TABLES

Table 1. Summary of Information Included in the Phase IV Sediment Quality Database

Parameter	Number of Records
Sediment Chemistry	97,155
Sediment Toxicity	1,464
Benthic Invertebrate Community (mean values)	19,396
Benthic Invertebrate Community (replicates)	59,642
Sample Tissue (plants/fish/invertebrates)	446
Tissue Chemistry	12,506
Mean Probable Effect Concentration Quotients (PEC-Qs)	2,135
Sample Information	3,447
Station Information	1,635
Sediment Studies	59

Table 2. Number of Samples of the Most Common Sediment Quality Indicators Available in the Phase IV Sediment Quality Database

Study Name	Study ID	# of Sediment Chemistry Samples	# of Sediment Toxicity Samples	# of Benthic Invert. Community Samples
Assessment Study of Slip C, 1997	10	51	0	0
Bay West Intlk Reconnaissance 2001	45	34	0	0
Bay West Intlk Supplemental 2001	44	44	28	0
Benthic Data Newton Creek, July 2002	61	0	0	6
Benthic Data Newton Creek, October 2002	60	0	0	6
Benthic Data Newton Creek, October 2003	59	0	0	6
Bioaccumulation Study, 1999	17	6	11	0
Chlorinated Bornane/Bornene Study, 1999	15	44	0	0
Cloquet Reservoirs Study, 1992-93	19	170	8	0
Dakota Pier Samples, 1998	12	8	0	0
Duluth Superfund Sites, 1993	02	40	4	0
Duluth-Superior Harbor Study, 1993	20	165	45	0
Duluth-Superior Harbor Study, 1995	28	8	0	0
Duluth-Superior Harbor Study, 2002	27	7	8	0
ENSR Mercury Study, 1995	18	56	0	0
Fond du Lac Reservation Lakes Phase 1 2000	47	103	8	0
Fond du Lac Reservation Lakes Phase 2 2002	48	20	5	0

Table 2. Continued

Study Name	Study ID	# of Sediment Chemistry Samples	# of Sediment Toxicity Samples	# of Benthic Invert. Community Samples
Fraser Shipyards/Howard's Pocket, 2002	31	16	0	0
Hog Island Inlet Study, 2002	29	23	5	4
Hog Island Inlet/Newton Creek 2004	57	74	0	0
Hotspot Study, 1994	05	219	43	80
IT Interlake Toxicity study, 1996	34	15	16	12
IT Interlake, 1993	35	22	0	0
IT Interlake, 1994	36	1	0	0
IT Interlake, 1996	37	54	0	0
IT Interlake, 1997	38	6	0	0
IT Interlake, 1998	39	26	0	0
IT Interlake, 1999	40	656	0	0
Koppers Industries Study, 1999	32	191	0	0
Lakehead Dock, 1995	01	2	2	0
LIF Study at USS Duluth Works, 2002	16	20	0	0
Minnesota Slip MPCA 2004	52	14	0	0
Minnesota Slip Samples, 1998	11	9	0	0
Minnesota Slip Sediment Remediation Scoping, 1999	09	100	9	0

Table 2. Continued

Study Name	Study ID	# of Sediment Chemistry Samples	# of Sediment Toxicity Samples	# of Benthic Invert. Community Samples
Nemadji Shoal, 2001	21	5	6	0
Newton Creek Segments B and C 2000	62	14	12	5
Newton Creek Study, 1993-94	33	247	0	0
Newton Creek Study, 2002	30	15	0	0
PBDE Study, 2001	14	1	0	0
Reference sites, 2001	46	20	0	0
R-EMAP Study, 1995	04	156	157	140
R-EMAP Study, 1996	06	33	41	30
Service Intlk WPIII, 2001	43	256	0	0
Service Intlk WPIIIA, 2001	42	100	0	0
Service Intlk, 2000	41	17	0	0
SLRIDT Reference Sites SEG 2004	51	31	0	0
SLRIDT Stryker Bay-Slip 7 SEG 2003-04	50	52	0	0
St. Louis Harbor Study, 1994	07	5	5	0
Toxaphene Study, 1996	13	10	0	0

Table 2. Continued

Study Name	Study ID	# of Sediment Chemistry Samples	# of Sediment Toxicity Samples	# of Benthic Invert. Community Samples
USACE DACW35-91-D-0001 DELIVERY ORDER 40	26	8	0	0
USACE DACW35-93-D-0005 DELIVERY ORDER 16	25	8	0	0
USACE DACW35-93-D-0005 DELIVERY ORDER 29	24	56	0	0
USACE DACW35-93-D-0005 DELIVERY ORDER 36	23	16	0	0
USACE DACW35-95-D-0002 DELIVERY ORDER 28	22	5	0	0
USS Superfund Site, MPCA 2003	55	16	0	0
USS Superfund Site, URS 2003	54	41	0	0
WI Coastal Harbor Study, 1992	08	4	5	0

Abbreviations: Intlk = Interlake; Invert. = invertebrate; IT = International Technology; LIF = laser-induced fluorescence; MPCA = Minnesota Pollution Control Agency; PBDE = polybrominated diphenyl ethers; R-EMAP = Regional Environmental Monitoring and Assessment Program; SEG = segment; SLRIDT = St. Louis River Interlake/Duluth Tar; USACE = U.S. Army Corps of Engineers; USS = U.S. Steel; and WI = Wisconsin.

Table 3. Number of Stations for Each Location in the Phase IV Sediment Quality Database

Area	Location Description	Station Count
Allouez Bay	Allouez Bay	14
Allouez Bay	Bear Creek	3
Duluth Harbor	Boat slip adjacent to Slip C	3
Duluth Harbor	Dakota Pier	4
Duluth Harbor	Duluth Harbor Basin	21
Duluth Harbor	Minnesota Slip	45
Duluth Harbor	Slip C	40
Duluth Harbor/Superior Bay	Duluth Harbor Basin/Superior Bay	1
Lower St. Louis River	Fond du Lac Creek	1
Lower St. Louis River	Fond du Lac Reservoir	31
Lower St. Louis River	Forbay Reservoir	6
Lower St. Louis River	Indian Point Bay	26
Lower St. Louis River	Interlake/Duluth Tar Superfund Site (Slip 7)	246
Lower St. Louis River	Interlake/Duluth Tar Superfund Site (Stryker Bay)	179
Lower St. Louis River	Kimball's Bay	15
Lower St. Louis River	Kingsbury Bay	8
Lower St. Louis River	Lower St. Louis River	91
Lower St. Louis River	North Bay	14
Lower St. Louis River	Pokegama Bay	6
Lower St. Louis River	Posey Island	1
Lower St. Louis River	Spirit Lake	18
Lower St. Louis River	St. Louis River Bay	1
Lower St. Louis River	Stoney Brook	1
Lower St. Louis River	Stryker Bay	2
Lower St. Louis River	Tallas Island Bay	13
Lower St. Louis River	Thomson Reservoir	29
Lower St. Louis River	Unknown	1
Lower St. Louis River	USS Superfund Site	64

Table 3. Continued

Area	Location Description	Station Count
Lower St. Louis River watershed	Big Lake	10
Lower St. Louis River watershed	Crystal Creek	1
Lower St. Louis River watershed	Deadfish Lake	7
Lower St. Louis River watershed	Joe Martin Lake	9
Lower St. Louis River watershed	Joker Creek	1
Lower St. Louis River watershed	Keene Creek/Slip 7	1
Lower St. Louis River watershed	Lake Superior	9
Lower St. Louis River watershed	Lost Lake	9
Lower St. Louis River watershed	Midway River	2
Lower St. Louis River watershed	Pat Martin Lake	7
Lower St. Louis River watershed	Perch Lake	18
Lower St. Louis River watershed	Rice Portage Lake	9
Lower St. Louis River watershed	Ridge Rd Creek	1
Lower St. Louis River watershed	Simian Creek	1
Lower St. Louis River watershed	Simian Lake	8
Lower St. Louis River watershed	Sofie Lake	6
Lower St. Louis River watershed	Third Lake	6
Lower St. Louis River watershed	Unnamed tributary just downstream of Potlatch dam	1
Lower St. Louis River watershed	West Twin Lake	13
NA	NA	28
Negative Control	Control sample - West Bearskin	2
Negative Control	Negative Control	32
Negative Control	West Bearskin (reference)	2
Nemadji River	Allouez Duck Pond	4
Nemadji River	Koppers Industries Inc. Site (Crawford Creek)	37
Nemadji River	Koppers Industries Inc. Site (Outfall 001 Ditch)	7
Reference	Reference	1
St. Louis Bay	Cross Channel	7
St. Louis Bay	Duluth Harbor Basin	1
St. Louis Bay	Erie Pier	8

Table 3. Continued

Area	Location Description	Station Count
St. Louis Bay	Grassy Point	1
St. Louis Bay	Grassy Point / Hibbard Plant Embayment	15
St. Louis Bay	Howard's Bay	42
St. Louis Bay	South of DM & IR Taconite Storage Facility	9
St. Louis Bay	St. Louis Bay	33
St. Louis Bay	Unknown	2
St. Louis Bay	WLSSD, Miller Creek & Coffee Creek Embayment	49
Superior Bay	Central Park Creek	4
Superior Bay	City of Superior WWTP	12
Superior Bay	East Gate Basin	6
Superior Bay	Hog Island Inlet	29
Superior Bay	Hog Island Inlet/Newton Creek	197
Superior Bay	Superior Bay	103
Superior Bay/Allouez Bay	Superior Bay/Allouez Bay	1

NA = Not Available; USS = U.S. Steel; WLSSD = Western Lake Superior Sanitary District; and WWTP = wastewater treatment plant.

Table 4. Number of Chemical Classes Used in the Calculation of Mean PEC-Qs for Sediment Samples Included in the Phase IV Sediment Quality Database

	Number of Chemical Classes		
Depth Interval	**1**	**2**	**3**
0 - 30 cm, inclusive	486	468	83
>30 cm, inclusive	495	177	28
Other Depths	144	178	76

Notes:
Chemical classes include mean metals (arsenic, cadmium, chromium, copper, lead, nickel, and zinc), total $PAHs_{13}$, and total PCBs.
"Inclusive" applies to the query results from the MS™ Access 2000 sediment quality database. The 0 - 30 cm inclusive depth interval includes the query results from the 0 - 5, 0 - 15, 0 - 30, and 15 - 30 cm queries. The >30 cm inclusive depth interval includes the query results from the 30 - 45 cm and >30 cm queries. Other depths applies to samples in which either the depth interval was for other ranges (e.g., 20 - 40 cm) or all or part of the depth interval was unknown.

Table 5. Statistical Summary of Sediment Chemistry Values in Surficial Sediments (0 - 30 cm, inclusive) of the St. Louis River AOC

Chemical	N	Mean	Standard Deviation	Minimum	10th Percentile*	Median*	90th Percentile*	Maximum
Conventional Metals (mg/kg dry wt.)								
Arsenic	190	7.5	8.4	0.05	1.4	3.4	*21.6*	39.7
Cadmium	182	1.2	1.2	0.010	0.15	0.68	*2.5*	7.2
Chromium	310	36.1	29.6	2.3	10.0	33	*55.3*	247
Copper	165	40.2	46.1	3.8	9.2	26	*82.1*	291
Lead	448	70.5	114	0.05	9.0	*36.5*	***150***	1500
Mercury	782	0.26	0.32	0.00095	0.026	0.17	*0.53*	2.9
Nickel	157	24.3	20.3	3.0	9.1	20	*36*	166
Zinc	201	190	188	13.7	45.8	*150*	*336*	1498
SEM Metals (mg/kg dry wt.)								
SEM Cadmium	297	0.76	0.65	0.012	0.19	0.73	*1.4*	8.6
SEM Copper	297	16.9	21.0	0.02	2.7	12.5	29.9	194
SEM Lead	296	37.1	57.1	0.56	3.7	16.7	*105*	595
SEM Mercury	27	0.034	0.12	0.0012	0.0024	0.0043	0.038	0.63
SEM Nickel	297	7.6	7	0.11	2.1	7.1	12.8	100
SEM Zinc	297	102	130	3.6	17.8	73.7	*184*	1680

Table 5. Continued

Chemical	N	Mean	Standard Deviation	Minimum	10th Percentile*	Median*	90th Percentile*	Maximum
PAHs (µg/kg dry wt.)								
2-Methylnaphthalene	361	15655	134434	1.1	*20.8*	***230***	***5502***	2063492
Acenaphthene	616	2438	14832	0.05	6.2	*59.7*	***2390***	220000
Acenaphthylene	632	4810	59931	0.12	*6.5*	*46.9*	***1653***	1100000
Anthracene	668	8174	61784	1.4	14.7	*230*	***6061***	1100000
Fluorene	662	6240	58315	0.5	9.4	*136*	***3932***	1100000
Naphthalene	566	91781	734115	0.5	28.1	*240*	***16593***	10793650
Phenanthrene	674	18691	150123	3.7	42.2	*619*	***11779***	3000000
Benzo(a)anthracene	671	7721	44253	3.5	35.0	*616*	***8380***	780000
Benzo(a)pyrene	677	5657	34063	3.5	36.2	*500*	***6864***	630000
Chrysene	675	6981	39236	5	49.0	*649*	***7800***	720000
Dibenzo(a,h)anthracene	628	627	2437	0.2	13.0	*75*	***1159***	30645
Fluoranthene	677	16295	101268	6.2	78.6	*1100*	***16244***	1800000
Pyrene	677	12048	71115	5.6	70.2	*1000*	***12510***	1300000
Total $PAHs_{13}$ (exclude high ND)	677	173760	1198126	35.0	448	*5930*	***102908***	18891000
HMW PAHs (exclude high ND)	677	49196	289402	28.3	285	4249	48937	5230000
LMW PAHs (exclude high ND)	674	125118	973643	6.7	124	1431	51805	13661000

Table 5. Continued

Chemical	N	Mean	Standard Deviation	Minimum	10th Percentile*	Median*	90th Percentile*	Maximum
PCBs (µg/kg dry wt.)								
Total PCBs - reported (can be recalculated)	110	215	203	4.2	23.7	*140*	*513*	1140
Total PCBs - reported only	49	56.7	58.0	0.72	4.2	50	*108*	286
Total Aroclor PCBs (exclude high ND)	10	198	79.5	56.3	*82.4*	*205*	*293*	312
Total Congener PCBs (exclude high ND)	116	214	199	4.6	38.9	*139*	*491*	1140
Pesticides (µg/kg dry wt.)								
Total Chlordane (exclude high ND)	20	1.0	2.4	0.023	0.065	0.23	*4.3*	8.1
Total Chlordane - reported only	3	3.2	1.7	1.8	1.8	2.7	*5*	5
Dieldrin	5	2.4	1.8	0.14	0.14	*2.7*	*4.1*	4.1
Sum DDD (exclude high ND)	5	1.0	1.1	0.13	0.13	0.34	2.7	2.7
Sum DDE (exclude high ND)	5	1.2	1.0	0.34	0.34	0.69	2.7	2.7
Sum DDT (exclude high ND)	5	0.71	1.1	0.005	0.005	0.2	2.7	2.7
Total DDT (exclude high ND)	7	5.5	5.2	0.54	0.61	3.6	*12.2*	12.2
Endrin	5	2.2	1.9	0.1	0.1	*2.7*	*4.1*	4.1

Table 5. Continued

Chemical	N	Mean	Standard Deviation	Minimum	10th Percentile*	Median*	90th Percentile*	Maximum
Heptachlor epoxide	3	3.6	0.78	2.7	*2.7*	*4.1*	*4.1*	4.1
Lindane	4	0.42	0.45	0.01	0.01	0.38	0.9	0.9
Toxaphene	14	29.0	20.8	4.9	*9.0*	*24.5*	***63.6***	69
Mean PEC-Q	905	5.2	44.6	0.00039	0.051	*0.25*	***2.3***	821
TOC (%)	617	4.5	5.3	0.0016	0.49	3.3	8.4	50.1

BHC = hexachlorocyclohexane; DDD = metabolite of DDT; DDE = metabolite of DDT; DDT = dichloro-diphenyl-trichloroethane; N = number of samples; ND = nondetect; PAHs = polycyclic aromatic hydrocarbons; PAH_{13} = sum of 13 low molecular weight (LMW) and high molecular weight (HMW) PAHs; PCBs = polychlorinated biphenyls; PEC-Q = probable effect concentration quotient; SEM = simultaneously extractable metals; SQT = sediment quality target; TOC = total organic carbon; and wt. = weight.

* Values in italics and yellow shading exceed the corresponding Level I SQT; values in bold italics and orange shading exceed the corresponding Level II SQT.

Note: The following depth intervals were queried in the MS™ Access 2000 sediment quality database to generate this table: 0 - 5, 0 - 15, 0 - 30, and 15 - 30 cm intervals.

Table 6. Statistical Summary of Sediment Chemistry Values in Subsurface Sediments (>30 cm, inclusive) of the St. Louis River AOC

Chemical	N	Mean	Standard Deviation	Minimum	10th Percentile*	Median*	90th Percentile*	Maximum
Conventional Metals (mg/kg dry wt.)								
Arsenic	121	9.8	12.8	0.05	1.1	3.8	*25.5*	66.4
Cadmium	101	0.97	0.89	0.013	0.13	0.6	*2.3*	4.7
Chromium	111	29.3	17.9	2.1	9.5	25	*53.4*	86.7
Copper	85	43.1	79.5	3.3	6.8	18.4	*88.1*	660
Lead	236	123	162	0.15	3.1	*61.1*	***329***	1350
Mercury	503	0.29	0.43	0.0005	0.0188	0.15	*0.71*	3.9
Nickel	74	22.7	15.7	6	10	18.9	*35.1*	97
Zinc	155	237	240	7.8	28	*167*	***520***	1700
SEM Metals (mg/kg dry wt.)								
SEM Cadmium	34	0.49	0.40	0.073	0.079	0.35	*1.1*	1.4
SEM Copper	36	15.4	11.6	1.6	2.8	12.7	*35.4*	40.0
SEM Lead	35	47.4	59.2	0.58	1.5	19.1	*129*	234
SEM Nickel	36	6.8	2.9	1.6	3.2	7.0	11.1	13.0
SEM Zinc	36	84.4	83.7	4.4	8.5	44.8	*212*	314

Table 6. Continued

Chemical	N	Mean	Standard Deviation	Minimum	10th Percentile*	Median*	90th Percentile*	Maximum
PAHs (µg/kg dry wt.)								
2-Methylnaphthalene	342	15621	127213	0.13	16.5	***320***	***8214***	2230769
Acenaphthene	380	11366	76051	0.19	*11.3*	***240***	***9800***	1269231
Acenaphthylene	388	2276	10696	0.045	*8.5*	*117*	***2598***	132000
Anthracene	399	11775	56899	0.19	16	*497*	***21416***	923077
Fluorene	397	10131	59689	0.19	11.2	*330*	***12993***	1038462
Naphthalene	390	130433	821923	0.31	15	***661***	***96000***	12307692
Phenanthrene	402	33092	160663	0.4	28.3	*1170*	***55300***	2576923
Benzo(a)anthracene	400	10863	32599	0.19	21.5	*800*	***26933***	342308
Benzo(a)pyrene	404	7043	22185	0.11	30.8	*540*	***15060***	253846
Chrysene	402	9795	29954	0.19	23.4	*775*	***23000***	311538
Dibenzo(a,h)anthracene	390	1150	3208	0.07	8.5	*71*	***2311***	31250
Fluoranthene	404	26160	93033	0.4	40.2	*1485*	***62004***	1192308
Pyrene	404	20111	63713	0.4	40.0	*1235*	***45268***	692308
Total $PAHs_{13}$ (exclude high ND)	404	281453	1405778	4.9	313	***11475***	***564633***	23204615
HMW PAHs (exclude high ND)	404	74927	239856	2.4	214	5155	176426	2804615
LMW PAHs (exclude high ND)	402	207555	1219157	2.4	129	4426	226871	20400000

Table 6. Continued

Chemical	N	Mean	Standard Deviation	Minimum	10th Percentile*	Median*	90th Percentile*	Maximum
PCBs (µg/kg dry wt.)								
Total PCBs - reported (can be recalculated)	69	170	255	14.2	22.0	*63.2*	*479*	1273
Total PCBs - reported only	141	37.6	76.8	0.0033	3.3	13	*89.4*	612
Total Aroclor PCBs (exclude high ND)	13	117	85	28.5	39.5	*66*	*256*	299
Total Congener PCBs (exclude high ND)	73	162	249	14.1	22.8	*63.2*	*462*	1273
Pesticides (µg/kg dry wt.)								
Total Chlordane (exclude high ND)	2	0.053	0.033	0.03	0.03	0.053	0.076	0.076
Total Chlordane - reported only	6	3.2	1.6	2.5	2.5	2.5	*6.1*	6.5
Dieldrin	6	3.2	1.6	2.5	*2.5*	*2.5*	*6.1*	6.5
Sum DDD (exclude high ND)	6	3.2	1.6	2.5	2.5	2.5	*6.1*	6.5
Sum DDE (exclude high ND)	6	3.2	1.6	2.5	2.5	2.5	*6.1*	6.5
Sum DDT (exclude high ND)	6	3.2	1.6	2.5	2.5	2.5	*6.1*	6.5
Total DDT (exclude high ND)	6	9.5	4.9	7.5	*7.5*	*7.5*	*18.3*	19.5
Endrin	6	3.2	1.6	2.5	*2.5*	*2.5*	*6.1*	6.5

Table 6. Continued

Chemical	N	Mean	Standard Deviation	Minimum	10th Percentile*	Median*	90th Percentile*	Maximum
Heptachlor epoxide	6	3.2	1.6	2.5	*2.5*	*2.5*	*6.1*	6.5
Lindane	5	2.5	0	2.5	*2.5*	*2.5*	*2.5*	2.5
Toxaphene (no data)								
Mean PEC-Q	644	6.8	47.5	0.0012	0.02	*0.23*	***6.5***	1010
TOC (%)	349	4.9	5.5	0.0029	0.28	3.4	11.7	37.6

BHC = hexachlorocyclohexane; DDD = metabolite of DDT; DDE = metabolite of DDT; DDT = dichloro-diphenyl-trichloroethane; N = number of samples; ND = nondetect; PAHs = polycyclic aromatic hydrocarbons; PAH_{13} = sum of 13 low molecular weight (LMW) and high molecular weight (HMW) PAHs; PCBs = polychlorinated biphenyls; PEC-Q = probable effect concentration quotient; SEM = simultaneously extractable metals; SQT = sediment quality target; TOC = total organic carbon; and wt. = weight.

* Values in italics and yellow shading exceed the corresponding Level I SQT; values in bold italics and orange shading exceed the corresponding Level II SQT.

Note: The following depth intervals were queried in the MS™ Access 2000 sediment quality database to generate this table: 30 - 45 cm and >30 cm intervals.

Table 7. Determination of Statistical Significance Between Median Chemical Values in Surface and Subsurface Sediments from the St. Louis River AOC

Chemical	Surface: N	Subsurface: N	Surface: Median*	Subsurface: Median*	Statistical Significance**
Conventional Metals (mg/kg dry wt.)					
Arsenic	190	121	3.4	3.8	No (p = 0.840)
Cadmium	182	101	0.68	0.6	No (p = 0.697)
Chromium	310	111	33	25	Yes (p = 0.026)
Copper	165	85	26	18.4	No (p = 0.082)
Lead	448	236	*36.5*	*61.1*	Yes (p = 0.009)
Mercury	782	503	0.17	0.15	No (p = 0.516)
Nickel	157	74	20	18.9	No (p = 0.498)
Zinc	201	155	*150*	*167*	No (p = 0.371)
SEM Metals (mg/kg dry wt.)					
SEM Cadmium	297	34	0.73	0.35	Yes (p = 0.003)
SEM Copper	297	36	12.5	12.7	No (p = 0.734)
SEM Lead	296	35	16.7	19.1	No (p = 0.604)
SEM Nickel	297	36	7.1	7.0	No (p = 0.862)
SEM Zinc	297	36	73.7	44.8	No (p = 0.162)

Table 7. Continued

Chemical	Surface: N	Subsurface: N	Surface: Median*	Subsurface: Median*	Statistical Significance**
PAHs (µg/kg dry wt.)					
2-Methylnaphthalene	361	342	***230***	***320***	No (p = 0.171)
Acenaphthene	616	380	*59.7*	***240***	Yes (p = <0.001)
Acenaphthylene	632	388	*46.9*	*117*	Yes (p = <0.001)
Anthracene	668	399	*230*	*497*	Yes (p = 0.002)
Fluorene	662	397	*136*	*330*	Yes (p = <0.001)
Naphthalene	566	390	*240*	***661***	Yes (p = <0.001)
Phenanthrene	674	402	*619*	*1170*	Yes (p = 0.013)
Benzo(a)anthracene	671	400	*616*	*800*	No (p = 0.323)
Benzo(a)pyrene	677	404	*500*	*540*	No (p = 0.540)
Chrysene	675	402	*649*	*775*	No (p = 0.808)
Dibenzo(a,h)anthracene	628	390	*75*	*71*	No (p = 0.094)
Fluoranthene	677	404	*1100*	*1485*	No (p = 0.288)
Pyrene	677	404	*1000*	*1235*	No (p = 0.381)
Total $PAHs_{13}$ (exclude high ND)	677	404	*5930*	*11475*	Yes (p = 0.007)
HMW PAHs (exclude high ND)	677	404	4249	5155	No (p = 0.425)
LMW PAHs (exclude high ND)	674	402	1431	4426	Yes (p = <0.001)

Table 7. Continued

Chemical	Surface: N	Subsurface: N	Surface: Median*	Subsurface: Median*	Statistical Significance**
PCBs (µg/kg dry wt.)					
Total PCBs - reported (can be recalculated)	110	69	*140*	*63.2*	Yes (p = <0.001)
Total PCBs - reported only	49	141	50	13	Yes (p = <0.001)
Total Aroclor PCBs (exclude high ND)	10	13	*205*	*66*	Yes (p = 0.031)***
Total Congener PCBs (exclude high ND)	116	73	*139*	*63.2*	Yes (p = <0.001)
Pesticides (µg/kg dry wt.)					
Total Chlordane (exclude high ND)	20	2	0.23	0.053	No (p = 0.060)
Total Chlordane - reported only	3	6	2.7	2.5	No (p = 0.905)
Dieldrin	5	6	*2.7*	*2.5*	No (p = 1.000)
Sum DDD (exclude high ND)	5	6	0.34	2.5	No (p = 0.082)
Sum DDE (exclude high ND)	5	6	0.69	2.5	No (p = 0.082)
Sum DDT (exclude high ND)	5	6	0.2	2.5	No (p = 0.082)
Total DDT (exclude high ND)	7	6	3.6	*7.5*	No (p = 0.445)
Endrin	5	6	*2.7*	*2.5*	No (p = 1.000)
Heptachlor epoxide	3	6	*4.1*	*2.5*	No (p = 0.167)

Table 7. Continued

Chemical	Surface: N	Subsurface: N	Surface: Median*	Subsurface: Median*	Statistical Significance**
Lindane	4	5	0.38	*2.5*	Yes (p = 0.016)
Toxaphene	14	No data	*24.5*	No data	No statistics
Mean PEC-Q	905	644	*0.25*	*0.23*	No (p = 0.062)
TOC (%)	617	349	3.3	3.4	No (p = 0.765)

BHC = hexachlorocyclohexane; DDD = metabolite of DDT; DDE = metabolite of DDT; DDT = dichloro-diphenyl-trichloroethane; N = number of samples; ND = nondetect; PAHs = polycyclic aromatic hydrocarbons; PAH_{13} = sum of 13 low molecular weight (LMW) and high molecular weight (HMW) PAHs; PCBs = polychlorinated biphenyls; PEC-Q = probable effect concentration quotient; SEM = simultaneously extractable metals; SQT = sediment quality target; TOC = total organic carbon; and wt. = weight.

* Values in italics and yellow shading exceed the corresponding Level I SQT; values in bold italics and orange shading exceed the corresponding Level II SQT.

** All chemical pairs failed the test for normality ($p < 0.050$), except for total Aroclor PCBs. Statistical significance (pink shading) was determined using the nonparametric Mann-Whitney Rank Sum test.

*** The data passed normality so a t-test was performed. However, the power of the performed test (0.505) was below the desired power of 0.800. Less than desired power indicates you are more likely to not detect a difference when one actually exists.

Table 8. Summary of Phenanthrene/Anthracene (P/A) and Fluoranthene/Pyrene (F/P) Ratios for Selected Depth Intervals in the St. Louis River AOC.

Depth Interval (cm)	N	P/A			F/P		
		Mean	SD	Median	Mean	SD	Median
St. Louis River AOC							
0 - 30 cm, inclusive	669	3.12	1.87	2.69[a]	1.18	0.69	1.17[b]
>30 cm, inclusive	399	3.07	3.57	2.46[a]	1.17	0.25	1.17[b]
Other depth intervals	273	2.73	2.1	2.15	1.21	0.87	1.12
Post-remediation St. Louis River AOC*							
0 - 30 cm, inclusive	506	2.88	1.54	2.48[c]	1.28	0.75	1.23[d]
>30 cm, inclusive	357	3.05	3.74	2.38[c]	1.19	0.23	1.19[d]
Other depth intervals	231	2.53	1.89	2.11	1.26	0.92	1.14

* Excluded the pre-remediation P/A and F/P data from Hog Island Inlet/Newton Creek.

[a] The difference in the median values between the two groups is greater than would be expected by chance; there is a statistically significant difference (p = 0.024).

[b] The difference in the median values between the two groups is not great enough to exclude the possibility that the difference is due to random sampling variability; there is not a statistically significant difference (p = 0.678).

[c] The difference in the median values between the two groups is not great enough to exclude the possibility that the difference is due to random sampling variability; there is not a statistically significant difference (p = 0.353).

[d] The difference in the median values between the two groups is greater than would be expected by chance; there is a statistically significantly difference (p=0.003)

Table 9. Distribution of Mean PEC-Qs in Surficial Sediments (i.e., upper 30 cm) of Selected Locations in the St. Louis River AOC

Location Description	N	Arithmetic Mean	Standard Deviation	Minimum	10th Percentile	Median	90th Percentile	Maximum
Hog Island Inlet/Newton Creek*	189	0.231	0.212	0.00764	0.0539	*0.194*	*0.39*	1.62
Howard's Bay	30	0.416	0.344	0.0355	*0.142*	*0.374*	***0.61***	2.03
Lower St. Louis River	46	0.289	0.555	0.0363	0.0508	*0.158*	*0.458*	3.78
Minnesota Slip	62	1.227	0.882	0.0814	*0.3*	***1.1***	***1.876***	6.21
Slip C	48	0.561	0.424	0.000385	0.0656	*0.491*	***1.171***	1.68
SLRIDT Superfund Site	214	20.334	90.121	0.00918	*0.187*	***1.325***	***21.38***	821
Superior Bay	41	0.128	0.0993	0.00942	0.0132	*0.105*	*0.283*	0.397
Thomson Reservoir	23	0.135	0.0429	0.0772	0.0818	*0.145*	*0.175*	0.261
USS Superfund Site	36	3.176	11.446	0.0055	0.0283	*0.168*	***4.84***	64.7
WLSSD, Miller Cr. & Coffee Cr. Embay.	42	0.364	0.303	0.00674	0.0213	*0.33*	***0.803***	1.29
St. Louis River AOC**	910	5.152	44.493	0.000385	0.0515	*0.246*	***2.27***	821

AOC = Area of Concern; Cr. = Creek; Embay. = embayment; N = number of sediment samples; PEC-Q = probable effect concentration quotient; SLRIDT = St. Louis River Interlake/Duluth Tar; USS = U.S. Steel; and WLSSD = Western Lake Superior Sanitary District.

* Pre-remediation data for this site; sediment remediation was completed November 2005.

** Includes the pre-remediation data for Hog Island Inlet and Newton Creek.

Values in italics and yellow shading exceed the Level I SQT of 0.1; values in bold italics and orange shading exceed the Level II SQT of 0.6.

Table 10. Frequency of Low, Moderate, and High Risk Samples in Surface Sediments (i.e., upper 30 cm) from the St. Louis River AOC

		Number (%) of Samples Within Ranges of Mean PEC-Qs					
	Overall	<0.1		0.1 to 0.6		>0.6	
Location Description	N	(Low Risk)		(Moderate Risk)		(High Risk)	
Hog Island Inlet/Newton Creek*	189	36	(19.0%)	148	(78.3%)	5	(2.7%)
Howard's Bay	30	2	(6.7%)	25	(83.3%)	3	(10.0%)
Lower St. Louis River	46	15	(32.6%)	28	(60.9%)	3	(6.5%)
Minnesota Slip	62	1	(1.6%)	7	(11.3%)	54	(87.1%)
Slip C	48	7	(14.6%)	22	(45.8%)	19	(39.6%)
SLRIDT Superfund Site	214	9	(4.2%)	53	(24.8%)	152	(71.0%)
Superior Bay	41	19	(46.3%)	22	(53.7%)	0	(0%)
Thomson Reservoir	23	7	(30.4%)	16	(69.6%)	0	(0%)
USS Superfund Site	36	11	(30.5%)	15	(41.7%)	10	(27.8%)
WLSSD, Miller Creek & Coffee Creek Embayment	42	10	(23.8%)	23	(54.8%)	9	(21.4%)
St. Louis River AOC**	910	191	(21.0%)	462	(50.8%)	257	(28.2%)

AOC = Area of Concern; N = number of sediment samples; PEC-Q = probable effect concentration quotient; SLRIDT = St. Louis River Interlake/Duluth Tar; USS = U.S. Steel; and WLSSD = Western Lake Superior Sanitary District

* Pre-remediation data for this site; sediment remediation was completed November 2005.

** Includes pre-remediation data for Hog Island Inlet and Newton Creek.

Table 11. Incidence of Toxicity for Mean PEC-Q Ranges as Determined Using Matching Sediment Chemistry and Toxicity Data From the St. Louis River AOC

Mean PEC-Q Range	Incidence of Toxicity				
	10-day *H. azteca* (Amphipod) Growth or Survival*§	**10-day *C. dilutus* (Midge) Growth or Survival*§**	**28-day *H. azteca* Growth or Survival***	**All Non-UV Tests Combined (excluding Microtox®)***	**All UV Tests Combined**
≤0.10	4.3% (2 of 46 stations)	2.1% (1 of 48 stations)	0% (0 of 1 station)	7.3% (4 of 55 stations)	50% (2 of 4 stations)
>0.10 to ≤0.50	12.8% (12 of 94 stations)	16.5% (17 of 103 stations)	61.5% (8 of 13 stations)	27.0% (34 of 126 stations)	45.8% (11 of 24 stations)
>0.50 to ≤1.0	36.4% (4 of 11 stations)	22.2% (4 of 18 stations)	44.4% (4 of 9 stations)	45.8% (11 of 24 stations)	25% (1 of 4 stations)
>1.0 to ≤5.0	41.7% (5 of 12 stations)	33.3% (4 of 12 stations)	83.3% (5 of 6 stations)	61.5% (16 of 26 stations)	66.7% (4 of 6 stations)
>5.0	83.3% (5 of 6 stations)	100% (8 of 8 stations)	No Data	100% (9 of 9 stations)	No Data
Overall	16.6% (28 of 169 stations)	18.0% (34 of 189 stations)	58.6% (17 of 29 stations)	30.8% (74 of 240 stations)	47.4% (18 of 38 stations)

PEC-Q = probable effect concentration quotient and UV = ultraviolet.

* Excluded UV-exposed toxicity test results.

§ Sites 102-TR and 044-TR, from the R-EMAP study (Breneman *et al*. 2000), were removed from the incidence of toxicity calculations due to incomplete sediment chemistry data (i.e., PAHs, PCBs) for these known contaminated areas.