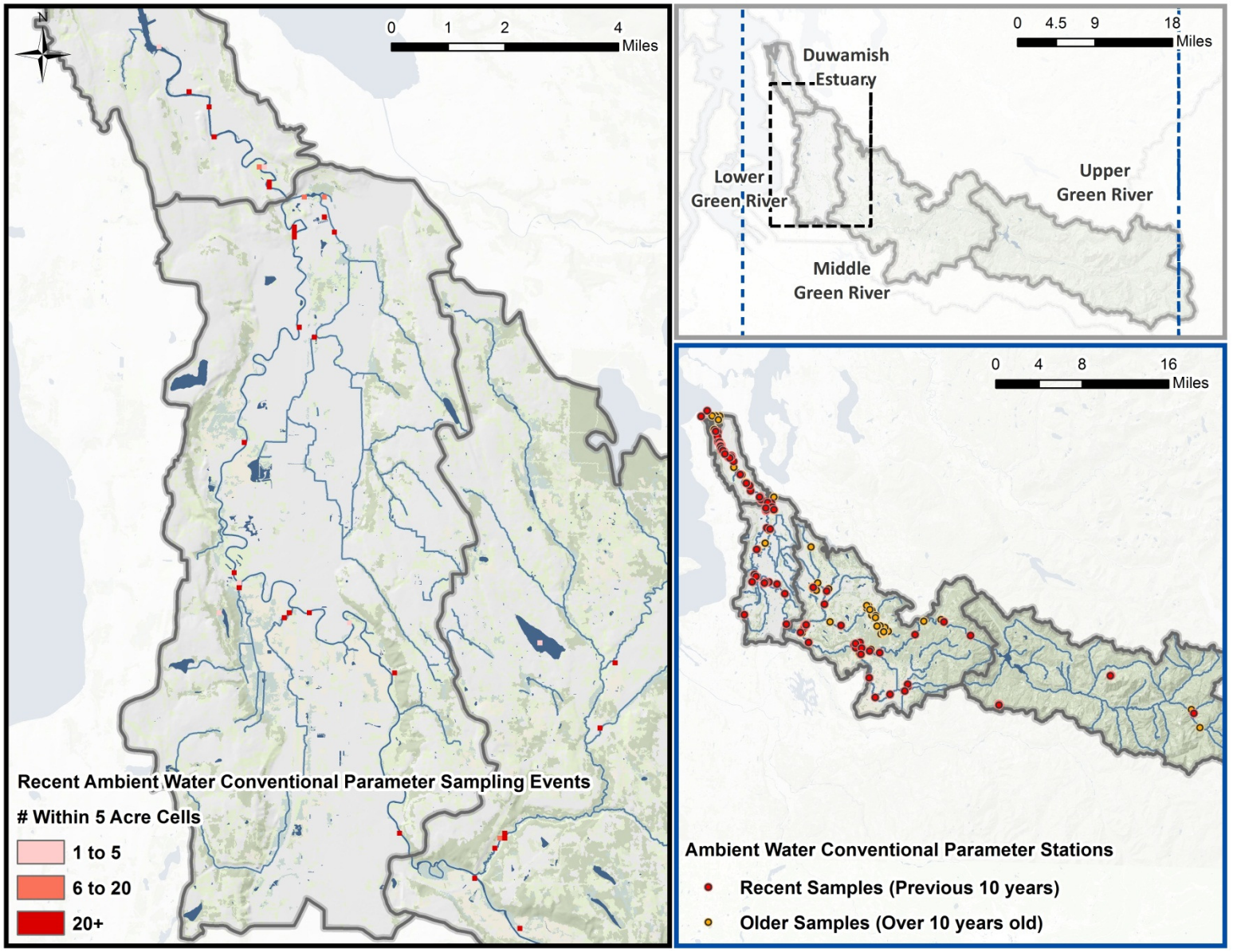

Figure A-4b. Ambient surface water quality sample locations for conventional pollutants (Lower Green River subwatershed)

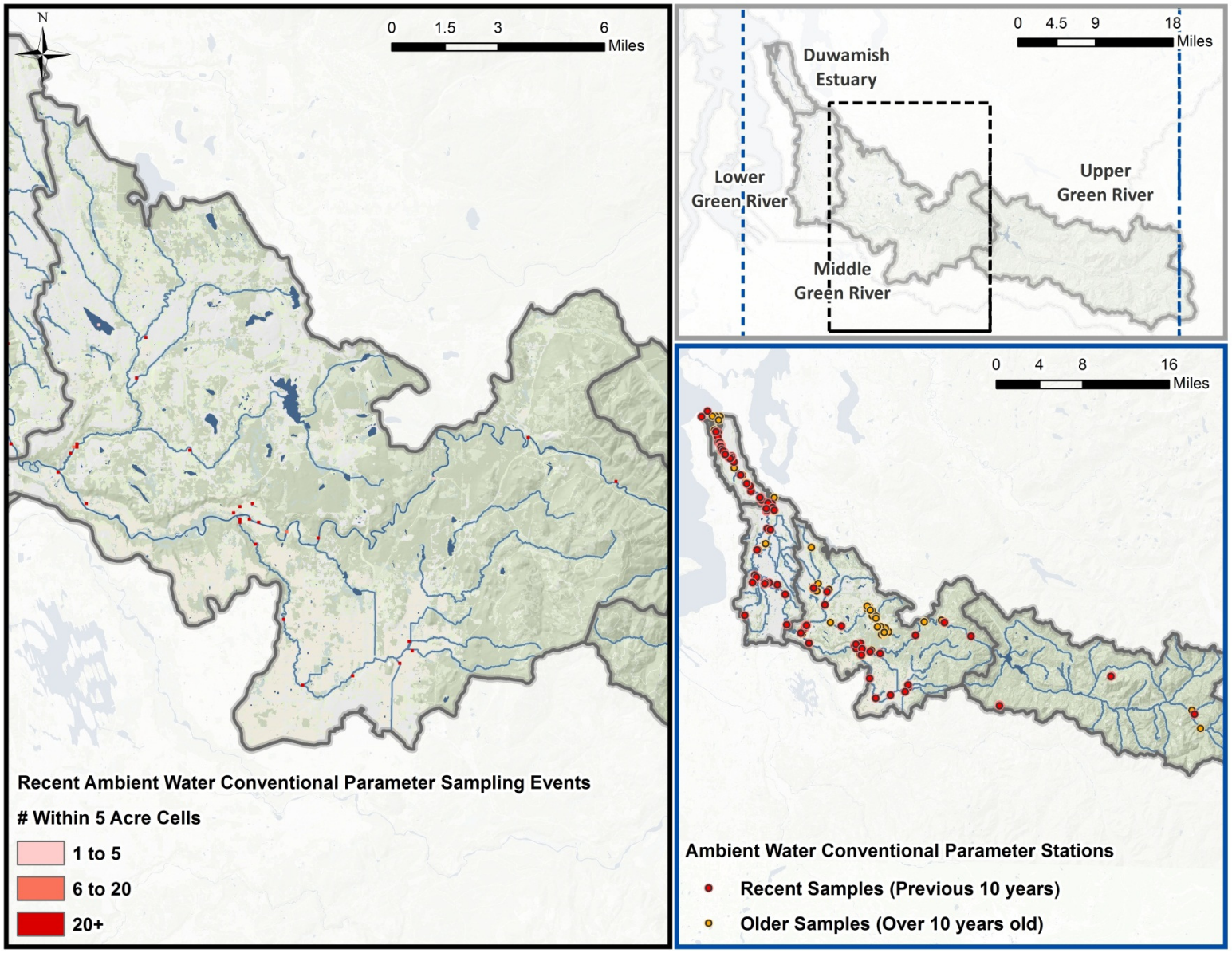

Figure A-4c. Ambient surface water quality sample locations for conventional pollutants (Middle Green River subwatershed)

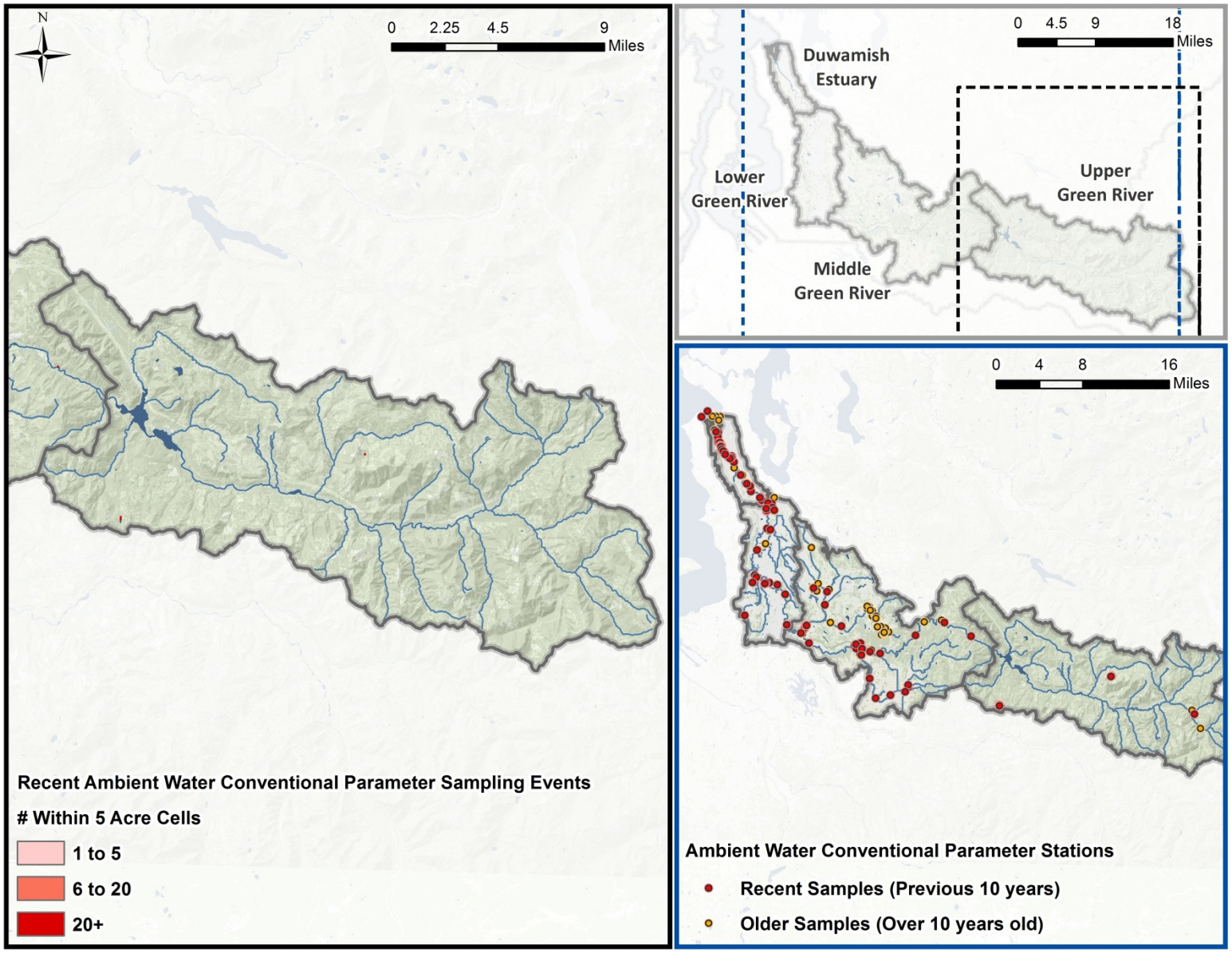

Figure A-4d. Ambient surface water quality sample locations for conventional pollutants (Upper Green River subwatershed)

A.1.2 Discharge Water Quality Data

Water quality data associated with point source and stormwater discharge are presented below (Table A-2) and include data provided in the general databases described in Section 3 (also illustrated in the following maps). Additional data are provided in Discharge Monitoring Reports (DMR) for each facility. DMR data (Table A-3) have been identified for the permitted facilities in the study area using Ecology's Water Quality Permitting and Reporting Information System (PARIS) database and have been summarized in the LDW WQA Data Inventory and Sources documentation (Tetra Tech, 2013).

Table A-2. Point Source Discharge Water Quality Data

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Data Source: EIM				
City of Seattle Phase I Municipal Stormwater Permit"	1	10/23/2009	3/11/2010	6
DR Concrete Recycle, Kenyon Street Property, Seattle, WA	23	2/6/2006	2/6/2006	3
Evaluation of sediment chemistry data, stormwater and stormwater solids data, and emergent groundwater data for discrete samples collected from the Lower Duwamish Waterway (LDW) adjacent to the 8801 East Marginal Way South Property. Phase I and II	35	10/15/2006	7/18/2007	16
Fostoria Gardens Building Property, Tukwila, WA	11	7/2/2008	7/2/2008	1
Lake Sawyer TMDL	17	3/21/1989	4/3/1990	21
Landau(Dec2012)	5	11/8/2011	12/6/2012	184
Landau(June 2012)	5	11/8/2011	6/7/2012	136
Data Source: EPA Enforcement				
EPA Enforcement	4	1/24/2012	5/21/2012	12
Data Source: Sherlock				
CSO Monitoring KC 2009	7	1/29/2004	4/12/2009	50
KCIA Central Outfall	2	3/17/2009	3/17/2009	2
LL/AST	12	1/13/2011	5/26/2011	132
NBF database	449	11/2/2006	6/30/2010	48
NBF database 2010-11	5	11/17/2010	5/25/2011	48
SPU 2010 NPDES Monitoring	1	10/22/2009	9/15/2010	22

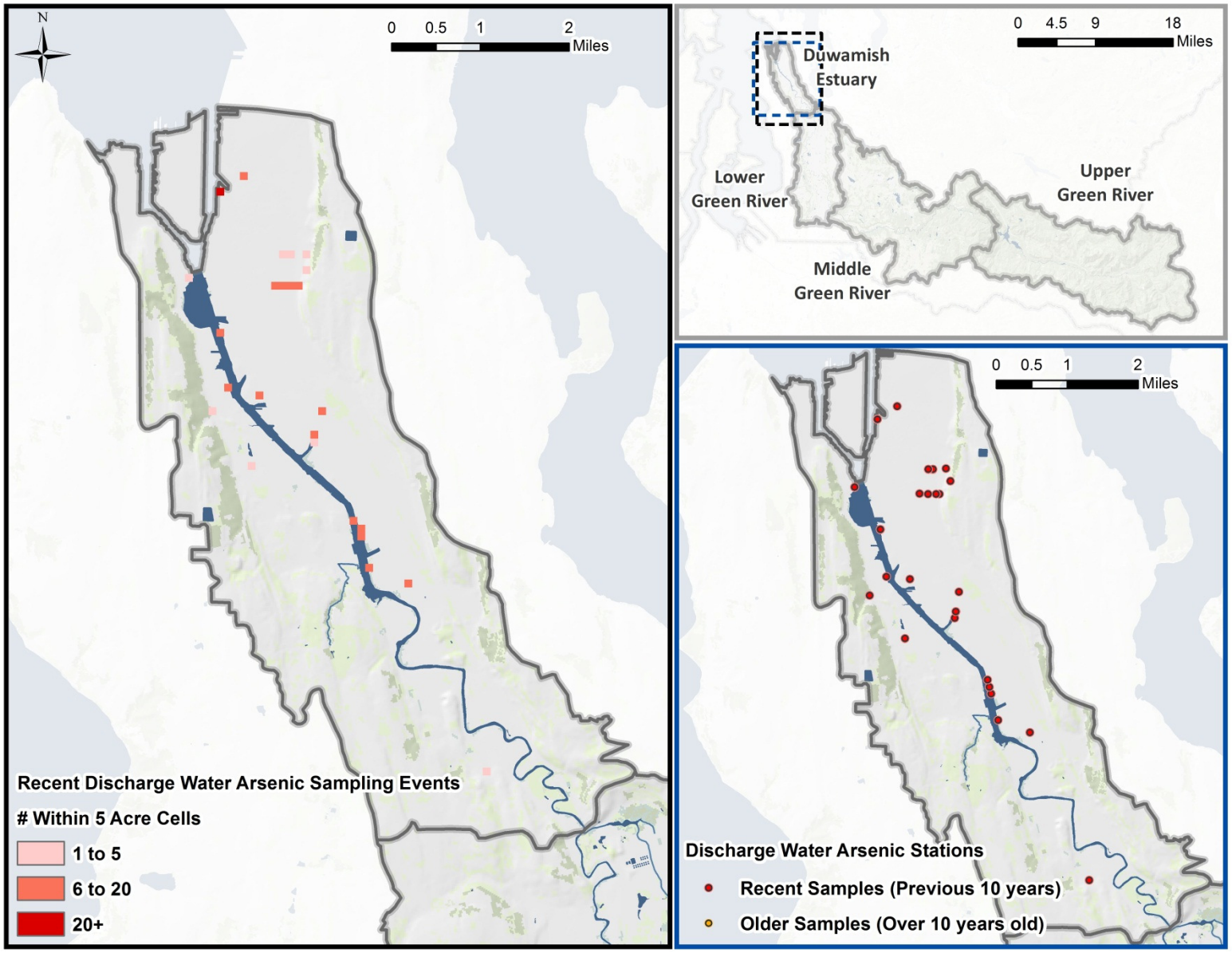

Figure A-5. Point source discharge water quality sample locations for arsenic

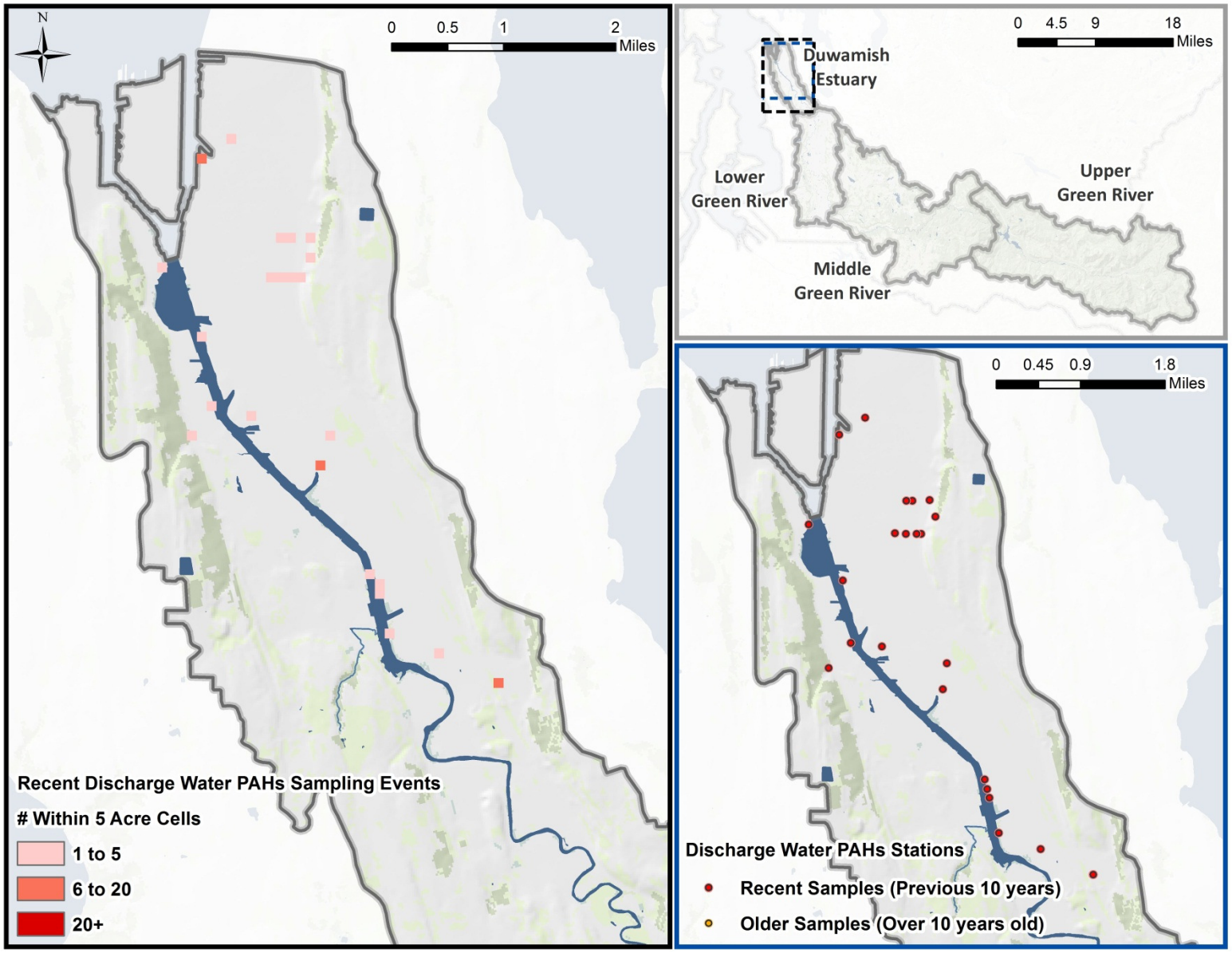

Figure A-6. Point source discharge water quality sample locations for PAHs

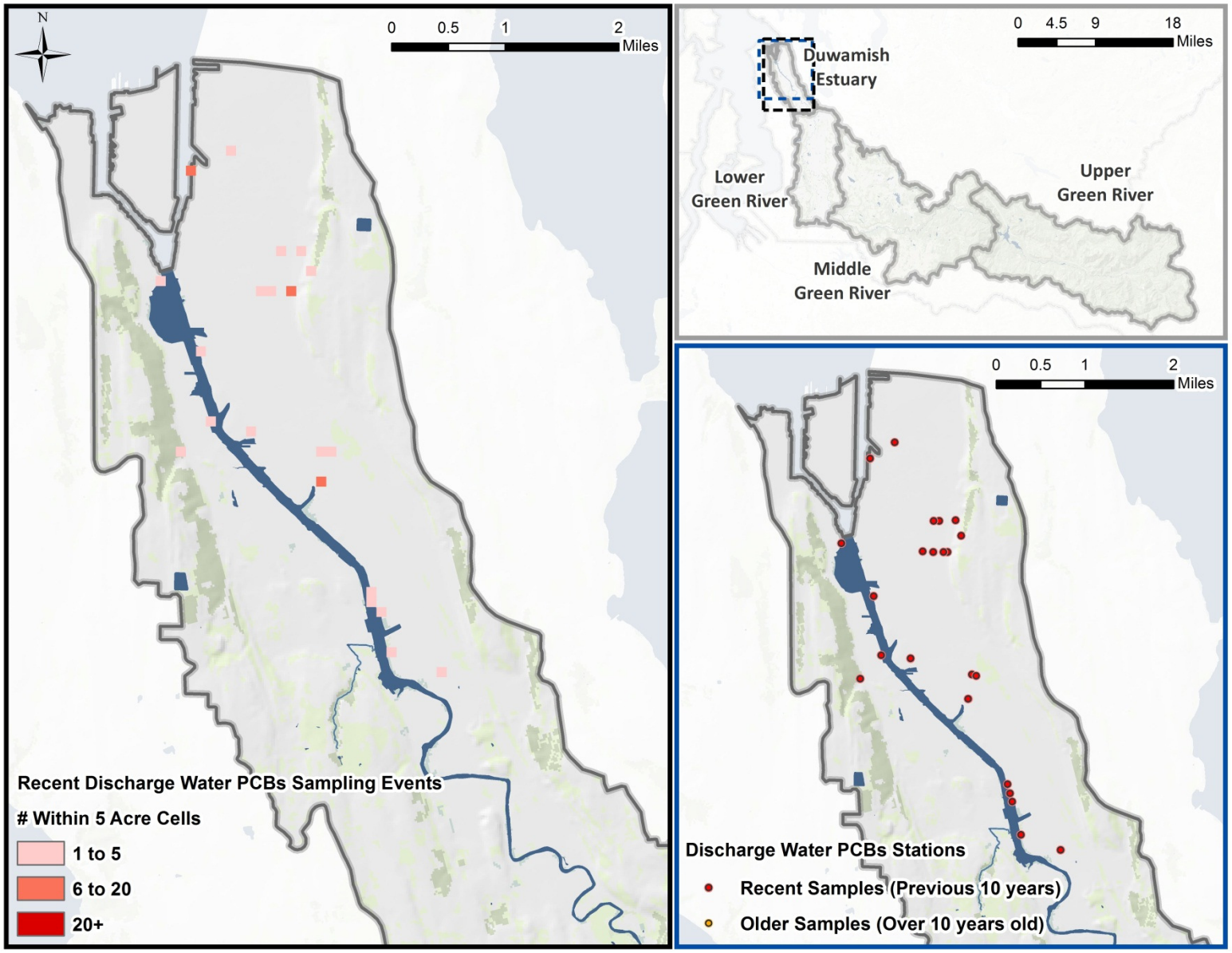

Figure A-7. Point source discharge water quality sample locations for PCBs

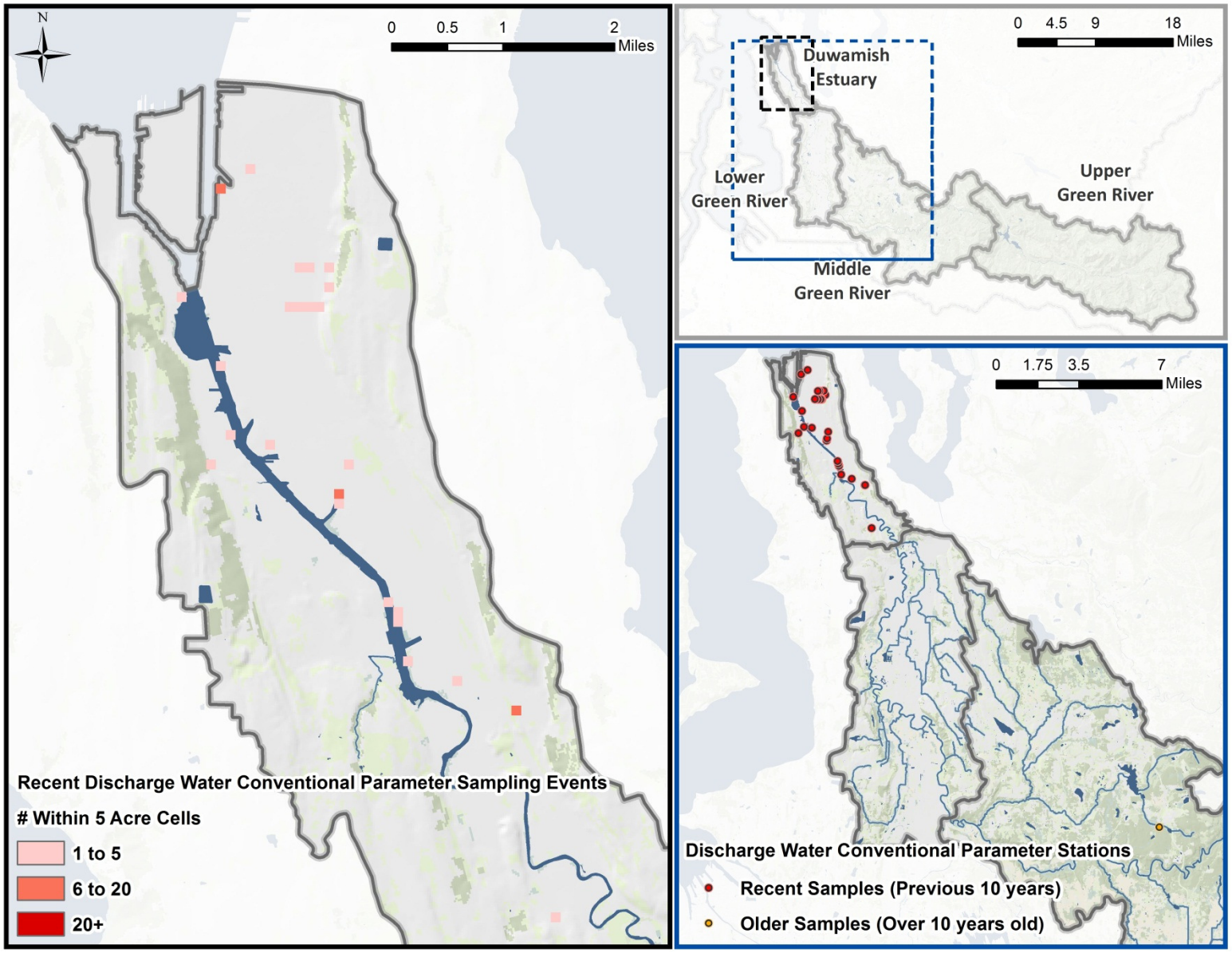

Figure A-8. Point source discharge water quality sample locations for conventional pollutants

Table A-3. Availability of Discharge Monitoring Report Data for Known Permits in the Green/Duwamish River Watershed

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
ConocoPhillips Renton Terminal	WA0001945	47.4584	-122.2275	11/1/10	3/1/13	X		X			X	X					X								
Lafarge Corporation	WA0002232	47.5552	-122.3449	1/1/11	9/30/12	X	X	X	X	X	X									X		X	X	X	X
King Cnty South Treatment Plant	WA0029581	47.4675	-122.2442																						
Seattle Iron & Metals Corp	WA0031968	47.5377	-122.3269	12/1/07	9/30/12	X	X	X	X	X	X					X									
Ash Grove Cement West Inc	WA0032221	47.5736	-122.3428	4/1/10	12/31/12	X	X	X	X	X							X			X			X	X	
Allan Thomas Dairy	WAG011051	47.2000	-121.9764	No DMR Data																					
Smith Brothers Dairy Bottling Plant	WAG013006	47.3559	-122.2516	No DMR Data																					
South Park Marina	WAG030045	47.5300	-122.3100	11/1/11	5/31/12				X	X	X														
Delta Marine Industries Inc	WAG030091	47.5179	-122.3060	10/1/11	1/31/12				X	X	X														
Stoneway Concrete Black River	WAG503057	47.4747	-122.2485	10/1/10	12/31/12		X	X																	
Renton Concrete Recyclers Monster Rd	WAG503067	47.4749	-122.2473	10/1/12	12/31/12			X																	
JA Jack & Sons Inc.	WAG503082	47.5512	-122.3394	10/1/10	9/30/12																				
JA Jack & Sons Inc.	WAG503082	47.5512	-122.3394	10/1/10	9/30/12			X																	
Glacier Northwest East Marginal Way (Concrete Batch Plant)	WAG503191	47.5514	-122.3367	10/1/10	9/30/12		X	X												X					
ICON Materials Seattle Asphalt	WAG503282	no lat/long for this outfall		10/1/10	6/30/12		X	X																	
Cadman Seattle	WAG503337	47.5578	-122.3403	10/1/10	3/31/11		X	X																	
Glacier Northwest W Marginal Plant (Truck Maintenance)	WAG503378	47.5519	-122.3478	10/1/10	6/30/12		X	X																	
Glacier Northwest W Marginal Plant (Truck Maintenance)	WAG503378	no lat/long for this outfall		10/1/10	9/30/12			X																	
Chemithon Corp	WAR000033	47.5511	-122.3400	1/1/10	6/30/12		X	X	X	X															

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
Certainteed Gypsum Manufacturing	WAR000056	no lat/long for this outfall		1/1/10	9/30/12		X	X	X	X										X					
Certainteed Gypsum Manufacturing	WAR000056	no lat/long for this outfall		1/1/10	9/30/12		X	X	X	X										X					
Certainteed Gypsum Manufacturing	WAR000056	47.5500	-122.3400	7/1/11	6/30/12		X	X	X	X										X					
Certainteed Gypsum Manufacturing	WAR000056	no lat/long for this outfall		1/1/10	12/31/10		X	X	X	X										X					
Certainteed Gypsum Manufacturing	WAR000056	47.5500	-122.3400	1/1/11	9/30/12		X	X	X	X										X					
Certainteed Gypsum Manufacturing	WAR000056	47.5500	-122.3400	7/1/10	9/30/12		X	X	X	X										X					
Alaskan Copper Works	WAR000139	facility could be found		No DMR Data																					
Boeing Developmental Center	WAR000146	no lat/long for this outfall		4/1/11	9/30/11		X	X	X	X										X					
Boeing Developmental Center	WAR000146	no lat/long for this outfall		4/1/11	9/30/11															X					
Boeing Developmental Center	WAR000146	no lat/long for this outfall		4/1/11	9/30/11		X	X	X	X										X					
Boeing Developmental Center	WAR000146	no lat/long for this outfall		7/1/11	9/30/11		X	X	X	X										X					
Boeing Developmental Center	WAR000146	no lat/long for this outfall		7/1/11	9/30/11															X					
Boeing Developmental Center	WAR000146	no lat/long for this outfall		7/1/11	9/30/11															X					
Boeing Developmental Center	WAR000146	no lat/long for this outfall		4/1/11	6/30/11		X	X	X	X										X					
Boeing Developmental Center	WAR000146	no lat/long for this outfall		4/1/11	6/30/11		X	X	X	X										X					
Boeing Developmental Center	WAR000147	47.4489	-122.2261	1/1/10	6/30/12		X	X	X	X										X					
Boeing Thompson Site	WAR000148	47.5239	-122.3061	1/1/10	6/30/12		X	X	X	X															
Boeing Thompson Site	WAR000148	47.5239	-122.3061	1/1/10	12/31/11		X	X	X	X															
Boeing Military Flight Center	WAR000150	47.5119	-122.2976	1/1/10	6/30/12		X	X	X	X											X				
Ace Galvanizing Inc 96th	WAR000154	47.5154	-122.3233	1/1/10	6/30/12		X	X	X	X	X					X									

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
Boeing - North Boeing Field	WAR000226	47.5369	-122.3181	1/1/10	3/31/12		X		X	X															
Boeing - North Boeing Field	WAR000226	47.5369	-122.3181	1/1/10	3/31/12		X		X	X															
Boeing - North Boeing Field	WAR000226	47.5369	-122.3181	1/1/10	3/31/12		X	X	X	X															
Boeing - North Boeing Field	WAR000226	47.5369	-122.3181	1/1/10	3/31/12		X	X	X	X															
Boeing - North Boeing Field	WAR000226	47.5368	-122.3191	4/30/12	9/30/12		X	X	X	X															
Protective Coatings Inc	WAR000263	47.4031	-122.2381	1/1/10	12/31/12		X	X	X	X	X					X	X								
PSF Mechanical Inc	WAR000264	47.5189	-122.3061	1/1/10	6/30/12		X	X	X	X	X					X									
Pozzi Bros Trans Inc	WAR000336	47.4119	-122.2381	Pending																					
King County Int Airport	WAR000343	47.5400	-122.3200	1/1/10	6/30/12		X	X	X	X															
King County Int Airport	WAR000343	47.5400	-122.3200	1/1/11	6/30/12		X	X	X	X															
King County Int Airport	WAR000343	47.5300	-122.3100	1/1/11	6/30/12		X	X	X	X															
King County Int Airport	WAR000343	47.5200	-122.3000	1/1/11	6/30/12		X	X	X	X															
King County Int Airport	WAR000343	47.5100	-122.3000	1/1/11	6/30/12		X	X	X	X															
Tex Enterprises Inc	WAR000360	47.3131	-122.2481	Could not download DMR information																					
Mutual Materials Kent Block Plant	WAR000364	47.4189	-122.2661	1/1/10	12/31/12		X	X	X	X							X								
Wells Trucking	WAR000392	47.5011	-122.2881	Pending																					
Quala Systems Inc	WAR000411	47.4300	-122.2419	Pending																					
Metro South Operating Base	WAR000417	47.4969	-122.2811	1/1/10	12/31/12		X	X	X	X							X								
United Parcel Service WABOE	WAR000434	47.5369	-122.3181	1/1/10	6/30/12		X	X	X	X															
United Parcel Service WASEA	WAR000444	47.5619	-122.3439	1/1/10	6/30/12		X	X	X	X										X					
UPS Tukwila	WAR000450	47.4489	-122.2431	1/1/10	12/31/12		X	X	X	X							X								
V Van Dyke Inc	WAR000453	47.5431	-122.3331	1/1/10	3/31/10		X	X	X	X															
Northland Services Inc Seattle	WAR000471	no lat/long for this outfall		1/1/10	3/31/12		X	X	X	X															

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
Northland Services Inc Seattle	WAR000471	47.5400	-122.3400	4/1/12	6/30/12															X					
Northland Services Inc Seattle	WAR000471	47.5500	-122.3400	4/1/12	6/30/12		X	X	X	X										X					
Northland Services Inc Seattle	WAR000471	47.5500	-122.3400	4/1/12	6/30/12		X	X	X	X										X					
Northland Services Inc Seattle	WAR000471	47.5400	-122.3400	4/1/12	6/30/12															X					
Northland Services Inc Seattle	WAR000471	no lat/long for this outfall		1/1/10	3/31/12		X	X	X	X															
Northland Services Inc Seattle	WAR000471	47.5500	-122.3400	4/1/10	3/31/12															X					
Northland Services Inc Seattle	WAR000471	47.5400	-122.3400	10/1/10	3/31/12															X					
Northland Services Inc Seattle	WAR000471	47.5400	-122.3400	10/1/10	3/31/12															X					
Northland Services Inc Seattle	WAR000471	47.5500	-122.3400	10/1/10	3/31/12															X					
Northland Services Inc Seattle	WAR000471	no lat/long for this outfall		10/1/10	3/31/12															X					
Northland Services Inc Seattle	WAR000471	47.5400	-122.3400	10/1/10	6/30/11															X					
Fog Tite Inc.	WAR000474	47.5589	-122.3481	1/1/10	3/31/12		X	X	X	X	X														
Boeing Plant 2	WAR000482	47.5328	-122.3217	1/1/10	9/30/12		X	X	X	X															
Boeing Plant 2	WAR000482	47.5339	-122.3189	1/1/10	12/31/11		X	X	X	X															
Boeing Plant 2	WAR000482	47.5319	-122.3161	1/1/10	9/30/12		X	X	X	X															
Boeing Plant 2	WAR000482	47.5311	-122.3139	1/1/10	9/30/12		X	X	X	X											X				
Boeing Plant 2	WAR000482	47.5289	-122.3111	1/1/10	9/30/10		X	X	X	X															
Boeing Plant 2	WAR000482	47.5281	-122.3100	1/1/10	9/30/10		X	X	X	X															
Boeing Plant 2	WAR000482	47.5281	-122.3089	1/1/10	9/30/12		X	X	X	X															
Waste Management of Seattle Marg Wy	WAR000581	47.5489	-122.3411	7/1/12	9/30/12		X	X	X	X															
Waste Management of Seattle 1st Ave	WAR000582	47.5489	-122.3411	1/1/10	9/30/12		X	X	X	X						X									
Galvin Flying Service Inc	WAR000607	47.5269	-122.3081	1/1/10	6/30/12		X	X	X	X															

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
Standard Steel Fabricating Co Inc	WAR000617	47.5339	-122.3200	1/1/10	6/30/12		X	X	X	X	X					X									
Meltec Division Of Young Corp	WAR000639	47.5711	-122.3511	7/1/10	12/31/12		X	X	X	X	X					X	X				X				
Selland Auto Transport	WAR000650	47.5161	-122.3250	1/1/10	6/30/12		X	X	X	X															
Pacific Metallurgical Inc	WAR000699	47.3689	-122.2389	1/1/10	12/31/12		X	X	X	X	X					X									
South Recycle & Disposal Station	WAR000737	47.5381	-122.3281	1/1/10	9/30/12		X	X	X	X															
Gear Works Seattle Inc	WAR000763	47.5339	-122.3211	1/1/10	9/30/12		X	X	X	X															
Farwest Paint Mfg Co	WAR000863	47.4875	-122.2781	1/1/10	12/31/12		X	X	X	X				X			X	X	X						
Skyline Electric & Mfg Co Inc	WAR000930	47.5711	-122.3431	1/1/10	6/30/12		X	X	X	X	X					X									
CleanScapes Inc	WAR000949	47.5361	-122.3231	1/1/10	6/30/12		X	X	X	X															
Seatac Marine Services LLC	WAR000962	47.5411	-122.3319	1/1/10	3/31/12		X	X	X	X															
Boeing South Park Facility	WAR001009	47.5231	-122.3081	1/1/10	6/30/12		X	X	X	X															
Boeing South Park Facility	WAR001009	47.5239	-122.3081	7/1/10	6/30/12		X	X	X	X															
Shasta Beverages Inc	WAR001080	47.4489	-122.2431	1/1/10	3/31/13		X	X	X	X				X			X	X	X						
Saint Gobain Containers LLC	WAR001134	47.5511	-122.3381	4/1/10	4/30/12		X	X	X	X															
Union Pacific Railroad Co Dawson St	WAR001155	47.5589	-122.3419	1/1/10	3/31/12		X	X	X	X															
Airgas Norpac	WAR001219	47.5300	-122.3131	4/1/10	3/31/12		X	X	X	X				X				X	X						
Alaska Marine Lines Seattle Terminal	WAR001365	47.5553	-122.3481	1/1/10	9/30/11		X	X	X	X	X									X					
Alaska Marine Lines Seattle Terminal	WAR001365	47.5531	-122.3411	1/1/10	6/30/12		X	X	X	X										X					
Alaska Marine Lines Seattle Terminal	WAR001365	47.5512	-122.3419	4/1/10	6/30/12		X	X	X	X	X									X					
Pioneer Industries	WAR001897	47.5431	-122.3339	1/1/10	9/30/12		X	X	X	X	X					X									
Northwest Grating Products	WAR001918	47.5369	-122.3261	1/1/11	3/31/12		X	X	X	X	X					X									
Industrial Automation Inc	WAR001949	47.5189	-122.3131	1/1/11	6/30/12		X	X	X	X															

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
Western Coating Inc	WAR001981	47.3081	-122.2489	1/1/12	12/31/12		X	X	X	X	X					X	X								
Unified Grocers 3301 Norfolk	WAR002040	47.5111	-122.2950	10/1/10	3/31/12		X	X	X	X							X								
Shareway Industries Inc	WAR002080	47.3300	-122.2100	1/1/10	12/31/12																				
West Coast Wire & Rope Rigging Inc	WAR002111	47.5339	-122.3211	1/1/10	6/30/11		X	X	X	X	X					X									
United Iron Works	WAR002137	47.5369	-122.3261	1/1/11	3/31/11		X	X	X	X	X														
Puget Sound Coatings	WAR002142	47.5169	-122.3219	1/1/10	9/30/12		X	X	X	X	X					X									
Rabanco Black River Transfer Station	WAR002149	47.4789	-122.2550	1/1/10	12/31/12		X	X	X	X	X					X	X								
Anderson Joseph B et al	WAR002153	47.4839	-122.2589	1/1/10	12/31/12		X	X	X	X	X	X					X								
Engstrom Machine Works Inc	WAR002198	47.4750	-122.2511	1/1/10	12/31/12		X	X	X	X							X								
Seattle Boilerworks Inc Myrtle St	WAR002208	47.5389	-122.3261	4/1/10	6/30/12		X	X	X	X	X					X									
General Recycling Of Washington LLC	WAR002341	47.5639	-122.3469	1/1/10	6/30/12		X	X	X	X	X					X									
Shultz Distributing Inc Sea	WAR002346	47.5411	-122.3300	1/1/10	12/31/11		X	X	X	X															
Shultz Distributing Inc Marginal Way	WAR002346	47.5411	-122.3300	1/1/10	12/31/12		X	X	X	X							X								
Becker Trucking Inc Tukwila	WAR002612	47.4769	-122.2539	1/1/10	12/31/12		X	X	X	X							X								
Emerald Services Inc	WAR002641	47.5361	-122.3181	4/1/10	6/30/12		X	X	X	X				X				X	X						
Emerald Services Inc	WAR002641	47.5361	-122.3181	10/1/10	9/30/11																				
Ameriflight Inc Hangar 5	WAR002830	47.5350	-122.3183	7/1/09	3/31/12		X	X	X	X			X	X	X			X			X				
Ameriflight Inc Hangar 5	WAR002830	47.5300	-122.3131	no data																					
UPS Freight	WAR002835	47.5011	-122.2911	4/1/10	12/31/12		X	X	X	X							X								
Burke Gibson Inc	WAR002938	47.3050	-122.2511	4/1/10	12/31/12		X	X	X	X							X								
Evergreen Trails Inc	WAR002966	47.5620	-122.3497	1/1/10	6/30/12		X	X	X	X															
Gary Merlino Construction Company	WAR003120	47.5161	-122.3219	1/1/10	12/31/12		X	X	X	X							X								
Jorgensen Forge Corp	WAR003231	no lat/long for this outfall		4/1/10	9/30/12		X	X	X	X	X					X									

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
Jeld Wen Coatings Tukwila	WAR003402	47.4450	-122.2450	4/1/12	12/31/12		X	X	X	X				X			X	X	X						
Fibres International Inc 4th Av	WAR003598	47.5431	-122.3339	1/1/10	3/31/12		X	X	X	X	X					X									
Colorgraphics	WAR003679	no lat/long for this outfall		1/1/10	3/31/12		X	X		X															
Peninsula Truck Lines Auburn	WAR003742	47.3150	-122.2461	1/1/10	12/31/12		X	X	X	X							X								
Segale Business Pk Pacific Gateway	WAR003802	47.4182	-122.2677	1/1/11	2/28/13																				
Westway Feed Products Co Inc	WAR004526	47.5750	-122.3429	1/1/12	3/31/13		X	X		X				X				X	X						
Architectural Stone Werkes	WAR004556	facility could be found		No DMR Data																					
ABX Air Inc. Seattle	WAR004602	47.5239	-122.3061	1/1/10	9/30/11		X	X	X	X															
Alaska Street Reload & Recycling	WAR004605	47.5603	-122.3441	1/1/10	9/30/12		X	X	X	X															
US Gypsum Corporation Auburn	WAR004607	47.3169	-122.2389	1/1/10	12/31/12		X	X	X	X	X			X		X	X	X	X						
Lee & Eastes Tank Lines Inc	WAR004614	47.5811	-122.3429	1/1/10	9/30/12		X	X	X	X															
Con Way Freight Use	WAR004630	47.4531	-122.2439	7/1/10	12/31/12		X	X	X	X							X								
Pacific Rail Serv & Bnsf So Seattle	WAR005562	no lat/long for outfall		4/1/12	1/1/13		X	X	X	X							X								
King Cnty Transit South Base Annex	WAR005569	47.4969	-122.2869	1/1/10	12/31/12		X	X	X	X	X					X	X								
Fatigue Technology FTI	WAR005588	47.4489	-122.2431	1/1/10	6/30/12		X	X	X	X	X					X	X								
FEDEX Ground Auburn	WAR005591	47.3389	-122.2069	4/1/10	9/30/12		X	X		X							X								
Boyer Logistics Inc	WAR005598	47.5394	-122.3311	1/1/10	6/30/12		X	X	X	X															
Colorado St Facility Rainier Petro	WAR005619	47.5711	-122.3431	1/1/10	9/30/12		X	X	X	X				X			X	X	X						
Sunset Bluff Sr900 LLC	WAR006297	47.4794	-122.2198	4/1/12	3/1/13																				
Maralco Restoration	WAR006920	47.4126	-122.2648	Pending																					
Insurance Auto Auctions Tukwila	WAR008681	47.5200	-122.3100	1/1/10	6/30/12		X	X	X	X															

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
Insurance Auto Auctions Tukwila	WAR008681	no lat/long for this outfall																							
Insurance Auto Auctions Tukwila	WAR008681	47.5200	-122.3100	1/1/10	9/30/12		X	X	X	X															
Insurance Auto Auctions Tukwila	WAR008681	47.5300	-122.3100	1/1/10	9/30/12		X	X	X	X															
Insurance Auto Auctions Tukwila	WAR008681	no lat/long for this outfall																							
Pepsi Bottling Group Seattle Plant	WAR008720	no lat/long for this outfall		7/1/10	9/30/12		X	X	X	X				X				X	X						
Mail Well	WAR009288	47.4333	-122.2558	1/1/10	12/31/12		X	X	X	X					X		X			X					
EFCO Warehouse	WAR009512	47.3697	-122.2356	Pending																					
Indian Plaza	WAR009589	47.4186	-122.1944	1/1/11	9/30/12																				
Independent Metals	WAR009725	47.5300	-122.3200	1/1/10	6/30/12		X	X	X	X	X	X													
WV68 Property	WAR009880	47.4031	-122.2497	Pending																					
Copper Ridge Plat & Pud	WAR009885	47.4104	-122.2184	Pending																					
UPS Freight Kent	WAR009892	47.4122	-122.2397	Pending																					
Elk Run Regional Stormwater Fac	WAR010197	47.3503	-122.0481	Pending																					
Compass Aerospace Northwest	WAR010296	47.3697	-122.2361	1/1/10	12/31/12		X	X	X	X	X					X	X								
Kealy Mini Storage	WAR010369	47.3888	-122.2730	Pending																					
General Biodiesel Seattle	WAR010447	47.5469	-122.3353	10/1/10	12/31/12		X	X	X	X				X				X	X						
Brennas Vista	WAR010536	47.4244	-122.2208	Pending																					
Cambridge Park Villa	WAR010541	47.4831	-122.2492	Pending																					
ConGlobal Industries	WAR010569	no lat/long for this outfall		1/1/11	9/30/12		X	X	X	X										X					
ConGlobal Industries	WAR010569	no lat/long for this outfall		3/31/11	9/30/12		X	X	X	X										X					
ConGlobal Industries	WAR010569	47.5600	-122.3500	1/1/11	9/30/12		X	X	X	X										X					
ConGlobal Industries	WAR010569	47.5700	-122.3500	1/1/11	9/30/12		X	X	X	X										X					
SKBA Buddhist Temple	WAR010699	47.5142	-122.3231	Pending																					
Machinists Inc 5th Ave	WAR010782	no lat/long for this outfall		1/1/10	3/31/12		X	X	X	X															

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
Machinists Inc 5th Ave	WAR010782	47.5344	-122.3250	4/1/10	6/30/11		X	X	X	X															
King County Biosolids (Georgetown Yard)	WAR010792	47.5431	-122.3331	1/1/10	6/30/12		X	X	X	X															
Famco Transport Inc	WAR010792	47.5431	-122.3331	1/1/12	12/31/12		X	X	X	X							X								
Auburn Marketplace Lot B	WAR010883	47.3172	-122.2275	3/1/12	3/31/12																				
The Highlands At Woodbrook Div 2	WAR010953	47.3458	-122.2689	Pending																					
Lukas Machine Inc	WAR011064	47.5344	-122.3250	1/1/10	6/30/11		X	X	X	X															
MAPSCO	WAR011078	47.5328	-122.3331	1/1/10	6/30/12		X	X	X	X	X														
MacMillan Piper Inc Airport Way	WAR011326	no lat/long for this outfall		4/1/10	3/31/12		X	X	X	X										X					
MacMillan Piper Inc Airport Way	WAR011326	47.5628	-122.3272	4/1/10	6/30/12		X	X	X	X										X					
MacMillan Piper Inc Airport Way	WAR011326	47.5658	-122.3456																						
North Star Casteel Products Inc	WAR011355	47.5583	-122.3444	1/1/10	6/30/12		X	X	X	X	X					X				X					
Samson Tug & Barge Seattle Facility	WAR011484	47.5481	-122.3369	1/1/10	6/30/12		X	X	X	X															
Western Ports Containers	WAR011548	47.5169	-122.3069	1/1/10	12/31/10		X	X	X	X															
Dawn Food Products-Sea Dry Mix	WAR011560	47.5428	-122.3294	1/1/10	9/30/12		X	X	X	X				X				X	X						
Puget Sound Personal Warehouse	WAR011569	47.4169	-122.1942	Construction Not Started																					
Empire Way	WAR011571	47.4886	-122.2628	Construction Not Started																					
Algas SDI	WAR011723	47.5429	-122.3322	7/1/10	6/30/12		X	X	X	X	X					X									
Algas SDI	WAR011724	47.5400	-122.3300	1/1/12	6/30/12		X	X	X	X	X					X									
Marine Lumber Service Inc	WAR011741	47.5353	-122.3303	10/1/10	6/30/12		X	X	X	X					X					X			X		
Farwest Steel Corp Renton	WAR011749	47.4483	-122.2439	1/1/10	12/31/12		X	X	X	X							X								
RMC Inc	WAR011783	47.5094	-122.3331	10/1/09	6/30/12		X	X	X	X	X					X									

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
Samson Tug & Barge Detroit Ave (Maintenance)	WAR011800	47.5378	-122.3408	10/1/10	6/30/11		X	X	X	X															
Samson Tug & Barge Detroit Ave (Maintenance)	WAR011800	47.5358	-122.3372	10/1/11	3/31/12		X		X	X															
Seattle Box Company	WAR011838	47.3919	-122.2450	Pending																					
tukwila south	WAR011880	47.4411	-122.2523	1/1/11	6/24/12		X	X																	
tukwila south	WAR011880	47.4295	-122.2611																						
tukwila south	WAR011880	47.4169	-122.2682																						
tukwila south	WAR011880	47.4410	-122.2524																						
Organic Fuel Processors	WAR012409	no lat/long for this outfall		7/1/10	12/31/10																				
Organic Fuel Processors	WAR012410	no lat/long for this outfall		7/1/10	6/30/12		X	X	X	X				X	X			X	X	X					
Organic Fuel Processors	WAR012411	no lat/long for this outfall		7/1/10	6/30/12		X	X	X	X				X	X			X	X	X					
Organic Fuel Processors	WAR012412	no lat/long for this outfall		7/1/10	6/30/12		X	X	X	X				X	X			X	X	X					
Organic Fuel Processors	WAR012413	no lat/long for this outfall		7/1/10	6/30/12		X	X	X	X				X	X			X	X	X					
Organic Fuel Processors	WAR012413	no lat/long for this outfall		7/1/10	6/30/12		X	X	X	X				X	X			X	X	X					
South Park Project No. 3179 Replacement Project CIP 300197	WAR012448	47.5298	-122.3144	1/1/11	2/28/13		X	X																	
Veolia Transportation	WAR012519	47.4158	-122.2392	7/1/10	12/31/12		X	X	X	X							X								
Duwamish Properties Shoreside Support HQ	WAR124667	47.5736	-122.3458	1/1/11	2/28/13		X	X																	
Bahamas Plat	WAR124706	47.4210	-122.2226	5/1/11	10/31/12																				
Airport Way S Viaduct Argo Yard	WAR124764	47.5631	-122.3453	2/1/11	9/30/12		X	X																	
Osterly Park	WAR124829	47.4825	-122.2672	Pending																					
Benchmark Heritage Lakeland A	WAR124988	47.3581	-122.1994	12/1/11	2/28/13		X	X																	

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
First Student Inc 8th Ave S	WAR124990	47.5367	-122.3192	4/1/11	6/30/12		X	X	X	X															
First Student Inc 1st Ave S (Maintenance)	WAR124991	47.5353	-122.3256	4/1/11	6/30/12		X	X	X	X															
Seattle Iron & Metals Corp Truck Parking	WAR125002	47.5394	-122.3281	7/1/11	6/30/12		X	X	X	X															
PCC Logistics Seattle	WAR125003	47.5700	-122.3456	4/1/11	12/31/12		X	X	X	X							X								
MacDonald Miller Facility Solutions Fab Shop	WAR125005	47.5126	-122.2858	7/1/11	6/30/12		X	X	X	X	X	X													
MacDonald Miller Facility Solutions Fab Shop	WAR125005	47.5110	-122.2851	7/1/11	6/30/12		X	X	X	X	X	X													
Absolute German	WAR125038	47.5172	-122.3142	10/1/11	9/30/12		X	X	X	X	X	X													
Horseshoe Bend Levee	WAR125081	47.3680	-122.2350	6/1/11	2/28/13																				
SR519 I90 to SR519 Ped Trail	WAR125083	47.5603	-122.3453	4/1/12	3/1/13																				
Hawley Road Levee project	WAR125253	47.3770	-122.2470	Construction Not Started																					
SW 27TH Strander Exten Stge 1 Ph 2a	WAR125254	47.4606	-122.2406	8/1/11	2/28/13		X	X																	
Plat Of Panther Ridge	WAR125298	47.4381	-122.2019	Pending																					
Goodwin Short Plat	WAR125303	47.4235	-122.1761	2/1/12	1/31/13		X	X																	
The Bridges	WAR125305	47.3431	-122.1815	9/1/11	2/28/13		X	X																	
Hopelink	WAR125323	47.3978	-122.2332	10/1/11	12/31/12		X	X	X	X							X								
January Company	WAR125325	47.4269	-122.2433	Construction Not Started																					
Allflight	WAR125326	47.4235	-122.2477	10/1/11	12/31/12		X	X	X	X							X								
TriVitro Corporation	WAR125339	47.4393	-122.2405	1/1/12	12/31/12		X	X	X	X							X				X				
Safety Kleen Systems Inc Auburn	WAR125340	47.3403	-122.2436	10/1/11	9/30/12		X	X	X	X							X				X				
Interurban Office Warehouse	WAR125343	47.4719	-122.2532	Pending																					
Steeler Inc	WAR125358	47.5100	-122.2931	No DMR Data																					

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
Central Ave Sidewalks Improvements	WAR125361	47.3612	-122.2300	10/1/11	2/28/13		X	X																	
Northlake Rim A	WAR125381	47.3052	-122.2742	11/1/11	2/28/13		X																		
First Hill Streetcar Project	WAR125384	47.5632	-122.3453	5/1/12	2/28/13		X	X																	
M Street Underpass Project	WAR125415	47.3157	-122.2059	12/1/11	2/28/13		X	X																	
Georgetown Brewing Co	WAR125420	47.5631	-122.3450	10/1/11	6/30/12		X	X	X	X								X		X					
Nelson Trucking Co 9777	WAR125421	47.5135	-122.2867	10/1/11	12/31/11																				
Duwamish Metal Fabrication	WAR125423	47.5437	-122.3365	1/1/12	6/30/12		X	X	X	X	X	X													
Northwest Gourmet Foods	WAR125428	47.5078	-122.2919	No DMR Data																					
Oakleigh	WAR125446	47.3478	-122.1976	4/1/12	2/1/13		X																		
Valley Medical Center Emergency Dept	WAR125458	47.3539	-122.1173	Pending																					
Pacific Industrial Supply Co Inc	WAR125474	47.5224	-122.3078	No DMR Data																					
Raisbeck Aviation High School	WAR125490	47.5196	-122.3023	2/1/12	2/28/13																				
South Park Landfill	WAR125544	47.5394	-122.3338	2/1/12	2/28/13																				
WA DOT Thunder Hills Creek Mitigation Fish Barrier Retrofit	WAR125549	47.4624	-122.2174	2/1/12	2/28/13		X																		
WA DOT Thunder Hills Creek Mitigation Fish Barrier Retrofit	WAR125549	47.4468	-122.2155	2/1/12	2/28/13		X																		
WA DOT Thunder Hills Creek Mitigation Fish Barrier Retrofit	WAR125549	47.4473	-122.2155	2/1/12	2/28/13																				
WA DOT Thunder Hills Creek Mitigation Fish Barrier Retrofit	WAR125549	47.4464	-122.2154	2/1/12	2/28/13																				
WA DOT Thunder Hills Creek Mitigation Fish Barrier Retrofit	WAR125549	47.4471	-122.2155	2/1/12	2/28/13																				

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
Brandon Meadows A	WAR125551	47.3164	-122.1591	Pending																					
Forest Ridge	WAR125552	47.3609	-122.1760	1/1/12	2/28/13		X	X																	
Security Contractor Services Inc	WAR125565	47.5158	-122.3233																						
Quad 7 Redevelopment	WAR125569	47.5250	-122.3080	3/1/12	2/28/13		X	X																	
South Transfer Station	WAR125583	47.5411	-122.3342																						
701 S Orchard St Building	WAR125589	47.5381	-122.3269	Pending																					
Boeing Levee Improvement	WAR125620	47.4234	-122.2651	3/1/12	2/28/13																				
Special Asphalt Products Inc	WAR125646	47.5113	-122.2852	4/1/12	12/31/12		X	X	X	X															
Alsco Building	WAR125654	47.4210	-122.2490	4/1/12	2/28/13																				
Charles Air Hangar	WAR125663	47.5198	-122.3025	5/1/12	9/1/12		X	X																	
Taxi King Auto Wrecking LLC	WAR125683	47.5382	-122.3273	No DMR Data																					
Nelson Middle School Site Improv	WAR125712	47.4614	-122.2054	Pending																					
Brandon Meadows B	WAR125713	47.3207	-122.1658	6/1/12	2/1/13																				
SR 516 to S. 231st Way	WAR125724	47.3866	-122.2640	Construction Not Started																					
Rainier Avenue S. Improvements	WAR125753	47.4681	-122.2337	7/1/12	2/1/13		X	X																	
64th Ave South Channel Improvements	WAR125767	47.4125	-122.2502	5/1/12	2/1/13		X																		
South 164th Street Sidewalk Improv	WAR125771	47.4650	-122.2813	Pending																					
Riverview Park Eco Restoration	WAR125799	47.3732	-122.2459	Pending																					
Market Based Affordability MBA Project	WAR125854	47.4131	-122.2584	6/1/12	2/28/13		X																		
Kentview Sewer Interceptor	WAR125892	47.4098	-122.2675	No DMR Data																					
Carlisle Interconnect Technologies	WAR125907	47.4353	-122.2409	Pending																					

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
Seaport Petroleum Detroit Ave	WAR125959	47.5348	-122.3366	No DMR Data																					
Stryker Business Center at Pac Gateway	WAR125971	47.4207	-122.2512	Pending																					
Altmyer	WAR126013	47.4443	-122.2011	8/1/12	2/28/13																				
Kent Auburn Conveyance System Improv	WAR126022	47.3653	-122.1925	Pending																					
Singh 9 Lot Short Plat	WAR126055	47.4008	-122.2032	Pending																					
Rainier Av S. Improvements ROW	WAR126085	47.4758	-122.2150	9/1/12	2/28/13																				
Boeing Plant 2 North Shorline Soil Excavation	WAR126089	47.5337	-122.3199	8/1/12	2/1/13		X																		
New Beginnings Christian Fellowship	WAR126122	47.4259	-122.1947	Pending																					
Wyncrest	WAR126149	47.3399	-122.2435	Pending																					
Tukwila Sounder Station	WAR126181	47.4431	-122.2394	Pending																					
Boeing Duwamish Office Park	WAR126230	47.5028	-122.2971	Pending																					
Boeing Duwamish Office Park	WAR126230	47.5028	-122.2973	Pending																					
Boeing Duwamish Office Park	WAR126230	47.5007	-122.2879	Pending																					
Boeing Duwamish Office Park	WAR126230	47.5002	-122.2943	Pending																					
Boeing Duwamish Office Park	WAR126230	47.5000	-122.2815	Pending																					
Quad 7 Redevelopment Partial	WAR126272	47.5250	-122.3080	Pending																					
Glendelle Plat	WAR126624	47.4206	-122.1761	Pending																					
Anheuser-Busch Sales of Renton	WAR126626	47.4490	-122.2241	Pending																					
Bridges (AKA Verdana)	WAR126627	47.3383	-122.1864	1/1/13	2/28/13		X																		
Reddington Levee Setback and Extension	WAR126654	47.3400	-122.2095	Pending																					

Facility	Permit Number	Latitude	Longitude	Data Start	Data End	Flow	Turbidity	pH	Copper	Zinc	Lead	TPH - Diesel	Ammonia	BOD	COD	TPH	Oil and Grease	Nitrate+Nitrite	Total Phosphorus	TSS	Fecal Coliform	Antimony	Arsenic	Mercury	PAHs
Reddington Levee Setback and Extension	WAR126654	47.3389	-122.2100	Pending																					
Reddington Levee Setback and Extension	WAR126654	47.3380	-122.2093	Pending																					
Reddington Levee Setback and Extension	WAR126654	47.3354	-122.2114	Pending																					
Reddington Levee Setback and Extension	WAR126654	47.3335	-122.2130	Pending																					
Reddington Levee Setback and Extension	WAR126654	47.3335	-122.2125	Pending																					
Wal Mart 2516	WAR126658	47.4758	-122.2376	Pending																					
Brandon Place	WAR126663	47.3154	-122.2057	Pending																					
Auburn School Dist 408 Auburn HS	WAR126664	47.3119	-122.2030	Pending																					

A.1.3 Groundwater Data

Table A-4. Groundwater Data

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Groundwater Data				
Data Source: EIM				
22588 84th Ave S cleanup site (Shell 120930), Kent, WA	4	8/25/2009	8/4/2010	19
7-11 Food Store #2303-20249 (NW1944), Auburn	4	7/19/2005	12/20/2006	48
7-Eleven Site 22671, Kent, WA	17	3/3/2005	3/30/2010	45
7-Eleven Site 23525 (Southland Facility), Seattle, WA	8	3/4/2005	1/20/2010	35
7-Eleven Site 25303, Kent, WA	21	3/8/2005	10/1/2009	57
ARCO FACILITY NO. 5219, 21214 84th Ave S, Kent, WA	17	5/14/2003	12/8/2010	114
BP West Coast Products Terminal 21T	13	12/13/2005	12/14/2006	76
Brewer Chrysler Plymouth, Auburn, WA	6	8/27/2008	3/22/2010	6
Chevron Groundwater Monitoring Wells	21	9/5/1991	1/31/2001	155
Chevron Service Center #21-1549 (Texaco Station 632320402) Renton, WA	6	6/30/2002	8/4/2008	111
Chevron Service Center #9-1557 (Chevron USA Inc 5591557), Tukwila, WA	4	12/17/2000	10/19/2010	77
Chevron Service Center #9-4283 (Wilderness Chevron), Maple Valley, WA	9	11/17/1995	3/30/2010	184
Chevron Service Center #9-7111, Renton, WA	5	3/10/1993	12/17/2010	93
Chevron Service Center #9-8473, Federal Way, WA	9	6/4/1998	1/20/2009	161
Chevron Service Center #9-8484, Seattle, WA	7	11/21/1990	12/14/2009	124
Chevron Service Center #9-9168, Seattle, WA	5	2/21/1992	9/10/2008	115
Chevron Site No. 306534; Former Unocal Bulk Plant No.5477, 2415 Beacon Avenue South, Seattle, Washington	8	11/7/2005	3/14/2009	132
CIRCLE K / 76 GAS STATION FACILITY NO. 2708566 (Store 8566), Auburn, WA	16	12/12/2007	10/7/2010	19
Circle K Ambaum Blvd SW, Burien, WA	14	9/16/2008	1/19/2010	5
Circle K Store 5491, Kent, WA	6	12/14/2010	12/14/2010	1
ConocoPhillips Facility 2708603 (Circle K, 76 Gas Station) Kent, WA	21	4/13/2004	10/7/2010	12
Cook's Chevron Mart II, Renton, WA	19	1/20/2005	4/4/2006	36
Custom Hydraulic Machine Inc, Kent, WA	144	9/12/2008	11/6/2008	11
Don's (Formerly Jerry's) Chevron Enumclaw Site Cleanup, Enumclaw, WA	40	8/6/2009	8/6/2009	5
Douglas Management Company Site Investigation, Seattle, WA	15	7/16/2008	7/18/2008	20
DR Concrete Recycle, Kenyon Street Property, Seattle, WA	23	10/4/2006	11/1/2007	19
Duwamish Marine Center, Seattle, WA	21	8/3/2000	6/9/2008	20
ELT_2708566_ConocoPhillips Service Station_5011 S 288th St, Auburn WA	3	6/15/2009	11/10/2009	8
Enterprises NW, Seattle, WA	119	11/19/2007	4/29/2010	124
Former Butler Auto Repair, Des Moines, WA	3	5/15/2008	3/20/2009	16
Former Levitz Warehouse, Tukwila, WA	9	9/12/2003	9/2/2008	40
Former Penthouse Draperies Facility, Seattle, WA (formerly VCNW0477) (Now called City Commerce Park)	31	6/15/2001	12/20/2005	83
Former Proliance International Inc Facility Soil and Groundwater Investigation	66	8/1/2006	8/1/2006	4
Former Shell Oil Station at 11803 Des Moines Memorial Drive South (Benson) (Auto Site Automotive), Seattle, WA	50	2/27/2008	2/27/2008	2

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Former Tally Printer (TallyGenicom LP), Kent, WA	14	8/3/2006	12/5/2008	84
Fox Avenue Building Site (Formerly Great Western Chemical) Seattle, WA	107	11/24/2008	8/11/2009	219
Fuel Farm, Auburn, WA	5	4/20/2010	4/20/2010	3
Gardner-Fields Corp/Kent Site Investigation, Kent, WA	25	1/21/2009	9/24/2010	27
Goodyear (Sam's) Tire Service Center 8342, Kent, WA	11	9/3/2009	2/26/2010	9
Iden Property, Kent, WA	36	3/18/2008	4/13/2009	26
Industrial Container Services WA LLC (Early Action Area 2 - Lower Duwamish), Seattle, WA	12	5/4/2007	5/22/2007	20
Jackpot Food Mart 309, TOC Holdings Co. Facility No. 01-309 (Salty's Properties), Seattle, WA	30	8/31/2005	12/8/2010	279
Jackpot Food Mart 311 (Time Oil Co. Facility No. 01-311, Kent)	38	8/29/2005	1/23/2009	56
Joseph Simon and Sons, Kent, WA	8	5/30/2006	8/29/2006	32
Kelly Moore Paint Co., 5410 Airport Way S, Seattle, WA	75	8/5/2009	3/28/2011	54
Kenworth Truck Co (PACCAR Inc.) Groundwater Sampling and IAAI Stormwater Improvement, 8801 E Marginal Way S, Tukwila, WA. Agreed Order # DE3599	56	2/27/2006	12/23/2009	172
Kinder Morgan Harbor Island Terminal, Seattle, WA	32	6/19/2007	3/2/2011	298
Lower Duwamish Source Control, T117 Early Action Area Non-Time Critical Removal Action (NTCRA)	310	3/11/2008	9/23/2010	162
Lower Duwamish Waterway Early Action Area 5, Summary of Site Characterization Activities: Basin Oil Property Dallas Avenue, Seattle, WA	16	5/26/2009	5/26/2009	4
Master Halco Inc., Kent, WA	6	9/12/2008	11/30/2010	15
MTBE in Groundwater at LUST in Washington	18	11/18/1999	5/16/2000	14
Multimedia sampling at the Georgetown Steam Plant property	52	8/1/2006	5/30/2007	30
Olympic Steamship Company Inc., Kent, WA	6	10/23/2008	1/26/2010	30
Port of Seattle Terminal 30 Ecology Agreed Order AODE1991	39	10/13/2004	11/19/2009	273
PSC (Philip Services Corp) Georgetown Groundwater Monitoring	171	10/25/2005	2/17/2011	958
PSC (Philip Services Corp) Kent	32	1/16/2006	10/7/2010	332
Renton Honda Shop, Renton, WA	28	4/4/2007	3/10/2010	39
Renton Village Cleaners Site, Renton, WA	28	11/27/2006	10/5/2007	28
Rite Aid Kent (KANGLX 76), 10407 SE 256th St, Kent, WA	4	11/10/2006	10/9/2007	16
SeaTac Development Site, Masterpark Lot C, Groundwater Investigation	7	6/29/2006	6/30/2006	8
Shell Oil Co Des Moines 129596, 12666 Des Moines Way, Seattle, WA	11	6/4/2010	11/22/2010	6
Shell Oil Product US SAP 121097, 32002 Military Road South, Federal Way, WA	10	3/21/2008	8/26/2009	21
Shell Oil Products US SAP 121430, 600 S Michigan, Seattle, WA	13	8/23/2005	11/22/2010	80
Shell Oil Products US SAP, Kent, WA	13	3/30/2009	9/9/2010	64
Shell Oil Seattle Distribution Terminal Consent Agreement Cleanup, Seattle, WA	19	4/26/2007	11/20/2008	31
Shell Station 120598, 13138 Interurban Ave S, Tukwila, WA	9	4/27/2006	4/5/2010	51
Shell Station 120654, 1439 Auburn Way N, Auburn, WA	13	1/12/2006	7/29/2009	39
Shell Station 120984, 2424 Beacon Ave, Seattle, WA	8	3/17/2008	9/25/2009	34
Shell Station 120993, 2461 4th Ave S, Seattle, WA	10	11/30/2005	9/29/2010	68
Shell Station 121333, 501 Tukwila Parkway, Tukwila, WA	53	4/27/1996	9/17/2010	89
Shell Station 121450, Seattle, WA	21	8/23/2005	7/21/2009	73

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
South Park Marina Site Investigation Seattle, WA	23	10/8/2007	7/31/2008	9
South Park Water Quality Facility and Pump Station Soil and Groundwater Quality Characterization and Remediation, Seattle, WA	88	1/17/2008	2/2/2010	26
Southern Alaska Forwarders, Seattle, WA	17	10/23/2007	1/30/2009	10
SPU Bus Barn, Seattle, WA	185	2/5/2008	10/21/2008	71
Taylor Edwards Soil and Groundwater Monitoring, Kent, WA	22	6/1/2006	6/28/2007	22
Texaco Station 120516 James St, Kent, WA	13	3/12/2009	7/29/2010	56
United Motors, Tukwila, WA	22	7/12/2006	1/4/2009	26
US General Services Administration Federal Center South, Seattle, WA	48	7/6/1999	11/30/2010	137
Waste Management of Seattle (Former Recycle America) First Avenue, Seattle, WA	10	5/18/2005	2/14/2006	60
Data Source: EPA RCRA RP Cleanup Data				
RCRA RP Cleanup	18	9/27/2002	9/16/2011	752
Data Source: NAWQA				
NAWQA	12	8/8/1996	6/8/2006	12
Groundwater Seep Data				
Data Source: Remedial Investigation Data				
GreatWestern Apr-94	6	4/28/1994	4/28/1994	6
GreatWestern Jul-94	2	7/22/1994	7/22/1994	2
GreatWestern May-95	7	5/15/1995	5/15/1995	7
GreatWestern Nov-94	7	11/4/1994	11/4/1994	7
GreatWestern-1995annual	7	10/27/1995	10/27/1995	7
GreatWestern-1996annual	5	12/11/1996	12/11/1996	5
GreatWestern-1997annual	4	11/4/1997	11/4/1997	4
GreatWestern-1998annual	9	11/6/1998	11/6/1998	9
GreatWestern-1999annual	5	10/29/1999	10/29/1999	5
GreatWestern-Embayment Study	10	4/28/1998	4/28/1998	10
LDWRI-Seep	16	6/29/2004	7/30/2004	16
LDWRI-Seep-Filtered	16	6/29/2004	7/3/2004	16
Plant 2 RFI-1	18	3/23/1995	3/23/1995	18
Rhône-Poulenc RFI-3	7	4/18/1995	4/18/1995	7
T117BoundaryDefinition	3	12/23/2003	12/23/2003	3

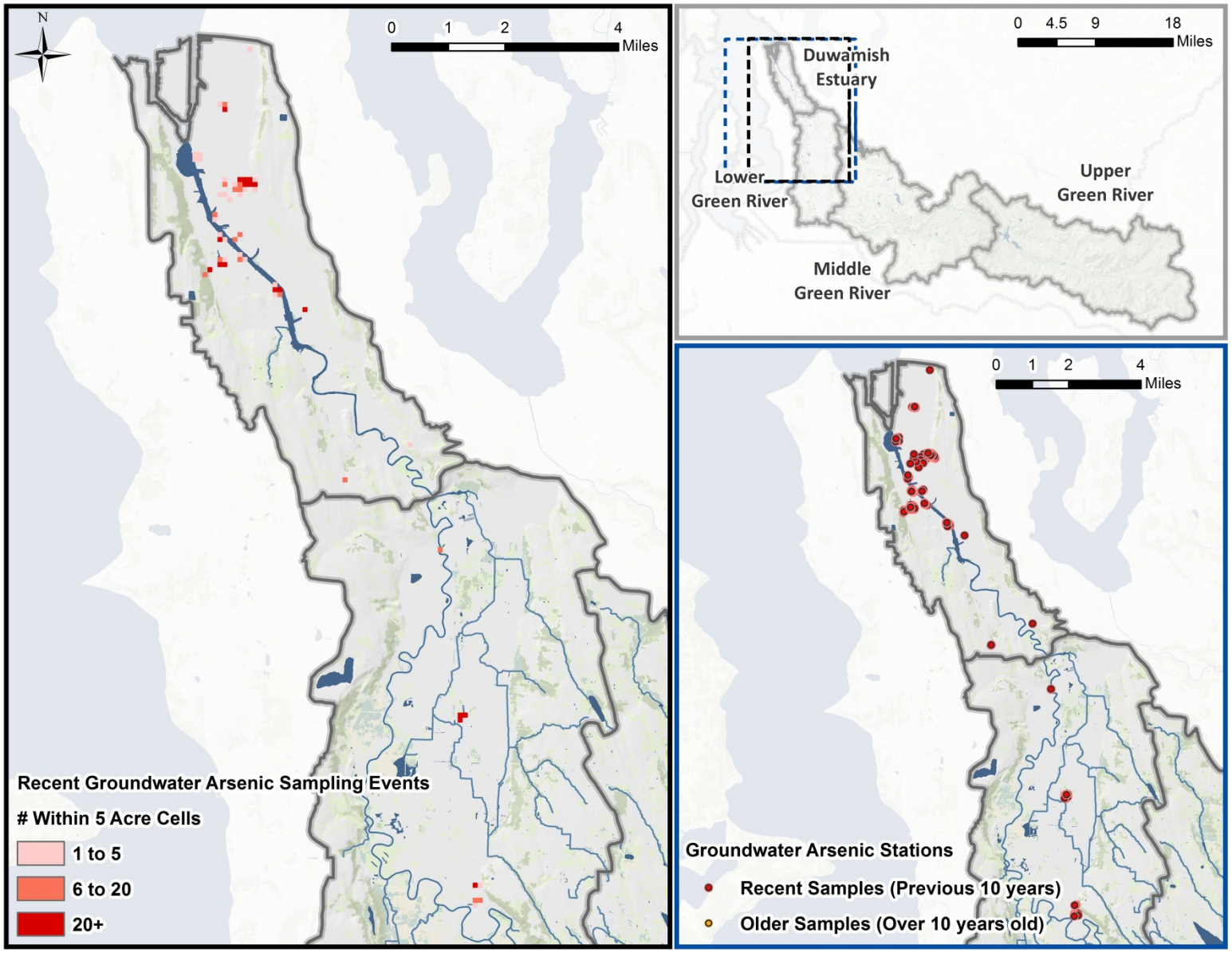

Figure A-9. Groundwater quality sample locations for arsenic

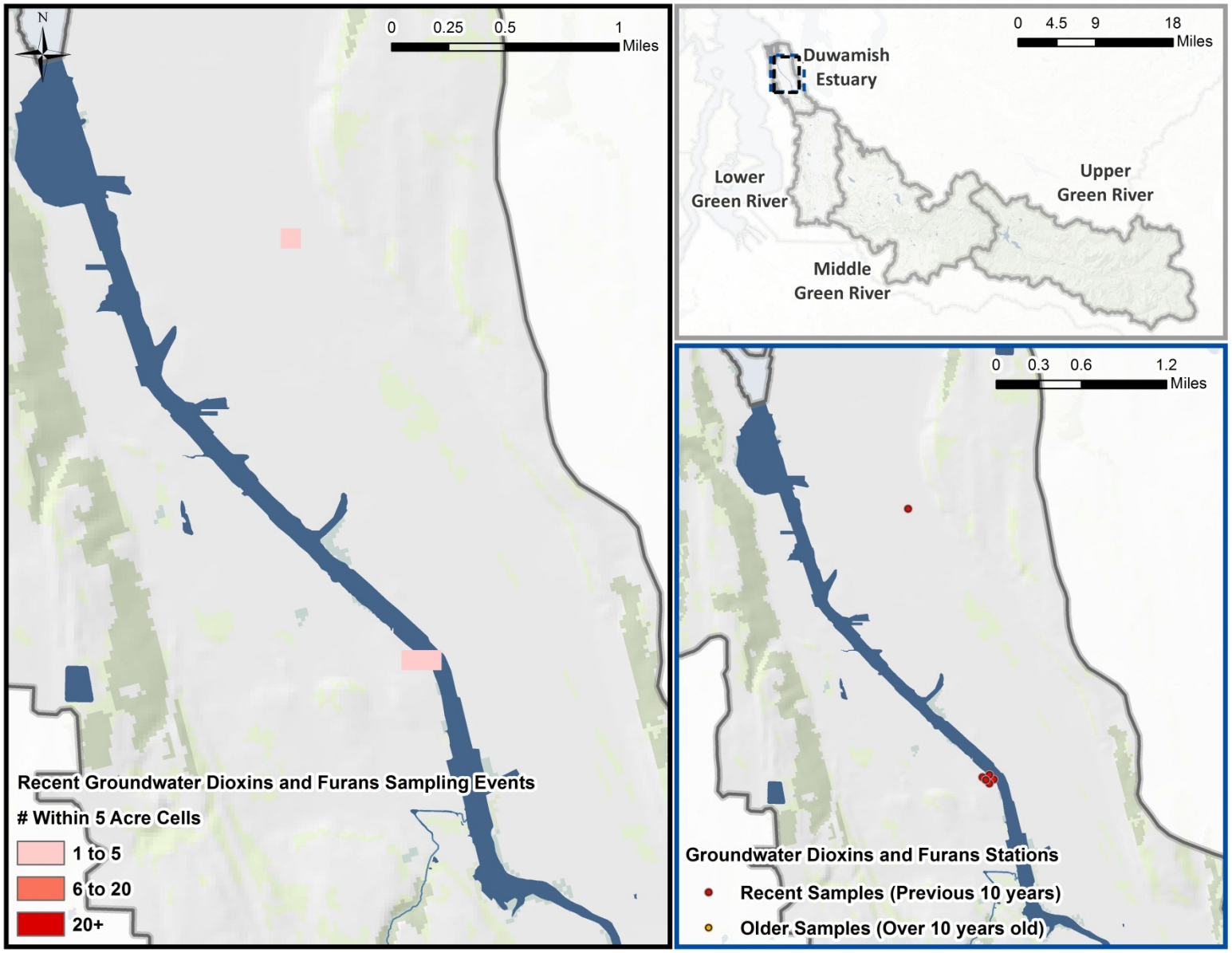

Figure A-10. Groundwater quality sample locations for dioxins and furans

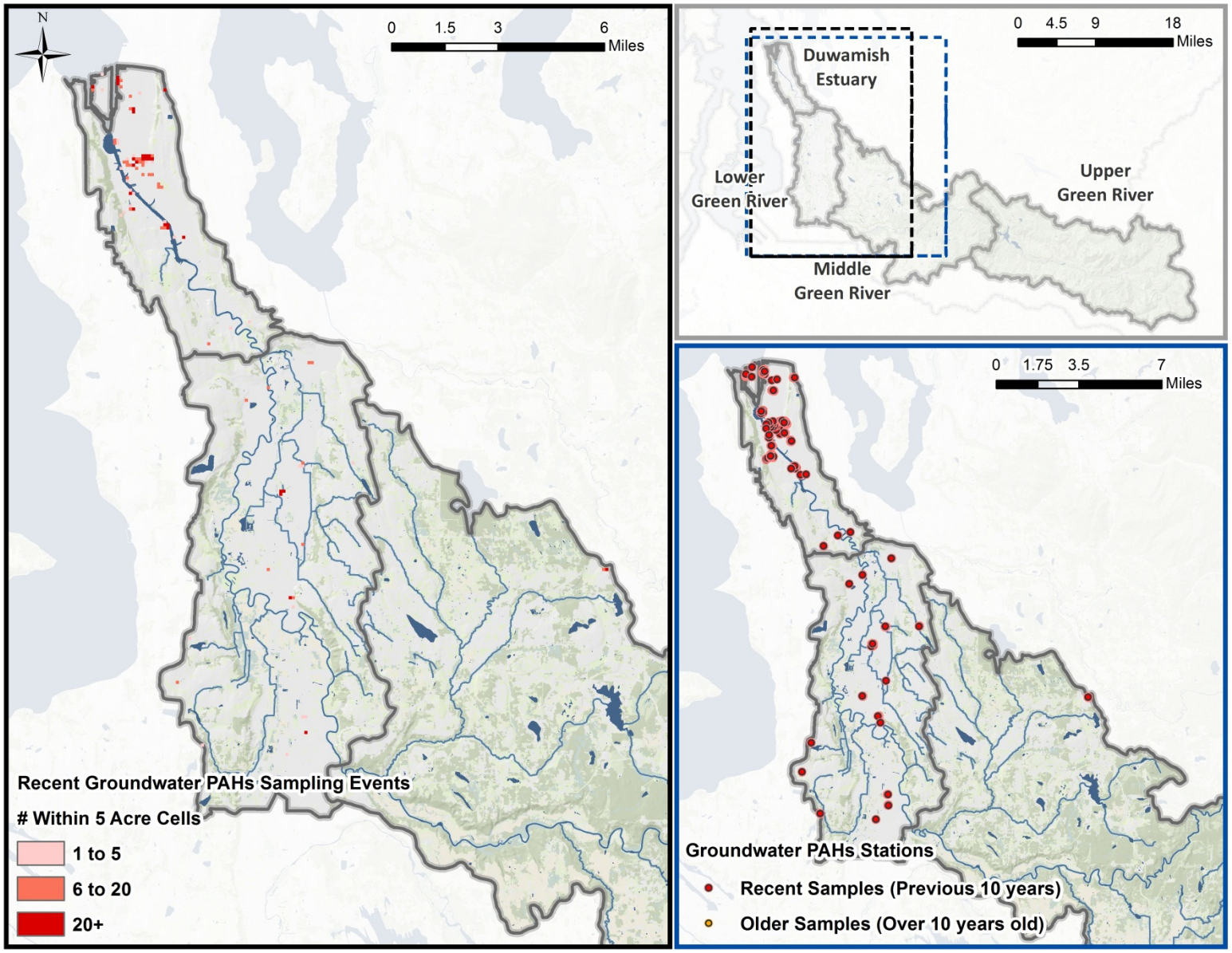

Figure A-11. Groundwater quality sample locations for PAHs

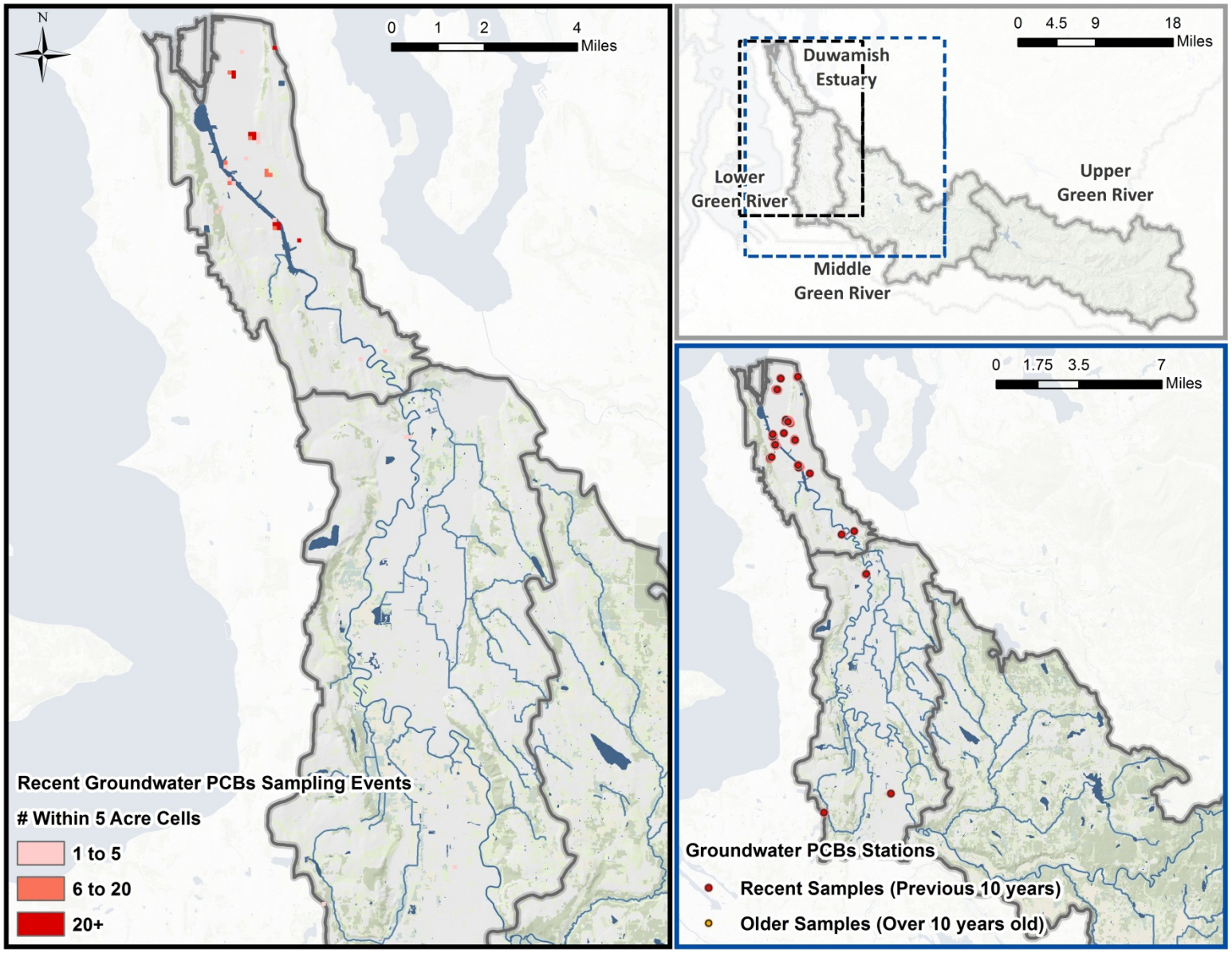

Figure A-12. Groundwater quality sample locations for PCBs

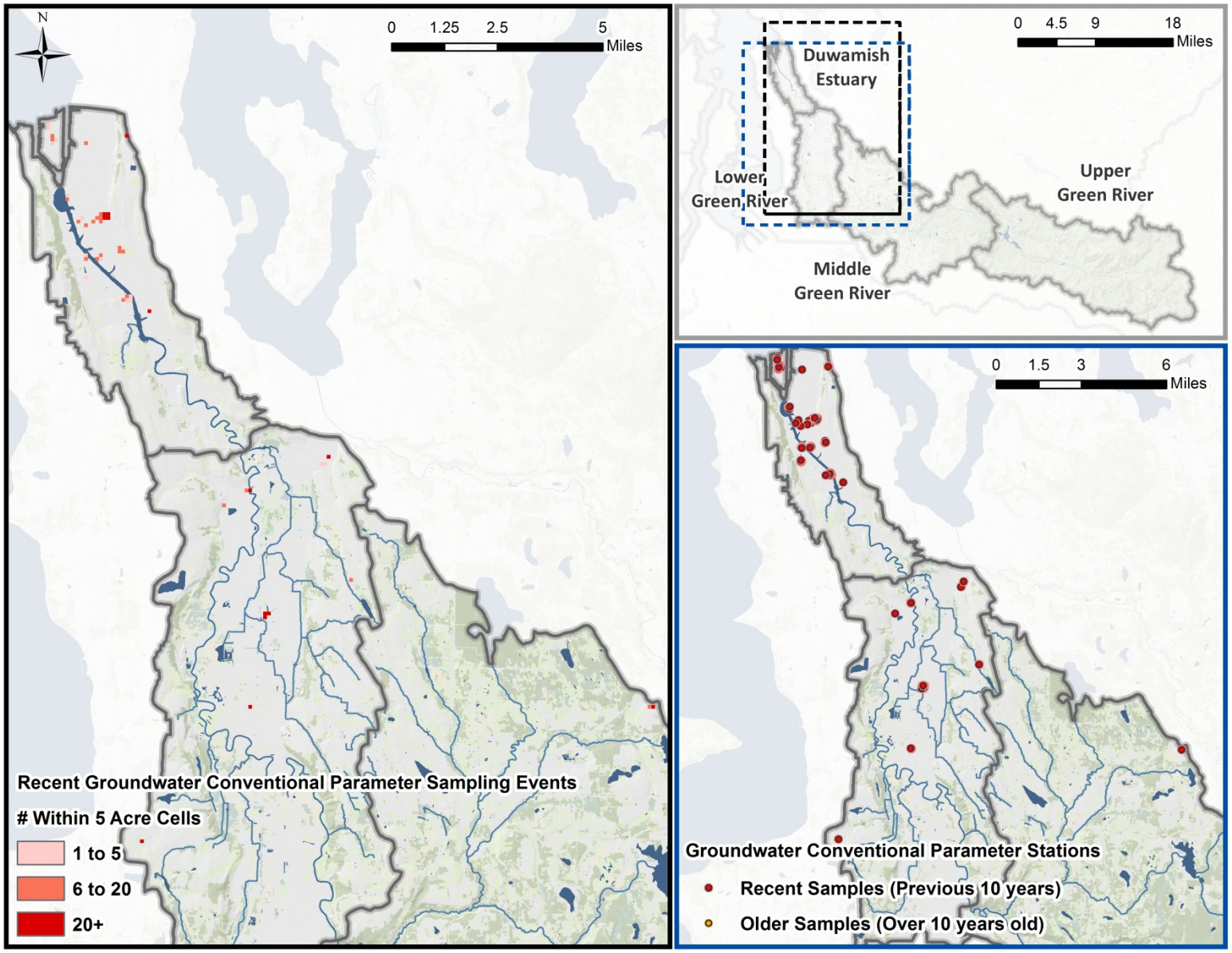

Figure A-13. Groundwater quality sample locations for conventional pollutants

A.2 Sediment Quality

A.2.1 Ambient Surface Sediment Quality

Table A-5. Ambient Surface Sediment Quality Data

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Data Source: ACOE				
USACE SubsurfaceSediment Characterization	1	10/16/2012	10/16/2012	1
Data Source: EIM				
1980 NOAA OMPA-19 survey of Elliott Bay.	10	1/1/1980	1/1/1980	9
1982-83 EPA survey of Duwamish River	65	9/1/1982	7/28/1983	76
1984 BWMP Fish Tissue and Sediment	1	9/19/1984	9/19/1984	1
1984 Duwamish Head Survey	18	1/1/1984	1/1/1984	8
1985 Elliott Bay sediment survey	80	9/25/1985	10/16/1985	104
1990 PSDDA Post-Disposal Site Monitoring	5	5/24/1990	5/25/1990	8
1992 PSDDA full monitoring, Elliott Bay	14	6/11/1992	6/16/1992	18
2009/2010 Lower Duwamish River surface sediment sampling results for dioxins and furans and other chemicals	47	12/15/2009	1/12/2010	50
A Cooperative Agreement with the Puget Sound Assessment and Monitoring Program and the National Oceanic and Atmospheric Administration(NOAA) National Status and Trends (NS&T) Program to jointly examine measures of sediment quality throughout Puget Sound.	22	6/22/1998	7/1/1998	33
Ambient_bio_1994	2	9/29/1994	10/11/1994	4
Ambient_bio_1997	2	9/3/1997	9/4/1997	8
Ambient_bio_1998	1	8/20/1998	8/20/1998	1
Ambient_bio_1999	3	8/18/1999	8/18/1999	2
American President's Line maint. dredge	1	3/30/1992	3/30/1992	4
April 1999 monitoring report - Norfolk CSO sediment remediation project five-year monitoring program. Prepared for Elliott Bay/Duwamish Restoration Program by King County DNR.	4	4/23/1999	4/23/1999	4
Benthic Surveillance 1986	3	5/1/1986	5/1/1986	2
Boeing Development Center	4	11/12/2005	11/12/2005	1
Boeing Duwamish Waterway Sediment Sampls	2	6/15/1994	6/15/1994	7
Boeing Plant 2 - Interim report RCRA facility investigation Duwamish Waterway sediment investigation	5	3/19/1996	3/20/1996	11
Boeing Plant 2 DSOA Additional Vertical Characterization - Phase 2 (2003)	15	8/12/2003	8/20/2003	31
Boeing Plant 2 DSOA Additional Vertical Characterization - Phase 3 (2004)	5	4/22/2004	4/23/2004	7
Boeing Plant 2 Phase 1 completion report Duwamish Waterway investigation RCRA facility investigation	88	9/2/1994	8/7/1995	90
Boeing Plant 2 Phase 1 Transformer PCB Investigation	18	8/20/2003	9/12/2003	55
Boeing Plant 2 Phase 2A Progress Report Duwamish Waterway RCRA facility investigation. Draft	54	10/23/1995	10/25/1995	54
Boeing Plant 2 Vertical Characterization	33	6/7/2001	6/18/2001	108
Boeing Plant2 Outfall 12 Data Collection	6	6/4/2001	6/19/2001	17
Boeing Site Characterization Study	91	10/8/1997	10/19/1997	108

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Crowley Marine Services Base Sed Samp	3	12/4/2001	12/4/2001	3
Crowley Marine Services, DY96	4	7/13/1995	7/13/1995	9
Delta Marine Industries Site	3	7/20/2001	7/20/2001	3
Denny Way Cap Monitoring 1994-96	1	9/1/1994	9/1/1994	1
DNR Dioxin Study	9	6/20/2005	7/16/2007	7
Dredge material characterization Duwamish Yacht Club Duwamish Waterway Seattle Washington. Prepared for Peratrovich Nottingham & Drage by Hart Crowser - Seattle. Renamed from DYATCHT99 to be compatible with previous naming convention.	6	3/4/1999	3/5/1999	8
Dredinge material characterization of Hurlen Construction Company and Boyer Alaska Barge Lines Berthing Areas	6	3/4/1999	3/5/1999	6
DUWAMISH CSO Sediment Sampling in 1990	4	5/23/1990	5/24/1990	4
Duwamish Diagonal - March 2004 post-dredging	12	3/29/2004	3/30/2004	15
Duwamish Diagonal 10-2003 pre-dredging	12	10/20/2003	10/21/2003	14
Duwamish Diagonal April 2005 baseline cap monitoring - year 1. Changed original LDWG's Sedqual survey name from DUWDIAGA to DUDI0405 to be consistent with previous naming convention.	6	4/27/2005	4/27/2005	7
Duwamish Diagonal Jan-Feb 2005 post-dredge perimeter - before thin-layer cap placement	20	1/31/2005	2/2/2005	22
Duwamish Diagonal June 2004 baseline cap monitoring - year 0 (post-cap placement)	7	6/1/2004	6/1/2004	8
Duwamish Diagonal Mar 2005 post-dredge perimeter - after thin-layer cap placement Changed LDWG's original Sedqual survey name from DUWDIAGM to DUDI0305 to be consistent with previous naming convention.	7	3/16/2005	3/24/2005	8
Duwamish R. maintenance dredge, Phase 1	8	8/28/1990	8/28/1990	10
Duwamish R. maintenance dredge, Phase 2	19	8/6/1991	8/7/1991	20
Duwamish R. maintenance dredging project	16	4/18/1989	1/19/1990	22
Duwamish River Water Quality Assessment	14	3/6/1997	9/24/1997	57
Duwamish Shipyard, Elliot Bay, WA	5	8/18/1993	8/18/1993	7
Duwamish Waterway sediment characterization study report	328	9/15/1997	11/13/1997	354
Duwamish Yacht Club Maintenance Dredge DY89	6	11/29/1988	11/29/1988	6
Duwamish/Diagonal Cleanup Phases 1 - 2	67	8/9/1994	9/9/1996	102
East waterway terminal 18 Stage 1A	2	4/16/2002	4/16/2002	2
Elliott Bay Full Monitoring	14	6/29/2000	7/6/2000	11
Evaluation of sediment chemistry data, stormwater and stormwater solids data, and emergent groundwater data for discrete samples collected from the Lower Duwamish Waterway (LDW) adjacent to the 8801 East Marginal Way South Property. Phase I and II	35	10/24/2006	2/12/2008	44
Final preliminary site investigation report for the South Park Bridge project. Prepared for King County Department of Transportation by Wilber Consulting.	2	7/22/2003	7/23/2003	15
Final sediment characterization report Boyer Towing Inc. dock replacement Seattle Washington	3	5/8/2004	5/8/2004	17
Gamponia survey of Elliott Bay	14	1/7/1985	2/4/1985	14
Glacier NW	2	1/15/2002	1/15/2002	2
Glacier NW Duwamish Mix Facility DY2002	2	6/21/2000	6/21/2000	4
Great Western - 1995 Annual	7	10/27/1995	10/27/1995	7
Great Western - 1996 Annual	5	12/11/1996	12/11/1996	5
Great Western - 1997 Annual by Floyd & Snider	4	11/4/1997	11/4/1997	5
Great Western - 1998 Annual by Floyd & Snider	9	11/6/1998	11/6/1998	10

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Great Western - 1999 Annual by Floyd & Snyder	5	10/29/1999	10/29/1999	12
Great Western Apr-94	6	4/28/1994	4/28/1994	6
Great Western Embayment Study by Floyd & Snider	10	4/28/1998	4/28/1998	18
Great Western Sampling by Hart Crowser July 1994	2	7/22/1994	7/22/1994	9
Great Western Sampling by Hart Crowser May 1995	7	5/15/1995	5/15/1995	7
Great Western Sampling by Hart Crowser November 1994	7	11/4/1994	11/4/1994	7
GTSP Flume Investigation	64	4/13/2004	4/14/2004	2
Harbor Island Phase II RI	106	9/24/1991	10/31/1991	182
Hurlen Construction Co. Maint. Dredging.	1	5/11/1990	5/11/1990	1
Industrial Container Services WA LLC (Early Action Area 2 - Lower Duwamish), Seattle, WA	12	5/4/2007	5/8/2007	6
James Hardie Gypsum Inc. sediment sampling and analysis, 1998	5	11/28/1998	11/28/1998	5
James Hardie Gypsum Inc. sediment sampling and analysis, 1999	9	7/15/1999	7/15/1999	9
James Hardie Gypsum Outfall and nearshore sediment sampling report, Year 2000. Prepared by Roy F. Weston, Inc.	9	7/3/2000	7/3/2000	9
Jorgensen April 2004 - Lower Duwamish Upriver (Area 1) sediment characterization (MCS 2004)	22	4/20/2004	4/23/2004	75
Jorgensen August 2004 - Triad Approach (Immunoassay as a Real-Time Measure) to Characterize PCB in a Washington Riverine Sediment Site (USACE)	60	8/16/2004	8/27/2004	24
KC Streams Sed data for 303D submission	5	9/1/1998	7/31/2002	28
King County 2005 Water Sampling	3	1/24/2005	12/19/2005	117
King County 2008. Denny Way/Lake Union CSO Control Project, Long-Term Sediment Monitoring Program, Areas A and B Nearshore Sediment Remediation Project, Areas C, D, and E Monitored Natural Recovery, Sampling and Analysis Plan. King County DNR	5	6/26/2007	6/26/2007	2
Lehigh Northwest Duwamish Waterway Facility Seattle Washington - Puget Sound dredged disposal analysis . Full PSDDA characterization. Prepared for Lehigh Northwest Inc. by MCS Environmental.	3	8/29/2003	8/29/2003	3
Loading of Contaminants Associated with Suspended Sediment in the Green River to the Lower Duwamish Waterway	2	7/15/2008	1/20/2009	19
Lockheed Shipyard 2 Sed Char/Geotch Stdy	32	8/29/1989	9/16/1989	68
Lone Star Northwest West Terminal Duwamish River PSDDA sampling and analysis results	4	6/23/1995	6/23/1995	5
Lonestar Northwest - West Terminal	1	5/29/1992	5/29/1992	3
Lonestar NW maintenance dredge Duwamish River	1	9/14/1989	9/14/1989	2
Lower Duwamish River LDWRI-Background areas surface sediment samples	10	1/31/2005	2/9/2005	13
Lower Duwamish River LDWRI-Benthic Invertebrate sampling. Data included Chemistry, Tissue and Bioaccumuation.	39	8/13/2004	9/28/2004	54
Lower Duwamish River LDWRI-Fish collection 2005. Original name was FISHCOLL.	65	8/29/2005	9/6/2005	66
Lower Duwamish River LDWRI-Peeper sampling	16	8/1/2005	8/1/2005	20
Lower Duwamish River LDWRI-Porewater Analysis	12	6/21/2005	6/23/2005	12
Lower Duwamish River LDWRI-Subsurface Sediment 2006	62	2/6/2006	2/24/2006	339
Lower Duwamish River LDWRI-Surface Sediment Round 1. Original name: LDWSment. Name changed to reflect it was the 1st of 3 sampling dates.	81	1/17/2005	2/2/2005	116

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Lower Duwamish River LDWRI-Surface Sediment Round 2. Original name: LDWRI-Su. Name changed to reflect it was the 2nd of 3 sampling dates.	84	2/2/2005	3/18/2005	122
Lower Duwamish River LDWRI-Surface Sediment Round 3. Original name: LDWRund3. Name changed to reflect it was the 3rd of 3 sampling dates.	44	10/2/2006	10/4/2006	53
Lower Duwamish River -Site Inspection	299	8/11/1998	9/23/1998	332
Lower Duwamish River upstream sediment analysis.	27	5/5/2008	5/9/2008	11
Lower Duwamish Source Control, T117 Early Action Area Non-Time Critical Removal Action (NTCRA)	310	12/4/2003	8/29/2008	183
Lower Duwamish Waterway Remedial Action Grant. Slip 4 Early Action Area.	23	6/19/2006	6/21/2006	17
Lower Duwamish Waterway Sediment Investigation	56	4/28/2008	5/9/2008	56
Mercury Trends in Fresh Water Fish 2006	1	9/19/2006	9/19/2006	3
METRO Hot Spot Invest. West Seattle, '90	6	9/20/1990	10/24/1990	6
METRO'S Duwamish CSO sed. sampling, 1992	26	10/28/1992	10/30/1992	29
METRO's Hot Spot Invest. Waterfront, '88	2	5/25/1988	5/25/1988	2
METRO's Hot Spot Invest. Waterfront, '89	1	6/19/1989	6/19/1989	1
Mill Creek Sediment Sampling & Analysis	18	9/22/1992	9/29/1992	19
Morton Marine maintenance dredging	1	9/15/1991	9/15/1991	3
Morton wharf construct. & draft increase	1	12/12/1989	12/12/1989	4
Norfolk combined sewer overflow (Duwamish River) sediment cap recontamination. Phase I investigation. Ecology Publ. no. 03-03-004	20	7/9/2002	7/9/2002	21
Norfolk CSO Sediment Cleanup Study 1,2,3	42	8/17/1994	12/6/1995	44
Norfolk CSO Sediment Phase I	1	7/9/2002	7/9/2002	42
NPDES Chelan CSO Baseline Study, 1995-96	6	6/28/1995	6/29/1995	6
NPDES Connecticut CSO Baseline Study	7	6/26/1995	6/27/1995	28
NPDES Hanford CSO Baseline Study, 1995	7	6/27/1995	6/29/1995	7
PBT Trend Monitoring: Measuring Lead in Suspended Particulate Matter from Washington State Rivers and Lakes, 2010 Results.	1	4/28/2010	10/5/2010	5
PBT Trend Monitoring: Lead in Suspended Particulate Matter, 2008	1	5/14/2008	10/9/2008	4
PBT Trend Monitoring: Lead in Suspended Particulate Matter, 2009	1	4/28/2009	10/1/2009	4
Port of Seattle Terminal5 Pier Extension	1	6/14/1994	6/14/1994	3
Port of Seattle, T18 Phase 2, DY97	13	5/30/1996	6/12/1996	21
Port of Seattle/Terminal 105 Dredging 85	12	6/20/1985	6/20/1985	45
PSAMP/NOAA98 Year 2 - Central Puget Sound. Ecology publication no. 00-03-055	3	6/22/1998	6/23/1998	3
PSDDA Phase I Survey of Disposal Sites	10	5/19/1988	6/7/1988	18
PSDDA sediment characterization of Duwamish River navigation channel: FY2000 operations and maintenance dredging data report. Prepared for US Army Corps of Engineers Seattle District by Striplin	20	8/26/1999	8/26/1999	27
Puget Sound Assessment and Monitoring Program's historical sediment monitoring program 1989-1995	5	4/1/1989	4/7/1995	7
Rhone Poulenc 2004 - RCRA facility investigation (RFI) report for the Marginal Way facility. Vol 1: RFI results and conclusions. Prepared for US Environmental Protection Agency Region 10	24	8/24/2004	9/1/2004	82
Rhone-Poulenc RFI-1 Marginal Way Facility - Round 1 March 1994. (now owned by Container Properties LLC)	7	3/3/1994	3/3/1994	8
Rhone-Poulenc RFI-2 Marginal Way Facility - Round 2 August 1994	7	8/18/1994	8/18/1994	8
Rhone-Poulenc RFI-3. RCRA facility investigation (RFI) report for the Marginal Way facility. Round 3 data and sewer sediment technical	23	4/18/1995	7/1/1996	24

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
memorandum. Prepared for US Environmental Protection Agency Region 10.				
Screening Survey of Mercury Levels in Fish Tissue	4	10/1/2002	10/1/2002	6
Seaboard Lumber Site. Phase 2 site investigation. Draft. Prepared for Seattle Department of Parks and Recreation by Herrera Environmental Consultants.	20	3/28/1996	3/28/1996	20
Seacrest Preliminary Study '97	4	3/21/1997	3/21/1997	4
Seattle, Port of, T18 Phase 1, DY97	76	3/11/1996	3/16/1997	109
Seattle, Port of, Terminal 5, DY97	2	1/17/1996	1/17/1996	2
Sediment Characterization Results for the Duwamish River Navigational Channel Turning Basin	5	6/26/2003	6/26/2003	5
Sediment Profile Imaging Feasibility Study - Lower Duwamish Waterway	30	8/8/2006	8/11/2006	31
Sediment Transport-2005	7	12/16/2004	12/28/2004	31
Six-month post-construction monitoring report - Norfolk CSO sediment remediation project five-year monitoring program. October 1999. Prepared for Elliott Bay/Duwamish Restoration Program by King County DNR.	4	10/8/1999	10/8/1999	8
South Park Marina maint. dredging, 1991	2	9/14/1991	9/14/1991	4
Surface Sediment and Fish Tissue Chemistry in Greater Elliott Bay (Seattle) -Urban Waters Initiative	16	6/13/2007	6/21/2007	48
Terminal 5 W. Waterway maint. dredging	3	6/14/1991	6/14/1991	7
The Puget Sound Assessment and Monitoring Program's (PSAMP) Spatial/Temporal Monitoring 2002-Present	12	6/3/2009	6/5/2009	6
Tiered-Partial Monitoring of Elliott Bay	6	7/2/2002	7/8/2002	11
Todd Shipyards Sediment Operable Unit	65	9/21/2004	11/16/2005	73
TPPS Preliminary survey	15	4/24/1981	9/29/1982	11
Urban Waters Initiative, Sediment Quality in Elliott Bay and Lower Duwamish Waterway	15	6/13/2007	6/21/2007	38
US Coast Guard dredging and construction	2	9/19/1989	9/19/1989	3
US Coast Guard Pier 36 Recency	1	11/14/2002	11/14/2002	1
USACE Duwamish O&M, DY97	4	9/6/1996	9/6/1996	6
Verification of 303(d) Listed Sites in NWRO, CRO and ERO	4	11/7/2003	11/8/2003	10
Washington State Department of Ecology's Status and Trends Habitat Monitoring Project 2009	2	10/7/2009	10/7/2009	1
Water & Sediment Quality in Ten Metals Mining Districts II	2	10/2/2000	10/2/2000	2
Year 1 - Annual monitoring report. Norfolk CSO sediment remediation project five-year monitoring program. April 2000. Prepared for Elliott Bay/Duwamish Restoration Program by King County DNR.	4	4/6/2000	4/6/2000	8
Year 1 - Feb. 2000 Sampling. Norfolk CSO sediment remediation project five-year monitoring program. King County environmental laboratory quality assurance review for estuarine sediment analytical data.	6	2/8/2000	2/10/2000	5
Year 2 - Norfolk CSO sediment remediation project five-year monitoring program. Annual monitoring report- April 2001. Prepared for Elliott Bay/Duwamish Restoration Program by King County DNR.	4	4/24/2001	4/24/2001	8
Year 4 - Norfolk CSO sediment monitoring project. Annual monitoring report - April 2003. Renamed from NORFNIT6 to NRFKNIT6 to be compatible with previous studies.	4	4/23/2003	4/23/2003	8

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Year 5 - Norfolk CSO Sediment Monitoring Final Report. Renamed from NORFNIT7 to NRFKNIT7 to be compatible with previous studies.	4	4/5/2004	4/5/2004	8
Data Source: Feasibility Study Data				
8801 E Marginal (formerly KenworthPACCAR)	33	10/24/2006	2/11/2008	29
Boeing DC 2008	3	2/4/2009	2/4/2009	3
Boeing DC 2009	3	9/2/2009	9/2/2009	3
Boeing SiteChar	80	10/9/1997	10/20/1997	80
BoeingDevelopmentalCenter-2007	3	6/20/2007	6/20/2007	3
Duw/Diag-1	34	8/9/1994	8/25/1994	34
Duw/Diag-1 / Duw/Diag-1.5	1	11/11/1995	11/11/1995	1
Duw/Diag-1.5	11	11/7/1995	11/11/1995	11
Duw/Diag-2	23	7/16/1996	9/9/1996	10
DuwamishShipyard	4	8/17/1993	8/17/1993	4
DuwDiagJan2005	12	1/31/2005	2/2/2005	12
DuwDiagMarch2006	7	3/8/2006	3/9/2006	7
DuwDiagonal April 2007	7	4/2/2007	4/2/2007	7
DuwDiagonalApril2009	8	4/27/2009	4/29/2009	8
DuwDiagonal-March2004	7	3/29/2004	3/30/2004	7
DuwDiagonal-October2003	12	10/20/2003	10/21/2003	12
Ecology SPI	30	8/8/2006	8/11/2006	30
Ecology-Norfolk	17	7/9/2002	7/9/2002	17
EPA SI	277	8/11/1998	9/16/1998	277
Harbor Island RI	9	9/24/1991	10/14/1991	9
Industrial Container Services	4	5/4/2007	5/7/2007	4
JamesHardieOutfall	9	7/3/2000	7/3/2000	9
JorgensenAugust2004	59	8/16/2004	8/27/2004	43
KC WQA	14	5/8/1997	9/24/1997	14
LDW Dioxin Sampling	41	12/15/2009	1/11/2010	41
LDW Upstream Sed	84	4/28/2008	5/9/2008	84
LDWRI-Benthic	35	8/13/2004	9/28/2004	35
LDWRI-SurfaceSedimentRound1	78	1/17/2005	1/26/2005	78
LDWRI-SurfaceSedimentRound2	82	2/2/2005	3/18/2005	82
LDWRI-SurfaceSedimentRound3	44	10/2/2006	10/4/2006	44
NOAA SiteChar	312	9/15/1997	11/13/1997	312
Norfolk-cleanup1	15	8/17/1994	8/22/1994	14
Norfolk-cleanup2	5	8/23/1995	8/28/1995	2
Norfolk-cleanup3	12	12/5/1995	12/6/1995	12
Norfolk-monit1	4	4/23/1999	4/23/1999	4
Norfolk-monit2a	4	10/8/1999	10/8/1999	4
Norfolk-monit2b	3	2/8/2000	2/10/2000	3
Norfolk-monit3	4	4/6/2000	4/6/2000	4
Norfolk-monit4	3	4/24/2001	4/24/2001	3
Norfolk-monit5	4	4/30/2002	4/30/2002	4
Norfolk-monit6	4	4/23/2003	4/23/2003	4
Norfolk-monit7	4	4/5/2004	4/5/2004	4
Plant 2 RFI-1	70	2/16/1995	8/7/1995	66
Plant 2 RFI-2a	54	10/23/1995	10/25/1995	54
Plant 2 RFI-2b	54	4/2/1996	4/4/1996	36
Plant 2-DSOA West Boundary and Nav Channel	23	4/3/2007	7/13/2007	11
Plant 2-TransformerPhase1	18	8/20/2003	9/12/2003	6

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Rhône-Poulenc RFI-2	7	8/18/1994	8/18/1994	7
Rhône-Poulenc RFI-3	16	7/1/1996	7/1/1996	16
RhônePoulenc2004	21	8/24/2004	8/26/2004	21
Seaboard-Ph2	20	3/28/1996	3/28/1996	20
Slip 4 EAA 2008	16	6/21/2006	6/21/2006	4
Slip4-EarlyAction	41	4/5/2004	4/9/2004	30
T115 Intertidal 2009	5	4/28/2009	4/28/2009	5
T117 Sed Boundary	17	8/29/2008	8/29/2008	17
T117BoundaryDefinition	76	12/4/2003	9/14/2004	52
Data Source: King County				
KC GreenRiverWshedStreamSedimentReport	57	7/28/2008	8/30/2012	174
Data Source: NAWQA				
NAWQA	12	9/20/1995	5/3/2007	6
Data Source: Remedial Investigation				
BoeingDevelopmentalCenter-2004	3	9/13/2004	9/13/2004	3
BoeingDevelopmentalCenter-2005	3	11/12/2005	11/12/2005	3
Data Source: Sherlock				
BDC 2010 Sediment Report	8	10/5/2010	10/6/2010	6
SAIC Slip4 Sediment	26	5/5/2010	5/5/2010	42
Data Source: STORET				
Environmental Monitoring and Assessment Program	1	7/18/2000	7/18/2000	1
EPA Region 10 Superfund Lower Duwamish Waterway Site	2129	8/28/1990	1/11/2010	27,828

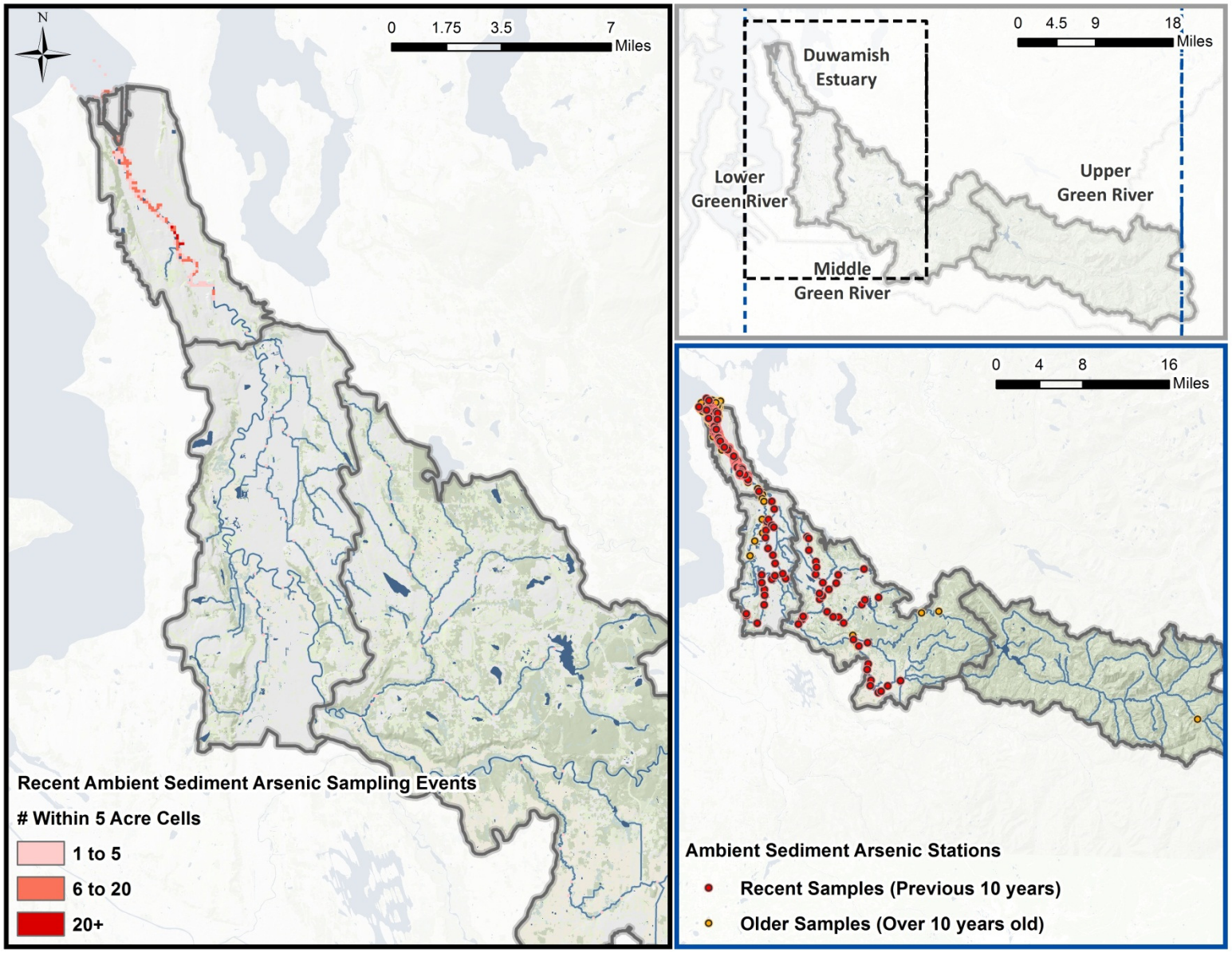

Figure A-14. Ambient surface sediment quality sample locations for arsenic

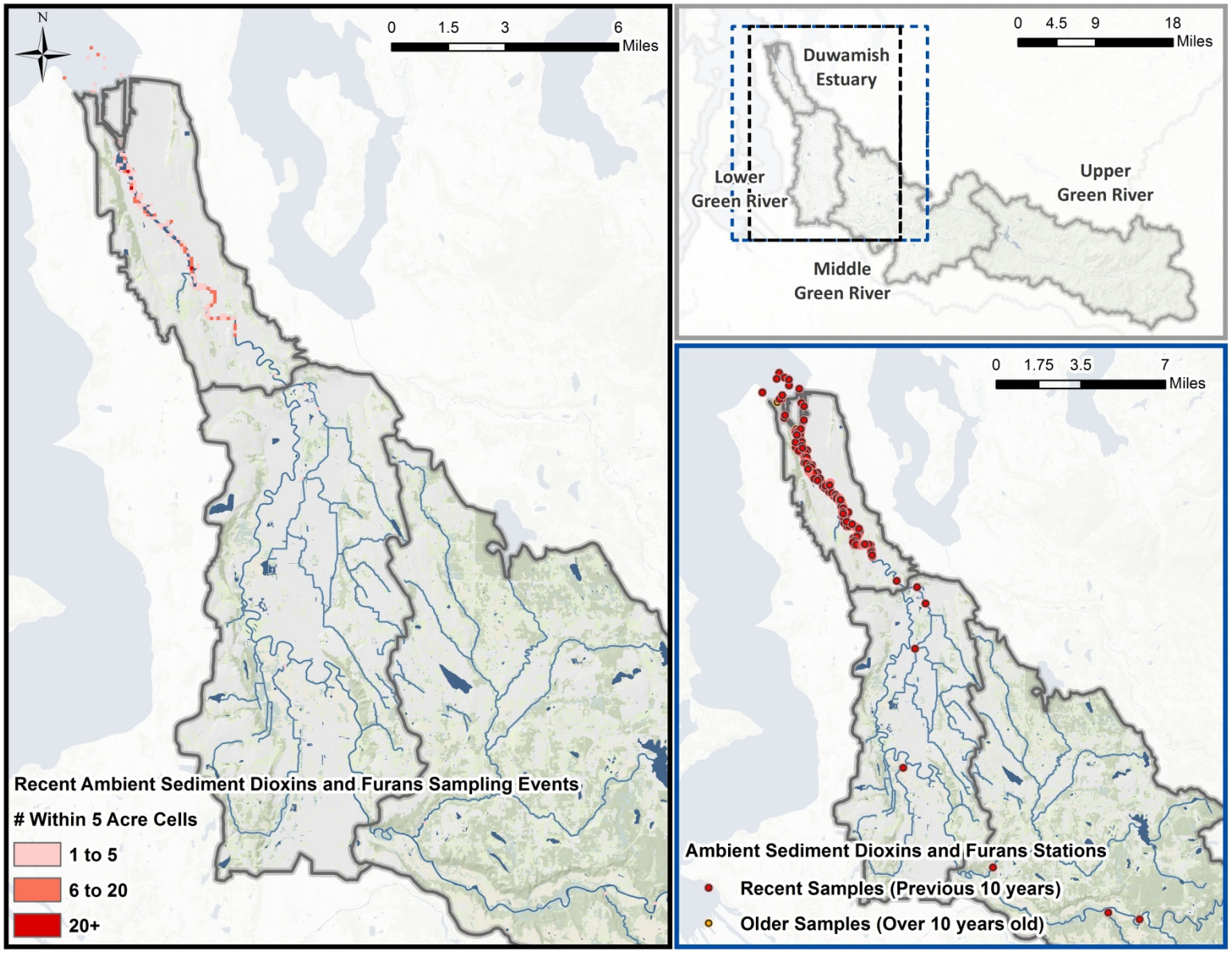

Figure A-15. Ambient surface sediment quality sample locations for dioxins and furans

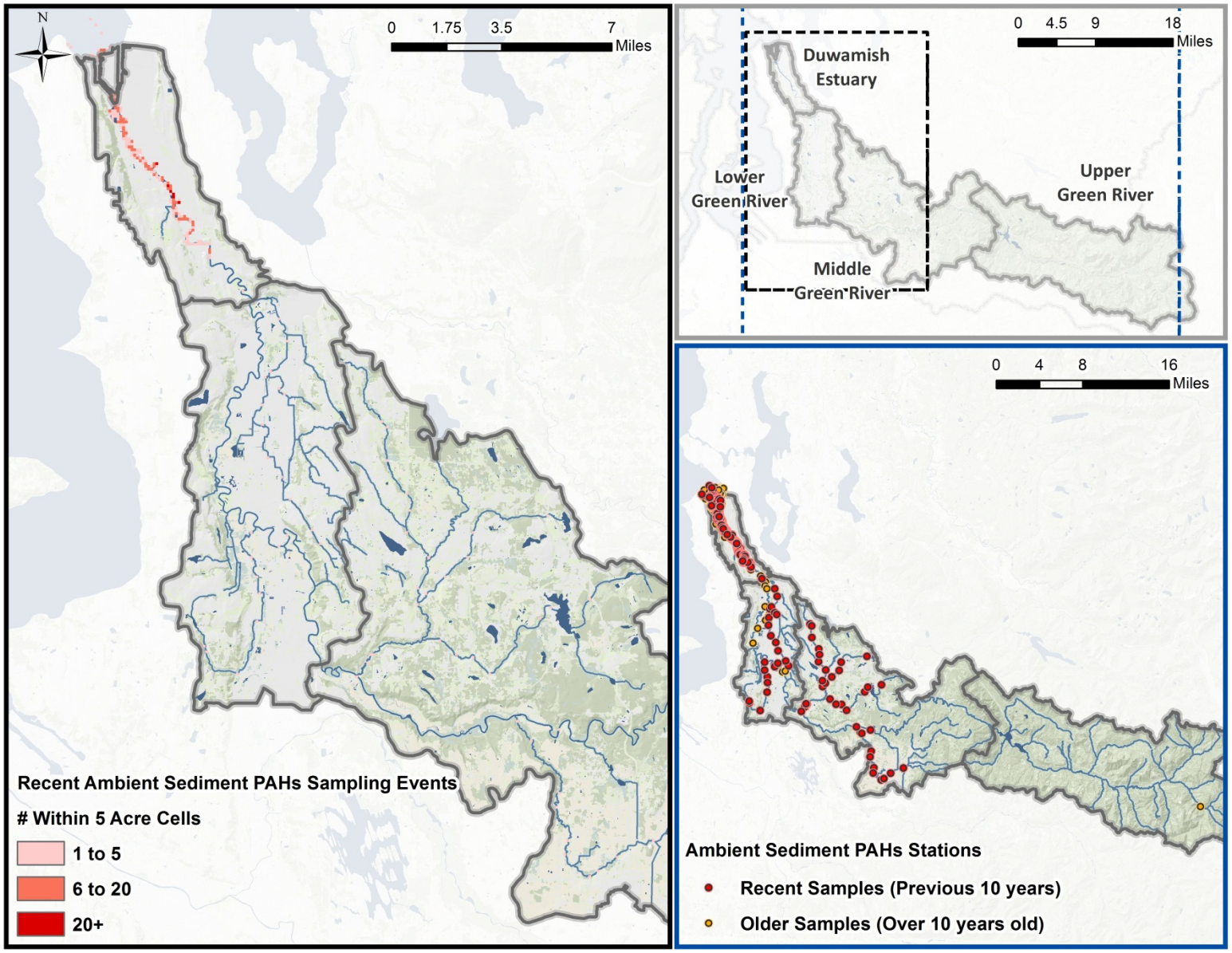

Figure A-16. Ambient surface sediment quality sample locations for PAHs

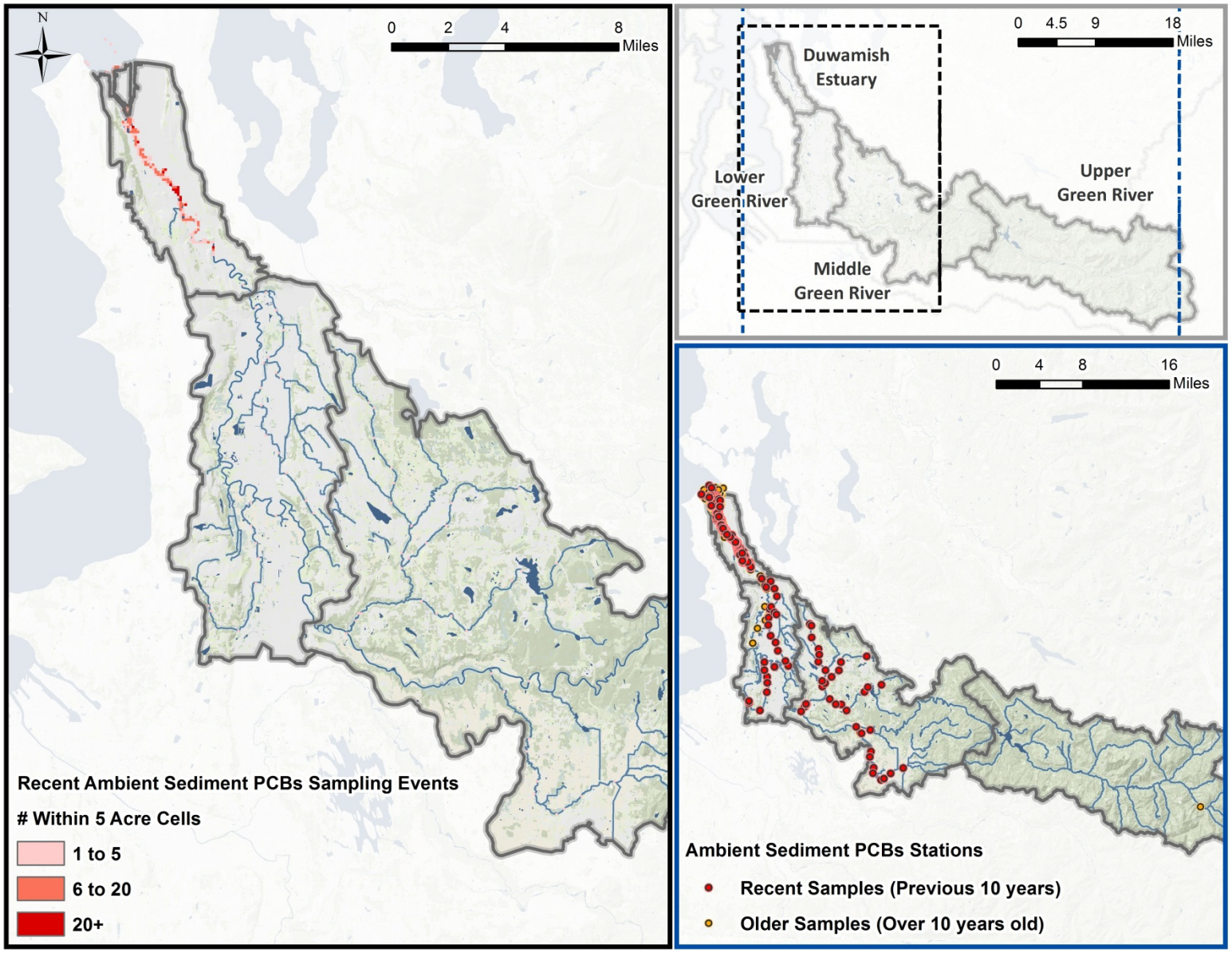

Figure A-17. Ambient surface sediment quality sample locations for PCBs

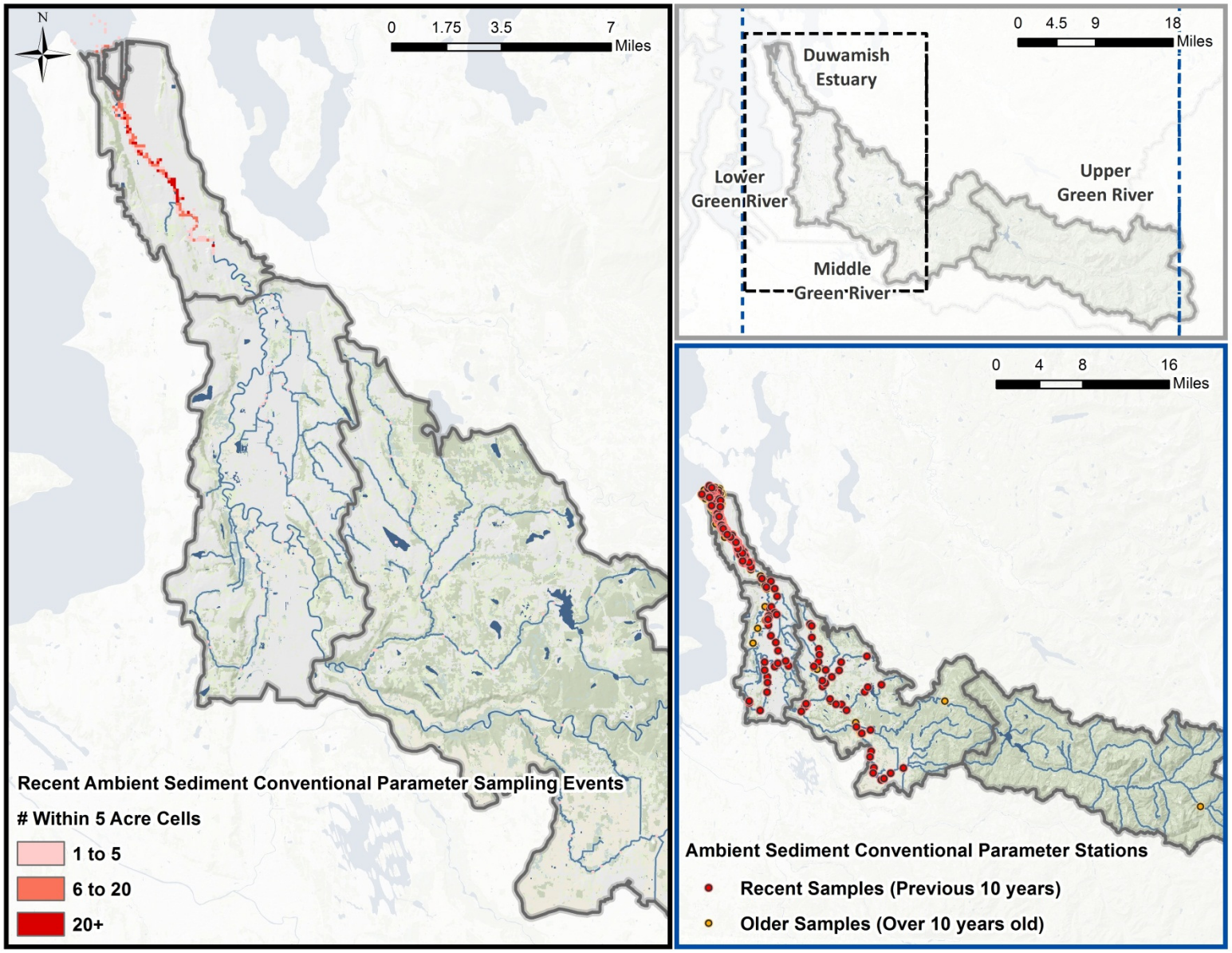

Figure A-18. Ambient surface sediment quality sample locations for conventional pollutants

A.2.2 Discharge Sediment Quality

Table A-6. Discharge Sediment or Solids Data

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Data Source: EIM				
8801 Site Stormwater System Solids 2009, Tukwila, WA	2	10/6/2009	10/6/2009	2
Boeing Split Samples	13	2/21/2008	7/15/2009	8
City of Seattle Phase I Municipal Stormwater Permit"	1	9/21/2009	9/21/2009	1
GTSP Flume Investigation	64	10/22/1998	7/17/2009	49
Source tracing for Lower Duwamish Waterway	248	8/18/2003	3/10/2010	361
South Storm Drain Outlet Boeing Development Center 2009	3	2/4/2009	10/5/2010	12
Data Source: EPA				
Landau(June 2012) Solids-Boeing	9	2/16/2005	4/24/2012	96
Data Source: Final Feasibility Study				
LDW StormDrain Solids	626	1/25/2002	6/15/2009	510
Data Source: Sherlock				
2011 Landau Sed Traps	6	4/5/2011	4/5/2011	7
Boeing-Isaacson	35	9/7/2011	9/12/2011	68
LL/AST	12	1/19/2011	6/15/2011	66
NBF database	449	3/23/2000	6/30/2010	787
NBF database 2010-11	5	1/27/2011	5/26/2011	9
SAIC 2011 Outfall Study	162	3/3/2011	4/20/2011	173
SPU 2010 Phasel Monitoring	1	9/30/2010	9/30/2010	1
SPU SD database	479	1/25/2002	5/13/2011	577
T-117 Data	5	9/2/2009	7/21/2010	16

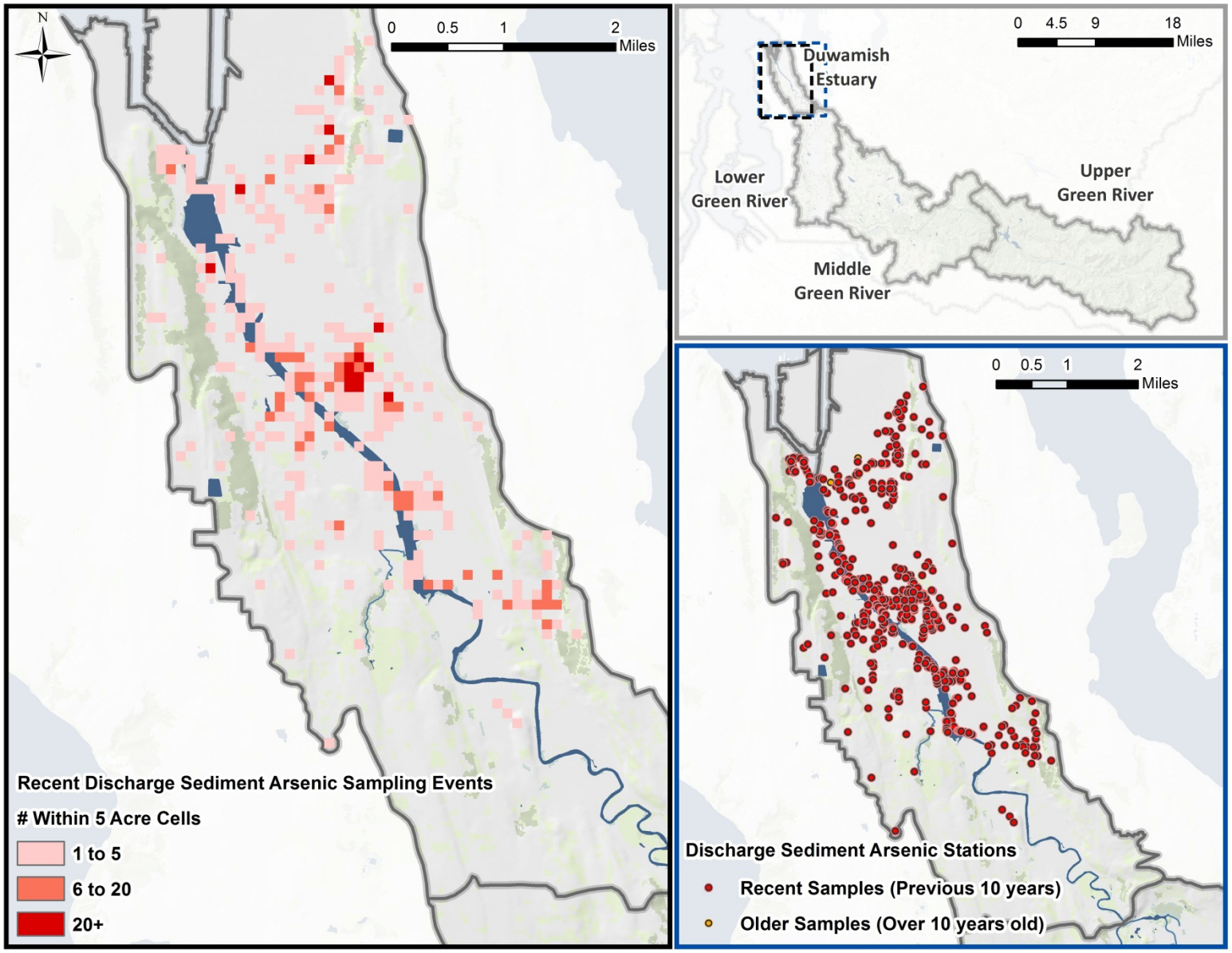

Figure A-19. Point source discharge sediment quality sample locations for arsenic

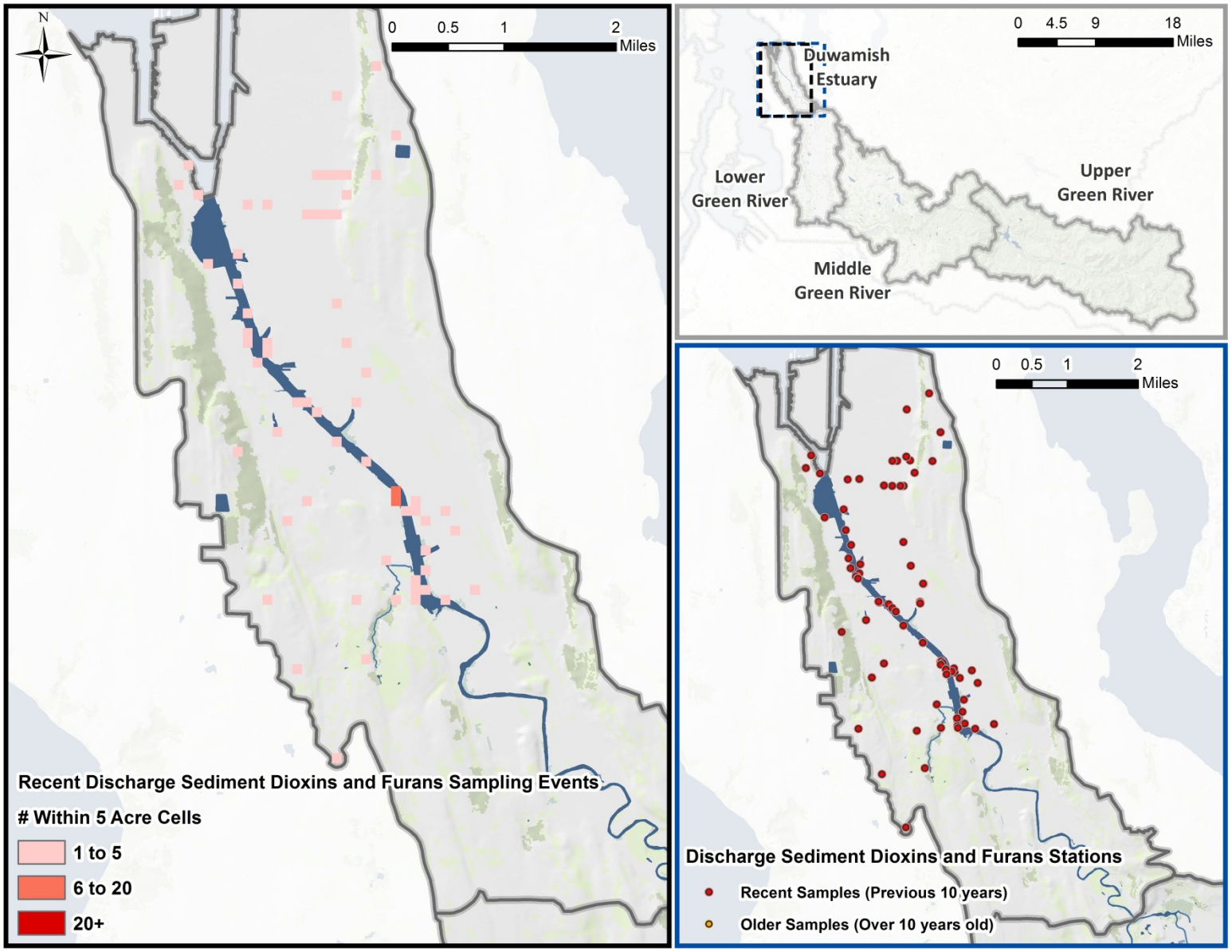

Figure A-20. Point source discharge sediment quality sample locations for dioxins and furans

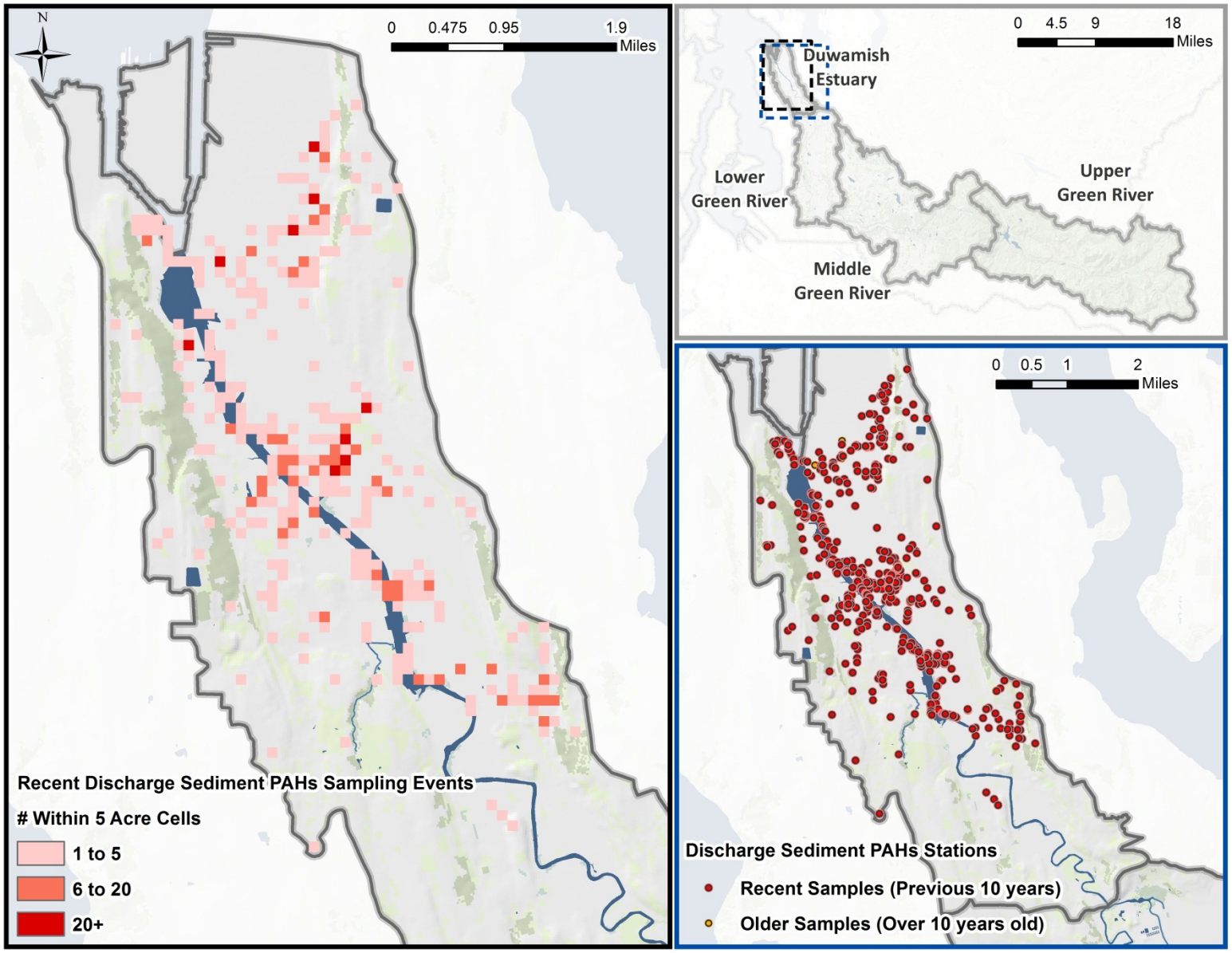

Figure A-21. Point source discharge sediment quality sample locations for PAHs

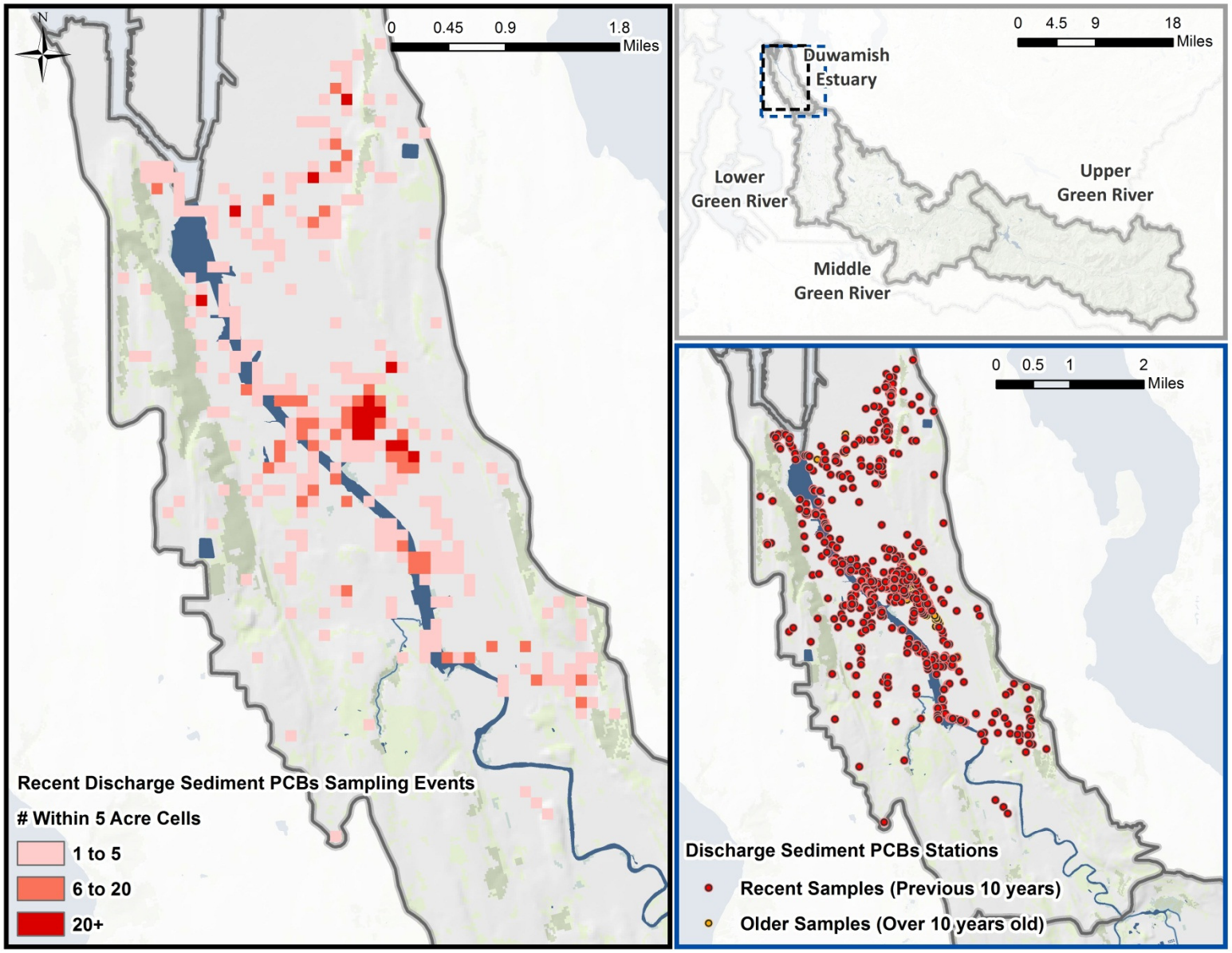

Figure A-22. Point source discharge sediment quality sample locations for PCBs

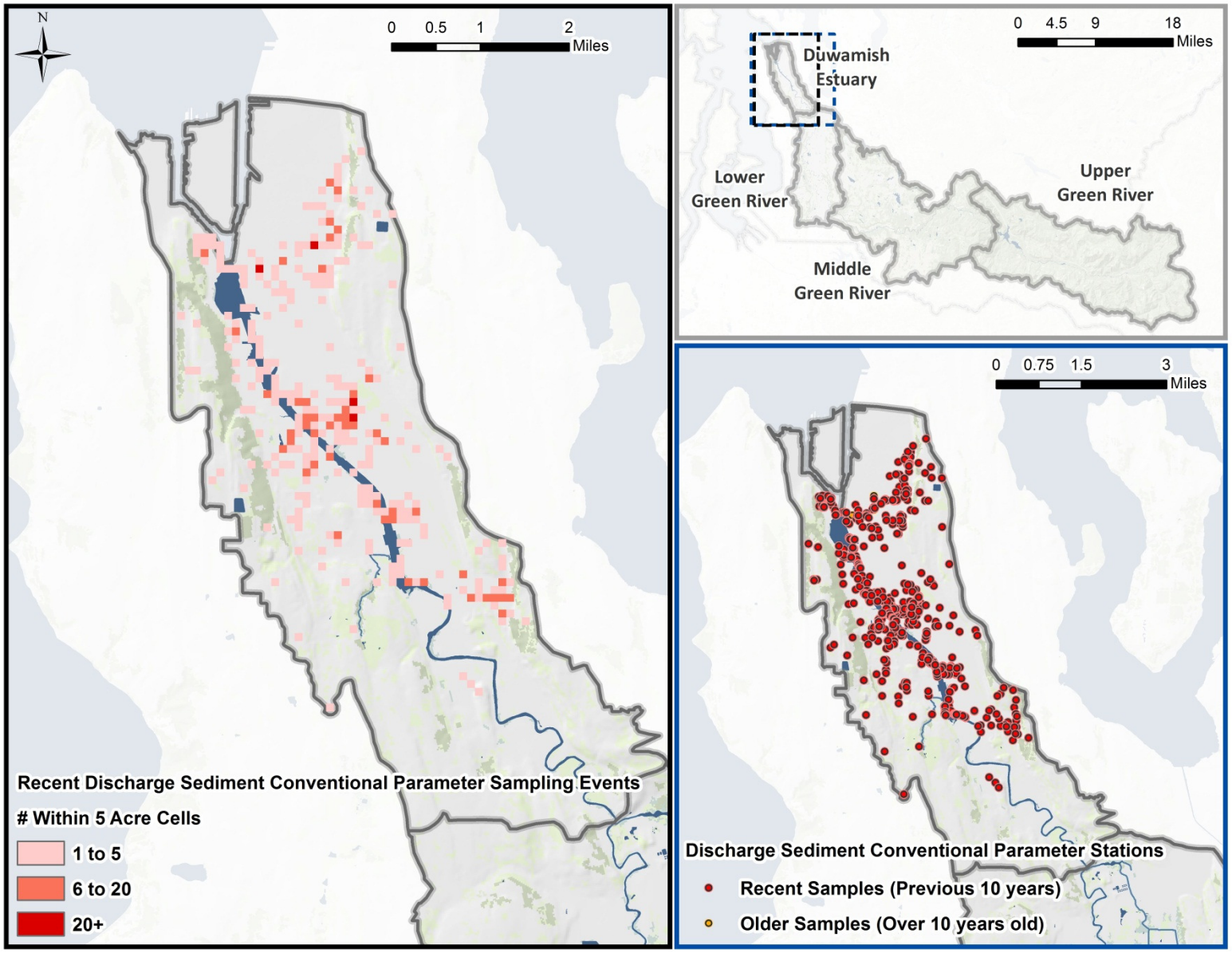

Figure A-23. Point source discharge sediment quality sample locations for conventional pollutants

A.2.3 Subsurface Sediment Quality

Sediment quality data associated with subsurface sampling, soil sampling, and bank sampling are presented below (Table A-7) and include data provided in the general databases described in Section 3 (also illustrated in the following maps).

Table A-7. Subsurface, Soil, and Bank Sampling Sediment Quality Data

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Subsurface Sampling Sediment Data				
Data Source: ACOE				
USACE SubsurfaceSediment Characterization	72	10/8/2012	10/19/2012	69
Data Source: EIM				
Lower Duwamish River LDWRI-Seep	16	6/29/2004	7/30/2004	36
Data Source: Feasibility Study Data				
8801 E Marginal (formerly KenworthPACCAR)	33	2/11/2008	2/12/2008	25
Boeing P2 2008 DSOA	12	7/24/2008	7/31/2008	39
Boeing P2 2009 DSOA	32	11/2/2009	12/15/2009	249
Boeing P2 Under Bldg	20	6/25/2008	7/10/2008	67
Delta Marine	4	7/18/2007	7/18/2007	4
DSOAvertchar	37	6/4/2001	6/19/2001	115
DSOAvertchar2	15	8/12/2003	8/20/2003	28
DSOAvertchar3	5	4/22/2004	4/23/2004	7
Duw/Diag-1	34	8/25/1994	8/25/1994	12
Duw/Diag-2	23	5/20/1996	6/3/1996	37
DuwamYachtClub	6	3/4/1999	3/5/1999	6
EPA SI	277	9/21/1998	9/23/1998	33
Glacier NW	6	1/15/2002	4/23/2002	9
Hardie Gypsum-1	5	11/28/1998	11/28/1998	5
Hardie Gypsum-2	9	7/15/1999	7/15/1999	9
JorgensenApril2004	22	4/20/2004	4/23/2004	75
JorgensenAugust2004	59	8/18/2004	8/20/2004	50
LDW Subsurface Sediment 2006	62	2/6/2006	2/24/2006	290
LDW Turning Basin 08	19	11/3/2008	11/6/2008	32
LDW Turning Basin 09	8	3/4/2009	8/13/2009	11
Lehigh NW	3	8/29/2003	8/29/2003	3
Lone Star 92	1	5/29/1992	5/29/1992	1
Lone Star-Hardie Gypsum	4	6/23/1995	6/23/1995	5
Norfolk-cleanup1	15	8/31/1994	8/31/1994	3
Norfolk-cleanup2	5	8/28/1995	8/28/1995	27
Plant 2 RFI-1	70	9/2/1994	4/17/1995	15
Plant 2 RFI-2b	54	3/19/1996	3/21/1996	41
Plant 2-DSOA West Boundary and Nav Channel	23	4/2/2007	7/13/2007	49
Plant 2-TransformerPhase1	18	8/20/2003	8/22/2003	45
PSDDA96	4	9/6/1996	9/6/1996	4
PSDDA98	9	8/23/1998	8/23/1998	10
PSDDA99	20	8/26/1999	8/26/1999	20
RhônePoulenc2004	21	8/24/2004	8/26/2004	12
Slip 4 EAA 2008	16	6/19/2006	6/21/2006	18
Slip 4-Landau 2008	4	9/19/2008	9/19/2008	13
Slip4-Crowley	4	7/13/1995	7/13/1995	4

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Slip4-EarlyAction	41	4/5/2004	4/6/2004	57
South Park Bridge	2	7/22/2003	7/23/2003	11
SouthParkMarina	2	9/2/1994	9/2/1994	2
T115	4	3/14/2008	3/14/2008	11
T117BoundaryDefinition	76	12/4/2003	9/16/2004	106
Turning-basin	5	6/26/2003	6/26/2003	5
USACE 1990	8	8/28/1990	8/28/1990	8
USACE 1991	19	8/6/1991	8/7/1991	20
USACE 1996	4	9/6/1996	9/6/1996	3
Bank Sampling Data				
Data Source: EIM				
Lower Duwamish Waterway Bank Sampling	43	5/10/2011	5/12/2011	90
Soil Sampling Data				
Data Source: EIM				
7-Eleven Site 25303, Kent, WA	21	3/2/2006	7/16/2009	35
ARCO FACILITY NO. 5219, 21214 84th Ave S, Kent, WA	17	12/22/2000	4/29/2003	17
Boeing Split Samples	13	5/16/2006	9/1/2009	7
CIRCLE K / 76 GAS STATION FACILITY NO. 2708566 (Store 8566), Auburn, WA	16	3/21/2007	8/4/2010	20
Circle K Ambaum Blvd SW, Burien, WA	14	8/28/2008	8/28/2008	6
Circle K Store 5491, Kent, WA	6	12/6/2007	11/17/2010	15
Coast Crane Company (Manitowak Western) TPH and VOC Wash Pad Characterization, Seattle, WA	61	6/13/2007	5/29/2008	68
ConocoPhillips Facility 2708603 (Circle K, 76 Gas Station) Kent, WA	21	4/13/2004	8/6/2010	49
Cook's Chevron Mart II, Renton, WA	19	8/27/2007	2/27/2008	16
Custom Hydraulic Machine Inc, Kent, WA	144	5/12/2008	8/28/2008	272
Don's (Formerly Jerry's) Chevron Enumclaw Site Cleanup, Enumclaw, WA	40	8/4/2009	9/4/2009	53
Douglas Management Company Site Investigation, Seattle, WA	15	6/18/2008	6/19/2008	12
DR Concrete Recycle, Kenyon Street Property, Seattle, WA	23	9/28/2006	2/8/2007	14
Duwamish Marine Center, Seattle, WA	21	8/3/2000	6/5/2008	18
Enterprises NW, Seattle, WA	119	11/5/2007	5/20/2010	421
Former Markey Machine Seattle, WA	2	11/12/2007	11/12/2007	2
Former Penthouse Draperies Facility, Seattle, WA (formerly VCNW0477) (Now called City Commerce Park)	31	10/16/2003	8/11/2004	40
Former Proliance International Inc Facility Soil and Groundwater Investigation	66	1/26/2006	3/29/2006	78
Former Shell Oil Station at 11803 Des Moines Memorial Drive South (Benson) (Auto Site Automotive), Seattle, WA	50	2/27/2008	12/16/2008	54
Fostoria Gardens Building Property, Tukwila, WA	11	7/2/2008	7/2/2008	13
Fox Avenue Building Site (Formerly Great Western Chemical) Seattle, WA	107	12/8/2008	6/24/2009	230
Fuel Farm, Auburn, WA	5	4/20/2010	4/20/2010	2
Gardner-Fields Corp/Kent Site Investigation, Kent, WA	25	1/20/2009	10/18/2010	34
Goodyear (Sam's) Tire Service Center 8342, Kent, WA	11	9/3/2009	1/25/2010	41
GTSP Flume Investigation	64	1/26/2006	1/27/2006	2
Iden Property, Kent, WA	36	12/5/2002	6/24/2008	36
Industrial Container Services WA LLC (Early Action Area 2 - Lower Duwamish), Seattle, WA	12	4/23/2007	4/24/2007	7
Jackpot Food Mart 309, TOC Holdings Co. Facility No. 01-309	30	8/31/2005	7/18/2008	63

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
(Salty's Properties), Seattle, WA				
Jackpot Food Mart 311 (Time Oil Co. Facility No. 01-311, Kent)	38	8/24/2004	6/22/2007	44
Johnston PCB Cleanup, Black Diamond, WA	2	1/21/2009	2/5/2009	23
Kelly Moore Paint Co., 5410 Airport Way S, Seattle, WA	75	8/5/2009	3/24/2011	154
Kenworth Truck Co (PACCAR Inc.) Groundwater Sampling and IAAI Stormwater Improvement, 8801 E Marginal Way S, Tukwila, WA. Agreed Order # DE3599	56	10/31/2007	12/6/2007	56
Lower Duwamish Source Control, T117 Early Action Area Non-Time Critical Removal Action (NTCRA)	310	5/1/1991	9/3/2008	595
Lower Duwamish Waterway Early Action Area 5, Summary of Site Characterization Activities: Basin Oil Property Dallas Avenue, Seattle, WA	16	5/12/2009	5/14/2009	56
Lower Duwamish Waterway Remedial Action Grant. Slip 4 Early Action Area.	23	6/22/2006	6/23/2006	4
Master Halco Inc., Kent, WA	6	9/10/2008	11/3/2010	10
Meadows at Rock Creek, Maple Valley, WA	15	10/13/2005	11/21/2006	15
Multimedia sampling at the Georgetown Steam Plant property	52	9/19/2001	7/28/2006	78
Plum Creek Land Company Soil Remediation, Ravensdale Rd, Black Diamond, WA	234	7/21/2008	9/4/2008	234
Port of Seattle Terminal 30 Ecology Agreed Order AODE1991	39	8/2/2005	8/2/2005	5
PSC (Philip Services Corp) Georgetown Groundwater Monitoring	171	8/29/2005	6/18/2008	243
PSC (Philip Services Corp) Kent	32	6/15/2007	6/15/2007	5
Renton Honda Shop, Renton, WA	28	4/4/2007	3/9/2010	29
Renton Village Cleaners Site, Renton, WA	28	2/4/1998	10/5/2007	33
Rite Aid Kent (KANGLX 76), 10407 SE 256th St, Kent, WA	4	11/9/2006	11/9/2006	2
Seattle City DOT Sunny Jim Encampment Plot Investigation	5	12/14/2010	12/14/2010	5
Shell Oil Co Des Moines 129596, 12666 Des Moines Way, Seattle, WA	11	6/2/2010	7/1/2010	8
Shell Oil Product US SAP 121097, 32002 Military Road South, Federal Way, WA	10	5/19/2008	5/19/2008	5
Shell Oil Products US SAP 121430, 600 S Michigan, Seattle, WA	13	5/19/2008	12/17/2009	8
Shell Station 120459, Kent, WA	5	6/5/2008	6/5/2008	5
Shell Station 120598, 13138 Interurban Ave S, Tukwila, WA	9	4/20/2009	3/8/2010	6
Shell Station 120654, 1439 Auburn Way N, Auburn, WA	13	5/30/2008	6/2/2008	6
Shell Station 120984, 2424 Beacon Ave, Seattle, WA	8	5/6/2008	5/6/2008	8
Shell Station 120993, 2461 4th Ave S, Seattle, WA	10	5/14/2008	5/14/2008	1
Shell Station 121333, 501 Tukwila Parkway, Tukwila, WA	53	12/18/2006	12/14/2007	102
Shell Station 121450, Seattle, WA	21	4/11/2007	5/20/2008	9
South Park Marina Site Investigation Seattle, WA	23	9/27/2007	10/9/2007	30
South Park Water Quality Facility and Pump Station Soil and Groundwater Quality Characterization and Remediation, Seattle, WA	88	1/17/2008	2/2/2010	203
Southern Alaska Forwarders, Seattle, WA	17	10/23/2007	10/15/2008	7
SPU Bus Barn, Seattle, WA	185	2/4/2008	5/9/2011	196
Tacoma Smelter Plume (TSP) King County Child Use Study	83	1/30/2002	4/7/2003	751
Tacoma Smelter Plume (TSP) King County Child Use Study 2	786	1/5/2005	5/9/2005	754
Tacoma Smelter Plume (TSP) King County Extended Footprint	34	6/21/2004	11/24/2004	120
Tacoma Smelter Plume (TSP) King County Soil Safety Program	1011	7/20/2006	4/21/2011	1,494
Tacoma Smelter Plume (TSP) Phase II Mainland Footprint	38	2/21/2001	4/17/2001	178

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Study				
Tacoma Smelter Plume (TSP) Tracer Study	21	3/19/2001	4/5/2001	16
Taylor Edwards Soil and Groundwater Monitoring, Kent, WA	22	4/24/2006	4/27/2006	10
United Motors, Tukwila, WA	22	7/12/2006	11/5/2007	17
US General Services Administration Federal Center South, Seattle, WA	48	8/29/2002	8/16/2010	36
UST Removal - 14404 51st Avenue S, Tukwila, Washington	30	10/27/2005	11/22/2005	30
West Seattle Estates, Seattle, WA	13	6/2/2009	6/2/2009	13

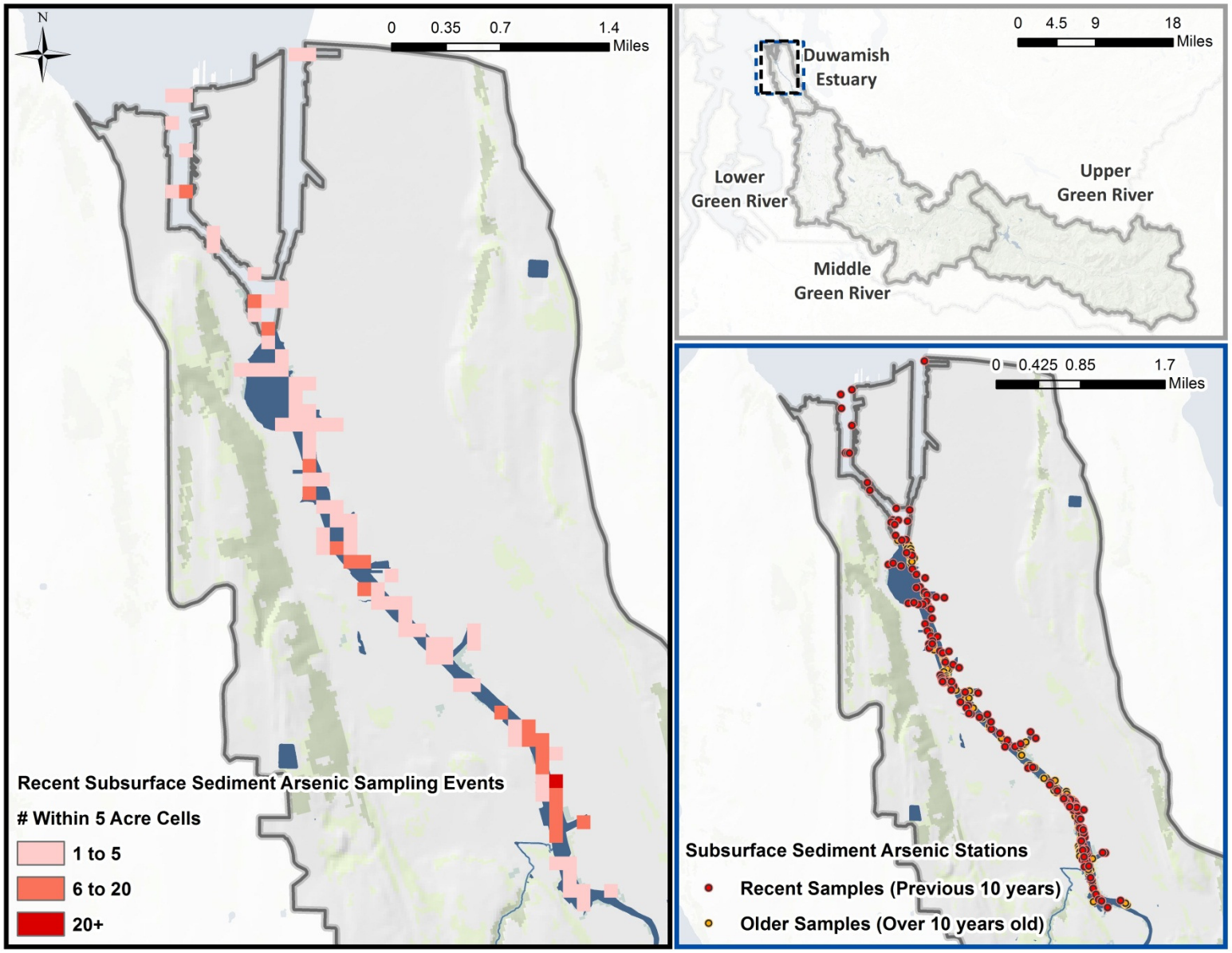

Figure A-24. Subsurface sediment quality sample locations for arsenic

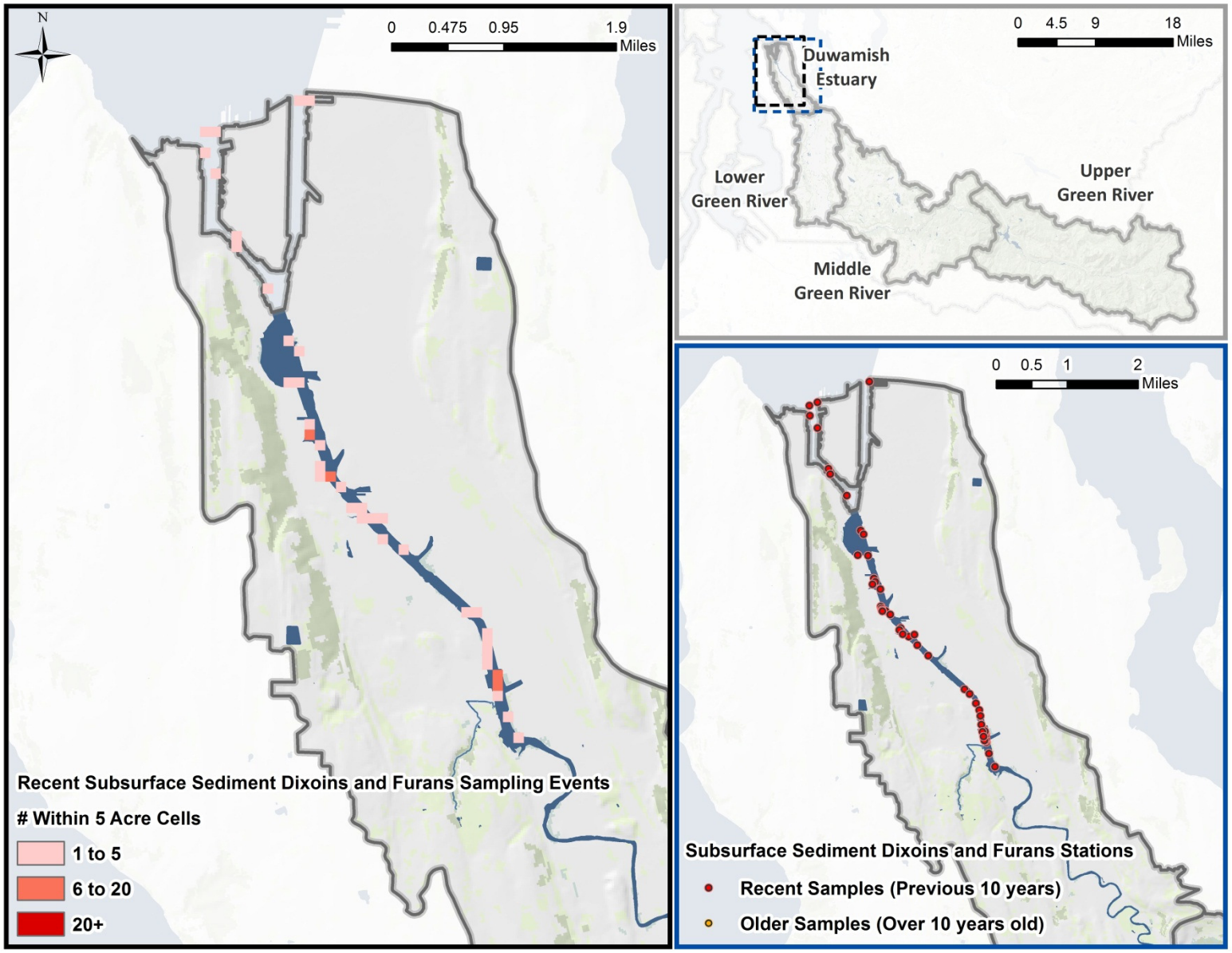

Figure A-25. Subsurface sediment quality sample locations for dioxins and furans

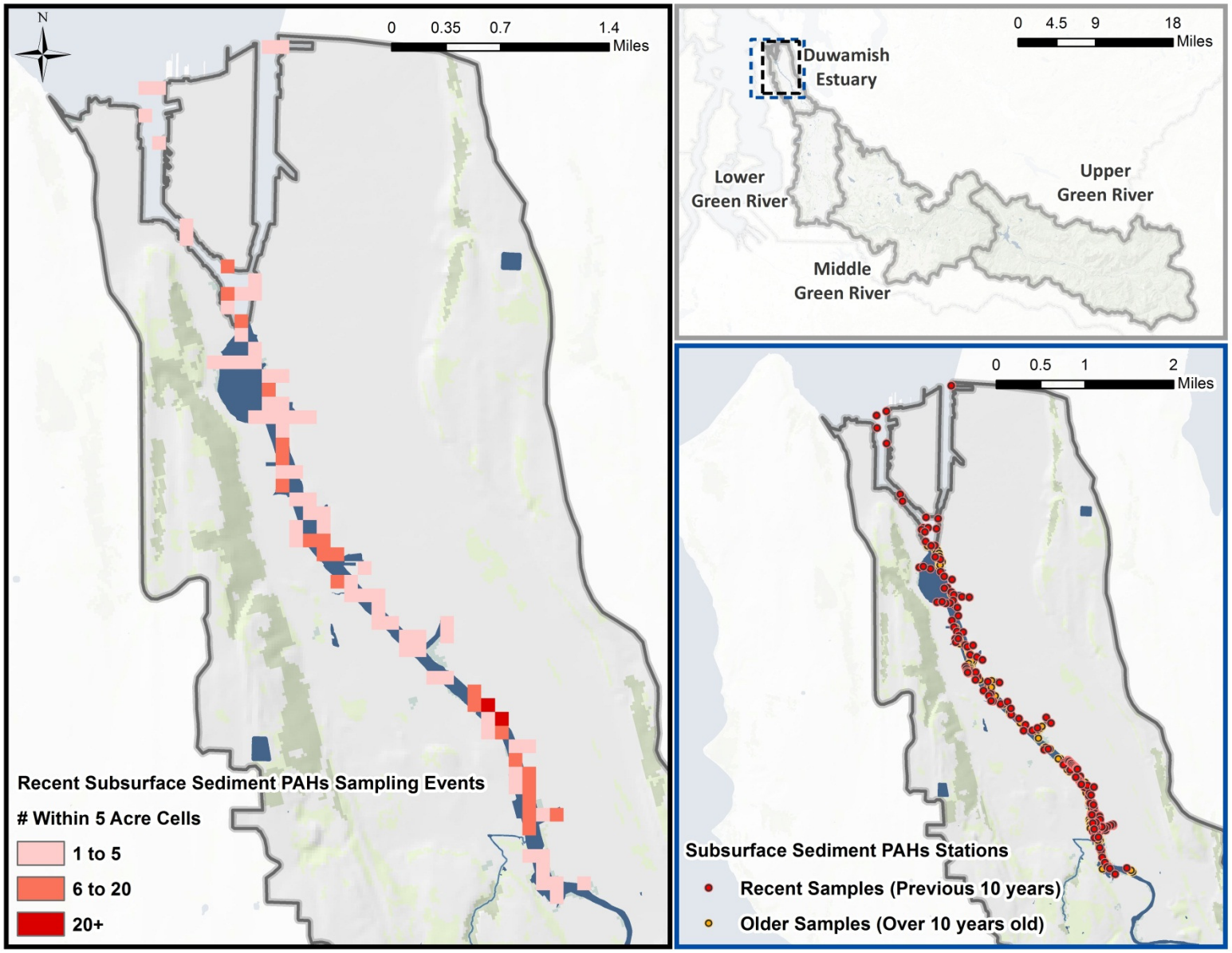

Figure A-26. Subsurface sediment quality sample locations for PAHs

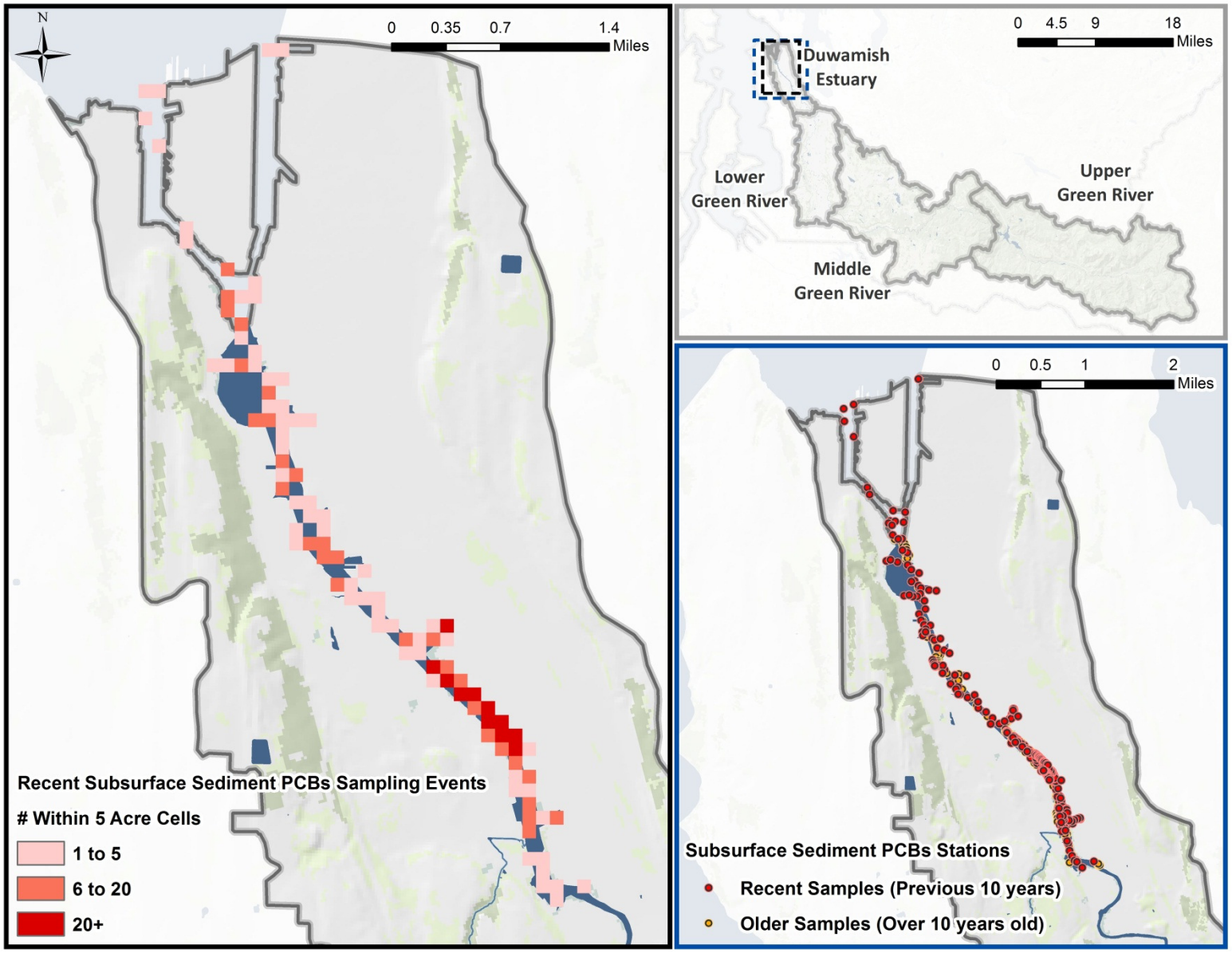

Figure A-27. Subsurface sediment quality sample locations for PCBs

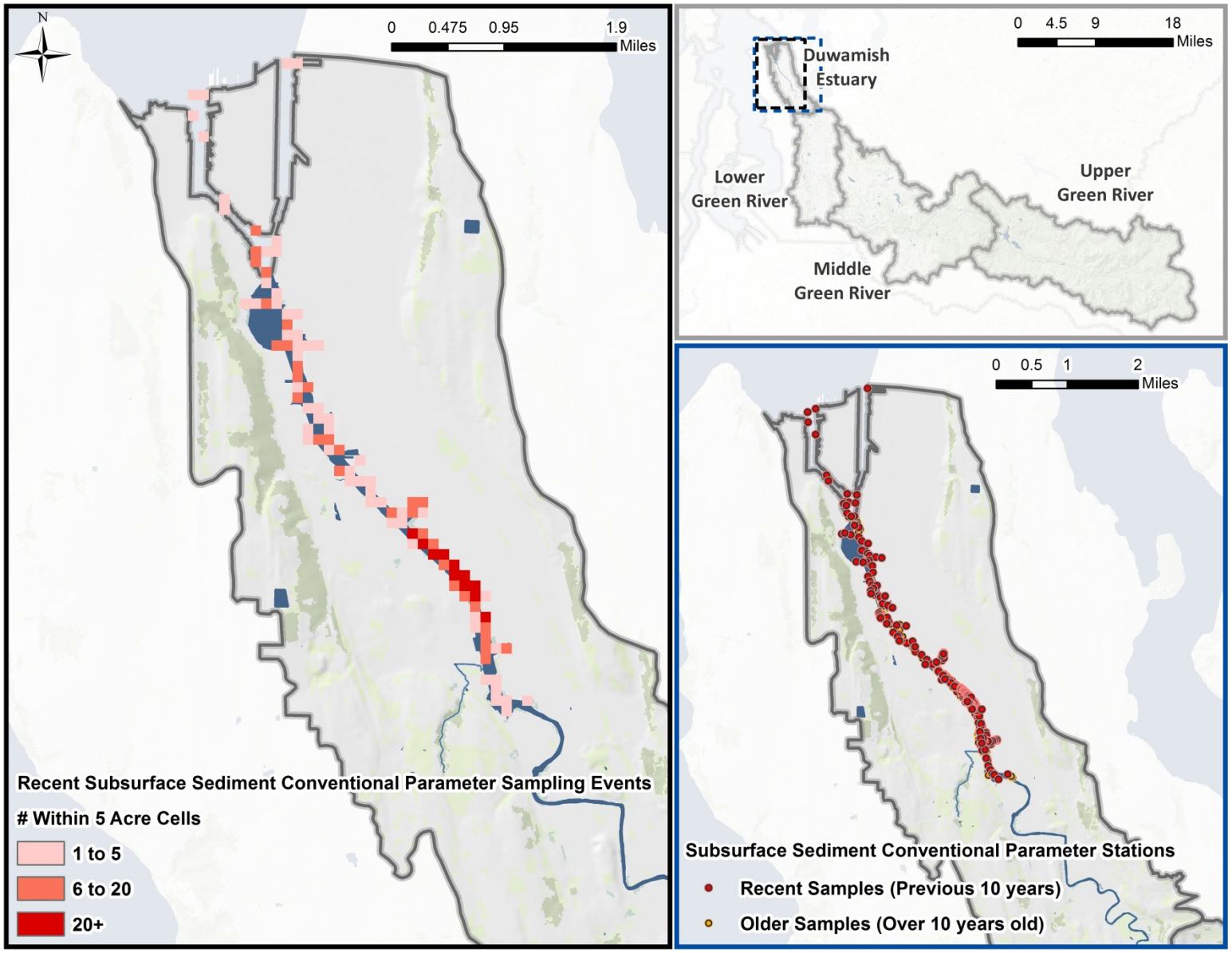

Figure A-28. Subsurface sediment quality sample locations for conventional pollutants

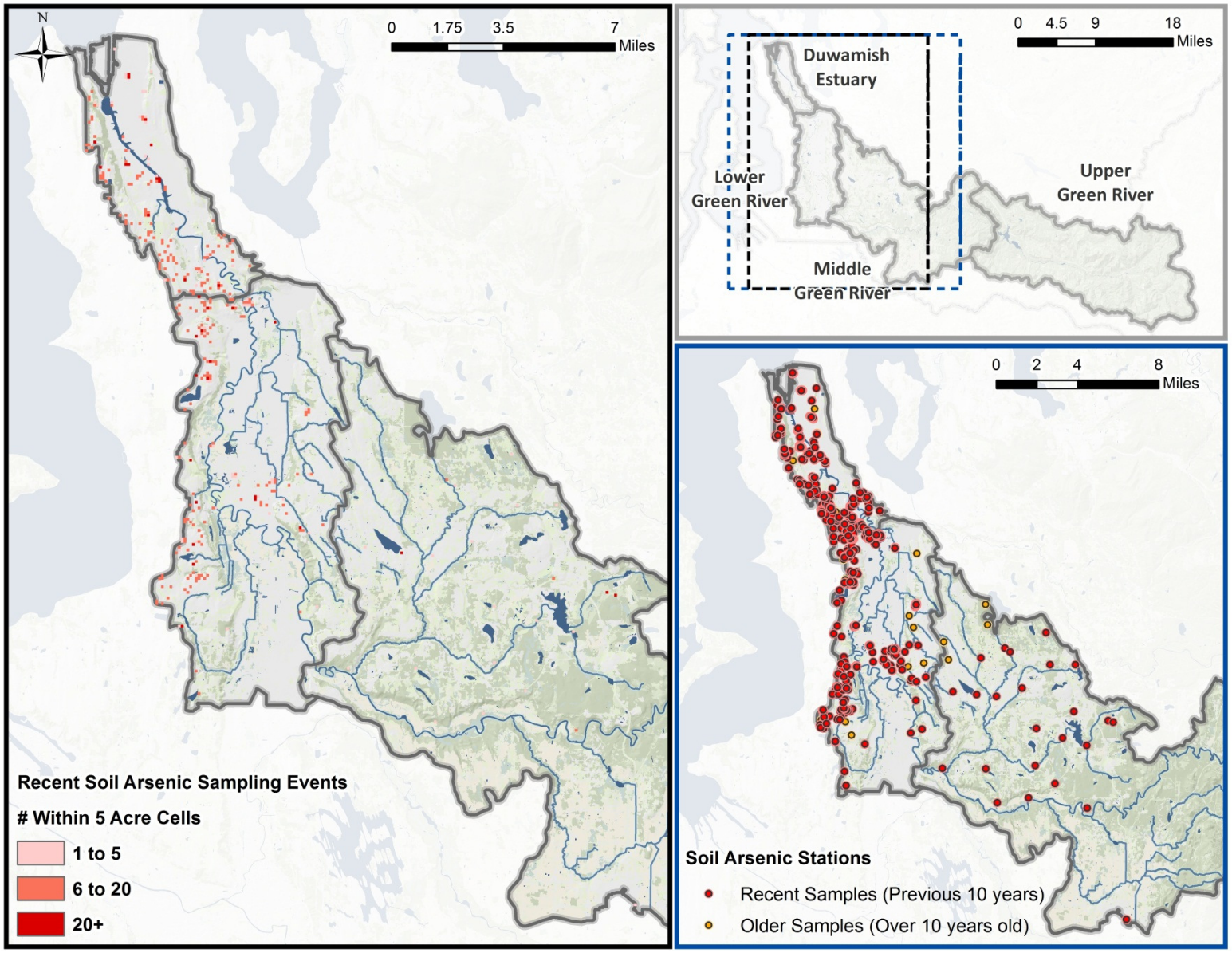

Figure A-29. Soil quality sample locations for arsenic

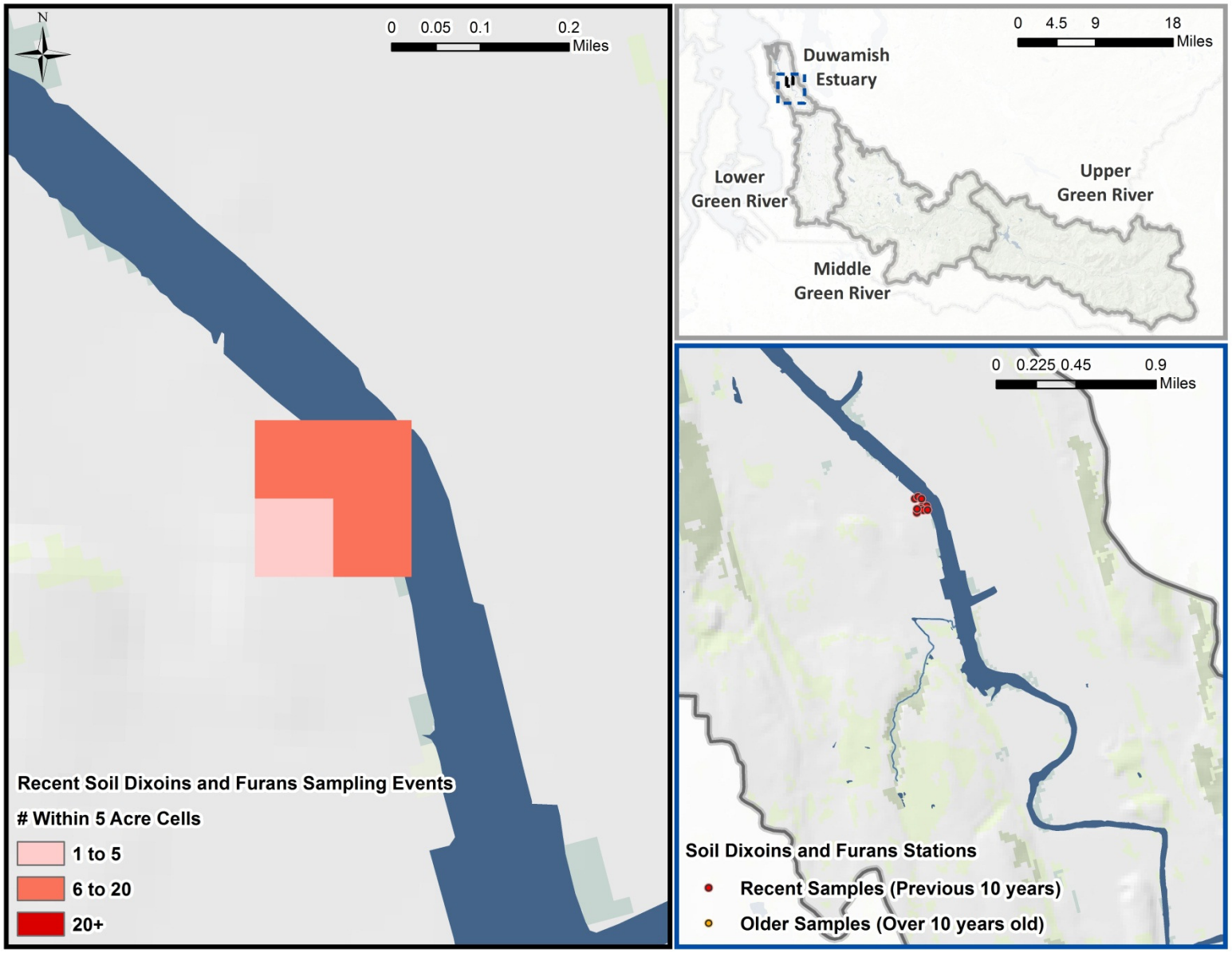

Figure A-30. Soil quality sample locations for dioxins and furans

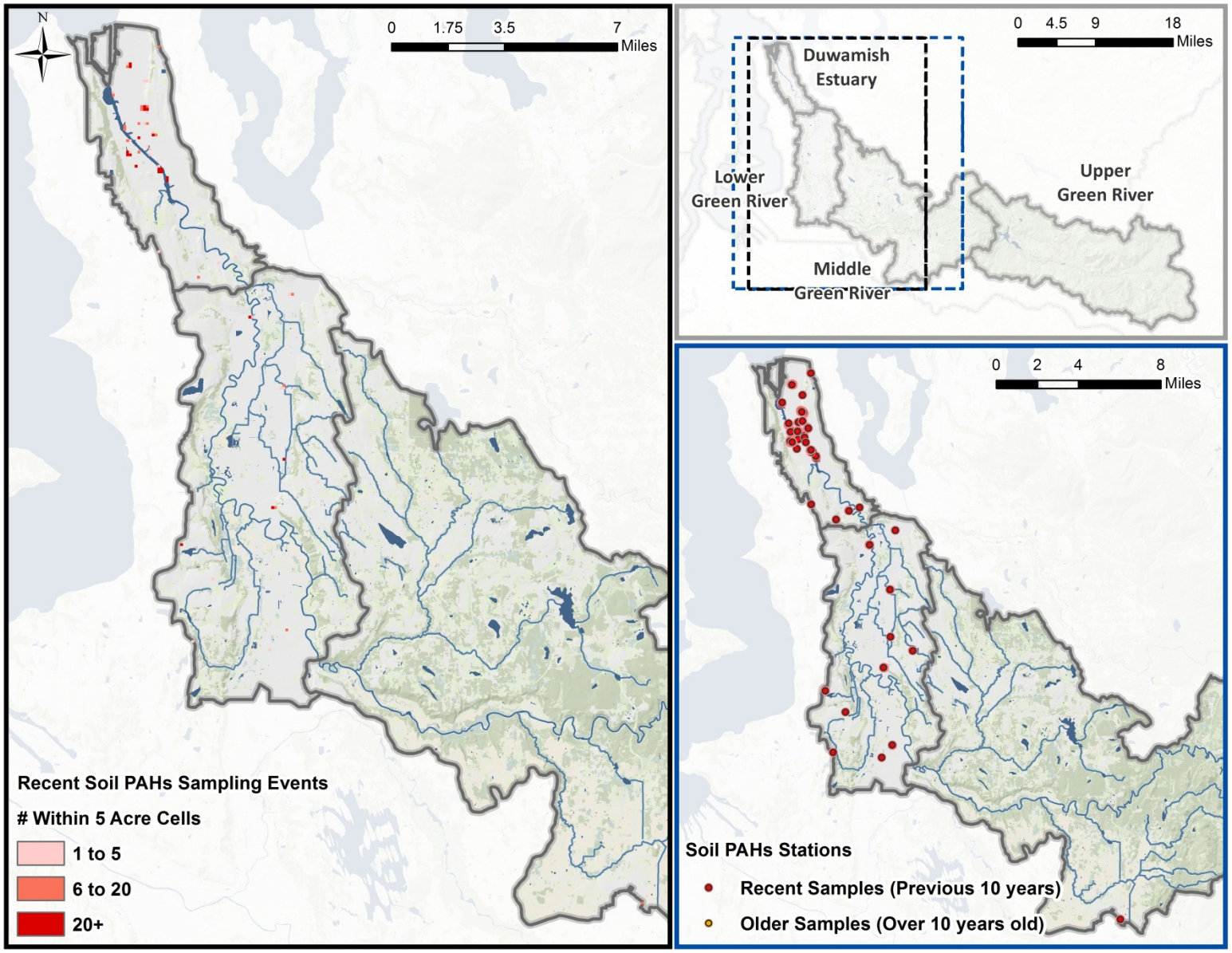

Figure A-31. Soil quality sample locations for PAHs

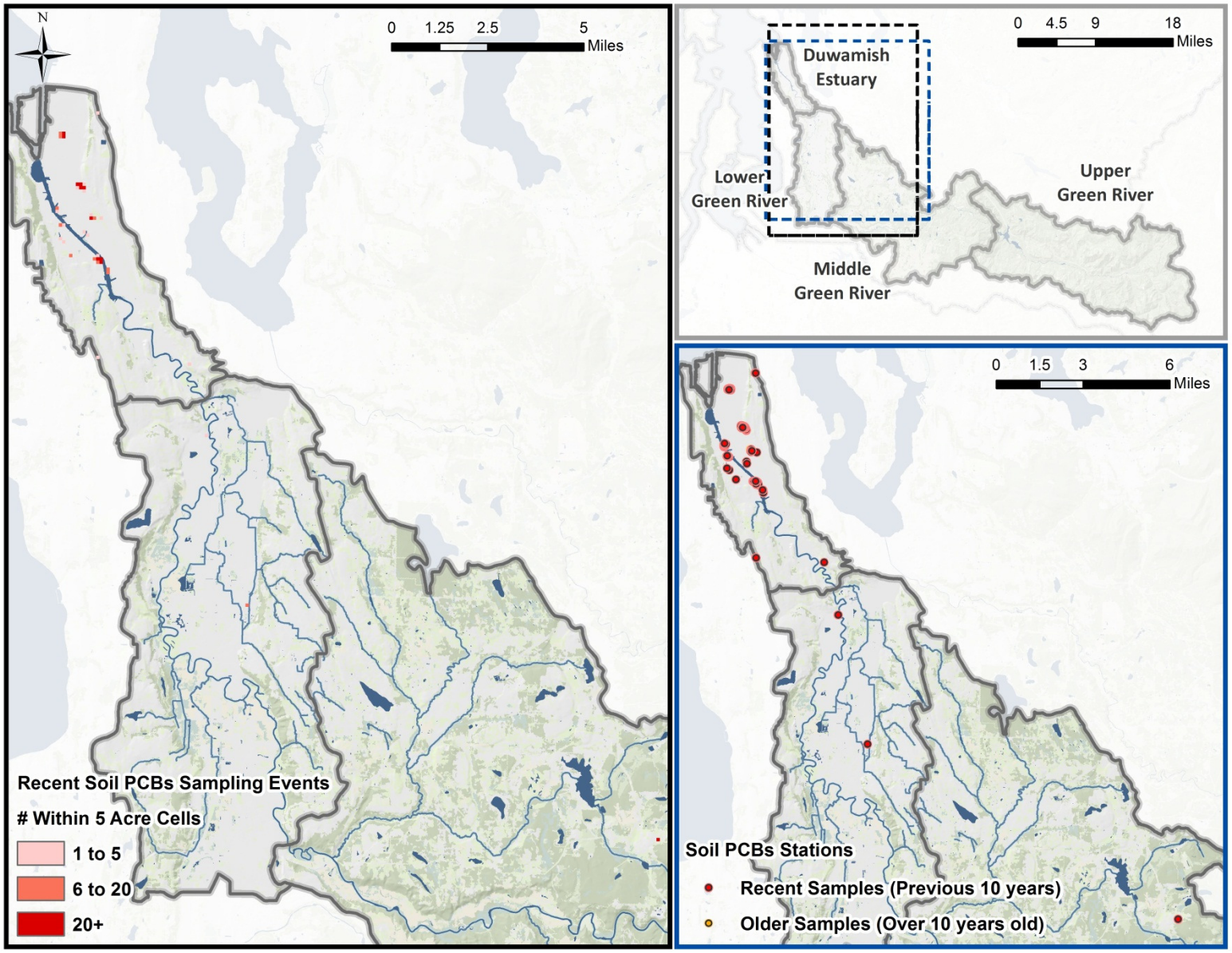

Figure A-32. Soil quality sample locations for PCBs

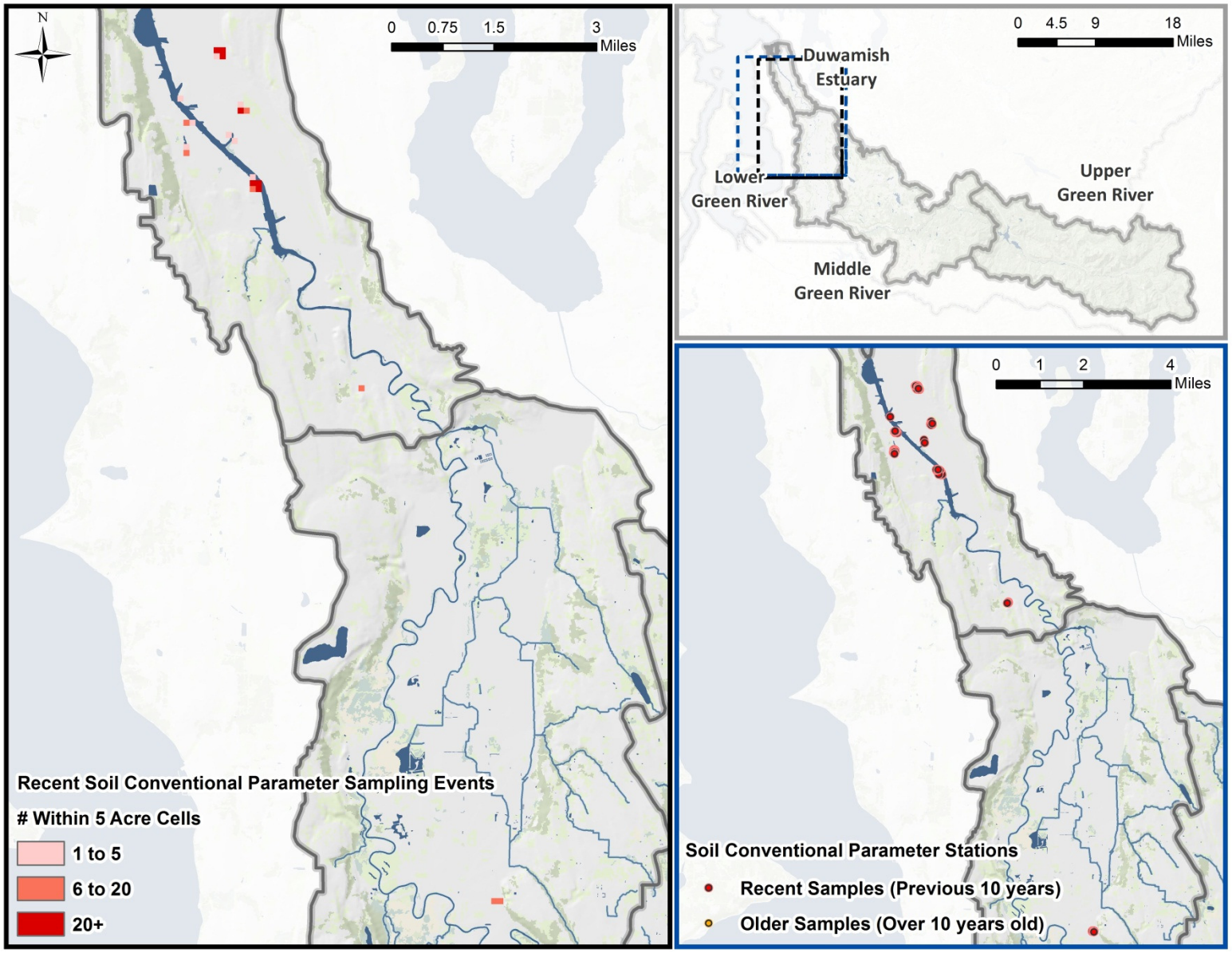

Figure A-33. Soil quality sample locations for conventional pollutants

A.3 Tissue Quality

Table A-8. Tissue Quality Data

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Data Source: EIM				
1984 BWMP Fish Tissue and Sediment	1	9/19/1984	9/19/1984	6
2007 PSAMP Groundfish Contaminant Survey	1	5/18/2007	5/18/2007	6
Benthic Surveillance 1986	3	6/19/1986	6/19/1986	3
Benthic Surveillance 1989	1	5/18/1989	5/18/1989	3
DNR Dioxin Study	9	7/12/2007	7/16/2007	7
Dumas Bay	13	6/5/2006	6/5/2006	2
Duwamish Waterway Sediment Operable Unit	22	10/21/1998	12/11/1998	31
Elliott Bay Duwamish River Fish Tissue & Bioaccumulation Investigation	12	12/15/1995	12/15/1995	12
EPA study of crab tissue dioxins/furans	1	3/11/1991	3/11/1991	4
Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	28	7/24/2006	8/2/2006	16
Inorganic Arsenic Levels in Puget Sound Fish and Shellfish	1	6/1/2000	6/1/2000	2
Lower Duwamish River LDWRI- Juvenile chinook salmon collection for tissue and bioaccumulation analysis - 2003	7	5/12/2003	6/25/2003	30
Lower Duwamish River LDWRI-Benthic Invertebrate sampling. Data included Chemistry, Tissue and Bioaccumuation.	39	8/13/2004	9/28/2004	49
Lower Duwamish River Remedial Investigation - Fish and Crab (LDWRI-FishCrab)	121	8/2/2004	9/8/2004	150
Lower Duwamish Waterway injury assessment - chinook salmon & shiner perch	4	5/18/2000	5/31/2000	55
Mercury Trends in Fresh Water Fish 2006	1	10/5/2006	10/5/2006	11
Monitoring - Elliott Bay Full, 2000	1	7/10/2000	7/10/2000	12
NOAA chinook salmon bioaccum. study	1	5/23/1989	6/18/1990	11
PSAMP trawl data for 1991	1	5/1/1991	5/1/1991	1
PSAMP trawl data for 1992	1	5/1/1992	5/1/1992	1
PSAMP-fish sampled for tissue and bioaccumuation analysis	5	1/1/1992	1/1/1998	184
Round 2 - East waterway terminal 18 Stage 1A, DY03	2	9/3/2002	9/4/2002	20
Screening Survey of Mercury Levels in Fish Tissue	4	12/1/2001	12/5/2001	9
Surface Sediment and Fish Tissue Chemistry in Greater Elliott Bay (Seattle) -Urban Waters Initiative	16	5/18/2007	5/18/2007	6
USACE/Port of Seatte EWW bioaccum, DY 00	25	3/29/1999	4/12/1999	180
User Study ID renamed from USFWS-Heron. Data from Brad Helland, NWRO	1	4/2/1998	4/5/1998	6
Washington State Toxics Monitoring Program: Exploratory Monitoring 2006.	2	10/5/2006	11/7/2006	7
WSPMP 1995 Pesticides and PCBs in Marine Mussels	1	5/17/1995	5/17/1995	1
Data Source: NAWQA				
NAWQA	12	9/20/1995	8/3/2005	15
Data Source: Remedial Investigation Data				
EVS 95	3	12/15/1995	12/15/1995	3
EW-Salmon	1	6/11/2002	6/11/2002	6
KC 2006 Fish tissue	8	9/30/2006	9/30/2006	13
KC WQA	19	10/21/1996	10/21/1998	70
LDW-Fish Collection 2005	65	8/29/2005	9/6/2005	65

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
LDWG-Fish Crab 2007	19	8/24/2007	9/12/2007	84
LDWRI-Benthic	34	8/13/2004	9/28/2004	34
LDWRI-FishCrab	108	8/2/2004	9/7/2004	108
LDWRI-Salmon	4	5/12/2003	6/23/2003	18
PSAMP-fish	1	1/1/1992	1/1/1997	9
WSOU	9	10/23/1998	11/10/1998	9
Data Source: STORET				
Environmental Monitoring and Assessment Program	1	7/18/2000	7/18/2000	1

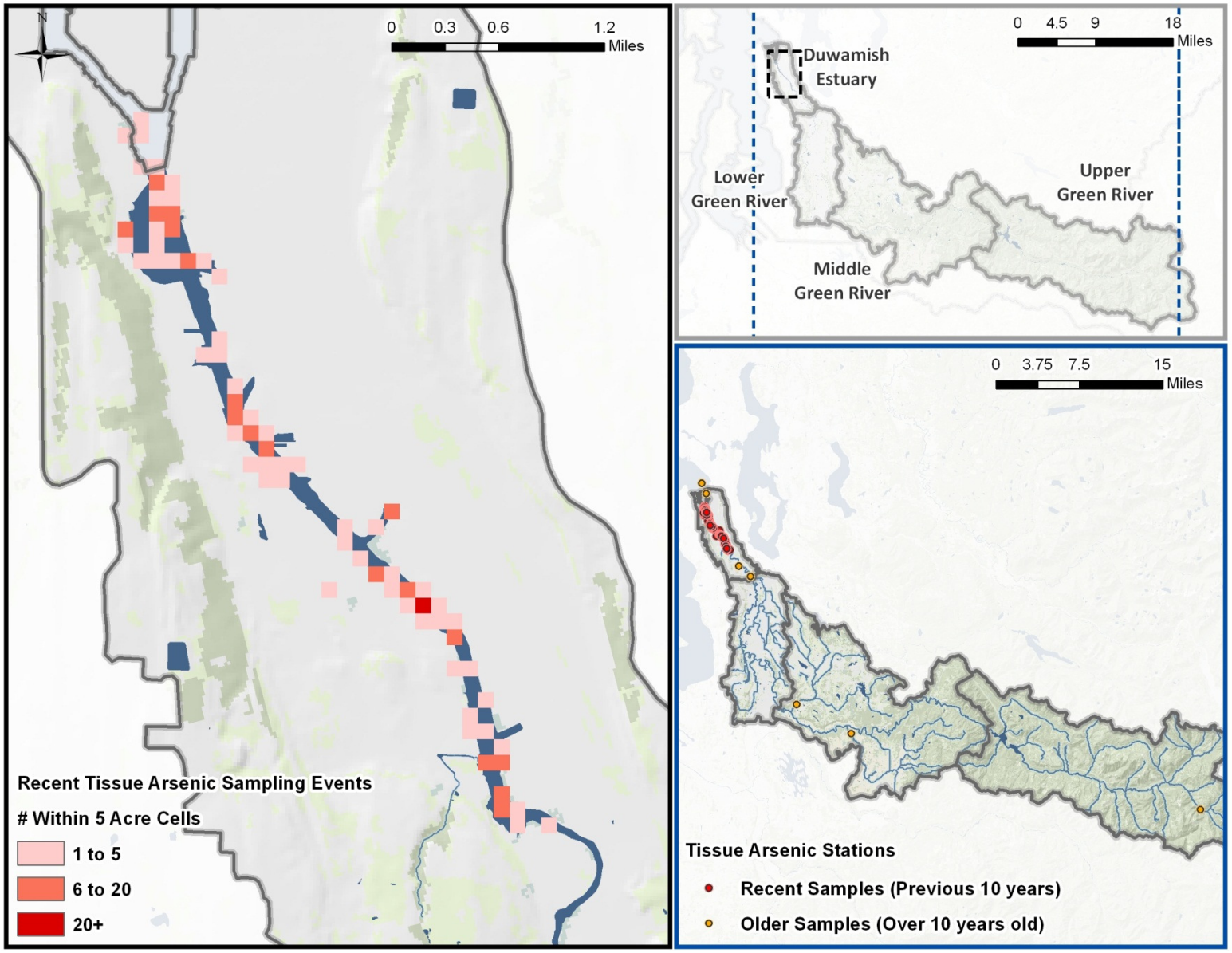

Figure A-34. Tissue quality sample locations for arsenic

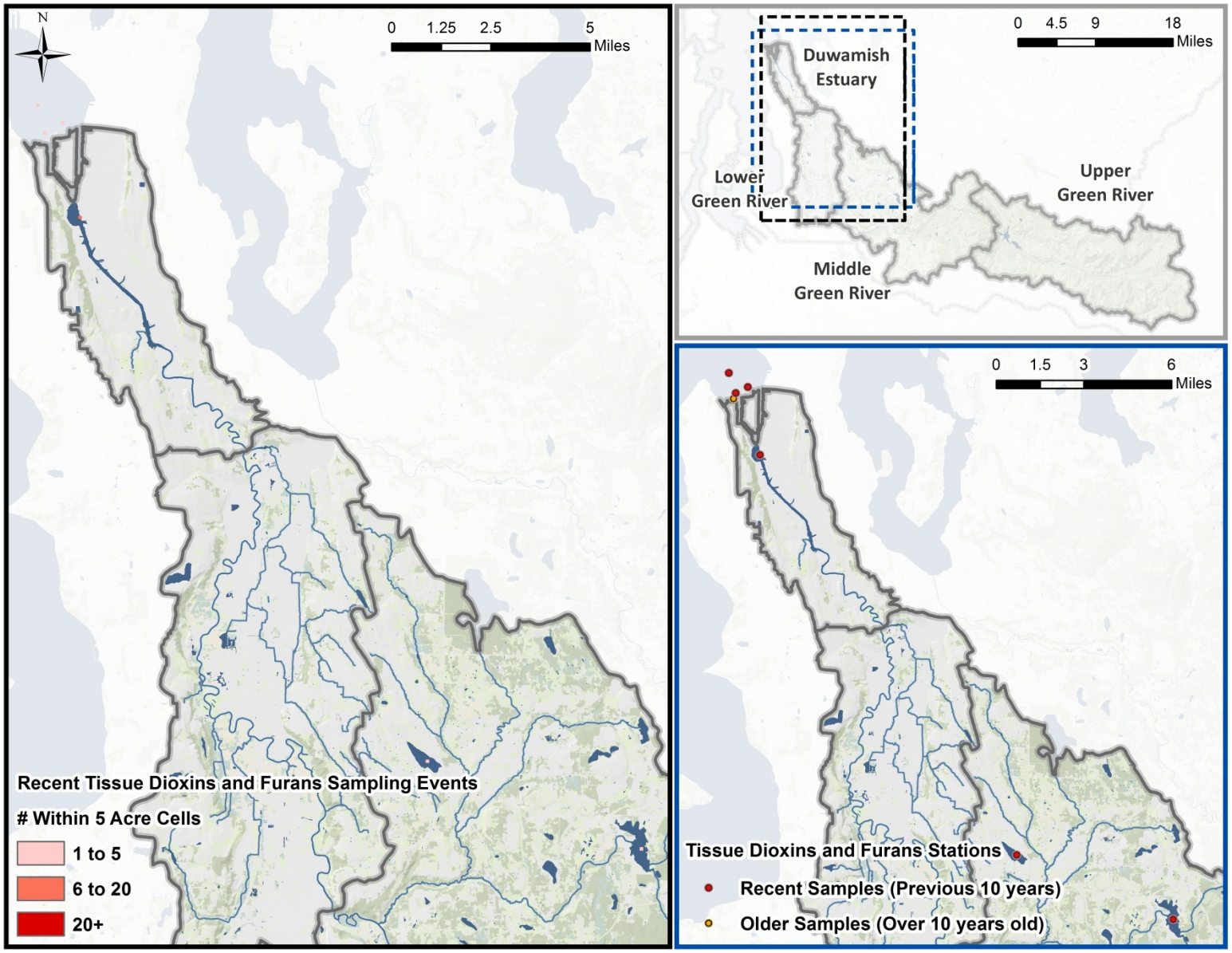

Figure A-35. Tissue quality sample locations for dioxins and furans

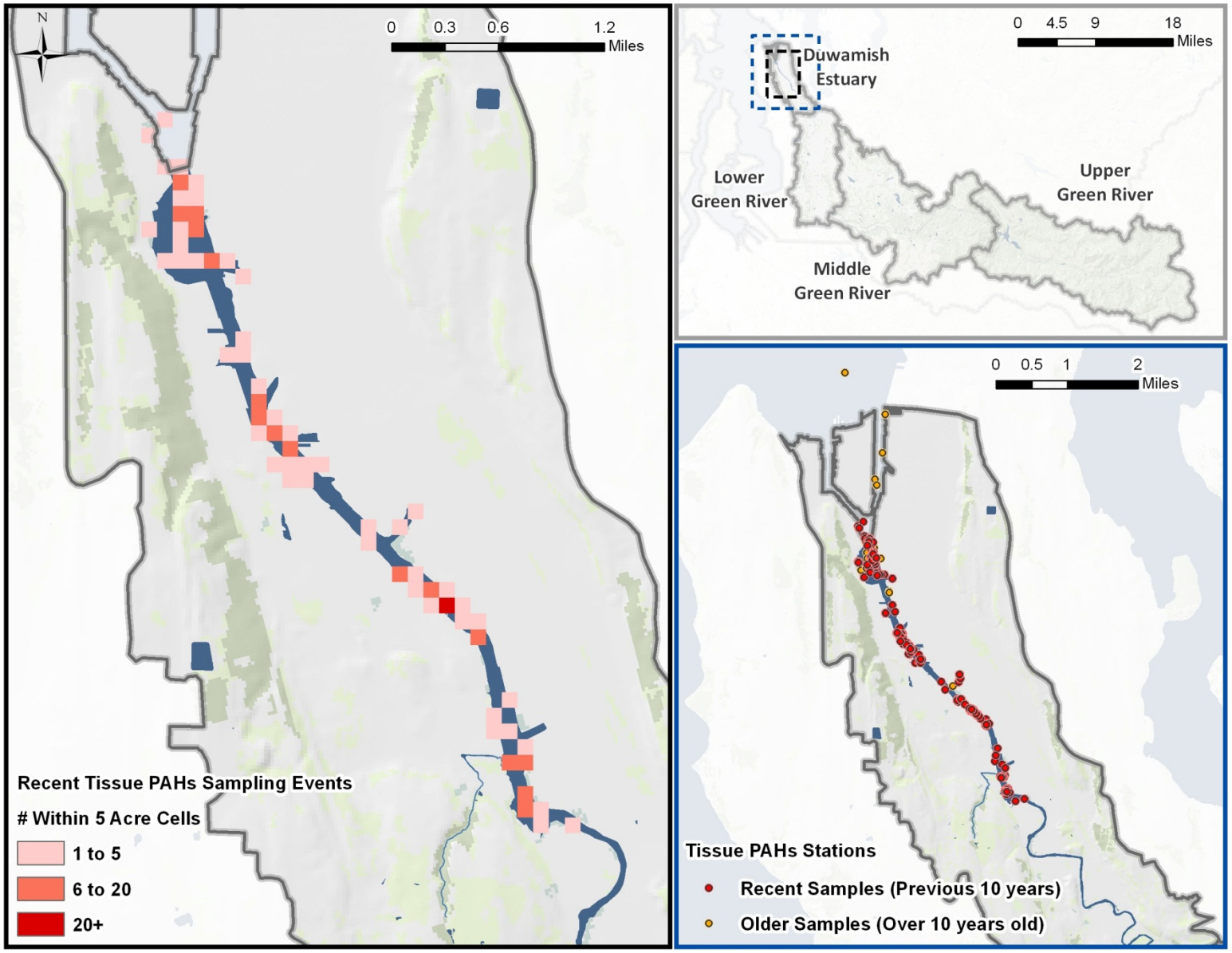

Figure A-36. Tissue quality sample locations for PAHs

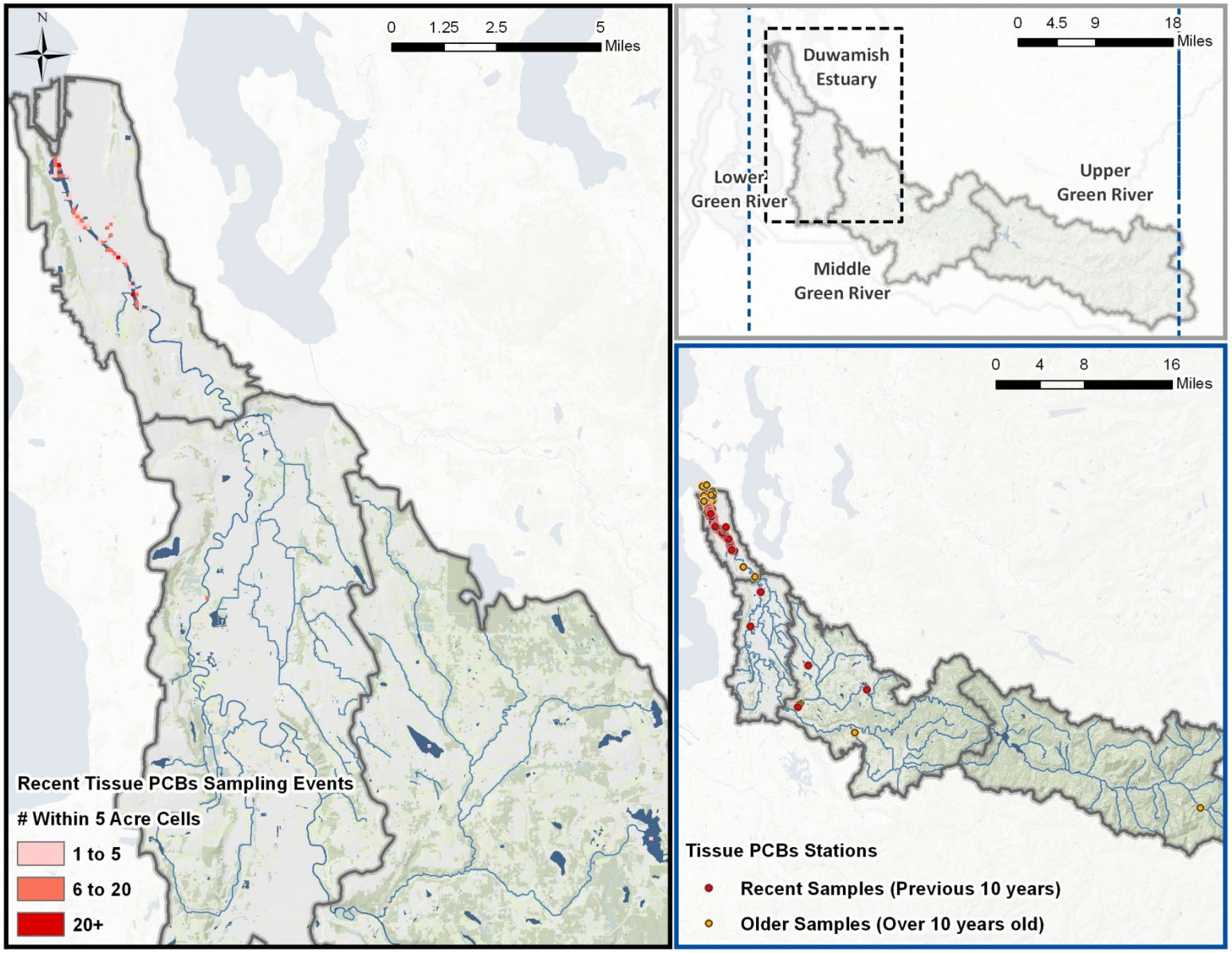

Figure A-37. Tissue quality sample locations for PCBs

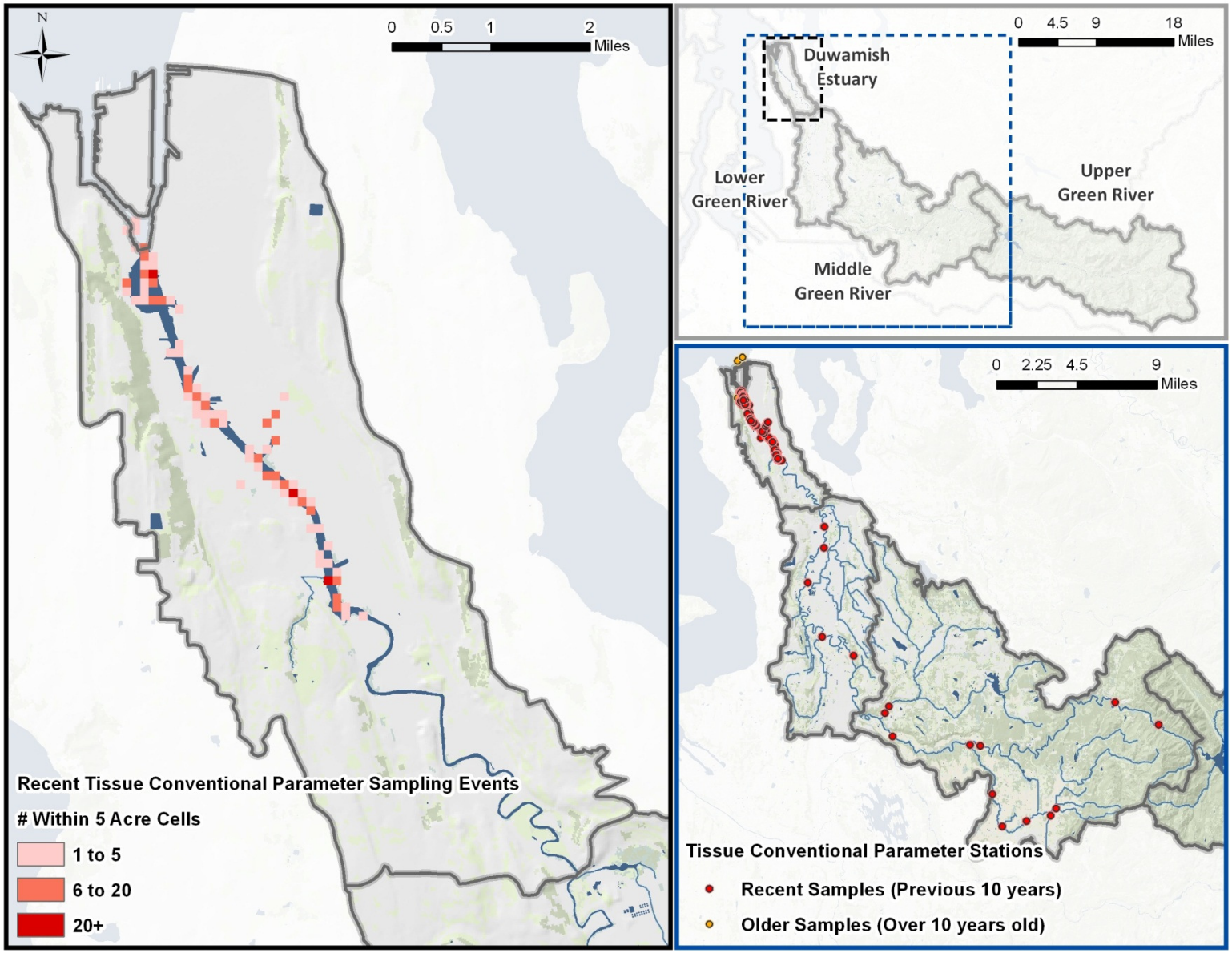

Figure A-38a. Tissue quality sample locations for conventional pollutants (Duwamish Estuary subwatershed)

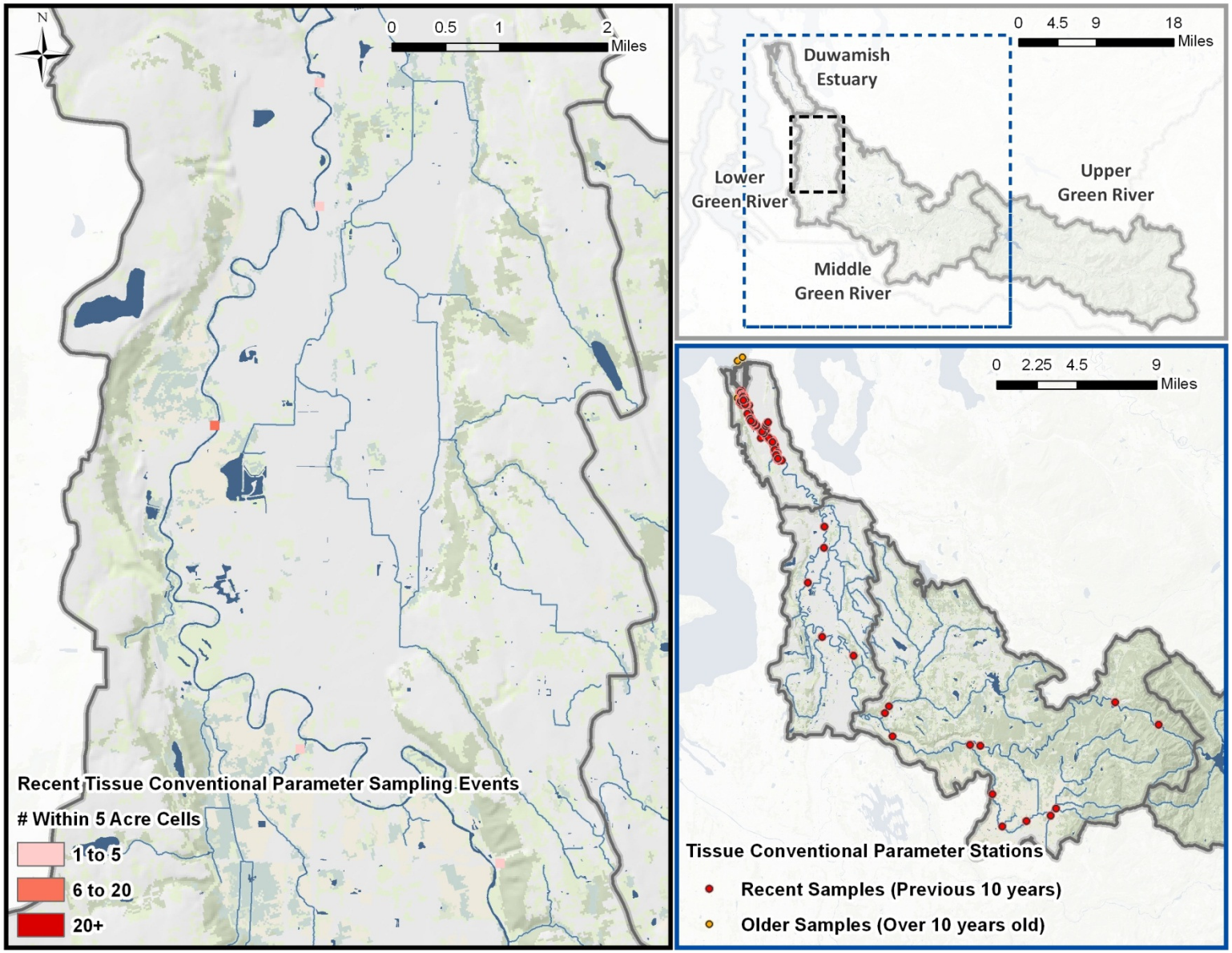

Figure A-38b. Tissue quality sample locations for conventional pollutants (Lower Green River subwatershed)

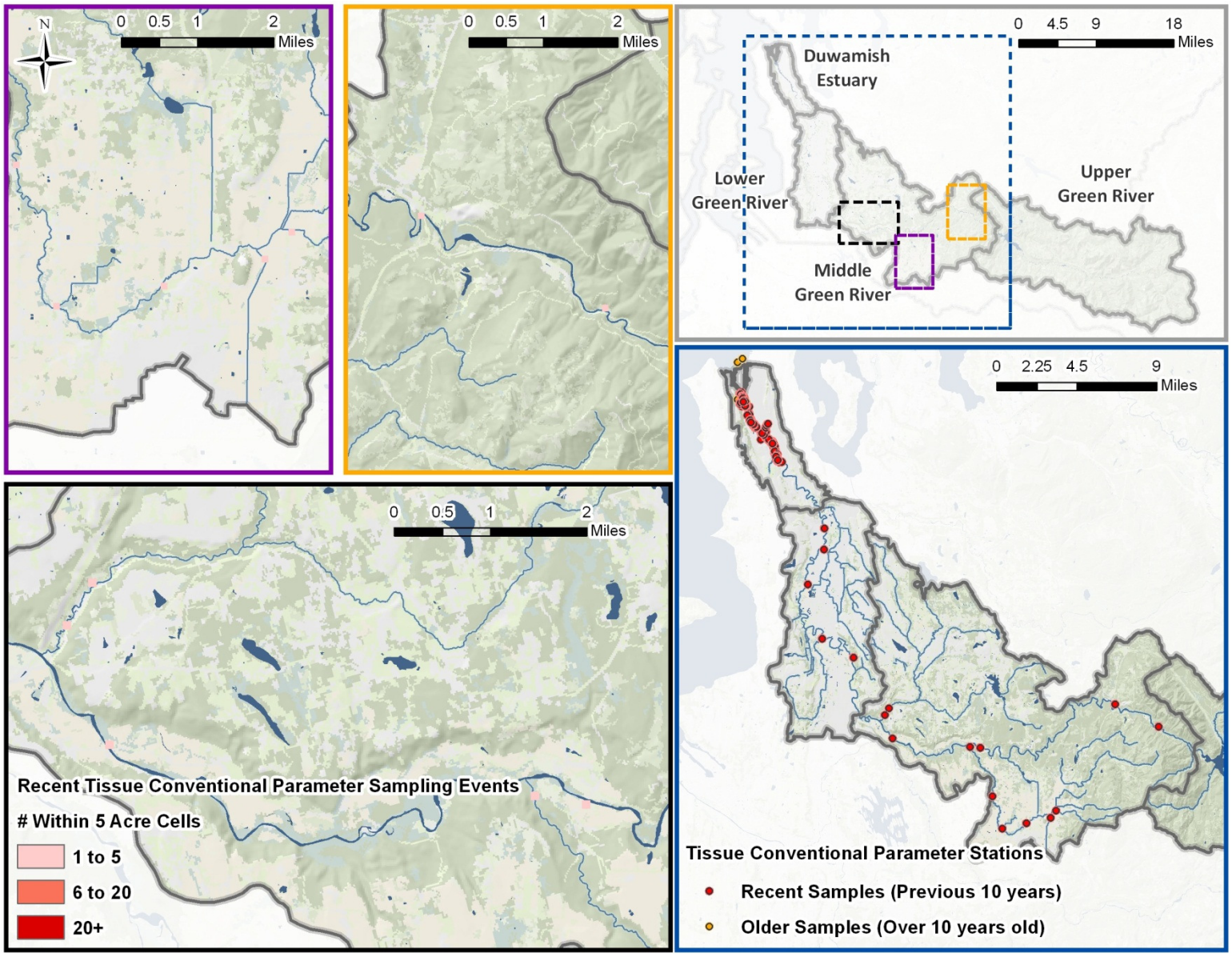

Figure A-38c. Tissue quality sample locations for conventional pollutants (Middle Green River subwatershed)

A.4 Air Quality

Table A-9. Air Quality Data

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Data Source: EIM				
Renton Village Cleaners Site, Renton, WA	28	4/4/2007	4/4/2007	1
Data Source: King County				
KC LDWBulkAirDeposition	6	8/25/2011	10/24/2012	106

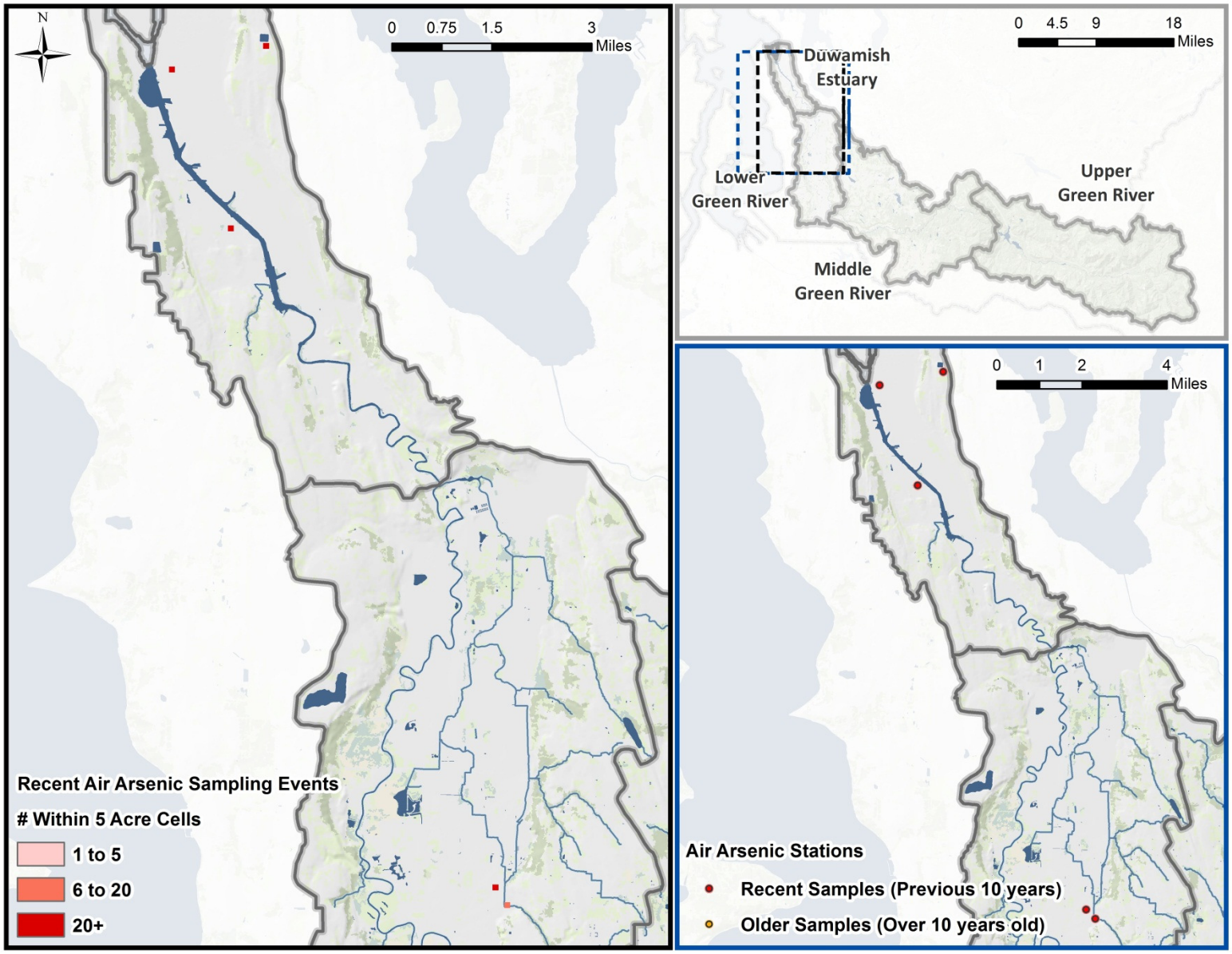

Figure A-39. Air quality sample locations for arsenic

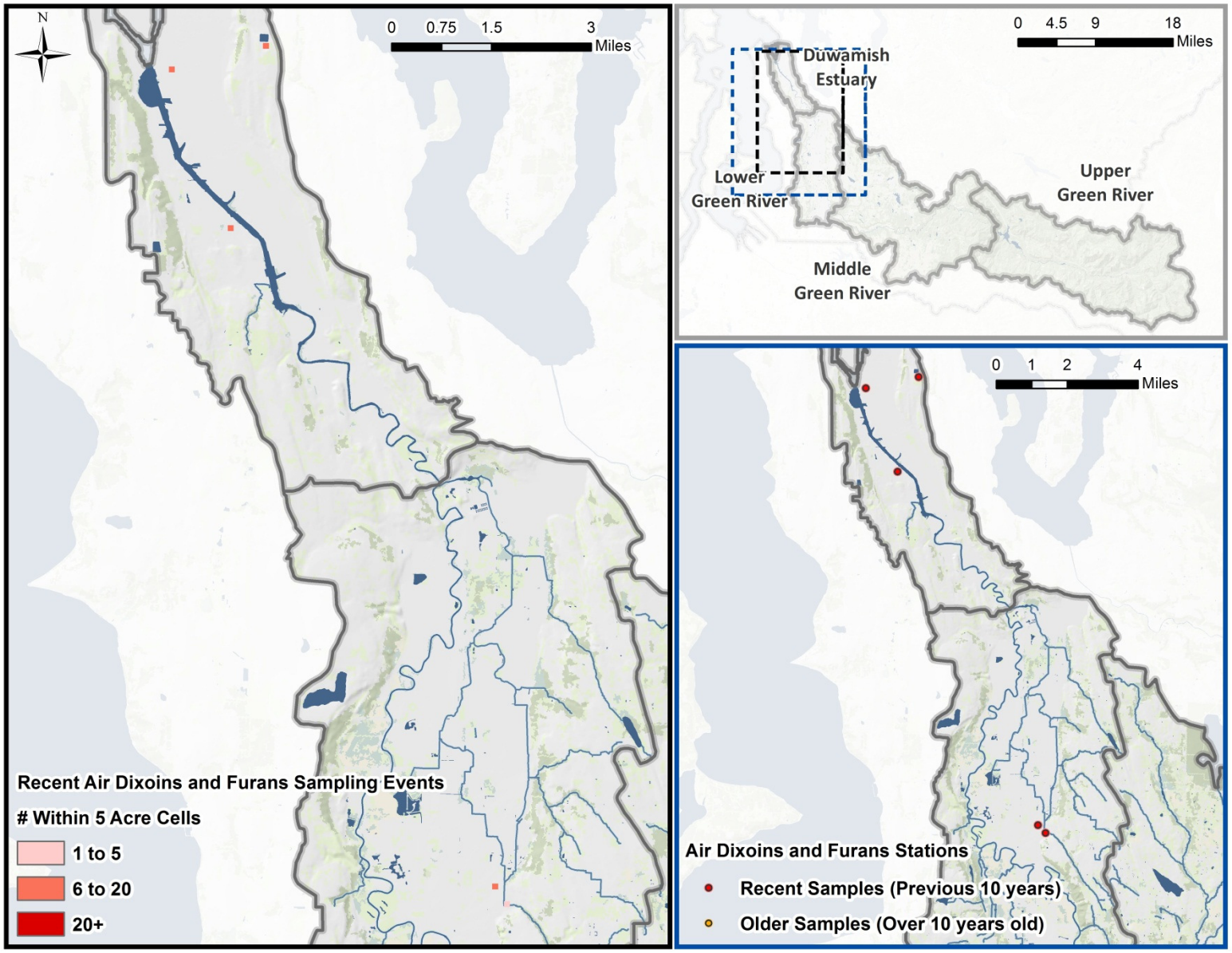

Figure A-40. Air quality sample locations for dioxins and furans

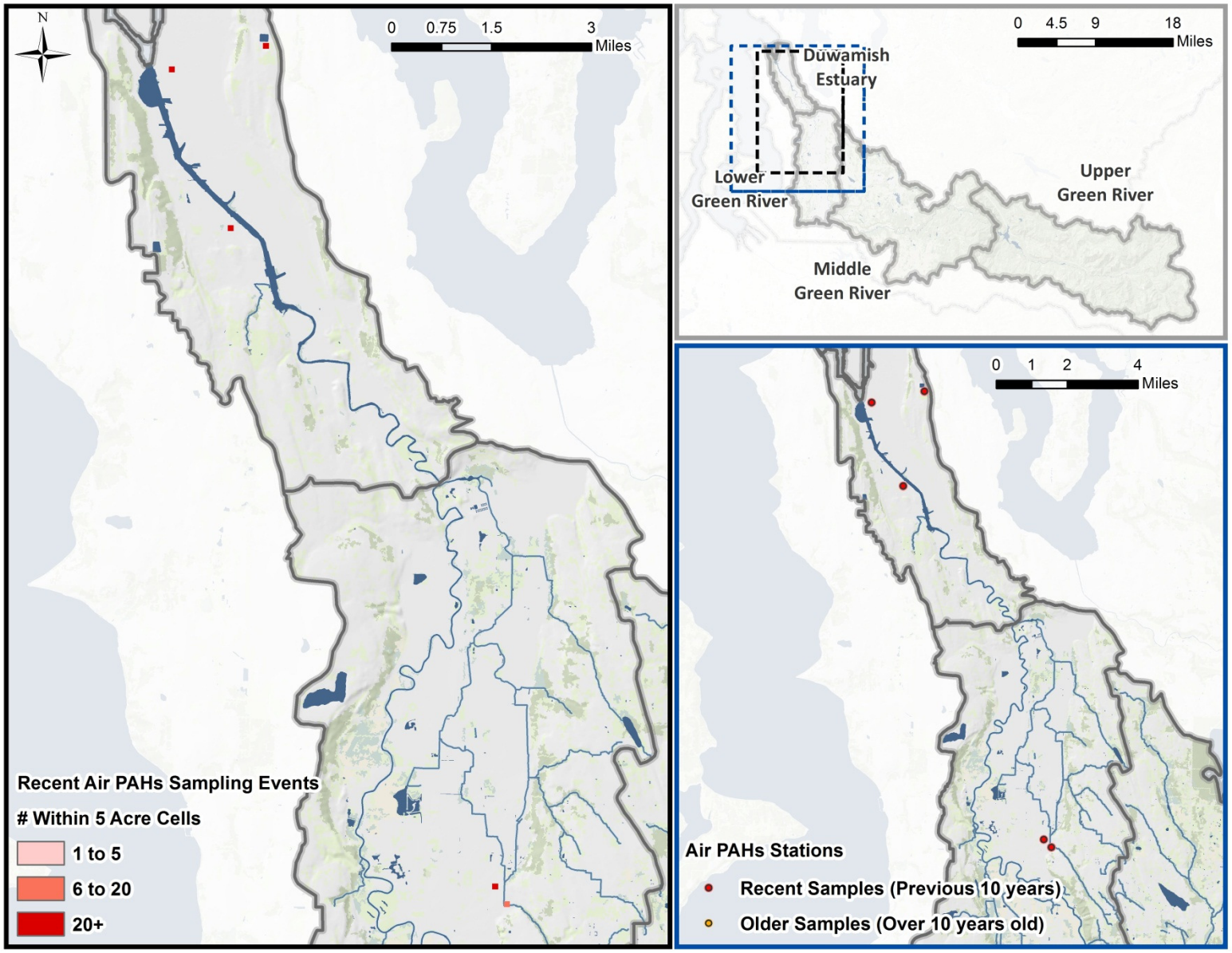

Figure A-41. Air quality sample locations for PAHs

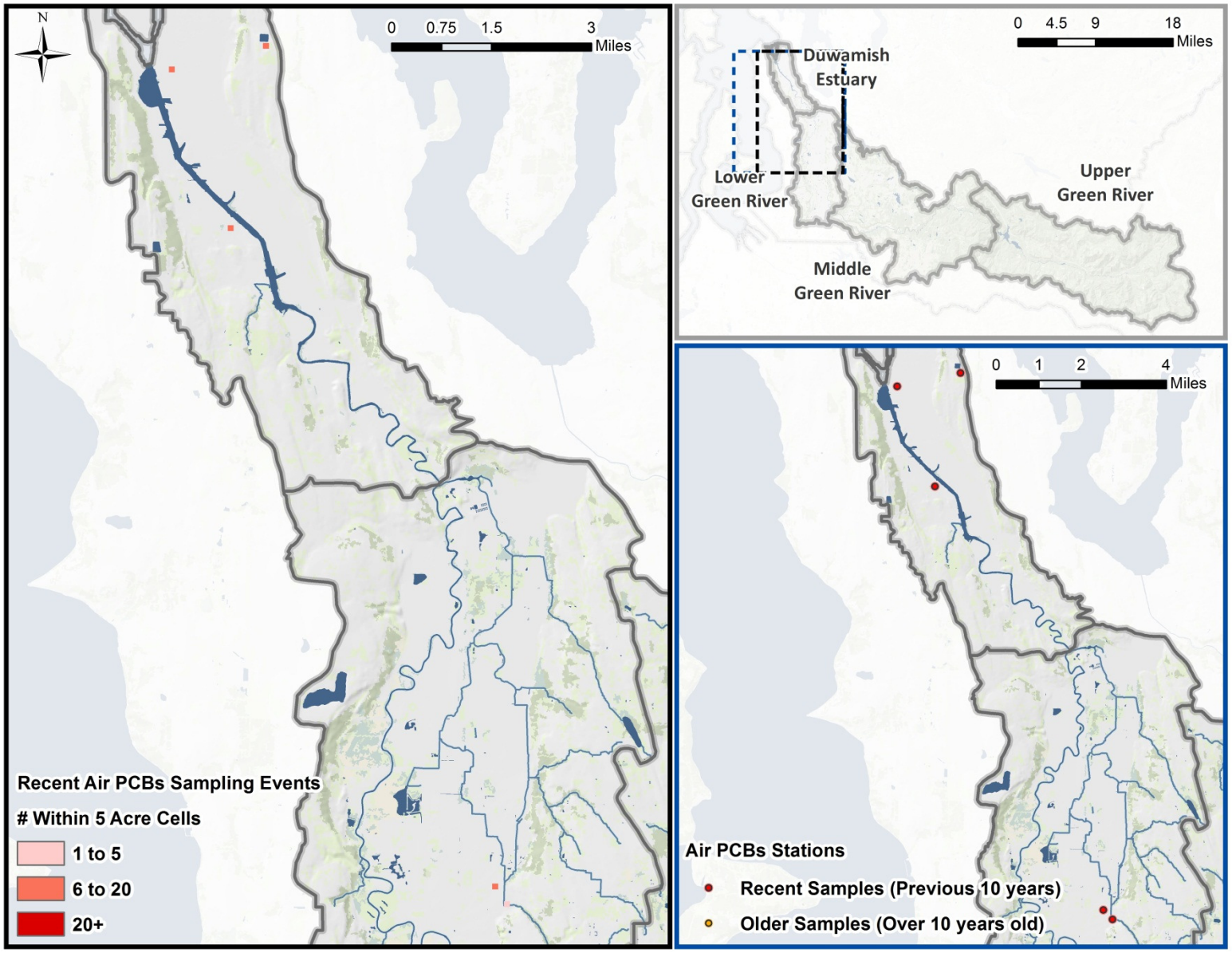

Figure A-42. Air quality sample locations for PCBs

A.5 Physical Data

Table A-10. GIS Data Types and Sources (Physical Data)

Data Type	Name	Source Level	Source
GIS Coverage	8-Digit HUC watershed boundaries	National	USGS
	12-Digit HUC watershed boundaries	National	USGS
	NHD Plus Catchments	National	USGS
	NHD Plus Stream Coverage	National	USGS
	Water Resource Inventory Areas (WRIA)	State	Dept of Ecology - State of Washington
	Stream coverage	State	Dept of Ecology - State of Washington
	Soils	National	NRCS
		State	Washington State Geospatial Portal
	Land Use	National	USGS
		State	Dept of Ecology - State of Washington
	Elevation	National	USGS
	Waterbodies	State	Washington State Geospatial Portal
	Dams	State	Dept of Ecology - State of Washington
	County Boundaries	State	Washington State Geospatial Portal
	Transportation	State	Washington State Dept of Transportation
	Dairy Farms	State	Dept of Ecology - State of Washington
	Spring Locations	State/Regional	Need to be obtained
	NPDES Discharge Locations	National	EPA - PCS
		State	Dept of Ecology - State of Washington (PARIS)
	Water withdrawal Locations	Regional	Need to be obtained
	Agricultural Irrigation	State	Washington State Dept of Agriculture
	Land Application Systems	Regional	Need to be obtained
	Flow Stations	National	USGS
		State	Dept of Ecology - State of Washington
	Water Quality Stations	National	USGS
		National	EPA - Storet
		National	National Water Quality Monitoring Council
		State	Dept of Ecology - State of Washington
		Regional	King County Water and Land Resources Division

Table A-11. Bathymetry Data Sources

Data Description	Source
Lake Bathymetry (Ecology GIS Portal):	http://www.ecy.wa.gov/services/gis/data/data.htm
Lower Duwamish Waterway Bathymetry (Bathymetric Report Data and GIS files):	http://www.ldwg.org/rifs_docs4.htm#bathy
Puget Sound Bathymetry (DEMs of regional bathymetry and topography):	http://www.ocean.washington.edu/data/pugetsound/
NOAA's Estuarine Bathymetry (Puget Sound DEMs):	http://estuarinebathymetry.noaa.gov/bathy_htmls/P290.html

A.6 Streamflow Data

Table A-12. Streamflow Stations

Agency	Station ID	Station Name	Data range	Data Interval
USGS	12105800	Howard A Hanson Reservoir near Palmer, WA	10/1998 - Present	Daily
USGS	12105900	Green River Below Howard A Hanson Dam, WA	10/1960 - 08/2012	Daily
USGS	12106700	Green River at Purification Plant Near Palmer, WA	07/1963 - Present	Daily
USGS	12108500	Newaukum Creek near Black Diamond, WA	07/1944 - 08/2012	Daily
USGS	12112600	Big Soos Creek Above Hatchery near Auburn, WA	09/1960 - Present	Daily
USGS	12113000	Green River near Auburn, WA	08/1936 - Present	Daily
USGS	12113346	Springbrook Creek at Orillia, WA	10/1993 - Present	Daily
USGS	12113347	Mill Creek at Earthworks Park At Kent, WA	01/1994 - Present	Daily
USGS	12113349	Mill Creek near Mouth At Orillia, WA	02/1994 - Present	Daily
USGS	12113375	Springbrook Creek at Tukwila, WA	10/1995 - 09/2004	Daily
USGS	12113390	Duwamish River at Golf Course at Tukwila, WA	10/1995 - 09/2004	Daily
USGS	12113450	Duwamish River at Boeing Pedestrian Bridge Near Duwamish, WA	New	Daily
USGS	12113470	Duwamish River at First Avenue S at Seattle, WA	New	Daily
King County	03a	Panther Creek at Talbot Road	09/1988 - 1/2004	15 min
King County	03F	Mill Creek (Kent) above Diversion	03/2002 - 6/2007	15 min
King County	03G	Springbrook Creek at O'Grady Way	12/2001 - Present	15 min
King County	09a	Covington Creek near Mouth, Soos CR Watershed	01/1988 - Present	15 min
King County	13a	Duwamish River Tributary 0003	10/2010 - Present	15 min
King County	26a	Jenkins Creek near Mouth - Soos Creek Watershed	08/1987 - Present	15 min
King County	26e	Jenkins Creek Tributary 0089 above Crestwood R/D - Soos Creek Watershed	10/1994 - 01/2001	15 min
King County	32c	Olsen Creek Lower Green River Tributary 0069 at Green River RD	09/1988 - 10/2011	15 min
King County	40d	Crisp Creek at Green River RD	08/1994 - Present	15 min
King County	40E	Crisp Creek above Auburn - Black Diamond RD	04/2009 - Present	15 min
King County	41a	Mill Creek at SR 181	09/1988 - Present	15 min
King County	41c	Mill Creek at Peaseley Canyon RD	10/1988 - Present	15 min
King County	41D2	Mullen Slough at 277th	11/2008 - Present	15 min
King County	44F	Green WQA-Urban	02/2001 - 09/2004	15 min
King County	44G	Green WQA-Agricultural	01/2001 - 09/2004	15 min
King County	44H	Newaukum Creek at 305th AV SE	08/2002 - 06/2004	15 min
King County	44I	Big Spring Creek at 424th	04/2007 - Present	15 min
King County	44N	Newaukum Creek at 416th	11/2010 - 07/2011	15 min
King County	50a	Salmon Creek at Shorewood DR	07/1991 - 02/2003	15 min
King County	54c	Springwood Regional Detention Pond Outflow	01/1992 - 09/2004	15 min
King County	54h	Soosette Creek Above SR 18	12/1993 - Present	15 min
King County	54i	Little Soos Creek at SE 272nd	10/1995 - Present	15 min
King County	54J	Soos Creek at Kent-Black Diamond RD	11/2010 - Present	15 min
King County	AN1	Green River above Auburn Narrows	12/2002 - 09/2004	15 min
King County	ANW1	Auburn Narrows Monitoring Piezo P26A	04/2003 - 09/2004	15 min

Agency	Station ID	Station Name	Data range	Data Interval
King County	ANW2	Auburn Narrows Monitoring Piezo P2A	04/2003 - 09/2004	15 min
King County	ANW3	Auburn Narrows Monitoring Piezo P6A	04/2003 - 09/2004	15 min
King County	ANW4	Auburn Narrows Monitoring Piezo P10A	04/2003 - 09/2004	15 min
King County	ANW5	Auburn Narrows Monitoring Piezo P11A	04/2003 - 09/2004	15 min
King County	ha5	Hamm Creek South Fork	09/1995 - 09/2008	15 min
King County	hslak	Horseshoe Lake	05/1991 - Present	15 min
King County	mf1	Mill Creek near Peasley Canyon	02/1997 - 01/2006	15 min
EIM[1]	09-AC322	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-AN322	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-CRI-GRE	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-E322	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-FRA-FRA	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-G322	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-GRE-167	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-GRE-180	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-GRE-277	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-GRE-DAM	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-GRE-FLA	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-GRE-GRE	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-GRE-KAN	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-GRE-OLD	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-GRE-WHI	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-MIL-WAS	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-N322	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-Q322	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	09-R322	Green River and Newaukum Creek Temperature and Dissolved Oxygen Study	08/2006 - 08/2006	instantaneous
EIM	Black Diamond Lake Creek (wetland station)	Lake Sawyer TMDL	02/1989 - 04/1990	instantaneous
EIM	Covington Creek (COV)	Lake Sawyer TMDL	03/1989 - 04/1990	instantaneous
EIM	Ginder Creek downstream (wetland station	Lake Sawyer TMDL	03/1989 - 03/1990	instantaneous

Agency	Station ID	Station Name	Data range	Data Interval
EIM	Ginder Creek upstream (wetland station #	Lake Sawyer TMDL	03/1989 - 04/1990	instantaneous
EIM	Morganville Marsh (wetland station #5)	Lake Sawyer TMDL	02/1989 - 04/1990	instantaneous
EIM	Palmer Spring (wetland station # 6)	Lake Sawyer TMDL	02/1989 - 04/1990	instantaneous
EIM	Ravensdale Creek (RAV)	Lake Sawyer TMDL	03/1989 - 04/1990	instantaneous
EIM	Rock Creek (RCLS)	Lake Sawyer TMDL	03/1989 - 04/1990	instantaneous
EIM	Rock Creek (wetland station #3)	Lake Sawyer TMDL	02/1989 - 07/1989	instantaneous
EIM	Rock Creek (wetland station #4)	Lake Sawyer TMDL	02/1989 - 04/1990	instantaneous
EIM	Newaukum Creek near Enumclaw	Measured Streamflow 1998-99	10/1998 - 04/1999	instantaneous
EIM	MILLCR0.1	Statewide Metals in Selected Rivers & Creeks	07/2001 - 05/2002	instantaneous
EIM	09A060	Statewide River and Stream Ambient Monitoring-1980 to 1988	07/1980 - 09/1987	instantaneous
EIM	09A090	Statewide River and Stream Ambient Monitoring-1980 to 1988	07/1980 - 09/1988	instantaneous
EIM	09A190	Statewide River and Stream Ambient Monitoring-1980 to 1988	01/1980 - 09/1988	instantaneous
EIM	9.00E+70	Statewide River and Stream Ambient Monitoring-1980 to 1988	04/1980 - 09/1988	instantaneous
EIM	9.00E+90	Statewide River and Stream Ambient Monitoring-1980 to 1988	04/1980 - 09/1988	instantaneous
EIM	9e+090	Statewide River and Stream Ambient Monitoring-1980 to 1988	06/1988 - 06/1988	instantaneous
EIM	09A090	Statewide River and Stream Ambient Monitoring-Pre 1980	07/1971 - 09/1976	instantaneous
EIM	09A110	Statewide River and Stream Ambient Monitoring-Pre 1980	12/1962 - 09/1971	instantaneous
EIM	09A130	Statewide River and Stream Ambient Monitoring-Pre 1980	07/1959 - 11/1969	instantaneous
EIM	09A150	Statewide River and Stream Ambient Monitoring-Pre 1980	07/1971 - 09/1971	instantaneous
EIM	09A170	Statewide River and Stream Ambient Monitoring-Pre 1980	10/1975 - 09/1976	instantaneous
EIM	09A190	Statewide River and Stream Ambient Monitoring-Pre 1980	07/1959 - 12/1979	instantaneous
EIM	09B070	Statewide River and Stream Ambient Monitoring-Pre 1980	10/1971 - 09/1976	instantaneous
EIM	09B090	Statewide River and Stream Ambient Monitoring-Pre 1980	10/1962 - 09/1972	instantaneous
EIM	09A080	Statewide River and Stream Ambient Monitoring-WY 2000 through WY 2009	10/1999 - 09/2009	instantaneous
EIM	09A190	Statewide River and Stream Ambient Monitoring-WY 2000 through WY 2009	10/1999 - 09/2009	instantaneous
EIM	09A080	Statewide River and Stream Ambient Monitoring-WY1989 through WY1999	10/1991 - 09/1999	instantaneous
EIM	09A090	Statewide River and Stream Ambient Monitoring-WY1989 through WY1999	10/1988 - 09/1994	instantaneous

Agency	Station ID	Station Name	Data range	Data Interval
EIM	09A130	Statewide River and Stream Ambient Monitoring-WY1989 through WY1999	10/1993 - 09/1994	instantaneous
EIM	09A190	Statewide River and Stream Ambient Monitoring-WY1989 through WY1999	10/1988 - 09/1999	instantaneous
EIM	09B090	Statewide River and Stream Ambient Monitoring-WY1989 through WY1999	10/1993 - 09/1999	instantaneous
EIM	09F150	Statewide River and Stream Ambient Monitoring-WY1989 through WY1999	10/1988 - 09/1999	instantaneous
EIM	9.00E+70	Statewide River and Stream Ambient Monitoring-WY1989 through WY1999	10/1988 - 09/1994	instantaneous
EIM	9.00E+90	Statewide River and Stream Ambient Monitoring-WY1989 through WY1999	10/1988 – 06/1990	instantaneous
EIM	Big Soos Creek	WSPMP 1996 Pesticides in Surface Water	04/1996 - 08/1996	instantaneous
EIM	Newaukum Creek	WSPMP 1996 Pesticides in Surface Water	04/1996 - 08/1996	instantaneous
EIM	Springbrook Creek	WSPMP 1996 Pesticides in Surface Water	04/1996 - 08/1996	instantaneous
EIM	Mill Creek	Zinc and Copper Concentrations in an Industrial Area Creek during Storm Events.	08/2005 - 12/2005	instantaneous
EIM	DUWAMISH	Zinc, Copper, Lead, and Cadmium in four WA rivers	07/1992 - 05/1993	instantaneous
EIM	GREEN	Zinc, Copper, Lead, and Cadmium in four WA rivers	07/1992 - 05/1993	instantaneous

[1] Information included “Station Name” field for EIM records are the EIM Study Names.

A.7 Meteorological Representation

Table A-13. Meteorological Stations

Source	Station ID/ WBAN	Station Name	Data Interval	Period of Record[1]			
				Precipitation	Air Pressure	Air Temperature	Wind
NOAA-NCDC[2]	24233	Seattle Tacoma International Airport	hourly	07/1996 - Present	07/1996 - Present	07/1996 - Present	07/1996 - Present
NOAA	9446482	Tacoma Met, WA	6 min, hourly			04/2008 - 04/2008	04/2007 - Present
NOAA	9449419	Cherry Point South Dock, WA	6 min, hourly			12/2007 - Present	12/2007 - Present
NOAA	9446484	Tacoma, WA	6 min, hourly		07/1997 - Present	07/1997 - Present	07/1997 - 06/2007
NOAA	9447130	Seattle, Puget Sound, WA	6 min, hourly		06/1991 - Present	06/1991 - Present	06/1991 - Present
NOAA	9444900	Port Townsend, WA	6 min, hourly		01/1999 - Present	10/2008 - Present	10/2008 - Present
NOAA	9449424	Cherry Point, WA	6 min, hourly		03/1999 - Present	12/2007 - Present	07/1994 - Present
NOAA	9449880	Friday Harbor, WA	6 min, hourly		03/1999 - Present	05/1999 - Present	11/1992 - Present
NOAA	9444090	Port Angeles, WA	6 min, hourly		03/1999 - Present	11/2009 - Present	03/1994 - Present
King County	03u	Panther Creek Precip	15 min	10/1988 - Present			
King County	09V	Covington Creek Rain Gauge below Lake Sawyer	15 min	09/2004 - Present			
King County	11u	Des Moines Creek Rain Gauge	15 min	08/1991 - Present			
King County	26u	Jenkins Creek Rain Gauge - Soos Creek Watershed	15 min	07/1991 - Present			
King County	32u	Lower Green River Rain Gauge	15 min	11/1988 - Present			
King County	40u	Middle Green Rain Gauge	15 min	07/1991 - Present			
King County	41u	Star Lake Rain Gauge	15 min	11/1988 - Present			
King County	41v	Lake Dolloff Rain Gauge	15 min	11/1988 - Present			
King County	42u	Lake Reba Rain Gauge	15 min	08/1990 - Present			
King County	44u	Enumclaw Rain Gauge	15 min	12/1999 – Present			
King County	50u	Salmon Creek Rain Gauge	15 min	07/1991 - Present			
King County	54v	Soos Creek Rain Gauge	15 min	07/1991 - Present			
King County	BART	Barton Rain Gage - Westside School	15 min	04/2011 - Present			

Source	Station ID/ WBAN	Station Name	Data Interval	Period of Record[1]			
				Precipitation	Air Pressure	Air Temperature	Wind
King County	BDIA	Black Diamond I&I Rain Gage	15 min	10/2000 - Present			
King County	hau	Hamm Creek rain guage	15 min	10/1995 - Present			
King County	KANG	Kent-Kangley I&I Rain Gage	15 min	10/2000 - Present			
King County	LQF806078VL	Chelan RS	15 min				
King County	SEQU	Sequoia JR High School I&I Rain Gage	15 min	10/2000 - Present			
King County	SUMM	Summit Weather Station	15 min	07/2002 - Present			
King County	TUKW	Tukwilla I&I Rain Gage	15 min	10/2000 - Present			

[1] Blank cells indicate no data.
[2] Station also has relative humidity and cloud cover data for July 1996-present.

A.8 Hydrodynamics Representation

Table A-14. NOAA Hydrodynamic Tide and Current Stations

Tide Station ID	Station Name	Data Interval	Data Type	Period of Record
9446484	Tacoma, WA	6min, hourly, monthly	Water level, water temperature[1]	07/1997 – Present
9447130	Seattle, Puget Sound, WA	6min, hourly, monthly	Water level, water temperature	06/1991 – Present
9444900	Port Townsend, WA	6min, hourly, monthly	Water level, water temperature	01/1996 – Present
9449424	Cherry Point, WA	6min, hourly, monthly	Water level, water temperature	01/1996 – Present
9449880	Friday Harbor, WA	6min, hourly, monthly	Water level, water temperature	01/1996 – Present
9444090	Port Angeles, WA	6min, hourly, monthly	Water level, water temperature	01/1996 – 09/2012
9447239	Sand Point, WA	6min, hourly, monthly	Water level	02/2004 – 12/2008
9447214	Shilshole Bay Gps Buoy, WA	6min, hourly, monthly	Water level	03/2009 – 04/2009
9445133	Bangor, WA	6min, hourly, monthly	Water level	01/2001 – 04/2003
9445016	Foulweather Bluff, WA	6min, hourly, monthly	Water level	04/2012 – 06/2012
9447729	Marysville, WA	6min, hourly, monthly	Water level	11/2000 – 03/2002
9448576	Sneeoosh Point, WA	6min, hourly, monthly	Water level	05/2000 – 08/2000
9448657	Turner Bay, WA	6min, hourly, monthly	Water level	05/2000 – 08/2000
cp0101	Cherry Point	6 min	Currents	10/2009 – Present

[1] Period of record for water temperature is similar, and occasionally, slightly longer than the period of record included for water level.

Table A-15. Water Quality Data for Transport Calibration

Source	Station ID	Station Name	Type of station[1]	Period of Record	Data Interval	Type of Data or Parameters[2]
Ecology	ADM001	Bush Pt.	Core	1992 – 2011	Monthly	Discrete; Detailed profile
Ecology	ADM002	Admiralty Inlet (N) – Quimper Pn.	Core	1989 – 2011	Monthly	Discrete; Detailed profile
Ecology	ADM003	Admiralty Inlet (south)	Core	1989 – 2011	Monthly	Discrete; Detailed profile
Ecology	BLL009	Bellingham Bay- Pt. Frances	Core	1989 – 2011	Monthly	Discrete; Detailed profile
Ecology	BLL011	Bellingham Bay – off Nooksack	Rotating	1996-1997, 2000, 2003	Monthly	Discrete; Detailed profile
Ecology	BML001	Burley-Minter Lagoon	Rotating	1995-1996	Monthly	Discrete; Detailed profile
Ecology	BUD002	Budd Inlet – S. End Oly Port	Rotating	1994-1999, 2002	Monthly	Discrete; Detailed profile
Ecology	BUD005	Budd Inlet – Olympia Shoal	Core	1989 – 2011	Monthly	Discrete; Detailed profile
Ecology	CMB003	Browns Point	Core	1989 – 2011	Monthly	Discrete; Detailed profile
Ecology	CMB006	Mouth of City WW	Rotating	1998-1999, 2002,2004,2010	Monthly	Discrete; Detailed profile
Ecology	CRR001	Carr Inlet – Off Green Point	Rotating	1995-2003, 2006, 2009-2011	Monthly	Discrete; Detailed profile
Ecology	CSE001	Case Inlet – S. Heron Island	Rotating	1995-1999, 2009-2011	Monthly	Discrete; Detailed profile
Ecology	CSE002	Case Inlet – Off Rocky Point	Rotating	1998-1999, 2006, 2008	Monthly	Discrete; Detailed profile
Ecology	DIS001	Discover Bay – Near Mill Point	Rotating	1996-1997, 2000	Monthly	Discrete; Detailed profile

Source	Station ID	Station Name	Type of station[1]	Period of Record	Data Interval	Type of Data or Parameters[2]
Ecology	DNA001	Dana Passage – S. of Brisco Point	Core	1989-2011	Monthly	Discrete; Detailed profile
Ecology	DRA002	Drayton Harbor – Inner Harbor	Rotating	1996-1997, 2000, 2005	Monthly	Discrete; Detailed profile
Ecology	DUN001	Dungeness Bay	Rotating	2000	Monthly	Discrete; Detailed profile
Ecology	DYE004	Dyes Inlet – NE of Chico Bay	Rotating	2011	Monthly	Discrete; Detailed profile
Ecology	EAG001	Eagle Harbor – Inner	Rotating	1997-1998	Monthly	Discrete; Detailed profile
Ecology	EAP001	SW of Three Tree Point	Core	1989-2011	Monthly	Discrete; Detailed profile
Ecology	EAS001	East Sound – Rosario Point	Rotating	2003, 2007	Monthly	Discrete; Detailed profile
Ecology	ELB015	E. of Duwamish Head	Core	1991-2011	Monthly	Discrete; Detailed profile
Ecology	ELD001	Eld Inlet – Flapjack Point	Rotating	1998-1999, 2010-2011	Monthly	Discrete; Detailed profile
Ecology	ELD002	Eld Inlet – S. Flapjack Point	Rotating	1998-1999, 2006	Monthly	Discrete; Detailed profile
Ecology	FID001	Fidalgo – E. of Anacortes	Rotating	1996-1997	Monthly	Discrete; Detailed profile
Ecology	FRI001	Friday Harbor – San Juan Island	Rotating	1996-1997	Monthly	Discrete; Detailed profile
Ecology	FSH001	Fisherman Bay – Lopez Island	Rotating	1996-1997	Monthly	Discrete; Detailed profile
Ecology	GOR001	Gordon Point	Core	1996-2011	Monthly	Discrete; Detailed profile
Ecology	GRG002	94eorgia Strait – N. of Patos Island	Core	1989-2011	Monthly	Discrete; Detailed profile
Ecology	HCB002	Hood Canal – Dabob Bay Pulali Point	Rotating	Data available on request		
Ecology	HCB003	Hood Canal – Eldon, Hamma Hamma R.	Rotating	1989-2011	Monthly	Discrete; Detailed profile
Ecology	HCB004	Hood Canal – Gt. Bend, Sisters Point	Core	1990-2011	Monthly	Discrete; Detailed profile
Ecology	HCB006	Hood Canal – King Spit, Bangor	Core	1989-2003	Monthly	Discrete; Detailed profile
Ecology	HCB007	Hood Canal – Lynch Cove	Rotating	1990-2011	Monthly	Discrete; Detailed profile
Ecology	HCB008	Hood Canal – Bangor-post 9/11	Core	2004-2005	Monthly	Discrete; Detailed profile
Ecology	HCB009	Hood Canal – Hazel Pt, Bangor	Core	2003	Monthly	Discrete; Detailed profile
Ecology	HCB010	Hood Canal – Send Creek, Bangor	Core	2005-2011	Monthly	Discrete; Detailed profile
Ecology	HLM001	Holmes Harbor – Honeymoon Bay	Rotating	2007-2008	Monthly	Discrete; Detailed profile
Ecology	HND001	Henderson Inlet – Cliff Point	Rotating	2005-2006	Monthly	Discrete; Detailed profile
Ecology	JDF005	Strait of Juan de Fuca – Sequim Bay	Rotating	1990-1994	Monthly	Discrete; Detailed profile
Ecology	JDF007	Strait of Juan de Fuca – Sequim Bay, Goose Point	Rotating	2007	Monthly	Discrete; Detailed profile
Ecology	LOP001	Lopez Island – Decatur Island	Rotating	2007	Monthly	Discrete; Detailed profile
Ecology	NRR001	Tacoma Narrows – Point Defiance	Rotating	1989-1991	Monthly	Discrete; Detailed profile
Ecology	NSQ001	Nisqually R. Delta	Rotating	1996	Monthly	Discrete; Detailed profile
Ecology	NSQ002	Nisqually R –Devils Head	Core	1996-2011	Monthly	Discrete; Detailed profile

Source	Station ID	Station Name	Type of station[1]	Period of Record	Data Interval	Type of Data or Parameters[2]
Ecology	OAK004	Oakland Bay – Near Eagle Point	Core	1989-2011	Monthly	Discrete; Detailed profile
Ecology	PAH003	Port Angles Harbor – Ediz Hook Head	Rotating	2001-2004	Monthly	Discrete; Detailed profile
Ecology	PAH008	Port Angles Harbor – Morse Creek	Rotating	1989-1994	Monthly	Discrete; Detailed profile
Ecology	PCK001	Pickering Passage – Harstene Island	Rotating	1991-1992	Monthly	Discrete; Detailed profile
Ecology	PGA001	Port Gamble – Inner Harbor	Rotating	2001	Monthly	Discrete; Detailed profile
Ecology	PMA001	Port Madison – S. of Buoy 65	Rotating	1994-1995	Monthly	Discrete; Detailed profile
Ecology	PNN001	Penn Cove Park	Rotating	2003, 2007-2008	Monthly	Discrete; Detailed profile
Ecology	POD006	Port Orchard – Liberty Bay/Virg. Point	Rotating	1994-1995	Monthly	Discrete; Detailed profile
Ecology	POD007	Port Orchard – Inner	Rotating	2004	Monthly	Discrete; Detailed profile
Ecology	PSB003	Puget Sound Main basin – West Point	Core	1989-2011	Monthly	Discrete; Detailed profile
Ecology	PSS008	Possession Sound – PG Bay Pier 3	Rotating	1997-1998	Monthly	Discrete; Detailed profile
Ecology	PSS010	Possession Sound – Added post-9/11	Rotating	2004	Monthly	Discrete; Detailed profile
Ecology	PSS019	Possession Sound – Gedney Island	Core	1989-2011	Monthly	Discrete; Detailed profile
Ecology	PTH005	Port Townsend Harbor – Walan Point	Core	1991-2011	Monthly	Discrete; Detailed profile
Ecology	QMH001	Quartermaster Harbor –Burton	Rotating	1994-1995	Monthly	Discrete; Detailed profile
Ecology	QMH002	Quartermaster Harbor – Inner Harbor	Rotating	2001, 2004, 2010	Monthly	Discrete; Detailed profile
Ecology	SAR003	Saratoga Passage – East Point	Core	1989-2011	Monthly	Discrete; Detailed profile
Ecology	SEQ002	Sequim Bay – Northern	Rotating	2000	Monthly	Discrete; Detailed profile
Ecology	SIN001	Sinclair Inlet – Naval Shipyards	Core	1991-2011	Monthly	Discrete; Detailed profile
Ecology	SJF000	JEMS – S. of Cattle Pt. – North	Core	2000	Monthly	Discrete
Ecology	SJF001	JEMS – S. of Cattle Pt. – Central	Core	2000	Monthly	Discrete
Ecology	SJF002	JEMS – S. of Cattle Pt. – South	Core	2000	Monthly	Discrete
Ecology	SKG001	Skagit Bay – Hope Island	Rotating	1997-1998	Monthly	Discrete; Detailed profile
Ecology	SKG003	Skagit Bay – Str. Point Red Buoy	Rotating	2006-2011	Monthly	Discrete; Detailed profile
Ecology	STL001	Steilacoom – Off Chambers Creek	Rotating	1990-1992	Monthly	Discrete; Detailed profile
Ecology	SUZ001	Port Susan - Kayak Point	Rotating	2006	Monthly	Discrete; Detailed profile
Ecology	TOT001	Windy Point	Rotating	1998-1999, 2010-2011	Monthly	Discrete; Detailed profile
Ecology	TOT002	Inner Totten Inlet	Rotating	1998-1999,2002,2006	Monthly	Discrete; Detailed profile
King County	LTUM03	South Park Bridge	Core	2005-2012	Monthly	Discrete; Detailed profile
King County	LTKE03	Harbor Island Marina	Core	2005-2012	Monthly	Discrete; Detailed profile
King County	HNF/C2	East Waterway – Depth	Core	Not available on website	Monthly	Discrete; Detailed profile

Source	Station ID	Station Name	Type of station[1]	Period of Record	Data Interval	Type of Data or Parameters[2]
King County	LTED04	South Central Elliott Bay	Core	1998-2012	Monthly	Discrete; Detailed profile
King County	LTBC43	Elliott West Outfall	Core	2005-2012	Monthly	Discrete; Detailed profile
King County	LSEP01	South Plant Outfall	Core	1998-2012	Monthly	Discrete; Detailed profile
King County	LSKQ06	Alki Outfall Offshore	Core	1998-2012	Monthly	Discrete; Detailed profile
Ecology	MCH01BR	Manchester	Mooring	2009-Present	15-min	Temperature, Conductivity, Salinity, Density, DO
Ecology	MUK01BR	Mukilteo	Mooring	2009-Present	15-min	Temperature, Conductivity, Salinity, Density, DO
Ecology	ADM01	Admiralty Reach[3]	Mooring	2009-Present	15-min	Temperature, Conductivity, Salinity, Density, DO
Ecology	SPM01	Shannon Point[3]	Mooring	2009-Present	15-min	Temperature, Conductivity, Salinity, Density, DO
King County	SEAQYSI	Seattle Aquarium	Mooring	2008-Present	15-min	Temperature, Conductivity, Salinity, Density, DO

[1] Core stations have long-term data records; Rotating stations are visited on a rotating basis (two to five stations visited every year); Data at mooring stations collected near the water surface and near the bottom.
[2] Discrete samples consist of data collected at 0, 10, and 30 m depth for nutrients, chlorophyll *a*, secchi depth; Detailed profile data are collected at 0.5 m depth intervals for the water temperature, salinity, density, chlorophyll *a*, dissolved oxygen, light transmissivity, and pH.
[3] Data only available for near bottom.

Table A-16. Supplementary Water Column Data for Transport Calibration

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Density Water Data				
Data Source: EIM				
Long term marine waters monitoring data for water year 1992	1	10/28/1991	9/15/1992	24
Long term marine waters monitoring data for water year 1993	1	10/26/1992	9/8/1993	33
Long term marine waters monitoring data for water year 1994	1	10/6/1993	9/13/1994	36
Long term marine waters monitoring data for water year 1995	2	10/25/1994	9/14/1995	36
Long term marine waters monitoring data for water year 1996	1	10/18/1995	9/9/1996	33
Long term marine waters monitoring data for water year 1997	1	10/1/1996	9/22/1997	30
Long term marine waters monitoring data for water year 1998	2	10/27/1997	9/22/1998	32
Long term marine waters monitoring data for water year 1999	2	10/19/1998	11/23/1999	30
Long term marine waters monitoring data for year 2000	2	1/19/2000	12/11/2000	36
Long term marine waters monitoring data for year 2001	2	1/8/2001	12/17/2001	30
Long term marine waters monitoring data for year 2002	2	1/14/2002	10/28/2002	23
Long term marine waters monitoring data for year 2003	2	1/7/2003	10/23/2003	17
Long term marine waters monitoring data for year 2004	2	2/23/2004	10/21/2004	17
Salinity Water Data				
Data Source: EIM				
King County Routine Ambient and Wet Weather Streams Monitoring	23	1/26/2004	12/27/2004	48
King County Routine Marine Ambient Monitoring	34	8/23/2006	12/16/2008	30
Long term marine waters monitoring data for water year 1973	7	8/22/1973	9/19/1973	19
Long term marine waters monitoring data for water year 1974	7	10/24/1973	9/18/1974	65
Long term marine waters monitoring data for water year 1975	7	10/16/1974	9/17/1975	60

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Long term marine waters monitoring data for water year 1980	2	7/9/1980	9/15/1980	12
Long term marine waters monitoring data for water year 1981	2	10/21/1980	9/14/1981	26
Long term marine waters monitoring data for water year 1982	2	10/21/1981	9/28/1982	29
Long term marine waters monitoring data for water year 1983	2	10/25/1982	9/26/1983	28
Long term marine waters monitoring data for water year 1984	2	10/10/1983	9/17/1984	32
Long term marine waters monitoring data for water year 1985	2	10/16/1984	9/25/1985	30
Long term marine waters monitoring data for water year 1986	2	10/7/1985	9/15/1986	27
Long term marine waters monitoring data for water year 1987	2	10/13/1986	9/21/1987	24
Long term marine waters monitoring data for water year 1988	3	10/12/1987	11/18/1987	8
Long term marine waters monitoring data for water year 1992	1	10/28/1991	9/15/1992	24
Long term marine waters monitoring data for water year 1993	1	10/26/1992	9/8/1993	33
Long term marine waters monitoring data for water year 1994	1	10/6/1993	9/13/1994	36
Long term marine waters monitoring data for water year 1995	2	10/25/1994	9/14/1995	36
Long term marine waters monitoring data for water year 1996	1	10/18/1995	9/9/1996	33
Long term marine waters monitoring data for water year 1997	1	10/1/1996	9/22/1997	30
Long term marine waters monitoring data for water year 1998	2	10/27/1997	9/22/1998	32
Long term marine waters monitoring data for water year 1999	2	10/19/1998	11/23/1999	30
Long term marine waters monitoring data for year 2000	2	1/19/2000	12/11/2000	36
Long term marine waters monitoring data for year 2001	2	1/8/2001	12/17/2001	30
Long term marine waters monitoring data for year 2002	2	1/14/2002	10/28/2002	23
Long term marine waters monitoring data for year 2003	2	1/7/2003	10/23/2003	17
Long term marine waters monitoring data for year 2004	2	2/23/2004	10/21/2004	17
PBT Monitoring: Measuring PBDE Levels in Washington Rivers and Lakes	2	9/2/2005	4/13/2006	5
Sediment Profile Imaging Feasibility Study - Lower Duwamish Waterway	30	8/9/2006	8/11/2006	23
Washington State Toxics Monitoring Program (WSTMP), Semipermeable Membrane Devices (SPMDs) Trends Monitoring.	1	4/30/2007	10/9/2008	12
Data Source: EPA				
Slip 4 Early Action Removal	2	10/4/2011	1/25/2012	222
Data Source: Remedial Investigation Data				
GreatWestern Apr-94	6	4/28/1994	4/28/1994	6
GreatWestern Jul-94	2	7/22/1994	7/22/1994	2
GreatWestern-1997annual	4	11/4/1997	11/4/1997	4
GreatWestern-1998annual	9	11/6/1998	11/6/1998	8
GreatWestern-1999annual	5	10/29/1999	10/29/1999	1
GreatWestern-Embayment Study	10	4/28/1998	4/28/1998	10
KC 2005 SW	3	1/24/2005	12/19/2005	30
Rhône-Poulenc RFI-3	7	4/18/1995	4/18/1995	5
Data Source: STORET				
Environmental Monitoring and Assessment Program	1	7/18/2000	7/18/2000	2
Sediment Concentration Water Data				
Data Source: EIM				
City of Seattle Phase I Municipal Stormwater Permit"	1	12/14/2009	1/2/2010	2
Custom Hydraulic Machine Inc, Kent, WA	144	6/10/2008	6/10/2008	3

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Evaluation of sediment chemistry data, stormwater and stormwater solids data, and emergent groundwater data for discrete samples collected from the Lower Duwamish Waterway (LDW) adjacent to the 8801 East Marginal Way South Property. Phase I and II	35	10/15/2006	7/18/2007	8
Former Proliance International Inc Facility Soil and Groundwater Investigation	66	8/1/2006	8/1/2006	2
King County Routine Ambient and Wet Weather Streams Monitoring	23	1/14/2004	8/16/2006	491
Lake Sawyer TMDL	17	2/27/1989	4/3/1990	241
Loading of Contaminants Associated with Suspended Sediment in the Green River to the Lower Duwamish Waterway	2	7/15/2008	2/13/2009	46
Lower Duwamish Source Control, T117 Early Action Area Non-Time Critical Removal Action (NTCRA)	310	3/11/2008	9/23/2010	94
Lower Duwamish Waterway Early Action Area 5, Summary of Site Characterization Activities: Basin Oil Property Dallas Avenue, Seattle, WA	16	5/26/2009	5/26/2009	2
PBT Monitoring: Measuring PBDE Levels in Washington Rivers and Lakes	2	9/2/2005	4/13/2006	5
Statewide Lake Monitoring	1	8/4/1992	8/23/1993	2
Statewide Metals in Selected Rivers & Creeks	1	7/24/2001	5/15/2002	7
Statewide River and Stream Ambient Monitoring-1980 to 1988	6	1/28/1980	9/21/1988	385
Statewide River and Stream Ambient Monitoring-Pre 1980	13	1/16/1978	12/10/1979	23
Statewide River and Stream Ambient Monitoring-WY 2000 through WY 2009	9	10/18/1999	9/21/2009	249
Statewide River and Stream Ambient Monitoring-WY1989 through WY1999	11	10/17/1988	9/22/1999	418
Statewide River and Stream Ambient Monitoring-WY2010 to present-2 (Transitional data that has not yet been QA'd. For previous data see User Study ID AMS001, and AMS001B-E.	4	10/21/2009	3/23/2011	40
US General Services Administration Federal Center South, Seattle, WA	48	5/14/2010	5/14/2010	2
Washington State Department of Ecology's Status and Trends Habitat Monitoring Project 2009	2	10/7/2009	10/7/2009	1
Washington State Toxics Monitoring Program (WSTMP), Semipermeable Membrane Devices (SPMDs) Trends Monitoring.	1	4/30/2007	10/9/2008	12
Washington State Toxics Monitoring Program: Exploratory Monitoring 2001	1	12/21/2001	12/21/2001	1
Water & Sediment Quality in Ten Metals Mining Districts II	2	10/2/2000	4/4/2001	4
WSPMP 1996 Pesticides in Surface Water	3	4/15/1996	8/12/1996	9
Zinc, Copper, Lead, and Cadmium in four WA rivers	2	7/27/1992	5/24/1993	12
Data Source: EPA				
Landau(Dec2012)	5	11/8/2011	12/6/2012	92
Landau(June 2012)	5	11/8/2011	6/7/2012	68
Data Source: NAWQA				
NAWQA	12	12/12/1995	8/30/2007	252
Data Source: Remedial Investigation Data				
KC 2005 SW	3	1/24/2005	12/19/2005	29

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
KC 2007 SW	2	3/7/2007	12/12/2007	23
KC 2008 SW	2	2/6/2008	8/20/2008	27
KC Arsenic SW	2	1/9/2001	12/13/2006	172
KC WQA	19	10/30/1996	6/3/1997	450
LDWRI-Seep	16	6/29/2004	7/3/2004	13
Plant 2 RFI-1	18	3/23/1995	3/23/1995	17
T117BoundaryDefinition	3	12/23/2003	12/23/2003	3
Data Source: Sherlock				
CSO Monitoring KC 2009	7	1/29/2004	4/12/2009	30
KCIA Central Outfall	2	3/17/2009	3/17/2009	2
LL/AST	12	1/13/2011	5/26/2011	69
NBF database	449	10/17/2009	6/30/2010	25
NBF database 2010-11	5	11/17/2010	5/25/2011	24
SPU 2010 NPDES Monitoring	1	10/22/2009	9/15/2010	11
Data Source: STORET				
Environmental Monitoring and Assessment Program	1	7/18/2000	7/18/2000	3
EPA National Aquatic Resource Survey Data	1	8/17/2000	9/3/2004	4
EPA National Aquatic Resources Survey	1	7/2/2003	7/2/2003	1

Table A-17. Receiving Water Porewater Data

Study Name	Number of Stations	Start Date	End Date	Number of Sampling Events
Data Source: Remedial Investigation Data				
EPA SI	15	9/1/1998	9/16/1998	15
LDWRI-Peeper	16	8/1/2005	8/1/2005	20
LDWRI-Porewater	12	6/21/2005	6/23/2005	12
PSDDA99	20	8/26/1999	8/26/1999	20
RhônePoulenc2004	14	8/30/2004	9/1/2004	15

A.9 Sediment Distribution and Transport Representation

Table A-18. Grain Size Distribution Data by Study

Study Name	Ambient Data Summary[1]				Discharge Data Summary[1]				Subsurface Data Summary[1]				Soil Data Summary[1]			
	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events
Data Source: EIM																
1984 BWMP Fish Tissue and Sediment	1	9/19/1984	9/19/1984	1												
1984 Duwamish Head Survey	8	1/1/1984	1/1/1984	8												
1985 Elliott Bay sediment survey	78	9/25/1985	10/16/1985	83												
1990 PSDDA Post-Disposal Site Monitoring	4	5/24/1990	5/25/1990	8												
2009/2010 Lower Duwamish River surface sediment sampling results for dioxins and furans and other chemicals	47	12/15/2009	1/12/2010	50												
A Cooperative Agreement with the Puget Sound Assessment and Monitoring Program and the National Oceanic and Atmospheric Administration(NOAA) National Status and Trends (NS&T) Program to jointly examine measures of sediment quality throughout Puget Sound.	14	6/22/1998	7/1/1998	17												
April 1999 monitoring report - Norfolk CSO sediment remediation project five-year monitoring program. Prepared for Elliott Bay/Duwamish Restoration Program by King County DNR.	4	4/23/1999	4/23/1999	4												
Boeing Plant 2 - Interim report RCRA facility investigation Duwamish Waterway sediment investigation	5	3/19/1996	3/20/1996	11												
Boeing Plant 2 Phase 1 completion report Duwamish Waterway investigation RCRA facility investigation	64	2/16/1995	8/7/1995	70												
Boeing Plant 2 Phase 1 Transformer PCB Investigation	18	8/20/2003	9/12/2003	19												
Boeing Plant 2 Phase 2A Progress Report Duwamish Waterway RCRA facility investigation. Draft	54	10/23/1995	10/25/1995	54												
Boeing Site Characterization Study	91	10/8/1997	10/19/1997	108												
Denny Way Cap Monitoring 1994-96	1	9/1/1994	9/1/1994	1												

Study Name	Ambient Data Summary[1]				Discharge Data Summary[1]				Subsurface Data Summary[1]				Soil Data Summary[1]			
	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events
Dredge material characterization Duwamish Yacht Club Duwamish Waterway Seattle Washington. Prepared for Peratrovich Nottingham & Drage by Hart Crowser - Seattle. Renamed from DYATCHT99 to be compatible with previous naming convention.	6	3/4/1999	3/5/1999	8												
Dredinge material characterization of Hurlen Construction Company and Boyer Alaska Barge Lines Berthing Areas	6	3/4/1999	3/5/1999	6												
Duwamish Diagonal - March 2004 post-dredging	12	3/29/2004	3/30/2004	15												
Duwamish Diagonal 10-2003 pre-dredging	12	10/20/2003	10/21/2003	14												
Duwamish Diagonal April 2005 baseline cap monitoring - year 1. Changed original LDWG's Sedqual survey name from DUWDIAGA to DUDI0405 to be consistent with previous naming convention.	6	4/27/2005	4/27/2005	7												
Duwamish Diagonal Jan-Feb 2005 post-dredge perimeter - before thin-layer cap placement	20	1/31/2005	2/2/2005	22												
Duwamish Diagonal June 2004 baseline cap monitoring - year 0 (post-cap placement)	7	6/1/2004	6/1/2004	8												
Duwamish Diagonal Mar 2005 post-dredge perimeter - after thin-layer cap placement Changed LDWG's original Sedqual survey name from DUWDIAGM to DUDI0305 to be consistent with previous naming convention.	7	3/16/2005	3/24/2005	8												
Duwamish R. maintenance dredging project	16	4/18/1989	1/19/1990	20												
Duwamish River Water Quality Assessment	14	3/6/1997	9/24/1997	57												
Duwamish Shipyard, Elliot Bay, WA	5	8/18/1993	8/18/1993	5												
Duwamish Waterway sediment characterization study report	50	9/16/1997	11/13/1997	66												
Duwamish Yacht Club Maintenance Dredge DY89	5	11/29/1988	11/29/1988	5												
Duwamish/Diagonal Cleanup Phases 1 - 2	20	8/10/1994	9/9/1996	50												
Elliott Bay Full Monitoring	7	6/29/2000	6/30/2000	9												
Evaluation of sediment chemistry data, stormwater and stormwater solids data, and emergent groundwater data for discrete samples collected from the Lower Duwamish Waterway (LDW) adjacent to the 8801 East Marginal Way South Property. Phase I and II	30	10/24/2006	2/12/2008	39												

Study Name	Ambient Data Summary[1]				Discharge Data Summary[1]				Subsurface Data Summary[1]				Soil Data Summary[1]			
	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events
Final sediment characterization report Boyer Towing Inc. dock replacement Seattle Washington	2	5/8/2004	5/8/2004	2												
Harbor Island Phase II RI	104	9/27/1991	10/31/1991	133												
Hurlen Construction Co. Maint. Dredging.	1	5/11/1990	5/11/1990	1												
James Hardie Gypsum Inc. sediment sampling and analysis, 1998	5	11/28/1998	11/28/1998	5												
James Hardie Gypsum Inc. sediment sampling and analysis, 1999	9	7/15/1999	7/15/1999	9												
James Hardie Gypsum Outfall and nearshore sediment sampling report, Year 2000. Prepared by Roy F. Weston, Inc.	9	7/3/2000	7/3/2000	9												
Jorgensen April 2004 - Lower Duwamish Upriver (Area 1) sediment characterization (MCS 2004)	22	4/20/2004	4/23/2004	43												
Jorgensen August 2004 - Triad Approach (Immunoassay as a Real-Time Measure) to Characterize PCB in a Washington Riverine Sediment Site (USACE)	20	8/16/2004	8/27/2004	24												
KC Streams Sed data for 303D submission	5	9/1/1998	7/31/2002	28												
King County 2008. Denny Way/Lake Union CSO Control Project, Long-Term Sediment Monitoring Program, Areas A and B Nearshore Sediment Remediation Project, Areas C, D, and E Monitored Natural Recovery, Sampling and Analysis Plan. King County DNR	2	6/26/2007	6/26/2007	2												
Lehigh Northwest Duwamish Waterway Facility Seattle Washington - Puget Sound dredged disposal analysis . Full PSDDA characterization. Prepared for Lehigh Northwest Inc. by MCS Environmental.	3	8/29/2003	8/29/2003	3												
Lockheed Shipyard 2 Sed Char/Geotch Stdy	32	8/29/1989	9/16/1989	62												
Lone Star Northwest West Terminal Duwamish River PSDDA sampling and analysis results	4	6/23/1995	6/23/1995	5												
Lower Duwamish River LDWRI-Background areas surface sediment samples	8	2/1/2005	2/9/2005	11												
Lower Duwamish River LDWRI-Benthic Invertebrate sampling. Data included Chemistry, Tissue and Bioaccumuation.	34	8/13/2004	9/28/2004	40												
Lower Duwamish River LDWRI-Subsurface Sediment 2006	60	2/6/2006	2/24/2006	186												

Study Name	Ambient Data Summary[1]				Discharge Data Summary[1]				Subsurface Data Summary[1]				Soil Data Summary[1]			
	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events
Lower Duwamish River LDWRI-Surface Sediment Round 1. Original name: LDWSment. Name changed to reflect it was the 1st of 3 sampling dates.	79	1/17/2005	1/26/2005	89												
Lower Duwamish River LDWRI-Surface Sediment Round 2. Original name: LDWRI-Su. Name changed to reflect it was the 2nd of 3 sampling dates.	84	2/2/2005	3/18/2005	98												
Lower Duwamish River LDWRI-Surface Sediment Round 3. Original name: LDWRund3. Name changed to reflect it was the 3rd of 3 sampling dates.	44	10/2/2006	10/4/2006	53												
Lower Duwamish River -Site Inspection	68	8/11/1998	9/23/1998	101												
Lower Duwamish Source Control, T117 Early Action Area Non-Time Critical Removal Action (NTCRA)	27	12/4/2003	10/2/2006	32									12	12/4/2003	6/6/2005	20
Lower Duwamish Waterway Early Action Area 5, Summary of Site Characterization Activities: Basin Oil Property Dallas Avenue, Seattle, WA													12	5/12/2009	5/14/2009	28
Lower Duwamish Waterway Remedial Action Grant. Slip 4 Early Action Area.	7	6/19/2006	6/21/2006	16									1	6/22/2006	6/22/2006	1
Mercury Trends in Fresh Water Fish 2006	1	9/19/2006	9/19/2006	3												
Morton wharf construct. & draft increase	1	12/12/1989	12/12/1989	2												
Norfolk combined sewer overflow (Duwamish River) sediment cap recontamination. Phase I investigation. Ecology Publ. no. 03-03-004	20	7/9/2002	7/9/2002	21												
Norfolk CSO Sediment Cleanup Study 1,2,3	15	8/17/1994	12/6/1995	31												
Norfolk CSO Sediment Phase I	1	7/9/2002	7/9/2002	21												
NPDES Chelan CSO Baseline Study, 1995-96	6	6/28/1995	6/29/1995	6												
NPDES Connecticut CSO Baseline Study	6	6/26/1995	6/27/1995	15												
NPDES Hanford CSO Baseline Study, 1995	6	6/27/1995	6/29/1995	6												
Port of Seattle/Terminal 105 Dredging 85	12	6/20/1985	6/20/1985	45												
PSDDA Phase I Survey of Disposal Sites	9	5/19/1988	6/7/1988	16												

Study Name	Ambient Data Summary[1]				Discharge Data Summary[1]				Subsurface Data Summary[1]				Soil Data Summary[1]			
	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events
PSDDA sediment characterization of Duwamish River navigation channel: FY2000 operations and maintenance dredging data report. Prepared for US Army Corps of Engineers Seattle District by Striplin	20	8/26/1999	8/26/1999	24												
Puget Sound Assessment and Monitoring Program's historical sediment monitoring program 1989-1995	1	4/1/1989	4/7/1994	6												
Rhone-Poulenc RFI-2 Marginal Way Facility - Round 2 August 1994	7	8/18/1994	8/18/1994	7												
Seaboard Lumber Site. Phase 2 site investigation. Draft. Prepared for Seattle Department of Parks and Recreation by Herrera Environmental Consultants.	20	3/28/1996	3/28/1996	20												
Seacrest Preliminary Study '97	4	3/21/1997	3/21/1997	4												
Sediment Characterization Results for the Duwamish River Navigational Channel Turning Basin	5	6/26/2003	6/26/2003	5												
Six-month post-construction monitoring report - Norfolk CSO sediment remediation project five-year monitoring program. October 1999. Prepared for Elliott Bay/Duwamish Restoration Program by King County DNR.	4	10/8/1999	10/8/1999	8												
Source tracing for Lower Duwamish Waterway					222	8/18/2003	3/10/2010	281								
Surface Sediment and Fish Tissue Chemistry in Greater Elliott Bay (Seattle) -Urban Waters Initiative	3	6/13/2007	6/15/2007	3												
The Puget Sound Assessment and Monitoring Program's (PSAMP) Spatial/Temporal Monitoring 2002-Present	5	6/3/2009	6/5/2009	6												
Tiered-Partial Monitoring of Elliott Bay	5	7/2/2002	7/8/2002	11												
Urban Waters Initiative, Sediment Quality in Elliott Bay and Lower Duwamish Waterway	12	6/13/2007	6/21/2007	13												
US Coast Guard dredging and construction	2	9/19/1989	9/19/1989	3												
Verification of 303(d) Listed Sites in NWRO, CRO and ERO	4	11/7/2003	11/8/2003	5												
Water & Sediment Quality in Ten Metals Mining Districts II	2	10/2/2000	10/2/2000	2												
Year 1 - Annual monitoring report. Norfolk CSO sediment remediation project five-year monitoring program. April 2000. Prepared for Elliott Bay/Duwamish Restoration Program by King County DNR.	4	4/6/2000	4/6/2000	8												

Study Name	Ambient Data Summary[1]				Discharge Data Summary[1]				Subsurface Data Summary[1]				Soil Data Summary[1]			
	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events
Year 1 - Feb. 2000 Sampling. Norfolk CSO sediment remediation project five-year monitoring program. King County environmental laboratory quality assurance review for estuarine sediment analytical data.	5	2/8/2000	2/10/2000	5												
Year 2 - Norfolk CSO sediment remediation project five-year monitoring program. Annual monitoring report- April 2001. Prepared for Elliott Bay/Duwamish Restoration Program by King County DNR.	4	4/24/2001	4/24/2001	8												
Year 4 - Norfolk CSO sediment monitoring project. Annual monitoring report - April 2003. Renamed from NORFNIT6 to NRFKNIT6 to be compatible with previous studies.	4	4/23/2003	4/23/2003	8												
Year 5 - Norfolk CSO Sediment Monitoring Final Report. Renamed from NORFNIT7 to NRFKNIT7 to be compatible with previous studies.	4	4/5/2004	4/5/2004	8												
Data Source: EPA																
Landau(Dec2012)					5	11/8/2011	12/6/2012	92								
Landau(June 2012)					5	11/8/2011	6/7/2012	68								
Data Source: Feasability Study Data																
8801 E Marginal (formerly KenworthPACCAR)	29	10/24/2006	2/11/2008	29					4	2/11/2008	2/12/2008	24				
Boeing SiteChar	77	10/9/1997	10/20/1997	77												
Delta Marine									3	7/18/2007	7/18/2007	3				
Duw/Diag-1	30	8/9/1994	8/25/1994	30					2	8/25/1994	8/25/1994	12				
Duw/Diag-1 / Duw/Diag-1.5	1	11/11/1995	11/11/1995	1												
Duw/Diag-1.5	8	11/7/1995	11/11/1995	8												
Duw/Diag-2	10	7/16/1996	9/9/1996	10					14	5/20/1996	6/3/1996	35				
DuwamishShipyard	1	8/17/1993	8/17/1993	1												
DuwamYachtClub									6	3/4/1999	3/5/1999	6				

Study Name	Ambient Data Summary[1]				Discharge Data Summary[1]				Subsurface Data Summary[1]				Soil Data Summary[1]			
	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events
DuwDiagJan2005	5	2/1/2005	2/2/2005	5												
DuwDiagonalApril2009	7	4/27/2009	4/29/2009	7												
DuwDiagonal-October2003	5	10/20/2003	10/20/2003	5												
Ecology SPI	30	8/8/2006	8/11/2006	30												
Ecology-Norfolk	17	7/9/2002	7/9/2002	17												
EPA SI	247	8/11/1998	9/16/1998	247					17	9/21/1998	9/23/1998	33				
Glacier NW									3	1/15/2002	1/15/2002	3				
Harbor Island RI	5	9/30/1991	10/14/1991	5												
Hardie Gypsum-1									5	11/28/1998	########	5				
Hardie Gypsum-2									9	7/15/1999	7/15/1999	9				
JamesHardieOutfall	9	7/3/2000	7/3/2000	9												
JorgensenApril2004									22	4/20/2004	4/23/2004	43				
JorgensenAugust2004	18	8/16/2004	8/27/2004	18					3	8/18/2004	8/19/2004	5				
KC WQA	14	5/8/1997	9/24/1997	14												
LDW Dioxin Sampling	41	12/15/2009	1/11/2010	41												
LDW Subsurface Sediment 2006									60	2/6/2006	2/24/2006	162				
LDW Turning Basin 08									19	11/3/2008	11/6/2008	30				
LDW Turning Basin 09									8	3/4/2009	8/13/2009	10				
LDW Upstream Sed	84	4/28/2008	5/9/2008	84												
LDWRI-Benthic	33	8/13/2004	9/28/2004	33												
LDWRI-SurfaceSedimentRound1	74	1/17/2005	1/26/2005	74												

Study Name	Ambient Data Summary[1]				Discharge Data Summary[1]				Subsurface Data Summary[1]				Soil Data Summary[1]			
	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events
LDWRI-SurfaceSedimentRound2	79	2/2/2005	3/18/2005	79												
LDWRI-SurfaceSedimentRound3	42	10/2/2006	10/4/2006	42												
Lehigh NW									3	8/29/2003	8/29/2003	3				
Lone Star-Hardie Gypsum									4	6/23/1995	6/23/1995	5				
NOAA SiteChar	299	9/15/1997	11/13/1997	299												
Norfolk-cleanup1	11	8/17/1994	8/22/1994	11					1	8/31/1994	8/31/1994	3				
Norfolk-cleanup2	2	8/23/1995	8/28/1995	2					3	8/28/1995	8/28/1995	15				
Norfolk-cleanup3	12	12/5/1995	12/6/1995	12												
Norfolk-monit1	2	4/23/1999	4/23/1999	2												
Norfolk-monit2a	2	10/8/1999	10/8/1999	2												
Norfolk-monit2b	3	2/8/2000	2/10/2000	3												
Norfolk-monit3	1	4/6/2000	4/6/2000	1												
Norfolk-monit4	1	4/24/2001	4/24/2001	1												
Norfolk-monit5	1	4/30/2002	4/30/2002	1												
Plant 2 RFI-1	63	2/16/1995	8/7/1995	63					1	4/17/1995	4/17/1995	2				
Plant 2 RFI-2a	54	10/23/1995	10/25/1995	54												
Plant 2 RFI-2b	36	4/2/1996	4/4/1996	36					16	3/19/1996	3/21/1996	40				
Plant 2-TransformerPhase1	6	8/20/2003	9/12/2003	6					12	8/20/2003	8/22/2003	12				
PSDDA99									20	8/26/1999	8/26/1999	20				
Rhône-Poulenc RFI-2	6	8/18/1994	8/18/1994	6												
Seaboard-Ph2	20	3/28/1996	3/28/1996	20												

Study Name	Ambient Data Summary[1]				Discharge Data Summary[1]				Subsurface Data Summary[1]				Soil Data Summary[1]			
	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events
Slip 4 EAA 2008									7	6/19/2006	6/21/2006	16				
Slip4-Crowley									4	7/13/1995	7/13/1995	4				
Slip4-EarlyAction	30	4/5/2004	4/9/2004	30					7	4/5/2004	4/6/2004	21				
T115									4	3/14/2008	3/14/2008	11				
T115 Intertidal 2009	5	4/28/2009	4/28/2009	5												
T117BoundaryDefinition	11	12/8/2003	9/14/2004	11					11	12/4/2003	9/16/2004	15				
Turning-basin									5	6/26/2003	6/26/2003	5				
Data Source: Final Feasibility Study																
LDW StormDrain Solids					347	1/25/2002	6/4/2009	381								
Data Source: GreenRiverWatershed-StreamSediment-FinalReport-Feb2014.pdf																
KC GreenRiverWshedStreamSedimentReport	58	7/28/2008	8/30/2012	116												
Data Source: LDW, East Waterway, and West Waterway Subsurface Sediment Characterization																
USACE SubsurfaceSediment Characterization	1	10/16/2012	10/16/2012	1					54	10/8/2012	10/19/2012	54				
Data Source: NAWQA																
NAWQA-Sediment	5	9/20/1995	8/25/2005	5												
NAWQA-Water	5	12/12/1995	12/16/1997	23												
Data Source: Sherlock																
2011 Landau Sed Traps					1	4/5/2011	4/5/2011	1								
LL/AST					10	1/19/2011	6/15/2011	14								
NBF database					8	2/16/2005	6/30/2010	20								
NBF database 2010-11					3	1/28/2011	4/28/2011	6								

Study Name	Ambient Data Summary[1]				Discharge Data Summary[1]				Subsurface Data Summary[1]				Soil Data Summary[1]			
	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events	Number of Stations	Start Date	End Date	Sampling Events
SAIC 2011 Outfall Study					162	3/3/2011	4/20/2011	173								
SAIC Slip4 Sediment	20	5/5/2010	5/5/2010	22												
SPU 2010 Phasel Monitoring					1	9/30/2010	9/30/2010	1								
SPU SD database					353	1/25/2002	5/13/2011	464								
Data Source: STORET																
EPA Region 10 Superfund Lower Duwamish Waterway Site	1668	9/27/1991	1/11/2010	27828												

[1] Blank cells indicate no data.

Appendix B. Numeric Targets Details

B.1 Ecology Water Quality Standards for Aquatic Life Protection (Toxic Substances Criteria [WAC 173-201A-240, Table 240(3)])

Note: All values are µg/L for all substances except Ammonia and Chloride which are mg/L.

Substance	Freshwater		Marine Water	
	Acute	Chronic	Acute	Chronic
Aldrin/Dieldrine	2.5a	0.0019b	0.71a	0.0019b
Ammonia (un-ionized NH3) hh	f,c	g,d	0.233h,c	0.035h,d
Arsenic dd	360.0c	190.0d	69.0c,ll	36.0d,cc,ll
Cadmium dd	i,c	j,d	42.0c	9.3d
Chlordane	2.4a	0.0043b	0.09a	0.004b
Chloride (Dissolved) k	860.0h,c	230.0h,d	-	-
Chlorine (Total Residual)	19.0c	11.0d	13.0c	7.5d
Chlorpyrifos	0.083c	0.041d	0.011c	0.0056d
Chromium (Hex) dd	15.0c,l,ii	10.0d,jj	1,100.0c,l,ll	50.0d,ll
Chromium (Tri) gg	m,c	n,d	-	-
Copper dd	o,c	p,d	4.8c,ll	3.1d,ll
Cyanide ee	22.0c	5.2d	1.0c,mm	d,mm
DDT (and metabolites)	1.1a	0.001b	0.13a	0.001b
Dieldrin/Aldrin e	2.5a	0.0019b	0.71a	0.0019b
Endosulfan	0.22a	0.056b	0.034a	0.0087b
Endrin	0.18a	0.0023b	0.037a	0.0023b
Heptachlor	0.52a	0.0038b	0.053a	0.0036b
Hexachlorocyclohexane (Lindane)	2.0a	0.08b	0.16a	-
Lead dd	q,c	r,d	210.0c,ll	8.1d,ll
Mercury s	2.1c,kk,dd	0.012d,ff	1.8c,ll,dd	0.025d,ff
Nickel dd	t,c	u,d	74.0c,ll	8.2d,ll
Parathion	0.065c	0.013d	-	-
Pentachlorophenol (PCP)	w,c	v,d	13.0c	7.9d
Polychlorinated Biphenyls (PCBs)	2.0b	0.014b	10.0b	0.030b
Selenium	20.0c,ff	5.0d,ff	290c,ll,dd	71.0d, x, ll, dd
Silver dd	y,a	-	1.9a,ll	-
Toxaphene	0.73c,z	0.0002d	0.21c,z	0.0002d
Zinc dd	aa,c	bb,d	90.0c,ll	81.0d,ll

Notes to Table 240(3):

a. An instantaneous concentration not to be exceeded at any time.
b. A 24-hour average not to be exceeded.
c. A 1-hour average concentration not to be exceeded more than once every three years on the average.
d. A 4-day average concentration not to be exceeded more than once every three years on the average.
e. Aldrin is metabolically converted to Dieldrin. Therefore, the sum of the Aldrin and Dieldrin concentrations are

compared with the Dieldrin criteria.

f. Shall not exceed the numerical value in total ammonia nitrogen (mg N/L) given by:

For salmonids present:	$\frac{0.275}{1\ 10^{7.204-pH}}$	+	$\frac{39.0}{1\ 10^{pH-7.204}}$
For salmonids absent:	$\frac{0.411}{1\ 10^{7.204-pH}}$	+	$\frac{58.4}{1\ 10^{pH-7.204}}$

g. Shall not exceed the numerical concentration calculated as follows:

Unionized ammonia concentration for waters where salmonid habitat is an existing or designated use:

$$0.80 \div (FT)(FPH)(RATIO)$$

where:

RATIO	=	$13.5;\ 7.7 \le pH \le 9$
RATIO	=	$(20.25 \times 10^{(7.7-pH)}) \div (1\ 10^{(7.4-pH)});\ 6.5 \le pH \le 7.7$
FT	=	$1.4;\ 15 \le T \le 30$
FT	=	$10^{[0.03(20-T)]};\ 0 \le T \le 15$
FPH	=	$1;\ 8 \le pH \le 9$
FPH	=	$(1\ 10^{(7.4-pH)}) \div 1.25;\ 6.5 \le pH \le 8.0$

Total ammonia concentrations for waters where salmonid habitat is not an existing or designated use and other fish early life stages are absent:

$$\text{Chronic Criterion} = \left(\frac{0.0577}{1\ 10^{7.688-pH}} + \frac{2.487}{1\ 10^{pH-7.688}} \right) (1.45 \times 10^{0.028(25-A)})$$

where: A = the greater of either T (temperature in degrees Celsius) or 7.

Applied as a thirty-day average concentration of total ammonia nitrogen (in mg N/L) not to be exceeded more than once every three years on average. The highest four-day average within the thirty-day period should not exceed 2.5 times the chronic criterion.

Total ammonia concentration for waters where salmonid habitat is not an existing or designated use and other fish early life stages are present:

$$\text{Chronic Criterion} = \left(\frac{0.0577}{1\ 10^{7.688-pH}} + \frac{2.487}{1\ 10^{pH-7.688}} \right) \times B$$

where: B = the lower of either 2.85, or $1.45 \times 10^{0.028 \times (25-T)}$. T = temperature in degrees Celsius.

Applied as a thirty-day average concentration of total ammonia nitrogen (in mg N/L) not to be exceeded more

than once every three years on the average. The highest four-day average within the thirty-day period should not exceed 2.5 times the chronic criterion.

h. Measured in milligrams per liter rather than micrograms per liter.

i. ≤ (0.944)(e(1.128[ln(hardness)]-3.828)) at hardness = 100. Conversion factor (CF) of 0.944 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.136672 - [(ln hardness)(0.041838)].

j. ≤ (0.909)(e(0.7852[ln(hardness)]-3.490)) at hardness = 100. Conversions factor (CF) of 0.909 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.101672 - [(ln hardness)(0.041838)].

k. Criterion based on dissolved chloride in association with sodium. This criterion probably will not be adequately protective when the chloride is associated with potassium, calcium, or magnesium, rather than sodium.

l. Salinity dependent effects. At low salinity the 1-hour average may not be sufficiently protective.

m. ≤ $(0.316)(e^{(0.8190[\ln(\text{hardness})]\ 3.688)})$

n. ≤ $(0.860)(e^{(0.8190[\ln(\text{hardness})]\ 1.561)})$

o. ≤ $(0.960)(e^{(0.9422[\ln(\text{hardness})]\ -\ 1.464)})$

p. ≤ $(0.960)(e^{(0.8545[\ln(\text{hardness})]\ -\ 1.465)})$

q. ≤ $(0.791)(e^{(1.273[\ln(\text{hardness})]\ -\ 1.460)})$ at hardness = 100. Conversion factor (CF) of 0.791 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.46203 - [(ln hardness)(0.145712)].

r. ≤ $(0.791)(e^{(1.273[\ln(\text{hardness})]\ -\ 4.705)})$ at hardness = 100. Conversion factor (CF) of 0.791 is hardness dependent. CF is calculated for other hardnesses as follows: CF = 1.46203 - [(ln hardness)(0.145712)].

s. If the four-day average chronic concentration is exceeded more than once in a three-year period, the edible portion of the consumed species should be analyzed. Said edible tissue concentrations shall not be allowed to exceed 1.0 mg/kg of methylmercury.

t. ≤ $(0.998)(e^{(0.8460[\ln(\text{hardness})]\ 3.3612)})$

u. ≤ $(0.997)(e^{(0.8460[\ln(\text{hardness})]\ 1.1645)})$

v. ≤ $e^{[1.005(\text{pH})\ -\ 5.290]}$

w. ≤ $e^{[1.005(\text{pH})\ -\ 4.830]}$

x. The status of the fish community should be monitored whenever the concentration of selenium exceeds 5.0 ug/ l in salt water.

y. ≤ $(0.85)(e^{(1.72[\ln(\text{hardness})]\ -\ 6.52)})$

z. Channel Catfish may be more acutely sensitive.

aa. ≤ $(0.978)(e^{(0.8473[\ln(\text{hardness})]\ 0.8604)})$

bb. ≤ $(0.986)(e^{(0.8473[\ln(\text{hardness})]\ 0.7614)})$

cc. Nonlethal effects (growth, C-14 uptake, and chlorophyll production) to diatoms (*Thalassiosira aestivalis* and *Skeletonema costatum*) which are common to Washington's waters have been noted at levels below the established criteria. The importance of these effects to the diatom populations and the aquatic system is sufficiently in question to persuade the state to adopt the USEPA National Criteria value (36 µg/L) as the state threshold criteria, however, wherever practical the ambient concentrations should not be allowed to exceed a chronic marine concentration of 21 µg/L.

dd. These ambient criteria in the table are for the dissolved fraction. The cyanide criteria are based on the weak acid dissociable method. The metals criteria may not be used to calculate total recoverable effluent limits unless the seasonal partitioning of the dissolved to total metals in the ambient water are known. When this information is absent, these metals criteria shall be applied as total recoverable values, determined by back-calculation, using the conversion factors incorporated in the criterion equations. Metals criteria may be adjusted on a site-specific basis when data are made available to the department clearly demonstrating the effective use of the water effects ratio approach established by USEPA, as generally guided by the procedures in USEPA Water Quality Standards Handbook, December 1983, as supplemented or replaced by USEPA or ecology. Information which is used to develop effluent limits based on applying metals partitioning studies or the water effects ratio approach shall be identified in the permit fact sheet developed pursuant to WAC 173-220-060 or 173-226-110, as appropriate, and shall be made available for the public comment period required pursuant to WAC 173-220-050 or 173-226-130(3), as appropriate. Ecology has developed supplemental guidance for conducting water effect ratio studies.

ee. The criteria for cyanide is based on the weak acid dissociable method in the 19th Ed. Standard Methods for the Examination of Water and Wastewater, 4500-CN I, and as revised (see footnote dd, above).

ff. These criteria are based on the total-recoverable fraction of the metal.

gg. Where methods to measure trivalent chromium are unavailable, these criteria are to be represented by total-recoverable chromium.

hh. The listed fresh water criteria are based on un-ionized or total ammonia concentrations, while those for marine water are based on un-ionized ammonia concentrations. Tables for the conversion of total ammonia to un-ionized ammonia for freshwater can be found in the USEPA's Quality Criteria for Water, 1986. Criteria concentrations based on total ammonia for marine water can be found in USEPA Ambient Water Quality Criteria for Ammonia (Saltwater)-1989, EPA440/5-88-004, April 1989.

ii. The conversion factor used to calculate the dissolved metal concentration was 0.982.

jj. The conversion factor used to calculate the dissolved metal concentration was 0.962.

kk. The conversion factor used to calculate the dissolved metal concentration was 0.85.

ll. Marine conversion factors (CF) which were used for calculating dissolved metals concentrations are given below. Conversion factors are applicable to both acute and chronic criteria for all metals except mercury. The CF for mercury was applied to the acute criterion only and is not applicable to the chronic criterion. Conversion factors are already incorporated into the criteria in the table. Dissolved criterion = criterion x CF

Metal	CF
Arsenic	1.000
Cadmium	0.994
Chromium (VI)	0.993
Copper	0.83
Lead	0.951
Mercury	0.85
Nickel	0.990
Selenium	0.998
Silver	0.85
Zinc	0.946

mm. The cyanide criteria are: 2.8µg/l chronic and 9.1µg/l acute and are applicable only to waters which are east of a line from Point Roberts to Lawrence Point, to Green Point to Deception Pass; and south from Deception Pass and of a line from Partridge Point to Point Wilson. The chronic criterion applicable to the remainder of the marine waters is l µg/L.

(4) USEPA Quality Criteria for Water, 1986, as revised, shall be used in the use and interpretation of the values listed in subsection (3) of this section.

(5) Concentrations of toxic, and other substances with toxic propensities not listed in subsection (3) of this section shall be determined in consideration of USEPA Quality Criteria for Water, 1986, and as revised, and other relevant information as appropriate. Human health-based water quality criteria used by the state are contained in 40 C.F.R. 131.36 (known as the National Toxics Rule).

(6) Risk-based criteria for carcinogenic substances shall be selected such that the upper-bound excess cancer risk is less than or equal to one in one million.

[Statutory Authority: RCW 90.48.035. 11-09-090 (Order 10-10), § 173-201A-240, filed 4/20/11, effective 5/21/11; 06-23-117 (Order 06-04), § 173-201A-240, filed 11/20/06, effective 12/21/06. Statutory Authority: Chapters 90.48 and 90.54 RCW. 03-14-129 (Order 02-14), amended and recodified as § 173-201A-240, filed 7/1/03, effective 8/1/03. Statutory Authority: Chapter 90.48 RCW and 40 C.F.R. 131. 97-23-064 (Order 94-19), § 173-201A-040, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-040, filed 11/25/92, effective 12/26/92.]

B.2 Ecology Water Quality Criteria and Fish Tissue Equivalent Concentrations for Human Health Protection

Water criteria presented in the table below are consistent with the NTR. Ecology calculated tissue equivalent values of the federal National Toxics Rule water criteria (40 CFR1.131.36, 2006) (http://www.ecy.wa.gov/programs/wq/swqs/NTRbyPriorityPollutantName.pdf). These tissue equivalent concentrations were developed by multiplying the NTR standard by a bioconcentration factor. The bioconcentration factors were taken from an EPA Region 3 document entitled "Origin of Human Health Criteria."

Priority Pollutant Number (text)	Priority Pollutant	CAS Number	Bio-concentration Factor†	Freshwater NTR Criterion - Water and Organisms (µg/L)	Freshwater Fish Tissue Equivalent (ug/Kg)*	Marine Water NTR Criterion - Organisms only (µg/L)	Marine Fish Tissue Equivalent (ug/Kg)*	Federal Register cite
37	1,1,2,2-Tetrachloroethane	79345	5	0.17	0.85	11	55	57FR60848
42	1,1,2-Trichloroethane	79005	4.5	0.60	2.7	42	189	57FR60848
30	1,1-Dichloroethylene	75354	5.6	0.057	0.3192	3.2	17.92	57FR60848
75	1,2-Dichlorobenzene	95501	55.6	2700	150,120	17000	945,200	57FR60848
29	1,2-Dichloroethane	107062	1.2	0.38	0.456	99	118.8	57FR60848
85	1,2-Diphenylhydrazine	122667	24.9	0.040	0.996	0.54	13.446	57FR60848
76	1,3-Dichlorobenzene	541731	55.6	400	22,240	2600	144,560	57FR60848
32	1,3-Dichloropropylene	542756	1.91	10	19.1	1700	3,247	57FR60848
77	1,4-Dichlorobenzene	106467	55.6	400	22,240	2600	144,560	57FR60848
16	2,3,7,8-TCDD (Dioxin)	1746016	5000	0.000000013	0.000065	0.000000014	0.00007	57FR60848
55	2,4,6-Trichlorophenol	88062	150	2.1	315	6.5	975	57FR60848
46	2,4-Dichlorophenol	120832	40.7	93	3,785.1	790	32,153	57FR60848
49	2,4-Dinitrophenol	51285	1.5	70	105	14,000	21,000	57FR60848
82	2,4-Dinitrotoluene	121142	3.8	0.11	0.418	9.1	34.58	57FR60848
48	2-Methyl-4,6-Dinitrophenol	534521	5.5	13.4	73.7	765	4,207.5	57FR60848
78	3,3'-Dichlorobenzidine	91941	312	0.04	12.48	0.077	24.024	57FR60848
110	4,4'-DDD	72548	53,600	0.00083	44.488	0.00084	45.024	57FR60848
109	4,4'-DDE	72559	53,600	0.00059	31.624	0.00059	31.624	57FR60848
108	4,4'-DDT	50293	53,600	0.00059	31.624	0.00059	31.624	57FR60848
17	Acrolein	107028	215	320	68,800	780	167,700	57FR60848
18	Acrylonitrile	107131	30	0.059	1.77	0.66	19.8	57FR60848
102	Aldrin	309002	4670	0.00013	0.6071	0.00014	0.6538	57FR60848
103	alpha-BHC	319846	130	0.0039	0.507	0.013	1.69	57FR60848
112	alpha-Endosulfan	959988	270	0.93	251.1	2.0	540	57FR60848
58	Anthracene	120127	30	9600	288,000	110,000	3,300,000	57FR60848
1	Antimony	7440360	1	14	14	4300	4,300	57FR60848
2	Arsenic†	7440382	44	0.018	0.792	0.14	6.16	57FR60848
15	Asbestos	1332214		7,000,000fibers/L	N/A		N/A	57FR60848
19	Benzene	71432	5.2	1.2	6.24	71	369.2	57FR60848
59	Benzidine	92875	87.5	0.00012	0.0105	0.00054	0.04725	57FR60848
60	Benzo(a)Anthracene	56553	30	0.0028	0.084	0.031	0.93	57FR60848
61	Benzo(a)Pyrene	50328	30	0.0028	0.084	0.031	0.93	57FR60848
62	Benzo(b)Fluoranthene	205992	30	0.0028	0.084	0.031	0.93	57FR60848
64	Benzo(k)Fluoranthene	207089	30	0.0028	0.084	0.031	0.93	57FR60848
104	beta-BHC	319857	130	0.014	1.82	0.046	5.98	57FR60848
113	beta-Endosulfan	33213659	270	0.93	251.1	2.0	540	57FR60848
66	Bis(2-Chloroethyl)Ether	111444	6.9	0.031	0.2139	1.4	9.66	57FR60848
67	Bis(2-Chloroisopropyl)Ether	108601	2.47	1400	3,458	170,000	419,900	57FR60848
68	Bis(2-Ethylhexyl)Phthalate	117817	130	1.8	234	5.9	767	57FR60848
20	Bromoform	75252	3.75	4.3	16.125	360	1,350	57FR60848
21	Carbon Tetrachloride	56235	18.75	0.25	4.6875	4.4	82.5	57FR60848
107	Chlordane	57749	14,100	0.00057	8.037	0.00059	8.319	57FR60848
22	Chlorobenzene	108907	10.3	680	7,004	21,000	216,300	57FR60848

Priority Pollutant Number (text)	Priority Pollutant	CAS Number	Bio-concentration Factor†	Freshwater NTR Criterion - Water and Organisms (µg/L)	Freshwater Fish Tissue Equivalent (ug/Kg)*	Marine Water NTR Criterion - Organisms only (µg/L)	Marine Fish Tissue Equivalent (ug/Kg)*	Federal Register cite
23	Chlorodibromomethane	124481	3.75	0.41	1.5375	34	127.5	57FR60848
26	Chloroform	67663	3.75	5.7	21.375	470	1,762.5	57FR60848
73	Chrysene	218019	30	0.0028	0.084	0.031	0.93	57FR60848
14	Cyanide	57125	1	700	700	220,000	220,000	57FR60848
74	Dibenzo(a,h)Anthracene	53703	30	0.0028	0.084	0.031	0.93	57FR60848
27	Dichlorobromomethane	75274	3.75	0.27	1.0125	22	82.5	57FR60848
111	Dieldrin	60571	4670	0.00014	0.6538	0.00014	0.6538	57FR60848
79	Diethyl Phthalate	84662	73	23,000	1,679,000	120,000	8,760,000	57FR60848
80	Dimethyl Phthalate	131113	36	313,000	11,268,000	2,900,000	104,400,000	57FR60848
81	Di-n-Butyl Phthalate	84742	89	2700	240,300	12,000	1,068,000	57FR60848
114	Endosulfan Sulfate	1031078	270	0.93	251.1	2.0	540	57FR60848
115	Endrin	72208	3970	0.76	3,017.2	0.81	3,215.7	57FR60848
116	Endrin Aldehyde	7421934	3970	0.76	3,017.2	0.81	3,215.7	57FR60848
33	Ethylbenzene	100414	37.5	3100	116,250	29,000	1,087,500	57FR60848
86	Fluoranthene	206440	1150	300	345,000	370	425,500	57FR60848
87	Fluorene	86737	30	1300	39,000	14,000	420,000	57FR60848
105	gamma-BHC (Lindane)	58899	130	0.019	2.47	0.063	8.19	57FR60848
117	Heptachlor	76448	11,200	0.00021	2.352	0.00021	2.352	57FR60848
118	Heptachlor Epoxide	1024573	11,200	0.00010	1.12	0.00011	1.232	57FR60848
88	Hexachlorobenzene	118741	8690	0.00075	6.5175	0.00077	6.6913	57FR60848
89	Hexachlorobutadiene	87683	2.78	0.44	1.2232	50	139	57FR60848
90	Hexachlorocyclopentadiene	77474	4.34	240	1,041.6	17,000	73,780	57FR60848
91	Hexachloroethane	67721	86.9	1.9	165.11	8.9	773.41	57FR60848
92	Indeno(1,2,3-cd)Pyrene	193395	30	0.0028	0.084	0.031	0.93	57FR60848
93	Isophorone	78591	4.38	8.4	36.792	600	2,628	57FR60848
8	Mercury (estuarine)	7439976	3765	0.14	N/A	0.15	564.75	57FR60848
8	Mercury (freshwater)	7439976	5500	0.14	770	0.15	N/A	57FR60848
8	Mercury (open ocean)	7439976	9000	0.14	N/A	0.15	1,350	57FR60848
34	Methyl Bromide	74839	3.75	48	180	4000	15,000	57FR60848
36	Methylene Chloride	75092	0.9	4.7	4.23	1600	1,440	57FR60848
9	Nickel	7440020	47	610	28,670	4600	216,200	57FR60848
95	Nitrobenzene	98953	2.89	17	49.13	1900	5,491	57FR60848
96	N-Nitrosodimethylamine	62759	0.026	0.00069	0.00001794	8.1	0.2106	57FR60848
98	N-Nitrosodiphenylamine	86306	136	5.0	680	16	2,176	57FR60848
53	Pentachlorophenol	87865	11	0.28	3.08	8.2	90.2	57FR60848
54	Phenol	108952	1.4	21,000	29,400	4,600,000	6,440,000	57FR60848
100	Pyrene	129000	30	960	28,800	11,000	330,000	57FR60848
38	Tetrachloroethylene	127184	30.6	0.8	24.48	8.85	270.81	57FR60848
12	Thallium	7440280	116	1.7	197.2	6.3	730.8	57FR60848
39	Toluene	108883	10.7	6800	72,760	200,000	2,140,000	57FR60848
119	Total Polychlorinated Biphenyls (PCBs)		31,200	0.00017	5.304	0.00017	5.304	64FR61182
120	Toxaphene	8001352	13,100	0.00073	9.563	0.00075	9.825	57FR60848
43	Trichloroethylene	79016	10.6	2.7	28.62	81	858.6	57FR60848

Priority Pollutant Number (text)	Priority Pollutant	CAS Number	Bio-concentration Factor†	Freshwater NTR Criterion - Water and Organisms (µg/L)	Freshwater Fish Tissue Equivalent (ug/Kg)*	Marine Water NTR Criterion - Organisms only (µg/L)	Marine Fish Tissue Equivalent (ug/Kg)*	Federal Register cite
44	Vinyl Chloride	75014	1.17	2	2.34	525	614.25	57FR60848

Notes:

* = Fish tissue criteria were calculated by multiplying the Bioconcentration Factor x the NTR Water Criteria. The criteria values should be used as written in this table and not rounded using significant figures conventions (per direction of Ecology's Water Quality Program).

The Federal Register (FR) citation for the human health criteria are from two sources. 57FR60848 is the National Toxics Rule (NTR) which was issued by EPA in 1992. 64FR61182 is a revision to the NTR that changed the PCB criteria from individual aroclors to total PCBs. The NTR can be found at 40CFR131.36. The NTR criteria used in this table are up to date as of 1-14-2010; data accessed online at http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr;rgn=div5;view=text;node=40%3A21.0.1.1.18;idno=40;sid=199029ea6a56ad760fd63aa5c80d5e1d;cc=ecfr#40:21.0.1.1.18.4.16.6

† = BCFs taken from EPA Region 3 Development Document called "Origin of Human Health Criteria" received in hard copy by the Department of Ecology 6-28-1993 except for acrolein which was taken from the original criteria documents. BCF values for mercury in estuarine, freshwater, and open ocean are PBCFs (practical bioconcentration factors) and are referenced in the 1980 EPA AWQC (EPA 440/5-80-058), pages c-99 through c-101.

[1] = Criteria for arsenic in water refer to total arsenic and criteria for arsenic in tissue refer to total inorganic arsenic only.

B.3 National Recommended Water Quality Criteria for Aquatic Life Protection

Pollutant	CAS Number	P/NP*	Freshwater		Saltwater		Publication Year
			CMC[1] (acute) (µg/L)	CCC[1] (chronic) (µg/L)	CMC[1] (acute) (µg/L)	CCC[1] (chronic) (µg/L)	
Acrolein	107028	P	3ug/L	3ug/L			2009
Aesthetic Qualities	—	NP	Narrative Statement—See Document				1986
Aldrin	309002	P	3.0 G		1.3 G		1980
Alkalinity	—	NP		20000 C			1986
alpha-Endosulfan	959988	P	0.22 G,Y	0.056 G,Y	0.034 G,Y	0.0087 G,Y	1980
Aluminum pH 6.5 – 9.0	7429905	NP	750 I	87 I,S			1988
Ammonia	7664417	NP	Freshwater Criteria are pH, Temperature and Life-stage Dependent Saltwater Criteria are pH and Temperature Dependent				1999
Arsenic	7440382	P	340 A,D	150 A,D	69 A,D	36 A,D	1995
Bacteria	—	NP	For Primary Recreation and Shellfish Uses—See Document				1986
beta-Endosulfan	33213659	P	0.22 G,Y	0.056 G,Y	0.034 G,Y	0.0087 G,Y	1980
Boron	—	NP	Narrative Statement—See Document				1986
Carbaryl	63252	NP	2.1	2.1	1.6		2012
Cadmium	7440439	P	2.0 D,E	0.25 D,E	40 D	8.8 D	2001
Chlordane	57749	P	2.4 G	0.0043 G	0.09 G	0.004 G	1980
Chloride	16887006	NP	860000	230000			1986
Chlorine	7782505	NP	19	11	13	7.5	1986
Chloropyrifos	2921882	NP	0.083	0.041	0.011	0.0056	1986
Chromium (III)	16065831	P	570 D,E	74 D,E			1995
Chromium (VI)	18540299	P	16 D	11 D	1,100 D	50 D	1995
Color	—	NP	Narrative Statement—See Document				1986
Copper	7440508	P	Freshwater criteria calculated using the BLM mm - See Document		4.8 D,cc	3.1 D,cc	2007
Cyanide	57125	P	22 Q	5.2 Q	1 Q	1 Q	1985
Demeton	8065483	NP		0.1 C		0.1 C	1985
Diazinon	333415	NP	0.17ug/L	0.17ug/L	0.82ug/L	0.82ug/L	2005
Dieldrin	60571	P	0.24	0.056 O	0.71 G	0.0019 G	1995
Endrin	72208	P	0.086	0.036 O	0.037 G	0.0023 G	1995
gamma-BHC	58899	P	0.95		0.16 G		1995

Pollutant	CAS Number	P/NP*	Freshwater		Saltwater		Publication Year
			CMC[1] (acute) (µg/L)	CCC[1] (chronic) (µg/L)	CMC[1] (acute) (µg/L)	CCC[1] (chronic) (µg/L)	
(Lindane)							
Gases, Total Dissolved	—	NP	Narrative Statement—See Document C				1986
Guthion	86500	NP		0.01 C		0.01 C	1986
Hardness	—	NP	Narrative Statement—See Document				1986
Heptachlor	76448	P	0.52 G	0.0038 G	0.053 G	0.0036 G	1980
Heptachlor Epoxide	1024573	P	0.52 G,V	0.0038 G,V	0.053 G,V	0.0036 G,V	1981
Iron	7439896	NP		1000 C			1986
Lead	7439921	P	65 D,E	2.5 D,E	210 D	8.1 D	1980
Malathion	121755	NP		0.1 C		0.1 C	1986
Mercury Methylmercury	7439976 22967926	P	1.4 D,hh	0.77 D,hh	1.8 D,ee,hh	0.94 D,ee,hh	1995
Methoxychlor	72435	NP		0.03 C		0.03 C	1986
Mirex	2385855	NP		0.001 C		0.001 C	1986
Nickel	7440020	P	470 D,E	52 D,E	74 D	8.2 D	1995
Nonylphenol	84852153	NP	28ug/L	6.6ug/L	7ug/L	1.7ug/L	2005
Nutrients	—	NP	See EPA's Ecoregional criteria for Total Phosphorus, Total Nitrogen, Chlorophyll *a* and Water Clarity (Secchi depth for lakes; turbidity for streams and rivers) (& Level III Ecoregional criteria)				
Oil and Grease	—	NP	Narrative Statement—See Document C				1986
Oxygen, Dissolved Freshwater Oxygen, Dissolved Saltwater	7782447	NP	Warmwater and Coldwater Matrix—See Document Saltwater—See Document				1986
Parathion	56382	NP	0.065 I	0.013 I			1995
Pentachlorophenol	87865	P	19 F	15 F	13	7.9	1995
pH	—	NP		6.5 – 9 C		6.5 – 8.5 C,P	1986
Phosphorus Elemental	7723140	NP					1986
Polychlorinated Biphenyls (PCBs)		P		0.014 N		0.03 N	
Selenium	7782492	P	L	5.0	290 D, dd	71 D, dd	1995
Silver	7440224	P	3.2 D,E		1.9 D		1980
Solids Suspended and Turbidity	—	NP	Narrative Statement—See Document C				1986

Pollutant	CAS Number	P/NP*	Freshwater		Saltwater		Publication Year
			CMC[1] (acute) (µg/L)	CCC[1] (chronic) (µg/L)	CMC[1] (acute) (µg/L)	CCC[1] (chronic) (µg/L)	
Sulfide-Hydrogen Sulfide	7783064	NP		2.0 C		2.0 C	1986
Tainting Substances	—	NP	Narrative Statement—See Document				1986
Temperature	—	NP	Species Dependent Criteria—See Document M				1986
Toxaphene	8001352	P	0.73	0.0002	0.21	0.0002	1986
Tributyltin (TBT)	—	NP	0.46	0.072	0.42	0.0074	2004
Zinc	7440666	P	120 D,E	120 D,E	90 D	81 D	1995
4,4'-DDT	50293	P	1.1 G,ii	0.001 G, ii	0.13 G,ii	0.001 G, ii	1980

***P/NP** – Indicates either a Priority Pollutant (P) or a Non Priority Pollutant (NP).

Footnotes

A This recommended water quality criterion was derived from data for arsenic (III), but is applied here to total arsenic, which might imply that arsenic (III) and arsenic (V) are equally toxic to aquatic life and that their toxicities are additive. No data are known to be available concerning whether the toxicities of the forms of arsenic to aquatic organisms are additive. Please consult the criteria document for details.

C The derivation of this value is presented in the Red Book (EPA 440/9-76-023, July, 1976). The CCC of 20mg/L is a minimum value except where alkalinity is naturally lower, in which case the criterion cannot be lower than 25% of the natural level.

D Freshwater and saltwater criteria for metals are expressed in terms of the dissolved metal in the water column. See "Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria (PDF)," (49 pp, 3MB) October 1, 1993, by Martha G. Prothro, Acting Assistant Administrator for Water, available on NSCEP's web site and 40CFR§131.36(b)(1). Conversion Factors applied in the table can be found in Appendix A to the Preamble- Conversion Factors for Dissolved Metals.

E The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. The value given here corresponds to a hardness of 100 mg/L. Criteria values for other hardness may be calculated per the equation presented in the criteria document.

F Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH. Values displayed in table correspond to a pH of 7.8.

G This Criterion is based on 304(a) aquatic life criterion issued in 1980, and was issued in one of the following documents: Aldrin/Dieldrin (PDF) (153 pp, 7.3MB) (EPA 440/5-80-019), Chlordane (PDF) (68 pp, 3.1MB) (EPA 440/5-80-027), DDT (PDF) (175 pp, 8.3MB) (EPA 440/5-80-038), Endosulfan (PDF) (155 pp, 7.3MB) (EPA 440/5-80-046), Endrin (PDF) (103 pp, 4.6MB) (EPA 440/5-80-047), Heptachlor (PDF) (114 pp, 5.4MB) (EPA 440/5-80-052), Hexachlorocyclohexane (PDF) (109 pp, 4.8MB) (EPA 440/5-80-054),

Silver (EPA 440/5-80-071). The Minimum Data Requirements and derivation procedures were different in the 1980 Guidelines than in the 1985 Guidelines (PDF) (104 pp, 3.3MB). If evaluation is to be done using an averaging period, the acute criteria values given should be divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines.

I This value for aluminum is expressed in terms of total recoverable metal in the water column.

J This value was derived using the GLI Guidelines (60 FR 15393-15399, March 23, 1995; 40CFR132 Appendix A); the differences between the 1985 Guidelines and the GLI Guidelines are explained on page iv of the 1995 Updates. No decision concerning this criterion was affected by any considerations that are specific to the Great Lakes.

L The CMC = 1/[(f1/CMC1) + (f2/CMC2)] where f1 and f2 are the fractions of total selenium that are treated as selenite and selenate, respectively, and CMC1 and CMC2 are 185.9 ug/l and 12.82 ug/l, respectively.

M U.S. EPA. 1973. Water Quality Criteria 1972. EPA-R3-73-033. National Technical Information Service, Springfield, VA.; U.S. EPA. 1977. Temperature Criteria for Freshwater Fish: Protocol and Procedures. EPA 600/3-77-061. National Technical Information Service, Springfield, VA.

N This criterion applies to total PCBs, (e.g., the sum of all congener or all isomer or homolog or Aroclor analyses.)

O The derivation of the CCC for this pollutant (Endrin) did not consider exposure through the diet, which is probably important for aquatic life occupying upper trophic levels.

P According to page 181 of the Red Book:

For open ocean waters where the depth is substantially greater than the euphotic zone, the pH should not be changed more than 0.2 units from the naturally occurring variation or any case outside the range of 6.5 to 8.5. For shallow, highly productive coastal and estuarine areas where naturally occurring pH variations approach the lethal limits of some species, changes in pH should be avoided but in any case should not exceed the limits established for fresh water, i.e., 6.5-9.0.

Q This recommended water quality criterion is expressed as ug free cyanide (as CN)/L.

S There are three major reasons why the use of Water-Effect Ratios might be appropriate.

1. The value of 87 µg/l is based on a toxicity test with the striped bass in water with pH = 6.5–6.6 and hardness <10 mg/L. Data in "Aluminum Water-Effect Ratio for the 3M Plant Effluent Discharge, Middleway, West Virginia" (May 1994) indicate that aluminum is substantially less toxic at higher pH and hardness, but the effects of pH and hardness are not well quantified at this time.
2. In tests with the brook trout at low pH and hardness, effects increased with increasing concentrations of total aluminum even though the concentration of dissolved aluminum was constant, indicating that total recoverable is a more appropriate measurement than dissolved, at least when particulate aluminum is primarily aluminum hydroxide particles. In surface waters,

however, the total recoverable procedure might measure aluminum associated with clay particles, which might be less toxic than aluminum associated with aluminum hydroxide.

3. EPA is aware of field data indicating that many high quality waters in the U.S. contain more than 87 g aluminum/L, when either total recoverable or dissolved is measured.

V This value was derived from data for heptachlor and the criteria document provides insufficient data to estimate the relative toxicities of heptachlor and heptachlor epoxide.

Y This value was derived from data for endosulfan and is most appropriately applied to the sum of alpha-endosulfan and beta-endosulfan.

cc When the concentration of dissolved organic carbon is elevated, copper is substantially less toxic and use of Water-Effect Ratios might be appropriate.

dd The selenium criteria document (EPA 440/5-87-006, September 1987) provides that if selenium is as toxic to saltwater fishes in the field as it is to freshwater fishes in the field, the status of the fish community should be monitored whenever the concentration of selenium exceeds 5.0 µg/L in salt water because the saltwater CCC does not take into account uptake via the food chain.

ee This recommended water quality criterion was derived on page 43 of the mercury criteria document (PDF) (144 pp, 6.4MB) (EPA 440/5-84-026, January 1985). The saltwater CCC of 0.025 ug/L given on page 23 of the criteria document is based on the Final Residue Value procedure in the 1985 Guidelines. Since the publication of the Great Lakes Aquatic Life Criteria Guidelines in 1995 (60 FR 15393-15399, March 23, 1995), the Agency no longer uses the Final Residue Value procedure for deriving CCCs for new or revised 304(a) aquatic life criteria.

hh This recommended water quality criterion was derived from data for inorganic mercury (II), but is applied here to total mercury. If a substantial portion of the mercury in the water column is methylmercury, this criterion will probably be under protective. In addition, even though inorganic mercury is converted to methylmercury and methylmercury bioaccumulates to a great extent, this criterion does not account for uptake via the food chain because sufficient data were not available when the criterion was derived.

ii This criterion applies to DDT and its metabolites (i.e., the total concentration of DDT and its metabolites should not exceed this value).

mm The available toxicity data, when evaluated using the procedures described in the "Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses" indicate that freshwater aquatic life should be protected if the 24-hour average and four-day average concentrations do not respectively exceed the acute and chronic criteria concentrations calculated by the Biotic Ligand Model.

B.4 National Recommended Water Quality Criteria for Human Health Protection

Pollutant	CAS Number	P/NP*	Human Health for the consumption of		Publication Year
			Water + Organism (µg/L)	Organism Only (µg/L)	
Acenaphthene	83329	P	670 B,U	990 B,U	2002
Acrolein	107028	P	6 ll	9 ll	2009
Acrylonitrile	107131	P	0.051 B,C	0.25 B,C	2002
Aldrin	309002	P	0.000049 B,C	0.000050 B,C	2002
alpha-BHC	319846	P	0.0026 B,C	0.0049 B,C	2002
alpha-Endosulfan	959988	P	62 B	89 B	2002
Anthracene	120127	P	8,300 B	40,000 B	2002
Antimony	7440360	P	5.6 B	640 B	2002
Arsenic	7440382	P	0.018 C,M,S	0.14 C,M,S	1992
Asbestos	1332214	P	7 million fibers/L I		1991
Barium	7440393	NP	1,000 A		1986
Benzene	71432	P	2.2 B,C	51 B,C	2002
Benzidine	92875	P	0.000086 B,C	0.00020 B,C	2002
Benzo(a) Anthracene	56553	P	0.0038 B,C	0.018 B,C	2002
Benzo(a) Pyrene	50328	P	0.0038 B,C	0.018 B,C	2002
Benzo(b) Fluoranthene	205992	P	0.0038 B,C	0.018 B,C	2002
Benzo(k) Fluoranthene	207089	P	0.0038 B,C	0.018 B,C	2002
Beryllium	7440417	P	Z		
beta-BHC	319857	P	0.0091 B,C	0.017 B,C	2002
beta-Endosulfan	33213659	P	62 B	89 B	2002
Bis(2-Chloroethyl) Ether	111444	P	0.030 B,C	0.53 B,C	2002
Bis(2-Chloroisopropyl) Ether	108601	P	1,400 B	65,000 B	2002
Bis(2-Ethylhexyl) Phthalate[X]	117817	P	1.2 B,C	2.2 B,C	2002
Bromoform	75252	P	4.3 B,C	140 B,C	2002
Butylbenzyl Phthalate[W]	85687	P	1,500 B	1,900 B	2002
Cadmium	7440439	P	Z		
Carbon Tetrachloride	56235	P	0.23 B,C	1.6 B,C	2002
Chlordane	57749	P	0.00080 B,C	0.00081 B,C	2002
Chlorobenzene	108907	P	130 Z,U	1,600 U	2003

Pollutant	CAS Number	P/NP*	Human Health for the consumption of		Publication Year
			Water + Organism (µg/L)	Organism Only (µg/L)	
Chlorodibromomethane	124481	P	0.40 B,C	13 B,C	2002
Chloroform	67663	P	5.7 C,P	470 C,P	2002
Chlorophenoxy Herbicide (2,4-D)	94757	NP	100 Z		1986
Chromium (III)	16065831	P	Z Total		
Chromium (VI)	18540299	P	Z Total		
Chrysene	218019	P	0.0038 B,C	0.018 B,C	2002
Copper	7440508	P	1,300 U		1992
Cyanide	57125	P	140 jj	140 jj	2003
Dibenzo(a,h)Anthracene	53703	P	0.0038 B,C	0.018 B,C	2002
Dichlorobromomethane	75274	P	0.55 B,C	17 B,C	2002
Dieldrin	60571	P	0.000052 B,C	0.000054 B,C	2002
Diethyl Phthalate[W]	84662	P	17,000 B	44,000 B	2002
Dimethyl Phthalate[W]	131113	P	270,000	1,100,000	2002
Di-n-Butyl Phthalate[W]	84742	P	2,000 B	4,500 B	2002
Dinitrophenols	25550587	NP	69	5300	2002
Endosulfan Sulfate	1031078	P	62 B	89 B	2002
Endrin	72208	P	0.059	0.060	2003
Endrin Aldehyde	7421934	P	0.29 B	0.30 B,H	2002
Ether, Bis(Chloromethyl)	542881	NP	0.00010 C	0.00029 C	2002
Ethylbenzene	100414	P	530	2,100	2003
Fluoranthene	206440	P	130 B	140 B	2002
Fluorene	86737	P	1,100 B	5,300 B	2002
gamma-BHC (Lindane)	58899	P	0.98	1.8	2003
Heptachlor	76448	P	0.000079 B,C	0.000079 B,C	2002
Heptachlor Epoxide	1024573	P	0.000039 B,C	0.000039 B,C	2002
Hexachlorobenzene	118741	P	0.00028 B,C	0.00029 B,C	2002
Hexachlorobutadiene	87683	P	0.44 B,C	18 B,C	2002
Hexachlorocyclo-hexane-Technical	608731		0.0123 H	0.0414H	
Hexachlorocyclopentadiene	77474	P	40 U	1,100 U	2003
Hexachloroethane	67721	P	1.4 B,C	3.3 B,C	2002
Ideno(1,2,3-cd)Pyrene	193395	P	0.0038 B,C	0.018 B,C	2002

Pollutant	CAS Number	P/NP*	Human Health for the consumption of		Publication Year
			Water + Organism (µg/L)	Organism Only (µg/L)	
Isophorone	78591	P	35 B,C	960 B,C	2002
Manganese	7439965	NP	50 O	100 A	
Methylmercury	22967926	P		0.3 mg/kg J	2001
Methoxychlor	72435	NP	100 A,Z		1986
Methyl Bromide	74839	P	47 B	1,500 B	2002
Methylene Chloride	75092	P	4.6 B,C	590 B,C	2002
Nickel	7440020	P	610 B	4,600 B	1998
Nitrates	14797558	NP	10,000 A		1986
Nitrobenzene	98953	P	17 B	690 B,H,U	2002
Nitrosamines	—	NP	0.0008	1.24	1980
Nitrosodibutylamine, N	924163	NP	0.0063 C	0.22 C	2002
Nitrosodiethylamine, N	55185	NP	0.0008 C	1.24 C	2002
Nitrosopyrrolidine, N	930552	NP	0.016 C	34 C	2002
N-Nitrosodimethylamine	62759	P	0.00069 B,C	3.0 B,C	2002
N-Nitrosodi-n-Propylamine	621647	P	0.0050 B,C	0.51 B,C	2002
N-Nitrosodiphenylamine	86306	P	3.3 B,C	6.0 B,C	2002
Nutrients	—	NP	See EPA's Ecoregional criteria for Total Phosphorus, Total Nitrogen, Chlorophyll *a* and Water Clarity (Secchi depth for lakes; turbidity for streams and rivers) (& Level III Ecoregional criteria)		
Pentachlorobenzene	608935	NP	1.4 E	1.5 E	2002
Pentachlorophenol	87865	P	0.27 B,C	3.0 B,C,H	2002
pH	—	NP	5 – 9		1986
Phenol	108952	P	10,000 II,U	860,000 II,U	2009
Polychlorinated Biphenyls (PCBs)		P	0.000064 B,C,N	0.000064 B,C,N	2002
Pyrene	129000	P	830 B	4,000 B	2002
Selenium	7782492	P	170 Z	4200	2002
Solids Dissolved and Salinity	—	NP	250,000 A		1986
Tetrachlorobenzene,1,2,4,5-	95943	NP	0.97 B	1.1 B	2002
Tetrachloroethylene	127184	P	0.69 C	3.3 C	2002
Thallium	7440280	P	0.24	0.47	2003
Toluene	108883	P	1,300 Z	15,000	2003
Toxaphene	8001352	P	0.00028 B,C	0.00028 B,C	2002

Pollutant	CAS Number	P/NP*	Human Health for the consumption of		Publication Year
			Water + Organism (µg/L)	Organism Only (µg/L)	
Trichloroethylene	79016	P	2.5 C	30 C	2002
Trichlorophenol,2,4,5-	95954	NP	1,800 B	3,600 B	2002
Vinyl Chloride	75014	P	0.025 C,kk	2.4 C,kk	2003
Zinc	7440666	P	7,400 U	26,000 U	2002
1,1,1-Trichloroethane	71556	P	Z		
1,1,2,2-Tetrachloroethane	79345	P	0.17 B,C	4.0 B,C	2002
1,1,2-Trichloroethane	79005	P	0.59 B,C	16 B,C	2002
1,1-Dichloroethylene	75354	P	330	7,100	2003
1,2,4-Trichlorobenzene	120821	P	35	70	2003
1,2-Dichlorobenzene	95501	P	420	1,300	2003
1,2-Dichloroethane	107062	P	0.38 B,C	37 B,C	2002
1,2-Dichloropropane	78875	P	0.50 B,C	15 B,C	2002
1,2-Diphenylhydrazine	122667	P	0.036 B,C	0.20 B,C	2002
1,2-Trans-Dichloroethylene	156605	P	140 Z	10,000	2003
1,3-Dichlorobenzene	541731	P	320	960	2002
1,3-Dichloropropene	542756	P	0.34 C	21 C	2003
1,4-Dichlorobenzene	106467	P	63	190	2003
2,3,7,8-TCDD (Dioxin)	1746016	P	5.0E-9 C	5.1E-9 C	2002
2,4,6-Trichlorophenol	88062	P	1.4 B,C	2.4 B,C,U	2002
2,4-Dichlorophenol	120832	P	77 B,U	290 B,U	2002
2,4-Dimethylphenol	105679	P	380 B	850 B,U	2002
2,4-Dinitrophenol	51285	P	69 B	5,300 B	2002
2,4-Dinitrotoluene	121142	P	0.11 C	3.4 C	2002
2-Chloronaphthalene	91587	P	1,000 B	1,600 B	2002
2-Chlorophenol	95578	P	81 B,U	150 B,U	2002
2-Methyl-4,6-Dinitrophenol	534521	P	13	280	2002
3,3'-Dichlorobenzidine	91941	P	0.021 B,C	0.028 B,C	2002
3-Methyl-4-Chlorophenol	59507	P	U	U	
4,4'-DDD	72548	P	0.00031 B,C	0.00031 B,C	2002
4,4'-DDE	72559	P	0.00022 B,C	0.00022 B,C	2002
4,4'-DDT	50293	P	0.00022 B,C	0.00022 B,C	2002

***P/NP** – Indicates either a Priority Pollutant (P) or a Non Priority Pollutant (NP).

Footnotes

A This human health criterion is the same as originally published in the Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value is now published in the Gold Book.

B This criterion has been revised to reflect The Environmental Protection Agency's q1* or RfD, as contained in the Integrated Risk Information System (IRIS) as of May 17, 2002. The fish tissue bioconcentration factor (BCF) from the 1980 Ambient Water Quality Criteria document used to derive the original criterion was retained in each case.

C This criterion is based on carcinogenicity of 10^{-6} risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10^{-5}, move the decimal point in the recommended criterion one place to the right).

D According to the procedures described in the *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, except possibly where a very sensitive species is important at a site, freshwater aquatic life should be protected if both conditions specified in Appendix C to the Preamble- Calculation of Freshwater Ammonia Criterion are satisfied.

F The derivation of this value is presented in the Red Book (EPA 440/9-76-023, July, 1976).

H No criterion for protection of human health from consumption of aquatic organisms excluding water was presented in the 1980 criteria document or in the *1986 Quality Criteria for Water*. Nevertheless, sufficient information was presented in the 1980 document to allow the calculation of a criterion, even though the results of such a calculation were not shown in the document.

I This criterion for asbestos is the Maximum Contaminant Level (MCL) developed under the Safe Drinking Water Act (SDWA).

J This fish tissue residue criterion for methylmercury is based on a total fish consumption rate of 0.0175 kg/day.

M EPA is currently reassessing the criteria for arsenic.

N This criterion applies to total pcbs, (e.g., the sum of all congener or all isomer or homolog or Aroclor analyses.)

O This criterion for manganese is not based on toxic effects, but rather is intended to minimize objectionable qualities such as laundry stains and objectionable tastes in beverages.

P Although a new RfD is available in IRIS, the surface water criteria will not be revised until the National Primary Drinking Water Regulations: Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) is completed, since public comment on the relative source contribution (RSC) for chloroform is anticipated.

R U.S. EPA. 1973. Water Quality Criteria 1972. EPA-R3-73-033. National Technical Information Service, Springfield, VA.; U.S. EPA. 1977. Temperature Criteria for Freshwater Fish: Protocol and Procedures. EPA 600/3-77-061. National Technical Information Service, Springfield, VA.

S This recommended water quality criterion for arsenic refers to the inorganic form only.

T U.S. EPA. 1986. Ambient Water Quality Criteria for Dissolved Oxygen. EPA 440/5-86-003. National Technical Information Service, Springfield, VA.

U The organoleptic effect criterion is more stringent than the value for priority toxic pollutants.

Z A more stringent Maximum Contaminant Level (MCL) has been issued by EPA under the Safe Drinking Water Act. Refer to drinking water regulations 40CFR141 or Safe Drinking Water Hotline (1-800-426-4791) for values.

jj This recommended water quality criterion is expressed as total cyanide, even though the IRIS RFD we used to derive the criterion is based on free cyanide. The multiple forms of cyanide that are present in ambient water have significant differences in toxicity due to their differing abilities to liberate the CN-moiety. Some complex cyanides require even more extreme conditions than refluxing with sulfuric acid to liberate the CN-moiety. Thus, these complex cyanides are expected to have little or no 'bioavailability' to humans. If a substantial fraction of the cyanide present in a water body is present in a complexed form (e.g., $Fe_4[Fe(CN)_6]_3$), this criterion may be over conservative.

kk This recommended water quality criterion was derived using the cancer slope factor of 1.4 (LMS exposure from birth).

ll This criterion has been revised to reflect the Environmental Protection Agency's cancer slope factor (CSF) or reference dose (RfD), as contained in the Integrated Risk Information System (IRIS) as of (date of publication of Final FR Notice). The fish tissue bioconcentration factor (BCF) from the 1980 Ambient Water Quality Criteria document was retained in each case.

B.5 Ecology Sediment Standards that Apply to Puget Sound Marine Sediments:

CHEMICAL PARAMETER	Sediment Quality Standards WAC 173-204-320 (a)	Sediment Impact Zone Maximum Level, WAC 173-204-420 (a); and Sediment Cleanup Screening Level/Minimum Cleanup Level, WAC 173-204-520 (a)
	MG/KG DRY WEIGHT (PARTS PER MILLION (PPM) DRY)	MG/KG DRY WEIGHT (PARTS PER MILLION (PPM) DRY)
ARSENIC	57	93
CADMIUM	5.1	6.7
CHROMIUM	260	270
COPPER	390	390
LEAD	450	530
MERCURY	0.41	0.59
SILVER	6.1	6.1
ZINC	410	960
	MG/KG ORGANIC CARBON (c) (PPM CARBON)	MG/KG ORGANIC CARBON (c) (PPM CARBON)
LPAH (b,d)	370	780
NAPHTHALENE	99	170
ACENAPHTHYLENE	66	66
ACENAPHTHENE	16	57
FLUORENE	23	79
PHENANTHRENE	100	480
ANTHRACENE	220	1200
2-METHYLNAPHTHALENE	38	64
HPAH (b,e)	960	5300
FLUORANTHENE	160	1200
PYRENE	1,000	1400
BENZ(A)ANTHRACENE	110	270
CHRYSENE	110	460
TOTAL BENZOFLUORANTHENES (b,f)	230	450
BENZO(A)PYRENE	99	210
INDENO (1,2,3,-C,D) PYRENE	34	88
DIBENZO (A,H) ANTHRACENE	12	33
BENZO(G,H,I)PERYLENE	31	78

CHEMICAL PARAMETER	Sediment Quality Standards WAC 173-204-320 (a)	Sediment Impact Zone Maximum Level, WAC 173-204-420 (a); and Sediment Cleanup Screening Level/Minimum Cleanup Level, WAC 173-204-520 (a)
	MG/KG DRY WEIGHT (PARTS PER MILLION (PPM) DRY)	MG/KG DRY WEIGHT (PARTS PER MILLION (PPM) DRY)
1,2-DICHLOROBENZENE	2.3	2.3
1,4-DICHLOROBENZENE	3.1	9
1,2,4-TRICHLOROBENZENE	0.81	1.8
HEXACHLOROBENZENE	0.38	2.3
DIMETHYL PHTHALATE	53	53
DIETHYL PHTHALATE	61	110
DI-N-BUTYL PHTHALATE	220	1700
BUTYL BENZYL PHTHALATE	4.9	64
BIS (2-ETHYLHEXYL) PHTHALATE	47	78
DI-N-OCTYL PHTHALATE	58	4500
DIBENZOFURAN	15	58
HEXACHLOROBUTADIENE	3.9	6.2
N-NITROSODIPHENYLAMINE	11	11
TOTAL PCBs (b)	12	65
	UG/KG DRY WEIGHT (PARTS PER BILLION (PPB) DRY)	UG/KG DRY WEIGHT (PARTS PER BILLION (PPB) DRY)
PHENOL	420	1200
2-METHYLPHENOL	63	63
4-METHYLPHENOL	670	670
2,4-DIMETHYL PHENOL	29	29
PENTACHLOROPHENOL	360	690
BENZYL ALCOHOL	57	73
BENZOIC ACID	650	650

Table Notes:

(a) Where laboratory analysis indicates a chemical is not detected in a sediment sample, the detection limit shall be reported and shall be at or below the Marine Sediment Quality Standards chemical criteria value set in this table.

(b) Where chemical criteria in this table represent the sum of individual compounds or isomers, the following methods shall be applied:

(i) Where chemical analyses identify an undetected value for every individual compound/isomer then the single highest detection limit shall represent the sum of the respective compounds/isomers; and

(ii) Where chemical analyses detect one or more individual compound/isomers, only the detected concentrations will be added to represent the group sum.

(c) The listed chemical parameter criteria represent concentrations in parts per million, "normalized," or expressed, on a total organic carbon basis. To normalize to total organic carbon, the dry weight concentration for each parameter is divided by the decimal fraction representing the percent total organic carbon content of the sediment.

(d) The LPAH criterion represents the sum of the following "low molecular weight polynuclear aromatic hydrocarbon" compounds: Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, and Anthracene. The LPAH criterion is not the sum of the criteria values for the individual LPAH compounds as listed.

(e) The HPAH criterion represents the sum of the following "high molecular weight polynuclear aromatic hydrocarbon" compounds: Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Total Benzofluoranthenes, Benzo(a)pyrene, Indeno(1,2,3,-c,d)pyrene, Dibenzo(a,h)anthracene, and Benzo(g,h,i)perylene. The HPAH criterion is not the sum of the criteria values for the individual HPAH compounds as listed.

(f) The TOTAL BENZOFLUORANTHENES criterion represents the sum of the concentrations of the "B," "J," and "K" isomers.

B.6 Proposed Plan Preliminary Remediation Goals (PRGs) for Sediment and Fish Tissue

Tables directly from EPA (2013).

Table 8. Sediment PRGs for PCBs, Arsenic, cPAHs, and Dioxins/Furans for Human Health and Ecological COCs

COC	Preliminary Remediation Goals				
	RAO 1: Human Seafood Consumption	RAO 2: Human Direct Contact	RAO 4: Ecological (River Otter)	Basis	Spatial Scale of PRG Application
PCBs (µg/kg dw)	2	1,300	128 - 159	background (RAO 1) RBTC (RAO 2) RBTC (RAO 4)	LDW-wide
	n/a	500	n/a	RBTC	Clamming Areas
	n/a	1,700	n/a	RBTC	Individual Beaches
Arsenic (mg/kg dw)	n/a	7	n/a	background	LDW-wide
	n/a	7	n/a	background	Clamming Areas
	n/a	7	n/a	background	Individual Beaches
cPAH (µg TEQ/kg dw)	n/a	380	n/a	RBTC	LDW-wide
	n/a	150	n/a	RBTC	Clamming Areas
	n/a	90	n/a	RBTC	Individual Beaches
Dioxins/Furans (ng TEQ/kg dw)	2	37	n/a	background (RAO 1) RBTC (RAO 2)	LDW-wide
	n/a	13	n/a	RBTC	Clamming Areas
	n/a	28	n/a	RBTC	Individual Beaches

RBTC - Risk-based threshold concentration (based on 1 in 1,000,000 excess cancer risk or HQ of 1)

Background - see Table 3 in Section 3.6.1

Table 9. Sediment PRGs for Ecological (Benthic Invertebrate) COCs

Benthic COC	Preliminary Remediation Goals for RAO 3		Benthic COC	Preliminary Remediation Goals for RAO 3	
	Value	Basis		Value	Basis
SMS metals , (mg/kg dw)			***OC-normalized SMS Organic Compounds (continued) (mg/kg OC)***		
Arsenic	57	SQS	Benzo(g,h,i)perylene	31	SQS
Cadmium	5.1	SQS	Chrysene	110	SQS
Chromium	260	SQS	Dibenz(a,h)anthracene	12	SQS
Copper	390	SQS	Indeno(1,2,3-cd)pyrene	34	SQS
Lead	450	SQS	Fluoranthene	160	SQS
Mercury	0.41	SQS	Fluorene	23	SQS
Silver	6.1	SQS	Naphthalene	99	SQS
Zinc	410	SQS	Phenanthrene	100	SQS
Dry Weight Basis SMS Organic Compounds, (µg/kg dw)			Pyrene	1,000	SQS
4-methylphenol	670	SQS	HPAH	960	SQS
2,4-dimethylphenol	29	SQS	LPAH	370	SQS
Benzoic acid	650	SQS	Bis(2-ethylhexyl)phthalate	47	SQS
Benzyl alcohol	57	SQS	Butyl benzyl phthalate	4.9	SQS
Pentachlorophenol	360	SQS	Dimethyl phthalate	53	SQS
Phenol	420	SQS	1,2-dichlorobenzene	2.3	SQS
OC-normalized SMS Organic Compounds, (mg/kg OC)			1,4-dichlorobenzene	3.1	SQS
PCBs	12	SQS	1,2,4-trichlorobenzene	0.81	SQS
Acenaphthene	16	SQS	2-methylnaphthalene	38	SQS
Anthracene	220	SQS	Dibenzofuran	15	SQS
Benzo(a)pyrene	99	SQS	Hexachlorobenzene	0.38	SQS
Benz(a)anthracene	110	SQS	n-Nitrosodiphenylamine	11	SQS
Total benzofluoranthenes	230	SQS			

Table 10. LDW Resident Fish and Shellfish Tissue PRGs

Species/Group and Tissue Type	Species[a,b]	PRG	Source of PRG
PCBs (µg/kg ww)			
Benthic fish, fillet	English sole	12	background
Pelagic fish, whole body	Perch	1.8	RBTC
Crab, edible meat	Dungeness crab	1.1	background
Crab, whole body	Dungeness crab	9.1	background
Clams	Eastern softshell clam	0.42	background
Inorganic arsenic (mg/kg ww)			
Clams	Eastern softshell clam	0.09	background
cPAH TEQ (µg/kg ww)			
Clams	Eastern softshell clam	0.24	RBTC
Dioxin/furan TEQ (ng/kg ww)			
Benthic fish, whole body	English sole	0.35	background
Crab, edible meat	Dungeness crab	0.53	background
Crab, whole body	Dungeness crab	2.0	background
Clams	Eastern softshell clam	0.71	background

a Substitutions of similar species may be made if sufficient numbers of the species listed here are not available.

b Background - see Table 5 in Section 3.6.2

B.7 Ecology Freshwater Sediment Chemical Criteria (Sediment Management Standards [WAC 173-204-563, Table VI]):

Table VI

Freshwater Sediment Cleanup Objectives and Cleanup Screening Levels Chemical Criteria

Chemical Parameter	Dry Weight Sediment Cleanup Objective	Dry Weight Cleanup Screening Level
Conventional chemicals (mg/kg)		
Ammonia	230	300
Total sulfides	39	61
Metals (mg/kg)		
Arsenic	14	120
Cadmium	2.1	5.4
Chromium	72	88
Copper	400	1200
Lead	360	> 1300
Mercury	0.66	0.8
Nickel	26	110
Selenium	11	> 20
Silver	0.57	1.7
Zinc	3200	> 4200
Organic chemicals (µg/kg)		
4-Methylphenol	260	2000
Benzoic acid	2900	3800
Beta-Hexachlorocyclohexane	7.2	11
Bis(2-ethylhexyl) phthalate	500	22000
Carbazole	900	1100
Dibenzofuran	200	680
Dibutyltin	910	130000
Dieldrin	4.9	9.3
Di-n-butyl phthalate	380	1000
Di-n-octyl phthalate	39	> 1100
Endrin Ketone	8.5	> 8.5
Monobutyltin	540	> 4800
Pentachlorophenol	1200	> 1200
Phenol	120	210
Tetrabutyltin	97	> 97
Total PCB Aroclors	110	2500
Total DDDs	310	860
Total DDEs	21	33
Total DDTs	100	8100
Total PAHs	17000	30000
Tributyltin	47	320
Bulk Petroleum Hydrocarbons (mg/kg)		
Total Petroleum Hydrocarbon (TPH) -Diesel	340	510
Total Petroleum Hydrocarbon (TPH) - Residual	3600	4400

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