

Endsley, Erin A - DNR

From: Graham, Joseph R - DNR
Sent: Monday, November 03, 2014 2:28 PM
To: Steiger, Matthew B - DNR; cieniewski.scott@epa.gov
Cc: Hagen, Cherie L - DNR; Galarneau, Stephen G - DNR; Endsley, Erin A - DNR
Subject: FW: SWL&P Sed Data and Maps
Attachments: SWLP_Sed_Data.xls; SWL&P Sed Sample Location Maps.pdf

FYI – The attached data support the identification of the Superior Water Light & Power Boat Slip in Superior as a “red site” or a site needing to be remediated in the 2013 RAP for the St Louis River AOC.

The average sediment TPAH concentration is 93 PPM with a maximum concentration of 1,160 PPM at the surface (0 – 24 inches).

A single grab sample from 2012 was positive for toxicity at 65 PPM TPAH (significantly reduced *C. tentans* growth compared to control).

Erin did a very nice job summarizing the available data. Thanks Erin.

We are committed to service excellence.

Visit our survey at <http://dnr.wi.gov/customersurvey> to evaluate how I did.

Joe Graham
Phone: (715) 292-4925
Joseph.graham@wisconsin.gov

From: Endsley, Erin A - DNR
Sent: Monday, November 03, 2014 1:16 PM
To: Graham, Joseph R - DNR
Subject: SWL&P Sed Data and Maps

Joe –

Here is what I compiled for sediment sampling results at the slip adjacent to the Superior Water Light & Power site:

- 2000 DNR (map and data)
- 2003 ENSR (map and data)
- 2007 EPA (map and data)
- 2010 AECOM (map and data)
- 2012 Graham (data)

The spreadsheet contains the data for all of the above. The maps include everything but the 2012 sample point, but you should have that information.

I would really like to see us move forward with some additional sediment characterization, based on the elevated PAHs in this location. A more comprehensive approach would hopefully help us with source identification. Please let me know if you need anything else or have any questions. Thanks!

Erin

SWL&P Boat Slip Sediment Analysis PAH September 2000

Location	Units	TEC	MEC	PEC	SPG-1S	SPG-1D	SPG-2S	SPG-2D	SPG-3S	SPG-3D	SPG-4S	SPG-4D	SPG-5S	SPG-5D	SPG-6S	SPG-6D
Depth (inches)					0-6.9	6.9-13.8	0-8.9	8.9-17.4	0-8.7	8.7-23.4	0-4.2	4.2-16.2	0-4.8	4.8-10	0-6.6	6.6-13.3
Date					9/19/2000	9/19/2000	9/19/2000	9/19/2000	9/19/2000	9/19/2000	9/19/2000	9/19/2000	9/19/2000	9/19/2000	9/19/2000	9/19/2000
PAHs																
1-methylnaphthalene	ug/kg				1300	670	450	1700	25000	8800	370	820	66	140	63	170
2-methylnaphthalene	ug/kg	20.2	111	201	650	210	180	120	31000	5900	200	450	100	200	90	190
acenaphthene	ug/kg	6.7	48	89	3600	880	740	4200	12000	6000	590	1300	92	170	68	150
acenaphthylene	ug/kg	5.9	67	128	4700	1200	930	5700	16000	7700	770	2000	130	240	93	230
anthracene	ug/kg	57.2	451	845	7100	1000	900	5300	15000	6800	610	1900	180	230	150	390
benzo (a) anthracene	ug/kg	108	579	1050	15000	1400	1000	14000	12000	8700	790	5800	660	680	520	1100
benzo (a) pyrene	ug/kg	150	800	1450	14000	1400	960	13000	12000	8700	760	5300	700	730	560	1100
benzo (b) fluoranthene	ug/kg	240	6820	13400	15000	1100	730	12000	7400	7200		3900	610	700	630	1200
benzo (e) pyrene	ug/kg				8200	750		6200		4900	410	2800	380	400	310	
benzo (g h i) perylene	ug/kg	170	1685	3200	12000	870	620	8300	7400	5800	450	3700	480	510	430	760
benzo (k) fluoranthene	ug/kg	240	6820	13400	7400	640	430	6900	5000	4100	300	2900	330	370	320	660
chrysene	ug/kg	166	728	1290	17000	990	990	15000	12000	9500	760	6600	700	810	650	1400
dibenzo (a h) anthracene	ug/kg	33	84	135	750	65	55	750	600	450	35	275	35	35	35	55
fluoranthene	ug/kg	423	1327	2230	52000	3200	2300	45000	23000	21000	1400	17000	1500	1700	1400	2800
fluorene	ug/kg	77.4	307	536	5100	670	600	8900	13000	6200	380	2400	130	280	120	370
indeno (1,2,3-cd) pyrene	ug/kg	200	1700	3200	11000	800	540	8100	6500	5400						790
naphthalene	ug/kg	176	369	561	2700	430	410	3800	76000	26000	370	760	130	210	76	220
phenanthrene	ug/kg	204	687	1170	50000	3900	3300	57000	54000	31000	2100	17000	680	1000	640	2300
pyrene	ug/kg	195	858	1520	43000	3400	2600	37000	35000	23000	2000	14000	1500	1600	1200	2200
total PAH	ug/kg	1610	12205	22800	270,500	23,575	17,735	252,970	362,900	197,150	12,295	88,905	8,403	10,005	7,355	16,085

SWL&P Boat Slip Sediment Analysis Metals September 2000

		TEC	MEC	PEC	SPG-1S	SPG-1D	SPG-2S	SPG-2D	SPG-3S	SPG-3D	SPG-4S	SPG-4D	SPG-5S	SPG-5D	SPG-6S	SPG-6D
Arsenic	mg/kg	9.8	21.4	33	15	9	19	13	32	14	7	14	13	8	9	13
Cadmium	mg/kg	0.99	3	5								0.6				0.7
Chromium	mg/kg	43	76.5	110	23	20	27	18	67	27	8	36	13	13	16	15
Copper	mg/kg	32	91	150	38.9	104	43.6	31	26.1	40.8	9.4	58	13	21	28	35
Lead	mg/kg	36	83	130	65.4	28.5	29.3	57.2	33	78.4	8	110	17	37	61	100
Mercury	mg/kg	0.18	0.64	1.1	0.45	0.26	0.18	0.56	0.051	0.2	0.31	1	0.26	0.34	0.64	0.98
Nickel	mg/kg	23	36	49	12	10	17	11	20	9	6	15	7	9	11	11
Zinc	mg/kg	120	290	460	100	62	53.2	82.3	49.2	159	26	180	43	67	88	110

WWTP 2003

Location	Units	TEC	MEC	PEC	SD1-0-1	SD1-1-2	SD2-0-1	SD2-1-2	SD3-0-1	SD3-1-2	SS-Outfall
Depth (inches)					0-12	12-24	0-12	12-24	0-12	12-24	
Date					3/12/2013	3/12/2013	3/12/2013	3/12/2013	3/12/2013	3/12/2013	3/12/2013
PAHs											
1-methylnaphthalene	ug/kg				400	90	270	490	1600	1200	390
2-methylnaphthalene	ug/kg	20.2	111	201	400	95	260	510	970	1600	440
acenaphthene	ug/kg	6.7	48	89	550	120	300	380	2200	1500	500
acenaphthylene	ug/kg	5.9	67	128	400	46	92	77	520	300	110
anthracene	ug/kg	57.2	451	845	620	110	290	540	1400	1100	580
benzo (a) anthracene	ug/kg	108	579	1050	1400	160	530	1100	2400	950	860
benzo (a) pyrene	ug/kg	150	800	1450	1700	170	530	1100	2400	890	740
benzo (b) fluoranthene	ug/kg	240	6820	13400	1000	130	410	970	1400	460	590
benzo (g h i) perylene	ug/kg	170	1685	3200	680	70	210	330	780	290	230
benzo (k) fluoranthene	ug/kg	240	6820	13400	1200	120	410	910	1800	600	650
chrysene	ug/kg	166	728	1290	1400	160	550	1100	2400	940	880
dibenzo (a h) anthracene	ug/kg	33	84	135	190	19	65	120	250	68	110
fluoranthene	ug/kg	423	1327	2230	2200	320	1100	2600	4200	2000	2200
fluorene	ug/kg	77.4	307	536	320	68	210	350	1000	730	560
indeno (1,2,3-cd) pyrene	ug/kg	200	1700	3200	680	70	230	400	840	280	250
naphthalene	ug/kg	176	369	561	740	160	520	870	1600	3300	1400
phenanthrene	ug/kg	204	687	1170	2200	360	1300	2500	5300	3800	3000
pyrene	ug/kg	195	858	1520	2600	380	1000	2300	4900	2700	1700
total PAH	ug/kg	1610	12205	22800	18,680	2,648	8,277	16,647	35,960	22,708	15,190

City of Superior Wastewater Treatment Plant (2007)

Location Description	Units	TEC	MEC	PEC	WW4A_182	WW4A_182	WW4A_203	WW4A_203	WW4A_183
Sample ID					A182	B182	A203	B203	P183
Depth (cm?)					0-15	15-61	0-15	15-61	
Date					5/8/2007	5/8/2007	5/8/2007	5/8/2007	5/17/2007
PAHs									
acenaphthene	ug/kg	6.7	48	89	4148.13	1178.27	205.74	606.16	74.16
acenaphthylene	ug/kg	5.9	67	128	604.49	153.34	179.96	442.4	38.26
anthracene	ug/kg	57.2	451	845	2462.57	1017.59	395.59	884.54	129.02
benzo (a) anthracene	ug/kg	108	579	1050	2132.52	1529.31	808.71	1495.54	293.32
benzo (a) pyrene	ug/kg	150	800	1450	2051.83	1510.55	902.27	1671.79	341.63
benzo (b) fluoranthene	ug/kg	240	6820	13400	1327.74	1056.81	673.02	1242.09	248.57
benzo (e) pyrene	ug/kg				1247.38	909.05	621.75	1162.03	229.73
benzo (g h i) perylene	ug/kg	170	1685	3200	973.33	829.96	517.13	909.72	244.4
benzo (k) fluoranthene	ug/kg	240	6820	13400	1327.35	1115.27	709.29	1187.73	294.76
chrysene	ug/kg	166	728	1290	2103.22	1515.23	861.03	1570.38	324.95
dibenzo (a h) anthracene	ug/kg	33	84	135	285.42	217.72	145.4	254.57	63.45
fluoranthene	ug/kg	423	1327	2230	4545.88	3320.42	1365.62	2539.05	555.5
fluorene	ug/kg	77.4	307	536	1939.01	755.83	208.54	439.2	84.32
indeno (1,2,3-cd) pyrene	ug/kg	200	1700	3200	1002.24	957.32	524.66	921.21	250.25
naphthalene	ug/kg	176	369	561	3385.31	1158.65	684.42	866.2	196.48
phenanthrene	ug/kg	204	687	1170	9271.56	4330.76	1222.55	2482.77	511.99
pyrene	ug/kg	195	858	1520	5765.7	3178.63	1463.39	2970.35	542.43
total PAH	ug/kg	1610	12205	22800	44,574	24,735	11,489	21,646	4,423
Total PAH at 1% TOC	ug/kg	1610	12205	22800	5,306	7,979	2,016	3,936	804
TOC	mg/kg				84000	31000	57000	55000	17000

Summary of Sediment Laboratory Analytical Results - PAHs (2010)

Location	Units	TEC	MEC	PEC	SedB1-0-1	SedB1-5-8	SedB1-22-24	SedB2-0-1
Depth (inches)					0-12	60-96	264-288	0-12
Date					2/23/2010	2/23/2010	2/23/2010	2/23/2010
PAHs								
acenaphthene	ug/kg	6.7	48	89	108	77.1		520
acenaphthylene	ug/kg	5.9	67	128	93.1	74.9		
anthracene	ug/kg	57.2	451	845	212	142		969
benzo (a) anthracene	ug/kg	108	579	1050	518	360		2110
benzo (a) pyrene	ug/kg	150	800	1450	458	339		1740
benzo (b) fluoranthene	ug/kg	240	6820	13400	588	425		2500
benzo (g h i) perylene	ug/kg	170	1685	3200	149	115		575
benzo (k) fluoranthene	ug/kg	240	6820	13400	233	130		969
chrysene	ug/kg	166	728	1290	446	319		1770
dibenzo (a h) anthracene	ug/kg	33	84	135		39		207
fluoranthene	ug/kg	423	1327	2230	878	621	21.7	4540
fluorene	ug/kg	77.4	307	536	111	77.9		549
indeno (1,2,3-cd) pyrene	ug/kg	200	1700	3200	145	110		605
naphthalene	ug/kg	176	369	561	150	86.7		315
phenanthrene	ug/kg	204	687	1170	752	521	39	4320
pyrene	ug/kg	195	858	1520	931	669	61	3950
total PAH	ug/kg	1610	12205	22800	5,772	4,107	122	25,639
Total PAH at 1% TOC	ug/kg	1610	12205	22800	5,951	9,270		21,728
TOC	mg/kg				9700	4430	1490	11800
Lead	mg/kg	36	83	130	20.9	19.8	1.8	53.8

SedB2-1-3	SedB3-0-2	SedB3-2-4	SedB3-10-14	SedB4-0-2	SedB4-0-6-7
12-36	0-24	24-48	120-168	0-24	72-84
2/23/2010	2/23/2010	2/23/2010	2/23/2010	2/23/2010	2/23/2010
1040	1570	3410	12.5	42500	12300
197	93.4	554		1460	1230
1590	3500	3500		72400	14200
3400	5070	8020		91400	22700
2680	3930	6720		55100	17100
3060	5090	9490		81600	22700
1380	1810	3070		20900	4690
1230	1790	3400		23600	8850
2510	3900	7550		66500	17800
464	592	1070		9070	2260
6370	10600	19100		179000	49000
1100	1850	2920		47200	10300
1310	1720	2870		22000	4920
1170	430	3620		40800	11300
6880	12600	21300		253000	65100
6150	9600	17700		152000	45800
40,531	64,145	114,294	13	1,158,530	310,250
8,090	19,983	17,136	20	212,185	23,504
50100	32100	66700	6370	54600	132000
49.3	39.6	27.4	2.8	72.8	205

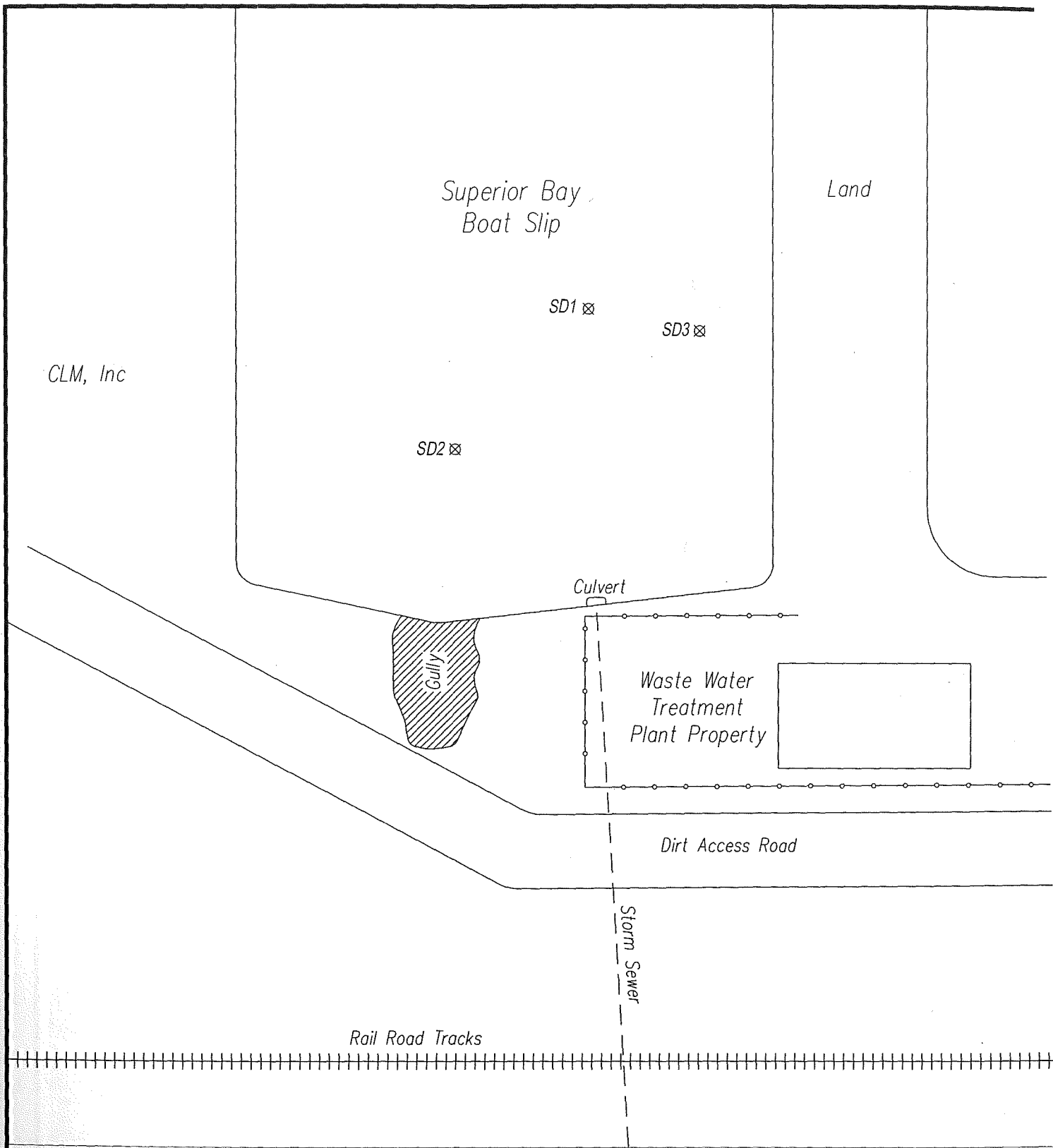
WWTP (Graham) 2012

Location	Units	TEC	MEC	PEC	WWTP
Depth (inches)					
Date					6/12/2012
PAHs					
1-methylnaphthalene	ug/kg				500
2-methylnaphthalene	ug/kg	20.2	111	201	700
2,7-dimethylnaphthalene	ug/kg				370
acenaphthene	ug/kg	6.7	48	89	1700
acenaphthylene	ug/kg	5.9	67	128	320
anthracene	ug/kg	57.2	451	845	1800
benzo (a) anthracene	ug/kg	108	579	1050	4900
benzo (a) pyrene	ug/kg	150	800	1450	4300
benzo (b) fluoranthene	ug/kg	240	6820	13400	3100
benzo (e) pyrene	ug/kg				3000
benzo (g h i) perylene	ug/kg	170	1685	3200	2700
benzo (k) fluoranthene	ug/kg	240	6820	13400	2800
chrysene	ug/kg	166	728	1290	4700
dibenzo (a h) anthracene	ug/kg	33	84	135	900
fluoranthene	ug/kg	423	1327	2230	9000
fluorene	ug/kg	77.4	307	536	1700
indeno (1,2,3-cd) pyrene	ug/kg	200	1700	3200	3400
naphthalene	ug/kg	176	369	561	1000
phenanthrene	ug/kg	204	687	1170	8900
pyrene	ug/kg	195	858	1520	8800
total PAH	ug/kg	1610	12205	22800	64,590
Total PAH at 1% TOC	ug/kg	1610	12205	22800	24,747
TOC	mg/kg				26100

Superior Gas Plant Sediment Sampling

09/19/2000





Explanation:

SD1 ☒ = Sediment Sample Location (3/12/03)



Source:

Salo Engineering Survey, 3/14/03 and ENSR field observations

APPROXIMATE SCALE
1 INCH = 50 FEET

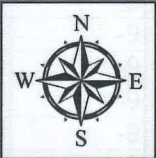


Figure 3-1
SEDIMENT SAMPLE LOCATIONS
Superior Water Light & Power
Former MGP
Superior, Wisconsin

DRAWN: CMB/5802	DATE: Sept 2003
FILE No.: Fig 3-1.dwg	PROJECT: 09413-098-500

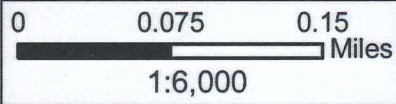


Saint Louis River Sediment Cores 2007 City of Superior WWTP



Samples Collected By

- DNR
- EPA
- Location Error



2010



Sediment Sample Locations

Superior Water, Light & Power
Former MGP Site
Superior, Wisconsin

Legend

- SedB-1 Sediment Sample from Superior Bay Boat Slip (Feb 2010)

Map Projection: UTM NAD83 15N Feet
Image Source: Aerial NAIP 2005 (ArcGIS online I3 imagery)

0 100 200 Feet Scale 1:2,000

Figure 1

March 2010

Project: 60148476-100.1