HANDOUTS FOR THE MAY 15, 1996 MEETING ABOUT THE C. W. CHRISTIANSEN WOOD TREATMENT FACILITY IN PHELPS, WISCONSIN

COMPILED BY CONTAMINANTS AND SEDIMENT UNIT, BUREAU OF WATERSHED MANAGEMENT
MADISON

Sediment Samples Results from Kreitlow Collection of November 1992.

	G-1-92	G-2-92	G-3-92	G-4-92
Pentachlorophenol	< 20 ug/Kg	50 ug/Kg	640 ug/Kg	30 ug/Kg
2,4,6-TCP	< 100 ug/Kg	< 100 ug/Kg	< 100 ug/Kg	< 100 ug/Kg
2,4,5-TCP	< 100 ug/Kg	< 100 ug/Kg	< 100 ug/Kg	< 100 ug/Kg
TOC (%)	22.4	1.14	12.6	1.37
Sand (%)	22	93	37	94
Silt (%)	51	3	51	4
Clay (%)	27	4	12	2
Pentachlorophenol ug PCP/Kg OC	--	4,380	5,080	2,190

Sediment Sample Results from Site Evaluation Unit Collection of September 1993.

	Background					
	S-20	S-22	S-22 (DUP)	S-21	S-23	S-24
Total Dioxin Isomers (ug/Kg)	0.630	646.01	562.66	286.49	15.97	19.60
Total Furan Isomers (ug/Kg)	0.070	148.11	110.34	66.07	3.26	5.00
Total Furan + Dioxin Isomers (ug/Kg)	0.700	794.12	673.00	352.56	19.23	24.60
TCDD - EQUIVALENCIES						
Dioxin Isomer EQ (pg TCDD-EQ/g) ppt	1.41	1611	1190	650	28.8	34
Furan Isomer EQ (pg TCDD-EQ/g)	0.92	893	623	333	8.2	14
Total TCDD EQ (pg TCDD-EQ/g)	2.33	2504	1813	983	37	48
Pentachlorophenol (ug/Kg)	ND (800)	1300	1600	1400	70	ND (800)
Total PAHs (ug/Kg)	1630	2500	2250	3610	2340	440
Endrin (ug/Kg)[1]	ND	ND	7.2	ND	ND	ND
4.4 - DDT[1]	ND	6.9	9.6	ND	ND	ND
Endrin aldehyde[1]	ND	7.8	11.0	9.3	ND	26
pH	6.6	6.9	7.2	7.3	6.7	6.4

Because of high detection levels, other Wisconsin reference site values used.

[1] See qualifiers associated with analytical results.

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Conce. trations of 17 2,3,7,8- Substituted Dioxin And Furan Isomers In Military Creek Sediments (Sept. 1993 S14 Samples)

	pg/g (ppt)						Reference Sediments Homolog Basis	
DIOXIN ISOMERS	S-20	S-22	S-25	S-21	S-23	S-24	Wisconsin R. @ Waysay	
2,3,7,8-TCDD	ND*	ND	ND	ND	ND	ND	TCDD	ND
1,2,3,7,8-PeCDD	ND	ND	ND	ND	ND	ND	PeCDD	ND
1,2,3,4,7,8-HxCDD	ND	400	300	ND	ND	ND	HxCDD	13
1,2,3,6,7,8-HxCDD	ND	2450	1660	970	ND	ND		
1,2,3,7,8,9-HxCDD	ND	910	700	380	ND	ND		
1,2,3,4,6,7,8-HpCDD	ND	64,750	40,000	25,350	1380	1600	HpCDD	83
OCDD	ND	577,500	520,000	259,790	14590	18000	OCDD	635
TOTAL Dioxin Isomer	ND	646,010	562,660	286,490	15970	19600		731
FURAN ISOMERS								
2,3,7,8-TCDF	ND	ND	ND	ND	ND	ND	TCDF	18
1,2,3,7,8-PeCDF	ND	ND	ND	ND	ND	ND	PeCDF	14
2,3,4,7,8-PeCDF	ND	ND	ND	ND	ND	ND		
1,2,3,4,7,8-HxCDF	ND	2630	1660	940	ND	ND	HxCDF	26
1,2,3,6,7,8-HxCDF	ND	790	580	310	ND	ND		
2,3,4,6,7,8-HxCDF	ND	790	780	530	ND	ND		
1,2,3,7,8,9-HxCDF	ND	750	380	ND	ND	ND		
1,2,3,4,6,7,8-HpCDF	ND	24,500	17,000	10,020	520	1000	HpCDF	47
1,2,3,4,7,8,9-HpCDF	ND	3150	1940	1060	ND	ND		
OCDF	ND	115,500	88,000	53,210	2740	4000	OCDF	26
TOTAL Furan Isomer	ND	148,110	110,340	66,070	3260	5000		131
TOTAL DIOXIN+FURAN	ND	794,120	673,000	352,560	19,230	24,600		862

* For summing purposes, isomers or homolog groups reported as being less than the detection level were assumed to be

Calculation of 2,3,7,8-TCDD EQUIVALENCIES Based On 2,3,7,8-Substituted Dioxin And Furan Isomer Concentrations In Military Creek Sediments

	pg TCDD-EQ/g Sed.						Reference Sediments	
DIOXIN ISOMERS	S-20	S-22	S-25	S-21	S-23	S-24	Rainbow Flowage	TEF
2,3,7,8-TCDD	ND	ND	ND	ND	ND	ND	ND	1.0
1,2,3,7,8-PeCDD	ND	ND	ND	ND	ND	ND	ND	0.5
1,2,3,4,7,8-HxCDD	ND	40	30	ND	ND	ND	0.22	0.1
1,2,3,6,7,8-HxCDD	ND	250	170	100	ND	ND	0.36	0.1
1,2,3,7,8,9-HxCDD	ND	91	70	40	ND	ND	0.31	0.1
1,2,3,4,6,7,8-HpCDD	ND	650	400	250	13.8	16	0.65	0.01
OCDD	ND	580	520	260	15	18	0.49	0.001
Dioxin TCDD-EQ		1611	1190	650	28.8	34	2.0	
FURAN ISOMERS								
2,3,7,8-TCDF	ND	ND	ND	ND	ND	ND	0.27	0.1
1,2,3,7,8-PeCDF	ND	ND	ND	ND	ND	ND	ND	0.05
2,3,4,7,8-PeCDF	ND	ND	ND	ND	ND	ND	ND	0.5
1,2,3,4,7,8-HxCDF	ND	260	170	90	ND	ND	0.22	0.1
1,2,3,6,7,8-HxCDF	ND	79	58	30	ND	ND	0.20	0.1
2,3,4,6,7,8-HxCDF	ND	79	80	50	ND	ND	0.11	0.1
1,2,3,7,8,9-HxCDF	ND	75	38	ND	ND	ND	ND	0.1
1,2,3,4,6,7,8-HpCDF	ND	250	170	100	5.2	10	0.17	0.01
1,2,3,4,7,8,9-HpCDF	ND	30	19	10	ND	ND	0.03	0.01
OCDF	ND	120	88	53	3	4	0.03	0.001
FURAN TCDD-EQ		893	623	333	8.2	14	1.03	
TOTAL TCDD-EQ		2504	1813	983	37	48	3.03	

pg TCDD-EQ/g Sediment

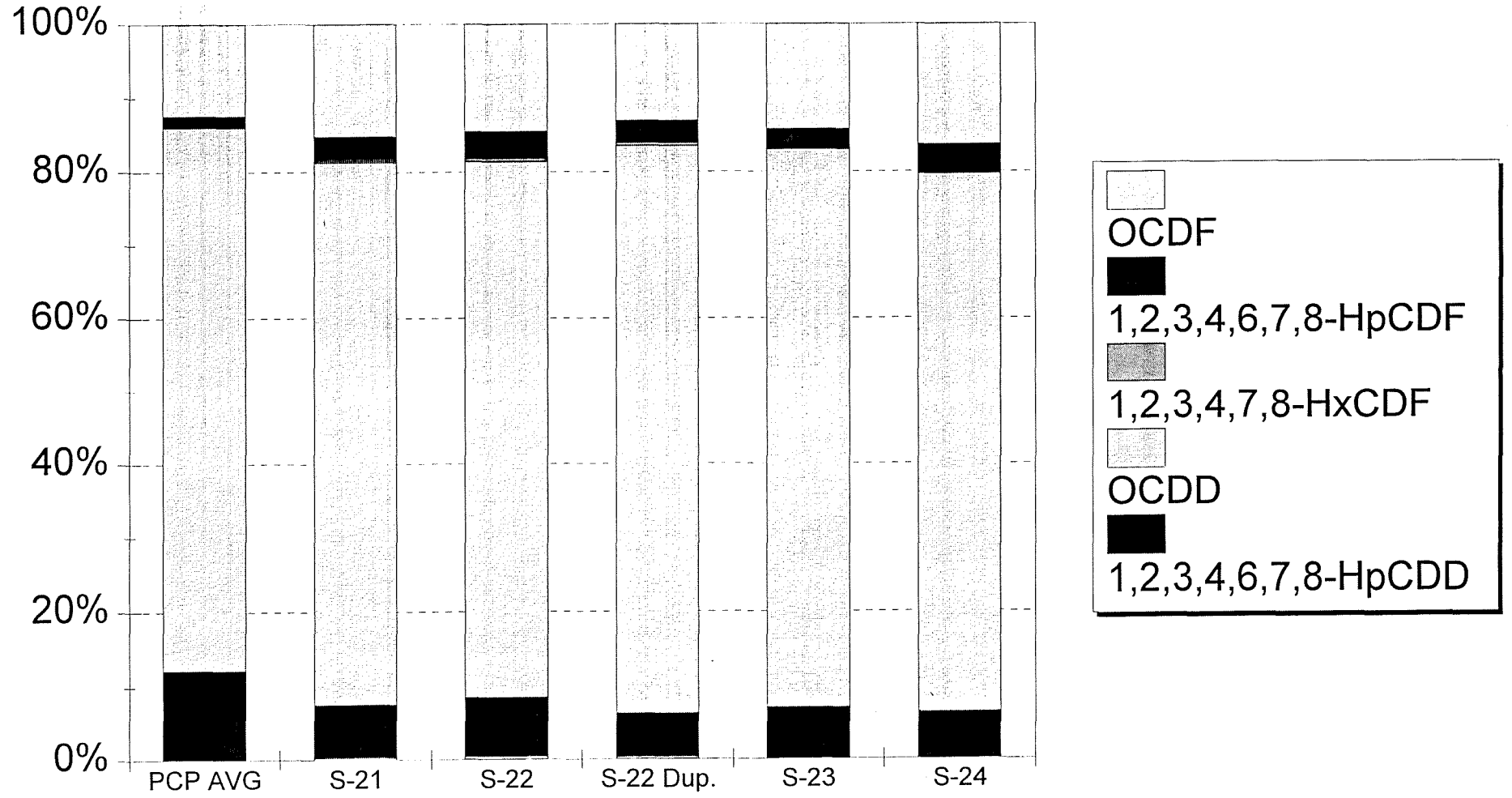
Statewide TCDD-EQ SEDIMENT VALUES

Site	pg TCDD-EQ/g
Military Creek	2504
	1813
	983
	37
	48
Lower Fox River (Below Depere Dam)	441
	379
	314
	268
	253
	229
	85
	61
	52
	49
	42
	21
(Study Reference)	4.3
Petenwell/Castle Rock Flowages-Wis R.	78
	62
	31

Site	pg TCDD EQ/g
Rainbow Flowage-Wis R.	2.5
	2.3
Lake Sediments	
WD · Hatfield Lake	0.15
Bass Lake	0.23
Kankapot Creek Trib. to Lower Fox	2.34
	1.86
	1.72
	0.79
	0.47
	0.39
	0.36
Soils (Literature)	
Great Britain	1.05
	1.30
Rural	1.65
	1.09

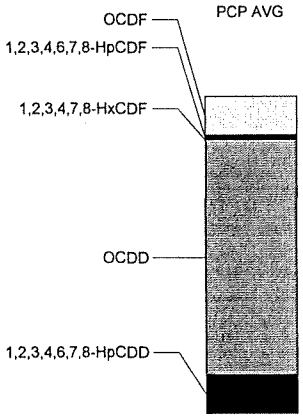
Dioxin & Furan Distributions

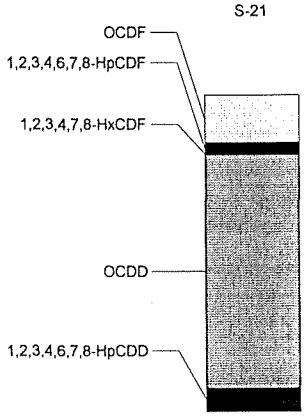
PCP Product and Military Cr. Sediment

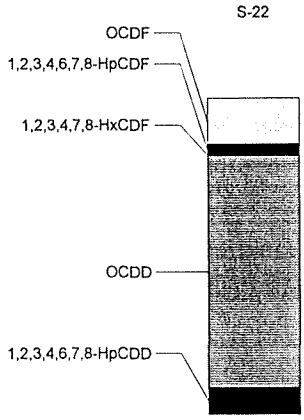


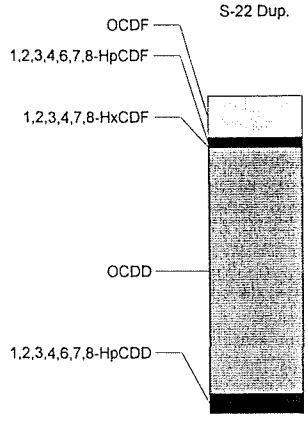
Dioxin & Furan Distributions

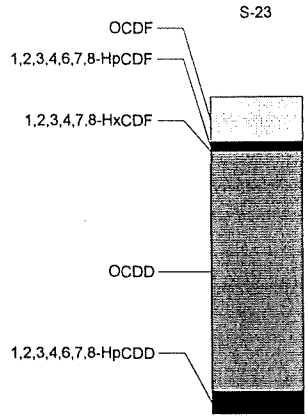
PCP Product and Military Cr. Sediment

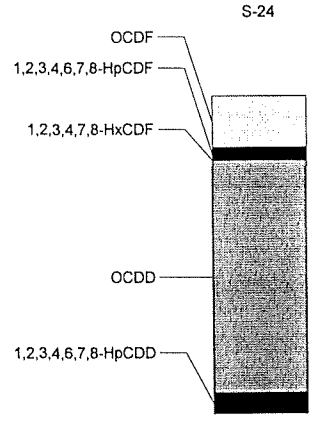












ESTIMATED PAST PENTACHLOROPHENOL CONCENTRATIONS IN SEDIMENTS AT THE MILITARY CREEK SAMPLING LOCATIONS[1] BASED ON THE CURRENT CONCENTRATIONS OF 17 2,3,7,8 - SUBSTITUTED DIOXIN AND FURAN ISOMERS

Sample Site	Past Pentachlorophenol Concentration mg/kg	Current Pentachlorophenol Concentration ug/kg	Core Length
S -20	N. D.	N. D.	2 ft.
S - 22	830	1300	1 ft.
S - 25 (DUP)	703	1600	1 ft.
S - 21	368	1400	2 ft.
S - 23	20	70	1 ft.
S - 24	26	N. D.	Trowel

1. Based on sediment sampling done by BHSW Site Evaluation Unit, Sept. 1993.

17 2,3,7,8 - substituted dioxin and furan isomers as impurities make up approximately 0.096 % by weight of the manufactured pentachlorophenol product. Based on the concentrations of these 17 .isomers at the 6 sediment sampling locations (duplicate of S - 22 considered as a separate sample) in Military Creek, the estimated pentachlorophenol concentrations associated with these concentrations was calculated. The dioxin and furan .isomers makeup of pentachlorophenol is based on Hagenmaier, H. and H. Brunner. 1987. Isomerspecific analysis of pentachlorophenol and sodium pentachlorophenol for 2,3,7,8 - substituted PCDD and PCDF at sub - ppb levels. Chemosphere. 8/9, 1759 - 1764.

Table 1. Sampling Locations and Sampling Types Associated with the October 9-11, 1995 Site Investigation at the C.M. Christiansen Wood Treatment Facility, Phelps, WI.

Sample Site	Soil/Sediment Chemistry (Corer)	Sediment Toxicity (Petite Ponar)	Macroinvertebrates (Corer) 0-15 cm	Sediment Traps (Quart Jars) Placed, Retrieval Later
Floodplain[1]				
FP-1A(Ref)	+[2]			
FP-2A	+			
FP-2B	+			
FP-3A	+			
FP-3B	+			
Military Creek				
MC-1A(Ref)		+	+	+
MC-2A		+	+	
MC-3A		+	+	+
MC-4A		+	+	
MC-5A		+	+	+
MC-6				+
North Twin Lake				
NT-1A(Ref)			+(Ponar)	
NT-2A	+	+	+(Ponar)	

1. Floodplain soil samples taken with a sharpshooter spade. Core cut with spade and extracted. FP-1A made up of 0-15 cm. Other floodplain samples made up of two strata -A is 0-7.6 cm and B is 7.6-20.3 cm.

2. The reference floodplain site FP-1A will be analyzed for particle size and DRO only. All other smaples will be also analyzed for pesticides and priority pollutants (PAHs and chlorophenolics).

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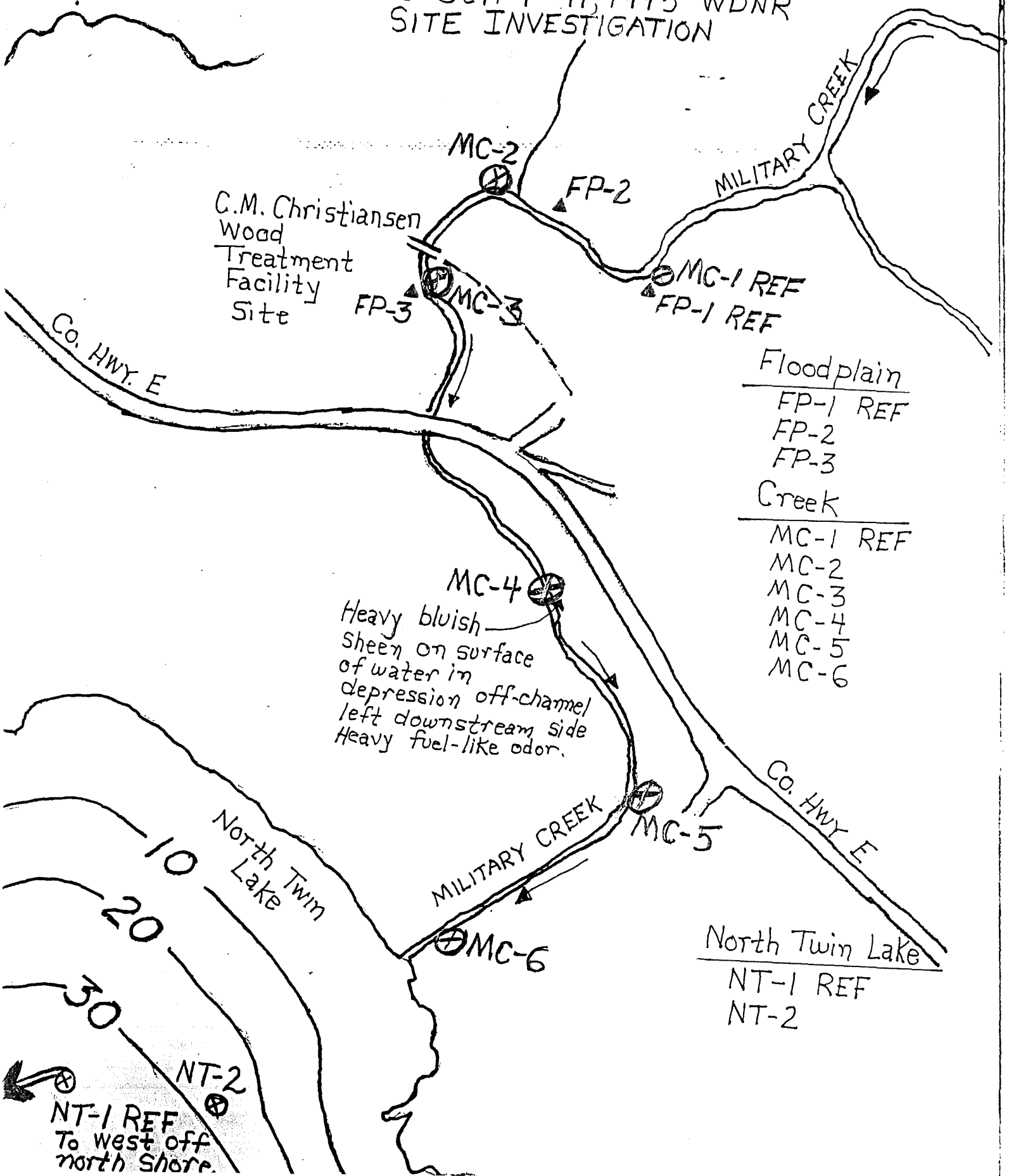
FIGURE 1. General Location of Floodplain Soil, MILITARY CREEK and NORTH TWIN LAKE SEDIMENT SAMPLING SITES FOR THE OCT. 9-11, 1995 WDNR SITE INVESTIGATION



Summary OF SLOH Analytical Results For Military Creek Soils and Sediments

Soil/Sediment Depth Analyzed

FP-1A 0-15 cm (6 in)
FP-2A 0-7.6 cm (0-3 in)
FP-2B 7.6-20.3 cm (3-8 in)
FP-3A 0-7.6 cm
FP-3B 7.6-20.3 cm
NT-2A 0-48 cm (0-19 in)

	mg/Kg								
Field Sample Site	Pentachlorophenol		Base/Neutral and Acid Etractable Method 1570	Pesticides Methods 1510 and 1570 GC-ECD	DRO Method 1556	TOC %	Particle Size Analysis %		
	Method 1540 GC-ECD	Method 1570 GC/MS					Sand	Silt	Clay
FP-2A	14	270	**[1]	< LOD[2]	< 10	14.4	31	66	3
FP-2B	3.4	26	**[1]	< LOD	< 10	5.55	66	32	2
FP-3A	**[1]	0.45	**[1]	< LOD	< 10	6.26	43	52	5
FP-3B	**[1]	0.55	**[1]	< LOD	< 10	2.01	56	41	3
FP-1A (Reference)	NA[3]	NA[3]	NA[3]	NA[3]	< 10	NA[3]	50	48	2
NT-2A	**[1]	0.02	**[1]	< LOD	NA[3]	11.30	59	39	2

1. LOD not achievable due to dilution
2. Interference reported for 6 pesticides
3. NA - No Analysis

FP-1A is floodplain reference site, only analyzed for DRO and particle size. NT-2A analyzed for organics and particle size but not DRO.

TABLE 5

STATE LABORATORY OF HYGIENE
AQUATIC LIFE TOXICITY TESTING LABORATORY
- METHODS FOR SEDIMENTS

> ACUTE TESTS WITH SURVIVAL ENDPOINT

48 HR ACUTE TEST WITH *DAPHNIA MAGNA* *

48 HR ACUTE TEST WITH *CERIODAPHNIA DUBIA* *

10 DAY ACUTE TEST WITH *HYALLELA AZTECA* * +

> CHRONIC TESTS WITH REPRODUCTION OR GROWTH ENDPOINTS (AND SURVIVAL)

10 DAY CHRONIC TEST WITH *DAPHNIA MAGNA* *
- REPRODUCTION AND SURVIVAL

10 DAY CHRONIC TEST WITH *CHIRONOMUS TENTANS* * +
WEIGHT AND SURVIVAL

SUMMARY OF SEDIMENT TOXICITY TEST RESULTS - MILITARY CREEK

Ceriodaphnia dubia 48 hour acute

No statistically significant toxicity. Survival was greatly reduced in MC-4A and MC-6A (NT-2A) at 45% less than the lab control and in MC-5A at 35% less than the lab control. However, there was considerable variability in survival within each test, which appears very likely due to the presence of spring tails and in one case presence of an amphipod. Results are therefore inconclusive.

Daphnia magna 48 hour acute

No significant difference in survival.

Daphnia magna 10-day chronic (survival and reproduction)

Organisms over MC-3A experienced significant mortality and subsequently significantly reduced reproduction relative to both the lab control and field reference. MC-4A experienced greatly reduced mortality, being at only 50% of the lab control, and greatly reduced reproduction, at 31% less than the lab control. However, survival within the MC-4A test was extremely variable, as was the resulting reproduction, making any conclusions about MC-4A difficult.

Chironomus tentans 10-day chronic (survival and growth)

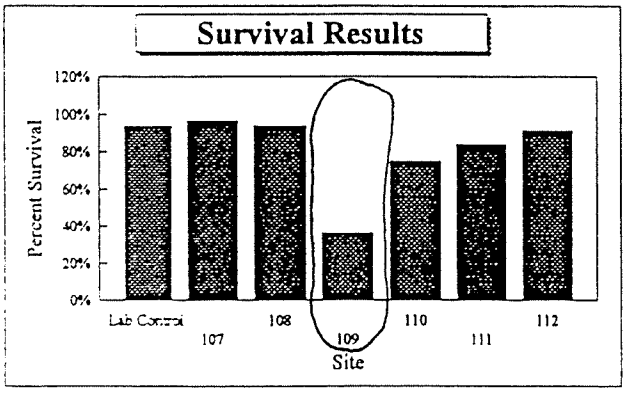
Organisms exposed to MC-3A experience significant mortality and subsequently significantly reduced growth.

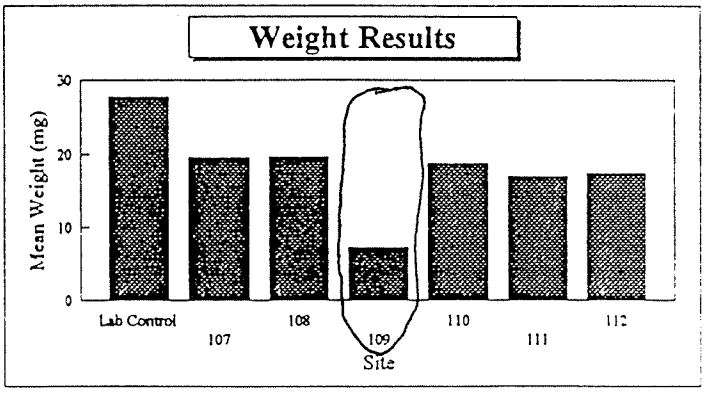
Growth is significantly reduced over all treatments relative to the control, but all grew equally well relative to the field reference treatment.

Military Creek Sediment Test Results

Chironomus tentans 10 d Chronic

Site	Mean Number of Survivors	STDV	Percent Survival (%)	Difference from Lab Control (%)	Mean Weight (mg)	STDV	Difference from Lab Control (%)
Lab Control	9	1	94%	—	27.72	4.09	—
MC-1A(REF) 107	10	1	96%	3%	19.53	2.09	-30%
MC-2A 108	9	1	94%	0%	19.61	3.17	-29%
MC-3A 109	4	3	36%	-61%	7.29	6.31	-74%
MC-4A 110	8	2	75%	-20%	18.77	7.11	-32%
MC-5A 111	8	1	84%	-11%	16.98	1.36	-39%
NT-2A 112	9	1	91%	-3%	17.41	1.91	-37%





Military Creek Sediment Test Results

Daphnia magna 10 d Chronic

	Site	Number of Survivors	Percent Survival (%)	Difference from Lab Control (%)	Number of Young	Difference from Lab Control (%)
	Lab Control	38	95%	—	1287	—
MC-1A (REF)	107	36	90%	-5%	1484	15%
MC-2A	108	38	95%	0%	1657	29%
MC-3A	109	2	5%	-95%	322	-75%
MC-4A	110	20	50%	-47%	893	-31%
MC-5A	111	39	98%	3%	1349	5%
NT-2A	112	37	93%	-3%	1305	1%