Final Report
Risk Assessment and Direct-Push Investigation of Red Water Pond Areas Former Plum Brook Ordnance Works Sandusky, Ohio

Volume II - Appendices

Submitted to:

Commander
U.S. Army Corps of Engineers
Nashville District
Post Office Box 1070
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IT Project No. 773701

Prepared by:

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Revision 2

August 2000

APPENDIX A

HTRW DRILL LOGS AND GROUNDWATER SAMPLING LOGS

PRRP

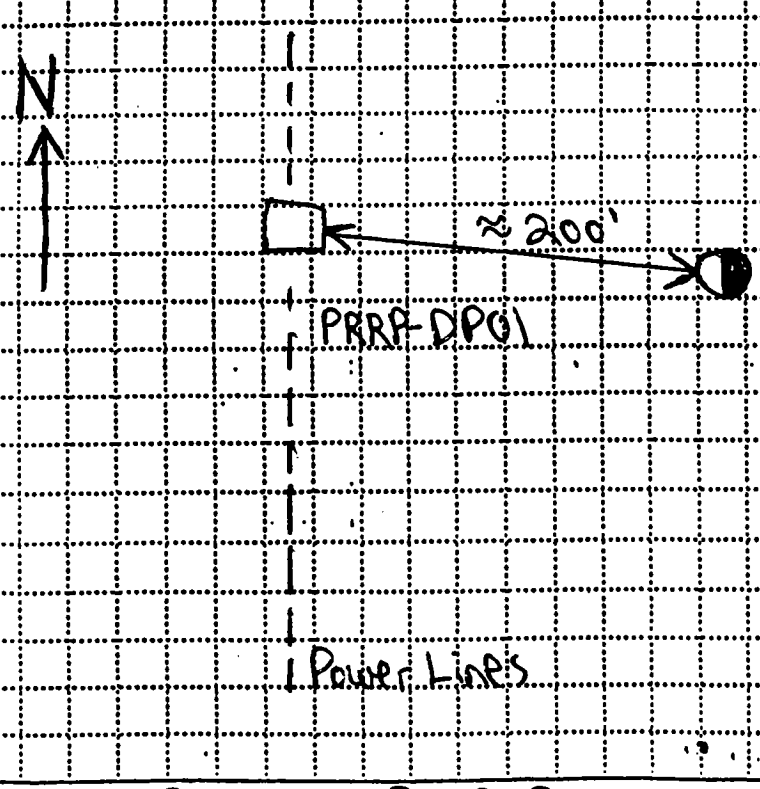
HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP01
1. COMPANY NAME	IT Corp
2. DRILL SUBCONTRACTOR	Geo Environmental
SHEET	1 OF 3
3. PROJECT	PBOW - PRRP
4. LOCATION	PRRP
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	X 1.5" Geoprobe Sample Rods ~~Diam.~~ w/Acetate Liners (4' Long)
8. HOLE LOCATION	PRRP - DP01
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-11-98
11. DATE COMPLETED	6-11-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH GROUNDWATER ENCOUNTERED	≈5-6', 9-10', 10-12' Ft. BGS.
13. DEPTH DRILLED INTO ROCK	NA
14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	12.0 Ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA
18. GEOTECHNICAL SAMPLES	NA
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	
20. SAMPLES FOR CHEMICAL ANALYSIS	
VOC	✓
TAL METALS	✓
OTHER (SPECIFY)	Nitroaromatics
OTHER (SPECIFY)	SVOC's
OTHER (SPECIFY)	PCB's
21. TOTAL CORE RECOVERY	NA
22. DISPOSITION OF HOLE	Grouted
BACKFILLED	
MONITORING WELL	—
OTHER (SPECIFY)	—
23. SIGNATURE OF INSPECTOR	John Vogel

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP01	624,939.62	1,918,740.53	630.39



PROJECT	PBOW - PRRP
HOLE NO.	PRRP - DP01

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

PRRP-DP01

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP01

PROJECT: PBOW - PRRP

INSPECTOR: John Voegding

SHEET 2 OF 3 SHEETS

USCS Symbol (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Intervals (g)	REMARKS (h)
Pt/ml		0-0.5' Grass and Topsoil	Headspace Hnu Readings		PBOW-98-SO-PRRP-DP01-7200-(0002)		Time Start 1230 End 1325
ml	1 2 3	0.5'-4' Soft, dark brown grading to light brown, low-med. Plasticity, Fine Sandy Silt and Sandy Clay, moist	NA			Push 1 3' Recovery	Hnu Meter Not Functioning Properly due to Atmospheric Moisture.
	4		4'		4	4'	
Cl	4 5 6 7	4'-8' Soft, brownish grey, med Plasticity, Clayey Silt and Clay, slightly wet (trace amount of free water)	NA	NA	PBOW-98-SO-PRRP-DP01-7210-(0406) 6	Push 2 4' Recovery	
	8		8'		8	8'	
	9 10	8'-12' Same as Above, med-high plasticity, wet from 9'-10' Slightly wet from 10'-12'	NA		PBOW-98-SO-PRRP-DP01-7220-(0810) 10	Push 3 (8'-12') 4' Recovery	

PROJECT: PBOW - PRRP

HOLE NO. PRRP-DP01

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP01

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET 3 OF 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	[redacted] (g)	REMARKS (h)
Cl 12'	11 12	10-12' See pg 1. 12'	Headspace Hnu Readings NA	NA	NA	Sample Interval Push 3 (8'-12') 4' Recovery	
		Bottom of Boring at 12.0'					

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP01

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP02
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo - Environmental Drilling	SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig.	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 1.5" Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: PRRP - DP02	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-14-98	11. DATE COMPLETED: 6-14-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ≈ 8 Ft. BGS	
15. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

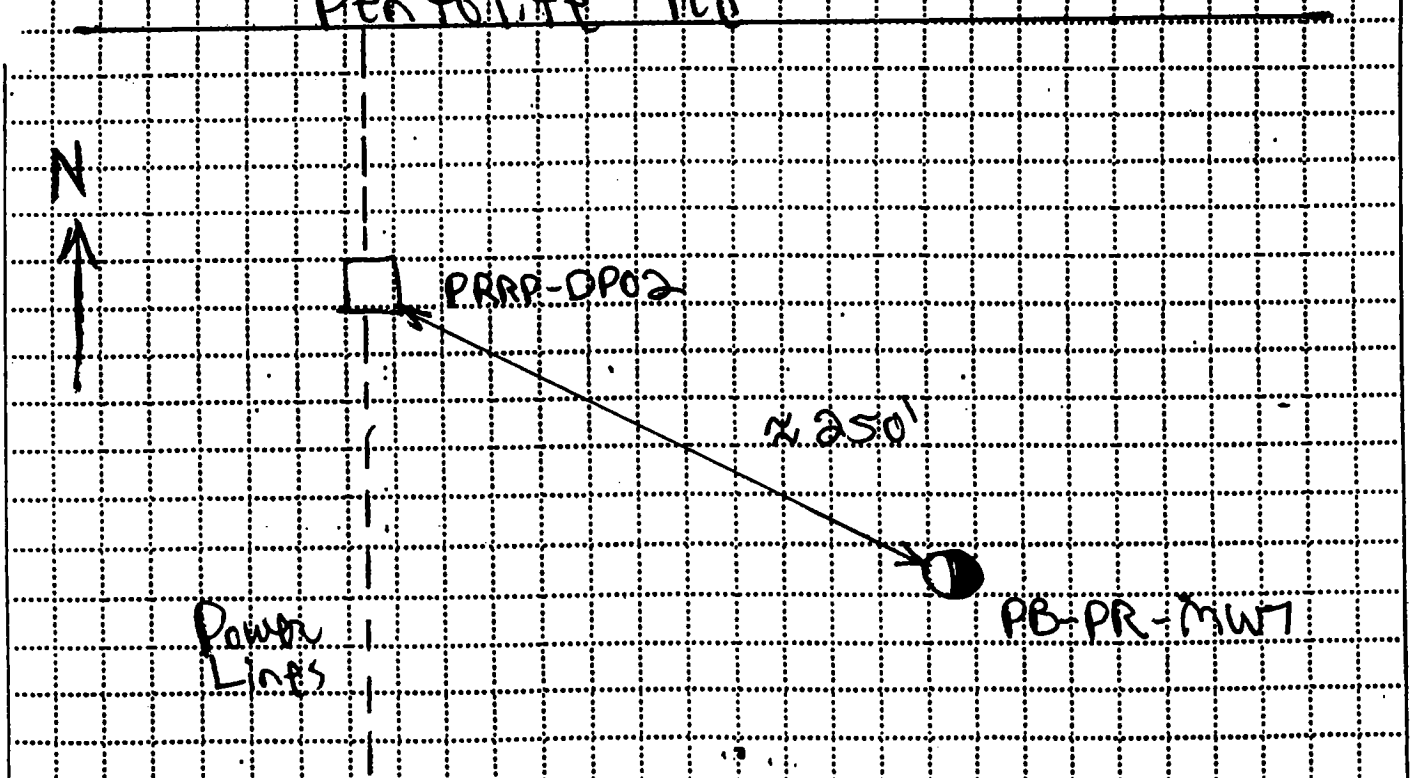
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogelin

LOCATION SKETCH/COMMENTS

	N	E	EL.
DP02	625,232.21	1,918,802.48	630.37

SCALE: Not to Scale



PROJECT: PBOW - PRRP | HOLE NO.: PRRP-DP02

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP02

SHEET 2 OF 3 SHEETS

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' grass and Topsoil	Headspace Hnu Readings		PBOW-98-SO-PRRP-DP02-7240 (0002) 2'	Push 1 3.5' Recovery	Start 0745 End 0815
	1	0.5'-4' Soft-m. Firm, brown and grey, V. Firm, Sandy Silt and Clayey Silt, moist					
	2		NA				
	3						Hnu meter Readings are erratic due to Headspace moisture.
ML/CL	4	4'-8' Same as Above, Clayey Silt and Clay med-high Plasticity, wet at 8'	4' NA	NA	4' PBOW-98-SO-PRRP-DP02-7250-(0406) 6'	4' Push 2 4' Recovery	
	5						
	6						
	7						
	8	8'-12' Same as Above Grey, Clayey Silt and Clay, wet	8' NA		8' PBOW-98-SO-PRRP-DP02-7260-(0810) 10'	8' Push 3 (8'-12') 4' Recovery	wet at 8'
	9						
	10						

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP02

(Proponent: CECW-EG)

ENG FORM 5056A-R, AUG 94

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP02

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET [redacted] OF SHEETS 3 OF 3

USCS, STRATA (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	[redacted] (g)	REMARKS (h)
ml/cl	11	10-12' See pg# 2	Headspace Hnu Readings NA	NA	NA	Sampling Intervals Push 3 (8-12')	Time Start 0745 End 0815
	12	Bottom of Boring at 12.0 Ft.					

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP02

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP-

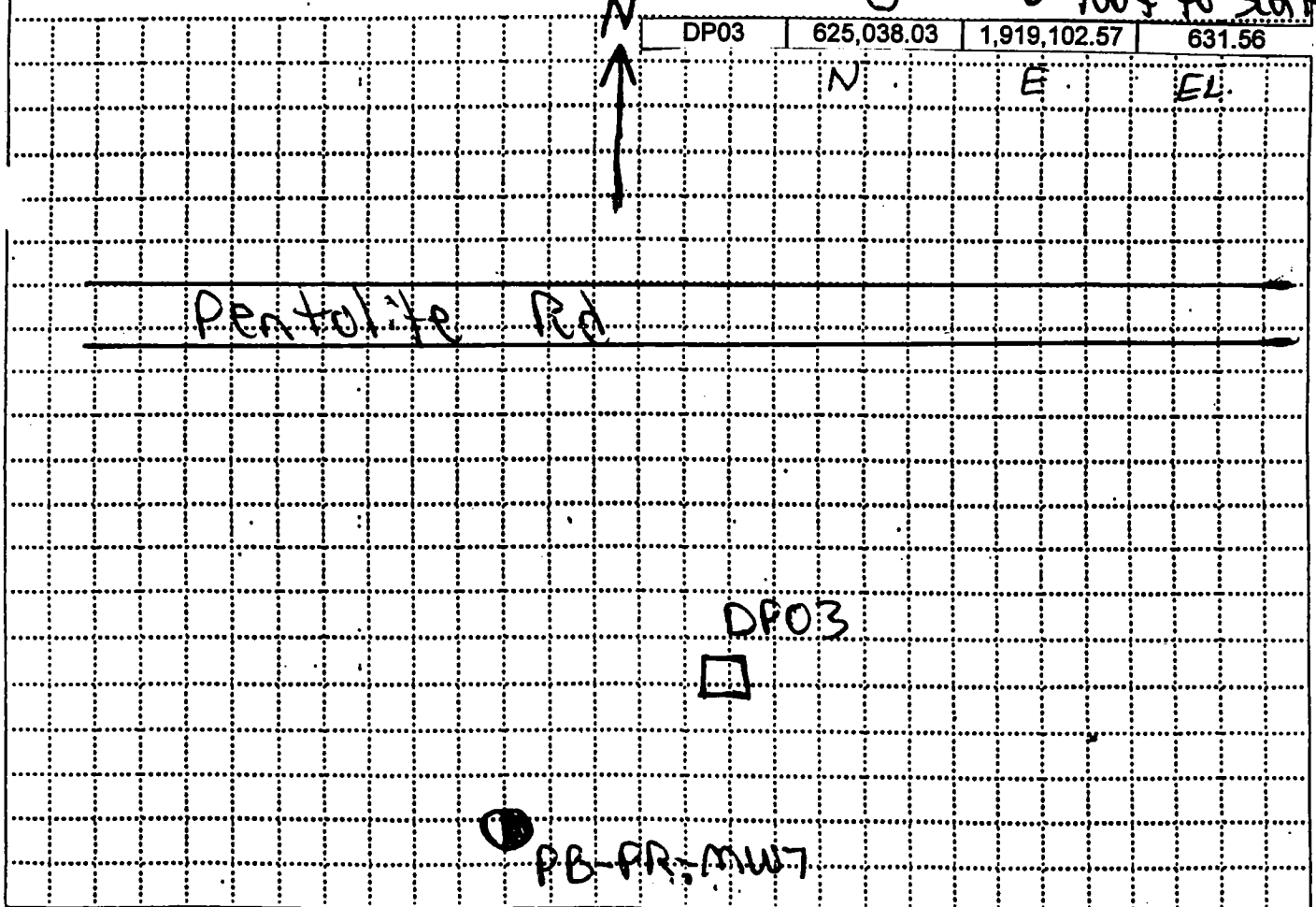
HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP03
1. COMPANY NAME	IT Corp
2. DRILL SUBCONTRACTOR	Geo Environmental
SHEET / SHEETS	1 of 2
3. PROJECT	PBOW - PRRP
4. LOCATION	PRRP
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	X 1.5" Geoprobe Sample Rods w/Acetate Liners (4' Long)
8. HOLE LOCATION	PRRP-
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-8-98
11. DATE COMPLETED	6-8-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH GROUNDWATER ENCOUNTERED	Ft. BGS.
13. DEPTH DRILLED INTO ROCK	NA
14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	10.0 Ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	~ 4.0 Ft.
18. GEOTECHNICAL SAMPLES	NA
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC ✓
	TAL METALS ✓
	OTHER (SPECIFY) Nitroaromatics
	OTHER (SPECIFY) SVOCs
	OTHER (SPECIFY) PCBs
21. TOTAL CORE RECOVERY	NA
22. DISPOSITION OF HOLE	BACKFILLED Grouted
	MONITORING WELL —
	OTHER (SPECIFY) —
23. SIGNATURE OF INSPECTOR	John Vogedin

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

DP03	625,038.03	1,919,102.57	631.56
	N	E	EL



PROJECT PBOW - PRRP

HOLE NO. PRRP-DP03

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: PRRP-DP03

PROJECT: PBOW - PRRP

INSPECTOR: John Vogeding

SHEET 2 OF 2 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Interval	REMARKS (h)
SC	1	0-3' Soft, brown and black, v. fine clayey Sand with 30% organic matter, moist	Headspace Hnu Readings		PBOW-98-50-PRRP-DP03-7280-(0002) 2'	Push 1	
	2		3.0 ppm				
	3	3'-4' Same as Above with No organic matter					
4'	4		4'		4'	4'	
SM	5	4'-7' loose, med. brown, v. fine-fine, Silty Sand, wet		NA	PBOW-98-50-PRRP-DP03-7290-(0406) 6'		wet from 4'-7'. (Perched zone ?)
	6		2.5 ppm			Push 2	
7'	7	7'-8' Soft-Firm, brown and grey, low-med. Plasticity, v. fine Sandy Silt, moist					
ML	8		8'			8'	No Recovery from 8'-10' (soft soupy mush).
	9					Push 3	Moved Rig 6" N and advanced borehole to 8' Sampled from 8'-10' No Recovery Again.
	10		10'				

PROJECT: PBOW - PRRP

HOLE NO. PRRP-DP03

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

Attempted to Sample From 10'-12'. Still No Recovery

PRRP

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP04
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	SHEET 1 OF 3
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: X 1.5" Geoprobe Sample Rods w/Acetate Liners (4' Long) ~~Diam.~~	8. HOLE LOCATION: PRRP-	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-9-98	11. DATE COMPLETED: 6-9-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

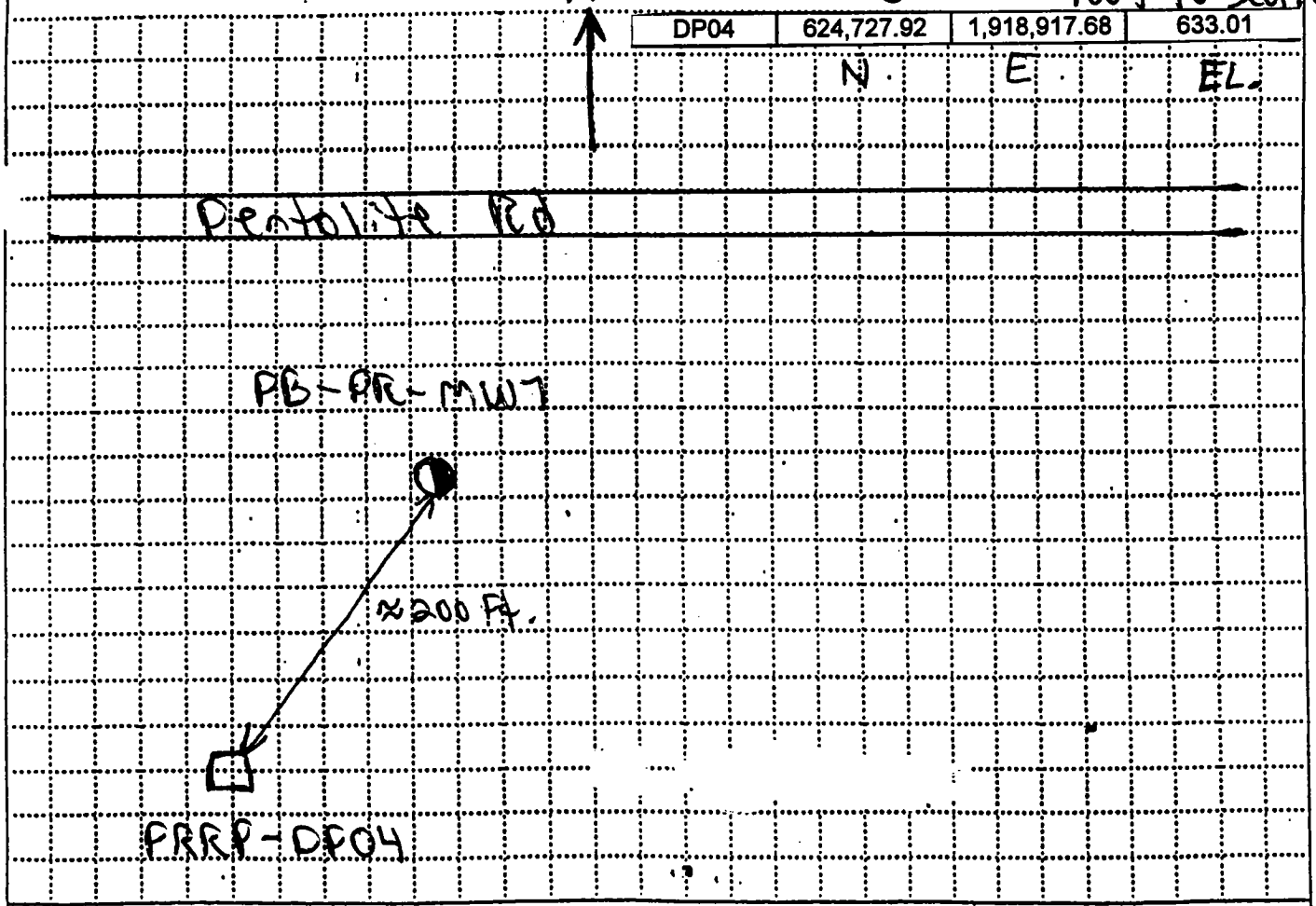
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted	—	—	—	John V Boyd

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

DP04	624,727.92	1,918,917.68	633.01
	N.	E.	EL.



PROJECT: PBOW - PRRP

HOLE NO: PRRP-DP04

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: PRRP-DP04

PROJECT: PBOW-PRRP | INSPECTOR: John Vogeding | SHEET 2 OF 3 SHEETS

USCS SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	[redacted] Sample Interval	REMARKS (h)
Pt/SM	1	0'-1' Loose, dark brown-black, Fine Silty Sand and Topsoil, moist	Headspace Hnu Readings		PBOW-98-SO-PRRP-DP04-7320-(0002) 2'		Time Start 1320 End 1400
SM/SC	2	1'-4' Loose, med. brown and grey, v. Fine-Fine, Clayey Sand, moist	2.5 ppm			Push 1	
	3	3" perched water at 3.5'					
	4	4'-4.5' Same as Above	4'		4'	4'	
ML/CL	5	5'-8' Soft, brown and grey, low-med. Plasticity, v. Fine, Sandy Silt and Clay, moist with few perched water zones.	2.5 ppm	NA	PBOW-98-SO-PRRP-DP04-7330-(0406) 6'	[redacted] Push 2	
	7						
	8	8'-12' Same as Above with few 2"-3" Fine Sand zones throughout, wet at 8 ft.	8'		8'	8'	
	9		2.0 ppm		PBOW-98-SO-PRRP-DP04-7340-(0810) 10'	Push 3	
	10						

PROJECT: PBOW-PRRP | HOLE NO. PRRP-DP04

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER PRRP-DP04

PROJECT PBOW-PRRP

INSPECTOR John Vogeding

SHEET 3 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Interval	REMARKS (h)
ml/cl	11	See Page 2	(8'-12') 2.0 ppm	NA	NA	Push 3 (Cont.)	
	12	12.0'	12.0'			12'	
		Bottom of Boring at 12.0 ft.					

PROJECT PBOW-PRRP

HOLE NO. PRRP-DP04

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG

1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo - Environmental Drilling	DISTRICT: Nashville - TN; HOLE NUMBER: DP05; SHEET 1 OF 3
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig.	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 1.5" Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: PRRP - DP05	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-14-98	11. DATE COMPLETED: 6-14-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ~ 10 Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

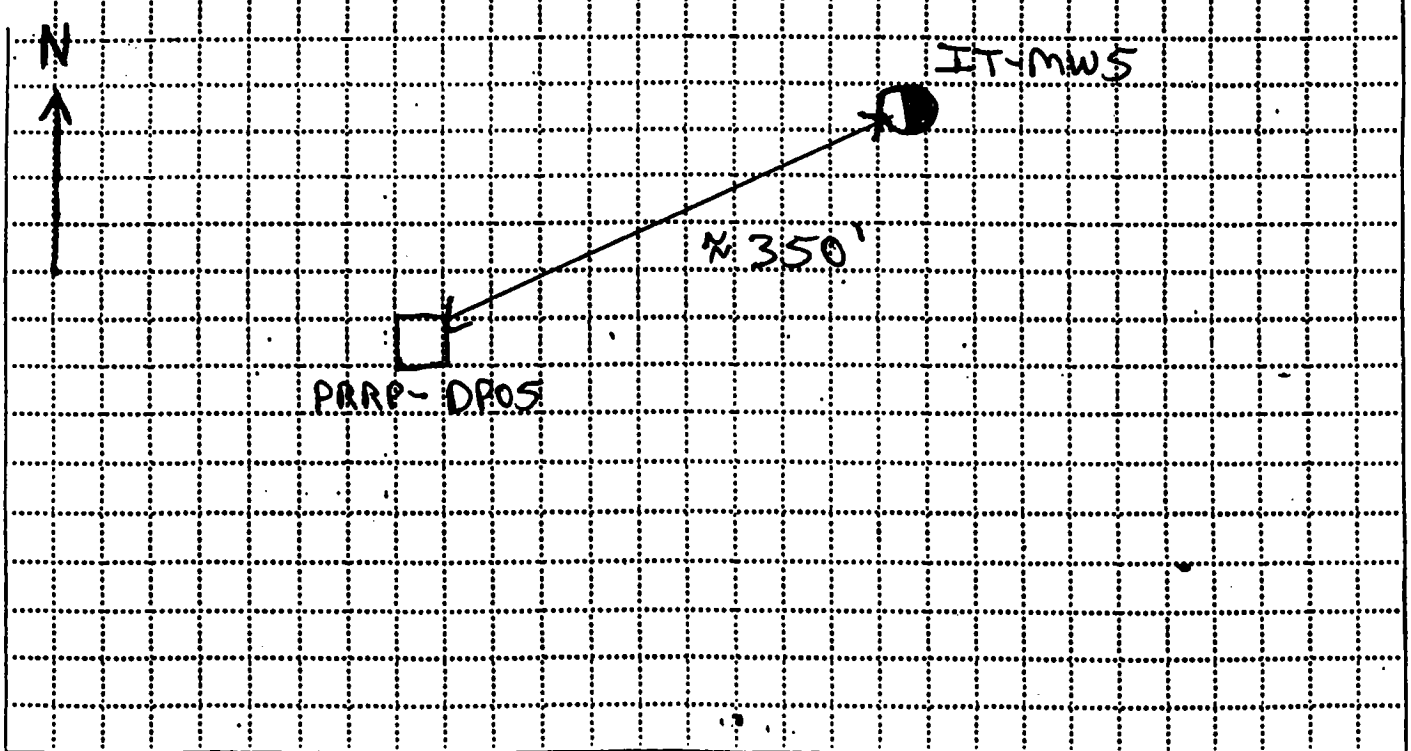
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogelsing

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP05	625,299.16	1,919,033.56	631.47



PROJECT: PBOW - PRRP

HOLE NO.: PRRP-DP05

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP05

PROJECT: PBOW - PRRP

INSPECTOR: John Vogeding

SHEET 2 OF 3 SHEETS

(a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' grass and Topsoil	Headspace Hnu Readings		PBOW-98-SO-PRRP-DP05-7360-(0002) 2'		Start 0930 End 1000
Sm	1	0.5'-3' Loose, med. brown, V. Fine, Silty Sand, Dry.				Push 1	
	2		NA			3.5' Recovery	
3'	3	3'					
Ml / Cl	4	3'-4' Soft-M. Firm, brown and grey, V. Fine, Sandy Silt, Slightly moist.	4'		4'	4'	Hnu meter Readings erratic due to Headspace moisture.
	5	4'-8' Same As Above, Sandy Silt grading to Clayey Silt w/ Fine Sand Stringers, Very moist		NA	PBOW-98-SO-PRRP-DP05-7370-(0006) 6'	Push 2 4' Recovery	
	6		NA				
	7						
	8		8'		8'	8'	
	9	8'-12' Same As Above, Clayey Silt, high Plasticity, Grey from 10'-12' Trace Free water From 8.5-9 ft.	NA		PBOW-98-SO-PRRP-DP05-7380-(0010) 10'	Push 3 (8'-12') 4' Recovery	
	10						

PROJECT: PBOW - PRRP

HOLE NO. PRRP - DP05

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP05

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET [redacted] SHEETS 3 of 3

SCS [redacted] (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	[redacted] (g)	REMARKS (h)
			Headspace Hnu Readings			Sampling Intervals	Time
		10'-12' See pg 2.	NA		NA	Push 3 (8'-12')	Start 0930 End 1000
	11		12'			12'	
Ml / Cl	12	12'-16' Same As Above Soft, grey, high Plasticity, Clayey Silt and Clay, v. moist - Slightly wet.	NA	NA	NA	Push 4 4' Recovery	
	13						
	14						
	15						
		16'	16'			16'	
	16	Bottom of Boring at 16.0 Ft.					

PROJECT PBOW - PRRP

HOLE NO. PRRP - [redacted]

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

DP05

PRRP-

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP06
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' Long X 1.5" Geoprobe Sample Rods Diam. w/Acetate Liners	8. HOLE LOCATION: PRRP-	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-8-98	11. DATE COMPLETED: 6-8-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 10.0 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): ≈ 8 Ft.	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

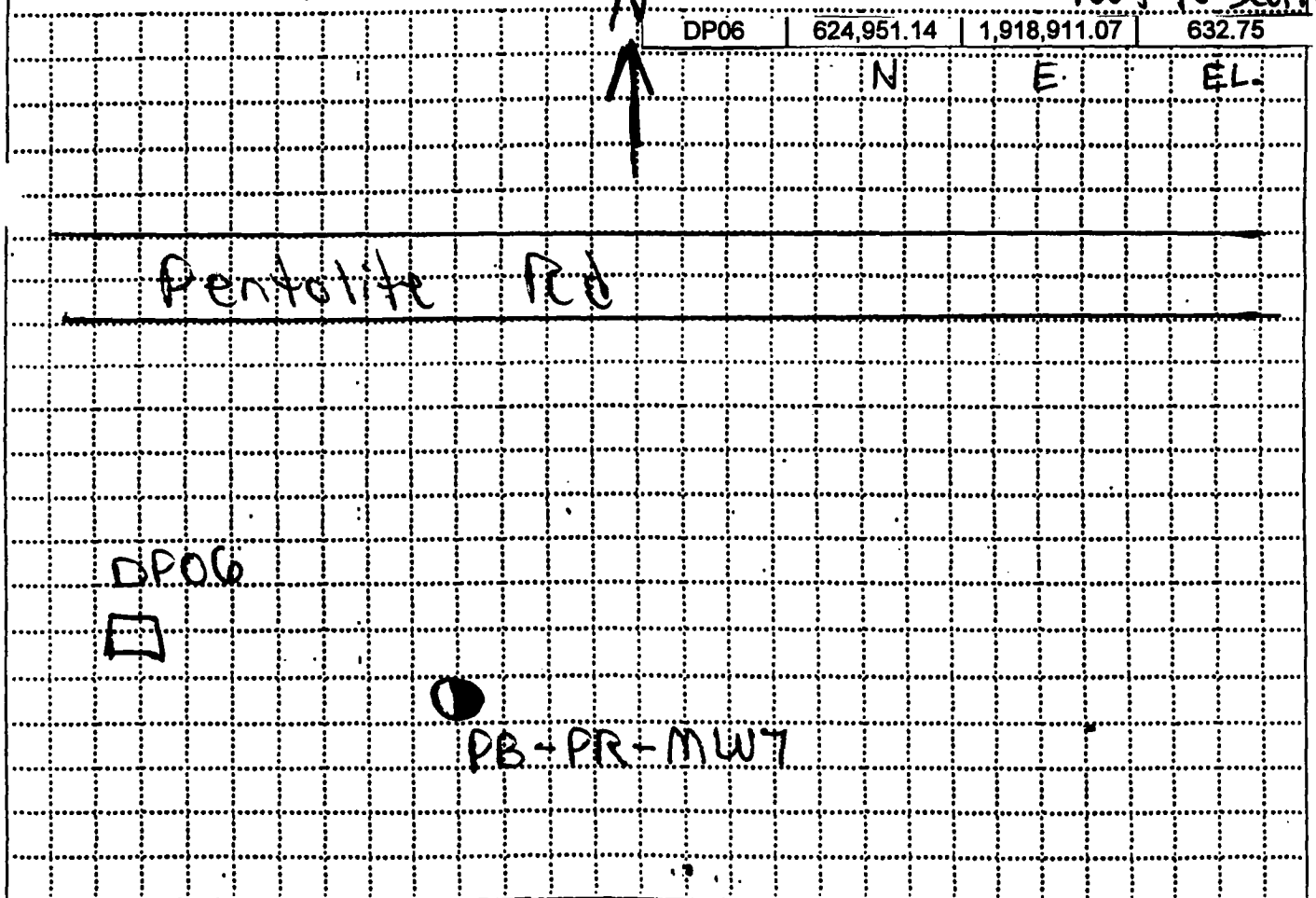
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted	—	—	—	John Vogel

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

DP06	624,951.14	1,918,911.07	632.75
	N	E	EL.



PROJECT: PBOW - PRRP

HOLE NO. PRRP-DP06

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: PRRP-DP06

PROJECT: PBOW - PRRP

INSPECTOR: John Vogeding

SHEET 2 OF 2 SHEETS

USCS SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Interval	REMARKS (h)
SM	1, 2, 3, 4	0-4' Loose, med. brown, v. fine-fine, silty sand, moist	Headspace Hnu Readings 0 ppm 4'		PBOW-98-SO-PRRP-DP06-7400-(0002) 2' 4'	Push 1	
ml	5, 6, 7, 8	4'-8' Soft-m. firm, brown and grey, low plasticity, v. fine, sandy silt, moist w/ few minor perched water zones.	0 ppm 8'	NA	PBOW-98-SO-PRRP-DP06-7410-(0406) 6' 8'	Push 2	▽ 8'
ml/cl	9, 10	8-10 Soft, grey, med-high plasticity, v. fine sandy silt and clay, wet at 8'	NA		PBOW-98-SO-PRRP-DP06-7420-(0806) 10'	Push 3	Bottom of Boring at 10 ft.

PROJECT: PBOW - PRRP

HOLE NO: PRRP-DP06

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP-

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP07
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	SHEET 1 OF 3
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' Long X 1.5" Diam. Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: PRRP-	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-9-98	11. DATE COMPLETED: 6-9-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: 4-5 Ft and ≈ 8 Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

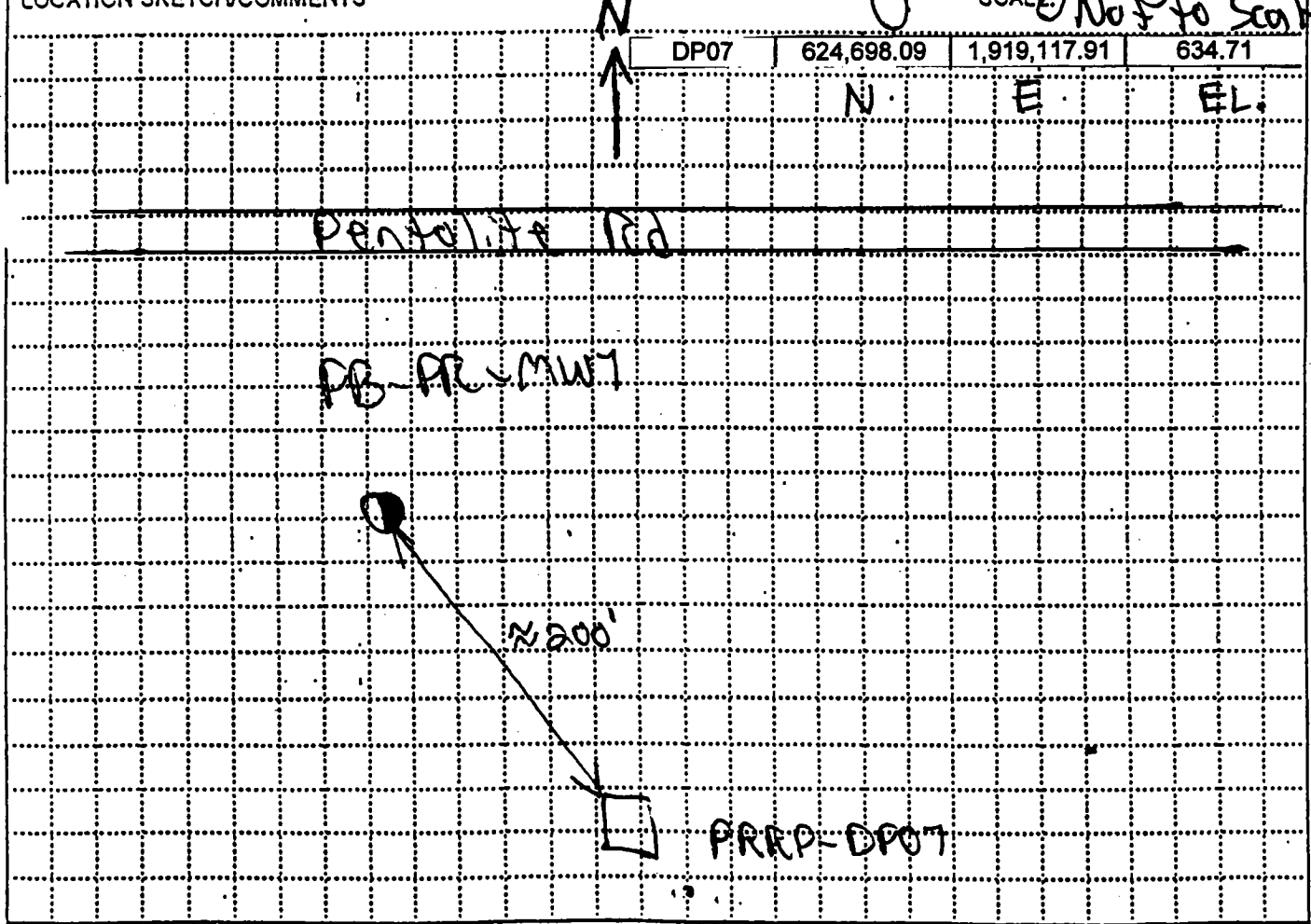
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted	—	—		John Vogelsing

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

DP07	624,698.09	1,919,117.91	634.71
	N	E	EL.



PROJECT: PBOW - PRRP

HOLE NO: PRRP-DP07

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER PRRP-DP07

PROJECT USCS

INSPECTOR John Vogeding

SHEET 2 OF 3 SHEETS

SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Intervals	REMARKS (h)
Sm/pt		0-0.5' Topsoil and grass	Headspace Hnu Readings				Start 1645 End 1715
Sm	1	0.5'-4' Loose, light-med. brown, Fine Sand, moist			PBOW-98-SO-PRRP-DP07-7440-(0002) 2'	Push 1 3' Recovery	
	2		2.8 ppm				
	3						
	4		4'		4'	4'	
		4-5' Same as Above, wet					wet From 4'-5'
5'	5	5'		NA			
ml/cl	6	5-8' Soft-M. Firm, brown grading to grey, med. plasticity, v. Fine Sandy silt and clay, moist	2.8 ppm		PBOW-98-SO-PRRP-DP07-7450-(0406) 6'	Push 2 4' Recovery	
	7						
	8		8'		8'	8'	
		8-12' Same as Above, Grey, v. Fine, Sandy Silt, moist - Slightly wet.					Some wettness @ ≈ 8 ft.
	9		2.8 ppm		PBOW-98-SO-PRRP-DP07-7460-(0808)	Push 3 4' Recovery	
	10				10'		

PROJECT PBOW-PRRP

HOLE NO. PRRP-DP07

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER PRRP-DP07

PROJECT PBOW-PRRP | INSPECTOR John Voyeding | SHEET 3 OF 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
n.l / cl	11	10-12' See pg. 2	2.8 ppm	NA	NA	Push #3 (8'-12') 4' Recovery	
	12	12.0'	12.0'				
		Bottom of Boring at 12.0 ft.					

PROJECT PBOW-PRRP | HOLE NO. PRRP-DP07

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: PRRP-DP08
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	SHEET 1 OF 3
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: X 1.5" Geoprobe Sample Rods w/Acetate Liners (4' Long) ~~Diam.~~	8. HOLE LOCATION: PRRP-DP08	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-10-98	11. DATE COMPLETED: 6-10-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ~3-4 Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

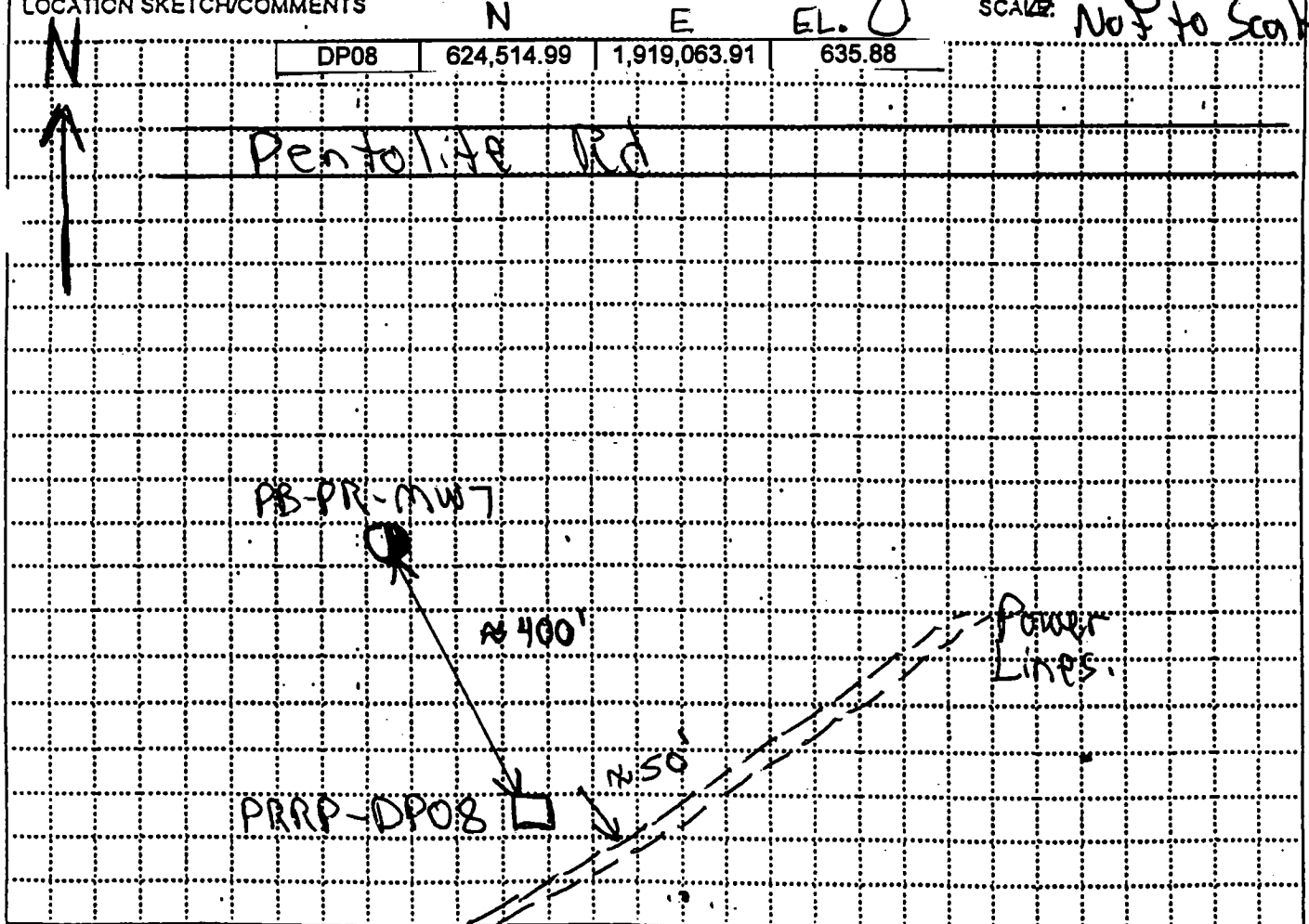
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted	—	—	—	John Vogeding

LOCATION SKETCH/COMMENTS

N	E	EL.
624,514.99	1,919,063.91	635.88

SCALE: Not to Scale



PROJECT: PBOW - PRRP

HOLE NO: PRRP-DP08

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: PRRP-DP08

PROJECT: PBOW-PRRP

INSPECTOR: John Vogeding

SHEET 2 OF 3 SHEETS

USCS SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	~~BOREHOLE~~ Sample Intervals (g)	REMARKS (h)
Pt / SM		0-0.5' grass and Topsoil	Headspace Hrv Readings				Time Start 0930 End 1000
SM	1 2 3 4	0.5-4.0' Loose, med-reddish brown, Fine, Silty sand, moist wet from 3'-4'	12 ppm		PBOW-98-SO-PRRP-DP08-7480-(0002) 2'	Push 1 3' Recovery	
	4 5	4'-5.5' Same as Above, wet	4'	NA	4	4'	
5.5'		5.5'			PBOW-98-SO-PRRP-DP08-7490-(0406) 6'		
ML / CL	6 7 8	5.5'-8' Soft, brown grading to grey, Low-med plasticity, V. Fine Sandy Silt and Clay, moist	8 ppm			Push 2 4' Recovery	
			8'		8'	8'	
	9 10	8'-12' Same as Above ~~[illegible]~~, Soft-Firm, grey, Clayey Silt and Clay, very moist	10 ppm		PBOW-98-SO-PRRP-DP08-7500-(0810) 10'	Push 3 (8'-12') 4' Recovery	

PROJECT: PBOW-PRRP

HOLE NO. PRRP-DP08

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: PRRP-DP08

PROJECT: PBOW - PRRP

INSPECTOR: John Vogeding

SHEET 3 OF 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
ml/cl 12'	11 12	10'-12' See pg 2	10 ppm 12'	NA	NA	Push 3 (8'-12') 4' Recovery	12'
		Bottom of Boring at 12.0 ft.					

PROJECT: PBOW - PRRP

HOLE NO. PRRP-DP08

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

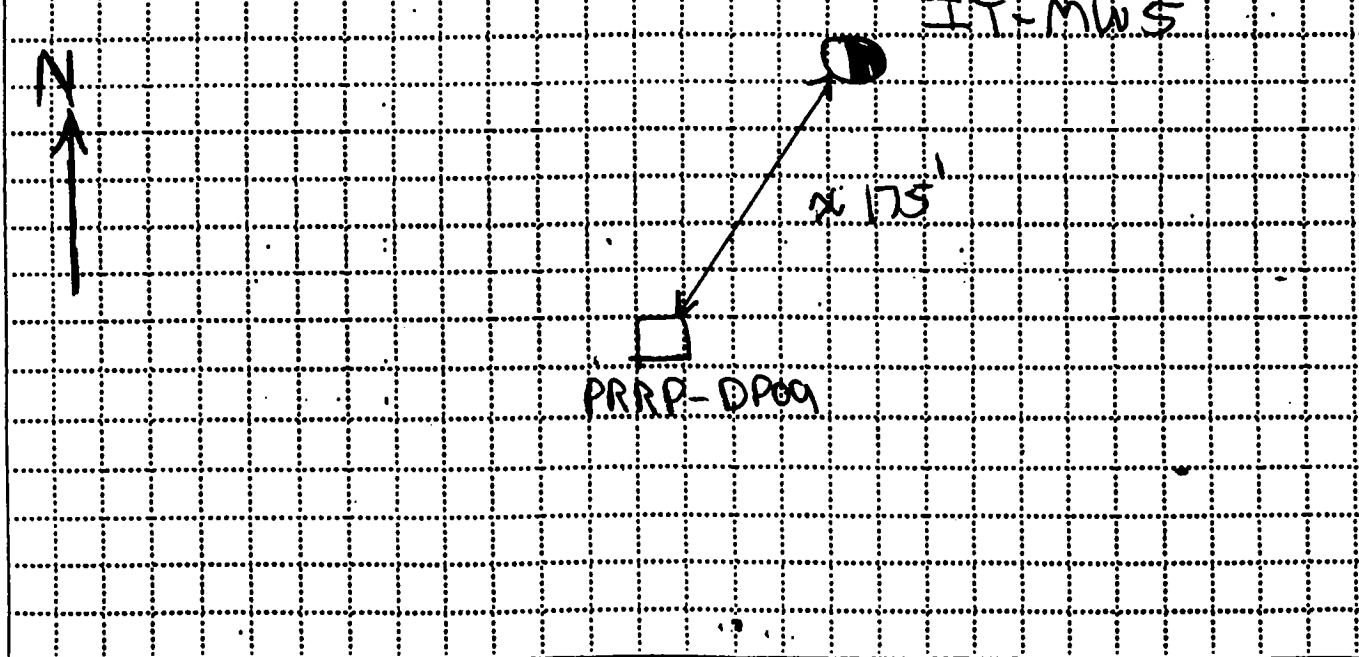
HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP09
1. COMPANY NAME	IT Corp
2. DRILL SUBCONTRACTOR	Geo - Environmental Drilling
SHEET	1 OF 3 SHEETS
3. PROJECT	PBOW - PRRP
4. LOCATION	PRRP
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig.
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4' x 1.5" Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	PRRP - DP09
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-14-98
11. DATE COMPLETED	6-14-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH GROUNDWATER ENCOUNTERED	~3 Ft. BGS
13. DEPTH DRILLED INTO ROCK	NA
14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	Ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA
18. GEOTECHNICAL SAMPLES	NA
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	[redacted]
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC ✓ / TAL METALS ✓ / OTHER (SPECIFY) Nitroaromatics / OTHER (SPECIFY) SVOCs / OTHER (SPECIFY) PCBs
21. TOTAL CORE RECOVERY	NA
22. DISPOSITION OF HOLE	BACKFILLED Grouted / MONITORING WELL — / OTHER (SPECIFY) —
23. SIGNATURE OF INSPECTOR	John Vogel

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP09	625,348.26	1,919,218.20	631.85



PROJECT PBOW - PRRP

HOLE NO. PRRP-DP09

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP09

PROJECT: PBOW - PRRP

INSPECTOR: John Vogeding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	EQUIPMENT (g) Sampling Intervals	REMARKS (h)
Pt/Sm		0-0.5' grass and Topsoil	Headspace Hnu Readings				Start 1340 End 1445
	1	0.5'-4.0' Loose, med brown, Fine, Silty Sand, wet at 3 ft.			PBOW-98-50-PRRP-DP09-7520-(0002)	Push 1	
	2		NA			Recovery	
	3						
			4'		4'	4'	
Sm	4	4'-8' Same as Above with few Clayey Silt Stringers at ≈ 4'-5.5', wet.		NA	PBOW-98-50-PRRP-DP09-7530-(0406)	Push 2	
	5						
	6		NA			Recovery	
	7						
			8'		8'	8'	
ml/Cl	8	8'-12' Soft, grey, med-high Plasticity, Clayey Silt and clay, wet	NA		PBOW-98-50-PRRP-DP09-7540-(0810)	Push 3 (8'-12') Recovery	
	9						
	10				10'		

PROJECT: PBOW - PRRP

HOLE NO. PRRP-DP09

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP09

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET 3 OF 3

CS DO (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)	
ml / Cl	11	10'-12' See pg 2	Headspace Hnu Readings NA	NA	NA	Push 3 (8'-12')	Start	Time 1340
							End	1445
	12	Bottom of Boring at 12.0'						

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP09

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: PRRP-DP10
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	SHEET 1 OF 3
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' Long X 1.5" Geoprobe Sample Rods Diam. w/Acetate Liners	8. HOLE LOCATION: PRRP-DP10	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-10-98	11. DATE COMPLETED: 6-10-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ≈ 13.0 Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 16.0 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

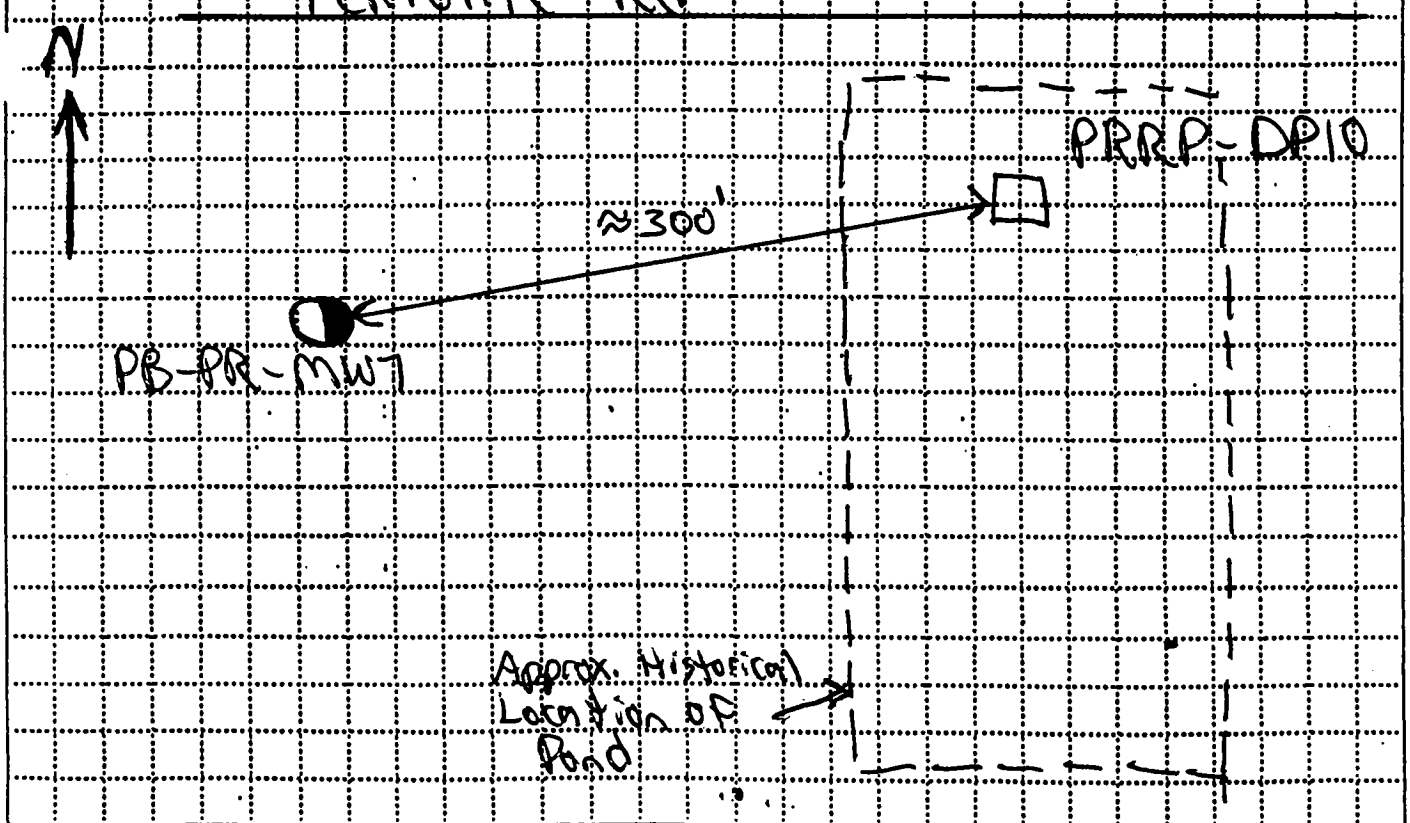
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOC's	PCB's	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted	—	—	—	John Vogel

LOCATION SKETCH/COMMENTS

	N	E	EL.
DP10	625,028.13	1,919,381.06	634.90

SCALE: Not to Scale



PROJECT: PBOW - PRRP | HOLE NO: PRRP-DP10

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: PRRP-DP10

PROJECT: PBOW-PRRP

INSPECTOR: John Vogeding

SHEET 2 OF 3 SHEETS

SCS Symbol (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	Sample Intervals (g)	REMARKS (h)
PE/Sm		0-0.5' grass + Topsoil.	Headspace Hnu Readings		PBOW-98-SO-PRRP-DP10-7560-(0002)		Time Start 1315 End 1400
	1	0.5'-4' Loose, med. brown, Fine, Silty Sand, moist				Push 1	
	2		100 ppm		2'	4' Recovery	
Sm	3		No odors or visible staining				
	4	4'-6' Same as Above, moist	4'	NA	4'	4'	
	5				PBOW-98-SO-PRRP-DP10-7570-(0406)		
6'	6	6'	150 ppm		6'	Push 2	
ml/Cl	7	6'-8' Soft-Mi. Firm, dark brown-black, low-med. Plasticity, v. Fine Sandy Silt and Silty Clay, moist.	No odors			4' Recovery	Black (organic?) From 6-6.5 ft.
	8		8'		8'	8'	
	9	8'-12' Same as Above moist-Slightly wet	50 ppm No odors		PBOW-98-SO-PRRP-DP10-7580-(0810)	Push 3 4' Recovery	
	10						

PROJECT: PBOW-PRRP

HOLE NO. PRRP-DP10

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: PRRP-DP10

PROJECT: PBOW - PRRP

INSPECTOR: John Vogelin

SHEET 3 OF 3

USCS SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO (f)	BLOW COUNT (g)	REMARKS (h)
ml/cl	11	10'-12' - See page 1	Headspace HNU Readings 50 ppm			Push 3 (8'-12') 4' Recovery	
	12	12'	12'			12'	
Cl	13 14 15	12'-16' Soft-m. Firm, reddish brown-grey, med-high Plasticity, Silty Clay with occasional v. Fine Sand Stringers throughout. Wet at ≈ 13 Ft.	NA (Saturated)	NA	NA	Push 4 4' Recovery	reddish brown gw.
	16	16'	16'			16'	
		Bottom of Boring at 16.0 Ft.					

PROJECT: PBOW - PRRP

HOLE NO. PRRP-DP10

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP11
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo - Environmental Drilling	SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig.	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: ~~4' x 1.5"~~ Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: PRRP - DP11	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-13-98	11. DATE COMPLETED: 6-13-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ≈ 8 Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

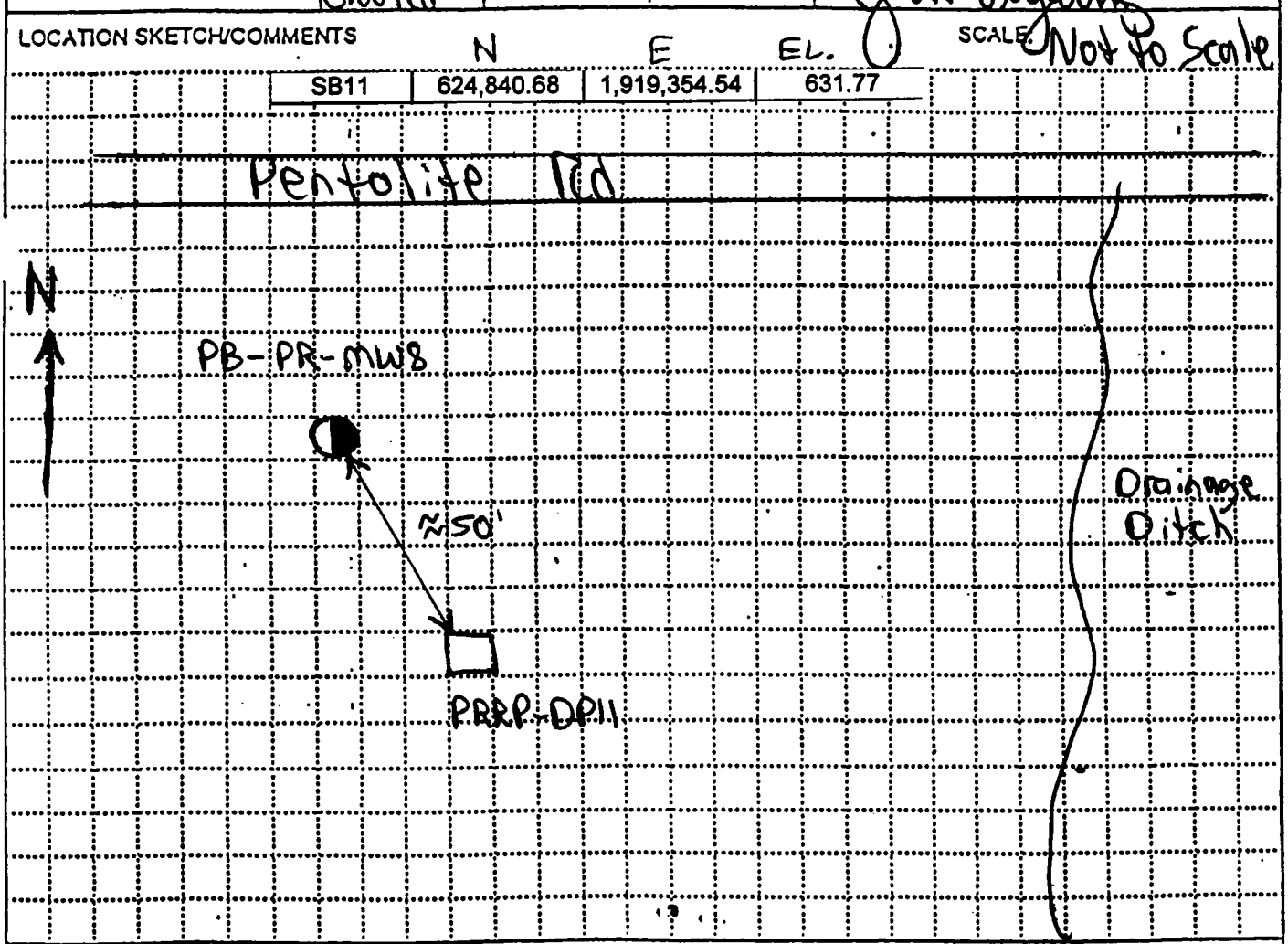
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogelin

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
SB11	624,840.68	1,919,354.54	631.77



PROJECT: PBOW - PRRP

HOLE NO.: PRRP-DP11

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP11

PROJECT: PBOW - PRRP

INSPECTOR: John Vogeding

SHEET 2 OF 3

SCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		[redacted] 0-0.5' grass and Topsoil	Headspace Hnu Readings				Time Start 1535 End 1555
Sm	1	0.5'-2.0' Loose, med-dark brown, V.Fine Silty Sand, Dry.			PBOW-98-SO-PRRP-DP11-7600-(0002) 2'	Push 1 3' Recovery	
2'	2	2'-4' Soft, dark brown and grey, low plasticity, V.Fine Sandy Silt and Clayey Silt, moist.	NA 4'		4'	4'	
ML/CL	3						
	4	4'-8' Same as Above, med-high Plasticity, V.Fine Sandy Silt and Clayey Silt and Clay, moist	NA	NA	PBOW-98-SO-PRRP-DP11-7610-(0406) 6'	Push 2 4' Recovery	
	5						
	6						
	7						
	8	wet at 8'	8'		8'	8'	
	9	8'-12' Same as Above, wet, w/ several thin V.Fine Sand Stringers throughout.	NA		PBOW-98-SO-PRRP-DP11-7620-(0810) 10'	Push 3 (8'-12') 4' Recovery.	
	10						

PROJECT: PBOW - PRRP

HOLE NO. PRRP - DP11

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP11

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET 3 OF 3 SHEETS

SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	~~INCREMENT~~ (g)	REMARKS (h)
ML/CL	11	10'-12' See pg 1	Headspace HNU Readings NA	NA	NA	Sampling Intervals Push 3 (8'-12')	Time Start 1535 End 1555
12'	12	12'				12'	

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP11

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG

1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	DISTRICT: Nashville - TN
		HOLE NUMBER: DP12
		SHEET 1 OF 3
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' Long X 1.5" Geoprobe Sample Rods Diam. w/ Acetate Liners	8. HOLE LOCATION: PRRP - DP12	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-11-98	11. DATE COMPLETED: 6-11-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ≈ 4 Ft. Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES

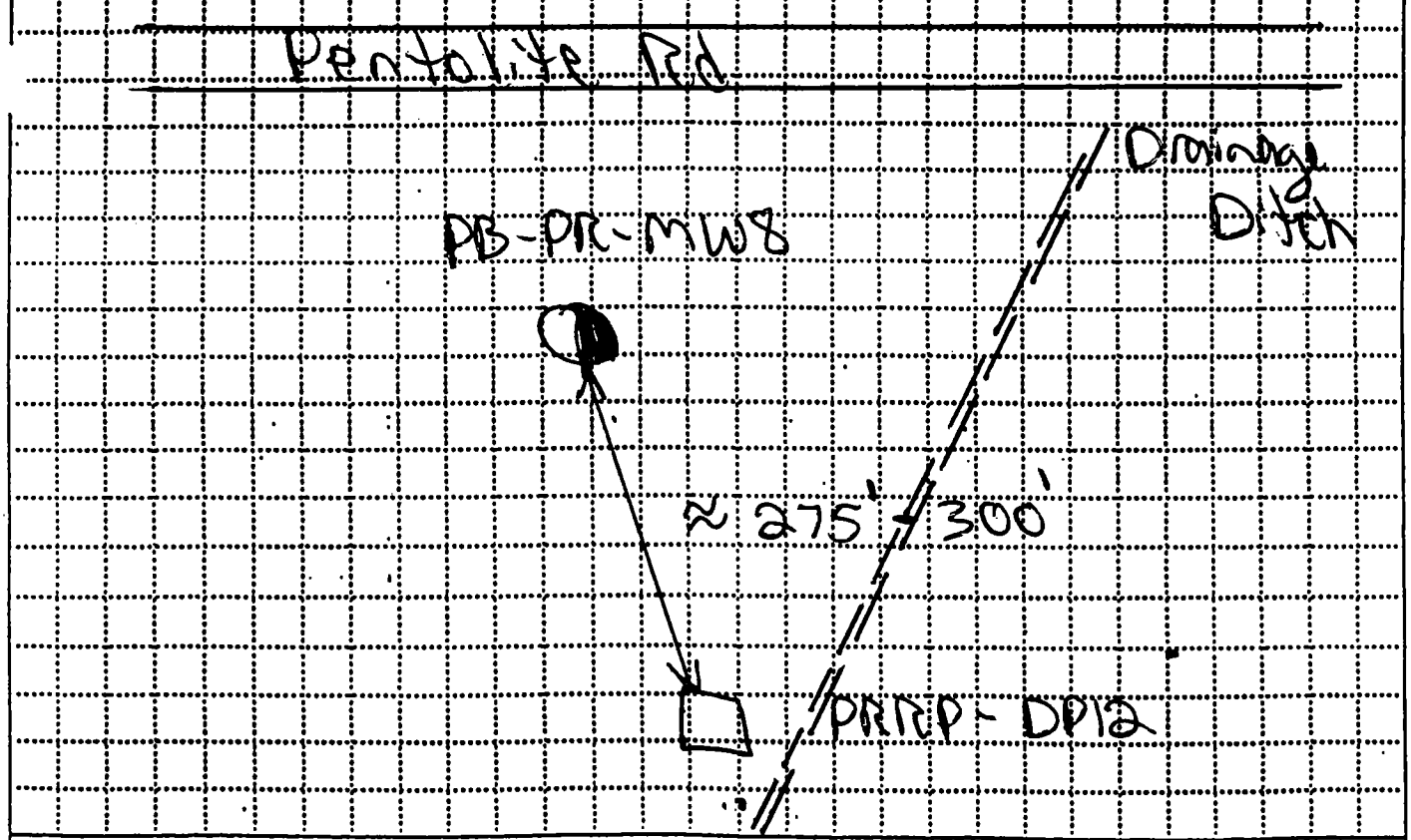
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOC's	PCB's	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted	—	—		John Vogel

LOCATION SKETCH/COMMENTS

N	E	EL.
624,592.96	1,919,301.87	631.10

SCALE: Not to Scale



PROJECT: PBOW - PRRP

HOLE NO: PRRP - DP12

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP12

PROJECT PBOW - PRRP

INSPECTOR John Voegding

SHEET 2 OF 3 SHEETS

USCS SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' grass and Topsoil	Headspace Hnu Readings		PBOW-98-SO-PRRP-DP12-7640-(0002)		Time Start 0820 End 0900
SC	1 2 3	0.5'-4.0' Loose, brown and grey, V.Fine Silty and clayey Sand, moist	NA		2'	Push 1 3' Recovery	Hnu meter Not Functioning Properly due to Atmospheric moisture.
4'	4	4'	4'		4'	4'	Slightly wet at ≈ 4'
ml/cl	5 6 7	4'-8' Soft, brownish grey, med. Plasticity, Clayey Silt and clay, slightly wet, some Free water present.	NA		PBOW-98-SO-PRRP-DP12-7650-(0406) 6'	Push 2 4' Recovery	Some Free Water Present.
	8		8'		8'	8'	
	9 10	8'-12' Soft-M.Firm, grey, med-high plasticity, Clayey silt and clay, very moist - slightly wet.	NA		PBOW-98-SO-PRRP-DP12-7660-(0810) 10'	Push 3 (8'-12') 4' Recovery	

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP12

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP12

PROJECT PBOW-PRRP

INSPECTOR John Vogeding

SHEET 3 OF 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~BLOW COUNT~~ Sample Intervals (g)	REMARKS (h)
ML/CL	11	10'-12' See Pg 2	Headspace HNU Readings			Push 3 (8'-12')	
			NA	NA	NA	4' Recovery	
12'	12	12'					
		Bottom of Boring at 12.0 Ft.					

PROJECT PBOW-PRRP

HOLE NO. PRRP-DP12

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP13
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	SHEET 1 [redacted] SHEETS OF 3
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' Long x 1.5" Diam. Geoprobe Sample Rods w/Acetate Liners	8. HOLE LOCATION: PRRP - DP13	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-12-98	11. DATE COMPLETED: 6-12-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ≈ 5-5.5' and 8'-9' Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES

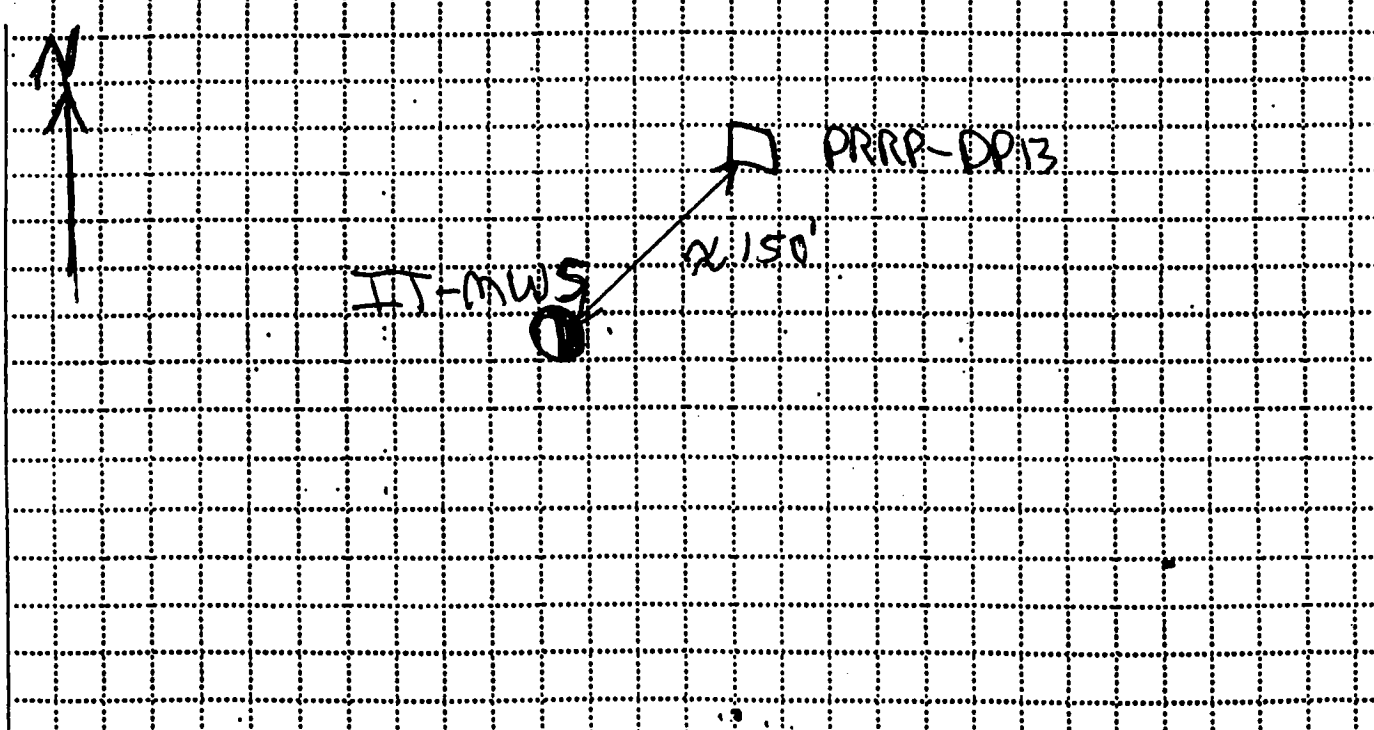
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOC's	PCB's	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted	—	—	—	John Vogel

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP13	625,442.21	1,919,550.70	633.36



PROJECT: PBOW - PRRP

HOLE NO: PRRP-DP13

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP13

PROJECT PBOW - PRRP

INSPECTOR John Voegding

SHEET 2 OF 3 SHEETS

SCS, ~~USCS~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~INSTRUMENT~~ Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' grass + Topsoil	Headspace Hnu Readings				Time Start 1030 End 1100
Sm	1 2 3 4 5	0.5'-4' Loose, light brown, Fine, Silty Sand, dry - Slightly moist 4-5.5' Same as Above, wet from 5-5.5'	NA 4'	NA	PBOW-98-SO-PRRP-DP13-7680-(0002) 2'	Push 1 3' Recovery 4'	Hnu meter NOT working due to high humidity
5.5'		5.5'					
ml	6	5.5'-7' Soft, med. brown, V. Fine, Sandy Silt, moist	NA		PBOW-98-SO-PRRP-DP13-7690-(0608) 6'	Push 2 4' Recovery	4'-8' Several trace perched water zones
7'	7	7'					
Sm	8	7'-8' Loose, med. brown, V. Fine, Silty Sand, moist - Slightly wet. 8'-9' Same as Above, wet	8'		8'	8'	
9'	9	9'	NA		PBOW-98-SO-PRRP-DP13-7700-(0810) 10'	Push 3 (8'-12') 4' Recovery	
ml	10	9'-12' Soft, grey, low plasticity, V. Fine Sandy Silt, moist - Slightly wet.					

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP13

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP13

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET [redacted] SHEETS 3 of 3

SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	[redacted] (g)	REMARKS (h)
		10'-12' See pg 1	Headspace Hnu Readings NA	NA	NA	Sampling Intervals Push 3 (8'-12') 4' Recovery	Time Start 1030 End 1100
M.L 12'	11 12	12'				12'	
		Bottom of Boring at 12.0'					

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP13

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG

DISTRICT: Nashville - TN	HOLE NUMBER: DP14	
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	SHEET 1 OF 3
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' Long X 1.5" Diam. Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: PRRP - DP14	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-11-98	11. DATE COMPLETED: 6-11-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ≈ 4-5' and 8-9' Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 16.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

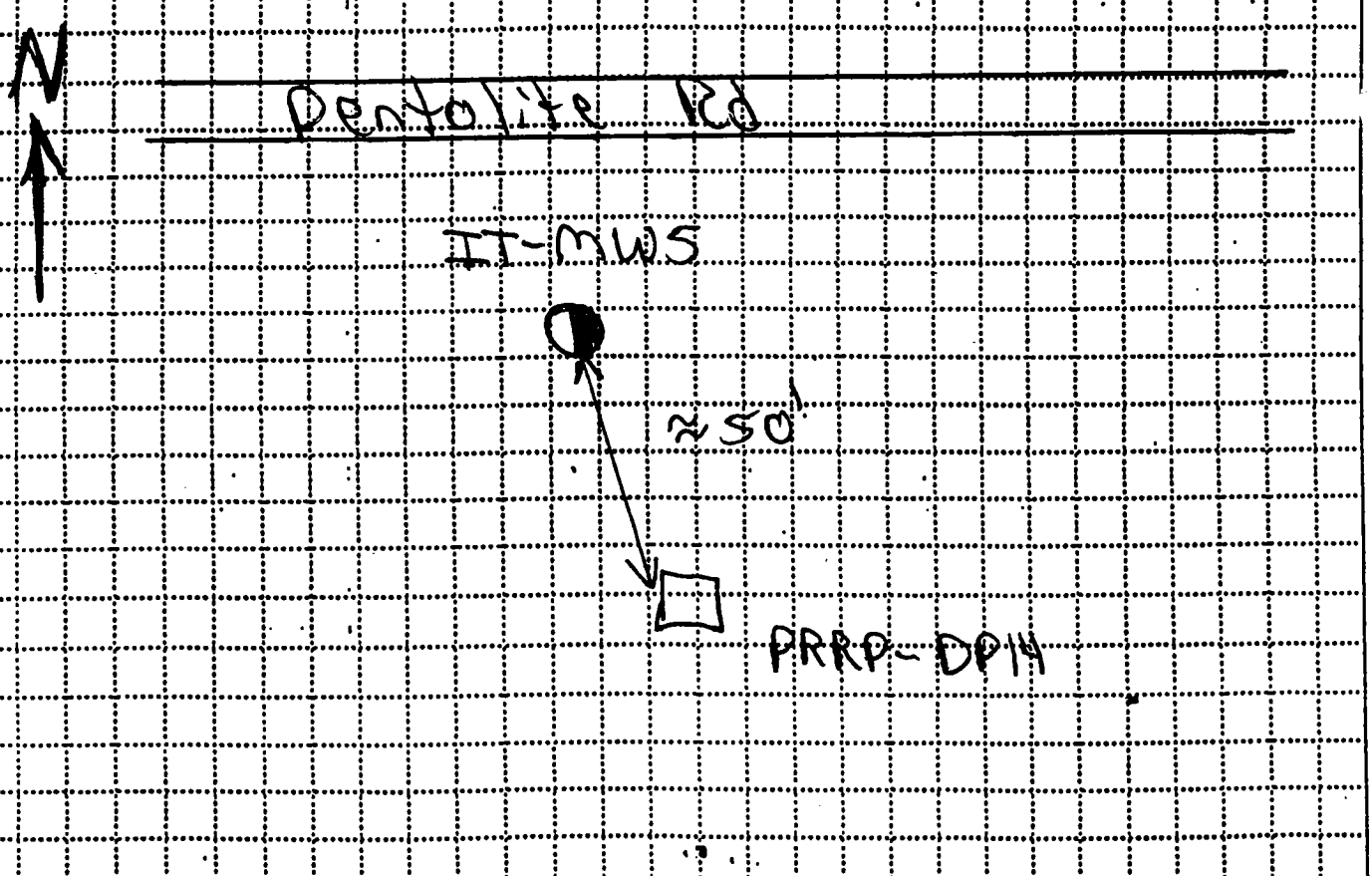
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted	—	—	—	John Vogel

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP14	625,286.03	1,919,485.76	630.96



PROJECT: PBOW - PRRP

HOLE NO: PRRP-DP14

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP-

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP14

PROJECT PBOW-PRRP INSPECTOR John Vogeding SHEET 2 OF 3 SHEETS

USCS SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	Sample Interval (g)	REMARKS (h)
Pt/Sm		0-0.5' grass and Topsoil			PBOW-98-SO-PRRP-DP14-7220-(0002)		Start Time 1615 End 1650
Sm/SC	1	0.5'-4' Loose, medium brown and grey, v. Fine Silty Sand grading to clayey sand, moist-slightly wet.				Push 1	
	2					3' Recovery	Hnu meter Not Functioning Properly due to Atmospheric moisture.
	3						
	4	4'-4.5' Same as Above			4'	4'	
4.5'							
Ml/Cl	5	4.5'-8' Soft, med brown grading to grey, low-med. plasticity, v. Fine Sandy Silt and Silty Clay, moist.-slightly wet	NA	NA	PBOW-98-SO-PRRP-DP14-7230-(0406) 6'	Push 2	
	6					4' Recovery	Trace amount of free water from 4'-5' and 8'-9'
	7						
	8	8'-12' Soft, grey, v. fine Sandy Silt and Clay (As Above), moist-slightly wet			8'	8'	
	9				PBOW-98-SO-PRRP-DP14-7240-(0810) 10'	Push 3 (4'-12') 4' Recovery.	
	10						

PROJECT PBOW-PRRP HOLE NO. PRRP-DP14

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP14

PROJECT PBOW - PRRP | INSPECTOR John Vogeding | SHEET 3 OF 3 SHEETS

USCS SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~BLOW COUNT~~ Sample Intervals (g)	REMARKS (h)
		10'-12' See pg 1				Push 3 (8'-12') 4' Recovery 12'	
	11						
ml / Cl	12	12'-16' Grey, Silty Clay as Above, moist.	NA	NA	NA		
	13					Push 4 4' Recovery	
	14						
	15						
16'	16					16'	
		Bottom of Boring at 16.0'					

PROJECT PBOW - PRRP | HOLE NO. PRRP - DP14

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP15
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	SHEET 1 OF 3
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: X 1.5" Geoprobe Sample Rods ~~Diam.~~ w/Acetate Liners (4' Long)	8. HOLE LOCATION: PRRP - DP15	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-12-98	11. DATE COMPLETED: 6-12-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ≈ 3.5' - 4' Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

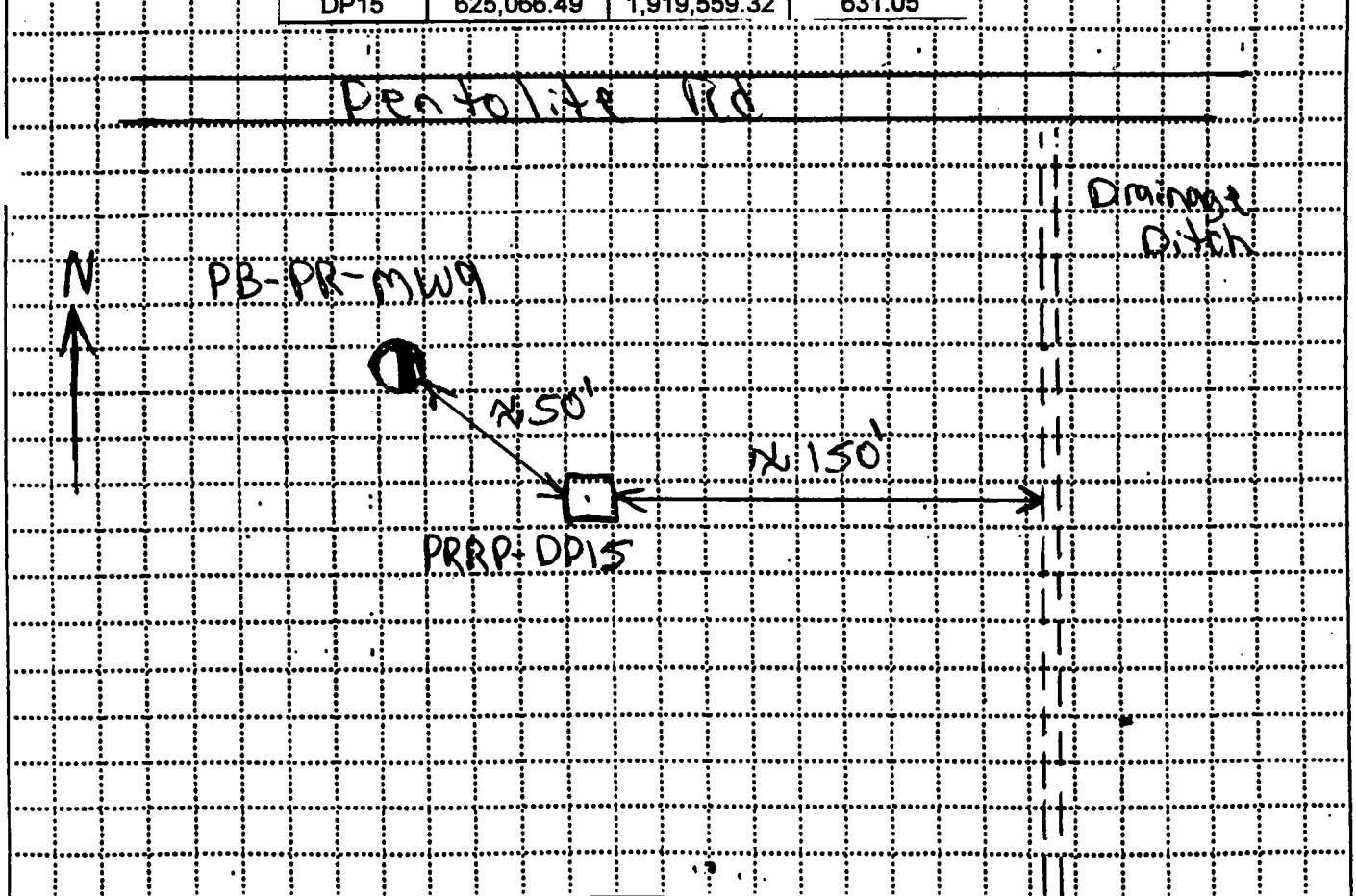
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted	—	—		John Vogeding

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

N	E	El.
625,066.49	1,919,559.32	631.05



PROJECT: PBOW - PRRP

HOLE NO: PRRP-DP15

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP15

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET 2 OF 3 SHEETS

SCS ~~USCS~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	~~INCREMENT~~ (g) Sampling Intervals	REMARKS (h)
Pt/Sm		0-0.5' grass + topsoil	Headspace Hnu Readings				Time Start 1300 End 1320
ml/Cl	1	0.5'-3.5' Soft, brown and grey, med Plasticity, v. Fine Sandy Silt and clayey Silt, moist			PBOW-98-SO-PRRP-DP15-7760-(0002) 2'	Push 1 3' Recovery	Hnu Meter Not Working due to very high humidity
	2		NA				
	3						
Sm	4	3.5'-4' Loose, brown, Fine, Silty Sand, wet	4'		4'	4'	
ml/Cl	5	4'-8' Soft-M. Firm, brownish grey, low-med. Plasticity, v. Fine Sandy Silt and clayey Silt, moist-Slightly wet (Trace amounts of free water)	NA	NA	PBOW-98-SO-PRRP-DP15-7770-(0406) 6'	Push 2 4' Recovery	
	6						
	7						
	8		8'		8'	8'	
	9	8'-12' Same as Above with numerous thin Fine Sand stringers throughout.	NA		PBOW-98-SO-PRRP-DP15-7780-(0810) 10'	Push 3 (8'-12') 4' Recovery	
	10						

PROJECT PBOW - PRRP

HOLE NO. PRRP-DP15

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP15

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET 3 OF 3

(A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	(G)	REMARKS (H)
m.l / Cl 12'	11 / 12	10'-12' See pg 1	Headspace Hnu Readings NA	NA	NA	Sampling Intervals Push 3 (8'-12') 4' Recovery	Time Start 1300 End 1320
		Bottom of Boring at 12.0 ft.					

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP15

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG

DISTRICT: Nashville - TN	HOLE NUMBER: DP16	
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' Long X 1.5" Geoprobe Sample Rods Diam. w/ Acetate Liners	8. HOLE LOCATION: PRRP - DP16	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-12-98	11. DATE COMPLETED: 6-12-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ≈ 8-12 Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 16.0 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES

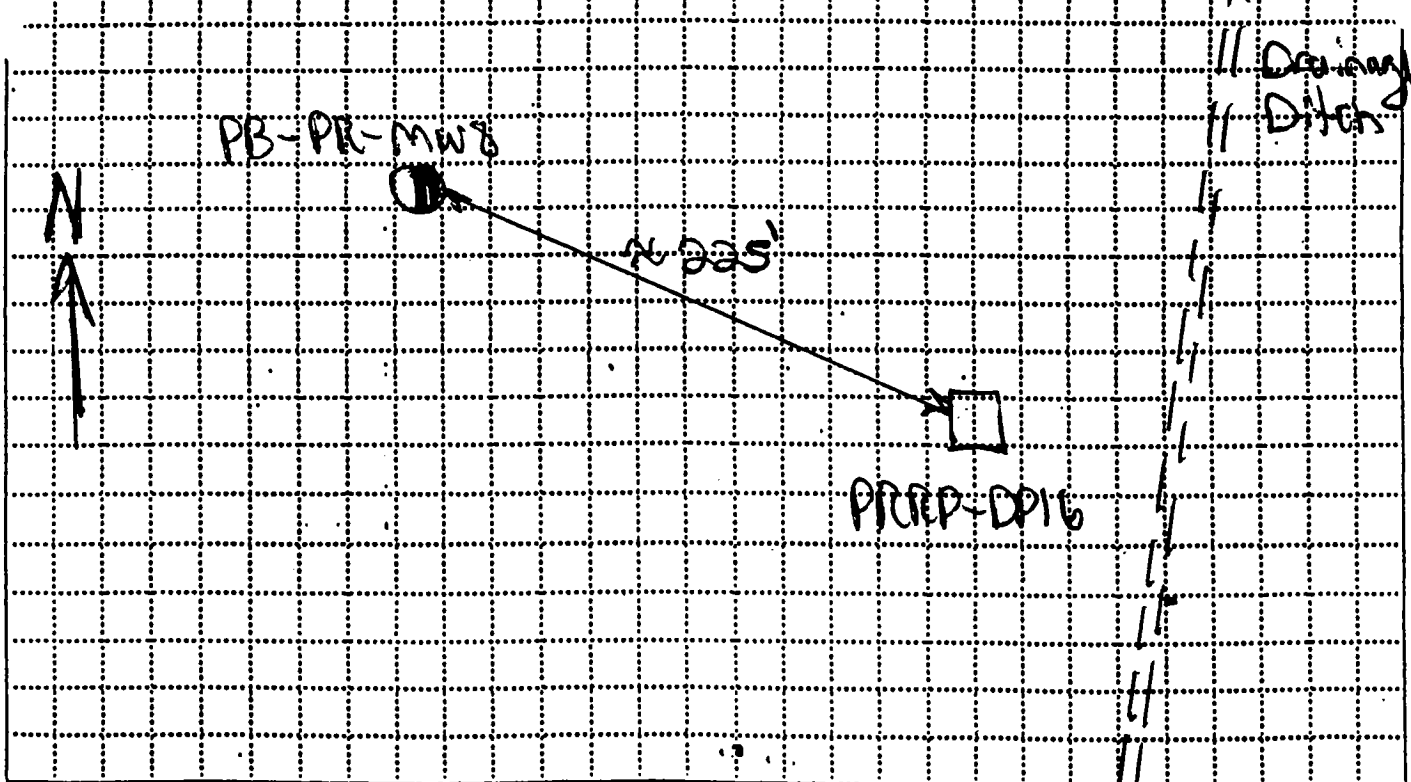
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted	—	—	—	John Vogeding

LOCATION SKETCH/COMMENTS

	N	E	EL.
DP16	624,825.74	1,919,459.48	632.35

SCALE: Not to Scale



PROJECT: PBOW - PRRP

HOLE NO: PRRP-DP16

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP16

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
PL/SM		0-0.5' grass and Topsoil	Headspace Hnu Readings		PBOW-98-SO-PRRP-DP16-7800-(0002)		Time Start 1600 End 1630
SM	1 2 3 4	0.5'-4' Loose-m.Dense, med brown grading to dark brown, V. Fine Silty Sand, Dry.	NA		2'	Push 1 4' Recovery	Hnu meter Not working due to high humidity
4.5'		4'-4.5' Same as Above	4'		4'	4'	
ml	5 6 7 8	4.5'-8' Soft-m.Firm, brownish grey, low Plasticity, V. Fine Sandy Silt, trace clay, Dry-Slightly moist	NA	NA	PBOW-98-SO-PRRP-DP16-7810-(0406) 6'	Push 2 2.5' Recovery	
8'		8'	8'		8'	8'	
cl	9 10	8'-12' Soft-m.Firm, grey, med-high Plasticity, Silty Clay, moist-Slightly wet.	NA		PBOW-98-SO-PRRP-DP16-7820-(0810) 10'	Push 3 4' Recovery	(8'-12')

PROJECT PBOW - PRRP

HOLE NO. PRRP-DP16

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP16

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET [redacted] SHEETS 3 of 3

>200.00 (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	[redacted] (g)	REMARKS (h)
			Headspace Hnu Readings			Sampling Intervals	Time
	11	10'-12' See pg 1	NA			Push 3 (8'-12') 4' Recovery	Start 1600 End 1630
	12		12'			12'	
Cl	13	12'-16' Same as Above Soft-Firm, grey, high Plasticity, Silty Clay w/ Fine well rounded gravel (Till), moist.	NA	NA	NA	Push 4 4' Recovery	
	14						
	15						
16'	16		16'			16'	
		Bottom of Boring at 16.0 ft.					

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP16

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: PRRP-DP17
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	SHEET 1 OF 3
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' Long X 1.5" Geoprobe Sample Rods ~~Diam.~~ w/Acetate Liners	8. HOLE LOCATION: PRRP-DP17	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-10-98	11. DATE COMPLETED: 6-10-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ≈5 Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

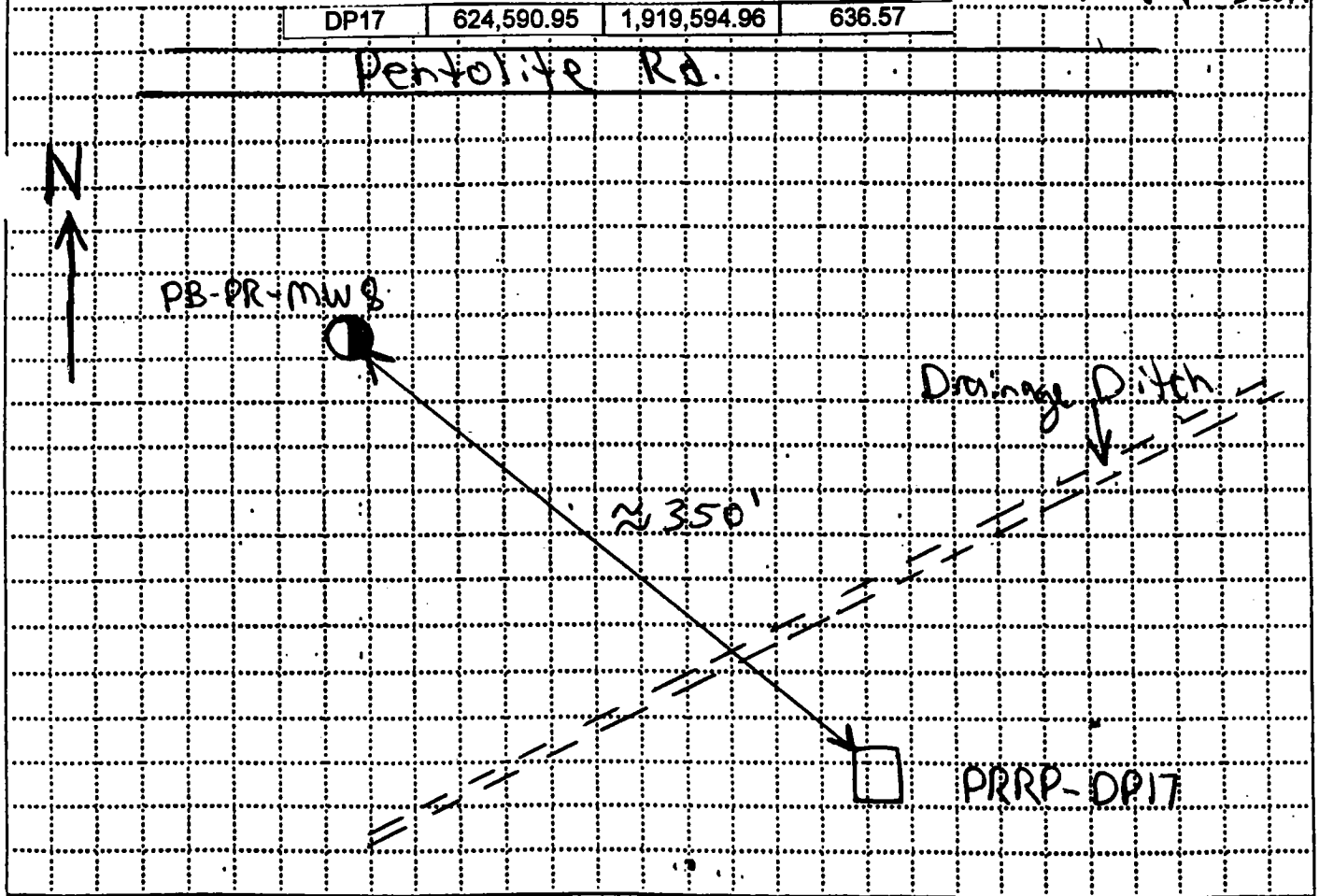
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOC's	PCB's	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted	—	—		John Vogeding

LOCATION SKETCH/COMMENTS

N	E	EL.
624,590.95	1,919,594.96	636.57

SCALE: Not to Scale



PROJECT: PBOW - PRRP

HOLE NO: PRRP-DP17

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: PRRP-DP17

PROJECT: PBOW - PRRP

INSPECTOR: John Vogeding

SHEET 2 OF 3

USCS Symbol (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sample Intervals	REMARKS (h)
		0-0.5' grass and Topsoil	Headspace Hnu Readings				Time Begin 1645 End 1715
	1	0.5-4' Loose, light reddish-orangish brown, Fine, Silty Sand, Dry - Slightly moist			PBOW-98-SO-PRRP-DP17-7840-(0002) 2	Push 1	
	2		NA			3' Recovery	Hnu meter Not Functioning Properly due to atmospheric moisture.
	3						
	4		4		4	4'	
SM	5	4-8' Same as Above, Brown grading to grey, Fine Silty Sand, wet at ≈ 5.0 ft		NA	PBOW-98-SO-PRRP-DP17-7850-(0906) 6	Push 2	
	6		NA			4' Recovery	
	7						
	8		8'		8	8'	
	9	8'-11' Same as Above, grey, v. Fine, Silty Sand, wet	NA		PBOW-98-SO-PRRP-DP17-7860-(0910) 10	Push 3 (8-12') 4' Recovery	
	10						

PROJECT: PBOW - PRRP

HOLE NO. PRRP-DP17

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER PRRP-DP 17

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET 3 OF 3 SHEETS

~~ELEVATION~~ USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO (f)	~~EQUIPMENT~~ Sample Intervals (g)	REMARKS (h)
SM	11'	10'-11' See pg 2.	Headspace Hnu Readings	NA	NA	Push 3 (8'-12')	
ml/Cl	12	11'-12' Soft, grey, med Plasticity, Clayty Silt, wet	12'			4' Recovery	
		Bottom of Boring at 12.0 ft.					

PROJECT PBOW - PRRP

HOLE NO. PRRP-DP17

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG

DISTRICT: Nashville - TN	HOLE NUMBER: DP18	
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	SHEET 1 OF 3
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: X 1.5" Geoprobe Sample Rods w/ Acetate Liners (4' Long, ~~Diam.~~)	8. HOLE LOCATION: PRRP - DP18	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-11-98	11. DATE COMPLETED: 6-11-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ≈4-5.5' and 8-10' Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

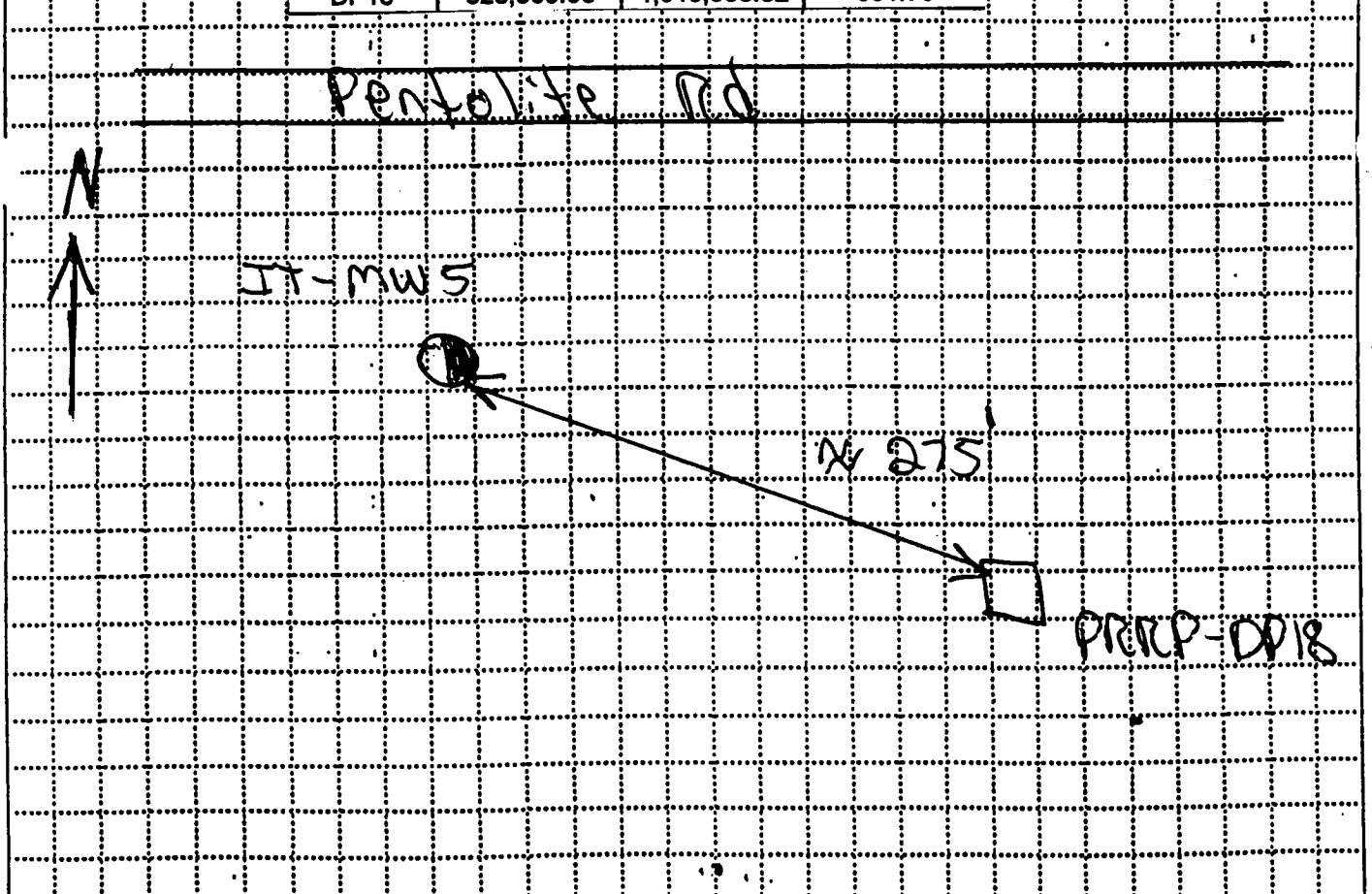
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOC's	PCB's	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted	—	—		John Vogel

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP18	625,300.98	1,919,638.32	631.78



PROJECT: PBOW - PRRP

HOLE NO: PRRP - DP18

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP18

PROJECT: PBOW - PRRP

INSPECTOR: John Vogeding

SHEET 2 OF 3 SHEETS

USCS SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	Sample Interval (g)	REMARKS (h)
Pt/SM		0-0.5' grass and Topsoil	Headspace Hnu Readings		PBOW-98-SO-PRRP-DP18-7880-(0002) 2'		Time Start 1420 End 1510
	1	0.5'-3.5' Loose, med. brown, Fine, Silty Sand, moist				Push 1 3' recovery	
SM	2		NA				Hnu meter Not Functioning Properly due to Atmospheric moisture.
	3						
3.5		3.5'					
	4	3.5'-4.0 Soft, med. brown and grey, low plasticity, v. Fine, Sandy Silt, moist	4'		4'	4'	
	5	4'-8' Same as Above Sandy Silt grading to Silt, wet from 4'-5.5'		NA	PBOW-98-SO-PRRP-DP18-7890-(0406) 6'	Push 2 4' Recovery	
ML	7		NA				
	8		8'		8'	8'	
	9	8'-12' Same as Above (Silt), grey at 9' wet from 8'-10'. with numerous fine Sand stringers.	NA		PBOW-98-SO-PRRP-DP18-7900-(0810) 10'	Push 3 (8'-12') 4' Recovery	
	10						

PROJECT: PBOW - PRRP

HOLE NO. PRRP - DP18

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP18

PROJECT PBOW - PRRP

INSPECTOR John Vogelin

SHEET 3 OF 3 SHEETS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
nd	11	10'-12' See pg 2	NA	NA	NA	Push 3 (8'-12') 4' Recovery	
12'	12	Bottom of Boring at 12.0 ft.					

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP18

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG

1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	HOLE NUMBER: DP19
	DISTRICT: Nashville - TN	SHEET 1 OF 3
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' Long X 1.5" Diam. Geoprobe Sample Rods w/Acetate Liners	8. HOLE LOCATION: PRRP - DP19	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-12-98	11. DATE COMPLETED: 6-12-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ~ 12-14 Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 16.0 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

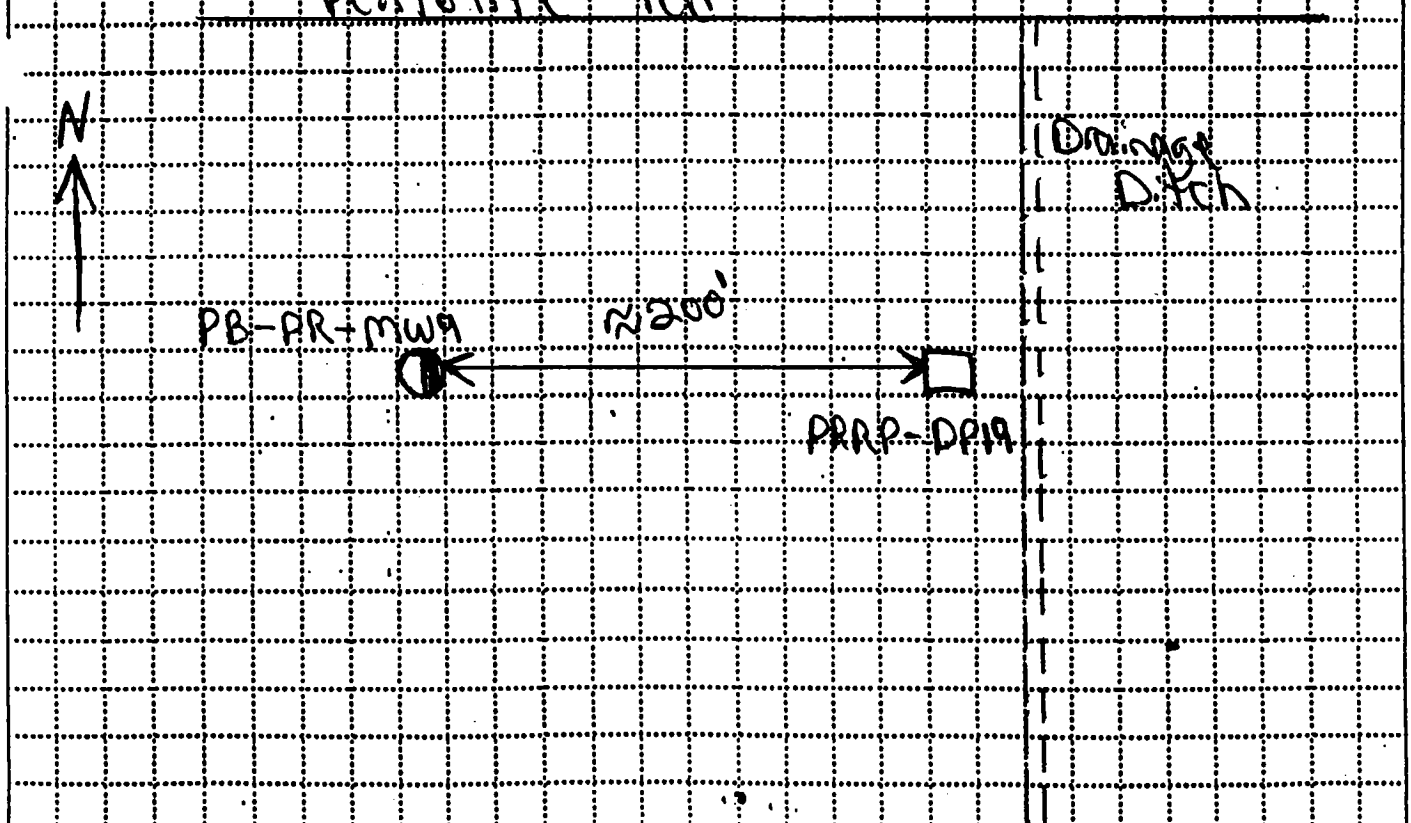
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOC's	PCB's	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted	—	—	—	John Vogeli

LOCATION SKETCH/COMMENTS N E EL. SCALE: Not to Scale

DP19	625,047.57	1,919,757.82	632.86



PROJECT: PBOW - PRRP

HOLE NO: PRRP-DP19

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP19

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	~~INCREMENT~~ (g) Sampling Intervals	REMARKS (h)
		0-0.5' grass and Topsoil.	Headspace Hnu Readings		PBOW-98-50-PRRP-DP19-7920-(0002) 2'		Time Start 1420 End 1445
	1	0.5'-4.0' Loose, med brown-brownish grey, v. fine Silty Sand, Dry.				Push 1	
	2		NA			3.5' Recovery	
	3		4'		4'	4'	
	4	4'-6.5' Same as Above		NA	PBOW-98-50-PRRP-DP19-7930-(0406) 6'	Push 2 4' Recovery.	
	5						
	6		NA				
	7	6.5'-8' Soft-m. Firm, grey, low-med. plasticity, clayey silt and clay, moist					
	8		8'		8'	8'	
	9	8'-12' Same as Above with few fine Sand stringers from 8'-9', moist-slightly wet.	NA		PBOW-98-50-PRRP-DP19-7940-(0810) 10'	Push 3 (8'-12') 4' Recovery	
	10						

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP19

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP19

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET 3 SHEETS 3 of 3

ICS SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
ML/CL	11	10'-12' See pg 1.	Headspace Hnu Readings				Start Time 1420 End 1445
12'	12	12'	12'			12'	
SC	13	12'-14' Loose, Brown and grey, fine clayey Sand, wet				Push 4	
14'	14	14'					
CL	15	14'-16' Soft-Med. Firm, grey, med-High Plasticity, Silty Clay, moist-Slightly wet.	NA	NA	NA	4' Recovery	
16'	16	16'	16'			16'	
		Bottom of Boring at 16.0 Ft.					

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP19

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG

1. COMPANY NAME: IT Corp	DISTRICT: Nashville - TN	HOLE NUMBER: DP20
2. DRILL SUBCONTRACTOR: Geo - Environmental Drilling		SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig.	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 1.5" Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: PRRP - DP20	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-13-98	11. DATE COMPLETED: 6-13-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ~ 3 Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

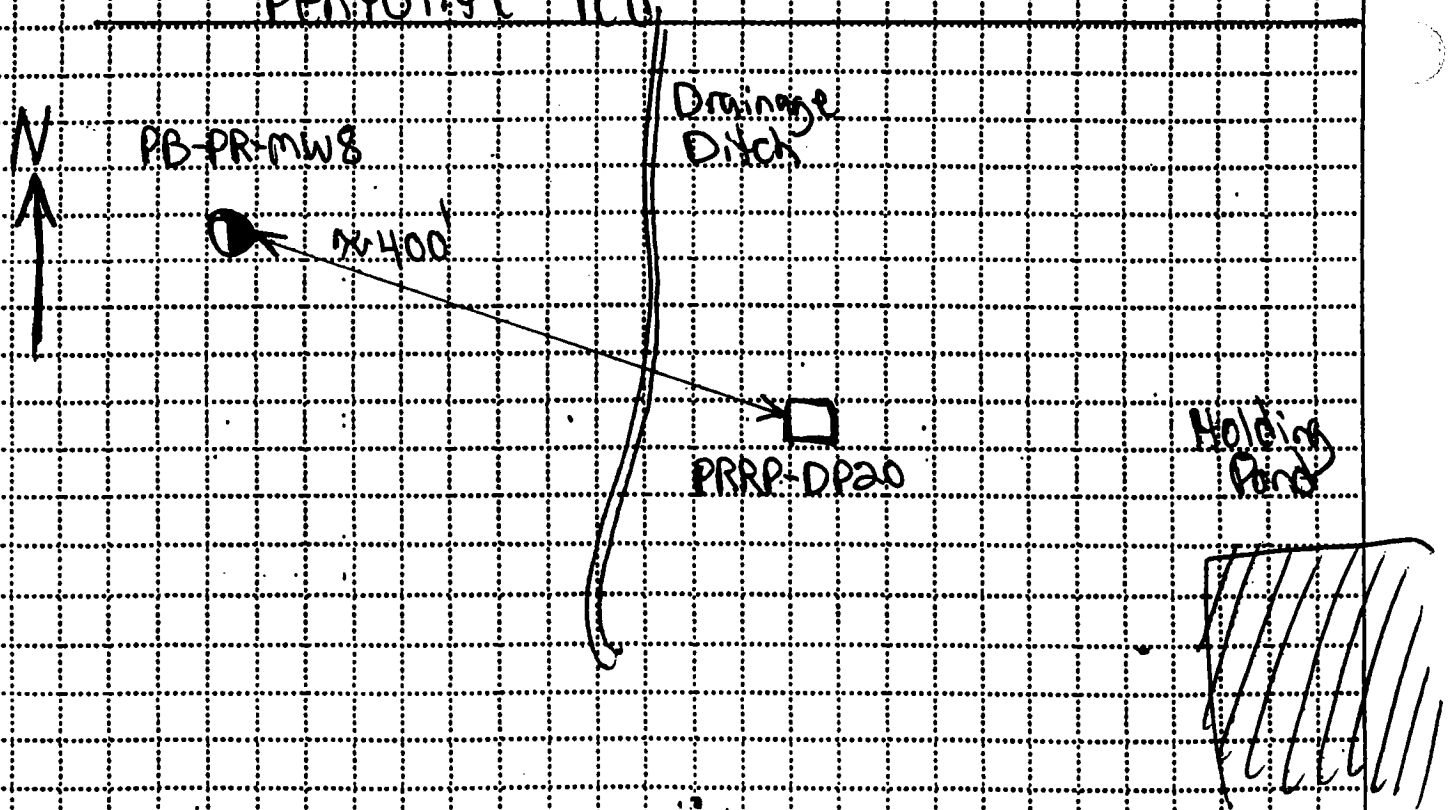
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogel

LOCATION SKETCH/COMMENTS

	N	E	EL.
DP20	624,747.62	1,919,619.92	632.82

SCALE: Not to Scale



PROJECT: PBOW - PRRP

HOLE NO.: PRRP-DP20

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP20

PROJECT: PBOW - PRRP | INSPECTOR: John Vogeding | SHEET 2 OF 3 SHEETS

~~MAJOR~~ USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	~~INCREMENT~~ Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' grass + Topsoil	Headspace Hnu Readings				Time Start 1420 End 1445
	1	0.5'-4' Loose, med brown grading to grey, Fine Silty Sand, wet at 3 Ft.			PBOW-98-50-PRRP-DP20-7960-(0802) 2'	Push 1 3.5' Recovery	
Sm	2		NA				
	3						Hnu Readings erratic due to excessive headspace moisture
	4		4'		4'	4'	
	5	4'-6' Same as Above, Grey, Fine Silty Sand, wet.		NA	PBOW-98-50-PRRP-DP20-7970-(0406) 6'	Push 2 4' Recovery	
6'	6	6'	NA				
Ml/Cl	7	6'-8' Soft, grey, low-med Plasticity, v. Fine, Sandy Silt grading to Clayey Silt, Slightly wet.					
	8		8'		8'	8'	
	9	8'-12' Same as Above, wet.	NA		PBOW-98-50-PRRP-DP20-7980-(0810) 10'	Push 3 (8'-12') 4' Recovery	
	10						

PROJECT: PBOW - PRRP | HOLE NO. PRRP - DP20

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP20

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET 3 OF 3

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
ML/CL	11	10'-12' See P51	Headspace Hnu Readings NA	NA	NA	Push 3 (8'-12')	Time Start 1420 End 1445
12'	12	12'				12'	
		Bottom of Boring at 12.0 ft.					

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP20

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG

1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	DISTRICT: Nashville - TN; HOLE NUMBER: DP21; SHEET 1 OF [redacted] 2
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' Long X 1.5" Geoprobe Sample Rods ~~Diam.~~ w/Acetate Liners	8. HOLE LOCATION: PRRP - DP21	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-13-08	11. DATE COMPLETED: 6-13-08
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: NA Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 10 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	(3)	—	

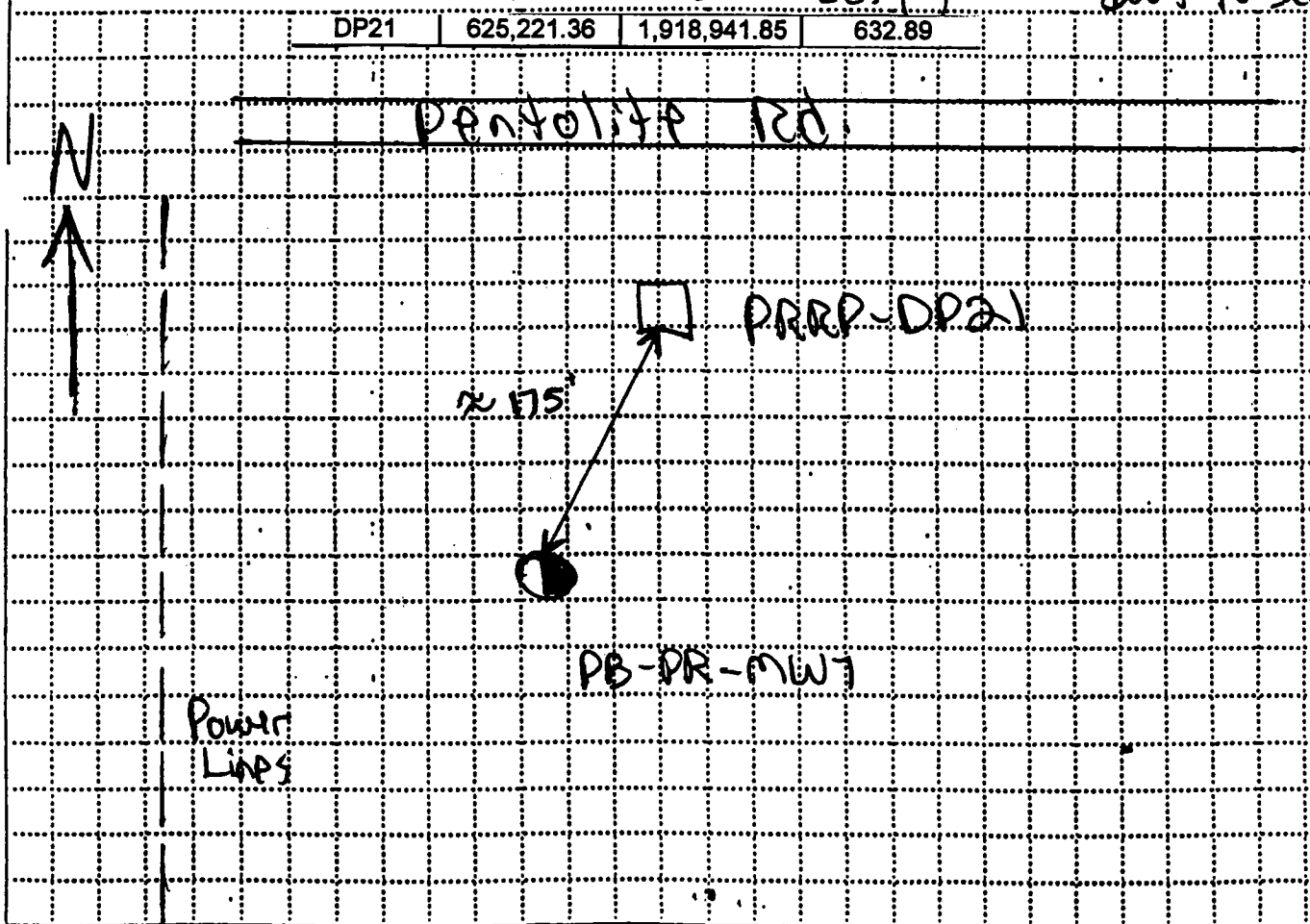
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
None	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Grouted	—	—	—	John Vogel

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP21	625,221.36	1,918,941.85	632.89



PROJECT: PBOW - PRRP

HOLE NO. PRRP-DP21

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP21

PROJECT: PBOW - PRRP

INSPECTOR: John Vogeding

SHEET 2 OF 3

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' grass and Topsoil	Headspace Hnu Readings				Time Start 0730 End 0800
	1	0.5'-4' Loose, med. brown, v. fine Silty Sand, moist		2'		Push 1 4' Recovery	
Sm	2			PBOW-PRRP-DP21-GEOT-0204			
	3						
4'	4	4'		4'		4'	
	5	4'-8' Soft, med. brown-grey, v. fine Sandy Silt, wet	NA		NA	Push 2 4' Recovery	
	6			6'			
Ml/Cl	7			PBOW-PRRP-DP21-GEOT-0608			
	8	8'-10' Same as Above, Grey, Sandy Silt to Clayey Silt, wet		8'		8'	
	9			PBOW-PRRP-DP21-GEOT-0810		Push 3 (8'-10') 4' Recovery.	Bottom of Boring at 10 Ft.
	10			10'			

PROJECT: PBOW - PRRP

HOLE NO. PRRP-DP21

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP22
1. COMPANY NAME: IT Corp	2. DRILL SUBCONTRACTOR: Geo Environmental	SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - PRRP	4. LOCATION: PRRP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: X 1.5" Geoprobe Sample Rods Diam. w/Acetate Liners (4' Long)	8. HOLE LOCATION: PRRP - DP22	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-13-98	11. DATE COMPLETED: 6-13-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: NA Ft. BGS.	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	(3)	—	—

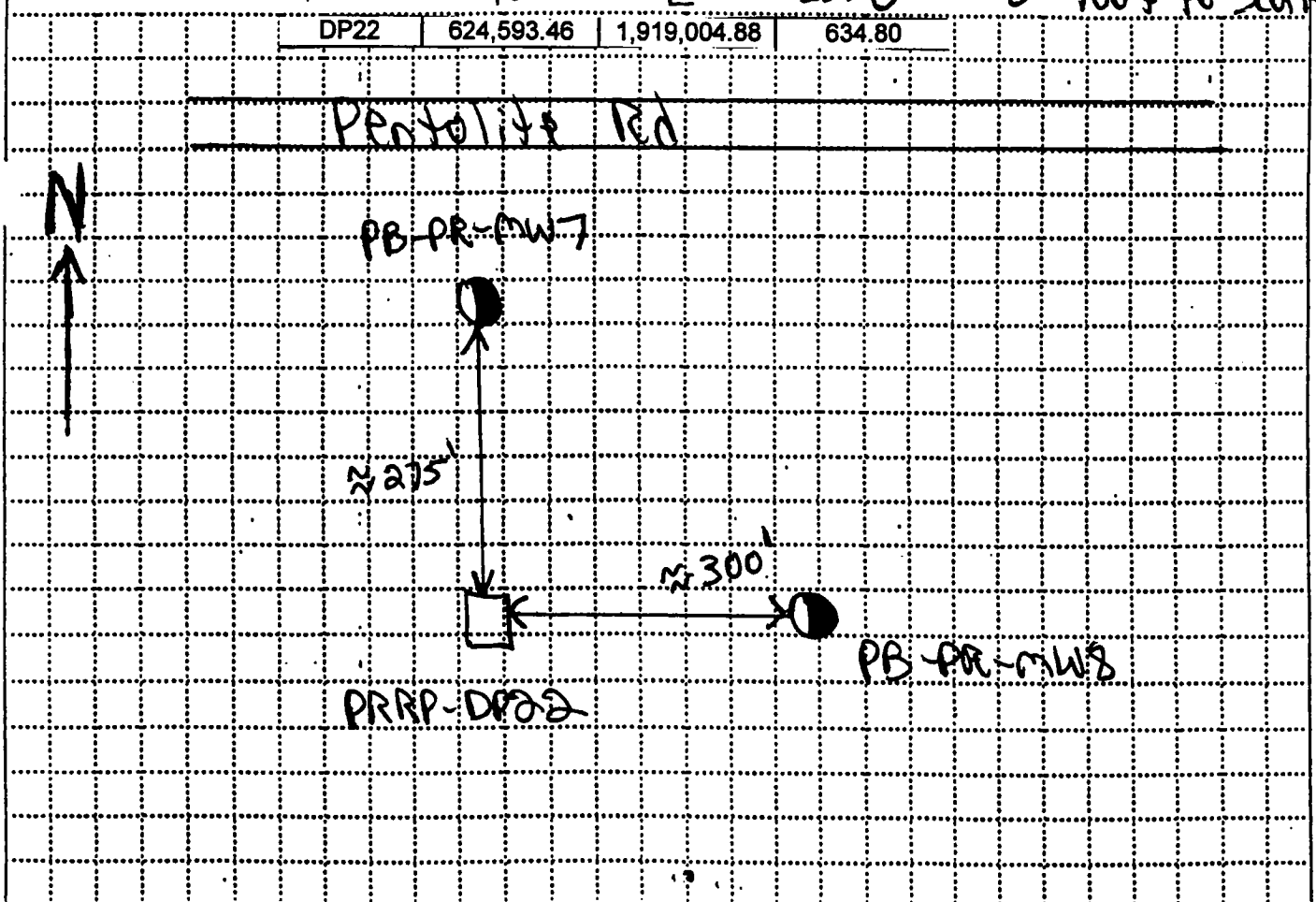
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogeding

LOCATION SKETCH/COMMENTS

N	E	EL.
624,593.46	1,919,004.88	634.80

SCALE: Not to Scale



PROJECT: PBOW - PRRP

HOLE NO: PRRP-DP22

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP22

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET 2 OF 3

SCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' grass and Topsoil	Headspace Hnu Readings				Time Start 0915 End 0930
Sm	1 2	0.5'-3' Loose, med. brown, v. Fine-Fine, Silty Sand, moist		2' PBOW-PRRP-DP22-GEOT-0204		Push 1 3.5' Recovery.	
ml/Cl	3 4	3'-4' Soft, m. brown-grey, v. Fine Sandy Silt-Clayey Silt, moist		4'		4'	
	5 6 7 8	4'-8' Same as Above, med-high Plasticity Slightly wet.	NA	6' PBOW-PRRP-DP22-GEOT-0608 8'	NA	Push 2 4' Recovery 8'	
	9 10	8'-12 Same as Above Grey, Silty Clay and Clay, Slightly wet		10'		Push 3 (8'-12') 4' Recovery	

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP22

(Proponent: CECW-EG)

ENG FORM 5056A-R, AUG 94

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP22

PROJECT SCS, PBOW - PRRP

INSPECTOR John Vogeding

SHEET [redacted] SHEETS 3 of 3

[redacted] (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	[redacted] (g)	REMARKS (h)
ml / cl	11	10'-12' See pg 1	Headspace Hnu Readings NA	PBOW-PRRP-DP22-GEOT-1012 12'	NA	Sampling Intervals Push 3 (8'-12')	Time Start 0915 End 0930
12'	12	Bottom of Boring at 12.0 ft.					

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP22

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

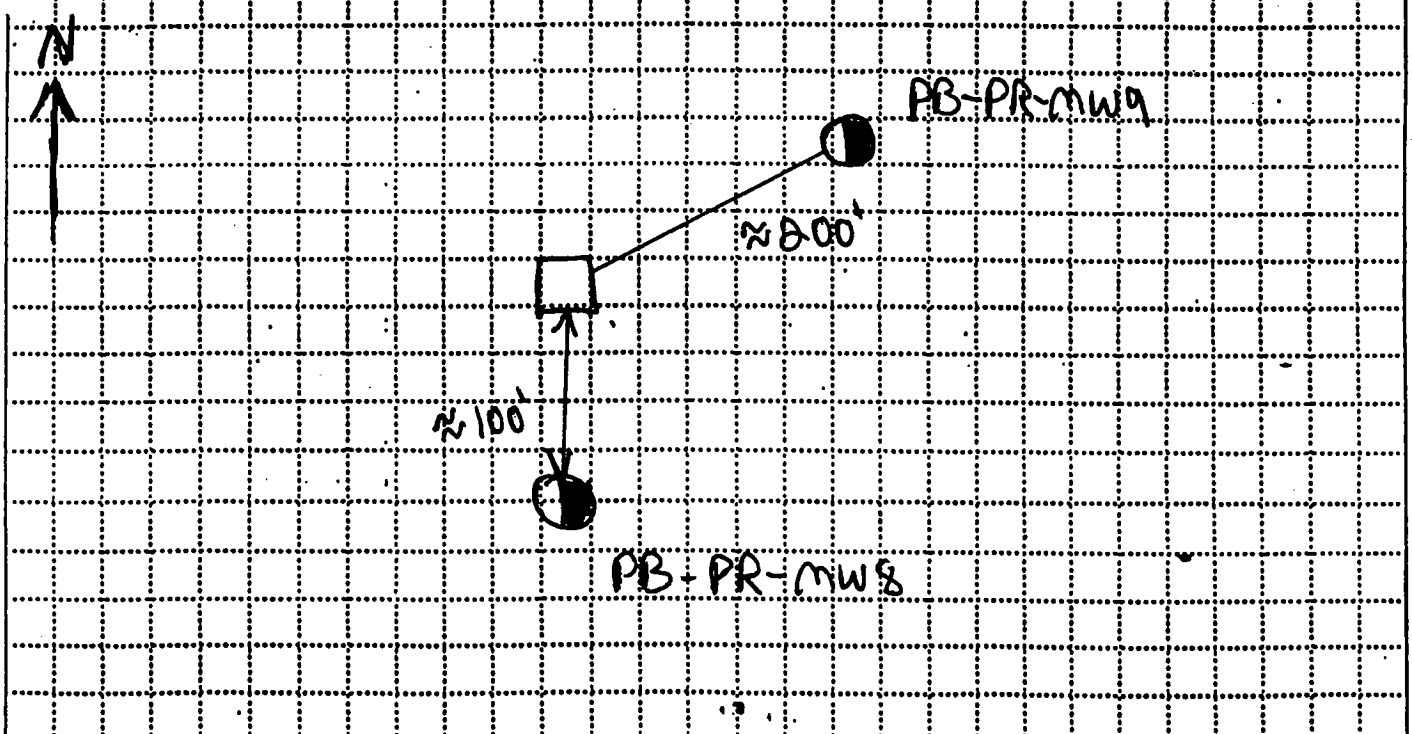
HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP23
1. COMPANY NAME	IT Corp
2. DRILL SUBCONTRACTOR	Geo - Environmental Drilling
SHEET / SHEETS	1 of 3
3. PROJECT	PBOW - PRRP
4. LOCATION	PRRP
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig.
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4' x 1.5" Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	PRRP - DP23
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-13-98
11. DATE COMPLETED	6-13-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH GROUNDWATER ENCOUNTERED	NA Ft. BGS
13. DEPTH DRILLED INTO ROCK	NA
14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	12.0 Ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA
18. GEOTECHNICAL SAMPLES	(3) DISTURBED; UNDISTURBED
19. TOTAL NUMBER OF CORE BOXES	
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: [redacted]; TAL METALS: [redacted]; OTHER (SPECIFY): [redacted]; OTHER (SPECIFY): [redacted]; OTHER (SPECIFY): [redacted]
21. TOTAL CORE RECOVERY	NA
22. DISPOSITION OF HOLE	BACKFILLED: Grouted; MONITORING WELL: — ; OTHER (SPECIFY): —
23. SIGNATURE OF INSPECTOR	John Vogeding

LOCATION SKETCH/COMMENTS

N	E	EL.
624,953.28	1,919,383.04	634.36

SCALE: Not to Scale



PROJECT PBOW - PRRP

HOLE NO. PRRP-DP23

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP23

PROJECT PBOW - PRRP | INSPECTOR John Vogeding | SHEET 2 OF 3

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' grass and Topsoil	Headspace Hnu Readings				Start Time 0835 End 0900
Sm	1	0.5'-4' Loose, med. brown, v. fine, silty sand, moist		2'		Push 1	
	2			PBOW-PRRP-DP23-GEOT-0204		4' Recovery	
	3						
	4	4'-6' Soft, brown and grey, v. fine sandy silt and clayey silt, moist.		4'		4'	
ml/Cl	5		NA		NA	Push 2	
	6	6-8 Same as Above, grading to clayey sand, moist.		6'		4' Recovery	
SC	7			PBOW-PRRP-DP23-GEOT-0608			
	8			8'		8'	
ml	9	8-10' Soft, brown and grey, v. fine sandy silt, wet				Push 3 (8'-12') 4' Recovery	
	10			10'			

PROJECT PBOW - PRRP | HOLE NO. PRRP-DP23

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP23

PROJECT PBOW - PRRP | INSPECTOR John Vogeding | SHEET 3 of 3

SCS Log Box (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
ml/Cl	10'-12' 11	Soft, grey, high Plasticity, Clayey Silt and Clay, wet	Headspace Hnu Readings NA	PBOW-PRRP-DP23-GEOT-10'-12'	NA	Push 3 (8-12) 12'	Start Time 0835 End 0900
	12	Bottom of Boring at 12.0 ft.					

PROJECT PBOW - PRRP | HOLE NO. PRRP - DP23

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

PRRP

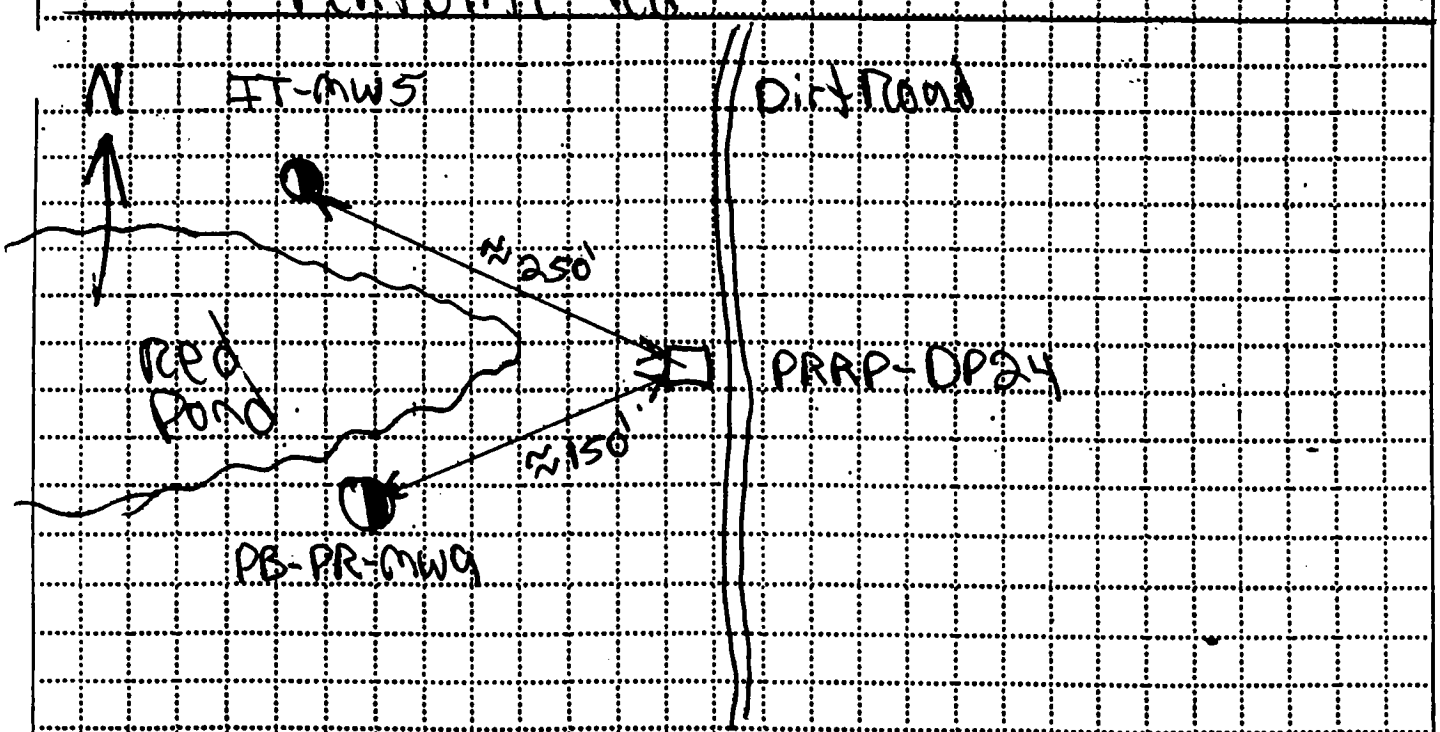
HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP24
1. COMPANY NAME	IT Corp
2. DRILL SUBCONTRACTOR	Geo - Environmental Drilling
SHEET	1 OF 3 SHEETS
3. PROJECT	PBOW - PRRP
4. LOCATION	PRRP
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig.
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4' x 1.5" Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	PRRP - DP24
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-13-98
11. DATE COMPLETED	6-13-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH GROUNDWATER ENCOUNTERED	NA Ft. BGS
13. DEPTH DRILLED INTO ROCK	NA
14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	12.0 Ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA
18. GEOTECHNICAL SAMPLES	(3) DISTURBED; UNDISTURBED
19. TOTAL NUMBER OF CORE BOXES	
20. SAMPLES FOR CHEMICAL ANALYSIS	None
VOC	[redacted]
TAL METALS	[redacted]
OTHER (SPECIFY)	[redacted]
OTHER (SPECIFY)	[redacted]
OTHER (SPECIFY)	[redacted]
21. TOTAL CORE RECOVERY	NA
22. DISPOSITION OF HOLE	BACKFILLED: Grouted; MONITORING WELL: -; OTHER (SPECIFY): -
23. SIGNATURE OF INSPECTOR	John Vogelding

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP24	625,170.69	1,919,685.68	630.80



PROJECT PBOW - PRRP

HOLE NO. PRRP-DP24

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP24

PROJECT USCS PBOW - PRRP

INSPECTOR John Vogeding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' grass + Topsoil	Headspace Hnu Readings				Time Start 1300 End 1320
Sm	1	0.5'-3.0' Loose, med. brown, V. Fine Silty Sand, moist				Push 1 4' Recovery	
	2			2' PBOW-98-PRRP-DP24-Geot-0204			
	3	3'-4' Soft, brownish grey, low Plasticity, V. Fine Sandy Silt, moist		4'		4'	
	4						
ML/Cl	5	4'-8' Same as Above, V. Fine Sandy Silt grading to Clayey Silt and Clay, slightly wet.	NA		NA	Push 2 4' Recovery	
	6			6' PBOW-98-PRRP-DP24-Geot-0608			
	7						
	8	8'-12' Same as Above w/ few Fine Sand stringers throughout, slightly wet		8'		8'	
	9					Push 3 (8-12') 4' Recovery	
	10			10'			

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP24

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP24

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET [redacted] SHEETS 3 of 3

(a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	(g) Sampling Intervals	REMARKS (h)
ML/CL	11	10'-12' See pg 1	Headspace Hnu Readings NA	PBOW-98-PRRP-DP24-Geot-1012	NA	Push 3 (8'-12')	Start 1300 End 1320
	12	Bottom of Boring at 12.0 ft.					

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP24

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

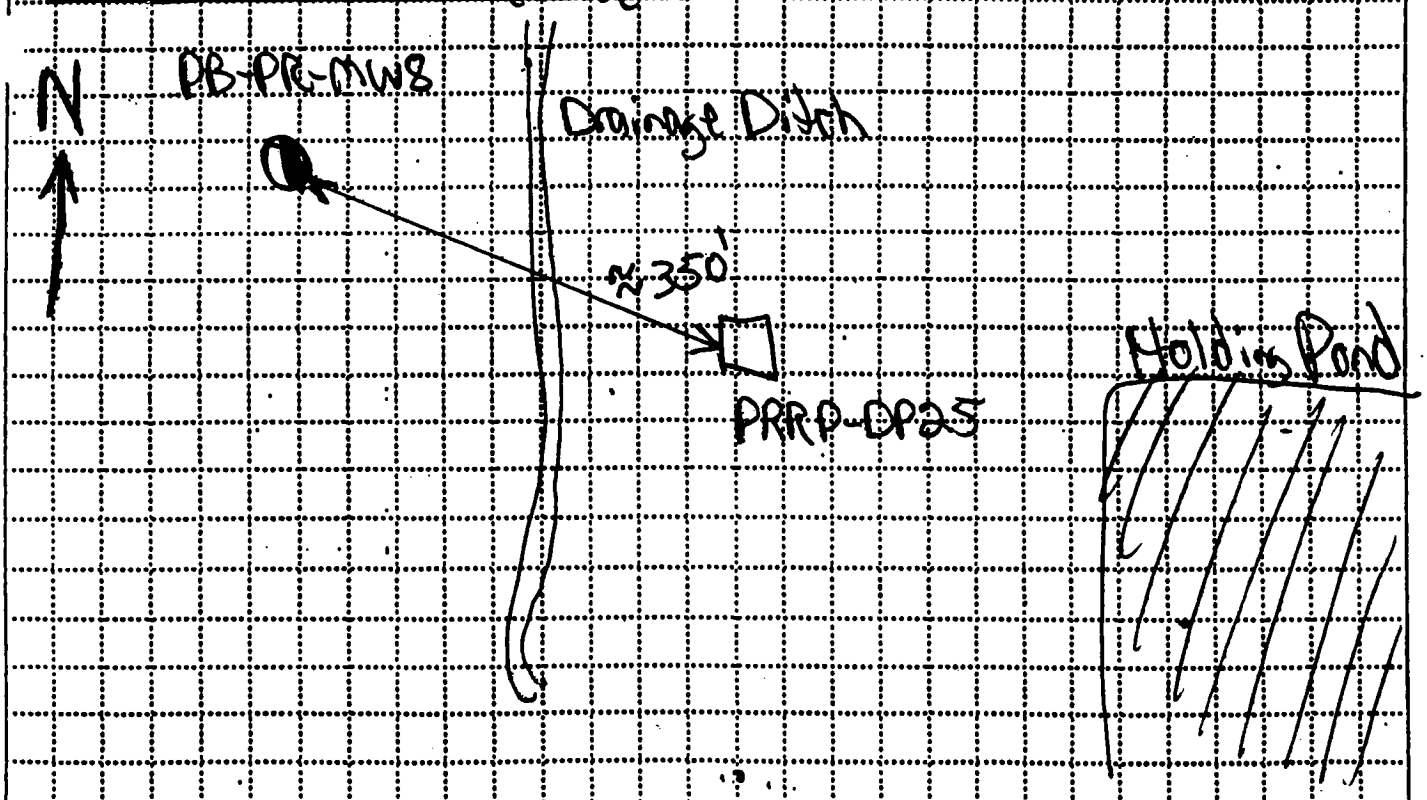
HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP25
1. COMPANY NAME	IT Corp
2. DRILL SUBCONTRACTOR	Geo - Environmental Drilling
SHEET	1 OF 3 SHEETS
3. PROJECT	PBOW - PRRP
4. LOCATION	PRRP
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig.
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	~~4' x 1.5"~~ Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	PRRP - DP25
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-13-98
11. DATE COMPLETED	6-13-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH DRILLED INTO ROCK	NA
14. TOTAL DEPTH OF HOLE	12.0 Ft.
15. DEPTH GROUNDWATER ENCOUNTERED	NA Ft. BGS
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA
18. GEOTECHNICAL SAMPLES	(3) DISTURBED; UNDISTURBED
19. TOTAL NUMBER OF CORE BOXES	
20. SAMPLES FOR CHEMICAL ANALYSIS	None
VOC	[redacted]
TAL METALS	[redacted]
OTHER (SPECIFY)	[redacted]
OTHER (SPECIFY)	[redacted]
OTHER (SPECIFY)	[redacted]
21. TOTAL CORE RECOVERY	NA
22. DISPOSITION OF HOLE	BACKFILLED: Grouted; MONITORING WELL: — ; OTHER (SPECIFY): —
23. SIGNATURE OF INSPECTOR	John Voggly

LOCATION SKETCH/COMMENTS

N	E	EL.
624,687.56	1,919,500.10	632.48

SCALE: Not to Scale



PROJECT PBOW - PRRP

HOLE NO. PRRP-DP25

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP25

PROJECT: PBOW - PRRP

INSPECTOR: John Vogeding

SHEET 2 OF 3 SHEETS

SCS ~~USCS~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~INCREMENT~~ (g) Sampling Intervals	REMARKS (h)
Pt/Sm		0-0.5' grass and Topsoil	Headspace Hnu Readings				Time Start 1055 End 1125
Sm	1 2	0.5'-3' Loose-M.Dense, brown and grey, v. Fine, Silty Sand, moist		2' PBOW-98-PRRP-DP25-Geot-0604		Push 1 3.5' Recovery	
3'	3	3'-4' Soft, brownish grey, low Plasticity, v. Fine, Sandy Silt, moist		4'		4'	
nl/Cl	4 5 6 7	4'-8' Same As Above brownish grey grading to grey, v. Fine Sandy Silt grading to clayey Silt and Clay, slightly wet	NA	6' PBOW-98-PRRP-DP25-Geot-0608	NA	Push 2 4' Recovery	
8'	8	8'-12' Loose, grey, v. Fine, Silty Sand, wet		8'		8'	
SM	9 10			10'		Push 3 (8'-12') 3' Recovery	

PROJECT: PBOW - PRRP

HOLE NO. PRRP - DP25

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

PRRP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP25

PROJECT PBOW - PRRP

INSPECTOR John Vogeding

SHEET 3 SHEETS 3 of 3

USCS SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	EQUIPMENT (g)	REMARKS (h)
SM 12'	11 12	10-12' See p51 12'	Headspace Hnu Readings NA	PBOW-98-PRRP-DP25-Geot-1 10-12 12'	NA	Sampling Intervals Push 3 (8'-12')	Start Time 1055 End 1125
		Bottom of Boring at 12.0 ft					

PROJECT PBOW - PRRP

HOLE NO. PRRP - DP25

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP01
1. COMPANY NAME	IT Corp.
2. DRILL SUBCONTRACTOR	Geo-Environmental Drilling Co.
SHEET / SHEETS	1 OF 3
3. PROJECT	PBOW - WARP
4. LOCATION	PBOW - WARP
5. NAME OF DRILLER	Scott [redacted] Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	WARP-DP01
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-23-98
11. DATE COMPLETED	6-23-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH GROUNDWATER ENCOUNTERED	≈ 8.5-9.5 and 12-14 Ft. BGS
13. DEPTH DRILLED INTO ROCK	NA
14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	16.0 Ft. BGS
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA
18. GEOTECHNICAL SAMPLES	NA
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	

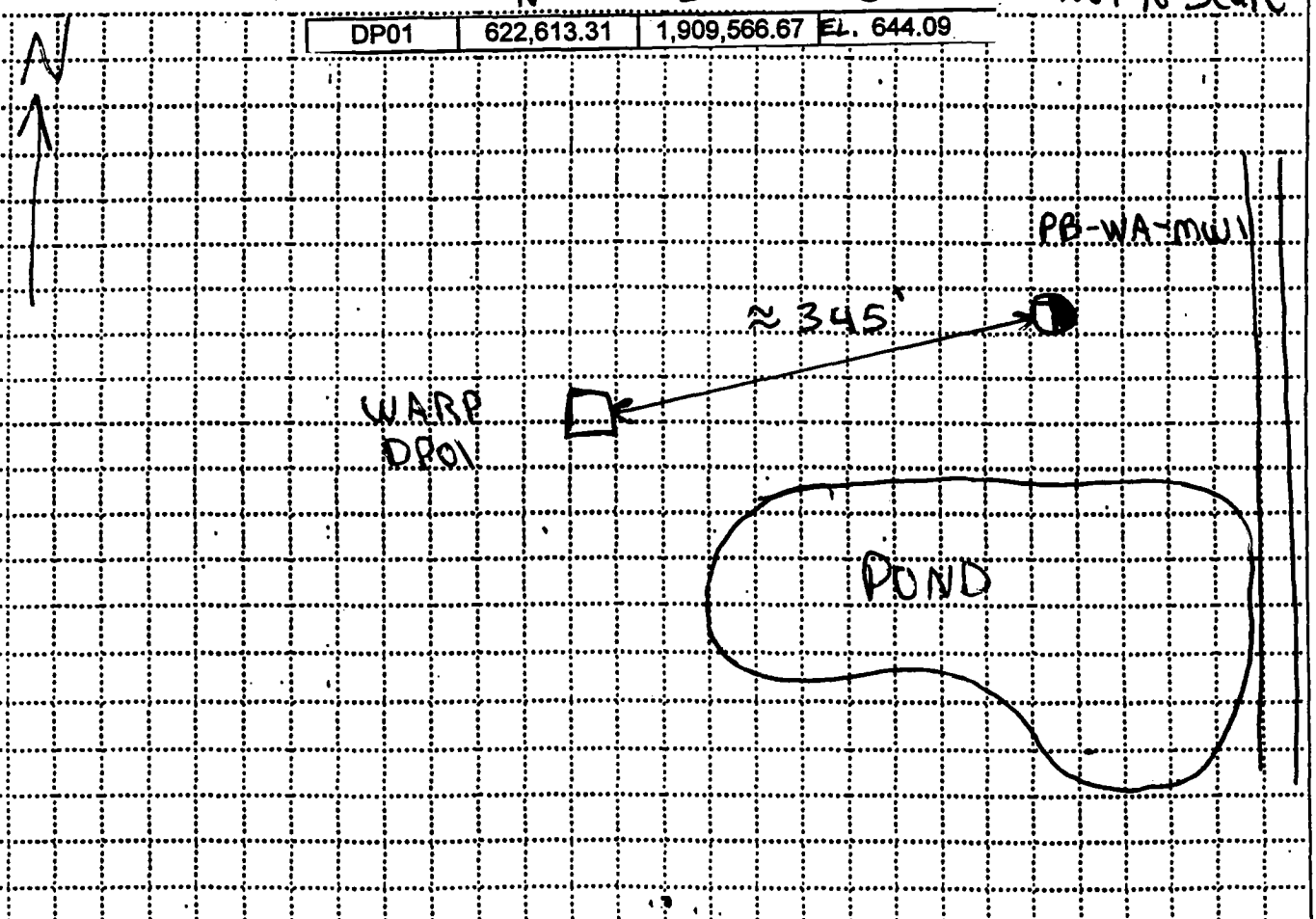
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogelin

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP01	622,613.31	1,909,566.67	644.09



PROJECT PBOW - WARP

HOLE NO. WARP-DP01

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP01

PROJECT: PBOW - WARP

INSPECTOR: John Voeding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals	REMARKS (h)
Pt/SM		0-0.5' grass and Topsoil	Headspace Hnu Readings				Time Start 1045 End 1110
SM	1 2 3 3.5'	0.5'-3.5' Loose, Light yellowish brown, Fine Sand, moist 3.5'	NA		PBOW-98-SO-WARP-DP01-8100-(0002) 2'	Push 1 3' Recovery	Hnu meter Not Functioning Properly due to high Ambient and Headspace moisture.
SC	4 4.5'	3.5'-4' m.Brown, Fine, Clayey Sand, moist 4'-4.5' Same as Above	4'		5'	4'	
ML	5 6 7 8 8.5'	4.5'-8' Soft, med brown and grey, low Plasticity, v. Fine Sandy Silt, moist 8-8.5' Same as Above 8.5'	NA 8'	NA	PBOW-98-SO-WARP-DP01-8110-(0406) 6'	Push 2 4' Recovery 8'	
SM	9 9.5'	8.5'-9.5' Loose, orangish brown, Fine Sand, wet 9.5'	NA		PBOW-98-SO-WARP-DP01-8120-(0810) 10'	Push 3 (8'-12')	
ML	10						

PROJECT: PBOW - WARP

HOLE NO. WARP - DP01

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP01

PROJECT PBOW - WARP

INSPECTOR John Voegeding

SHEET 3 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals	REMARKS (h)
ML 12'	11 12	9.5'-12' Soft, brown and grey, low plasticity, v. fine, Sandy Silt, moist - Slightly wet. 12'	Headspace Hnu Readings NA		NA	Push 3 (8'-12')	Start 1045 End 1110
SM 14'	13 14	12'-14' Loose, orangish brown, Fine Sand, wet. 14'	NA	NA	NA	Push 4 4' Recovery	
CL 16'	15 16	14'-16' Soft, grey, high plasticity Clay, moist. 16'				16'	
		Bottom of Boring at 16.0 Ft.					

PROJECT PBOW - WARP

HOLE NO. WARP - DP01

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

1. COMPANY NAME: IT Corp.	2. DRILL SUBCONTRACTOR: Geo-Environmental Drilling Co.	DISTRICT: Nashville - TN
		HOLE NUMBER: DP02
		SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - WARP	4. LOCATION: PBOW - WARP	
5. NAME OF DRILLER: Scott [redacted] Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: WARP-DP02	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-23-98	11. DATE COMPLETED: 6-23-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: 5-5.5' and 13-14 Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 16.0 Ft. BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

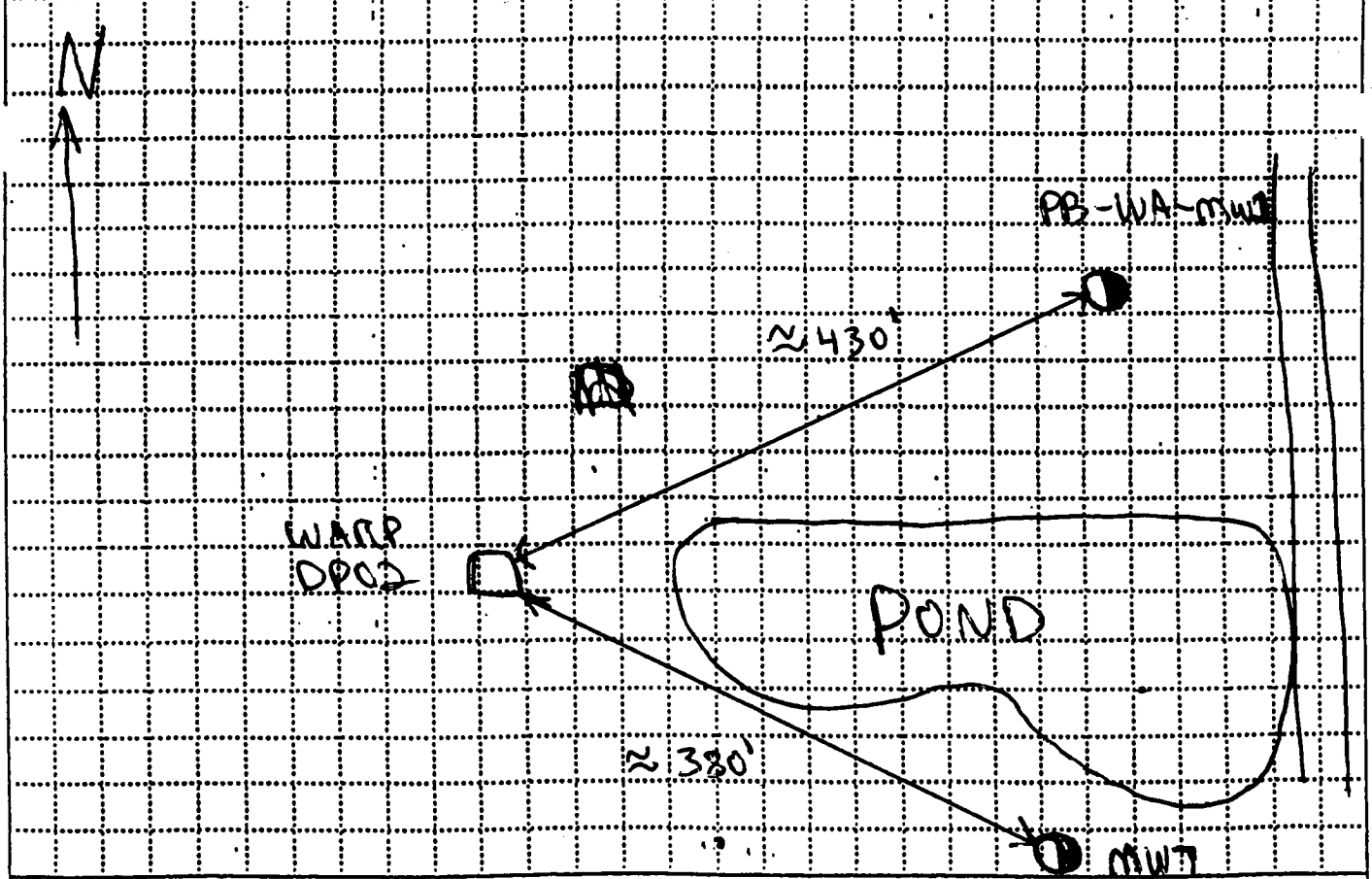
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogedin

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP02	622,379.43	1,909,598.56	636.50



PROJECT: PBOW - WARP

HOLE NO.: WARP-DP02

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP02

PROJECT: SCS, PBOW - WARP

INSPECTOR: John Vogeding

SHEET 2 OF 3

~~ADD DO~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~Recovery~~ Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' weeds and Topsoil	Headspace Hnu Readings				Time Start 1135 End 1200
	1	0.5'-4' Soft-m. Firm, dark brown, v. Fine Sandy Silt, dry			PBOW-98-SO-WARP-DP02-8140-(0002) 2'	Push 1 3.5' Recovery	0.5'-1' Some reddish staining
ml	2 3		NA				
	4	4'-5' Same as Above 5'	4'		4'	4'	
5'	5			NA	PBOW-98-SO-WARP-DP02-8150-(0406) 6'	Push 2 4' Recovery	
Sm 5.5'		5'-5.5' Loose, light brown, Fine Sand, wet					
ml/Cl	6 7	5.5'-8' m. Firm, brown and grey, low plasticity, clayey Silt and Clay, moist	NA				
	8		8'		8'	8'	
	9 10	8'-12' Same as Above, w/ Several Fine Sand Stringers throughout, moist.	NA		PBOW-98-SO-WARP-DP02-8160-(0810) 10'	Push 3 (8'-12') 4' Recovery	

PROJECT: PBOW - WARP

HOLE NO. WARP - DP02

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP02

PROJECT ISCS PBOW-WARP

INSPECTOR John Voeding

SHEET 3 OF 3 SHEETS

~~LOG~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~EQUIPMENT~~ Sampling Intervals (g)	REMARKS (h)
Ml/Cl 12'	11 12	10'-12' See pg. 2 12'	Headspace Hnu Readings NA 12'		NA	Push 3 (8'-12') 12'	Start 1135 End 1200
SC 13'	12 13	12'-13' Loose, greyish brown, Fine Clayey Sand, moist-Slightly wet.		NA		Push 4	
Sm 14'	13 14	13'-14' Loose, med. brown, F-M Sand, wet 14'	NA		NA		
Cl 16'	14 15 16	14'-16' Soft, grey, med. Plasticity, Clay, moist-Slightly wet 16'	16'			16'	
		Bottom of Boring at 16.0 Ft					

PROJECT PBOW-WARP

HOLE NO. WARP-DP02

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP03
1. COMPANY NAME	IT Corp.
2. DRILL SUBCONTRACTOR	Geo-Environmental Drilling Co.
SHEET / OF SHEETS	1 of 3
3. PROJECT	PBOW - WARP
4. LOCATION	PBOW - WARP
5. NAME OF DRILLER	Scott ~~[illegible]~~ Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	WARP-DP03
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-23-98
11. DATE COMPLETED	6-23-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH GROUNDWATER ENCOUNTERED	5-7 Ft and 8-9.5 Ft. BGS
13. DEPTH DRILLED INTO ROCK	NA
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	16.0 Ft. BGS
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA
18. GEOTECHNICAL SAMPLES	NA
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	

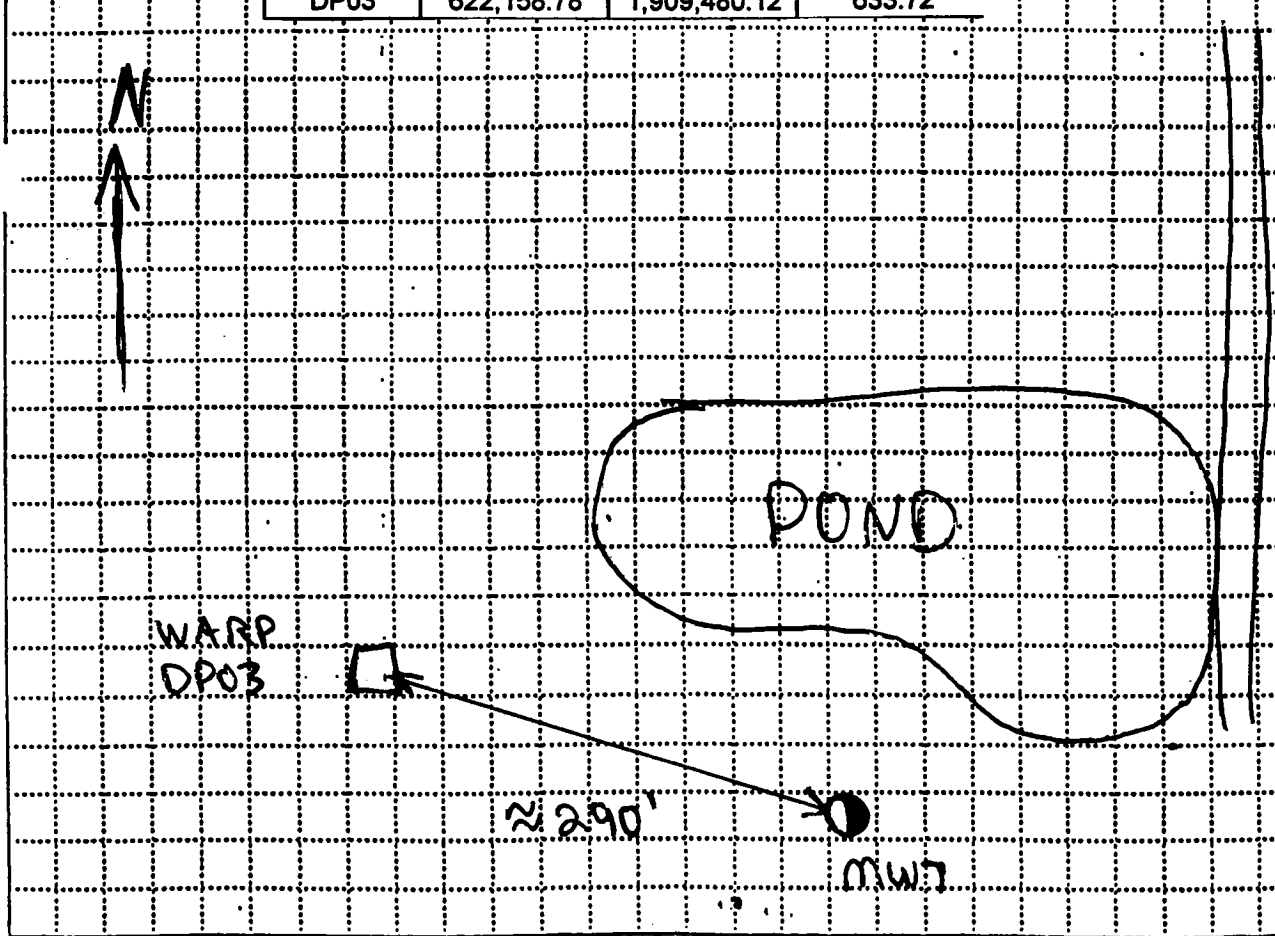
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vigelding

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP03	622,158.78	1,909,480.12	633.72



PROJECT PBOW - WARP

HOLE NO. WARP-DP03

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP03

PROJECT PBOW - WARP

INSPECTOR John Voegding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' Weeds and Topsoil	Headspace Hnu Readings				Start Time 1415 End 1450
ml/cl	1 2 3'	0.5'-3' Firm, m. brown, low plasticity clayey Silt and clay, moist 3'	NA		PBOW-98-SO-WARP-DP03-8180-(0002) 2'	Push 1 3.5' Recovery	
SC	3 4 5 6 7'	3'-4' Loose, m. brown, Fine-med. clayey Sand, moist 4'-7' Same as Above wet from 5-7 ft. 7'	4' NA	NA	PBOW-98-SO-WARP-DP03-8190-(0406) 4' 6'	Push 2 4' Recovery	Hnu meter Readings are erratic Due to High ambient and Headspace Moisture.
ml/cl	7 8	7'-8' Soft-m. Firm, Brown and grey, low-med. plasticity Clayey Silt and clay moist 8'	8'		8'	8'	Collected FD/FS and MS/MSD Samples from 0-2 ft.
SC	9	8-9.5' Loose, m. Brown, Fine, Clayey sand, wet 9.5'	NA		PBOW-98-SO-WARP-DP03-8200-(0810) 10'	Push 3 (8-12') 4' Recovery	
9.5'							
Cl	10						

PROJECT PBOW - WARP

HOLE NO. WARP - DP03

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP03

PROJECT USCS, PBOW-WARP | INSPECTOR John Voegding | SHEET 3 OF 3 SHEETS

~~USCS~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~COMMENT~~ Sampling Intervals (g)	REMARKS (h)
	11	9.5'-12' Soft, grey, med-high Plasticity, Clay, moist-Slightly wet.	Headspace Hnu Readings NA 12'		NA	Push 3 (8'-12') 12'	Start Time 1415 End 1450
Cl	12 13 14	12'-15' Same as Above	NA	NA	NA	Push 4 4' Recovery	
15'	15	15'					
Cl (Till)	16	15-16' Hard, grey, low plasticity, clay w/ 50% sand + gravel (TILL)	16'			16'	
		Bottom of Boring at 16.0 Ft.					

PROJECT PBOW-WARP | HOLE NO. WARP-DP03

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP04
1. COMPANY NAME: IT Corp.	2. DRILL SUBCONTRACTOR: Geo-Environmental Drilling Co.	SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - WARP	4. LOCATION: PBOW - WARP	
5. NAME OF DRILLER: Scott [redacted] Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: WARP-DP04	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-23-98	11. DATE COMPLETED: 6-[redacted]23-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: NA Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft. BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

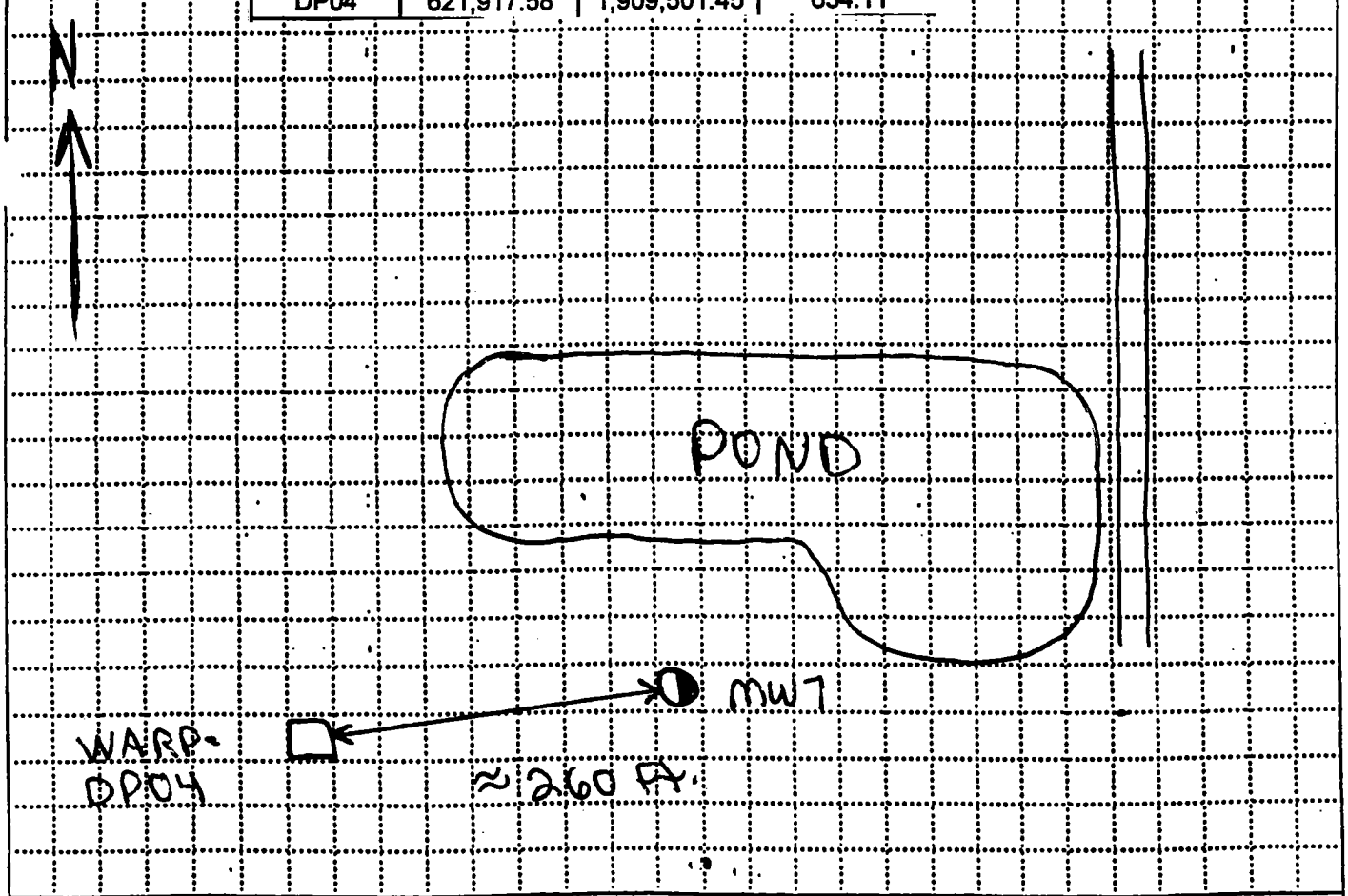
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogeding

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP04	621,917.58	1,909,501.45	634.11



PROJECT: PBOW - WARP

HOLE NO.: WARP-DP04

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP04

PROJECT USCS PBOW - WARP

INSPECTOR John Voeding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' weeds and Topsoil	Headspace Hnu Readings				Start 1540 End 1615
ml	1	0.5'-3.5' Firm, light brown, low Plasticity V. Fine, Sandy Silt, Dry			PBOW-98-50-WARP-DP04-8220-(0000) 2'	Push 1 3.5' Recovery	
	2		NA				
	3	3.5'					Hnu meter Readings Erratic Due to High Ambient and Headspace Moisture.
3.5'							
Sm	4	3.5'-4' Loose, med greyish brown, F-m, Silty Sand, moist	4'		4'	4'	
	5	4-6.5' Same as Above	NA	NA	PBOW-98-50-WARP-DP04-8230-(0400) 6'	Push 2 4' Recovery	
	6	6.5'					
6.5'							
ml / Cl	7	6.5'-8' Soft-Firm, med brown and grey, low Plasticity, Clayey Silt and clay, moist	8'		8'	8'	
	8						
	9	8'-10' Same as Above, grey, moist	NA		PBOW-98-50-WARP-DP04-8240-(0810) 10'	Push 3 (8'-12') 4' Recovery	
	10						

PROJECT PBOW - WARP

HOLE NO. WARP - DP04

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP04

PROJECT ISCS PBOW - WARP

INSPECTOR John Voeding

SHEET 3 OF 3 SHEETS

~~ID NO.~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~EQUIPMENT~~ Sampling Intervals (g)	REMARKS (h)
ML CL	11	10'-12' Same as Above, Firm-Hard, grey, with 30% Fine, angular gravel, (Till), Slightly wet	Headspace Hnu Readings NA	NA	NA	Push 3 (8'-12')	Start Time 1540 End 1615
	12	Trace weathered shale at 12 Ft.	12'				Sampler Refusal at 12 Ft.
	13	Bottom of Boring at 12.0 Ft.					
	14						
	15						

PROJECT PBOW - WARP

HOLE NO. WARP - DP04

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

1. COMPANY NAME: IT Corp.	DISTRICT: Nashville - TN	HOLE NUMBER: DP05
2. DRILL SUBCONTRACTOR: Geo-Environmental Drilling Co.		SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - WARP	4. LOCATION: PBOW - WARP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: WARP-DP05	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-16-98	11. DATE COMPLETED: 6-16-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: NA Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 16.0 Ft. BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

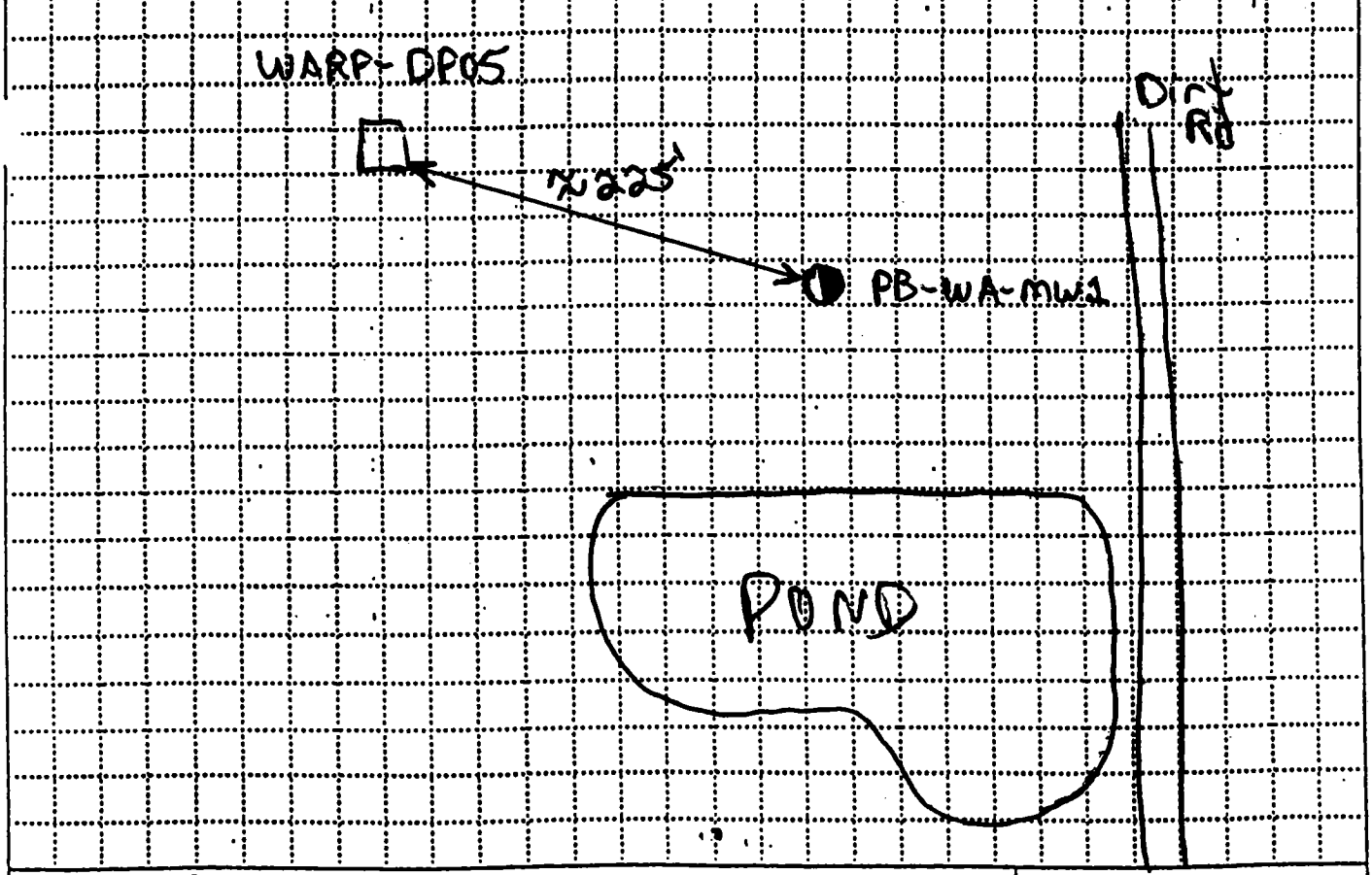
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogel

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP05	622,820.86	1,909,789.37	643.60



PROJECT: PBOW - WARP

HOLE NO.: WARP-DP05

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP05

PROJECT: USCS, PBOW - WARP

INSPECTOR: John Vogeding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
		0-0.5' weeds and Topsoil	Headspace Hnu Readings				Start Time 1100 End 1120
SM / SC	1 2 3 4	0.5'-4' Loose, Light-med. brown, Fine Silty Sand, moist. grading to clayey Sand	NA		PBOW-SO-98-WARP-DP05-8260-(0002) 2' 4'	Push 1 3.5' Recovery 4'	Hnu meter Not working Properly due to high humidity and headspace moisture
ML / CL	5 6 7 8	4'-8' Soft, brown and grey, low Plasticity, v. Fine Sandy Silt and clayey Silt w/ v. Fine Sand stringers throughout, very moist	NA	NA	PBOW-98-SO-WARP-DP05-8270-(0406) 6' 8'	Push 2 4' Recovery 8'	
	9 10	8'-12' Same as Above, grey from 10.5'-12' Some trace Free Water from 9'-9.5'. Slightly wet	NA		PBOW-98-SO-WARP-DP05-8280-(0810) 10'	Push 3 (8'-12') 4' Recovery	

PROJECT: PBOW - WARP

HOLE NO. WARP - DP05

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP05

PROJECT ICS PBOW-WARP | INSPECTOR John Voegding | SHEET 3 OF 3 SHEETS

~~OD~~ DO (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~REMARKS~~ Sampling Intervals (g)	REMARKS (h)
↑ ml/Cl	11	10-12' See pg 2 ~~[illegible]~~	Headspace HNU Readings NA	NA	NA	Push 3 (8-12') 12'	Start 1100 End 1120 (Time)
	12						
↓	13	Bottom of Boring at 16.0 Ft. 12-16' Clayey Silt and Clay as Above ↓				Push 4 4' Recovery	Note: Initially Advanced borehole to 12 Ft and Installed Temp. well for gw collection Due to lack of gw borehole was advanced further to 16 Ft. and Temp. well re-Installed.
	14		NA	NA	NA		
	15						
	16					16'	

PROJECT PBOW-WARP | HOLE NO. WARP-DP05

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP06
1. COMPANY NAME	IT Corp.
2. DRILL SUBCONTRACTOR	Geo-Environmental Drilling Co.
SHEET / SHEETS	1 of 3
3. PROJECT	PBOW - WARP
4. LOCATION	PBOW - WARP
5. NAME OF DRILLER	Scott [redacted] Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	WARP-DP06
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-23-98
11. DATE COMPLETED	6-23-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH GROUNDWATER ENCOUNTERED	14-15 Ft. BGS
13. DEPTH DRILLED INTO ROCK	NA
14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	16.0 Ft. BGS
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA
18. GEOTECHNICAL SAMPLES	NA
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	

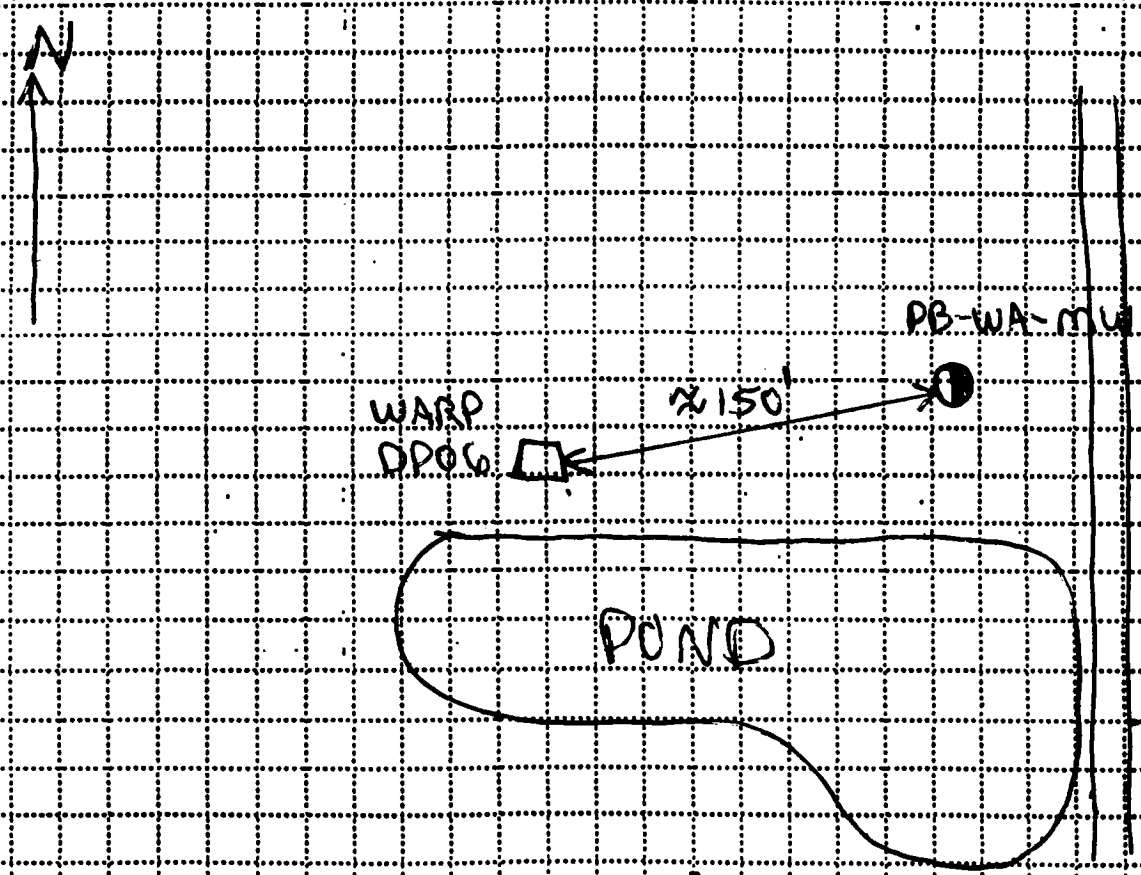
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Voegding

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP06	622,610.42	1,909,780.55	643.32



PROJECT PBOW - WARP

HOLE NO. WARP-DP06

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP06

PROJECT: USCS, PBOW - WARP

INSPECTOR: John Voeding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' grass and Topsoil	Headspace Hnu Readings		PBOW-98-SO-WARP-DP06-8300-(0002)		Start 0910 End 0930
SM	1	0.5'-4' Loose, light yellowish brown, Fine Sand, Dry - Slightly Moist				Push 1	
	2		NA		2'	3' Recovery	
	3		4'		4'	4'	Hnu Meter Not Functioning Properly due to high ambient and headspace Humidity
4.5'	4	4'-4.5' Same as Above 4.5'					
Ml/Cl	5	4.5-8' Soft, med brown and grey, low plasticity, clayey silt and clay, moist		NA	PBOW-98-SO-WARP-DP06-8310-(0406)	Push 2	
	6		NA		6'	4' Recovery	
	7		8'		8'	8'	
	8	8'-12' Same as Above, with V. Fine Sand Stringers throughout, moist - Slightly wet					
	9		NA		PBOW-98-SO-WARP-DP06-8320-(0810)	Push 3 (8'-12')	Few Minor wet Perched Zones from 10'-12'
	10				10'	4' Recovery	

PROJECT: PBOW - WARP

HOLE NO. WARP - DP06

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP06

PROJECT: PBOW - WARP

INSPECTOR: John Voegeding

SHEET 3 OF 3 SHEETS

SCS ~~USCS~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~EQUIPMENT~~ Sampling Intervals (g)	REMARKS (h)
		10'-12' See pg 2	Headspace Hnu Readings NA 12'		12'	Push 3 (8'-12') 12'	Start 0910 End 0930
ML/CL	12	12'-16' v. soft, grey, med plasticity, Clayey Silt and clay, slightly wet-wet from 14-15 Ft.	NA	NA	NA	Push 4 4' Recovery	
16'	16	16'	16'			16'	
		Bottom of Boring at 16.0 Ft.					

PROJECT: PBOW - WARP

HOLE NO. WARP - DP06

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

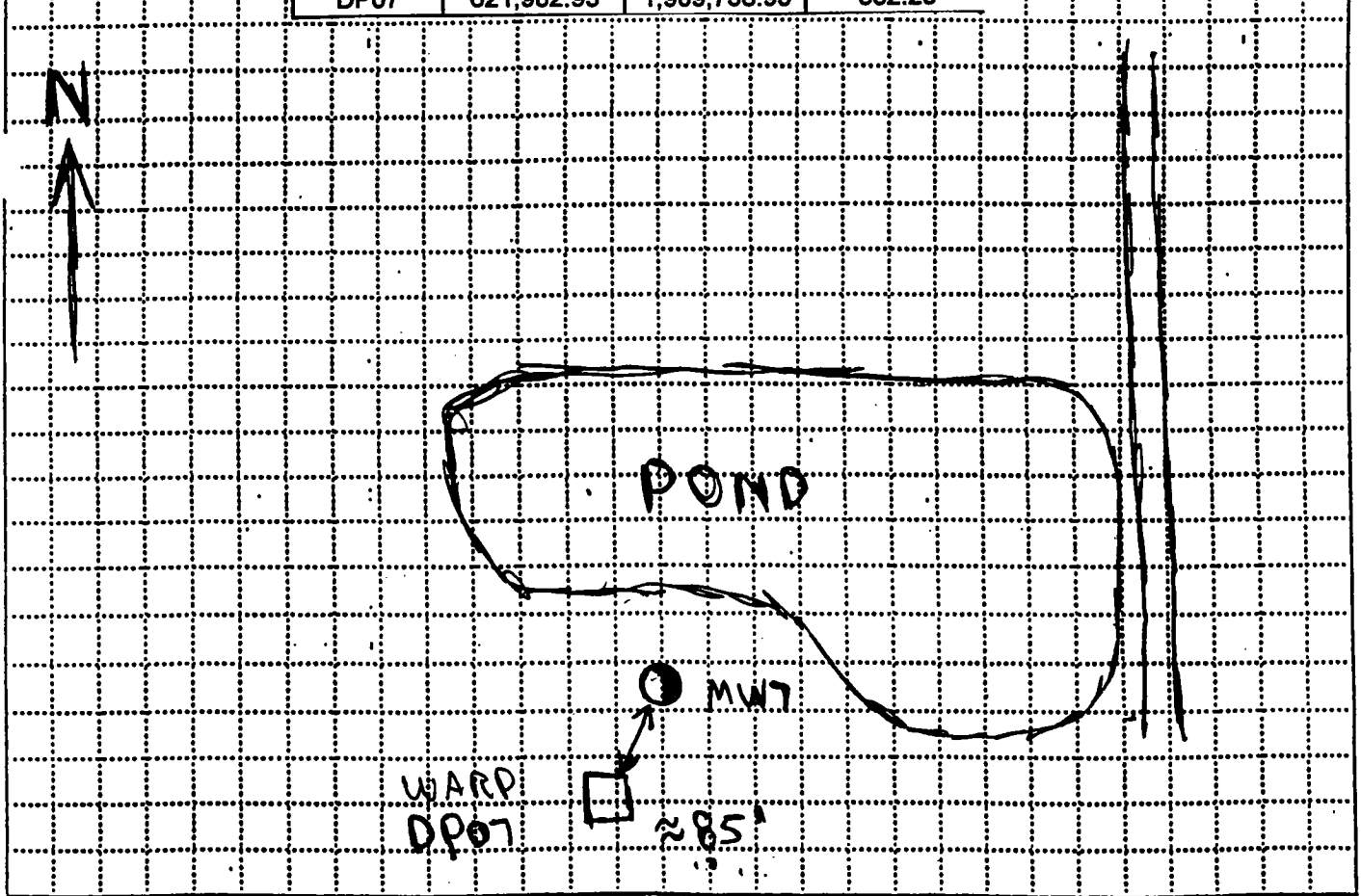
HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP07
1. COMPANY NAME	IT Corp.
2. DRILL SUBCONTRACTOR	Geo-Environmental Drilling Co.
SHEET / SHEETS	1 of 3
3. PROJECT	PBOW - WARP
4. LOCATION	PBOW - WARP
5. NAME OF DRILLER	Scott [redacted] Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 Ft Long x 1.5 Inch Diameter Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	WARP-DP07
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-25-98
11. DATE COMPLETED	6-25-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH DRILLED INTO ROCK	NA
14. TOTAL DEPTH OF HOLE	12.0 Ft. BGS
15. DEPTH GROUNDWATER ENCOUNTERED	NA Ft. BGS
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA
18. GEOTECHNICAL SAMPLES	NA
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC ✓ / TAL METALS ✓ / OTHER (SPECIFY) Nitroaromatics / OTHER (SPECIFY) SVOCs / OTHER (SPECIFY) PCBs
21. TOTAL CORE RECOVERY	NA
22. DISPOSITION OF HOLE	BACKFILLED Grouted / MONITORING WELL — / OTHER (SPECIFY) —
23. SIGNATURE OF INSPECTOR	John Vogeding

LOCATION SKETCH/COMMENTS

N	E	EL.
DP07	621,982.93	1,909,758.95	632.28

SCALE: Not to Scale



PROJECT PBOW - WARP

HOLE NO. WARP-DP07

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP07

PROJECT PBOW-WARP | INSPECTOR John Voegding | SHEET 2 OF 3

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' grass and Topsoil	Headspace Hnu Readings				Start Time 1545 End 1555
ml/Cl	1 2 3	0.5-4' Soft, dark-light brown, low plasticity, clayey silt and clay, moist.	NA		PBOW-98-SO-WARP-DP07-8340-(0002) 2'	Push 1 3.5' Recovery	Hnu meter Not working properly due to high ambient and headspace moisture.
4'	4	4'	4'		4'	4'	
SC	5 6	4'-7' Loose/soft, brown and grey, F-m, clayey sand, moist	NA	NA	PBOW-98-SO-WARP-DP07-8350-(0406) 6'	Push 2 4' Recovery	
7'	7	7'					
Cl	8 9 10	7'-8' Hard, med. brown and grey Silty clay w/ 30% F-m, angular gravel, (TILL), moist 8'-10' Same as Above	8' NA		8' PBOW-98-SO-WARP-DP07-8360-(0810) 10'	8' Push 3 (8-12') 4' Recovery	

PROJECT PBOW-WARP | HOLE NO. WARP-DP07

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP07

PROJECT SCS, PBOW - WARP

INSPECTOR John Voeding

SHEET 3 OF 3 SHEETS

~~ELEV~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~DISTURBANCE~~ (g) Sampling Intervals	REMARKS (h)
NA	11	8'-12' Hard, grey, weathered shale, Dry.	Headspace Hnu Readings NA	NA	NA	Push 3 (8'-12'	Time Start 1545 End 1555
	12	Bottom of Boring at 12.0 Ft.					

PROJECT PBOW - WARP

HOLE NO. WARP - DP07

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

1. COMPANY NAME: IT Corp.	2. DRILL SUBCONTRACTOR: Geo-Environmental Drilling Co.	DISTRICT: Nashville - TN
		HOLE NUMBER: DP08
		SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - WARP	4. LOCATION: PBOW - WARP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: WARP-DP08	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-15-98	11. DATE COMPLETED: 6-15-98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: NA Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 16 Ft. BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

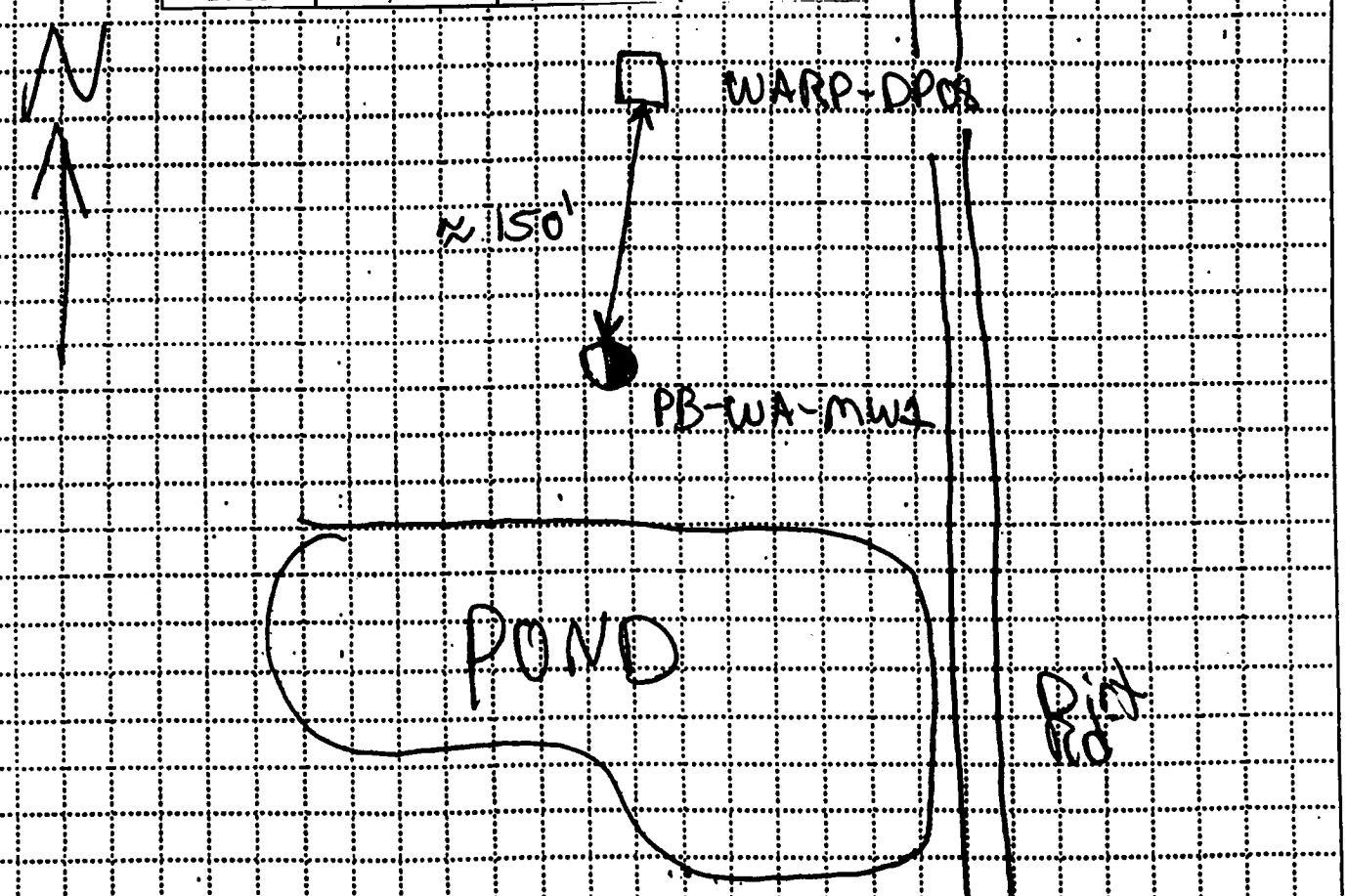
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogedin

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP08	622,727.47	1,909,986.13	642.69



PROJECT: PBOW - WARP

HOLE NO.: WARP-DP08

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP08

PROJECT PBOW - WARP | INSPECTOR John Voeding | SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals	REMARKS (h)
Pt/Sm		0-0.5' grass + Topsoil	Headspace Hnu Readings				Start 1345 End 1410
Sm	1	0.5'-3' Loose, Light-dark brown, v. Fine, Silty Sand, Dry			PBOW-98-SO-WARP-DP08-8380-(0002) 2'	Push 1	
	2		NA			3.5' Recovery	
3'	3	3'					
ml/Cl	4	3'-4' Soft, med. brown, low Plasticity, v. Fine Sandy Silt, moist	4'		4'	4'	Hnu meter not working due to high humidity
	5	4'-8' Same as Above grey, Sandy Silt and clayey Silt w/ v. Fine Sand Stringers throughout. Trace amount of free water within Sand Stringers.		NA	PBOW-98-SO-WARP-DP08-8390-(0406) 6'	Push 2 4' Recovery	
	6		NA				
	7		8'		8'	8'	
	8	8-9' Same as Above, moist			PBOW-98-SO-WARP-DP08-8400-(0810) 10'	Push 3 (8'-12') 4' Recovery	
9'	9	9'	NA				
Sm 9.5'		9-9.5' Loose, med. brown, Fine silty Sand, wet 9.5'					
ml/Cl	10	9.5'-12' Soft, grey, med. Plasticity Clayey Silt + Clay, moist					

PROJECT PBOW - WARP | HOLE NO. WARP - DP08

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP08

PROJECT ISCS PBOW-WARP

INSPECTOR John Voeding

SHEET 3 OF 3 SHEETS

~~MATERIAL~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~EQUIPMENT~~ Sampling Intervals (g)	REMARKS (h)
Fill / Cil	11	10-12' See pg 2	Headspace Hnu Readings NA	NA	NA	Push 3 (8'-12')	Start 1345 End 1410
12'	12	12'				12'	
	13	Bottom of Boring at ~~[illegible]~~ Ft. 16.0	NA	Note: Initially advanced borehole to 12 ft. and Installed Temp. Well for gw Collection. Due to lack of gw borehole was advanced further to 16 ft. and Temp. Well re-Installed		Push 4 4' recovery	
	14						
	15						
	16	16'					

PROJECT PBOW-WARP

HOLE NO. WARP-DP08

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP09
1. COMPANY NAME: IT Corp.	2. DRILL SUBCONTRACTOR: Geo-Environmental Drilling Co.	SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - WARP	4. LOCATION: PBOW - WARP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: WARP-DP09	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-16-98	11. DATE COMPLETED: 6-16-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ~ 6-8 Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft. BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

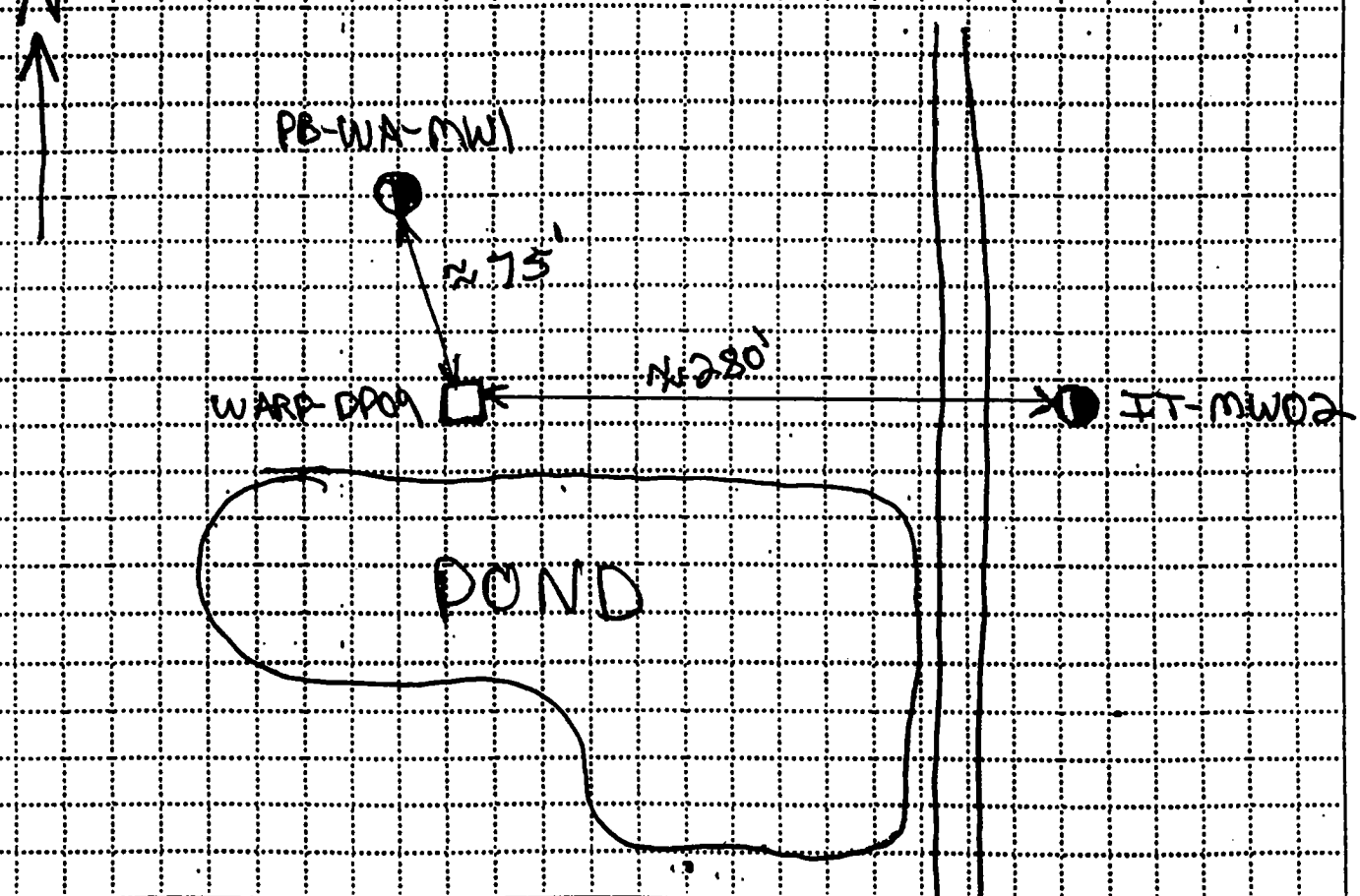
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogeding

LOCATION SKETCH/COMMENTS

N	E	EL.
622,546.61	1,909,995.23	639.02

SCALE: Not to Scale



PROJECT: PBOW - WARP

HOLE NO.: WARP-DP09

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP09

PROJECT USCS PBOW - WARP | INSPECTOR John Voegeding | SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' grass and Topsoil	Headspace Hnu Readings				Time Start 0800 End 0850
Sm	1 2	0.5'-3.0' Loose, med-dark brown, v. fine, Silty Sand, Dry - Slightly moist	NA		PBOW-98-SO-WARP-DP09-8420-(0002) 2'	Push 1 3.5' Recovery	
3'	3						Hnu meter Not working property due to high humidity and Headspace moisture.
ml/Cl	4	3'-4' Soft, med brown-White, low plasticity, Clayey Silt and Clay, moist 4'-5' Same as Above	4'		4'	4'	
5'	5						
Pt 6'		5'-6' Soft, Black, Sandy Peat, moist	NA	NA	PBOW-98-SO-WARP-DP09-8430-(0406) 6'	Push 2 4' Recovery	
SC	6 7	6'-8' Loose, med-dark brown, Silty and Clayey Fine Sand, moist - Slightly wet.	8'		8'	8'	
8'	8						
Cl	9	8'-12' Soft-m. Firm, m. brown and grey, low Plasticity, Silty Clay, moist	NA		PBOW-98-SO-WARP-DP09-8440-(0810) 10'	Push 3 (8'-12') 4' Recovery	
	10						

PROJECT PBOW - WARP | HOLE NO. WARP - DP09

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP09

PROJECT SCS PBOW-WARP

INSPECTOR John Voeding

SHEET 3 OF 3 SHEETS

~~ODOR~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~EQUIPMENT~~ Sampling Intervals (g)	REMARKS (h)
Cl	11	10'-12' See Pg 2	Headspace Hnu Readings NA	NA	NA	Push 3 (8'-12')	Start 0800 End 0850 (Time)
	12	Bottom of Boring at 12.0'					

PROJECT PBOW-WARP

HOLE NO. WARP-DP09

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

1. COMPANY NAME: IT Corp.	DISTRICT: Nashville - TN	HOLE NUMBER: DP10
2. DRILL SUBCONTRACTOR: Geo-Environmental Drilling Co.		SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW - WARP	4. LOCATION: PBOW - WARP	
5. NAME OF DRILLER: Scott ~~[illegible]~~ Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: WARP-DP10	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-26-98	11. DATE COMPLETED: 6-26-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: 5.5' - 6.5 Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 8.0 Ft. BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

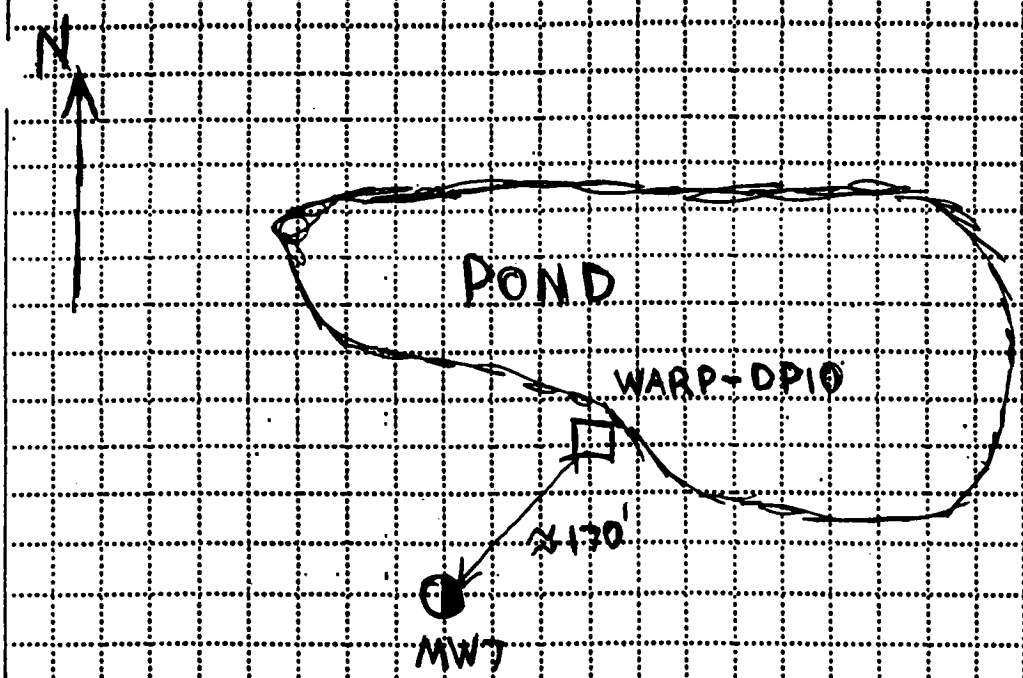
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogeding

LOCATION SKETCH/COMMENTS

	N	E	EL.
DP10	622,147.23	1,910,023.31	633.34

SCALE: Not to Scale



PROJECT: PBOW - WARP

HOLE NO. WARP-DP10

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP10

PROJECT SCS PBOW - WARP

INSPECTOR John Voeding

SHEET 2 OF 2

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sn		0-0.5' weeds and Topsoil	Headspace Hnu Readings				Time Start 1025 End 1045
ml/Cl	1 2	0.5'-4' Soft-m. Firm, Light-dark brown, low plasticity, Clayey silt and clay, Dry			PBOW-98-50-WARP-DP10-8460-(0002) 2'	Push 1 3.5' Recovery	
	3 4		NA 4'		4'	4'	
	5	4-5.5' Same as Above, reddish brown, moist 5.5'		NA	PBOW-98-50-WARP-DP10-8470-(0406) 6'	Push 2 4' Recovery	
5.5' Cl	6	5.5'-6.5' Soft, reddish brown, F-m Sandy Clay, wet. 6.5'	NA				
6.5' ml/Cl	7	6.5-8' Firm, reddish brown, low Plasticity, clayey Silt, moist 8'			8'	8'	
8'	8 9 10	Bottom of Boring at 8.0 ft.	8'		10'	~~Push 3 3-4 Recovery~~	Rig Broke Down at 8'

PROJECT PBOW - WARP

HOLE NO. WARP - DP10

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP11
1. COMPANY NAME: IT Corp.	2. DRILL SUBCONTRACTOR: Geo-Environmental Drilling Co.	SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - WARP	4. LOCATION: PBOW - WARP	
5. NAME OF DRILLER: Scott [redacted] Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: WARP-DP11	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-25-98	11. DATE COMPLETED: 6-25-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ≈4-7 FT. [redacted] Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft. BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

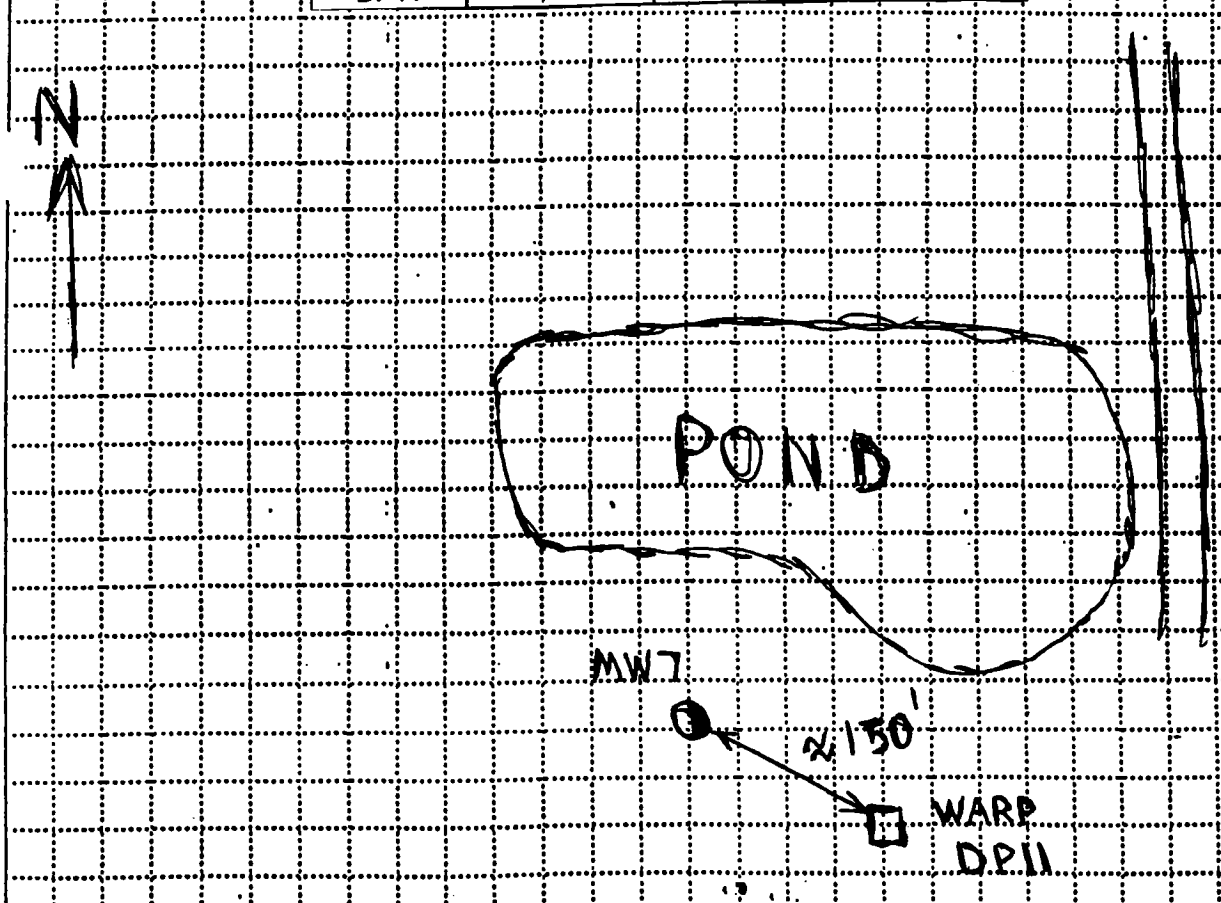
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogeding

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP11	622,016.75	1,909,999.70	632.04



PROJECT: PBOW - WARP

HOLE NO. WARP-DP11

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP11

PROJECT: USCS, PBOW - WARP

INSPECTOR: John Voeding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' weeds and Topsoil.	Headspace Hnu Readings				Start Time 1615 End 1630
Sm	1 2 3'	0.5'-3' Loose, Light-dark brown, Fine Silty Sand, dry-Slightly moist 3'	NA		PBOW-98-SO-WARP-DP11-8500-(0002) 2'	Push 1 3' Recovery	
ml	3 4 4'	3'-4' Soft, m. brown and grey, low plasticity, Clayey Silt, moist.	4'		4'	4'	Hnu Meter Not working Due to high ambient and headspace moisture.
SC	5 6 7'	4-7' Loose/Soft, m. brown and grey, F-m, Clayey Sand, wet. 7'	NA	NA	PBOW-98-SO-WARP-DP11-8510-(0406) 6'	Push 2 4' Recovery	
ml / Cl	7 8 9 10	7'-8' Firm, brownish grey, low Plasticity, Clayey Silt and Clay w/ 30% F-m angular gravel, (Till), moist. 8'-11' Same as Above, Hard, grey, moist	8' NA		8' PBOW-98-SO-WARP-DP11-8520-(0810) 10'	8' Push 3 (8'-12') 4' Recovery	

PROJECT: PBOW - WARP

HOLE NO. WARP - DP11

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP11

PROJECT: USCS, PBOW - WARP

INSPECTOR: John Vogeding

SHEET 3 OF 3 SHEETS

~~SOIL~~ USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~EQUIPMENT~~ Sampling Intervals (g)	REMARKS (h)
cl 11'	11	10'-11' See pg. 2 11'	Headspace Hnu Readings			Push 3 (8-12')	Start Time 1615 End 1630
NA 12'	12	11-12' Hard, grey, weathered Shale, Dry.	NA	NA	NA		
		Bottom of Boring at 12.0 Ft.					

PROJECT: PBOW - WARP

HOLE NO. WARP - DP11

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP12
1. COMPANY NAME: IT Corp.	2. DRILL SUBCONTRACTOR: Geo-Environmental Drilling Co.	SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - WARP	4. LOCATION: PBOW - WARP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: WARP-DP12	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-15-98	11. DATE COMPLETED: 6-15-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ≈ 4.5-5 Ft and 8-10 Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft. BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

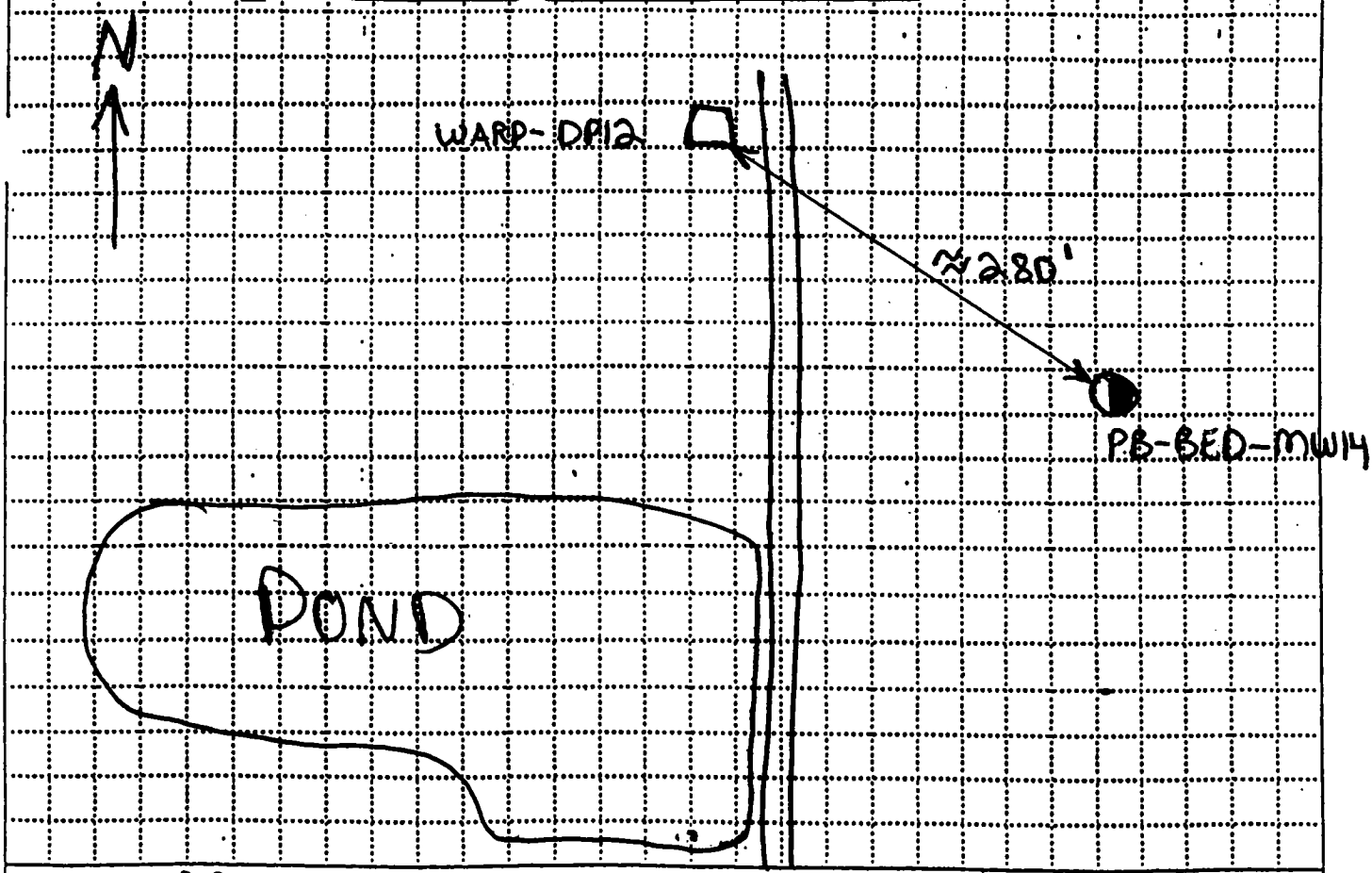
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogeding

LOCATION SKETCH/COMMENTS

N	E	EL.
622,764.13	1,910,219.74	642.78

SCALE: Not to Scale



PROJECT: PBOW - WARP

HOLE NO.: WARP-DP12

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP12

PROJECT: PBOW - WARP

INSPECTOR: John Vogeding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/SM		0-0.5' grass and Topsoil	Headspace Hnu Readings				Start Time 0905 End 0935
SM	1	0.5'-3' Loose, Light-med brown, Fine, Silty Sand, Dry-Slightly moist			PBOW-98-SO-WARP-DP12-8540-(0002) 2'	Push 1	
	2		NA			4' Recovery	
3'	3	3'					
ml	4	3'-4' Soft, greyish brown, low Plasticity, Sandy Silt, moist 4-4.5' Same as Above	4'		4'	4'	Hnu meter Not working due to excessive Headspace moisture.
4.5'				NA			
SM 5'	5	4.5'-5' Loose, Silty Fine Sand, wet 5'					
ml / Cl	6	5'-8' Soft, brown-grey, low Plasticity, v. Fine Sandy Silt w/ few Fine Sand stringers throughout, Slightly wet.			PBOW-98-SO-WARP-DP12-8550-(0406) 6'	Push 2 4' Recovery	
	7		NA				
	8		8'		8'	8'	
	9	8-10' Loose, med. brown, Fine, Clayey Sand, wet.	NA		PBOW-98-SO-WARP-DP12-8560-(0806) 10'	Push 3 (8-12) 4' Recovery	
	10						

PROJECT: PBOW - WARP

HOLE NO. WARP - DP12

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP12

SHEET 3 OF 3 SHEETS

PROJECT PBOW - WARP

INSPECTOR John Voegeding

USCS SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~EQUIPMENT~~ Sampling Intervals (g)	REMARKS (h)
ml/Cl	11	10-12' Soft-M. Firm, grey, med Plasticity, Clayey Silt and clay, moist. 12'	Headspace Hnu Readings NA 12'	NA	NA	Push 3 (8'-12') 12'	Start 0905 End 0935
	12	Bottom of Boring at 12.0 ft.					

PROJECT PBOW - WARP

HOLE NO. WARP - DP12

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP13
1. COMPANY NAME: IT Corp.	2. DRILL SUBCONTRACTOR: Geo-Environmental Drilling Co.	SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - WARP	4. LOCATION: PBOW - WARP	
5. NAME OF DRILLER: Jack Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: WARP-DP13	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-15-98	11. DATE COMPLETED: 6-15-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: Ft. BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

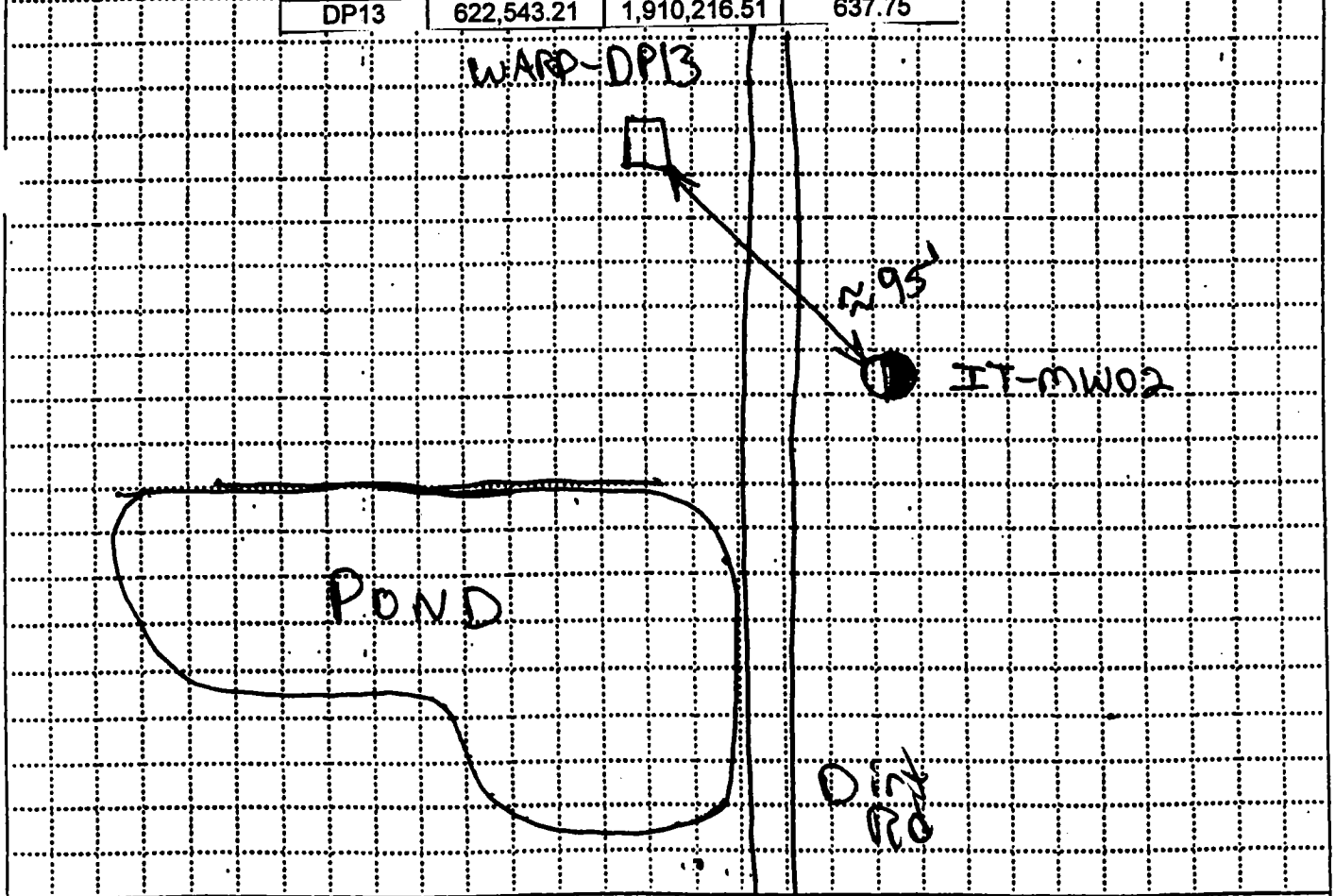
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogelin

LOCATION SKETCH/COMMENTS

	N	E	EL.
DP13	622,543.21	1,910,216.51	637.75

SCALE: Not to Scale



PROJECT: PBOW - WARP

HOLE NO.: WARP-DP13

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP13

PROJECT: PBOW - WARP

INSPECTOR: John Voegeding

SHEET 2 OF 3 SHEETS

SCS ~~USCS~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~SAMPLE~~ Sampling Intervals (g)	REMARKS (h)
ml	1, 2, 3, 4'	0-0.5' grass and Topsoil 0.5'-4' m.Firm, v.dark brown, Fine Sandy Silt, Dry.	Headspace Hnu Readings NA		PBOW-98-SO-WARP-DP13-8580-(0002) 2'	Push 1 3.5' Recovery 3' Recovery.	Start Time 1045 End 1115
SM	5, 6	4'-8' Loose, light-dark brown, v.Fine Silty Sand grading to Clayey v.Fine Sand, Moist	NA	NA	PBOW-98-SO-WARP-DP13-8590-(0406) 6'	Push 2 3' Recovery	
SC	7, 8	slightly wet at ≈ 8' 8'-8.5' Same as Above	NA				
ml/Cl	9, 10	8.5'-12' Soft-m.Firm, Med. Plasticity, Brown and Grey Clayey Silt and Clay, moist	NA		PBOW-98-SO-WARP-DP13-8600-(0810) 10'	Push 3 (8'-12') 4' Recovery	

PROJECT: PBOW - WARP

HOLE NO. WARP - DP13

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP13

PROJECT USCS PBOW-WARP

INSPECTOR John Voegding

SHEET 3 OF 3 SHEETS

~~MATERIAL~~ USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~EQUIPMENT~~ Sampling Intervals (g)	REMARKS (h)
			Headspace Hnu Readings			Push 3	Time
	11	10-12' See pg 2	NA		NA	(8'-12')	Start 1045 End 1115
			12'			12'	
ML/CL	12	12'-16' Same as Above				Push 4	
	13	Trace Amount of free water from ≈ 13'-14'.		NA		4' Recovery	
	14	All other intervals are moist	NA		NA		
	15						
	16		16'			16'	
		Bottom of Boring At 16.0 Ft.					

PROJECT PBOW-WARP

HOLE NO. WARP-DP13

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP15
1. COMPANY NAME: IT Corp.	2. DRILL SUBCONTRACTOR: Geo-Environmental Drilling Co.	SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - WARP	4. LOCATION: PBOW - WARP	
5. NAME OF DRILLER: Scott ~~[illegible]~~ Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: WARP-DP15	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-24-98	11. DATE COMPLETED: 6-24-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 16.0 Ft. BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

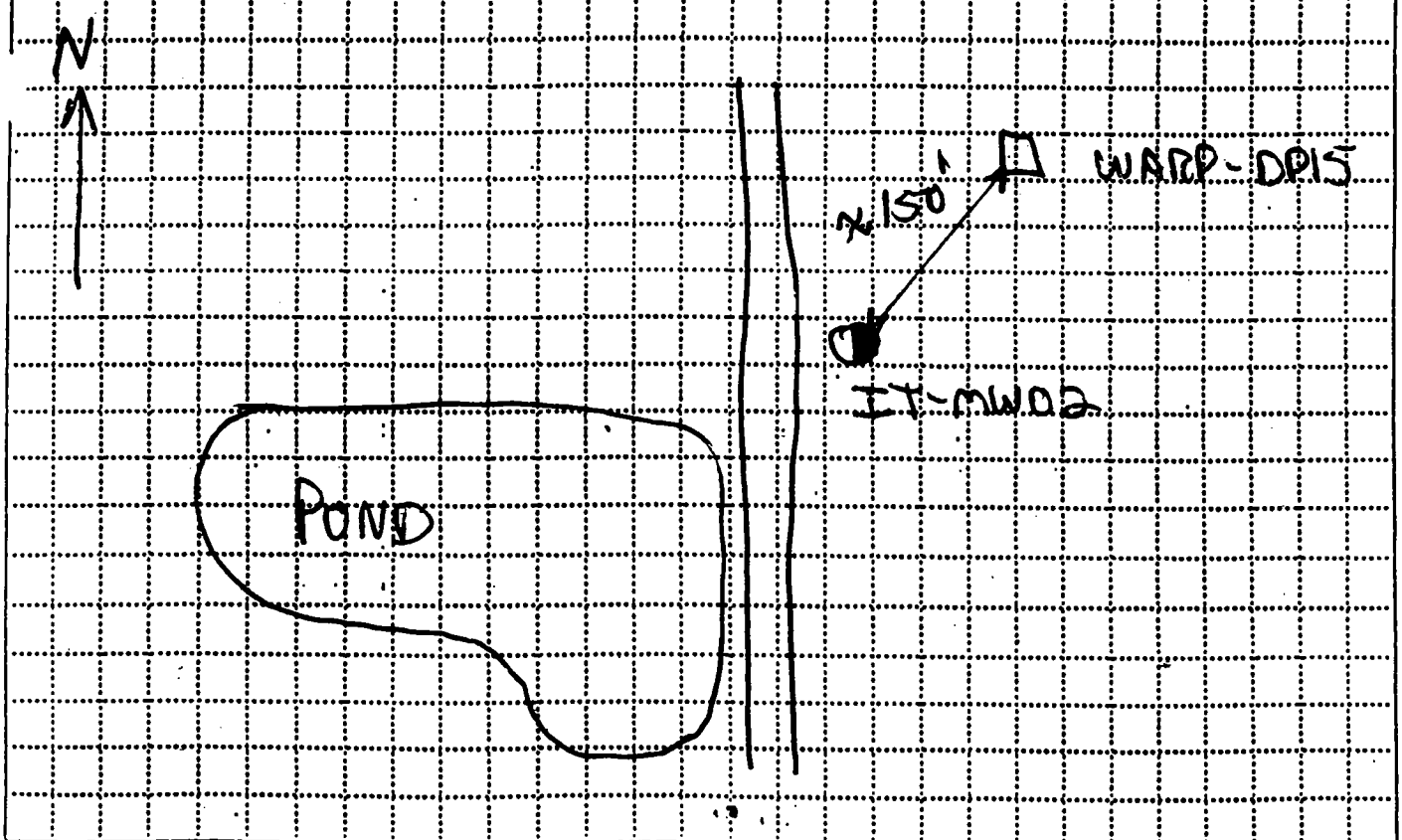
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vangelis

LOCATION SKETCH/COMMENTS

	N	E	EL.
DB15	622,601.84	1,910,385.32	637.86

SCALE: Not to Scale



PROJECT: PBOW - WARP

HOLE NO.: WARP-DP15

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP15

PROJECT PBOW-WARP

INSPECTOR John Voeding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' weeds and Topsoil	Headspace Hnu Readings				Start Time 1045 End 1105
ml	1 2 3 4'	0.5'-4' Soft-m. Firm, Light-dark brown, low plasticity, v. Fine Sandy Silt, Dry-Slightly moist	NA 4'		PBOW-98-SO-WARP-DP15-8660-(0002) 2' 4'	Push 1 3.5' Recovery 4'	Hnu Meter Reading: erratic Due to High Ambient and headspace moisture
Sm	5 6 6.5'	4'-6.5' Loose, light-dark brown, v. Fine, Silty Sand, Dry-Slightly moist.	NA	NA	PBOW-98-SO-WARP-DP15-8670-(0406) 6'	Push 2 4' Recovery	
ml/Cl	7 8	6.5'-8' m. Firm, med brown and grey, low plasticity, Clayey Silt, Dry.	8'		8'	8'	
	9 10	8'-12' Same as Above Clayey Silt and Clay	NA		PBOW-98-SO-WARP-DP15-8680-(0810) 10'	Push 3 (8'-12') 4' Recovery	

PROJECT PBOW-WARP

HOLE NO. WARP-DP15

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP15

PROJECT SCS, PBOW - WARP

INSPECTOR John Voegding

SHEET 3 OF 3 SHEETS

(a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
			Headspace				
		10-12' See ps 2	Hnu Readings			Push 3	Start Time 1045
	11	Clayey Silt and Clay, Dry-Slightly moist.	NA		NA	(8'-12')	End 1105
			12'		12'	12'	
	12						
ml		12'-16' grey,				Push 4	
cl	13	Clayey Silt and Clay (As Above)		NA		4' Recovery	
		med-high Plasticity,					
	14	moist	NA		NA		
							No Noticable gw encountered.
	15						
		16'	16'			16'	
16'	16	Bottom of Boring at 16.0 Ft.					

PROJECT PBOW - WARP

HOLE NO. WARP - DP15

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: DP16
1. COMPANY NAME: IT Corp.	2. DRILL SUBCONTRACTOR: Geo-Environmental Drilling Co.	SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - WARP	4. LOCATION: PBOW - WARP	
5. NAME OF DRILLER: Scott ~~[illegible]~~ Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: WARP-DP16	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-24-98	11. DATE COMPLETED: 6-24-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: 5.5-7.0 Ft. and 9-10 Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft. BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

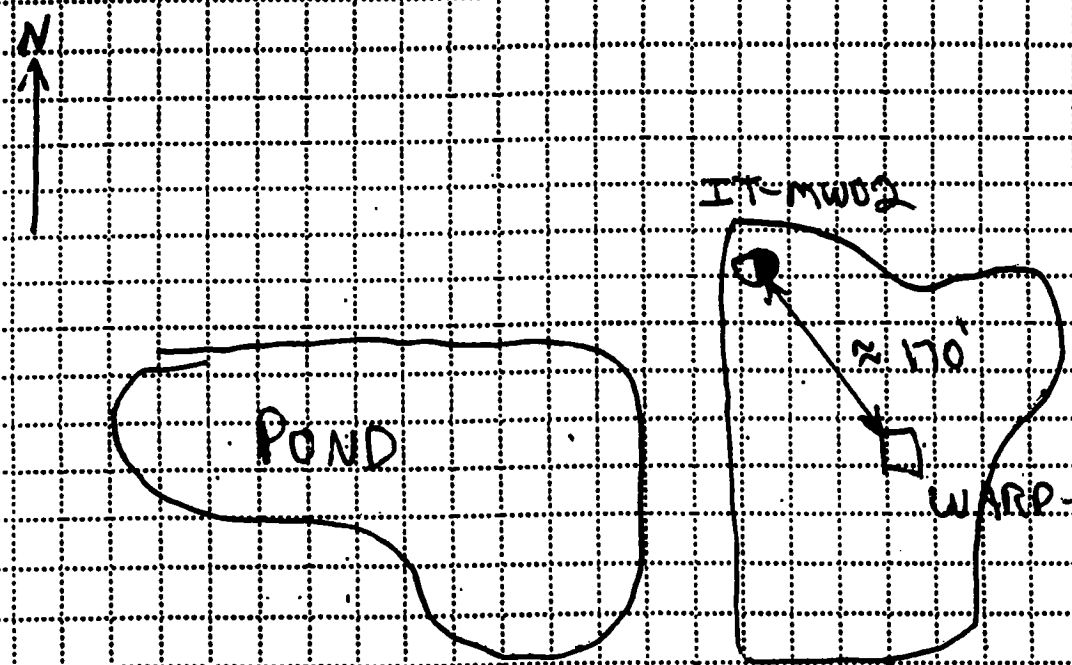
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogdi

LOCATION SKETCH/COMMENTS

N	E	EL.
622,425.11	1,910,395.07	632.83

SCALE: Not to Scale



PROJECT: PBOW - WARP

HOLE NO.: WARP-DP16

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP16

PROJECT: PBOW-WARP

INSPECTOR: John Voeding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' weeds and Topsoil	Headspace Hnu Readings				Time Start 1330 End 1350
ml/Cl	1 2 3 4	0.5'-4' m. Firm, m. Brown and grey, low plasticity, Clayey Silt and Clay, Dry-Slightly moist.	NA 4'		PBOW-98-SO-WARP-DP16-8700-(0002) 2'	Push 1 4' Recovery 4'	Hnu meter readings erratic due to high Ambient and headspace moisture.
5.5'	5	4-5.5' Same as Above 5.5'		NA			
SC 7'	6 7	5.5'-7' Loose/Soft, m. brown, F-m, Clayey Sand, wet 7'	NA		PBOW-98-SO-WARP-DP16-8710-(0406) 6'	Push 2 4' Recovery	
ml/Cl 9'	8 9	7'-8' m. Firm, m. brown and grey, low plasticity, Clayey Silt and clay, moist 8'-9' Same as Above 9'	8'		8'	8'	
SC 10'	10	9'-10' Loose/Soft, m. brown, F-m, Clayey Sand, wet. 10'	NA		PBOW-98-SO-WARP-DP16-8720-(0810) 10'	Push 3 (8'-12') 4' Recovery	

PROJECT: PBOW-WARP

HOLE NO. WARP-DP16

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP16

PROJECT CS PBOW-WARP

INSPECTOR John Voegding

SHEET 3 OF 3 SHEETS

SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
ml/cl	11	10'-12' Soft, grey, med. Plasticity, Clayey Silt, wet	Headspace Hnu Readings NA	NA	NA	Push 3 (8'-12')	Start Time 1330 End 1350
	12	12'				18'	
	13	Bottom of Boring at 12.0 ft.					
	14						
	15						
	16						

PROJECT PBOW-WARP

HOLE NO. WARP-DP16

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP17
1. COMPANY NAME	IT Corp.
2. DRILL SUBCONTRACTOR	Geo-Environmental Drilling Co.
SHEET / SHEETS	1 OF 3
3. PROJECT	PBOW - WARP
4. LOCATION	PBOW - WARP
5. NAME OF DRILLER	Scott Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	WARP-DP17
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-24-98
11. DATE COMPLETED	6-24-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH GROUNDWATER ENCOUNTERED	5-6.5 Ft. and 8-10 Ft. BGS
13. DEPTH DRILLED INTO ROCK	NA
14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	12.0 Ft. BGS
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

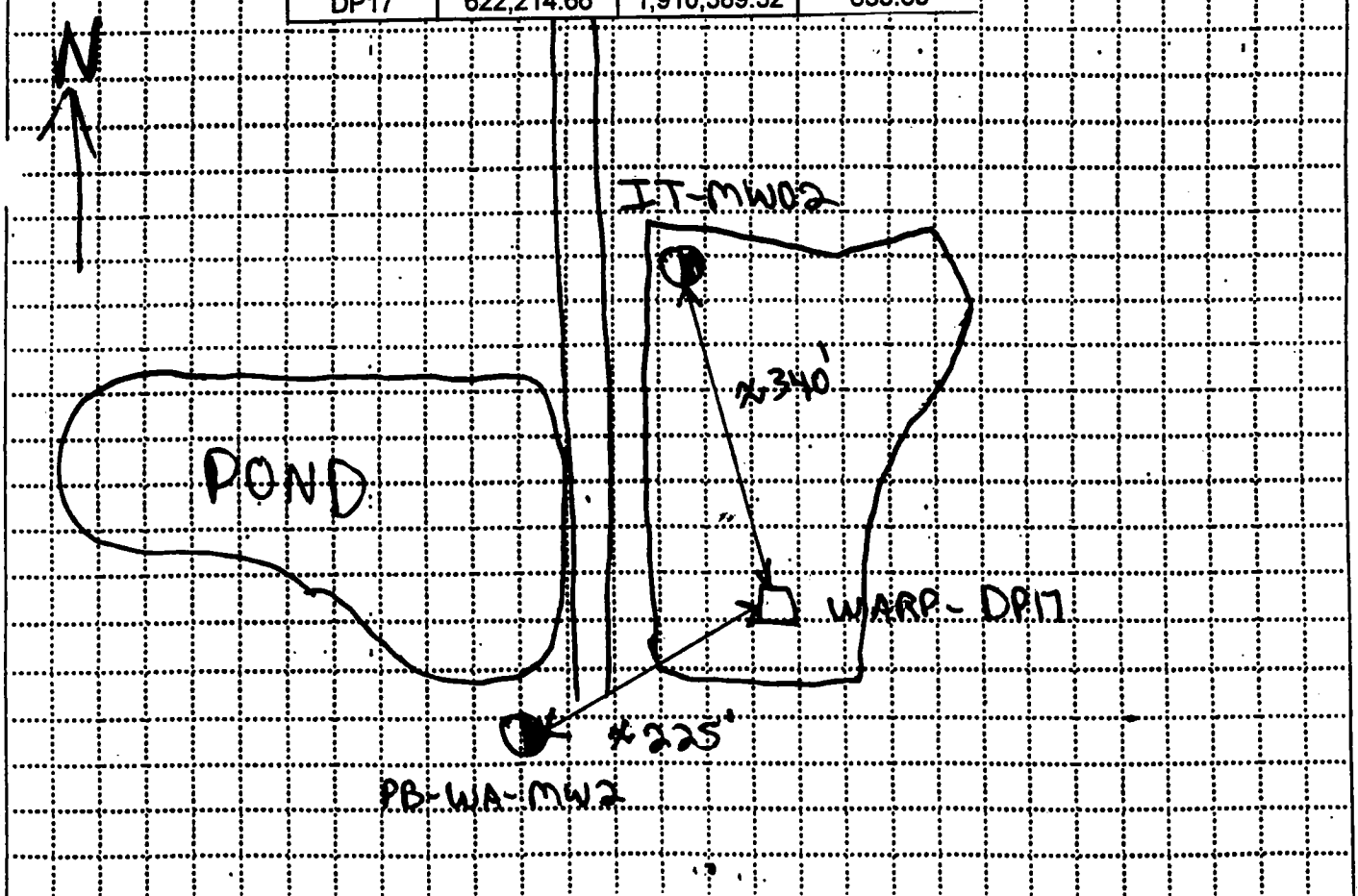
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogel

LOCATION SKETCH/COMMENTS

N	E	EL.
622,214.66	1,910,389.32	633.63

SCALE: Not to Scale



PROJECT PBOW - WARP

HOLE NO. WARP-DP17

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP17

PROJECT: PBOW-WARP

INSPECTOR: John Vogeding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' weeds and Topsoil	Headspace Hnu Readings				Start 1410 End 1430
ml	1	0.5'-4' m. Firm, light-dark brown, low plasticity, Clayey Silt, Dry	NA		PBOW-98-SO-WARP-DP17-8740-(0002) 2'	Push 1 3.5' Recovery	
	2						
	3						
	4	4'-5' Same as Above, Soft, moist. 5'	4'		4'	4'	Hnu Meter Readings erratic due to high Ambient and Headspace moisture
5'	5						
SC	6	5-6.5' Loose/Soft, m. brown, F-m, Clayey Sand, moist-slightly wet. 6.5'	NA	NA	PBOW-98-SO-WARP-DP17-8750-(0400) 6'	Push 2 4' Recovery	
6.5'							
ml/Cl	7	6.5'-8' Firm, m. brown and grey, low-med. plasticity, Clayey Silt and Clay, moist	8'		8'	8'	
	8						
	9	8'-10' Same as Above, Sandy Clay, wet 10'	NA		PBOW-98-SO-WARP-DP17-8760-(0800) 10'	Push 3 (8'-12') 4' Recovery	
10'	10						

PROJECT: PBOW-WARP

HOLE NO. WARP-DP17

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP17

PROJECT USCS PBOW-WARP

INSPECTOR John Vogeding

SHEET 3 OF 3 SHEETS

~~LOG~~ USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~EQUIPMENT~~ Sampling Intervals (g)	REMARKS (h)
		10'-12'	Headspace Hnu Readings			Push 3	Start 1410
Cl	11	Soft, grey, high Plasticity Silty Clay, moist.	NA	NA	NA	(8'-12')	End 1430
	12	Slightly wet	12'		12'	12'	
		Bottom of Boring at 12.0 ft.					
	13						
	14						
	15						
	16						

PROJECT PBOW-WARP

HOLE NO. WARP-DP17

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP18
1. COMPANY NAME	IT Corp.
2. DRILL SUBCONTRACTOR	Geo-Environmental Drilling Co.
SHEET / SHEETS	1 of 3
3. PROJECT	PBOW - WARP
4. LOCATION	PBOW - WARP
5. NAME OF DRILLER	Scott ~~[illegible]~~ Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	WARP-DP18
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-24-98
11. DATE COMPLETED	6-24-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH GROUNDWATER ENCOUNTERED	6-6.5 Ft. Ft. BGS
13. DEPTH DRILLED INTO ROCK	NA
14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	12.0 Ft. BGS
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

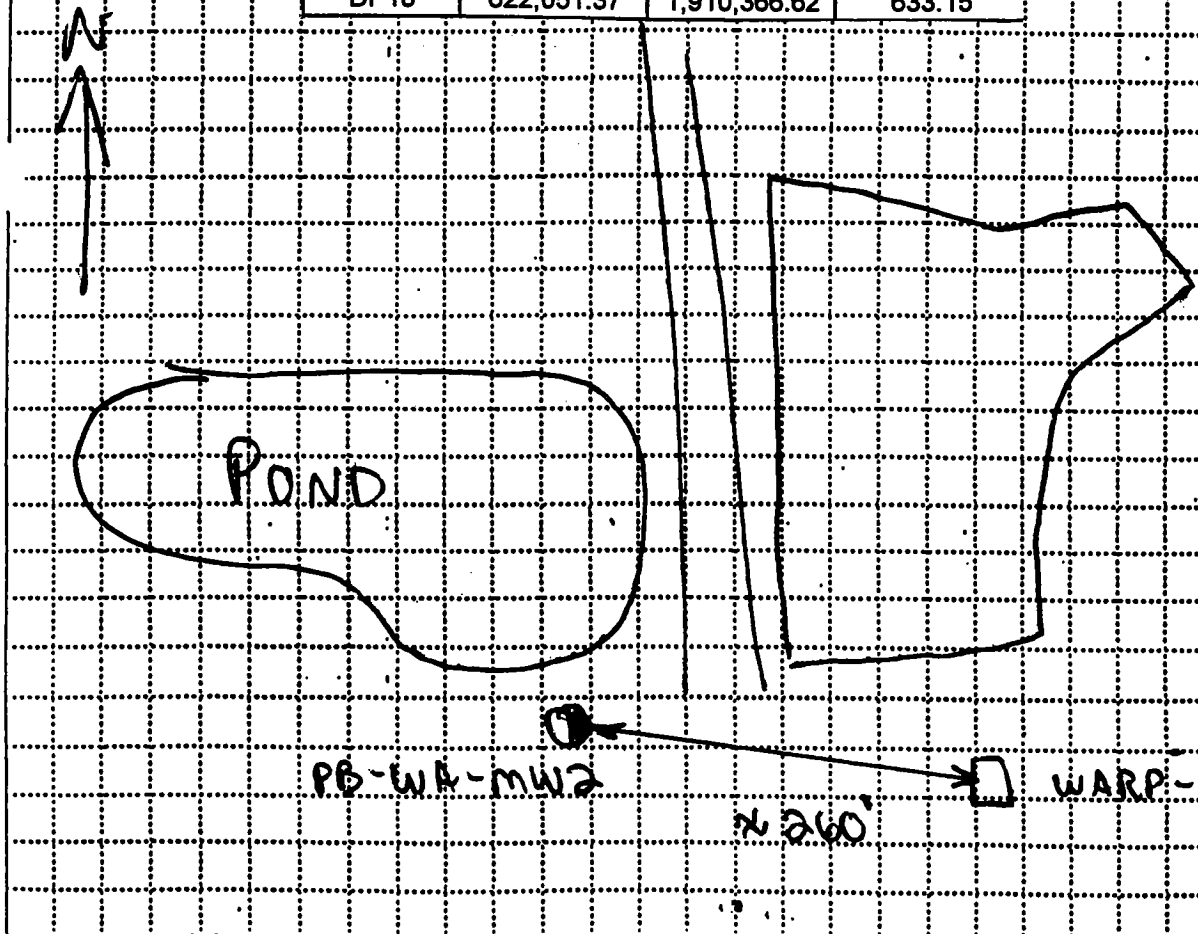
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogel

LOCATION SKETCH/COMMENTS

	N	E	EL.
DP18	622,051.37	1,910,366.62	633.15

SCALE Not to Scale



PROJECT PBOW - WARP

HOLE NO. WARP-DP18

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP18

PROJECT PBOW - WARP | INSPECTOR John Voeding | SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~EQUIPMENT~~ Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' grass and Topsoil	Headspace Hnu Readings				Start Time 1520 End 1600
ml	1	0.5'-4' Soft/Loose, light-dark brown, v. fine, Sandy Silt, Dry	NA		PBOW-98-SO-WARP-DP18-8780-(0000) 2'	Push 1 4' Recovery	
	2						
	3						Hnu meter Readings erratic Due to High Ambient and headspace moisture.
4'	4	4'	4'		4'	4'	
SC	5	4-7.5' Loose, med-dark brown, F-m, clayey Sand, v. moist.	NA	NA	PBOW-98-SO-WARP-DP18-8790-(0400) 6'	Push 2 4' Recovery	
	6	wet from 6-6.5'					
	7						
7.5'		7.5'					
ml/cl	8	7.5-8' m. Firm, brownish grey, med. Plasticity, Clayey Silt and clay, moist	8'		8'	8'	
	9	8'-11' Same as Above grey, clayey Silt and Clay, moist	NA		PBOW-98-SO-WARP-DP18-8800-(0810) 10'	Push 3 (8'-12') 4' Recovery	
	10						

PROJECT PBOW - WARP | HOLE NO. WARP-DP18

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP18

PROJECT USCS PBOW-WARP

INSPECTOR John Vogeding

SHEET 3 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
ml cl. 11	11	10'-11' See pg 2. 11'	Headspace Hnu Readings	NA	NA	Push 3 (8'-12')	Start 1520 End 1600
NA 12'	12	11'-12' Highly weathered grey shale 12'	NA 12'	12'	12'	12'	
	13	Bottom of Boring at 12.0 ft.					

PROJECT PBOW-WARP

HOLE NO. WARP-DP18

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	WARP DP19
1. COMPANY NAME	IT Corp.
2. DRILL SUBCONTRACTOR	Geo-Environmental Drilling Co.
SHEET / SHEETS	1 of 3
3. PROJECT	PBOW - WARP
4. LOCATION	PBOW - WARP
5. NAME OF DRILLER	Scott [redacted] Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	WARP-DP19
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-24-98
11. DATE COMPLETED	6-24-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH GROUNDWATER ENCOUNTERED	NA Ft. BGS
13. DEPTH DRILLED INTO ROCK	NA
14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	16.0 Ft. BGS
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA
18. GEOTECHNICAL SAMPLES	NA
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	

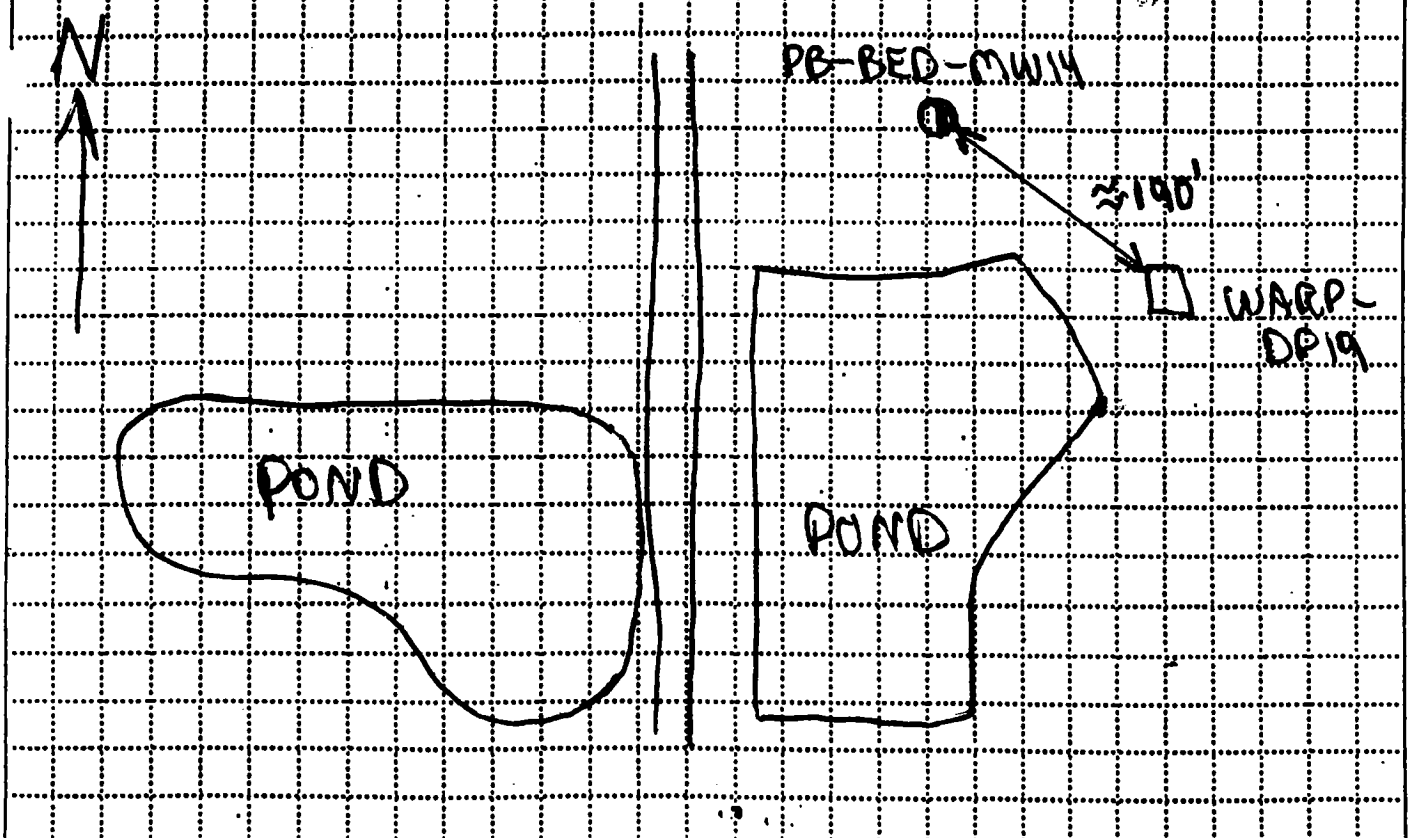
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogedin

LOCATION SKETCH/COMMENTS

	N	E	EL.
DP19	622,689.12	1,910,553.60	638.96

SCALE: Not to Scale



PROJECT PBOW - WARP

HOLE NO. WARP-DP19

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP19

PROJECT SCS PBOW - WARP | INSPECTOR John Voegding | SHEET 2 OF 3 SHEETS

~~USCS~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~COMMENT~~ Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' weeds and Topsoil	Headspace Hnu Readings		PBOW-98-SO-WARP-DP19-8820-(0002)		Start Time 0900 End 0920
	1	0.5'-3.5' Loose, med. brown, Fine Silty Sand, moist			2'	Push 1	
Sm	2					3.5' Recovery	
	3		NA				
3.5'		3.5'					
	4	3.5'-4' Soft, Brown and grey, low plasticity, v. Fine, Sandy Silt, moist	4'		4'	4'	Hnu meter Readings erratic due to high ambient and headspace Moistu
	5	4'-8' Same as Above, grading to clayey Silt and Clay, moist.		NA	PBOW-98-SO-WARP-DP19-8830-(0406)	Push 2	
ml/Cl	6		NA		6'	4' Recovery	
	7						
	8		8'		8'	8'	
	9	8'-12' Soft-m. Firm, brownish grey, Clayey Silt and Clay (As Above), Moist	NA		PBOW-98-SO-WARP-DP19-8840-(0810)	Push 3 (8'-12')	
	10					10'	

PROJECT PBOW - WARP | HOLE NO. WARP - DP 19

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP19

PROJECT PBOW - WARP

INSPECTOR John Voegeding

SHEET 3 OF 3 SHEETS

~~PLOT~~ ES (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~EQUIPMENT~~ Sampling Intervals (g)	REMARKS (h)
		10'-12' See pg 2.	Headspace Hnu Readings			Push 3	Start Time 0900
	11				NA	(8'-12')	End 0920
			NA				
			12'			12'	
Ml/Cl	12						
		12'-14' Grey,		NA		Push 4	
	13	Clayey Silt and					
		Clay (As Above),				4'	
		med.-high Plasticity,	NA			Recovery	
	14	moist, with several			NA		
		v. fine Sand stringers					No Noticable
		Throughout.					gw encountered.
	15						
		16'				16'	
16'	16	Bottom of Boring at 16.0 Ft.					

PROJECT PBOW - WARP

HOLE NO. WARP - DP19

(Proponent: CECW-EG)

ENG FORM 5056A-R, AUG 94

WARP

HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP20
1. COMPANY NAME	IT Corp.
2. DRILL SUBCONTRACTOR	Geo-Environmental Drilling Co.
SHEET / SHEETS	1 of 3
3. PROJECT	PBOW - WARP
4. LOCATION	PBOW - WARP
5. NAME OF DRILLER	Scott [redacted] Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	WARP-DP20
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-24-98
11. DATE COMPLETED	6-24-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH GROUNDWATER ENCOUNTERED	10-12 Ft. BGS
13. DEPTH DRILLED INTO ROCK	NA
14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	16.0 Ft. BGS
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA
18. GEOTECHNICAL SAMPLES	NA
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	

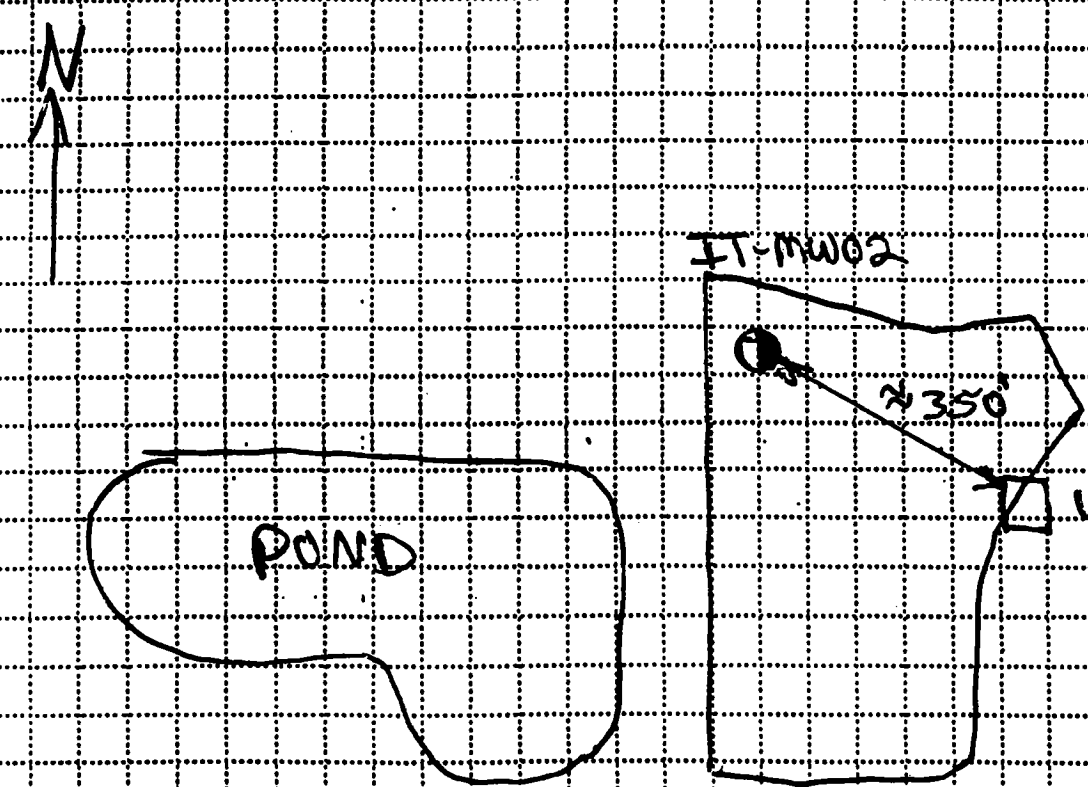
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Voogd

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP20	622,518.16	1,910,681.29	636.78



PROJECT	PBOW - WARP
HOLE NO.	WARP-DP20

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP20

PROJECT SCS, PBOW - WARP

INSPECTOR John Voegding

SHEET 2 OF 3 SHEETS

~~AREA~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~EQUIPMENT~~ Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' weeds and Topsoil	Headspace Hnu Readings		PBOW-98-SO-WARP-DP20-8860-(0002)		Time Start 0950 End 1010
Sm	1 2 3'	0.5'-3' Loose, Light-dark brown, Fine, Silty Sand, moist 3'	NA		2'	Push 1 3.5' Recovery	
Ml/Cl	3 4 5 6 7 8 9 10	3'-4' Soft-m. Firm, Light-dark brown and grey, low plasticity v. fine, Sandy Silt, moist 4'-8' Same as Above, grading to clayey Silt, Dry-Slightly moist 8'-10' Same as Above.	4' NA 8' NA	NA	4' PBOW-98-SO-WARP-DP20-8870-(0406) 6' PBOW-98-SO-WARP-DP20-8880-(0906) 8' 10'	4' Push 2 4' Recovery 8' Push 3 (8'-12') 4' Recovery	Hnu Meter Readings erratic Due to High Ambient and headspace moisture.

PROJECT PBOW - WARP

HOLE NO. WARP - DP20

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP20

PROJECT PBOW - WARP

INSPECTOR John Voeding

SHEET 3 OF 3

SYMBOL (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
SC	11 12	10'-12' Loose, M. brown, Fine-med, Clayey Sand, wet 12'-13' Same as Above, moist 13'	Headspace HNU Readings 12'		NA	Push 3 (8'-12') 12'	Start Time 0950 End 1010
Cl	13 14 15	13'-16' Soft, brown grading to grey, med plasticity, Clay, moist 16'	NA 16'	NA	NA	Push 4 4' Recovery 16'	
	16	Bottom of Boring at 16.0 Ft.					

PROJECT PBOW - WARP

HOLE NO. WARP - DP20

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT: Nashville - TN		HOLE NUMBER: WARP DP21
1. COMPANY NAME: IT Corp.	2. DRILL SUBCONTRACTOR: Geo-Environmental Drilling Co.	SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW - WARP	4. LOCATION: PBOW - WARP	
5. NAME OF DRILLER: Scott [redacted] Beal	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe Rig	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 Ft Long x 1.5 Inch Diameter Geoprobe Sample Rods w/ Acetate Liners	8. HOLE LOCATION: WARP-DP21	
	9. SURFACE ELEVATION: ~~NA~~ See below	
	10. DATE STARTED: 6-23-98	11. DATE COMPLETED: 6-23-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: NA Ft. BGS	
13. DEPTH DRILLED INTO ROCK: NA	14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 12.0 Ft. BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	(3)		

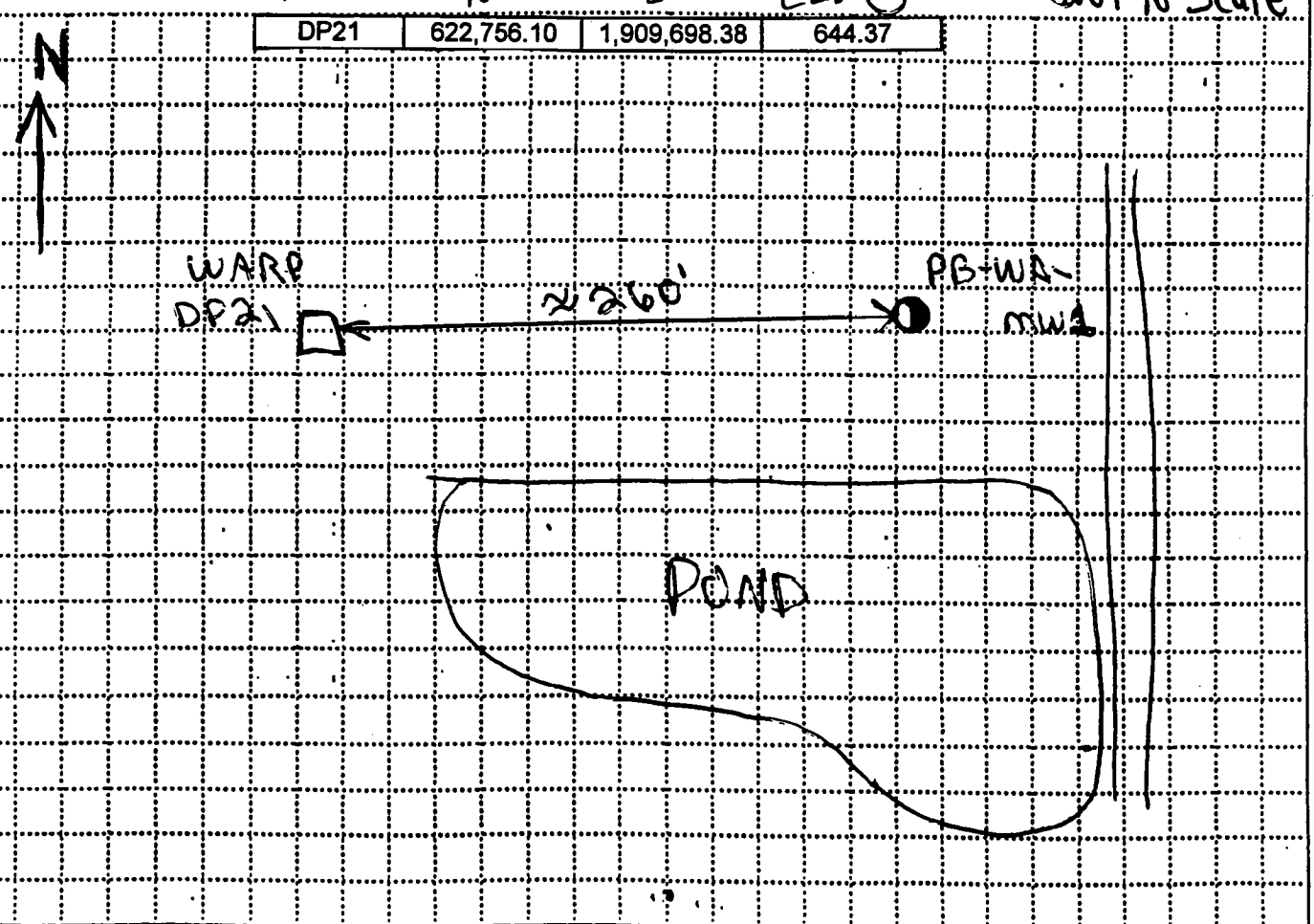
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogelsin

LOCATION SKETCH/COMMENTS

	N	E	EL.
DP21	622,756.10	1,909,698.38	644.37

SCALE: Not to Scale



PROJECT: PBOW - WARP

HOLE NO.: WARP-DP21

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER: DP21

PROJECT: USCS PBOW-WARP

INSPECTOR: John Voeding

SHEET 2 OF 3

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' grass and Topsoil	Headspace Hnu Readings				Start 1000 End 1020
ml	1	0.5'-4' Soft, greyish brown, low Plasticity, v. Fine Sandy Silt, dry-Slightly moist	NA	PBOW-98-WARP-DP21-GEOT-0204 2'	NA 2'	Push 2 3' Recovery	
	3				NA		
	4	4'	4'	4'	4'	4'	
Sm	5	4'-6' Loose-M. Dense, brown and grey, v. Fine Silty Sand, moist	NA	6'	NA 6'	Push 2 4' Recovery	
	6	6'					
ml	7	6'-8' Soft-M. Firm, brown and grey, v. Fine, Sand, Silt and Clayey Silt, moist		PBOW-98-WARP-DP21-GEOT-0608	NA		
	8		8'	8'	8'	8'	
	9	8'-12' Same as Above, grey, with Fine Sand stringers throughout, moist-Slightly wet	NA		NA	Push 3 (8'-12') 4' Recovery	
	10			10'	10'		

PROJECT: PBOW-WARP

HOLE NO. WARP-DP21

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP21

PROJECT SCS PBOW - WARP

INSPECTOR John Voegding

SHEET 3 OF 3 SHEETS

~~LOG~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~EQUIPMENT~~ Sampling Intervals (g)	REMARKS (h)
ML	11	10'-12' See page 2	Headspace Hnu Readings NA	PBOW-98-WARP-DP21-GE01-1012	NA	Push 3 (8'-12')	Start 1000 End 1020
	12	12'		12'		12'	
		Bottom of Boring at 12.0 Ft.					

PROJECT PBOW - WARP

HOLE NO. WARP - DP21

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

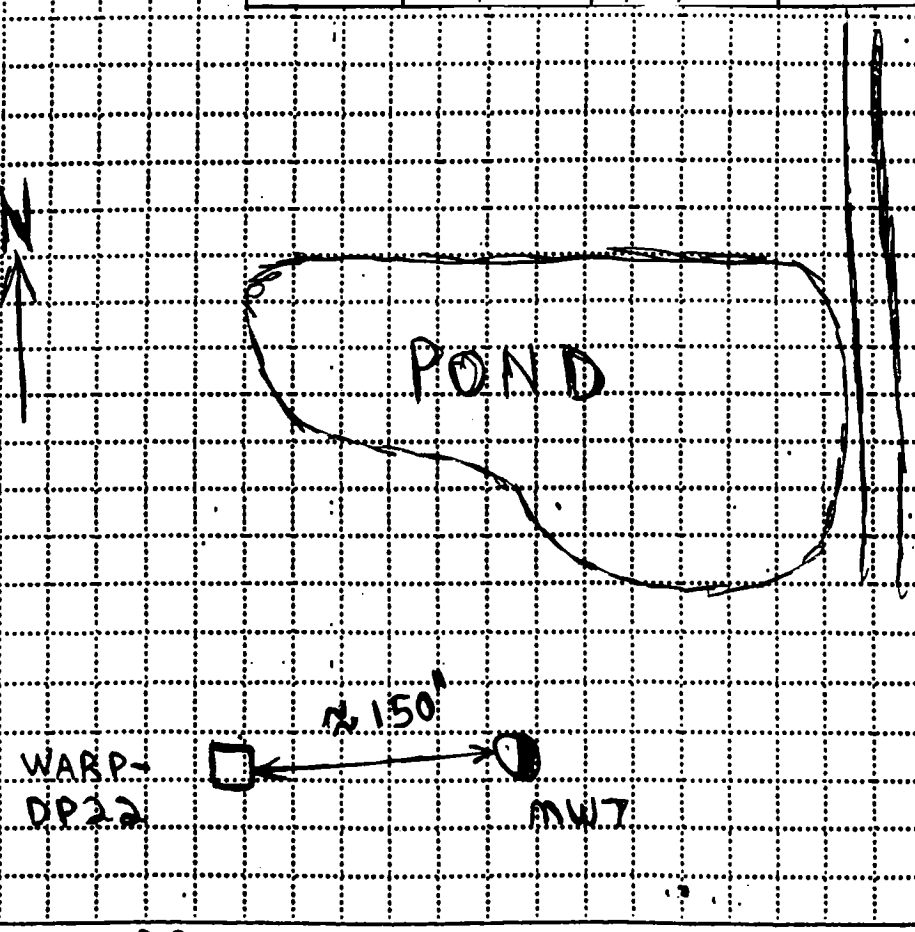
HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP22
1. COMPANY NAME	IT Corp.
2. DRILL SUBCONTRACTOR	Geo-Environmental Drilling Co.
SHEET / SHEETS	1 of 3
3. PROJECT	PBOW - WARP
4. LOCATION	PBOW - WARP
5. NAME OF DRILLER	Scott [redacted] Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	WARP-DP22
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-25-98
11. DATE COMPLETED	6-25-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH GROUNDWATER ENCOUNTERED	NA Ft. BGS
13. DEPTH DRILLED INTO ROCK	NA
14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	12.0 Ft. BGS
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA
18. GEOTECHNICAL SAMPLES	(3) DISTURBED; UNDISTURBED
19. TOTAL NUMBER OF CORE BOXES	
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: [redacted]; TAL METALS: [redacted]; OTHER (SPECIFY): [redacted]; OTHER (SPECIFY): [redacted]; OTHER (SPECIFY): [redacted]
21. TOTAL CORE RECOVERY	NA
22. DISPOSITION OF HOLE	BACKFILLED: Grouted; MONITORING WELL: — ; OTHER (SPECIFY): —
23. SIGNATURE OF INSPECTOR	John Vogelin

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP22	622,056.95	1,909,921.72	632.41



PROJECT PBOW - WARP

HOLE NO. WARP-DP22

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP22

PROJECT PBOW - WARP | INSPECTOR John Voeding | SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' weeds and Topsoil	Headspace Hnu Readings				Start 1645 End 1700
Sm	1	0.5'-4' Loose, Light-med. brown, F-m Silty sand grading to Clayey Sand, moist				Push 1 3' Recovery	
2'	2		NA	2' PBOW-98-WARP-DP22-GEOT-0204 4'		4'	
SC	3						
	4	4-8' Clayey F-m Sand (As Above) grading to clayey Silt and Clay, moist			NA	Push 2 4' Recovery	
6'	6		NA	6' PBOW-98-WARP-DP22-GEOT-0608 8'		8'	
Ml/Cl	7						
	8	8'-11' M. Firm, grey, Med. Plasticity Clayey Silt and clay, moist	NA	10'		Push 3 (8-12') 4' Recovery	
	9						
	10						

PROJECT PBOW - WARP | HOLE NO. WARP-DP22

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP22

PROJECT ISCS PBOW - WARP

INSPECTOR John Voeding

SHEET 3 OF 3 SHEETS

~~MATERIAL~~ USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~EQUIPMENT~~ Sampling Intervals (g)	REMARKS (h)
ML/CL 11'	11	10'-11' See pg. 2 11'	Headspace Hnu Readings	PBOW-98-WARP-DP22-GEOT-1012	NA	Push 3 (8'-12')	Start 1645 End 1700
NA	12	11'-12' Hard, grey, weathered clayey shale, moist 12'	NA				
		Bottom of Boring at 12.0 Ft.					

PROJECT PBOW - WARP

HOLE NO. WARP - DP22

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

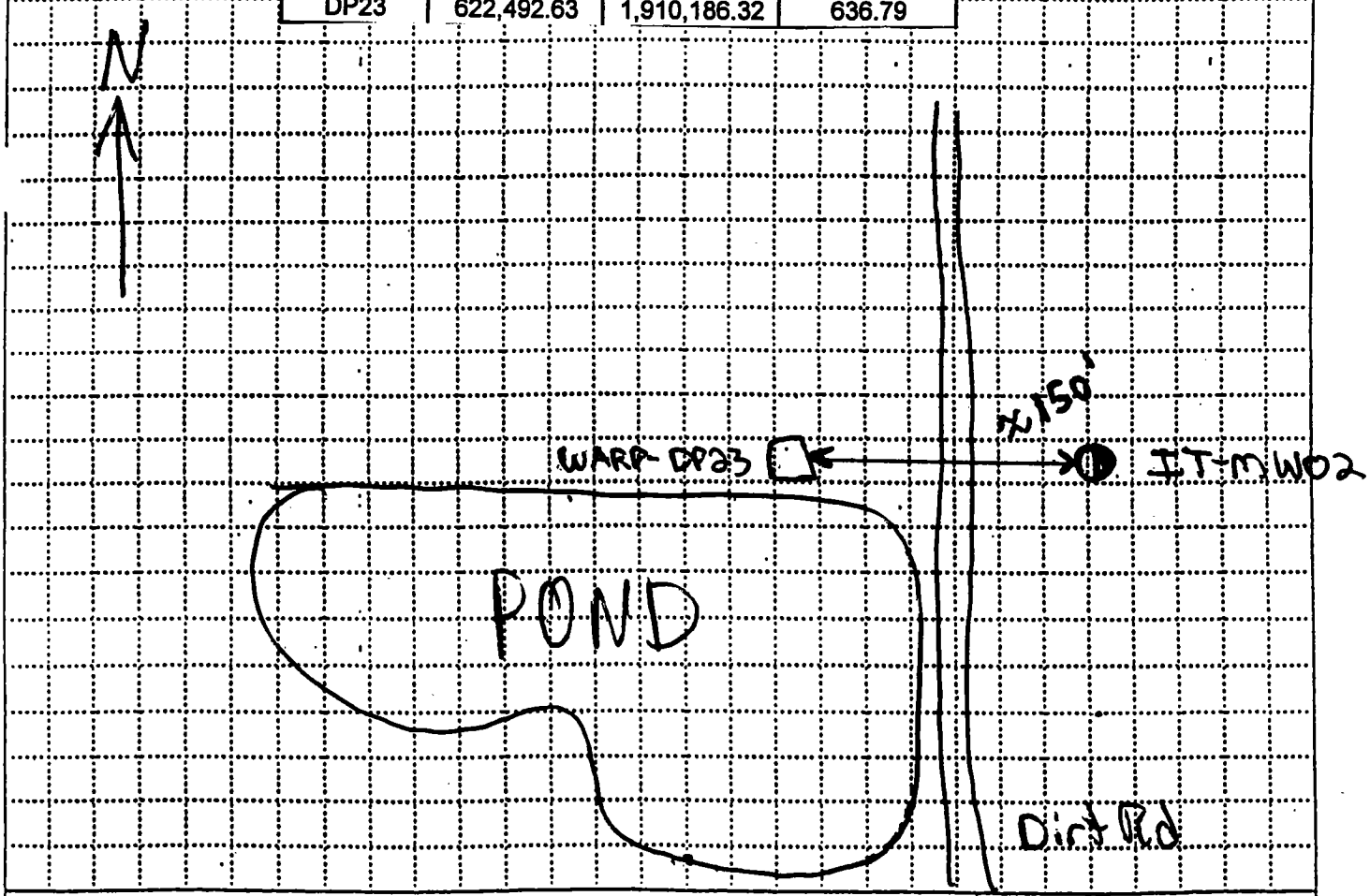
HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP23
1. COMPANY NAME	IT Corp.
2. DRILL SUBCONTRACTOR	Geo-Environmental Drilling Co.
SHEET / SHEETS	1 OF 3
3. PROJECT	PBOW - WARP
4. LOCATION	PBOW - WARP
5. NAME OF DRILLER	Jack Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 Ft Long x 1.5 inch Diameter Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	WARP-DP23
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-16-98
11. DATE COMPLETED	6-16-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH DRILLED INTO ROCK	NA
14. TOTAL DEPTH OF HOLE	12.0 Ft. BGS
15. DEPTH GROUNDWATER ENCOUNTERED	NA Ft. BGS
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA
18. GEOTECHNICAL SAMPLES	(3) DISTURBED; UNDISTURBED
19. TOTAL NUMBER OF CORE BOXES	
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: [redacted]; TAL METALS: [redacted]; OTHER (SPECIFY): [redacted]; OTHER (SPECIFY): [redacted]; OTHER (SPECIFY): [redacted]
21. TOTAL CORE RECOVERY	NA
22. DISPOSITION OF HOLE	BACKFILLED: Grouted; MONITORING WELL: —; OTHER (SPECIFY): —
23. SIGNATURE OF INSPECTOR	John Vogel

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale

	N	E	EL.
DP23	622,492.63	1,910,186.32	636.79



PROJECT PBOW - WARP

HOLE NO. WARP-DP23

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP23

PROJECT PBOW - WARP

INSPECTOR John Voeding

SHEET 2 OF 3 SHEETS

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5 grass and Topsoil	Headspace Hnu Readings				Time Start 1330 End 1350
SC	1 2	0.5'-4' Soft, dark brown, Fine Clayey Sand, moist grading to Silty Clay.		2' PBOW-98-WARP-DP23-GEOT-0204 4'		Push 1 3.5' Recovery 4'	
ml/Cl	3 4 5	4'-6' Soft, whitish, grey-brown, med. plasticity, Clayey Silt and clay, moist	NA	6'	NA	Push 2 4' Recovery	
Pt	6 7	6-7' Soft, Black, Clayey Peat.		PBOW-98-WARP-DP23-GEOT-0608 8'		8'	
ml/Cl	8 9 10	7'-8' Soft, dark brown-grey, low-med. plasticity, Clayey Silt and Clay, moist-Slightly wet 8'-12' Same as Above		10'		Push 3 4' Recovery (8'-12')	

PROJECT PBOW - WARP

HOLE NO. WARP - DP23

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP23

SHEET 3 OF 3 SHEETS

PROJECT PBOW - WARP

INSPECTOR John Voegding

SCS ~~MODO~~ (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	~~Recovery~~ (g) Sampling Intervals	REMARKS (h)
Ml / Cl	11	10'-12' See pg 2	Headspace, HNU Readings NA	PBOW-98-WARP-DP23-GEOT-1012 12'	NA	Push 3 (8'-12') 12'	Start Time 1330 End 1350
	12	Bottom of Boring at 12.0 Ft.					

PROJECT PBOW - WARP

HOLE NO. WARP - DP23

(Proponent: CECW-EG)

ENG FORM 5056A-R, AUG 94

WARP

HTRW DRILLING LOG

DISTRICT	Nashville - TN
HOLE NUMBER	DP24
1. COMPANY NAME	IT Corp.
2. DRILL SUBCONTRACTOR	Geo-Environmental Drilling Co.
SHEET / SHEETS	1 OF 3
3. PROJECT	PBOW - WARP
4. LOCATION	PBOW - WARP
5. NAME OF DRILLER	Scott [redacted] Beal
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe Rig
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 Ft Long x 1.5 Inch Diameter Geoprobe Sample Rods w/ Acetate Liners
8. HOLE LOCATION	WARP-DP24
9. SURFACE ELEVATION	~~NA~~ See below
10. DATE STARTED	6-24-98
11. DATE COMPLETED	6-24-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH GROUNDWATER ENCOUNTERED	NA Ft. BGS
13. DEPTH DRILLED INTO ROCK	NA
14. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	12.0 Ft. BGS
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			

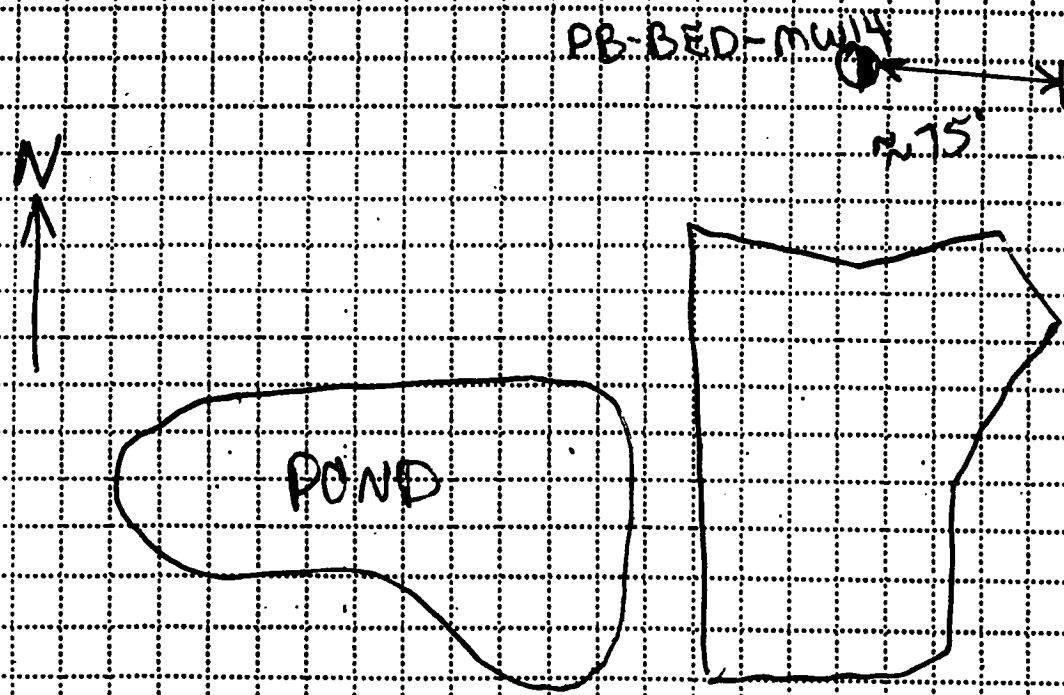
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	TAL METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Nitroaromatics	SVOCs	PCBs	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grouted	—	—	John Vogeding

LOCATION SKETCH/COMMENTS

SCALE Not to Scale

N	E	EL.
622,692.52	1,910,510.14	641.54



PROJECT PBOW - WARP

HOLE NO. WARP-DP24

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

WARP

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NUMBER DP 24

PROJECT PBOW - WARP

INSPECTOR John Voeding

SHEET 2 OF 3

USCS (a)	DEPTH (b)	DESCRIPTION OF MATERIALS (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO (e)	ANALYTICAL SAMPLE NO. (f)	Sampling Intervals (g)	REMARKS (h)
Pt/Sm		0-0.5' weeds and Topsoil	Headspace Hnu Readings				Start 0830 End 0845
Sm	1	0.5'-4' Loose, med-dark brown, v. Fine, Silty Sand, moist.		2' PBOW-98-WARP-DP24-GEOT-0204		Push 1 3.5' Recovery	
	2		NA				
	3						
4'	4	4'	4'	4'		4'	
Ml	5	4'-8' Soft, med. brown, low Plasticity, v. Fine, Sandy Silt, moist	NA	6' PBOW-98-WARP-DP24-GEOT-0608	NA	Push 2 4' Recovery	
	6						
	7		8'	8'		8'	
	8	8'-12' Same as Above, grading to clayey Silt and Clay, moist	NA			Push 3 (8'-12') 4' Recovery	
	9						
12'	10	10'	10'	10'			

PROJECT PBOW - WARP

HOLE NO. WARP - DP 24

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

GROUNDWATER SAMPLIN FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: Red Water Pentaho
RFA/COC Number:

Collection Date: 6-12-98
Collection Time: 1100
Sample Filtered (Yes / No): YES
Weather/Temp: 81°F

Form Completed By: E. Kanesky
Sampler(s): E. Kanesky
Reviewed By:

Sample Number: P B O W – 9 8 – G W – P R R P – D P 0 1 – 7 2 3 0 – – –

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PRRP-DP01
Well Secure (Yes / No):
Well Labeled (Yes / No):
Well Condition: NA
Screen Height:
Casing Type:

Outside Casing Dia. (in): NA
Depth to Product (ft):
Total Well Depth (ft):
Depth to Water (ft):
Water Column (ft):
Elev. Ref. for Water Level:

Odor: NO
Vapor Monitor Type:
- Vapor Monitor S/N:
- Reading (ppm): Red Water
Remarks: ↓

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE	1115		4.61	7.63		16.4	>1000	8.57	

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	[illegible]	[illegible]	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLIN(FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: PBOW-PRRP
RFA/COC Number:

Collection Date:
Collection Time:
Sample Filtered (Yes / No):
Weather/Temp:

Form Completed By:
Sampler(s):
Reviewed By:

Sample Number: P B O W – 9 8 – G W – P R R P – D P 0 2 – 7 2 7 0 – – –

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Boring ~~Well~~ Number: PRRP-DP02
Well Secure (Yes / No): \
Well Labeled (Yes / No): \
Well Condition:
Screen Height: NA
Casing Type: \

Outside Casing Dia. (in): NA
Depth to Product (ft): NA
Total Well Depth (ft): 12.0 Ft.
Depth to Water (ft): ≈ 8 Ft.
Water Column (ft): NA
Elev. Ref. for Water Level: Ground Surface

Odor: None
Vapor Monitor Type: \
- Vapor Monitor S/N:
- Reading (ppm): NA
Remarks: \

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons NA

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((NA^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x NA gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal NA

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE		NA	1.78 mS/cm	7.17	NA	15.0	24	13.20	NA

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: PRRP
RFA/COC Number:

Collection Date: 6-8-98
Collection Time: 1600
Sample Filtered (Yes / No): yes
Weather/Temp: Sunny, 75°F

Form Completed By: John Vogeding
Sampler(s): John Vogeding, Dave Steinman
Reviewed By:

Sample Number: PBOW-98-GW-PRRP-DP03-7310-

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Boring ~~Well~~ Number: PRRP-DP03
Well Secure (Yes / No):
Well Labeled (Yes / No):
Well Condition: NA
Screen Height:
Casing Type:

Outside Casing Dia. (in): NA
Depth to Product (ft): NA
Boring ~~Total~~ Depth (ft): 10 ft.
Depth to Water (ft): ≈ 4.0 ft.
Water Column (ft): NA
Elev. Ref. for Water Level: Ground Surface

Odor:
Vapor Monitor Type:
- Vapor Monitor S/N: NA
- Reading (ppm):
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

NA

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

NA

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

NA

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE	1600	NA	21.3 mS/cm	7.28	NA	15.1	675	8.38	NA

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: PBOW - PRRP
RFA/COC Number:

Collection Date: 6-9-98
Collection Time: 1505
Sample Filtered (Yes / No): YES
Weather/Temp: Cloudy, light Rain, 70°F

Form Completed By: John Vogeding
Sampler(s): John Vogeding, Dave Stineman
Reviewed By:

Sample Number: P B O W – 9 8 – G W – P R R P – D P 0 4 – 7 3 5 0 – – –

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

~~Well~~ Boring Number: PRRP - DP04
Well Secure (Yes / No): \
Well Labeled (Yes / No): \
Well Condition: NA
Screen Height: \
Casing Type: \

Outside Casing Dia. (in): NA
Depth to Product (ft): \
Total Well Depth (ft): Boring Depth = 12 Ft.
Depth to Water (ft): ≈ 8 Ft.
Water Column (ft): NA
Elev. Ref. for Water Level: Ground Surface

Odor: None
Vapor Monitor Type: \
- Vapor Monitor S/N: \
- Reading (ppm): NA
Remarks: \

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons NA

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x NA gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal NA

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

NA

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: PBOW-PRRP
RFA/COC Number:

Collection Date: 6-14-98
Collection Time: 1100
Sample Filtered (Yes / No): No
Weather/Temp: Cool, Cloudy, 60°F

Form Completed By: John Vogeding
Sampler(s): John Vogeding, Dave Straenahn
Reviewed By:

Sample Number: P B O W – 9 8 – G W – P R R P – D P 0 5 – 7 3 9 0 – – –

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

~~Well~~ Boring Number: PRRP-DP05
Well Secure (Yes / No): \
Well Labeled (Yes / No): \
Well Condition: NA
Screen Height: \
Casing Type: \

Outside Casing Dia. (in): NA
Depth to Product (ft): NA
Total Well Depth (ft): 16.0 Ft.
Depth to Water (ft): ≈ 9 Ft.
Water Column (ft): NA
Elev. Ref. for Water Level: Ground Surface

Odor: None
Vapor Monitor Type: \
- Vapor Monitor S/N: \
- Reading (ppm): NA
Remarks: \

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons NA

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x NA gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

NA

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5	1100								
SAMPLE	~~1230~~	NA	1.74 mS/cm	7.71	NA	15	48	11.31	NA

SAMPLE ANALYTICAL INFORMATION

BTN

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: PBOW - PRRP
RFA/COC Number:

Collection Date: 6-9-98
Collection Time: 1415
Sample Filtered (Yes / No): No
Weather/Temp: Cloudy, 70 °F

Form Completed By: John Vogeding
Sampler(s): Ed Karonsky
Reviewed By:

Sample Number: P B O W – 9 8 – G W – P R R P – D P 0 6 – 7 4 3 0 – – –

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

~~Well~~ Boring Number: PRRP-DP06
Well Secure (Yes / No):
Well Labeled (Yes / No):
Well Condition:
Screen Height: NA
Casing Type:

Outside Casing Dia. (in): NA
Depth to Product (ft):
Total Well Depth (ft): Boring depth = 12.0 Ft.
Depth to Water (ft): ≈ 8 Ft.
Water Column (ft): NA
Elev. Ref. for Water Level: Ground Surface

Odor: None
Vapor Monitor Type:
- Vapor Monitor S/N:
- Reading (ppm): NA
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons NA

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((NA)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal NA

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

NA

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLIN FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: PBOW-PRRP
RFA/COC Number:

Collection Date: 6-10-98
Collection Time: 0815
Sample Filtered (Yes / No): yes
Weather/Temp: Cool, Cloudy, 55°F

Form Completed By: John Vogeding
Sampler(s): John Vogeding, Dave Stinemond
Reviewed By:

Sample Number: PBOW-98-GW-PRRP-DP07-7470-

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Boring ~~Well~~ Number: PRRP-DP07
Well Secure (Yes / No): \
Well Labeled (Yes / No): \
Well Condition:
Screen Height: NA
Casing Type: \

Outside Casing Dia. (in):
Depth to Product (ft): NA
Total Well Depth (ft): 12.0 Ft.
Depth to Water (ft): ≈ 8 Ft.
Water Column (ft): NA
Elev. Ref. for Water Level: Ground Surface

Odor: None
Vapor Monitor Type: \
- Vapor Monitor S/N: \
- Reading (ppm): NA
Remarks: \

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons NA

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x NA gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal NA

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE	0815	≈ 8 Ft.	0.423 mS/cm	7.68	NA	14.8	667	9.50	NA

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLIN(FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: PBOW-PRRP
RFA/COC Number:

Collection Date: 6-10-98
Collection Time: 1400
Sample Filtered (Yes / No): yes
Weather/Temp: Mild, Cloudy, 60°F

Form Completed By: John Vogeding
Sampler(s): John Vogeding
Dave Stineman - Ed Ranavsky
Reviewed By:

Sample Number: P B O W – 9 8 – G W – P R R P – D P 0 8 – 7 5 1 0 – -

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Boring ~~Well~~ Number: PRRP-DP08
Well Secure (Yes / No): \
Well Labeled (Yes / No): \
Well Condition: NA
Screen Height: \
Casing Type: \

Outside Casing Dia. (in): \
Depth to Product (ft): \
Total Well Depth (ft):
Depth to Water (ft): 16 ft. NA
Water Column (ft): \
Elev. Ref. for Water Level: Ground Surface.

Odor: None
Vapor Monitor Type: \
- Vapor Monitor S/N: \
- Reading (ppm): NA
Remarks: \

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons NA

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x NA gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal NA

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4				NA					
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLIN FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701 03000000
Project Name: PBOW Red Water
Investigation Site: PBOW-PRRP
RFA/COC Number:

Collection Date: 6-14-98
Collection Time: 1600
Sample Filtered (Yes / No): Yes
Weather/Temp: Mild, Cloudy, 70°F

Form Completed By: John Vogeding
Sampler(s): John Vogeding, Dave Steinman
Reviewed By:

Sample Number: P B O W – 9 8 – G W – P R R P – D P O 9 – 7 5 5 0 – – –

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

~~Well~~ Boring Number: PRRP-DPO9
Well Secure (Yes / No): \
Well Labeled (Yes / No): \
Well Condition: NA
Screen Height: \
Casing Type: \

Outside Casing Dia. (in): NA
Depth to Product (ft): NA
Total Well Depth (ft): 12.0 Ft.
Depth to Water (ft): ≈ 3 Ft.
Water Column (ft): NA
Elev. Ref. for Water Level: ground Surface

Odor: None
Vapor Monitor Type: \
- Vapor Monitor S/N: NA
- Reading (ppm):
Remarks: Water reddish brown

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons NA

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x NA gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal NA

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE	1600	NA	3.32 mS/cm	7.54	NA	15.5	331	10.20	NA

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: PRRP
RFA/COC Number:

Collection Date: 6-10-98
Collection Time: 1415
Sample Filtered (Yes / No): yes
Weather/Temp: P. Cloudy, 65°F

Form Completed By: John Vogeding
Sampler(s): John Vogeding, Dave Stinpman
Reviewed By:

Sample Number: PBOW-98-GW-PRRP-DP10-7590-

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Boring ~~Well~~ Number: PRRP-DP10
Well Secure (Yes / No): \
Well Labeled (Yes / No): NA
Well Condition: \
Screen Height: \
Casing Type: \

Outside Casing Dia. (in): NA
Depth to Product (ft): 16.0 Ft.
Total Well Depth (ft): ≈ 13.0 Ft.
Depth to Water (ft): NA
Water Column (ft): Ground Surface
Elev. Ref. for Water Level:

Odor: None
Vapor Monitor Type: \
- Vapor Monitor S/N: \
- Reading (ppm): NA
Remarks: \

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons NA

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons NA

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal NA

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE	1415	≈ 13 Ft	28.2	7.17	NA	17.0	> 999	5.47	NA

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLIN FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: Pentonite RD
RFA/COC Number:

Collection Date: 6-14-98
Collection Time: 1700
Sample Filtered (Yes / No): Yes
Weather/Temp: 72°F

Form Completed By: EK
Sampler(s): EK
Reviewed By:

Sample Number: PBOW-98-GW-PRRP-DP11-7630-

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number:
Well Secure (Yes / No):
Well Labeled (Yes / No): NA
Well Condition:
Screen Height:
Casing Type:

Outside Casing Dia. (in):
Depth to Product (ft):
Total Well Depth (ft):
Depth to Water (ft):
Water Column (ft):
Elev. Ref. for Water Level:

Odor: ND
Vapor Monitor Type:
- Vapor Monitor S/N:
- Reading (ppm):
Remarks: Red water

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE			12.4	7.92		17.8		10.12	

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701 03000000
Project Name: PBOW Red Water
Investigation Site: Red water ponds
RFA/COC Number:

Collection Date: 6-11-98
Collection Time: 0930
Sample Filtered (Yes / No): YES
Weather/Temp: 78°F

Form Completed By: EJ Kanouse
Sampler(s): E.K.
Reviewed By:

Sample Number: PBOW-98-GW-PRRP-DP12-7670-

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PRRP-DP12
Well Secure (Yes / No): NA
Well Labeled (Yes / No): NA
Well Condition: NA
Screen Height: NA
Casing Type: NA

Outside Casing Dia. (in): NA
Depth to Product (ft): ~~[illegible]~~ NA
Total Well Depth (ft): 16'
Depth to Water (ft): 4'
Water Column (ft): NA
Elev. Ref. for Water Level: Ground surface

Odor: NO
Vapor Monitor Type: HNU
- Vapor Monitor S/N: ~~0 ppm~~
- Reading (ppm): 0 ppm
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1			0.537	7.96		15°C	<1000	7.65	
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: Red Water Ponds
RFA/COC Number:

Collection Date: 6-12-98
Collection Time: 1430
Sample Filtered (Yes / No):
Weather/Temp:

Form Completed By: E.R.
Sampler(s): E.R.
Reviewed By:

Sample Number: PBOW-98-GW-PRRP-DR13-7710-

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PRRP-DP13
Well Secure (Yes / No):
Well Labeled (Yes / No): NA
Well Condition:
Screen Height:
Casing Type:

Outside Casing Dia. (in):
Depth to Product (ft): NA
Total Well Depth (ft):
Depth to Water (ft):
Water Column (ft):
Elev. Ref. for Water Level:

Odor: NO
Vapor Monitor Type:
- Vapor Monitor S/N:
- Reading (ppm):
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1			1.01	7.94		15.3	38.2	7.17	
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: PBOW-PRRP
RFA/COC Number:

Collection Date: 6-12-98
Collection Time: 1000
Sample Filtered (Yes / No): yes
Weather/Temp: Hot, Humid, 75°F

Form Completed By: John Vogeding
Sampler(s): John Vogeding of Dave Stineman - Ed Kanavsky
Reviewed By:

Sample Number: P B O W – 9 8 – G W – P R R P – D P 1 4 – 7 7 5 0 – [illegible] - [ ] [ ]

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Boring ~~Well~~ Number: PRRP - DP14
Well Secure (Yes / No): \
Well Labeled (Yes / No): \
Well Condition: NA
Screen Height: \
Casing Type: \

Outside Casing Dia. (in): NA
Depth to Product (ft):
Total Well Depth (ft): 16 Ft.
Depth to Water (ft): ≈ 4-5' and 8-9'
Water Column (ft): NA
Elev. Ref. for Water Level: Ground Surface

Odor: None
Vapor Monitor Type: \
- Vapor Monitor S/N: \
- Reading (ppm): NA
Remarks: \

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons NA

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x NA gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal NA

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

NA

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: Pentowsh RD
RFA/COC Number:

Collection Date: 6-12-98
Collection Time: 1700
Sample Filtered (Yes / No):
Weather/Temp:

Form Completed By: EK
Sampler(s): EK
Reviewed By:

Sample Number: PBOW - 98 - GW - PRRP - DP15 - 7790 - ___ - ___

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PRRP-DP15
Well Secure (Yes / No):
Well Labeled (Yes / No): NA
Well Condition:
Screen Height:
Casing Type:

Outside Casing Dia. (in):
Depth to Product (ft): NA
Total Well Depth (ft):
Depth to Water (ft):
Water Column (ft):
Elev. Ref. for Water Level:

Odor:
Vapor Monitor Type:
- Vapor Monitor S/N:
- Reading (ppm):
Remarks: Red water

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE			10.2	8.23		14.5	<1000	10.7	

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLIN(FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: Pentonite Road
RFA/COC Number:

Collection Date: 6-13-98
Collection Time: 1100
Sample Filtered (Yes / No): yes
Weather/Temp: 78°

Form Completed By: EK
Sampler(s): EK
Reviewed By:

Sample Number: P B O W – 9 8 – G W – P R R P – D P 1 6 – 7 8 5 0 – – –

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number:
Well Secure (Yes / No): NA
Well Labeled (Yes / No):
Well Condition:
Screen Height:
Casing Type:

Outside Casing Dia. (in):
Depth to Product (ft):
Total Well Depth (ft): NA
Depth to Water (ft):
Water Column (ft):
Elev. Ref. for Water Level:

Odor: NV
Vapor Monitor Type:
- Vapor Monitor S/N:
- Reading (ppm):
Remarks: Red water

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE			5.73	8.22		16.5	>1000	10.67	

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE 0.5	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE 0.5	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: PBOW Pentonite
RFA/COC Number:

Collection Date: 6-11-98
Collection Time: 1200
Sample Filtered (Yes / No): yes
Weather/Temp: 78°F

Form Completed By: E. Kanuszy
Sampler(s):
Reviewed By:

Sample Number: PBOW-98-[ ][ ]-DRRP-DP17-7870 (7872) - [ ][ ]-[ ][ ]

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PRRP-DP17
Well Secure (Yes / No): NA
Well Labeled (Yes / No): NA
Well Condition: NA
Screen Height: NA
Casing Type: NA

Outside Casing Dia. (in): NA
Depth to Product (ft): NA
Total Well Depth (ft): NA
Depth to Water (ft): ~~NA~~ 4'
Water Column (ft): NA
Elev. Ref. for Water Level:

Odor: NO
Vapor Monitor Type: 0ppm
- Vapor Monitor S/N:
- Reading (ppm):
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1	1200	4	0.269	8.26		18.6	0	10.85	
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site:
RFA/COC Number:

Collection Date: 6-12-98
Collection Time: 0800
Sample Filtered (Yes / No): Yes
Weather/Temp: 78°F

Form Completed By: E. Kanevsky
Sampler(s): E. Kanevsky
Reviewed By:

Sample Number: PBOW-98-GW-PRRW-BP18-7910-

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PRRW-DP-18
Well Secure (Yes / No):
Well Labeled (Yes / No):
Well Condition:
Screen Height:
Casing Type:

Outside Casing Dia. (in):
Depth to Product (ft): NA
Total Well Depth (ft):
Depth to Water (ft):
Water Column (ft):
Elev. Ref. for Water Level:

Odor: NO
Vapor Monitor Type:
- Vapor Monitor S/N:
- Reading (ppm):
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2		NA							
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site:
RFA/COC Number:

Collection Date: 6-13-98
Collection Time: 1000
Sample Filtered (Yes / No):
Weather/Temp: 78°F

Form Completed By: EK
Sampler(s): EK
Reviewed By:

Sample Number: PBOW-98-GW-PRRP-DP19-7950-

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number:
Well Secure (Yes / No):
Well Labeled (Yes / No): NA
Well Condition:
Screen Height:
Casing Type:

Outside Casing Dia. (in):
Depth to Product (ft): NA
Total Well Depth (ft):
Depth to Water (ft):
Water Column (ft):
Elev. Ref. for Water Level:

Odor: NO
Vapor Monitor Type:
- Vapor Monitor S/N:
- Reading (ppm):
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE			0.440	8.32		14.9	>1000	11.84	

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE 0.5	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE 0.5	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLIN FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: Pentaritt RD
RFA/COC Number:

Collection Date: 6-14-98
Collection Time: 1600
Sample Filtered (Yes / No): Ye
Weather/Temp: 72°F

Form Completed By: EK
Sampler(s): EK
Reviewed By:

Sample Number: P B O W – 9 8 – 6 w – P R R P – D P 2 0 – 7 9 9 0 – -

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number:
Well Secure (Yes / No):
Well Labeled (Yes / No): NA
Well Condition:
Screen Height:
Casing Type:

Outside Casing Dia. (in):
Depth to Product (ft):
Total Well Depth (ft): NA
Depth to Water (ft):
Water Column (ft):
Elev. Ref. for Water Level:

Odor: ND
Vapor Monitor Type:
- Vapor Monitor S/N: NA
- Reading (ppm):
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE			0.292	7.29		14.5	21000	9.30	

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

DP 02 / 6-23-98

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701 03000000
Project Name: PBOW Red Water
Investigation Site: PBOW - WARP
RFA/COC Number:

Collection Date: 6-23-98
Collection Time: 1300
Sample Filtered (Yes / No): No
Weather/Temp:

Form Completed By: T. HENSLEY
Sampler(s): TOM HENSLEY
Reviewed By:

Sample Number: PBOW-98-GW-WARP-DP02-8170-00-00

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: WARP - DP02
Well Secure (Yes / No):
Well Labeled (Yes / No):
Well Condition: N/A
Screen Height:
Casing Type:

Outside Casing Dia. (in):
Depth to Product (ft):
Total Well Depth (ft): N/A
Depth to Water (ft):
Water Column (ft):
Elev. Ref. for Water Level:

Odor: NONE
Vapor Monitor Type:
- Vapor Monitor S/N:
- Reading (ppm): N/A
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE	0835		2.56	7.33		13.8	999+	13.51	

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

i -04 / 6-24-98

GROUNDWATER SAMPLING ORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: PBOW-WARP
RFA/COC Number:

Collection Date: 6/24/98
Collection Time: 1500
Sample Filtered (Yes / No): YES
Weather/Temp:

Form Completed By:
Sampler(s): T. HEWACEY
Reviewed By:

Sample Number: PBOW-98-GW-WARP-AP04-8250-00-00

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: WARP-AP04
Well Secure (Yes / No):
Well Labeled (Yes / No):
Well Condition: N/A
Screen Height:
Casing Type:

Outside Casing Dia. (in):
Depth to Product (ft):
Total Well Depth (ft): N/A
Depth to Water (ft):
Water Column (ft):
Elev. Ref. for Water Level:

Odor: NONE
Vapor Monitor Type:
- Vapor Monitor S/N:
- Reading (ppm): N/A
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE	1725		38.03	7.27		16.7	999+	8.94	

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

L-06 / 6-23-98

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: WARP-AP06
RFA/COC Number:

Collection Date: 6/23/98
Collection Time: 1600
Sample Filtered (Yes / No): NO
Weather/Temp:

Form Completed By:
Sampler(s): T. HEWALET
Reviewed By:

Sample Number: PBOW-98-GW-WARP-AP06-8330-00-00

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: WARP-AP06
Well Secure (Yes / No): N/A
Well Labeled (Yes / No): N/A
Well Condition: N/A
Screen Height: N/A
Casing Type: N/A

Outside Casing Dia. (in): N/A
Depth to Product (ft): N/A
Total Well Depth (ft): N/A
Depth to Water (ft): N/A
Water Column (ft): N/A
Elev. Ref. for Water Level: N/A

Odor: NON
Vapor Monitor Type: N/A
- Vapor Monitor S/N: N/A
- Reading (ppm): N/A
Remarks: N/A

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE	0850		1.05	7.47		14.6	972	12.96	

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701 03000000
Project Name: PBOW Red Water
Investigation Site: PBOW-WARP
RFA/COC Number:

Collection Date: 6-16-98
Collection Time: 0730
Sample Filtered (Yes / No): No
Weather/Temp: Cool, Cloudy, 60°F

Form Completed By: John Vogeding
Sampler(s): John Vogeding, Dave Stinetman
Reviewed By:

Sample Number: P B O W – 9 8 – G W – W A R P – D P 0 8 – 8 4 1 0 – – –

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

~~Well~~ Boring Number: WARP-DP08
Well Secure (Yes / No): \
Well Labeled (Yes / No): \
Well Condition: NA
Screen Height: \
Casing Type: \

Outside Casing Dia. (in): \
Depth to Product (ft): \
Total Well Depth (ft): NA
Depth to Water (ft): \
Water Column (ft): \
Elev. Ref. for Water Level: \

Odor: None
Vapor Monitor Type: \
- Vapor Monitor S/N: NA
- Reading (ppm): \
Remarks: No Water Quality Readings due to limited gw Present.

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons NA

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x NA gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal NA

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

NA

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLIN FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: PBOW-WARP
RFA/COC Number:

Collection Date: 6-15-98
Collection Time: 1030
Sample Filtered (Yes / No): No
Weather/Temp: Mild, Cloudy, 60°F

Form Completed By: John Vogeding
Sampler(s): John Vogeding, Dave Stineman
Reviewed By:

Sample Number: PBOW-98-GW-WARP-DP12-8576-

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Boring ~~Well~~ Number: WARP-DP12
Well Secure (Yes / No): \
Well Labeled (Yes / No): \
Well Condition: NA
Screen Height: \
Casing Type: \

Outside Casing Dia. (in): \
Depth to Product (ft): \
Total Well Depth (ft): \
Depth to Water (ft): NA
Water Column (ft): \
Elev. Ref. for Water Level: \

Odor: None
Vapor Monitor Type: \
- Vapor Monitor S/N: NA
- Reading (ppm): \
Remarks: No Water Quality Readings due to limited GW present.

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons NA

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x NA gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal NA

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3				NA					
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: PBOW - WARP
RFA/COC Number:

Collection Date: 6-15-98
Collection Time: 1300
Sample Filtered (Yes / No): yes
Weather/Temp: Mild, Cloudy, 60°F

Form Completed By: John Vogeding
Sampler(s): John Vogeding, Dave Stineman
Reviewed By:

Sample Number: P B O W – 9 8 – G W – W A R P – D P 1 3 – 8 6 1 0 – -

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Boring ~~Well~~ Number: WARP - DP13
Well Secure (Yes / No): \
Well Labeled (Yes / No): \
Well Condition:
Screen Height: NA
Casing Type: \

Outside Casing Dia. (in): NA
Depth to Product (ft): NA
Total Well Depth (ft): 16.0 Ft
Depth to Water (ft): NA
Water Column (ft): NA
Elev. Ref. for Water Level: Ground Surface

Odor: None
Vapor Monitor Type: \
- Vapor Monitor S/N: NA
- Reading (ppm):
Remarks: Water is yellowish brown

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons NA

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons NA

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal NA

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE	1300	NA	1.42	7.32	NA	15.0°C	186	9.57	NA

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310 1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

D 16 / 6-25-98

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: WARP - AP16
RFA/COC Number:

Collection Date: 6/25/98
Collection Time: 1400
Sample Filtered (Yes / No): YES
Weather/Temp:

Form Completed By:
Sampler(s): T. HENNICKET
Reviewed By:

Sample Number: PBOW - 98 - GW - WARP - AP16 - 8730 - 00-00

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: WARP - AP16
Well Secure (Yes / No):
Well Labeled (Yes / No):
Well Condition:
Screen Height: N/A
Casing Type:

Outside Casing Dia. (in):
Depth to Product (ft):
Total Well Depth (ft): N/A
Depth to Water (ft):
Water Column (ft):
Elev. Ref. for Water Level:

Odor:
Vapor Monitor Type:
- Vapor Monitor S/N: N/A
- Reading (ppm):
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE			5.42	7.42		15.9	999+	12.96	

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

D-17 / 6-25-98

GROUNDWATER SAMPLING FORM

INTERNATIONAL TECHNOLOGY CORPORATION

Project Number: 773701.03000000
Project Name: PBOW Red Water
Investigation Site: PBOW-WARP
RFA/COC Number:

Collection Date: 6/25/98
Collection Time: 1300
Sample Filtered (Yes / No): YES
Weather/Temp:

Form Completed By:
Sampler(s): T. HENSLEY
Reviewed By:

Sample Number: PBOW-98-GW-WARP-AP17-8770-00-00

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: WARP-AP17
Well Secure (Yes / No):
Well Labeled (Yes / No):
Well Condition: N/A
Screen Height:
Casing Type:

Outside Casing Dia. (in):
Depth to Product (ft):
Total Well Depth (ft): N/A
Depth to Water (ft):
Water Column (ft):
Elev. Ref. for Water Level:

Odor: NONE
Vapor Monitor Type:
- Vapor Monitor S/N:
- Reading (ppm): N/A
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°C	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE	1020		5.19	7.50		15.4	680	13.42	

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	PCBs	3520B/8081	2 - 1 Liter Amber Glass	Chloride	325.3	1 - 1 Liter HDPE
TCL Volatile Organics	8260A	3 - 40 mL Glass Vials	Cyanide (total)	9010A/9012	1 - 1 Liter HDPE	Nitrate	353.2	
TCL SVOCs	3520B/8270B	2 - 1 Liter Amber Glass	Alkalinity	310.1	1 - 1 Liter HDPE	Sulfate	375.4	
Total TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Total Organic Carbon	9060	1 - 1 Liter HDPE	Tot. Suspended Solids	160.2	1 - 1 Liter HDPE
Dissolved TAL Metals	3005A/6010A	1 - 1 Liter HDPE	Hardness	130.2	1 - 1 Liter HDPE	Total Dissolved Solids	160.1	1 - 1 Liter HDPE

APPENDIX B

LAND SURVEY DATA

Land Survey Results for the Acid Areas and the Red Water Ponds Areas at the Plum Brook Ordnance Works

Point ID	Y	X	Elevation	Remarks
Pentolite Road Red Water Ponds Direct Push Locations				
DP01	624,939.62	1,918,740.53	630.39	
DP02	625,232.21	1,918,802.48	630.37	
DP03	625,038.03	1,919,102.57	631.56	
DP04	624,727.92	1,918,917.68	633.01	
DP05	625,299.16	1,919,033.56	631.47	
DP06	624,951.14	1,918,911.07	632.75	
DP07	624,698.09	1,919,117.91	634.71	
DP08	624,514.99	1,919,063.91	635.88	
DP09	625,348.26	1,919,218.20	631.85	
DP10	625,028.13	1,919,381.06	634.90	
SB11	624,840.68	1,919,354.54	631.77	As marked in field - DP11
DP12	624,592.96	1,919,301.87	631.10	
DP13	625,442.21	1,919,550.70	633.36	
DP14	625,286.03	1,919,485.76	630.96	
DP15	625,066.49	1,919,559.32	631.05	
DP16	624,825.74	1,919,459.48	632.35	
DP17	624,590.95	1,919,594.96	636.57	
DP18	625,300.98	1,919,638.32	631.78	
DP19	625,047.57	1,919,757.82	632.86	
DP20	624,747.62	1,919,619.92	632.82	
Pentolite Road Red Water Ponds Geotechnical Locations				
DP21	625,221.36	1,918,941.85	632.89	
DP22	624,593.46	1,919,004.88	634.80	
DP23	624,953.28	1,919,383.04	634.36	
DP24	625,170.69	1,919,685.68	630.80	
SB25	624,687.56	1,919,500.10	632.48	As marked in field - DP25
Pentolite Road Red Water Ponds Surface Water and Sediment Locations				
SW01	624458.10	1919253.13	626.47	
SD01	624458.46	1919252.71	626.19	
SW02	624942.11	1919717.83	624.45	
SD02	624941.69	1919718.45	624.27	
SW03	625772.62	1919871.34	623.44	
SD03	625772.14	1919872.13	622.17	
SW04	625779.27	1919148.97	623.26	
SD04	625778.19	1919149.05	622.97	

Land Survey Results for the Acid Areas and the Red Water Ponds Areas at the Plum Brook Ordnance Works

Point ID	Y	X	Elevation	Remarks
West Area Red Water Ponds Direct Push Locations				
DP01	622,613.31	1,909,566.67	644.09	
DP02	622,379.43	1,909,598.56	636.50	
DP03	622,158.78	1,909,480.12	633.72	
DP04	621,917.58	1,909,501.45	634.11	
DP05	622,820.86	1,909,789.37	643.60	
DP06	622,610.42	1,909,780.55	643.32	
DP07	621,982.93	1,909,758.95	632.28	
DP08	622,727.47	1,909,986.13	642.69	
DP09	622,546.61	1,909,995.23	639.02	
DP10	622,147.23	1,910,023.31	633.34	
DP11	622,016.75	1,909,999.70	632.04	
DP12	622,764.13	1,910,219.74	642.78	
DP13	622,543.21	1,910,216.51	637.75	
DP14	622,049.80	1,910,188.23	632.04	
DB15	622,601.84	1,910,385.32	637.86	
DP16	622,425.11	1,910,395.07	632.83	
DP17	622,214.66	1,910,389.32	633.63	
DP18	622,051.37	1,910,366.62	633.15	
DP19	622,689.12	1,910,553.60	638.96	
DP20	622,518.16	1,910,681.29	636.78	
West Area Red Water Ponds Geotechnical Locations				
DP21	622,756.10	1,909,698.38	644.37	
DP22	622,056.95	1,909,921.72	632.41	
DP23	622,492.63	1,910,186.32	636.79	
DP24	622,692.52	1,910,510.14	641.54	
DP25	622,049.80	1,910,188.23	632.04	Also DP14
West Area Red Water Ponds Surface Water and Sediment Locations				
SW01	621762.51	1909434.98	625.09	
SD01	621760.93	1909434.49	624.65	
SW02	621937.76	1909811.87	624.98	
SD02	621936.88	1909811.94	624.73	
SW03	622012.13	1910446.96	624.44	
SD03	622012.58	1910446.14	624.29	
SW04	622490.42	1910795.65	623.10	
SD04	622490.63	1910796.51	626.64	
SW05	622498.50	1909841.06	634.49	
SD05	622496.86	1909841.32	634.27	
SW06	622468.69	1910162.64	634.50	
SD06	622468.10	1910162.48	634.12	

NOTICE:

Values were scaled to the Ohio State Plane Coordinate System (North Zone).
A combined factor of 0.999927 (0.999927034 for SW/SD) was used in this determination.
These coordinates are NAD 1983 Datum expressed in feet.
Vertical datum is NGVD 1929.

APPENDIX C

DATA QUALITY EVALUATION

Appendix C

Data Quality Evaluation
Investigation of Red Water Ponds Areas
Plum Brook Ordnance Works

C1.0 Introduction

This appendix of the Plum Brook Site Investigation Report presents the results of the Quality Assurance/Quality Control (QA/QC) protocols implemented during the sampling and analysis portion of the investigations of the Pentolite Road Red Water Ponds (PRRP) and the West Area Red Water Ponds (WARP). The quality indicators from every aspect of the data collection process have been reviewed, and an assessment of the data with regard to the project specific objectives is presented. The reliability of the sampling and analytical procedures used during the investigations was demonstrated by implementing the project specific quality assurance procedures specified in the site-wide Sampling and Analysis Plan and Quality Assurance Project Plan (IT, 1996a) and its site-specific attachments (SSAP, IT 1998). Successful execution of these procedures provides strong supporting evidence for the acceptance of the data as representative of the area under investigation. A complete evaluation of the procedures implemented in the investigations is summarized in this Data Quality Evaluation (DQE).

The DQE for the Plum Brook site investigations is divided into two phases. The first phase includes the discussion of the overall field sampling effort and the field quality control (QC) activities employed. The resulting QC data are presented and compared to the procedures and goals established in the Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP), as well as the verification of the completeness, accuracy and representativeness of the field sampling. The second phase deals with the analytical program and the results of the QC activities employed. An overall comparison to data quality objectives (DQOs) was performed as well as a complete data review. All elements of data evaluation were compiled and used to determine the usability and overall applicability of the resulting data.

C2.0 Field Sampling Program

To ensure the reliability of the field sampling procedures and analytical data, field QA/QC samples were collected or prepared for each medium sampled, each sample shipment, and/or

each sampling event. The QA/QC samples are used to address sample variability and uncertainty in procedures.

C2.1 Field Duplicates

The purpose of the field duplicate is to evaluate the precision of the sample collection, handling and analysis procedures. Field duplicate samples were collected from the following locations: PRRP-DP01, PRRP-DP09, PRRP-DP17, PRRP-DP18, WARP-DP03, WARP-DP04, WARP-DP09, AND WARP-DP18.

It can be difficult to collect true duplicate samples, especially for solid matrices that are inherently more heterogeneous than liquid matrices. Greater variations are seen in the precision data which are measured by calculating the relative percent difference (RPD) between the original sample results and its duplicate results. Higher RPDs are thought to reflect difficulties encountered during the collection of duplicate samples or sample handling. Wide variations in soil results may be attributed to actual variations in concentrations rather than problems with precision or sampling effectiveness.

All positive concentrations and the calculated RPD for the original sample and/or its duplicate are presented in Tables C-1 to C-7. The RPD results were calculated as follows:

$$RPD = \frac{A-B}{[(A+B)/2]} 100$$

where:

RPD = Relative percent difference
A = Original sample result
B = Duplicate sample result.

When concentrations are detected in only one of the two samples, "NC" is used to represent the RPD which is then "not calculable" for the parameter. There is no quantifiable result available from the "non-detect" sample to be used in the RPD calculation. When "estimated" (J qualified) concentrations are reported, there is a greater potential for increased variability between the primary and duplicate results as reflected in the RPD calculation. Sample results with "B" qualification were not used for the RPD calculation.

Results from PRRP-DP01 demonstrated good precision for metals, but less for organics. bis(2-Ethylhexyl)phthalate, 2,4-dinitrotoluene, and 1,3,5-trinitrobenzene were detected in the duplicate, but not in the original. The values for the three compounds were qualified "J". The RPD values could not be calculated. The results from PRRP-DP09 showed a great degree of variability. RPDs were calculated for fifteen compounds. Only four RPD values were below 50. The results from the PRRP-DP17 water sample and duplicate were highly variable. Seven compounds were detected in the original, but not in the duplicate. Of those detected in both, the RPD values ranged from 2.5 for dissolved calcium to 184 for total manganese. The least variability was in the dissolved metals. The RPDs were from 2.5 to 35.5. RPD values for arsenic, calcium, copper, and nickel exceeded 50 in the sample pair from PRRP-DP18. Eleven other compounds had RPD values ranging from 7.9 to 37.1. bis(2-Ethylhexyl)phthalate was detected below the reporting limit in the duplicate, but not in the original. The RPD could not be calculated.

The data from WARP-DP03 demonstrated good precision. All compounds detected in the samples had RPD values less than 50. The values ranged from 0 for zinc to 40.5 for cadmium. Thirteen of seventeen RPDs were below 20. The precision data from the sample pair from WARP-DP09 was variable. The RPD values for inorganics ranged from 8.5 to 36.7. Nine semivolatile compounds were detected below the reporting limit in the duplicate. They were not detected in the original sample. Fluoranthene and pyrene were detected in both with high RPD values of 122 and 123, respectively. The sample pair from WARP-DP18 showed good precision. All RPD values were below 50. Twelve of the sixteen RPD values were below 10.

C2.2 Trip Blanks

Trip blanks are used to ensure that samples requiring volatile analysis are not exposed to contamination during storage and transport to the laboratory. They consist of a pair of VOA vials filled with ASTM Type II water. They are analyzed for volatile organics only. Acetone, chloroform, trichloroethene, toluene, and xylenes were detected in the trip blanks at estimated concentrations below the laboratory's reporting limits. The trip blank data were used in the validation process by applying the "5X/10X Rule" and associated results were qualified accordingly.

C2.3 Equipment Rinse Blanks

Equipment rinsates (ER) are used to assess the effectiveness of the equipment decontamination procedures employed and the potential of cross-contamination of environmental samples between sampling locations. The rinsates are collected by passing clean, analyte-free water through and over the sampling equipment after the decontamination procedures have been

executed. One ER was collected for each of the two areas. The blanks were analyzed for the same analytical parameters as the associated project samples.

The analyses detected low level concentrations of volatile organics. Acetone, chloroform, toluene, and xylenes were reported in the rinsates at estimated concentrations below the laboratory's reporting limits. Careful review of sample data suggested that the concentrations reported are not indicative of deficiencies in the decon process but laboratory process contamination or constituents detected or inherent in the water used in the final rinse. The ER data were used in the validation process by applying the "5X/10X Rule" and associated results were qualified accordingly.

C2.4 Field Blanks

Field blanks were prepared from clean water used in the decontamination procedures employed. Analysis of the blanks ensures that all water sources used during decon are free of parameters of interest. A field blank was collected from the final decontamination rinse water. Only one lot number of the deionized final rinse water was used; therefore, one (1) field blank was submitted for analysis and tested for the parameters analyzed in this investigation.

The non-potable, analyte-free water used in the final rinse of the sampling equipment exhibited low level concentrations of volatile organics. The volatiles detected were acetone at 1.6 μg/L, chloroform at 0.18 μg/L, and toluene at 0.17 μg/L. All concentrations are below reporting limits and qualified as estimated. Review of the associated field sample data suggest that these concentrations are a result of laboratory process contamination and should not be considered to be native to the water source being evaluated.

C3.0 Analytical Program

The analytical program determined, with documented precision and accuracy, if specific compounds were present in the samples collected from the areas investigated. Chemical analyses for the investigation were performed in accordance with the guidelines prescribed by the U.S. Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846), Physical/Chemical Methods, Third Edition, September 1986 and subsequent revisions and Methods for the Chemical Analysis of Water and Wastes (MCAWW), EPA-600/4-79-020, March 1983 and subsequent revisions. The samples and associated QA/QC samples were

analyzed for volatile organics, semivolatile organics, PCBs, metals, nitroaromatics, and several water quality analytes using the methods presented in Table C-8.

All analytical samples collected for the generation of definitive data were reported in EPA Level IV CLP-like data packages and a Level III data validation was performed using EPA validation guidelines as stated in EPA Contract Laboratory Functional Guidelines for organic and inorganic data review dated February 1994. To clarify the extent of blank contamination, blank evaluations were based on the criteria outlined in *Region III Modifications to National Functional Guidelines for Organic Data Review* (September 1994) and *Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses* (April 1993). The regulatory compound/analyte list reported was the Target Compound List (TCL) for organics and the Target Analyte List (TAL) for inorganics. These data packages have also been reviewed for completeness and compliance to the approved final work plan (IT, 1996). All samples were submitted to the laboratory accompanied by an analysis request/ chain of custody (AR/COC) form. The AR portion of the form provides project specific analytical specifications and quality control instruction to the laboratories. A formal chain-of-custody (COC) traceability record was included as part of the document ensuring documentation of custody for sample transportation, storage and eventual disposal by the laboratory. Copies of all custody documentation are included in the data packages submitted. All samples were received at the laboratory with intact custody seals. Several samples were received in the laboratory at greater temperatures than allowed by the SAP and QAPP. The samples were recollected. Several samples collected for metal analyses were received with pHs greater than two. Additional nitric acid was added to the samples by the laboratory to lower the pH. No data were qualified.

C3.1 QA/QC Procedures

The project QA/QC program described in the SAP and QAPP was followed for the sample collection and laboratory analysis of samples. The elements of this program are discussed in the sections that follow. The laboratory analytical program consisted of EPA SW-846 and MCAWW methods with Level IV CLP-like deliverables for the generation of definitive data for the investigation. Deliverables included sample preparation information, calibration records, QC data such as method blanks, spikes, duplicates, surrogate recoveries, internal standards, and copies of the AR and COC records. Chemical analyses for this project were performed following standardized protocols, which include specific requirements for how compounds are analyzed, identified and reported.

Each of the methods employed included specific QA/QC protocols that are used to support the validity of the sampling event and the resulting data. These QA/QC protocols are a critical part of the analytical method and were followed explicitly during sample analysis. Specific measures included detailed record keeping procedures, analysis of duplicate samples, instrument calibrations, and the analyses of blanks, surrogate and internal standards.

C3.1.1 Reporting Limits

Practical Quantitation Limits (PQLs), the laboratory's statistically determined reporting limits, were presented in the QAPP section of the Final Work Plan for the investigation for the Quanterra-Knoxville, TN laboratory. The analytical program executed required the use of SW-846 methods which specify the procedures for calculating the PQLs presented. Each laboratory is required to demonstrate method performance through method detection limit (MDL) studies for every analysis, media, and instrument. These studies are required to be laboratory specific so that individual laboratory variables such as equipment brands, reagent suppliers, chemist technique, etc., are all factored into the performance study. The PQL is statistically supported by the MDL established. The PQL calculation is designed to use the MDL, established using controlled matrices (i.e., distilled water), and adjusts the limit by a predetermined mathematical factor for the analysis of actual environmental sample matrices (i.e., soil, groundwater, etc.). For purposes of clarity and consistency with respect to definition and terminology, the term "reporting limit" has been substituted for PQL when referencing the limit of detection the laboratory reported for each sample and analytical parameter. This value has been corrected for all necessary dilution and interference factors based on the analytical data for each sample.

All laboratory results were reviewed with respect to the actual reporting limits achieved as compared to the limits presented in the SAP. Dilutions resulted in high reporting limits for several organics and metals. Samples 7550, 7590, 7630, 7790, and 7830 were diluted before VOA analysis because of foaming noticed during the screening process. Samples 7290, 7310, 7590, 8450, and 8610 were reported with elevated reporting limits for PCBs because of sample matrix difficulties. Samples 7200, 7290, 7310, 7550, 7590, 7630, 7790, 8610, 8730, and 8770 were reported with elevated reporting limits for semivolatiles because of matrix difficulties. Samples 7210, 7270, 7390, 7550, 7580, 7870, 7750, 7780, 7790, 7830, 8130, 8170, 8250, 8251, 8370, 8690, and 8850 were reported with elevated reporting limits for explosives because of sample matrix. Samples 7550, 7630, 8450, and 8610 were reported with elevated reporting limits for chloride. Data were reported on a dry-weight basis.

C3.1.2 Holding Times

All laboratory results submitted for the Plum Brook site investigations were reviewed with respect to laboratory adherence to analysis holding times. Maximum analytical holding times, as presented in Table 5-1 of the QAPP, were usually met by the laboratory. The laboratory exceeded the holding time for volatile analyses. Upon analysis it was determined the pHs of several samples were greater than two. The holding time for unpreserved samples is seven days. Benzene, chlorobenzene, ethylbenzene, styrene, toluene, and xylenes were qualified as estimated, "J" for detects and "UJ" for non-detects. Samples 7270, 7310, 7350, 7550, 7990, and 8610 were analyzed by method E300.0 instead of E353.2 to meet holding times. They were analyzed by 353.2 after the holding time was exceeded. The results of the two methods are compared in Table C-9. The values for E353.2 are estimated because they were analyzed past the holding time. No nitrate was detected in samples 7270, 7350, and 7990. Samples 7550 and 8610 had RPD values of 3 and 6, respectively. Sample 7310 had an RPD value of 113.

C3.1.3 Method Blanks

Method blanks were analyzed with each analytical "batch" processed. The blanks were carried through the analytical procedure, step-by-step, including the addition of all solvents and other reagents required in the analytical process. The purpose of the blank is to ensure that no contaminants are being introduced to the sample as a result of the analytical process, helping to eliminate the element of doubt as to the origin of reported concentrations.

The method blank results reported with the direct push investigation data were evaluated for high readings characteristic of background or process contamination. There were no significant concentrations detected in the designated blank samples that deem any analytical process out of control or require further corrective action. Methylene chloride and bis(2-ethylhexyl)phthalate concentrations reported for the method blanks submitted should be attributed to laboratory process contamination. Methylene chloride is a solvent used in the preparation and extraction of samples for many analyses. Phthalate esters are thought to originate from the extraction portion of the semivolatiles analysis either through the safety gloves worn by the extraction technician or other theorized origins. Lead and copper were detected in one method blank. Associated results were qualified accordingly. The method blank data were used in the validation process by applying the "5X/10X Rule" and associated samples were qualified accordingly.

C3.1.4 Laboratory Control Samples

Laboratory control samples (LCSs) were used in the analytical program as a measure of accuracy without the influence of matrix on the analysis. The laboratory control sample is best described as a spiked laboratory blank measured and reported by calculating the percent recovery of the known spiked concentrations. An LCS was analyzed with every batch of samples processed and analyzed. The control limits applied were statistically derived by the laboratory as required by the method. The review of the LCS data associated with these site investigation data sets showed the data to be within the specified control limits demonstrating accuracy for the analytical processes employed, except for a few compounds. RDX was outside control limits in the LCS associated with sample delivery group PB029. 2,4,6-Trinitotoluene was outside control limits in PB033, PB035, and PB036. No data were qualified.

C3.1.5 Matrix Spike\Matrix Spike Duplicates

Matrix spikes are used to provide an indication of bias due to matrix effects and a measure of accuracy of associated results. Duplicate analyses, sometimes performed using a matrix spike duplicate in the case of organics analyses, provide a measure of precision in the analytical process. Six matrix spike/matrix spike duplicate (MS/MSD) pairs were analyzed for the Red Water Area Ponds investigation. Samples 7200, 7530R, 7880, 7990, 8100, 8170, 8180, 8430, and 8780 were collected and submitted for an MS/MSD analysis. The observed percent recoveries of the spikes were used to determine accuracy for the analyses. Control limits used to evaluate these recoveries were determined statistically by the laboratory for organics as required by the methods employed. Relative percent difference (RPD) calculations are used to evaluate precision between matrix spike and matrix spike duplicate results. The acceptance criteria for the precision data were statistically determined by the laboratory. Metals data exhibited variability in accuracy for several elements in all of the MS/MSD pairs except 8430. Antimony percent recoveries were low in the MS/MSDs for 7200, 7880, 8180, and 8780. Detects were qualified "J" and non-detects were qualified "UJ". Percent recoveries for several metals fell below the acceptable project range of 80-120 percent in the MS/MSDs of 7200. They were arsenic, silver, and thallium. Thallium was low in 7880 also. Detects were qualified "J" and non-detects were qualified "UJ". Chromium recovery was high in 8780, but low in 8180. Magnesium recovery was high in the MS/MSDs of 7990 and 8780. Detects were qualified "J". Potassium recovery was high in 8180 and 8780. Vanadium recovery was high in 8180. Detects were qualified "J".

Overall, percent recovery for organic MS/MSD compounds was good. For explosive compounds, six compounds in the MSD for 7200 were high. 2,4-Dinitrotoluene and

1,3,5- trinitrobenzene were qualified "J". They were the only compounds detected in the associated samples. HMX recovery was low in 7880. The RPD for pentachlorophenol and pyrene exceeded the acceptable range in the sample pair of 7990. No data were qualified. Only one VOA compound RPD was unacceptable. 1,1-Dichloroethene RPD exceeded the range in the MS/MSD of 7880. No data were qualified.

C3.1.6 Surrogate Standards

Surrogate standards were used in the analytical program to monitor the percent recovery efficiencies of the sample preparation and analytical procedure on a sample-by-sample basis for organic constituents. The surrogate standards used were those required by the analytical methods employed and were compliant with the requirements of the methods. Control limits for the surrogate recoveries were determined statistically by the laboratory as required by the methodology. Evaluation of the surrogate standard data exhibited acceptable results for most analyses. Surrogate recovery for the PCB analysis of 7320 was low. The sample was reanalyzed outside the holding time. The reanalysis was rejected and all compounds in the original were qualified "UJ" as estimated. Surrogate recoveries for the explosives analyses of 7780, 7880, and 8230 were high. No qualifications were necessary. Surrogate recoveries for the semivolatile analyses of 8730 and 8770 were out of control. Both samples were dilutions. 8730 was not reanalyzed. 8770 was reanalyzed after the holding time. The reanalysis was rejected. No qualifications were applied to the original samples. No other problems were encountered in the surrogate standard data reported. All data were found to be acceptable as reported and qualified.

C4.0 Data Quality Objectives

DQOs are qualitative and quantitative criteria used to guide sample collection and analysis activities. The DQOs for the project were developed at the outset of the investigation to ensure that the data generated during the execution of the analytical program were of appropriate quality to support the anticipated end use of the data. DQOs describe the level of uncertainty that a decision-maker is willing to accept in results derived from the environmental data. This uncertainty is used to the quality of the measurement data, usually in terms of objectives, bias, representativeness, comparability and completeness. DQOs seek to ensure that the right type, amount and quality of data are collected to accomplish the objectives of the project. The DQOs for this project are to produce scientifically valid data of known accuracy and precision, which

are complete with respect to identified critical samples, comparable with similar data types and representative of the media sampled so as to be useful for the cited purposes.

In order to achieve these DQOs, criteria were established in the SAP by which these goals could be achieved. The Site Investigation required that all laboratory analyses be performed and resulting data reported as definitive data. A non-CLP, (SW-846) method was employed and Level IV (CLP-like) data packages were provided for evaluation for these samples. Definitive data criteria were chosen because compliance with the criteria specified within its guidelines provides quantified concentrations with acceptable reliability for the purposes of the investigation.

C5.0 Data Useability

The data review process as presented in this report, compares sample results to preestablished criteria to confirm that the data are of acceptable technical quality. Specific criteria were reviewed which verifies the achievement of all precision, accuracy, completeness, comparability and representativeness goals established to meet the project DQOs. To verify that these objectives were met, field measurements, sampling and handling procedures, laboratory analysis and reporting and all nonconformances and discrepancies in the data were examined to determine compliance with the appropriate and applicable procedures. The results of this review were presented in previous sections with all outliers or nonconformances were discussed where they occurred.

Precision data was obtained through the analysis and evaluation of duplicate QA samples. Accuracy was determined through the analysis and evaluation of method blanks, laboratory control samples, trip blanks and matrix spike samples. These QA samples were collected and/or analyzed at the frequency established in the SAP, verifying the completeness element of the goals along with the evaluation of holding times, and reporting limits.

Completeness is a measure of the amount of valid data that are obtained during a sampling event. Although most analyses were acceptable, some data points were rejected in the evaluation process. Acetone, 2-butanone, and 2-hexanone were rejected in several samples due to low RRF values in the initial and continuing calibrations. Only non-detects were rejected. Detects were qualified "J".

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Comparability ensures that results for the sampling event can be compared with data from other past and/or future sampling programs. Comparability for this sampling event was achieved through the use of established and recognized techniques and accepted standard EPA methods. All samples collected and analyzed were subjected to the same sampling, handling, preparation, analysis, reporting and validation criteria for the purpose of achieving comparability goals within the data set.

To verify sample representativeness, field data such as field activity daily logs (FADL), sample collection logs, COC/RFA forms, field instrument calibrations and variances were reviewed. The overall results of the analyses as discussed in this evaluation suggest that representative samples were collected and analyzed with results being indicative of the media analyzed with the exception of the few anomalies noted. Organic chemicals were omitted from consideration if they were common laboratory contaminants or could be traced to some other source within the analytical investigation process.

All analytical results for chemicals are reported using validation qualifiers. Chemicals flagged with a "U" qualifier are considered to be not detected, or detected at a concentration below the normal, random "noise" of the analytical instrument. The "J" qualifier describes an estimated value when a compound is qualitatively identified (spectral identification criteria are met), but at values less that the project-required reporting limit. The "UJ" qualifier is applied to analytes that are not detected above the reporting limit. The reporting limit, however, is approximate. The "R" qualifier is used to denote data that are rejected because of deficiencies in the ability to analyze the sample and meet QC criteria. The absence or presence of an analyte cannot be verified.

C6.0 Conclusions

The purpose of the direct-push sampling effort at the Red Water Ponds Areas was to determine the nature and extent of source areas. Specifically, the objectives of the investigation were as follows: to delineate the vertical and lateral extent of overburden contamination in the Red Water Ponds Area in anticipation of future remedial action and to collect data for use in fate and transport modeling. To accomplish this goal, samples were collected and definitive data were generated for the contaminants of potential concern. Evaluation of the data using the specific DQOs established for the project and the data validation process resulted in the determination

that the data set is valid and of sufficient quality to meet the objectives of the investigation. There were no significant problems observed that would adversely affect the application of the data or the success of the overall investigation.

Table C-1

Field Duplicate Results
Pentolite Road Red Water Ponds
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-PRRP-DP01-7200 (0-1.0)

Parameter	7200 Original (mg/kg)	7201 Duplicate (mg/kg)	RPD %
bis(2-Ethylhexyl)phthalate	4.1 U	0.047 J	NC
Aluminum	9370	10100	7.5
Arsenic	4.5 J	6.3 J	33.3
Barium	84.3	80.1	5.1
Beryllium	0.69	0.73	5.6
Calcium	5740	5080	12.2
Chromium	14.7	16.1	9.1
Cobalt	11.1	10.4	6.5
Copper	22.6	24.0	6.0
Iron	18000	21400	17.3
Lead	8.6	9.0	4.5
Magnesium	2480	2620	5.5
Manganese	321	275	15.4
Nickel	27.2	32.7	18.4
Potassium	777	1060	30.8
Selenium	0.84	0.68	21.1
Sodium	1240	985	22.9
Vanadium	19.1	22.0	14.1
Zinc	78.5	78.6	0.1
2,4-Dinitrotoluene	0.25 U	0.28 J	NC
1,3,5-Trinitrobenzene	0.25 U	0.34 J	NC

U = Compound analyzed for but not detected; value given is quantitation limit.
J = Compound detected but value is estimated.
NC = Not calculable.

Table C-2

Field Duplicate Results
Pentolite Road Red Water Ponds
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-PRRP-DP09-7530 (4.0-5.0)

Parameter	7530R Original (mg/kg)	7531R Duplicate (mg/kg)	RPD %
2,4-Dinitrotoluene	0.056 J	0.083 J	38.8
Toluene	0.0017 J	0.0018 J	5.7
Aluminum	4410	9820	76.0
Arsenic	2.6	6.6	198
Barium	24.9 U	81.4	NC
Calcium	63200	47900	27.5
Chromium	9.2	15.4	50.4
Cobalt	6.2 U	10.4	NC
Copper	11.2	18.9	51.2
Iron	9480	18700	65.4
Lead	4.9	7.5	41.9
Magnesium	16800	17200	2.4
Manganese	184 J	727 J	119
Nickel	8.4	27.6	107
Potassium	1050	1870	56.2
Vanadium	20.9 J	27.2 J	26.2
Zinc	24.8	54.1	74.3

U = Compound analyzed for but not detected; value given is quantitation limit.
J = Compound detected but value is estimated.
NC = Not calculable.

Table C-3

Field Duplicate Results
Pentolite Road Red Water Ponds
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-GW-PRRP-DP17-7870

Parameter	7870 Original (ug/L)	7871 Duplicate (ug/L)	RPD %
2,4-Dinitrotoluene (by 8270)	1.5 J	2.4 J	46.2
1,3-Dinitrobenzene	6.4	1.7	116
2,4-Dinitrotoluene (by 8330)	8.9	3.7	82.5
2,6-Dinitrotoluene	1.7	0.51	108
Aluminum (Total)	38600	1930	181
Barium (Total)	218	200 U	NC
Calcium (Dissolved)	55000	56400	2.5
Calcium (Total)	1270000	86100	175
Chromium (Total)	65.8	10 U	NC
Copper (Total)	106	25 U	NC
Iron (Total)	87000	4250	181
Magnesium (Dissolved)	13200	13600	3.0
Magnesium (Total)	286000	21200	172
Manganese (Dissolved)	22.4	25.4	12.6
Manganese (Total)	3280	141	184
Nickel (Total)	113	40 U	NC
Potassium (Total)	6430	5000 U	NC
Sodium (Total)	6010	5000 U	NC
Vanadium (Total)	163	50 U	NC
Zinc (Dissolved)	28.7	41.1	35.5
Zinc (Total)	341	44.7	154

U = Compound analyzed for but not detected; value given is quantitation limit.
J = Compound detected but value is estimated.
NC = Not calculable.

Table C-4

Field Duplicate Results
Pentolite Road Red Water Ponds
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-PRRP-DP18-7880 (0-1.0)

Parameter	7880 Original (mg/kg)	7881 Duplicate (mg/kg)	RPD %
bis(2-Ethylhexyl)phthalate	0.38 U	0.047 J	NC
Aluminum	10700	8940	22.9
Arsenic	4.0 J	7.3 J	58.4
Barium	32.3	41.0	23.7
Calcium	1040	2360	77.6
Chromium	14.6	15.8	7.9
Cobalt	6.2	7.3	16.3
Copper	7.5	13.7	58.5
Iron	17800	19900	11.1
Lead	5.6	6.1	8.5
Magnesium	1120	1630	37.1
Manganese	158	216	31.0
Nickel	9.8	17.7	57.5
Vanadium	30.3	27.5	9.7
Zinc	27.9	39.5	34.4

U = Compound analyzed for but not detected; value given is quantitation limit.
J = Compound detected but value is estimated.
NC = Not calculable.

Table C-5

Field Duplicate Results
West Area Red Water Ponds
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-WARP-DP03-8180 (0-1.0)

Parameter	8180 Original (mg/kg)	8181 Duplicate (mg/kg)	RPD %
bis(2-Ethylhexyl)phthalate	0.390 U	0.068 J	NC
Aluminum	16500	14700	11.5
Arsenic	8.1	6.5	21.9
Barium	112	158	34.1
Beryllium	0.76 J	0.81 J	6.4
Cadmium	0.59	0.89	40.5
Calcium	2710	2560	5.7
Chromium	19.9 J	17.4 J	13.4
Cobalt	17.9	20.9	15.5
Copper	21.4	22.5	5.0
Iron	30200	26300	13.8
Lead	11.7	10.3	12.7
Magnesium	3760	3630	3.5
Manganese	1340	1270	5.4
Nickel	44.3	45.6	2.9
Potassium	2970 J	2350 J	23.3
Vanadium	32.5 J	26.7 J	19.6
Zinc	111	111	0

U = Compound analyzed for but not detected; value given is quantitation limit.
J = Compound detected but value is estimated.
NC = Not calculable.

Table C-6

Field Duplicate Results
West Area Red Water Ponds
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-WARP-DP09-8430 (4.0-5.0)

Parameter	8430 Original (ug/kg)	8431 Duplicate (ug/kg)	RPD %
Anthracene	390 U	36 J	NC
Benzo(a)anthracene	390 U	110 J	NC
Benzo(a)pyrene	390 U	84 J	NC
Benzo(b)fluoranthene	390 U	74 J	NC
Benzo(ghi)perylene	390 U	46 J	NC
Benzo(k)fluoranthene	390 U	87 J	NC
Chrysene	390 U	100 J	NC
Fluoranthene	58 J	240 J	122
Indeno(1,2,3-cd)pyrene	390 U	47 J	NC
Phenanthrene	390 U	140 J	NC
Pyrene	43 J	180 J	123

U = Compound analyzed for but not detected; value given is quantitation limit.
J = Compound detected but value is estimated.
NC = Not calculable.

Table C-6

Field Duplicate Results
West Area Red Water Ponds
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-WARP-DP09-8430 (4.0-5.0)

Parameter	8430 Original (mg/kg)	8431 Duplicate (mg/kg)	RPD %
Aluminum	6470	5370	18.6
Arsenic	2.2	2.4	8.7
Barium	41.3	37.2	10.4
Calcium	1220	1100	10.3
Chromium	8.2	6.7	20.1
Copper	4.9	7.1	36.7
Iron	8490	7110	17.7
Lead	5.8	4.1	34.3
Magnesium	2010	1660	19.1
Manganese	83.4	91.2	8.9
Nickel	7.4	6.8	8.5
Vanadium	14.2 J	10.9 J	26.3
Zinc	30.6	27.3	11.4

U = Compound analyzed for but not detected; value given is quantitation limit.
J = Compound detected but value is estimated.
NC = Not calculable.

Table C-7

Field Duplicate Results
West Area Red Water Ponds
Former Plum Brook Ordnance Works, Sandusky, Ohio
PBOW-98-SO-WARP-DP18-8780 (0.0-1.0)

Parameter	8780 Original (mg/kg)	8781 Duplicate (mg/kg)	RPD %
Aluminum	10700	9480	12.1
Arsenic	5.3	5.5	3.7
Barium	61.9	60.3	2.6
Beryllium	0.59	0.61	3.3
Calcium	7330	11400	43.5
Chromium	15.3 J	14.3 J	6.8
Cobalt	11.1	10.7	3.7
Copper	17.3	18.0	4.0
Iron	18400	18400	0
Lead	9.6	11.9	21.4
Magnesium	4680 J	5000 J	6.6
Manganese	453	350	26.6
Nickel	23.5	22.7	3.5
Potassium	1270 J	1180 J	7.4
Vanadium	23.0	21.2	8.1
Zinc	60.3	64.6	6.9

U = Compound analyzed for but not detected; value given is quantitation limit.
J = Compound detected but value is estimated.
NC = Not calculable.

Table C-8

Summary of Chemical Analyses and Methodologies
Direct Push Investigation of Red Water Ponds Areas
Former Plum Brook Ordnance Works, Sandusky, Ohio

Matrix	Analytical Parameters	Analytical Method
Soil	TCL Volatile Organic Compounds	SW-846 8260A[a]
	TCL Semivolatile Organic Compounds	SW-846 3520B/3541/8270B[a]
	TAL Metals	SW-846 3050A/6010A[b] for Ag, Al, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Sb, Tl, V, Zn 7471A[a] for Hg 7060A[b] for As 7740[b] for Se
	PCBs	SW-846 3520B/8081[a]
	Nitroaromatic Compounds	SW-846/8330[c] (as modified)
Water	TCL Volatile Organic Compounds	SW-846 8260A[a]
	TCL Semivolatile Organic Compounds	SW-846 3520B/3541/8270B[a]
	TAL Metals	SW-846 3050A/6010A[b] for Ag, Al, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Sb, Tl, V, Zn 7470A[a] for Hg 7060A[b] for As 7740[b] for Se
	PCBs	SW-846 3520B/8081[a]
	Nitroaromatic Compounds	SW-846/8330[c] (as modified)
	TOC, Total Cyanide Alkalinity, Chloride, TDS, TSS, Nitrate Sulfate	SW-846 9060, 9010A MCAWW[d] 310.1, 325.2 160.1, 160.2, 353.2 375.4

[a]U.S. Environmental Protection Agency (EPA), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third Edition, Update II, September 1994.
[b]U.S. Environmental Protection Agency (EPA), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third Edition, Update I, July 1992.
[c]U.S. Environmental Protection Agency (EPA), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third Edition, Revision 1, December 1990
[d]U.S. Environmental Protection Agency (EPA), *Methods for Chemical Analysis of Water and Wastes,* EPA-600/4-79-020, March 1983 and subsequent revisions

TCL - Target compound list
TAL - Target analyte list
TDS - Total dissolved solids
TOC - Total organic carbon
TSS - Total suspended solids

Table C-9

Nitrate Analysis Results
Methods E300 and E353.2
Former Plum Brook Ordnance Works
Sandusky, Ohio

Sample	E300 (ug/L)	E353.2 (ug/L)	RPD %
7270	500 U	1000 U	NC
7310	465000	130000 J	113
7350	500 U	100 U	NC
7550	16900	16400 J	3.0
7990	500 U	100 U	NC
8610	1600	1700 J	6.0

U = Compound analyzed for but not detected; value given is quantitation limit.
J = Compound detected but value is estimated.
NC = Not calculable.

APPENDIX D

DATA VALIDATION SUMMARY

E & I Technologies, Inc.

Plum Brook Ordnance Works
Data Validation Summary Report

August, 1998

Analytical results from soil and water samples, collected in June, 1998, were 100% validated at Level III according to the EPA National Functional Guidelines for Data Review. Volatiles, Semi-volatiles, PCBs, Explosives, Metals, and miscellaneous analyses were reviewed from 10 SDGs including PB027, PB028, PB029, PB030, PB031, PB032, PB033, PB034, PB035, and PB036.

Volatiles. Sixteen samples from SDGs -027, -031, and -034 were not correctly preserved and consequently the aromatic fraction was analyzed outside of the acceptable QC holding times. These compounds were qualified as "UJ/J" in the samples. Additionally, 36 samples from the same SDGs required an "R" or "J" qualifier for acetone, 2-butanone, and 2-hexanone due to low RRFs(<0.05) for both the initial and continuing calibration standards analyses. Low Internal Standard (IS) counts for 13 samples in SDGs -028, -029, -032, -033, and -036 resulted in the compounds associated with the IS being qualified as "UJ/J". Due to the trip blank and equipment rinsate blank contamination, acetone was qualified as "U" and raised to the reporting limit in 35 samples, toluene in 23, TCE in 3 three, and chloroform in one. Contamination in the method blank resulted in methylene chloride being qualified as "U" and raised to the reporting limit in 18 samples across all of the SDGs.

Semi-volatiles. Five samples from -028 had a low perylene IS area count and the associated compounds were qualified as "UJ". Bis- (2 ethyl hexyl) phthalate was qualified as "U" in one sample in -034.

Pesticides/PCBs. One sample from -028 had low surrogate recoveries and was qualified as "UJ".

(continued, Page 1 of 2)

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Explosives. The soil samples from -028, -029, -030, -032, -033, -035, and -036 did not have the detected results corrected for the percent moisture content of the sample. All results were corrected and changed on their respective Form I. Twenty samples were changed in the effected SDGs. One sample in -027 had tetryl reported on the primary column, an inspection of the confirmation analysis did not show tetryl detected. The original value was lowered to the reporting limit and qualified as "U". In -029, one sample had results for 2,4-DNT and 1,3,5-TNB that were qualified as "J" since it appeared that they could have been effected by residual contamination from the previous sample.

Metals. High or low recoveries in the matrix spike resulted in a number of elements being qualified as "UJ/J" in 85 samples across all SDGs. The effected elements were antimony, thallium, lead, arsenic, selenium, silver, potassium, magnesium, chromium, vanadium, and manganese. Additionally, high percent difference in the serial dilution analysis had vanadium, lead, chromium, and beryllium qualified as "J" in a total of 53 samples from -027, -032, -035, and -036.

Wet Chemistry. No qualifiers were required.

APPENDIX E

ANALYTICAL DATA DUMP

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PB-BG-S1		PB-BG-S1		PB-BG-S2		PB-BG-S2		PB-BG-S3	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S1-0.5-3.0		PB-BG-S1-3.0-5.0		PB-BG-S2-0.5-3.0		PB-BG-S2-3.0-5.0		PB-BG-S3-0.5-3.0	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94		01-NOV-94	
Depth:		.5 - 3		3 - 5		.5 - 3		3 - 5		.5 - 3	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,1,2,2-Tetrachloroethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,1,2-Trichloroethane	mg/kg										
1,1-Dichloroethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,1-Dichloroethene	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,2-Dichloroethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,2-Dichloroethene	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,2-Dichloropropane	mg/kg	.0005		.0005		.0005		.0005		.0005	
2-Butanone	mg/kg	.011		.0115		.011		.0115		.011	
2-Hexanone	mg/kg	.0055		.0055		.0055		.006		.0055	
4-Methyl-2-pentanone	mg/kg	.0055		.0055		.0055		.006		.0055	
Acetone	mg/kg	.011		.0115		.011		.0115		.011	
Benzene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Bromodichloromethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
Bromoform	mg/kg	.0005		.0005		.0005		.0005		.0005	
Bromomethane	mg/kg	.001		.001		.001		.001		.001	
Carbon disulfide	mg/kg	.011		.0115		.011		.0115		.011	
Carbon tetrachloride	mg/kg	.0005		.0005		.0005		.0005		.0005	
Chlorobenzene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Chloroethane	mg/kg	.001		.001		.001		.001		.001	
Chloroform	mg/kg	.0005		.0005		.0005		.0005		.0005	
Chloromethane	mg/kg	.001		.001		.001		.001		.001	
Dibromochloromethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
Ethylbenzene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Methylene chloride	mg/kg	.0005		.0005		.0005		.0005		.0005	
Styrene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Tetrachloroethene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Toluene	mg/kg	.0005		.0022		.0005		.0013		.0017	
Total xylenes	mg/kg	.0005		.0005		.0012		.0005		.0005	
Trichloroethene	mg/kg	.0014		.0005		.0005		.0045		.0005	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PB-BG-S3		PB-BG-S4		PB-BG-S5		PB-BG-S5		PB-BG-S6	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S3-3.0-4.0		PB-BG-S4-0.5-3.0		PB-BG-S5-0.5-3.0		PB-BG-S5-3.0-5.0		PB-BG-S6-0.5-3.0	
Sample Date:		01-NOV-94		30-OCT-94		30-OCT-94		30-OCT-94		01-NOV-94	
Depth:		3 - 4		.5 - 3		.5 - 3		3 - 5		.5 - 3	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,1,2,2-Tetrachloroethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,1,2-Trichloroethane	mg/kg										
1,1-Dichloroethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,1-Dichloroethene	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,2-Dichloroethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,2-Dichloroethene	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,2-Dichloropropane	mg/kg	.0005		.0005		.0005		.0005		.0005	
2-Butanone	mg/kg	.011		.012		.011		.012		.0115	
2-Hexanone	mg/kg	.0055		.006		.0055		.006		.0055	
4-Methyl-2-pentanone	mg/kg	.0055		.006		.0055		.006		.0055	
Acetone	mg/kg	.011		.012		.011		.012		.0115	
Benzene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Bromodichloromethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
Bromoform	mg/kg	.0005		.0005		.0005		.0005		.0005	
Bromomethane	mg/kg	.001		.001		.001		.001		.001	
Carbon disulfide	mg/kg	.011		.012		.011		.012		.0115	
Carbon tetrachloride	mg/kg	.0005		.0005		.0005		.0005		.0005	
Chlorobenzene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Chloroethane	mg/kg	.001		.001		.001		.001		.001	
Chloroform	mg/kg	.0005		.0005		.0005		.0005		.0005	
Chloromethane	mg/kg	.001		.001		.001		.001		.001	
Dibromochloromethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
Ethylbenzene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Methylene chloride	mg/kg	.0005		.0005		.0005		.0005		.0005	
Styrene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Tetrachloroethene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Toluene	mg/kg	.0019		.0035		.0005		.0005		.0005	
Total xylenes	mg/kg	.0005		.0035		.0005		.0005		.0005	
Trichloroethe	mg/kg	.0005		0005		.0012		.0005		05	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PB-BG-S6		PB-BG-S7		PB-BG-S8		PB-BG-S9		PB-BG-S9	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S6-3.0-4.5		PB-BG-S7-0.5-3.0		PB-BG-S8-0.5-3.0		PB-BG-S9-0.5-3.0		PB-BG-S9-3.0-5.0	
Sample Date:		01-NOV-94		01-NOV-94		30-OCT-94		01-NOV-94		01-NOV-94	
Depth:		3 - 4.5		.5 - 3		.5 - 3		.5 - 3		3 - 5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,1,2,2-Tetrachloroethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,1,2-Trichloroethane	mg/kg										
1,1-Dichloroethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,1-Dichloroethene	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,2-Dichloroethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,2-Dichloroethene	mg/kg	.0005		.0005		.0005		.0005		.0005	
1,2-Dichloropropane	mg/kg	.0005		.0005		.0005		.0005		.0005	
2-Butanone	mg/kg	.0115		.0115		.012		.011		.012	
2-Hexanone	mg/kg	.0055		.0055		.006		.0055		.006	
4-Methyl-2-pentanone	mg/kg	.0055		.0055		.006		.0055		.006	
Acetone	mg/kg	.0115		.0115		.012		.011		.012	
Benzene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Bromodichloromethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
Bromoform	mg/kg	.0005		.0005		.0005		.0005		.0005	
Bromomethane	mg/kg	.001		.001		.001		.001		.001	
Carbon disulfide	mg/kg	.0115		.0115		.012		.011		.012	
Carbon tetrachloride	mg/kg	.0005		.0005		.0005		.0005		.0005	
Chlorobenzene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Chloroethane	mg/kg	.001		.001		.001		.001		.001	
Chloroform	mg/kg	.0005		.0005		.0005		.0005		.0005	
Chloromethane	mg/kg	.001		.001		.001		.001		.001	
Dibromochloromethane	mg/kg	.0005		.0005		.0005		.0005		.0005	
Ethylbenzene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Methylene chloride	mg/kg	.0005		.0005		.0005		.0005		.0005	
Styrene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Tetrachloroethene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Toluene	mg/kg	.0005		.0005		.0005		.0005		.0005	
Total xylenes	mg/kg	.0005		.0005		.0005		.0005		.0005	
Trichloroethene	mg/kg	.0005		.0005		.0046		.0005		.0022	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		WARP-DP01		WARP-DP02		WARP-DP03		WARP-DP04		WARP-DP05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8110		8140		8180		8240		8270	
Sample Date:		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98		16-JUN-98	
Depth:		4 - 6		0 - 2		0 - 2		8 - 10		4 - 6	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
1,1,2,2-Tetrachloroethane	mg/kg	.00315	U	.003	UJ	.00295	U	.0032	U	.00305	U
1,1,2-Trichloroethane	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
1,1-Dichloroethane	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
1,1-Dichloroethene	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
1,2-Dichloroethane	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
1,2-Dichloroethene	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
1,2-Dichloropropane	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
2-Butanone	mg/kg	.0125	U	.012	U	.012	U	.0125	U	.012	U
2-Hexanone	mg/kg	.0125	U	.012	U	.012	U	.0125	U	.012	U
4-Methyl-2-pentanone	mg/kg	.0125	U	.012	U	.012	U	.0125	U	.012	U
Acetone	mg/kg	.0125	U	.012	U	.012	U	.0125	U	.012	U
Benzene	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
Bromodichloromethane	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
Bromoform	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
Bromomethane	mg/kg	.0065	U	.006	U	.006	U	.0065	U	.006	U
Carbon disulfide	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
Carbon tetrachloride	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
Chlorobenzene	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
Chloroethane	mg/kg	.0065	U	.006	U	.006	U	.0065	U	.006	U
Chloroform	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
Chloromethane	mg/kg	.0065	U	.006	U	.006	U	.0065	U	.006	U
Dibromochloromethane	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
Ethylbenzene	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
Methylene chloride	mg/kg	.0032	B	.0023	B	.0039	B	.0027	B	.00305	U
Styrene	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
Tetrachloroethene	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
Toluene	mg/kg	.0022	J	.0018	J	.00295	U	.0025	J	.00305	U
Total xylenes	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
Trichloroethe	mg/kg	.00315	U	003	U	.00295	U	.0032	U	305	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		WARP-DP06		WARP-DP07		WARP-DP08		WARP-DP09		WARP-DP10	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8300		8350		8380		8430		8460	
Sample Date:		23-JUN-98		25-JUN-98		15-JUN-98		16-JUN-98		26-JUN-98	
Depth:		0 - 2		4 - 6		0 - 2		4 - 6		0 - 2	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	mg/kg	.0028	U	.0029	U	.0029	U	.003	U	.0029	U
1,1,2,2-Tetrachloroethane	mg/kg	.0028	U	.0029	UJ	.0029	U	.003	U	.0029	UJ
1,1,2-Trichloroethane	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
1,1-Dichloroethane	mg/kg	.0028	U	.0029	U	.0029	U	.003	U	.0029	U
1,1-Dichloroethene	mg/kg	.0028	U	.0029	U	.0029	U	.003	U	.0029	U
1,2-Dichloroethane	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
1,2-Dichloroethene	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
1,2-Dichloropropane	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
2-Butanone	mg/kg	.011	U	.0115	U	.0115	U	.012	U	.0115	U
2-Hexanone	mg/kg	.011	U	.0115	U	.0115	U	.012	UJ	.0115	U
4-Methyl-2-pentanone	mg/kg	.011	U	.0115	U	.0115	U	.012	UJ	.0115	U
Acetone	mg/kg	.011	U	.0115	U	.035		.012	U	.0115	U
Benzene	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
Bromodichloromethane	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
Bromoform	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
Bromomethane	mg/kg	.0055	U	.006	U	.006	U	.006	U	.006	U
Carbon disulfide	mg/kg	.0028	U	.0029	U	.0029	U	.003	U	.0029	U
Carbon tetrachloride	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
Chlorobenzene	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
Chloroethane	mg/kg	.0055	U	.006	U	.006	U	.006	U	.006	U
Chloroform	mg/kg	.0028	U	.0029	U	.0029	U	.003	U	.0029	U
Chloromethane	mg/kg	.0055	U	.006	U	.006	U	.006	U	.006	U
Dibromochloromethane	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
Ethylbenzene	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
Methylene chloride	mg/kg	.0018	B	.0032	B	.002	J	.003	U	.0027	B
Styrene	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
Tetrachloroethene	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
Toluene	mg/kg	.0023	J	.0029	U	.0029	U	.003	UJ	.0029	U
Total xylenes	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
Trichloroethene	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		WARP-DP11		WARP-DP12		WARP-DP13		WARP-DP15		WARP-DP16	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8500		8550		8580		8670		8700	
Sample Date:		25-JUN-98		15-JUN-98		15-JUN-98		24-JUN-98		24-JUN-98	
Depth:		0 - 2		4 - 6		0 - 2		4 - 6		0 - 2	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
1,1,2,2-Tetrachloroethane	mg/kg	.003	UJ	.0031	U	.00285	U	.00295	U	.003	U
1,1,2-Trichloroethane	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
1,1-Dichloroethane	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
1,1-Dichloroethene	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
1,2-Dichloroethane	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
1,2-Dichloroethene	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
1,2-Dichloropropane	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
2-Butanone	mg/kg	.012	U	.0125	U	.0115	U	.012	U	.012	U
2-Hexanone	mg/kg	.012	U	.0125	U	.0115	U	.012	U	.012	U
4-Methyl-2-pentanone	mg/kg	.012	U	.0125	U	.0115	U	.012	U	.012	U
Acetone	mg/kg	.012	U	.0125	U	.0115	U	.012	U	.012	U
Benzene	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
Bromodichloromethane	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
Bromoform	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
Bromomethane	mg/kg	.006	U	.006	U	.0055	U	.006	U	.006	U
Carbon disulfide	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
Carbon tetrachloride	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
Chlorobenzene	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
Chloroethane	mg/kg	.006	U	.006	U	.0055	U	.006	U	.006	U
Chloroform	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
Chloromethane	mg/kg	.006	U	.006	U	.0055	U	.006	U	.006	U
Dibromochloromethane	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
Ethylbenzene	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
Methylene chloride	mg/kg	.0037	B	.002	J	.0023	J	.0025	B	.0026	B
Styrene	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
Tetrachloroethene	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
Toluene	mg/kg	.0032	J	.0031	U	.00285	U	.0021	J	.003	U
Total xylenes	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
Trichloroeth	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	3	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		WARP-DP17		WARP-DP18		WARP-DP19		WARP-DP20	
Associated Site:		WARP		WARP		WARP		WARP	
Sample No:		8750		8780		8820		8870	
Sample Date:		25-JUN-98		25-JUN-98		24-JUN-98		24-JUN-98	
Depth:		4 - 6		0 - 2		0 - 2		4 - 6	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
1,1,2,2-Tetrachloroethane	mg/kg	.00305	U	.00285	UJ	.0028	U	.00285	U
1,1,2-Trichloroethane	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
1,1-Dichloroethane	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
1,1-Dichloroethene	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
1,2-Dichloroethane	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
1,2-Dichloroethene	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
1,2-Dichloropropane	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
2-Butanone	mg/kg	.012	U	.0115	U	.011	U	.0115	U
2-Hexanone	mg/kg	.012	U	.0115	U	.011	U	.0115	U
4-Methyl-2-pentanone	mg/kg	.012	U	.0115	U	.011	U	.0115	U
Acetone	mg/kg	.012	U	.0115	U	.011	U	.0115	U
Benzene	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
Bromodichloromethane	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
Bromoform	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
Bromomethane	mg/kg	.006	U	.0055	U	.0055	U	.0055	U
Carbon disulfide	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
Carbon tetrachloride	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
Chlorobenzene	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
Chloroethane	mg/kg	.006	U	.0055	U	.0055	U	.0055	U
Chloroform	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
Chloromethane	mg/kg	.006	U	.0055	U	.0055	U	.0055	U
Dibromochloromethane	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
Ethylbenzene	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
Methylene chloride	mg/kg	.00305	U	.0019	B	.0024	B	.0024	B
Styrene	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
Tetrachloroethene	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
Toluene	mg/kg	.0022	J	.00285	U	.0028	U	.0015	J
Total xylenes	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
Trichloroethene	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PB-BG-S1		PB-BG-S1		PB-BG-S2		PB-BG-S2		PB-BG-S3	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S1-0.5-3.0		PB-BG-S1-3.0-5.0		PB-BG-S2-0.5-3.0		PB-BG-S2-3.0-5.0		PB-BG-S3-0.5-3.0	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94		01-NOV-94	
Depth:		.5 - 3		3 - 5		.5 - 3		3 - 5		.5 - 3	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl acetate	mg/kg	.0055		.0055		.0055		.006		.0055	
Vinyl chloride	mg/kg	.0002		.00025		.0002		.00025		.0002	
cis-1,2-Dichloroethene	mg/kg	.0005		.0005		.0005		.0005		.0005	
cis-1,3-Dichloropropene	mg/kg	.0005		.0005		.0005		.0005		.0005	
trans-1,3-Dichloropropene	mg/kg	.0005		.0005		.0005		.0005		.0005	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PB-BG-S3		PB-BG-S4		PB-BG-S5		PB-BG-S5		PB-BG-S6	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S3-3.0-4.0		PB-BG-S4-0.5-3.0		PB-BG-S5-0.5-3.0		PB-BG-S5-3.0-5.0		PB-BG-S6-0.5-3.0	
Sample Date:		01-NOV-94		30-OCT-94		30-OCT-94		30-OCT-94		01-NOV-94	
Depth:		3 - 4		.5 - 3		.5 - 3		3 - 5		.5 - 3	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl acetate	mg/kg	.0055		.006		.0055		.006		.0055	
Vinyl chloride	mg/kg	.0002		.00025		.0002		.00025		.00025	
cis-1,2-Dichloroethene	mg/kg	.0005		.0005		.0005		.0005		.0005	
cis-1,3-Dichloropropene	mg/kg	.0005		.0005		.0005		.0005		.0005	
trans-1,3-Dichloropropene	mg/kg	.0005		.0005		.0005		.0005		.0005	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PB-BG-S6		PB-BG-S7		PB-BG-S8		PB-BG-S9		PB-BG-S9	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S6-3.0-4.5		PB-BG-S7-0.5-3.0		PB-BG-S8-0.5-3.0		PB-BG-S9-0.5-3.0		PB-BG-S9-3.0-5.0	
Sample Date:		01-NOV-94		01-NOV-94		30-OCT-94		01-NOV-94		01-NOV-94	
Depth:		3 - 4.5		.5 - 3		.5 - 3		.5 - 3		3 - 5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl acetate	mg/kg	.0055		.0055		.006		.0055		.006	
Vinyl chloride	mg/kg	.0002		.00025		.00025		.0002		.00025	
cis-1,2-Dichloroethene	mg/kg	.0005		.0005		.0013		.0005		.0005	
cis-1,3-Dichloropropene	mg/kg	.0005		.0005		.0005		.0005		.0005	
trans-1,3-Dichloropropene	mg/kg	.0005		.0005		.0005		.0005		.0005	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		WARP-DP01		WARP-DP02		WARP-DP03		WARP-DP04		WARP-DP05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8110		8140		8180		8240		8270	
Sample Date:		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98		16-JUN-98	
Depth:		4 - 6		0 - 2		0 - 2		8 - 10		4 - 6	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl acetate	mg/kg										
Vinyl chloride	mg/kg	.0065	U	.006	U	.006	U	.0065	U	.006	U
cis-1,2-Dichloroethene	mg/kg										
cis-1,3-Dichloropropene	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U
trans-1,3-Dichloropropene	mg/kg	.00315	U	.003	U	.00295	U	.0032	U	.00305	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		WARP-DP06		WARP-DP07		WARP-DP08		WARP-DP09		WARP-DP10	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8300		8350		8380		8430		8460	
Sample Date:		23-JUN-98		25-JUN-98		15-JUN-98		16-JUN-98		26-JUN-98	
Depth:		0 - 2		4 - 6		0 - 2		4 - 6		0 - 2	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl acetate	mg/kg										
Vinyl chloride	mg/kg	.0055	U	.006	U	.006	U	.006	U	.006	U
cis-1,2-Dichloroethene	mg/kg										
cis-1,3-Dichloropropene	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U
trans-1,3-Dichloropropene	mg/kg	.0028	U	.0029	U	.0029	U	.003	UJ	.0029	U

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West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		WARP-DP11		WARP-DP12		WARP-DP13		WARP-DP15		WARP-DP16	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8500		8550		8580		8670		8700	
Sample Date:		25-JUN-98		15-JUN-98		15-JUN-98		24-JUN-98		24-JUN-98	
Depth:		0 - 2		4 - 6		0 - 2		4 - 6		0 - 2	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl acetate	mg/kg										
Vinyl chloride	mg/kg	.006	U	.006	U	.0055	U	.006	U	.006	U
cis-1,2-Dichloroethene	mg/kg										
cis-1,3-Dichloropropene	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U
trans-1,3-Dichloropropene	mg/kg	.003	U	.0031	U	.00285	U	.00295	U	.003	U

Report Date: 09/19/00

Sample Location:		WARP-DP17		WARP-DP18		WARP-DP19		WARP-DP20	
Associated Site:		WARP		WARP		WARP		WARP	
Sample No:		8750		8780		8820		8870	
Sample Date:		25-JUN-98		25-JUN-98		24-JUN-98		24-JUN-98	
Depth:		4 - 6		0 - 2		0 - 2		4 - 6	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl acetate	mg/kg								
Vinyl chloride	mg/kg	.006	U	.0055	U	.0055	U	.0055	U
cis-1,2-Dichloroethene	mg/kg								
cis-1,3-Dichloropropene	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U
trans-1,3-Dichloropropene	mg/kg	.00305	U	.00285	U	.0028	U	.00285	U

Report Date: 09/19/00

Sample Location:		PB-BG-S1		PB-BG-S1		PB-BG-S2		PB-BG-S2		PB-BG-S3	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S1-0.5-3.0		PB-BG-S1-3.0-5.0		PB-BG-S2-0.5-3.0		PB-BG-S2-3.0-5.0		PB-BG-S3-0.5-3.0	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94		01-NOV-94	
Depth:		.5 - 3		3 - 5		.5 - 3		3 - 5		.5 - 3	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	mg/kg	.18		.19		.185		.19		.18	
1,2-Dichlorobenzene	mg/kg	.18		.19		.185		.19		.18	
1,3-Dichlorobenzene	mg/kg	.18		.19		.185		.19		.18	
1,4-Dichlorobenzene	mg/kg	.18		.19		.185		.19		.18	
2,4,5-Trichlorophenol	mg/kg	.18		.19		.185		.19		.18	
2,4,6-Trichlorophenol	mg/kg	.18		.19		.185		.19		.18	
2,4-Dichlorophenol	mg/kg	.18		.19		.185		.19		.18	
2,4-Dimethylphenol	mg/kg	.18		.19		.185		.19		.18	
2,4-Dinitrophenol	mg/kg	.895		.94		.915		.96		.895	
2,4-Dinitrotoluene	mg/kg	.18		.19		.185		.19		.18	
2,6-Dinitrotoluene	mg/kg	.18		.19		.185		.19		.18	
2-Chloronaphthalene	mg/kg	.18		.19		.185		.19		.18	
2-Chlorophenol	mg/kg	.18		.19		.185		.19		.18	
2-Methylnaphthalene	mg/kg	.18		.19		.185		.19		.18	
2-Methylphenol	mg/kg	.18		.19		.185		.19		.18	
2-Nitroaniline	mg/kg	.895		.94		.915		.96		.895	
2-Nitrophenol	mg/kg	.18		.19		.185		.19		.18	
3,3'-Dichlorobenzidine	mg/kg	.36		.375		.365		.385		.36	
3-Nitroaniline	mg/kg	.895		.94		.915		.96		.895	
4,6-Dinitro-2-methylphenol	mg/kg	.895		.94		.915		.96		.895	
4-Bromophenyl phenyl ether	mg/kg	.18		.19		.185		.19		.18	
4-Chloro-3-methylphenol	mg/kg	.36		.375		.365		.385		.36	
4-Chloroaniline	mg/kg	.36		.375		.365		.385		.36	
4-Chlorophenyl phenyl ether	mg/kg	.18		.19		.185		.19		.18	
4-Methylphenol	mg/kg	.18		.19		.185		.19		.18	
4-Nitroaniline	mg/kg	.36		.375		.365		.385		.36	
4-Nitrophenol	mg/kg	.895		.94		.915		.96		.895	
Acenaphthene	mg/kg	.18		.19		.185		.19		.18	
Acenaphthylene	mg/kg	.18		.19		.185		.19		.18	
Anthracene	mg/kg	.18		.19		.185		.19		.18	

Report Date: 09/19/00

Sample Location:		PB-BG-S3		PB-BG-S4		PB-BG-S5		PB-BG-S5		PB-BG-S6	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S3-3.0-4.0		PB-BG-S4-0.5-3.0		PB-BG-S5-0.5-3.0		PB-BG-S5-3.0-5.0		PB-BG-S6-0.5-3.0	
Sample Date:		01-NOV-94		30-OCT-94		30-OCT-94		30-OCT-94		01-NOV-94	
Depth:		3 - 4		.5 - 3		.5 - 3		3 - 5		.5 - 3	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	mg/kg	.18		.2		.185		.195		.19	
1,2-Dichlorobenzene	mg/kg	.18		.2		.185		.195		.19	
1,3-Dichlorobenzene	mg/kg	.18		.2		.185		.195		.19	
1,4-Dichlorobenzene	mg/kg	.18		.2		.185		.195		.19	
2,4,5-Trichlorophenol	mg/kg	.18		.2		.185		.195		.19	
2,4,6-Trichlorophenol	mg/kg	.18		.2		.185		.195		.19	
2,4-Dichlorophenol	mg/kg	.18		.2		.185		.195		.19	
2,4-Dimethylphenol	mg/kg	.18		.2		.185		.195		.19	
2,4-Dinitrophenol	mg/kg	.905		.995		.915		.97		.95	
2,4-Dinitrotoluene	mg/kg	.18		.2		.185		.195		.19	
2,6-Dinitrotoluene	mg/kg	.18		.2		.185		.195		.19	
2-Chloronaphthalene	mg/kg	.18		.2		.185		.195		.19	
2-Chlorophenol	mg/kg	.18		.2		.185		.195		.19	
2-Methylnaphthalene	mg/kg	.18		.2		.185		.195		.19	
2-Methylphenol	mg/kg	.18		.2		.185		.195		.19	
2-Nitroaniline	mg/kg	.905		.995		.915		.97		.95	
2-Nitrophenol	mg/kg	.18		.2		.185		.195		.19	
3,3'-Dichlorobenzidine	mg/kg	.365		.4		.365		.39		.38	
3-Nitroaniline	mg/kg	.905		.995		.915		.97		.95	
4,6-Dinitro-2-methylphenol	mg/kg	.905		.995		.915		.97		.95	
4-Bromophenyl phenyl ether	mg/kg	.18		.2		.185		.195		.19	
4-Chloro-3-methylphenol	mg/kg	.365		.4		.365		.39		.38	
4-Chloroaniline	mg/kg	.365		.4		.365		.39		.38	
4-Chlorophenyl phenyl ether	mg/kg	.18		.2		.185		.195		.19	
4-Methylphenol	mg/kg	.18		.2		.185		.195		.19	
4-Nitroaniline	mg/kg	.365		.4		.365		.39		.38	
4-Nitrophenol	mg/kg	.905		.995		.915		.97		.95	
Acenaphthene	mg/kg	.18		.2		.185		.195		.19	
Acenaphthylene	mg/kg	.18		.2		.185		.195		.19	
Anthracene	mg/kg	.18		2		.185		.195			

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Sample Location:		PB-BG-S6		PB-BG-S7		PB-BG-S8		PB-BG-S9		PB-BG-S9	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S6-3.0-4.5		PB-BG-S7-0.5-3.0		PB-BG-S8-0.5-3.0		PB-BG-S9-0.5-3.0		PB-BG-S9-3.0-5.0	
Sample Date:		01-NOV-94		01-NOV-94		30-OCT-94		01-NOV-94		01-NOV-94	
Depth:		3 - 4.5		.5 - 3		.5 - 3		.5 - 3		3 - 5	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	mg/kg	.19		.19		.195		.185		.2	
1,2-Dichlorobenzene	mg/kg	.19		.19		.195		.185		.2	
1,3-Dichlorobenzene	mg/kg	.19		.19		.195		.185		.2	
1,4-Dichlorobenzene	mg/kg	.19		.19		.195		.185		.2	
2,4,5-Trichlorophenol	mg/kg	.19		.19		.195		.185		.2	
2,4,6-Trichlorophenol	mg/kg	.19		.19		.195		.185		.2	
2,4-Dichlorophenol	mg/kg	.19		.19		.195		.185		.2	
2,4-Dimethylphenol	mg/kg	.19		.19		.195		.185		.2	
2,4-Dinitrophenol	mg/kg	.95		.94		.98		.915		1.005	
2,4-Dinitrotoluene	mg/kg	.19		.19		.195		.185		.2	
2,6-Dinitrotoluene	mg/kg	.19		.19		.195		.185		.2	
2-Chloronaphthalene	mg/kg	.19		.19		.195		.185		.2	
2-Chlorophenol	mg/kg	.19		.19		.195		.185		.2	
2-Methylnaphthalene	mg/kg	.19		.19		.195		.185		.2	
2-Methylphenol	mg/kg	.19		.19		.195		.185		.2	
2-Nitroaniline	mg/kg	.95		.94		.98		.915		1.005	
2-Nitrophenol	mg/kg	.19		.19		.195		.185		.2	
3,3'-Dichlorobenzidine	mg/kg	.38		.375		.395		.365		.405	
3-Nitroaniline	mg/kg	.95		.94		.98		.915		1.005	
4,6-Dinitro-2-methylphenol	mg/kg	.95		.94		.98		.915		1.005	
4-Bromophenyl phenyl ether	mg/kg	.19		.19		.195		.185		.2	
4-Chloro-3-methylphenol	mg/kg	.38		.375		.395		.365		.405	
4-Chloroaniline	mg/kg	.38		.375		.395		.365		.405	
4-Chlorophenyl phenyl ether	mg/kg	.19		.19		.195		.185		.2	
4-Methylphenol	mg/kg	.19		.19		.195		.185		.2	
4-Nitroaniline	mg/kg	.38		.375		.395		.365		.405	
4-Nitrophenol	mg/kg	.95		.94		.98		.915		1.005	
Acenaphthene	mg/kg	.19		.19		.195		.185		.2	
Acenaphthylene	mg/kg	.19		.19		.195		.185		.2	
Anthracene	mg/kg	.19		.19		.195		.185		.2	

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Sample Location:		WARP-DP01		WARP-DP02		WARP-DP03		WARP-DP04		WARP-DP05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8110		8140		8180		8240		8270	
Sample Date:		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98		16-JUN-98	
Depth:		4 - 6		0 - 2		0 - 2		8 - 10		4 - 6	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
1,2-Dichlorobenzene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
1,3-Dichlorobenzene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
1,4-Dichlorobenzene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
2,4,5-Trichlorophenol	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
2,4,6-Trichlorophenol	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
2,4-Dichlorophenol	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
2,4-Dimethylphenol	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
2,4-Dinitrophenol	mg/kg	1	U	.95	U	.95	U	1	U	1	U
2,4-Dinitrotoluene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
2,6-Dinitrotoluene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
2-Chloronaphthalene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
2-Chlorophenol	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
2-Methylnaphthalene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
2-Methylphenol	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
2-Nitroaniline	mg/kg	1	U	.95	U	.95	U	1	U	1	U
2-Nitrophenol	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
3,3'-Dichlorobenzidine	mg/kg	1	U	.95	U	.95	U	1	U	1	U
3-Nitroaniline	mg/kg	1	U	.95	U	.95	U	1	U	1	U
4,6-Dinitro-2-methylphenol	mg/kg	1	U	.95	U	.95	U	1	U	1	U
4-Bromophenyl phenyl ether	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
4-Chloro-3-methylphenol	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
4-Chloroaniline	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
4-Chlorophenyl phenyl ether	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
4-Methylphenol	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
4-Nitroaniline	mg/kg	1	U	.95	U	.95	U	1	U	1	U
4-Nitrophenol	mg/kg	1	U	.95	U	.95	U	1	U	1	U
Acenaphthene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Acenaphthylene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Anthracene	mg/kg	.205	U	.2	U	.195	U	.21	U		U

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Sample Location:		WARP-DP06		WARP-DP07		WARP-DP08		WARP-DP09		WARP-DP10	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8300		8350		8380		8430		8460	
Sample Date:		23-JUN-98		25-JUN-98		15-JUN-98		16-JUN-98		26-JUN-98	
Depth:		0 - 2		4 - 6		0 - 2		4 - 6		0 - 2	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
1,2-Dichlorobenzene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
1,3-Dichlorobenzene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
1,4-Dichlorobenzene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
2,4,5-Trichlorophenol	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
2,4,6-Trichlorophenol	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
2,4-Dichlorophenol	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
2,4-Dimethylphenol	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
2,4-Dinitrophenol	mg/kg	.9	U	.95	U	.95	U	.95	U	.95	U
2,4-Dinitrotoluene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
2,6-Dinitrotoluene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
2-Chloronaphthalene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
2-Chlorophenol	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
2-Methylnaphthalene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
2-Methylphenol	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
2-Nitroaniline	mg/kg	.9	U	.95	U	.95	U	.95	U	.95	U
2-Nitrophenol	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
3,3'-Dichlorobenzidine	mg/kg	.9	U	.95	U	.95	U	.95	U	.95	U
3-Nitroaniline	mg/kg	.9	U	.95	U	.95	U	.95	U	.95	U
4,6-Dinitro-2-methylphenol	mg/kg	.9	U	.95	U	.95	U	.95	U	.95	U
4-Bromophenyl phenyl ether	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
4-Chloro-3-methylphenol	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
4-Chloroaniline	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
4-Chlorophenyl phenyl ether	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
4-Methylphenol	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
4-Nitroaniline	mg/kg	.9	U	.95	U	.95	U	.95	U	.95	U
4-Nitrophenol	mg/kg	.9	U	.95	U	.95	U	.95	U	.95	U
Acenaphthene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Acenaphthylene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Anthracene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U

Sample Location:		WARP-DP11		WARP-DP12		WARP-DP13		WARP-DP15		WARP-DP16	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8500		8550		8580		8670		8700	
Sample Date:		25-JUN-98		15-JUN-98		15-JUN-98		24-JUN-98		24-JUN-98	
Depth:		0 - 2		4 - 6		0 - 2		4 - 6		0 - 2	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
1,2-Dichlorobenzene	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
1,3-Dichlorobenzene	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
1,4-Dichlorobenzene	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
2,4,5-Trichlorophenol	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
2,4,6-Trichlorophenol	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
2,4-Dichlorophenol	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
2,4-Dimethylphenol	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
2,4-Dinitrophenol	mg/kg	.95	U	1	U	.9	U	.95	U	.95	U
2,4-Dinitrotoluene	mg/kg	.043	J	.205	U	.19	U	.195	U	.2	U
2,6-Dinitrotoluene	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
2-Chloronaphthalene	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
2-Chlorophenol	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
2-Methylnaphthalene	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
2-Methylphenol	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
2-Nitroaniline	mg/kg	.95	U	1	U	.9	U	.95	U	.95	U
2-Nitrophenol	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
3,3'-Dichlorobenzidine	mg/kg	.95	U	1	U	.9	U	.95	U	.95	U
3-Nitroaniline	mg/kg	.95	U	1	U	.9	U	.95	U	.95	U
4,6-Dinitro-2-methylphenol	mg/kg	.95	U	1	U	.9	U	.95	U	.95	U
4-Bromophenyl phenyl ether	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
4-Chloro-3-methylphenol	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
4-Chloroaniline	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
4-Chlorophenyl phenyl ether	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
4-Methylphenol	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
4-Nitroaniline	mg/kg	.95	U	1	U	.9	U	.95	U	.95	U
4-Nitrophenol	mg/kg	.95	U	1	U	.9	U	.95	U	.95	U
Acenaphthene	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Acenaphthylene	mg/kg	.195	U	.205	U	.041	J	.195	U	.2	U
Anthracene	mg/kg	.195	U	.205	U	.23	J	.195	U		U

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Sample Location:		WARP-DP17		WARP-DP18		WARP-DP19		WARP-DP20	
Associated Site:		WARP		WARP		WARP		WARP	
Sample No:		8750		8780		8820		8870	
Sample Date:		25-JUN-98		25-JUN-98		24-JUN-98		24-JUN-98	
Depth:		4 - 6		0 - 2		0 - 2		4 - 6	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	mg/kg	.2	U	.185	U	.185	U	.19	U
1,2-Dichlorobenzene	mg/kg	.2	U	.185	U	.185	U	.19	U
1,3-Dichlorobenzene	mg/kg	.2	U	.185	U	.185	U	.19	U
1,4-Dichlorobenzene	mg/kg	.2	U	.185	U	.185	U	.19	U
2,4,5-Trichlorophenol	mg/kg	.2	U	.185	U	.185	U	.19	U
2,4,6-Trichlorophenol	mg/kg	.2	U	.185	U	.185	U	.19	U
2,4-Dichlorophenol	mg/kg	.2	U	.185	U	.185	U	.19	U
2,4-Dimethylphenol	mg/kg	.2	U	.185	U	.185	U	.19	U
2,4-Dinitrophenol	mg/kg	.95	U	.9	U	.9	U	.9	U
2,4-Dinitrotoluene	mg/kg	.2	U	.185	U	.185	U	.19	U
2,6-Dinitrotoluene	mg/kg	.2	U	.185	U	.185	U	.19	U
2-Chloronaphthalene	mg/kg	.2	U	.185	U	.185	U	.19	U
2-Chlorophenol	mg/kg	.2	U	.185	U	.185	U	.19	U
2-Methylnaphthalene	mg/kg	.2	U	.185	U	.185	U	.19	U
2-Methylphenol	mg/kg	.2	U	.185	U	.185	U	.19	U
2-Nitroaniline	mg/kg	.95	U	.9	U	.9	U	.9	U
2-Nitrophenol	mg/kg	.2	U	.185	U	.185	U	.19	U
3,3'-Dichlorobenzidine	mg/kg	.95	U	.9	U	.9	U	.9	U
3-Nitroaniline	mg/kg	.95	U	.9	U	.9	U	.9	U
4,6-Dinitro-2-methylphenol	mg/kg	.95	U	.9	U	.9	U	.9	U
4-Bromophenyl phenyl ether	mg/kg	.2	U	.185	U	.185	U	.19	U
4-Chloro-3-methylphenol	mg/kg	.2	U	.185	U	.185	U	.19	U
4-Chloroaniline	mg/kg	.2	U	.185	U	.185	U	.19	U
4-Chlorophenyl phenyl ether	mg/kg	.2	U	.185	U	.185	U	.19	U
4-Methylphenol	mg/kg	.2	U	.185	U	.185	U	.19	U
4-Nitroaniline	mg/kg	.95	U	.9	U	.9	U	.9	U
4-Nitrophenol	mg/kg	.95	U	.9	U	.9	U	.9	U
Acenaphthene	mg/kg	.2	U	.185	U	.185	U	.19	U
Acenaphthylene	mg/kg	.2	U	.185	U	.185	U	.04	J
Anthracene	mg/kg	.2	U	.185	U	.185	U	.12	J

Sample Location:		PB-BG-S1		PB-BG-S1		PB-BG-S2		PB-BG-S2		PB-BG-S3	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S1-0.5-3.0		PB-BG-S1-3.0-5.0		PB-BG-S2-0.5-3.0		PB-BG-S2-3.0-5.0		PB-BG-S3-0.5-3.0	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94		01-NOV-94	
Depth:		.5 - 3		3 - 5		.5 - 3		3 - 5		.5 - 3	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	mg/kg	.18		.19		.185		.19		.18	
Benzo(a)pyrene	mg/kg	.18		.19		.185		.19		.18	
Benzo(b)fluoranthene	mg/kg	.18		.19		.185		.19		.18	
Benzo(ghi)perylene	mg/kg	.18		.19		.185		.19		.18	
Benzo(k)fluoranthene	mg/kg	.18		.19		.185		.19		.18	
Benzoic acid	mg/kg	.895		.94		.915		.96		.895	
Benzyl alcohol	mg/kg	.36		.375		.365		.385		.36	
Butyl benzyl phthalate	mg/kg	.18		.19		.185		.19		.18	
Carbazole	mg/kg										
Chrysene	mg/kg	.18		.19		.185		.19		.18	
Dibenz(a,h)anthracene	mg/kg	.18		.19		.185		.19		.18	
Dibenzofuran	mg/kg	.18		.19		.185		.19		.18	
Diethyl phthalate	mg/kg	.18		.19		.185		.19		.18	
Dimethyl phthalate	mg/kg	.18		.19		.185		.19		.18	
Fluoranthene	mg/kg	.18		.19		.185		.19		.18	
Fluorene	mg/kg	.18		.19		.185		.19		.18	
Hexachlorobenzene	mg/kg	.18		.19		.185		.19		.18	
Hexachlorobutadiene	mg/kg	.18		.19		.185		.19		.18	
Hexachlorocyclopentadiene	mg/kg	.18		.19		.185		.19		.18	
Hexachloroethane	mg/kg	.18		.19		.185		.19		.18	
Indeno(1,2,3-cd)pyrene	mg/kg	.18		.19		.185		.19		.18	
Isophorone	mg/kg	.18		.19		.185		.19		.18	
Naphthalene	mg/kg	.18		.19		.185		.19		.18	
Nitrobenzene	mg/kg	.18		.19		.185		.19		.18	
Pentachlorophenol	mg/kg	.895		.94		.915		.96		.895	
Phenanthrene	mg/kg	.18		.19		.185		.19		.18	
Phenol	mg/kg	.18		.19		.185		.19		.18	
Pyrene	mg/kg	.18		.19		.185		.19		.18	
bis(2-Chloroethoxy)methane	mg/kg	.18		.19		.185		.19		.18	
bis(2-Chloroe her	mg/kg	.18		19		.185		.19			

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Sample Location:		PB-BG-S3		PB-BG-S4		PB-BG-S5		PB-BG-S5		PB-BG-S6	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S3-3.0-4.0		PB-BG-S4-0.5-3.0		PB-BG-S5-0.5-3.0		PB-BG-S5-3.0-5.0		PB-BG-S6-0.5-3.0	
Sample Date:		01-NOV-94		30-OCT-94		30-OCT-94		30-OCT-94		01-NOV-94	
Depth:		3 - 4		.5 - 3		.5 - 3		3 - 5		.5 - 3	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	mg/kg	.18		.2		.185		.195		.19	
Benzo(a)pyrene	mg/kg	.18		.2		.185		.195		.19	
Benzo(b)fluoranthene	mg/kg	.18		.2		.915		.195		.19	
Benzo(ghi)perylene	mg/kg	.18		.2		.185		.195		.19	
Benzo(k)fluoranthene	mg/kg	.18		.2		.185		.195		.19	
Benzoic acid	mg/kg	.905		.995		.915		.97		.95	
Benzyl alcohol	mg/kg	.365		.4		.365		.39		.38	
Butyl benzyl phthalate	mg/kg	.18		.2		.185		.195		.19	
Carbazole	mg/kg										
Chrysene	mg/kg	.18		.2		.185		.195		.19	
Dibenz(a,h)anthracene	mg/kg	.18		.2		.185		.195		.19	
Dibenzofuran	mg/kg	.18		.2		.185		.195		.19	
Diethyl phthalate	mg/kg	.18		.2		.185		.195		.19	
Dimethyl phthalate	mg/kg	.18		.2		.185		.195		.19	
Fluoranthene	mg/kg	.18		.2		.185		.195		.19	
Fluorene	mg/kg	.18		.2		.185		.195		.19	
Hexachlorobenzene	mg/kg	.18		.2		.185		.195		.19	
Hexachlorobutadiene	mg/kg	.18		.2		.185		.195		.19	
Hexachlorocyclopentadiene	mg/kg	.18		.2		.185		.195		.19	
Hexachloroethane	mg/kg	.18		.2		.185		.195		.19	
Indeno(1,2,3-cd)pyrene	mg/kg	.18		.2		.915		.195		.19	
Isophorone	mg/kg	.18		.2		.185		.195		.19	
Naphthalene	mg/kg	.18		.2		.185		.195		.19	
Nitrobenzene	mg/kg	.18		.2		.185		.195		.19	
Pentachlorophenol	mg/kg	.905		.995		.915		.97		.95	
Phenanthrene	mg/kg	.18		.2		.185		.195		.19	
Phenol	mg/kg	.18		.2		.185		.195		.19	
Pyrene	mg/kg	.18		.2		.185		.195		.19	
bis(2-Chloroethoxy)methane	mg/kg	.18		.2		.185		.195		.19	
bis(2-Chloroethyl)ether	mg/kg	.18		.2		.185		.195		.19	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PB-BG-S6		PB-BG-S7		PB-BG-S8		PB-BG-S9		PB-BG-S9	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S6-3.0-4.5		PB-BG-S7-0.5-3.0		PB-BG-S8-0.5-3.0		PB-BG-S9-0.5-3.0		PB-BG-S9-3.0-5.0	
Sample Date:		01-NOV-94		01-NOV-94		30-OCT-94		01-NOV-94		01-NOV-94	
Depth:		3 - 4.5		.5 - 3		.5 - 3		.5 - 3		3 - 5	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	mg/kg	.19		.19		.195		.185		.2	
Benzo(a)pyrene	mg/kg	.19		.19		.195		.185		.2	
Benzo(b)fluoranthene	mg/kg	.19		.19		.195		.185		.2	
Benzo(ghi)perylene	mg/kg	.19		.19		.195		.185		.2	
Benzo(k)fluoranthene	mg/kg	.19		.19		.195		.185		.2	
Benzoic acid	mg/kg	.95		.94		.98		.915		1.005	
Benzyl alcohol	mg/kg	.38		.375		.395		.365		.405	
Butyl benzyl phthalate	mg/kg	.19		.19		.195		.185		.2	
Carbazole	mg/kg										
Chrysene	mg/kg	.19		.19		.195		.185		.2	
Dibenz(a,h)anthracene	mg/kg	.19		.19		.195		.185		.2	
Dibenzofuran	mg/kg	.19		.19		.195		.185		.2	
Diethyl phthalate	mg/kg	.19		.19		.195		.185		.2	
Dimethyl phthalate	mg/kg	.19		.19		.195		.185		.2	
Fluoranthene	mg/kg	.19		.19		.195		.185		.2	
Fluorene	mg/kg	.19		.19		.195		.185		.2	
Hexachlorobenzene	mg/kg	.19		.19		.195		.185		.2	
Hexachlorobutadiene	mg/kg	.19		.19		.195		.185		.2	
Hexachlorocyclopentadiene	mg/kg	.19		.19		.195		.185		.2	
Hexachloroethane	mg/kg	.19		.19		.195		.185		.2	
Indeno(1,2,3-cd)pyrene	mg/kg	.19		.19		.98		.185		.2	
Isophorone	mg/kg	.19		.19		.195		.185		.2	
Naphthalene	mg/kg	.19		.19		.195		.185		.2	
Nitrobenzene	mg/kg	.19		.19		.195		.185		.2	
Pentachlorophenol	mg/kg	.95		.94		.98		.915		1.005	
Phenanthrene	mg/kg	.19		.19		.195		.185		.2	
Phenol	mg/kg	.19		.19		.195		.185		.2	
Pyrene	mg/kg	.19		.19		.195		.185		.2	
bis(2-Chloroethoxy)methane	mg/kg	.19		.19		.195		.185		.2	
bis(2-Chloro[illegible]her	mg/kg	.19		19		.195		.185			

Sample Location:		WARP-DP01		WARP-DP02		WARP-DP03		WARP-DP04		WARP-DP05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8110		8140		8180		8240		8270	
Sample Date:		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98		16-JUN-98	
Depth:		4 - 6		0 - 2		0 - 2		8 - 10		4 - 6	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Benzo(a)pyrene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Benzo(b)fluoranthene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Benzo(ghi)perylene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Benzo(k)fluoranthene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Benzoic acid	mg/kg										
Benzyl alcohol	mg/kg										
Butyl benzyl phthalate	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Carbazole	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Chrysene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Dibenz(a,h)anthracene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Dibenzofuran	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Diethyl phthalate	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Dimethyl phthalate	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Fluoranthene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Fluorene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Hexachlorobenzene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Hexachlorobutadiene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Hexachlorocyclopentadiene	mg/kg	1	U	.95	U	.95	U	1	U	1	U
Hexachloroethane	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Indeno(1,2,3-cd)pyrene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Isophorone	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Naphthalene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Nitrobenzene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Pentachlorophenol	mg/kg	1	U	.95	U	.95	U	1	U	1	U
Phenanthrene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Phenol	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
Pyrene	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
bis(2-Chloroethoxy)methane	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
bis(2-Chloroethyl)ether	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U

Sample Location:		WARP-DP06		WARP-DP07		WARP-DP08		WARP-DP09		WARP-DP10	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8300		8350		8380		8430		8460	
Sample Date:		23-JUN-98		25-JUN-98		15-JUN-98		16-JUN-98		26-JUN-98	
Depth:		0 - 2		4 - 6		0 - 2		4 - 6		0 - 2	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Benzo(a)pyrene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Benzo(b)fluoranthene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Benzo(ghi)perylene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Benzo(k)fluoranthene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Benzoic acid	mg/kg										
Benzyl alcohol	mg/kg										
Butyl benzyl phthalate	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Carbazole	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Chrysene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Dibenz(a,h)anthracene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Dibenzofuran	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Diethyl phthalate	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Dimethyl phthalate	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Fluoranthene	mg/kg	.185	U	.195	U	.19	U	.058	J	.19	U
Fluorene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Hexachlorobenzene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Hexachlorobutadiene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Hexachlorocyclopentadiene	mg/kg	.9	U	.95	U	.95	U	.95	U	.95	U
Hexachloroethane	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Indeno(1,2,3-cd)pyrene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Isophorone	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Naphthalene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Nitrobenzene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Pentachlorophenol	mg/kg	.9	U	.95	U	.95	U	.95	U	.95	U
Phenanthrene	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Phenol	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
Pyrene	mg/kg	.185	U	.195	U	.19	U	.043	J	.19	U
bis(2-Chloroethoxy)methane	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
bis(2-Chloro[illegible]her	mg/kg	.185	U	195	U	.19	U	.195	U		U

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Sample Location:		WARP-DP11		WARP-DP12		WARP-DP13		WARP-DP15		WARP-DP16	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8500		8550		8580		8670		8700	
Sample Date:		25-JUN-98		15-JUN-98		15-JUN-98		24-JUN-98		24-JUN-98	
Depth:		0 - 2		4 - 6		0 - 2		4 - 6		0 - 2	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	mg/kg	.195	U	.205	U	.4		.195	U	.2	U
Benzo(a)pyrene	mg/kg	.195	U	.205	U	.39		.195	U	.2	U
Benzo(b)fluoranthene	mg/kg	.195	U	.205	U	.3	J	.195	U	.2	U
Benzo(ghi)perylene	mg/kg	.195	U	.205	U	.22	J	.195	U	.2	U
Benzo(k)fluoranthene	mg/kg	.195	U	.205	U	.35	J	.195	U	.2	U
Benzoic acid	mg/kg										
Benzyl alcohol	mg/kg										
Butyl benzyl phthalate	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Carbazole	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Chrysene	mg/kg	.195	U	.205	U	.42		.195	U	.2	U
Dibenz(a,h)anthracene	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Dibenzofuran	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Diethyl phthalate	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Dimethyl phthalate	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Fluoranthene	mg/kg	.195	U	.205	U	.76		.195	U	.2	U
Fluorene	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Hexachlorobenzene	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Hexachlorobutadiene	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Hexachlorocyclopentadiene	mg/kg	.95	U	1	U	.9	U	.95	U	.95	U
Hexachloroethane	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Indeno(1,2,3-cd)pyrene	mg/kg	.195	U	.205	U	.23	J	.195	U	.2	U
Isophorone	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Naphthalene	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Nitrobenzene	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Pentachlorophenol	mg/kg	.95	U	1	U	.9	U	.95	U	.95	U
Phenanthrene	mg/kg	.195	U	.205	U	.36	J	.195	U	.2	U
Phenol	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
Pyrene	mg/kg	.195	U	.205	U	.55		.195	U	.2	U
bis(2-Chloroethoxy)methane	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
bis(2-Chloroethyl)ether	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U

Sample Location:		WARP-DP17		WARP-DP18		WARP-DP19		WARP-DP20	
Associated Site:		WARP		WARP		WARP		WARP	
Sample No:		8750		8780		8820		8870	
Sample Date:		25-JUN-98		25-JUN-98		24-JUN-98		24-JUN-98	
Depth:		4 - 6		0 - 2		0 - 2		4 - 6	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	mg/kg	.2	U	.185	U	.185	U	.17	J
Benzo(a)pyrene	mg/kg	.2	U	.185	U	.185	U	.14	J
Benzo(b)fluoranthene	mg/kg	.2	U	.185	U	.185	U	.14	J
Benzo(ghi)perylene	mg/kg	.2	U	.185	U	.185	U	.076	J
Benzo(k)fluoranthene	mg/kg	.2	U	.185	U	.185	U	.11	J
Benzoic acid	mg/kg								
Benzyl alcohol	mg/kg								
Butyl benzyl phthalate	mg/kg	.2	U	.185	U	.185	U	.19	U
Carbazole	mg/kg	.2	U	.185	U	.185	U	.19	U
Chrysene	mg/kg	.2	U	.185	U	.185	U	.17	J
Dibenz(a,h)anthracene	mg/kg	.2	U	.185	U	.185	U	.19	U
Dibenzofuran	mg/kg	.2	U	.185	U	.185	U	.19	U
Diethyl phthalate	mg/kg	.2	U	.185	U	.185	U	.19	U
Dimethyl phthalate	mg/kg	.2	U	.185	U	.185	U	.19	U
Fluoranthene	mg/kg	.2	U	.185	U	.185	U	.38	
Fluorene	mg/kg	.2	U	.185	U	.185	U	.19	U
Hexachlorobenzene	mg/kg	.2	U	.185	U	.185	U	.19	U
Hexachlorobutadiene	mg/kg	.2	U	.185	U	.185	U	.19	U
Hexachlorocyclopentadiene	mg/kg	.95	U	.9	U	.9	U	.9	U
Hexachloroethane	mg/kg	.2	U	.185	U	.185	U	.19	U
Indeno(1,2,3-cd)pyrene	mg/kg	.2	U	.185	U	.185	U	.076	J
Isophorone	mg/kg	.2	U	.185	U	.185	U	.19	U
Naphthalene	mg/kg	.2	U	.185	U	.185	U	.19	U
Nitrobenzene	mg/kg	.2	U	.185	U	.185	U	.19	U
Pentachlorophenol	mg/kg	.95	U	.9	U	.9	U	.9	U
Phenanthrene	mg/kg	.2	U	.185	U	.185	U	.25	J
Phenol	mg/kg	.2	U	.185	U	.185	U	.19	U
Pyrene	mg/kg	.2	U	.185	U	.185	U	.28	J
bis(2-Chloroethoxy)methane	mg/kg	.2	U	.185	U	.185	U	.19	U
bis(2-Chloroe her	mg/kg	.2	U	185	U	.185	U	.19	U

Sample Location:		PB-BG-S1		PB-BG-S1		PB-BG-S2		PB-BG-S2		PB-BG-S3	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S1-0.5-3.0		PB-BG-S1-3.0-5.0		PB-BG-S2-0.5-3.0		PB-BG-S2-3.0-5.0		PB-BG-S3-0.5-3.0	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94		01-NOV-94	
Depth:		.5 - 3		3 - 5		.5 - 3		3 - 5		.5 - 3	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
bis(2-Chloroisopropyl)ether	mg/kg	.18		.19		.185		.19		.18	
bis(2-Ethylhexyl)phthalate	mg/kg	.18		.41		.185		.19		.18	
di-n-Butyl phthalate	mg/kg	.18		.19		.185		.19		.18	
di-n-Octyl phthalate	mg/kg	.18		.19		.185		.19		.18	
n-Nitroso-di-n-propylamine	mg/kg	.18		.19		.185		.19		.18	
n-Nitrosodiphenylamine	mg/kg										

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Sample Location:		PB-BG-S3		PB-BG-S4		PB-BG-S5		PB-BG-S5		PB-BG-S6	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S3-3.0-4.0		PB-BG-S4-0.5-3.0		PB-BG-S5-0.5-3.0		PB-BG-S5-3.0-5.0		PB-BG-S6-0.5-3.0	
Sample Date:		01-NOV-94		30-OCT-94		30-OCT-94		30-OCT-94		01-NOV-94	
Depth:		3 - 4		.5 - 3		.5 - 3		3 - 5		.5 - 3	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
bis(2-Chloroisopropyl)ether	mg/kg	.18		.2		.185		.195		.19	
bis(2-Ethylhexyl)phthalate	mg/kg	.18		1.07		.98		.195		.19	
di-n-Butyl phthalate	mg/kg	.18		.2		.185		.195		.19	
di-n-Octyl phthalate	mg/kg	.18		.2		.185		.195		.19	
n-Nitroso-di-n-propylamine	mg/kg	.18		.2		.185		.195		.19	
n-Nitrosodiphenylamine	mg/kg										

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Sample Location:		PB-BG-S6		PB-BG-S7		PB-BG-S8		PB-BG-S9		PB-BG-S9	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S6-3.0-4.5		PB-BG-S7-0.5-3.0		PB-BG-S8-0.5-3.0		PB-BG-S9-0.5-3.0		PB-BG-S9-3.0-5.0	
Sample Date:		01-NOV-94		01-NOV-94		30-OCT-94		01-NOV-94		01-NOV-94	
Depth:		3 - 4.5		.5 - 3		.5 - 3		.5 - 3		3 - 5	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
bis(2-Chloroisopropyl)ether	mg/kg	.19		.19		.195		.185		.2	
bis(2-Ethylhexyl)phthalate	mg/kg	.19		.19		.195		.185		.2	
di-n-Butyl phthalate	mg/kg	.19		.19		.195		.185		.2	
di-n-Octyl phthalate	mg/kg	.19		.19		.195		.185		.2	
n-Nitroso-di-n-propylamine	mg/kg	.19		.19		.195		.185		.2	
n-Nitrosodiphenylamine	mg/kg										

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Sample Location:		WARP-DP01		WARP-DP02		WARP-DP03		WARP-DP04		WARP-DP05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8110		8140		8180		8240		8270	
Sample Date:		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98		16-JUN-98	
Depth:		4 - 6		0 - 2		0 - 2		8 - 10		4 - 6	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
bis(2-Chloroisopropyl)ether	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
bis(2-Ethylhexyl)phthalate	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
di-n-Butyl phthalate	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
di-n-Octyl phthalate	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
n-Nitroso-di-n-propylamine	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U
n-Nitrosodiphenylamine	mg/kg	.205	U	.2	U	.195	U	.21	U	.2	U

Sample Location:		WARP-DP06		WARP-DP07		WARP-DP08		WARP-DP09		WARP-DP10	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8300		8350		8380		8430		8460	
Sample Date:		23-JUN-98		25-JUN-98		15-JUN-98		16-JUN-98		26-JUN-98	
Depth:		0 - 2		4 - 6		0 - 2		4 - 6		0 - 2	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
bis(2-Chloroisopropyl)ether	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
bis(2-Ethylhexyl)phthalate	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
di-n-Butyl phthalate	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
di-n-Octyl phthalate	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
n-Nitroso-di-n-propylamine	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U
n-Nitrosodiphenylamine	mg/kg	.185	U	.195	U	.19	U	.195	U	.19	U

Sample Location:		WARP-DP11		WARP-DP12		WARP-DP13		WARP-DP15		WARP-DP16	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8500		8550		8580		8670		8700	
Sample Date:		25-JUN-98		15-JUN-98		15-JUN-98		24-JUN-98		24-JUN-98	
Depth:		0 - 2		4 - 6		0 - 2		4 - 6		0 - 2	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
bis(2-Chloroisopropyl)ether	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
bis(2-Ethylhexyl)phthalate	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
di-n-Butyl phthalate	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
di-n-Octyl phthalate	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
n-Nitroso-di-n-propylamine	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U
n-Nitrosodiphenylamine	mg/kg	.195	U	.205	U	.19	U	.195	U	.2	U

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Sample Location:		WARP-DP17		WARP-DP18		WARP-DP19		WARP-DP20	
Associated Site:		WARP		WARP		WARP		WARP	
Sample No:		8750		8780		8820		8870	
Sample Date:		25-JUN-98		25-JUN-98		24-JUN-98		24-JUN-98	
Depth:		4 - 6		0 - 2		0 - 2		4 - 6	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
bis(2-Chloroisopropyl)ether	mg/kg	.2	U	.185	U	.185	U	.19	U
bis(2-Ethylhexyl)phthalate	mg/kg	.2	U	.185	U	.185	U	.19	U
di-n-Butyl phthalate	mg/kg	.2	U	.185	U	.185	U	.19	U
di-n-Octyl phthalate	mg/kg	.2	U	.185	U	.185	U	.19	U
n-Nitroso-di-n-propylamine	mg/kg	.2	U	.185	U	.185	U	.19	U
n-Nitrosodiphenylamine	mg/kg	.2	U	.185	U	.185	U	.19	U

Sample Location:		WARP-DP01		WARP-DP02		WARP-DP03		WARP-DP04		WARP-DP05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8110		8140		8180		8240		8270	
Sample Date:		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98		16-JUN-98	
Depth:		4 - 6		0 - 2		0 - 2		8 - 10		4 - 6	
PEST/PCB	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	mg/kg	.0205	U	.02	U	.0195	U	.021	U	.02	U
Aroclor 1221	mg/kg	.0205	U	.02	U	.0195	U	.021	U	.02	U
Aroclor 1232	mg/kg	.0205	U	.02	U	.0195	U	.021	U	.02	U
Aroclor 1242	mg/kg	.0205	U	.02	U	.0195	U	.021	U	.02	U
Aroclor 1248	mg/kg	.0205	U	.02	U	.0195	U	.021	U	.02	U
Aroclor 1254	mg/kg	.0205	U	.02	U	.0195	U	.021	U	.02	U
Aroclor 1260	mg/kg	.0205	U	.02	U	.0195	U	.021	U	.02	U

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Sample Location:		WARP-DP06		WARP-DP07		WARP-DP08		WARP-DP09		WARP-DP10	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8300		8350		8380		8430		8460	
Sample Date:		23-JUN-98		25-JUN-98		15-JUN-98		16-JUN-98		26-JUN-98	
Depth:		0 - 2		4 - 6		0 - 2		4 - 6		0 - 2	
PEST/PCB	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	mg/kg	.0185	U	.0195	U	.019	U	.0195	U	.019	U
Aroclor 1221	mg/kg	.0185	U	.0195	U	.019	U	.0195	U	.019	U
Aroclor 1232	mg/kg	.0185	U	.0195	U	.019	U	.0195	U	.019	U
Aroclor 1242	mg/kg	.0185	U	.0195	U	.019	U	.0195	U	.019	U
Aroclor 1248	mg/kg	.0185	U	.0195	U	.019	U	.0195	U	.019	U
Aroclor 1254	mg/kg	.0185	U	.0195	U	.019	U	.0195	U	.019	U
Aroclor 1260	mg/kg	.0185	U	.0195	U	.019	U	.0195	U	.019	U

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Sample Location:		WARP-DP11		WARP-DP12		WARP-DP13		WARP-DP15		WARP-DP16	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8500		8550		8580		8670		8700	
Sample Date:		25-JUN-98		15-JUN-98		15-JUN-98		24-JUN-98		24-JUN-98	
Depth:		0 - 2		4 - 6		0 - 2		4 - 6		0 - 2	
PEST/PCB	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	mg/kg	.0195	U	.0205	U	.019	U	.0195	U	.02	U
Aroclor 1221	mg/kg	.0195	U	.0205	U	.019	U	.0195	U	.02	U
Aroclor 1232	mg/kg	.0195	U	.0205	U	.019	U	.0195	U	.02	U
Aroclor 1242	mg/kg	.0195	U	.0205	U	.019	U	.0195	U	.02	U
Aroclor 1248	mg/kg	.0195	U	.0205	U	.019	U	.0195	U	.02	U
Aroclor 1254	mg/kg	.0195	U	.0205	U	.019	U	.0195	U	.02	U
Aroclor 1260	mg/kg	.0195	U	.0205	U	.019	U	.0195	U	.02	U

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Sample Location:		WARP-DP17		WARP-DP18		WARP-DP19		WARP-DP20	
Associated Site:		WARP		WARP		WARP		WARP	
Sample No:		8750		8780		8820		8870	
Sample Date:		25-JUN-98		25-JUN-98		24-JUN-98		24-JUN-98	
Depth:		4 - 6		0 - 2		0 - 2		4 - 6	
PEST/PCB	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	mg/kg	.02	U	.0185	U	.0185	U	.019	U
Aroclor 1221	mg/kg	.02	U	.0185	U	.0185	U	.019	U
Aroclor 1232	mg/kg	.02	U	.0185	U	.0185	U	.019	U
Aroclor 1242	mg/kg	.02	U	.0185	U	.0185	U	.019	U
Aroclor 1248	mg/kg	.02	U	.0185	U	.0185	U	.019	U
Aroclor 1254	mg/kg	.02	U	.0185	U	.0185	U	.019	U
Aroclor 1260	mg/kg	.02	U	.0185	U	.0185	U	.019	U

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Sample Location:		PB-BG-S1		PB-BG-S1		PB-BG-S2		PB-BG-S2		PB-BG-S3	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S1-0.5-3.0		PB-BG-S1-3.0-5.0		PB-BG-S2-0.5-3.0		PB-BG-S2-3.0-5.0		PB-BG-S3-0.5-3.0	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94		01-NOV-94	
Depth:		.5 - 3		3 - 5		.5 - 3		3 - 5		.5 - 3	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	2.7		2.85		6.3		2.9		2.7	
Arsenic	mg/kg	6.8		10		8.4		12		3.5	
Barium	mg/kg										
Beryllium	mg/kg	.55		.55		.55		.6		.55	
Cadmium	mg/kg	.55		.55		.55		.6		.55	
Calcium	mg/kg										
Chromium	mg/kg	11		14		17		17		6.2	
Cobalt	mg/kg										
Copper	mg/kg	3.6		5.2		2.3		4		1.1	
Iron	mg/kg										
Lead	mg/kg	8.5		9.5		11		9.9		5.3	
Magnesium	mg/kg										
Manganese	mg/kg	270		400		340		314		152	
Mercury	mg/kg	.135		.14		.14		.145		.135	
Nickel	mg/kg	13		16		16		17		9	
Potassium	mg/kg										
Selenium	mg/kg	2.15		2.25		2.2		2.35		2.15	
Silver	mg/kg	.55		.55		.55		.6		.55	
Sodium	mg/kg										
Thallium	mg/kg	2.7		2.85		2.8		2.9		2.7	
Vanadium	mg/kg										
Zinc	mg/kg	41		39		51		45		43	

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Sample Location:		PB-BG-S3		PB-BG-S4		PB-BG-S5		PB-BG-S5		PB-BG-S6	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S3-3.0-4.0		PB-BG-S4-0.5-3.0		PB-BG-S5-0.5-3.0		PB-BG-S5-3.0-5.0		PB-BG-S6-0.5-3.0	
Sample Date:		01-NOV-94		30-OCT-94		30-OCT-94		30-OCT-94		01-NOV-94	
Depth:		3 - 4		.5 - 3		.5 - 3		3 - 5		.5 - 3	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	2.75		7.6		6.7		5.9		6.4	
Arsenic	mg/kg	15		17		17		6.1		23	
Barium	mg/kg										
Beryllium	mg/kg	.55		.6	UJ	.55	UJ	.6	UJ	.55	
Cadmium	mg/kg	.55		.6		.55		.6		.55	
Calcium	mg/kg										
Chromium	mg/kg	13		13		17		29		6	
Cobalt	mg/kg										
Copper	mg/kg	35		34		10		6.7		14	
Iron	mg/kg										
Lead	mg/kg	24		27		11		13		15	
Magnesium	mg/kg										
Manganese	mg/kg	154		24		220		330		78	
Mercury	mg/kg	.135		.15		.14		.145		.145	
Nickel	mg/kg	33		11		28		33		15	
Potassium	mg/kg										
Selenium	mg/kg	2.2		2.4		2.2		2.35		2.3	
Silver	mg/kg	.55		.6		.55		.6		.55	
Sodium	mg/kg										
Thallium	mg/kg	2.75		3		2.8		2.95		2.85	
Vanadium	mg/kg										
Zinc	mg/kg	187		13		54		64		56	

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Sample Location:		PB-BG-S6		PB-BG-S7		PB-BG-S8		PB-BG-S9		PB-BG-S9	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S6-3.0-4.5		PB-BG-S7-0.5-3.0		PB-BG-S8-0.5-3.0		PB-BG-S9-0.5-3.0		PB-BG-S9-3.0-5.0	
Sample Date:		01-NOV-94		01-NOV-94		30-OCT-94		01-NOV-94		01-NOV-94	
Depth:		3 - 4.5		.5 - 3		.5 - 3		.5 - 3		3 - 5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	2.85		7.5		6.4		2.8		3.05	
Arsenic	mg/kg	8.3		14		19		1.65		1.85	
Barium	mg/kg										
Beryllium	mg/kg	.55		.55		.6	UJ	.55		.6	
Cadmium	mg/kg	.55		.55		.6		.55		.6	
Calcium	mg/kg										
Chromium	mg/kg	9.1		14		10		9.2		15	
Cobalt	mg/kg										
Copper	mg/kg	7.5		34		27		1.1		17	
Iron	mg/kg										
Lead	mg/kg	11		22		23		6.6		15	
Magnesium	mg/kg										
Manganese	mg/kg	21		63		8.7		133		695	
Mercury	mg/kg	.145		.14		.15		.14		.15	
Nickel	mg/kg	20		24		9.4		7.6		30	
Potassium	mg/kg										
Selenium	mg/kg	2.3		2.25		2.4		2.2		2.45	
Silver	mg/kg	.55		.55		.6		.55		.6	
Sodium	mg/kg										
Thallium	mg/kg	2.85		2.85		3		2.8		3.05	
Vanadium	mg/kg										
Zinc	mg/kg	34		32		10		24		61	

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Sample Location:		PB-PR-S1		PB-PR-S1		PB-PR-S10		PB-PR-S10		PB-PR-S10	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S1-0.0-2.0		PB-PR-S1-2.0-5.0		PB-PR-S10-0.0-3.0		PB-PR-S10-3.0-5.0		PB-PR-S10-5.0-10.0	
Sample Date:		31-OCT-94		31-OCT-94		29-OCT-94		29-OCT-94		29-OCT-94	
Depth:		0 - 2		2 - 5		0 - 3		3 - 5		5 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	2.65		2.85		2.95		3		3.15	
Arsenic	mg/kg	1.6		4.1		22		9.6		12	
Barium	mg/kg										
Beryllium	mg/kg	.55		.55		.6		.6		.65	
Cadmium	mg/kg	.55		.55		.6		.6		.65	
Calcium	mg/kg										
Chromium	mg/kg	8.7		11		15		17		18	
Cobalt	mg/kg										
Copper	mg/kg	1.05		3.3		1.2		14		9.4	
Iron	mg/kg										
Lead	mg/kg	5.9		8.4		12		18		11	
Magnesium	mg/kg										
Manganese	mg/kg	150		260		820		1040		490	
Mercury	mg/kg	.135		.14		.145		.15		.16	
Nickel	mg/kg	6.7		10		15		35		25	
Potassium	mg/kg										
Selenium	mg/kg	2.15		2.25		2.35		2.4		2.55	
Silver	mg/kg	.55		.55		.6		.6		.65	
Sodium	mg/kg										
Thallium	mg/kg	2.65		2.85		2.95		3		3.15	
Vanadium	mg/kg										
Zinc	mg/kg	23		31		38		65		56	

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Sample Location:		PB-PR-S11		PB-PR-S11		PB-PR-S11		PB-PR-S12		PB-PR-S12	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S11-0.0-3.0		PB-PR-S11-3.0-5.0		PB-PR-S11-5.0-10.0		PB-PR-S12-0.0-3.0		PB-PR-S12-3.0-5.0	
Sample Date:		29-OCT-94		29-OCT-94		29-OCT-94		30-OCT-94		30-OCT-94	
Depth:		0 - 3		3 - 5		5 - 10		0 - 3		3 - 5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	2.75		7.3		3.1		3		3.05	
Arsenic	mg/kg	1.65		8		1.85		6.7		11	
Barium	mg/kg										
Beryllium	mg/kg	.55		.6		.6		.6		.6	
Cadmium	mg/kg	.55		.6		.6		.6		.6	
Calcium	mg/kg										
Chromium	mg/kg	11		15		15		8.7		16	
Cobalt	mg/kg										
Copper	mg/kg	1.1		13		16		12		12	
Iron	mg/kg										
Lead	mg/kg	5.9		8.9		11		18		8.9	
Magnesium	mg/kg										
Manganese	mg/kg	150		800		720		810		520	
Mercury	mg/kg	.135		.15		.155		.15		.15	
Nickel	mg/kg	6.4		24		30		8.3		23	
Potassium	mg/kg										
Selenium	mg/kg	2.2		2.45		2.45		2.4		2.45	
Silver	mg/kg	.55		.6		.6		.6		.6	
Sodium	mg/kg										
Thallium	mg/kg	2.75		3.05		3.1		3		3.05	
Vanadium	mg/kg										
Zinc	mg/kg	24		52		58		28		49	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PB-PR-S12		PB-PR-S13		PB-PR-S13		PB-PR-S13		PB-PR-S13	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S12-5.0-10.0		PB-PR-S13-0.0-3.0		PB-PR-S13-3.0-10.0		PB-PR-S13-3.0-5.0		PB-PR-S13-5.0-10.0	
Sample Date:		30-OCT-94		31-OCT-94		31-OCT-94		31-OCT-94		31-OCT-94	
Depth:		5 - 10		0 - 3		3 - 10		3 - 5		5 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	3		2.85				2.8		3.1	
Arsenic	mg/kg	9.3		4.4				3.6		15	
Barium	mg/kg										
Beryllium	mg/kg	.6		.55				.55		.6	
Cadmium	mg/kg	.6		.55				.55		.6	
Calcium	mg/kg										
Chromium	mg/kg	14		13				17		17	
Cobalt	mg/kg										
Copper	mg/kg	14		3.8				11		12	
Iron	mg/kg										
Lead	mg/kg	9.2		9.8				13		15	
Magnesium	mg/kg										
Manganese	mg/kg	410		330				530		580	
Mercury	mg/kg	.15		.14				.14		.155	
Nickel	mg/kg	20		9.7				20		22	
Potassium	mg/kg					1500					
Selenium	mg/kg	2.4		2.25				2.25		2.45	
Silver	mg/kg	.6		.55				.55		.6	
Sodium	mg/kg										
Thallium	mg/kg	3		2.85				2.8		3.1	
Vanadium	mg/kg										
Zinc	mg/kg	47		33				53		58	

Plum Brook Ordnance Works
West Area Red Water Ponds
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Report Date: 09/19/00

Sample Location:		PB-PR-S13		PB-PR-S14		PB-PR-S14		PB-PR-S14		PB-PR-S14	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S13-0.0-0.5		PB-PR-S14-0.0-3.0		PB-PR-S14-3.0-5.0		PB-PR-S14-5.0-10.0		PB-PR-S14-0.0-0.5	
Sample Date:		11-DEC-94		07-NOV-94		07-NOV-94		07-NOV-94		11-DEC-94	
Depth:		0 - 0.5		0 - 3		3 - 5		5 - 10		0 - 0.5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	3.15		2.65		2.8		3.1		3	
Arsenic	mg/kg	10		3.4		6.6		4.3		1.8	
Barium	mg/kg										
Beryllium	mg/kg	.65		.55		.55		.6		.6	
Cadmium	mg/kg	.65		.55		.55		.6		.6	
Calcium	mg/kg										
Chromium	mg/kg	21		8.2		11		15		9.3	
Cobalt	mg/kg										
Copper	mg/kg	5.9		1.05		1.1		7		1.2	
Iron	mg/kg										
Lead	mg/kg	19		7.1		16		11		6.9	
Magnesium	mg/kg										
Manganese	mg/kg	390		170		225		260		190	
Mercury	mg/kg	.155		.13		.14		.155		.15	
Nickel	mg/kg	20		6.6		9.4		21		6.7	
Potassium	mg/kg										
Selenium	mg/kg	2.5		2.1		2.25		2.45		2.4	
Silver	mg/kg	.65		.55		.55		.6		.6	
Sodium	mg/kg										
Thallium	mg/kg	3.15		2.65		2.8		3.1		3	
Vanadium	mg/kg										
Zinc	mg/kg	64		33		47		85		24	

Plum Brook Ordnance Works
West Area Red Water Ponds
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Report Date: 09/19/00

Sample Location:		PB-PR-S15		PB-PR-S15		PB-PR-S15		PB-PR-S16		PB-PR-S16	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S15-0.0-3.0		PB-PR-S15-3.0-5.0		PB-PR-S15-5.0-10.0		PB-PR-S16-0.0-3.0		PB-PR-S16-3.0-5.0	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94	
Depth:		0 - 3		3 - 5		5 - 10		0 - 3		3 - 5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	2.75		2.75		3.1		2.7		5.6	
Arsenic	mg/kg	4.6		6.3		11		1.65		19	
Barium	mg/kg										
Beryllium	mg/kg	.55		.55		.6		.55		.55	
Cadmium	mg/kg	.55		.55		.6		.55		.55	
Calcium	mg/kg										
Chromium	mg/kg	9.9		12		21		10		16	
Cobalt	mg/kg										
Copper	mg/kg	4.1		3		3.2		1.1		1.1	
Iron	mg/kg										
Lead	mg/kg	7.8		6.9		11		4.6		8	
Magnesium	mg/kg										
Manganese	mg/kg	320		340		780		250		210	
Mercury	mg/kg	.135		.135		.155		.135		.14	
Nickel	mg/kg	9.3		11		20		7.2		9.6	
Potassium	mg/kg										
Selenium	mg/kg	2.2		2.2		2.45		2.15		2.25	
Silver	mg/kg	.55		.55		.6		.55		.55	
Sodium	mg/kg										
Thallium	mg/kg	2.75		2.75		3.1		2.7		2.8	
Vanadium	mg/kg										
Zinc	mg/kg	29		33		59		22		28	

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Report Date: 09/19/00

Sample Location:		PB-PR-S16		PB-PR-S17		PB-PR-S17		PB-PR-S17		PB-PR-S18	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S16-5.0-10.0		PB-PR-S17-0.0-2.0		PB-PR-S17-2.0-5.0		PB-PR-S17-0.0-0.5		PB-PR-S18-0.0-2.0	
Sample Date:		30-OCT-94		31-OCT-94		31-OCT-94		15-DEC-94		30-OCT-94	
Depth:		5 - 10		0 - 2		2 - 5		0 - 0.5		0 - 2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	3.05		2.75		6.1		3.1		2.8	
Arsenic	mg/kg	9.5		3.3		7.1		5.8		3.6	
Barium	mg/kg										
Beryllium	mg/kg	.6		.55		.55		.6		.55	
Cadmium	mg/kg	.6		.55		.55		.6		.55	
Calcium	mg/kg										
Chromium	mg/kg	17		11		18		12		9.1	
Cobalt	mg/kg										
Copper	mg/kg	9.8		1.1		11		1.25		2.7	
Iron	mg/kg										
Lead	mg/kg	13		7		11		9		9	
Magnesium	mg/kg										
Manganese	mg/kg	480		165		1500		185		160	
Mercury	mg/kg	.15		.135		.145		.155		.14	
Nickel	mg/kg	23		7.8		28		9.1		8.6	
Potassium	mg/kg										
Selenium	mg/kg	2.45		2.2		2.3		2.45		2.2	
Silver	mg/kg	.6		.55		.55		.6		.55	
Sodium	mg/kg										
Thallium	mg/kg	3.05		2.75		2.85		3.1		2.8	
Vanadium	mg/kg										
Zinc	mg/kg	60		26		51		28		28	

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Report Date: 09/19/00

Sample Location:		PB-PR-S18		PB-PR-S19		PB-PR-S19		PB-PR-S19		PB-PR-S19	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S18-2.0-5.0		PB-PR-S19-0.0-3.0		PB-PR-S19-3.0-5.0		PB-PR-S19-5.0-10.0		PB-PR-S19-0.0-0.5	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94		11-DEC-94	
Depth:		2 - 5		0 - 3		3 - 5		5 - 10		0 - 0.5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	3		2.7		6		6.8		3.15	
Arsenic	mg/kg	6.4		4.6		14		7.9		6.1	
Barium	mg/kg										
Beryllium	mg/kg	.6		.55		.6		.6		.65	
Cadmium	mg/kg	.6		.55		.6		.6		.65	
Calcium	mg/kg										
Chromium	mg/kg	14		11		13		15		10	
Cobalt	mg/kg										
Copper	mg/kg	8.6		1.1		7.5		8.8		1.25	
Iron	mg/kg										
Lead	mg/kg	12		7.5		11		12		8	
Magnesium	mg/kg										
Manganese	mg/kg	390		370		380		570		300	
Mercury	mg/kg	.15		.135		.15		.15		.155	
Nickel	mg/kg	17		9.9		18		24		7.1	
Potassium	mg/kg										
Selenium	mg/kg	2.4		2.15		2.4		2.45		2.5	
Silver	mg/kg	.6		.55		.6		.6		.65	
Sodium	mg/kg										
Thallium	mg/kg	3		2.7		3		3.05		3.15	
Vanadium	mg/kg										
Zinc	mg/kg	43		37		43		48		24	

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Sample Location:		PB-PR-S2		PB-PR-S2		PB-PR-S2		PB-PR-S20		PB-PR-S20	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S2-0.0-3.0		PB-PR-S2-3.0-5.0		PB-PR-S2-5.0-10.0		PB-PR-S20-0.0-2.0		PB-PR-S20-2.0-5.0	
Sample Date:		28-OCT-94		28-OCT-94		28-OCT-94		30-OCT-94		30-OCT-94	
Depth:		0 - 3		3 - 5		5 - 10		0 - 2		2 - 5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	2.8		6.8		3.1		2.75		5.7	
Arsenic	mg/kg	1.7		6.5		6		3.8		1.7	
Barium	mg/kg										
Beryllium	mg/kg	.55		.55		.6		.55		.55	
Cadmium	mg/kg	.55		.55		.6		.55		.55	
Calcium	mg/kg										
Chromium	mg/kg	11		14		19		11		16	
Cobalt	mg/kg										
Copper	mg/kg	2.5		7.4		8.4		4.4		1.15	
Iron	mg/kg										
Lead	mg/kg	6.9		8.5		9.5		12		10	
Magnesium	mg/kg										
Manganese	mg/kg	110		280		400		340		140	
Mercury	mg/kg	.14		.14		.155		.135		.145	
Nickel	mg/kg	6.7		13		19		13		14	
Potassium	mg/kg										
Selenium	mg/kg	2.25		2.25		2.45		2.2		2.3	
Silver	mg/kg	.55		.55		.6		.55		.55	
Sodium	mg/kg										
Thallium	mg/kg	2.8		2.85		3.1		2.75		2.85	
Vanadium	mg/kg										
Zinc	mg/kg	22		36		49		35		38	

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Sample Location:		PB-PR-S21		PB-PR-S22		PB-PR-S23		PB-PR-S24		PB-PR-S25	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S21-0.0-0.5		PB-PR-S22-0.0-0.5		PB-PR-S23-0.0-0.5		PB-PR-S24-0.0-0.5		PB-PR-S25-5.0-10.0	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94		29-OCT-94	
Depth:		0 - 0.5		0 - 0.5		0 - 0.5		0 - 0.5		5 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	2.7		2.8		2.85		2.8		3.05	
Arsenic	mg/kg	1.6		1.65		1.7		1.65		9.8	
Barium	mg/kg										
Beryllium	mg/kg	.55		.55		.55		.55		.6	
Cadmium	mg/kg	.55		.55		.55		.55		.6	
Calcium	mg/kg										
Chromium	mg/kg	10		7		7.1		5.6		15	
Cobalt	mg/kg										
Copper	mg/kg	1.1		1.1		1.15		1.1		13	
Iron	mg/kg										
Lead	mg/kg	9.8		7.2		8.7		14		13	
Magnesium	mg/kg										
Manganese	mg/kg	460		130		180		180		1100	
Mercury	mg/kg	.135		.14		.145		.14		.15	
Nickel	mg/kg	8.8		8.4		6		4.7		40	
Potassium	mg/kg										
Selenium	mg/kg	2.15		2.2		2.3		2.2		2.45	
Silver	mg/kg	.55		.55		.55		.55		.6	
Sodium	mg/kg										
Thallium	mg/kg	2.7		2.8		2.85		2.8		3.05	
Vanadium	mg/kg										
Zinc	mg/kg	20		19		26		17		52	

Sample Location:		PB-PR-S26		PB-PR-S27		PB-PR-S28		PB-PR-S29		PB-PR-S3	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S26-5.0-10.0		PB-PR-S27-5.0-10.0		PB-PR-S28-5.0-10.0		PB-PR-S29-2.0-5.0		PB-PR-S3-0.0-2.0	
Sample Date:		29-OCT-94		30-OCT-94		07-NOV-94		31-OCT-94		30-OCT-94	
Depth:		5 - 10		5 - 10		5 - 10		2 - 5		0 - 2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	6.7		3.1		3		2.95		2.65	
Arsenic	mg/kg	13		12		5.6		6.2		1.6	
Barium	mg/kg										
Beryllium	mg/kg	.6		.6		.6		.6		.55	
Cadmium	mg/kg	.6		.6		.6		.6		.55	
Calcium	mg/kg										
Chromium	mg/kg	19		16		20		13		9	
Cobalt	mg/kg										
Copper	mg/kg	7.7		11		3.6		13		1.05	
Iron	mg/kg										
Lead	mg/kg	10		12		9.5		10		6.4	
Magnesium	mg/kg										
Manganese	mg/kg	420		530		570		380		88	
Mercury	mg/kg	.15		.155		.15		.145		.135	
Nickel	mg/kg	29		26		20		15		5.5	
Potassium	mg/kg										
Selenium	mg/kg	2.4		2.45		2.4		2.35		2.15	
Silver	mg/kg	.6		.6		.6		.6		.55	
Sodium	mg/kg										
Thallium	mg/kg	3		3.1		3		2.95		2.65	
Vanadium	mg/kg										
Zinc	mg/kg	62		59		54		44		23	

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Sample Location:		PB-PR-S3		PB-PR-S30		PB-PR-S4		PB-PR-S4		PB-PR-S4	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S3-2.0-5.0		PB-PR-S30-0.0-0.5		PB-PR-S4-0.0-3.0		PB-PR-S4-3.0-5.0		PB-PR-S4-5.0-10.0	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94	
Depth:		2 - 5		0 - 0.5		0 - 3		3 - 5		5 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	3		2.65		2.9		3.1		3.1	
Arsenic	mg/kg	3.9		1.6		1.75		8		1.85	
Barium	mg/kg										
Beryllium	mg/kg	.6		.55		.6		.6		.6	
Cadmium	mg/kg	.6		.55		.6		.6		.6	
Calcium	mg/kg										
Chromium	mg/kg	11		8.3		9.5		15		20	
Cobalt	mg/kg										
Copper	mg/kg	6.2		1.05		4.3		6.9		6.3	
Iron	mg/kg										
Lead	mg/kg	9		8.5		12		7.3		11	
Magnesium	mg/kg										
Manganese	mg/kg	310		150		210		560		470	
Mercury	mg/kg	.15		.135		.145		.155		.155	
Nickel	mg/kg	13		5.9		9.3		16		20	
Potassium	mg/kg										
Selenium	mg/kg	2.4		2.15		2.35		2.45		2.45	
Silver	mg/kg	.6		.55		.6		.6		.6	
Sodium	mg/kg										
Thallium	mg/kg	3		2.65		2.9		3.1		3.1	
Vanadium	mg/kg										
Zinc	mg/kg	38		24		34		46		51	

Report Date: 09/19/00

Sample Location:		PB-PR-S5		PB-PR-S5		PB-PR-S5		PB-PR-S6		PB-PR-S6	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S5-0.0-3.0		PB-PR-S5-3.0-5.0		PB-PR-S5-5.0-10.0		PB-PR-S6-0.0-3.0		PB-PR-S6-3.0-5.0	
Sample Date:		28-OCT-94		28-OCT-94		28-OCT-94		29-OCT-94		29-OCT-94	
Depth:		0 - 3		3 - 5		5 - 10		0 - 3		3 - 5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	2.8		3.1		3.1		2.8		3.05	
Arsenic	mg/kg	15		9.3		4.8		3.9		6.3	
Barium	mg/kg										
Beryllium	mg/kg	.55		.6		.6		.55		.6	
Cadmium	mg/kg	.55		.6		.6		.55		.6	
Calcium	mg/kg										
Chromium	mg/kg	9.8		21		27		13		16	
Cobalt	mg/kg										
Copper	mg/kg	3.5		6.8		3.2		1.1		1.2	
Iron	mg/kg										
Lead	mg/kg	7.2		12		11		12		9.5	
Magnesium	mg/kg										
Manganese	mg/kg	200		270		490		150		280	
Mercury	mg/kg	.14		.155		.155		.14		.15	
Nickel	mg/kg	8.8		19		27		8.9		12	
Potassium	mg/kg										
Selenium	mg/kg	2.25		2.45		2.45		2.25		2.45	
Silver	mg/kg	.55		.6		.6		.55		.6	
Sodium	mg/kg										
Thallium	mg/kg	2.8		3.1		3.1		2.8		3.05	
Vanadium	mg/kg										
Zinc	mg/kg	28		62		62		35		41	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PB-PR-S6		PB-PR-S7		PB-PR-S7		PB-PR-S7		PB-PR-S8	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S6-5.0-10.0		PB-PR-S7-0.0-3.0		PB-PR-S7-3.0-5.0		PB-PR-S7-5.0-10.0		PB-PR-S8-0.0-2.0	
Sample Date:		29-OCT-94		28-OCT-94		28-OCT-94		28-OCT-94		31-OCT-94	
Depth:		5 - 10		0 - 3		3 - 5		5 - 10		0 - 2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	3.05		2.85		3.1		3.1		2.6	UJ
Arsenic	mg/kg	9.4		3.7		14		8.3		1.55	
Barium	mg/kg										
Beryllium	mg/kg	.6		.55		.6		.6		.5	
Cadmium	mg/kg	.6		.55		.6		.6		.5	
Calcium	mg/kg										
Chromium	mg/kg	15		11		15		19		8	
Cobalt	mg/kg										
Copper	mg/kg	7.9		1.15		7.8		4.2		1.05	
Iron	mg/kg										
Lead	mg/kg	12		6.4		11		10		3.9	
Magnesium	mg/kg										
Manganese	mg/kg	490		230		650		500		86	
Mercury	mg/kg	.15		.145		.155		.155		.13	
Nickel	mg/kg	16		8.6		20		20		5.4	
Potassium	mg/kg										
Selenium	mg/kg	2.45		2.3		2.45		2.45		2.05	
Silver	mg/kg	.6		.55		.6		.6		.5	UJ
Sodium	mg/kg										
Thallium	mg/kg	3.05		2.85		3.1		3.1		2.6	
Vanadium	mg/kg										
Zinc	mg/kg	45		25		48		54		33	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PB-PR-S8		PB-PR-S8		PB-PR-S9		PB-PR-S9		PB-PR-S9	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S8-2.0-5.0		PB-PR-S8-0.0-0.5		PR-PR-S9-0.0-3.0		PB-PR-S9-3.0-5.0		PB-PR-S9-5.0-10.0	
Sample Date:		31-OCT-94		15-DEC-94		29-OCT-94		29-OCT-94		29-OCT-94	
Depth:		2 - 5		0 - 0.5		0 - 3		3 - 5		5 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	2.6		2.9		2.8		3.1		6.7	
Arsenic	mg/kg	1.55		1.75		4.6		6		11	
Barium	mg/kg										
Beryllium	mg/kg	.5		.6		.55		.6		.6	
Cadmium	mg/kg	.5		.6		.55		.6		.6	
Calcium	mg/kg										
Chromium	mg/kg	8		7.9		10		16		15	
Cobalt	mg/kg										
Copper	mg/kg	1.05		1.15		1.1		6.5		7.3	
Iron	mg/kg										
Lead	mg/kg	3.9		8.6		7.8		11		10	
Magnesium	mg/kg										
Manganese	mg/kg	230		90		130		320		415	
Mercury	mg/kg	.13		.145		.14		.155		.15	
Nickel	mg/kg	6.4		6		7.3		17		18	
Potassium	mg/kg										
Selenium	mg/kg	2.1		2.35		2.2		2.45		2.45	
Silver	mg/kg	.5		.6		.55		.6		.6	
Sodium	mg/kg										
Thallium	mg/kg	2.6		2.9		2.8		3.1		3.05	
Vanadium	mg/kg										
Zinc	mg/kg	23		31		28		47		48	

Plum Brook Ordnance Works
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Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PB-WA-S1		PB-WA-S10		PB-WA-S10		PB-WA-S11		PB-WA-S11	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S1-0.0-0.5		PB-WA-S10-3.0-5.0		PB-WA-S10-5.0-10.0		PB-WA-S11-0.0-2.0		PB-WA-S11-2.0-5.0	
Sample Date:		27-OCT-94		27-OCT-94		27-OCT-94		25-OCT-94		25-OCT-94	
Depth:		0 - 0.5		3 - 5		5 - 10		0 - 2		2 - 5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	3.05		3.25		3.15		2.85		2.8	
Arsenic	mg/kg	6		5.8		14		5.1		4.3	
Barium	mg/kg										
Beryllium	mg/kg	.6		.65		.65		.55		.55	
Cadmium	mg/kg	.6		.65		.65		.55		.55	
Calcium	mg/kg										
Chromium	mg/kg	23		26		25		16		10.6	
Cobalt	mg/kg										
Copper	mg/kg	1.2		3.4		1.25		6.8		6.4	
Iron	mg/kg										
Lead	mg/kg	16		10		10.9		18		13	
Magnesium	mg/kg										
Manganese	mg/kg	366		455		392		466		267	
Mercury	mg/kg	.15		.16		.16		.14		.14	
Nickel	mg/kg	23		23		25		27		19	
Potassium	mg/kg										
Selenium	mg/kg	2.45		2.6		2.55		2.25		2.2	
Silver	mg/kg	.6		.65		.65		.55		.55	
Sodium	mg/kg										
Thallium	mg/kg	3.05		3.25		3.15		2.85		2.8	
Vanadium	mg/kg										
Zinc	mg/kg	73		60		68		76		51	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PB-WA-S12		PB-WA-S12		PB-WA-S13		PB-WA-S13		PB-WA-S13	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S12-0.0-2.0		PB-WA-S12-2.0-5.0		PB-WA-S13-0.0-3.0		PB-WA-S13-3.0-5.0		PB-WA-S13-5.0-10.0	
Sample Date:		25-OCT-94		25-OCT-94		18-OCT-94		18-OCT-94		18-OCT-94	
Depth:		0 - 2		2 - 5		0 - 3		3 - 5		5 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	2.85		3		2.85		3.05		3	
Arsenic	mg/kg	4.8		7.2		1.7		1.85		1.8	
Barium	mg/kg										
Beryllium	mg/kg	.55		.6		.55		.6		.6	
Cadmium	mg/kg	.55		.6		.55		.6		.6	
Calcium	mg/kg										
Chromium	mg/kg	15		29		16		11		23	
Cobalt	mg/kg										
Copper	mg/kg	1.15		3.5		7.4		8.8		12	
Iron	mg/kg										
Lead	mg/kg	10.6		16		15		11.1		18	
Magnesium	mg/kg										
Manganese	mg/kg	216		373		184		220		434	
Mercury	mg/kg	.14		.15		.145		.15		.15	
Nickel	mg/kg	16		29		20		22		35	
Potassium	mg/kg										
Selenium	mg/kg	2.25		2.4		2.3		2.45		2.4	
Silver	mg/kg	.55		.6		.55		.6		.6	
Sodium	mg/kg										
Thallium	mg/kg	2.85		3		2.85		3.05		3	
Vanadium	mg/kg										
Zinc	mg/kg	41		58		55		54		59	

Plum Brook Ordnance Works
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Report Date: 09/19/00

Sample Location:		PB-WA-S13		PB-WA-S14		PB-WA-S14		PB-WA-S15		PB-WA-S15	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S13-0.0-0.5		PB-WA-S14-0.0-2.0		PB-WA-S14-2.0-5.0		PB-WA-S15-0.0-2.0		PB-WA-S15-2.0-5.0	
Sample Date:		13-DEC-94		25-OCT-94		25-OCT-94		24-OCT-94		24-OCT-94	
Depth:		0 - 0.5		0 - 2		2 - 5		0 - 2		2 - 5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	3.1		2.7		2.75		2.8		2.7	
Arsenic	mg/kg	6.4		5.6		5.5		6.1		4.8	
Barium	mg/kg										
Beryllium	mg/kg	.6		.55		.55		.55		.55	
Cadmium	mg/kg	.6		.55		.55		.55		.55	
Calcium	mg/kg										
Chromium	mg/kg	14		9.2		9.9		16		13	
Cobalt	mg/kg										
Copper	mg/kg	3.2		5.1		7.4		7.1		7.1	
Iron	mg/kg										
Lead	mg/kg	17		10.3		8.4		17		12	
Magnesium	mg/kg										
Manganese	mg/kg	200		398		198		433		413	
Mercury	mg/kg	.155		.135		.135		.14		.135	
Nickel	mg/kg	17		17		19		21		23	
Potassium	mg/kg										
Selenium	mg/kg	2.45		2.15		2.2		2.2		2.15	
Silver	mg/kg	.6		.55		.55		.55		.55	
Sodium	mg/kg										
Thallium	mg/kg	3.1		2.7		2.75		2.8		2.7	
Vanadium	mg/kg										
Zinc	mg/kg	57		45		46		64		62	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Sample Location:		PB-WA-S16		PB-WA-S16		PB-WA-S17		PB-WA-S17		PB-WA-S17	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S16-0.0-2.0		PB-WA-S16-2.0-4.0		PB-WA-S17-0.0-3.0		PB-WA-S17-3.0-5.0		PB-WA-S17-5.0-10.0	
Sample Date:		18-OCT-94		18-OCT-94		19-OCT-94		19-OCT-94		19-OCT-94	
Depth:		0 - 2		2 - 4		0 - 3		3 - 5		5 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	2.95		3.1		2.9		2.85		3	
Arsenic	mg/kg	4.4		6.9		1.75		8.5		5.4	
Barium	mg/kg										
Beryllium	mg/kg	.6		.6		.6		.55		.6	
Cadmium	mg/kg	.6		.6		.6		.55		.6	
Calcium	mg/kg										
Chromium	mg/kg	21		19		17		16		11.2	
Cobalt	mg/kg										
Copper	mg/kg	2.8		5.3		8.5		8.2		11.3	
Iron	mg/kg										
Lead	mg/kg	8.4		8.9		23		16		11.4	
Magnesium	mg/kg										
Manganese	mg/kg	165		185		1023		398		274	
Mercury	mg/kg	.145		.155		.145		.14		.15	
Nickel	mg/kg	10.1		9.5		31		22		18	
Potassium	mg/kg										
Selenium	mg/kg	2.35		2.45		2.35		2.25		2.4	
Silver	mg/kg	.6		.6		.6		.55		.6	
Sodium	mg/kg										
Thallium	mg/kg	2.95		3.1		2.9		2.85		3	
Vanadium	mg/kg										
Zinc	mg/kg	32		33		80		64		50	

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West Area Red Water Ponds
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Sample Location:		PB-WA-S17		PB-WA-S18		PB-WA-S18		PB-WA-S18		PB-WA-S19	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S17-0.0-0.5		PB-WA-S18-0.0-3.0		PB-WA-S18-3.0-5.0		PB-WA-S18-5.0-10.0		PB-WA-S19-0.0-2.0	
Sample Date:		13-DEC-94		18-OCT-94		18-OCT-94		18-OCT-94		24-OCT-94	
Depth:		0 - 0.5		0 - 3		3 - 5		5 - 10		0 - 2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	7.4		3.15		3		3.35		2.9	
Arsenic	mg/kg	8.5		3.9		1.8		2		5.7	
Barium	mg/kg										
Beryllium	mg/kg	.65		.65		.6		.65		.6	
Cadmium	mg/kg	.65		.65		.6		.65		.6	
Calcium	mg/kg										
Chromium	mg/kg	19		20		11		19		22	
Cobalt	mg/kg										
Copper	mg/kg	3.7		16		9.3		5.9		6.2	
Iron	mg/kg										
Lead	mg/kg	22		19		12		15		20	
Magnesium	mg/kg										
Manganese	mg/kg	270		1000		325		333		442	
Mercury	mg/kg	.16		.16		.15		.165		.145	
Nickel	mg/kg	18		34		18		24		27	
Potassium	mg/kg										
Selenium	mg/kg	2.55		2.55		2.4		2.65		2.35	
Silver	mg/kg	.65		.65		.6		.65		.6	
Sodium	mg/kg										
Thallium	mg/kg	3.2		3.15		3		3.35		2.9	
Vanadium	mg/kg										
Zinc	mg/kg	69		87		54		57		79	

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West Area Red Water Ponds
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Sample Location:		PB-WA-S19		PB-WA-S2		PB-WA-S20		PB-WA-S21		PB-WA-S22	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S19-2.0-5.0		PB-WA-S2-0.0-0.5		PB-WA-S20-0.0-0.5		PB-WA-S21-0.0-2.0		PB-WA-S22-2.0-5.0	
Sample Date:		24-OCT-94		27-OCT-94		29-OCT-94		17-OCT-94		18-OCT-94	
Depth:		2 - 5		0 - 0.5		0 - 0.5		0 - 2		2 - 5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	2.85		3.15		3		3.05		2.65	
Arsenic	mg/kg	7.7		5.7		4.6		5.2		5	
Barium	mg/kg										
Beryllium	mg/kg	.55		.65		.6		.6		.55	
Cadmium	mg/kg	.55		.65		.6		.6		1.6	
Calcium	mg/kg										
Chromium	mg/kg	22		10.8		16		16		12	
Cobalt	mg/kg										
Copper	mg/kg	11		7.6		2.9		6		14	
Iron	mg/kg										
Lead	mg/kg	15		10		12		15		8.5	
Magnesium	mg/kg										
Manganese	mg/kg	494		329		190		695		3300	
Mercury	mg/kg	.145		.16		.15		.15		.135	
Nickel	mg/kg	31		20		16		29		52	
Potassium	mg/kg										
Selenium	mg/kg	2.3		2.55		2.4		2.45		2.15	
Silver	mg/kg	.55		.65		.6		.6		.55	
Sodium	mg/kg										
Thallium	mg/kg	2.85		3.15		3		3.05		2.65	
Vanadium	mg/kg										
Zinc	mg/kg	66		26		45		72		37	

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Sample Location:		PB-WA-S23		PB-WA-S24		PB-WA-S3		PB-WA-S4		PB-WA-S5	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S23-0.0-0.5		PB-WA-S24-5.0-10		PB-WA-S3-0.0-0.5		PB-WA-S4-0.0-0.5		PB-WA-S5-0.0-2.0	
Sample Date:		29-OCT-94		19-OCT-94		27-OCT-94		29-OCT-94		17-OCT-94	
Depth:		0 - 0.5		5 - 10		0 - 0.5		0 - 0.5		0 - 2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	3		2.9		3.6		3.05		3.1	
Arsenic	mg/kg	5		1.75		6.5		1.85		4.7	
Barium	mg/kg										
Beryllium	mg/kg	.6		.6		.7		.6		.6	
Cadmium	mg/kg	.6		.6		.7		.6		.6	
Calcium	mg/kg										
Chromium	mg/kg	18		11.2		16		12		35	
Cobalt	mg/kg										
Copper	mg/kg	3.1		5.3		11.3		2.4		1.25	
Iron	mg/kg										
Lead	mg/kg	13		11		16		12		19	
Magnesium	mg/kg										
Manganese	mg/kg	290		198		841		350		1012	
Mercury	mg/kg	.15		.145		.18		.15		.155	
Nickel	mg/kg	18		15		29		15		35	
Potassium	mg/kg										
Selenium	mg/kg	2.4		2.35		2.9		2.45		2.45	
Silver	mg/kg	.6		.6		.7		.6		.6	
Sodium	mg/kg										
Thallium	mg/kg	3		2.9		3.6		3.05		3.1	
Vanadium	mg/kg										
Zinc	mg/kg	51		43		78		49		91	

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Sample Location:		PB-WA-S5		PB-WA-S6		PB-WA-S6		PB-WA-S7		PB-WA-S7	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S5-2.0-5.0		PB-WA-S6-0.0-2.0		PB-WA-S6-2.0-5.0		PB-WA-S7-0.0-2.0		PB-WA-S7-2.0-5.0	
Sample Date:		17-OCT-94		17-OCT-94		17-OCT-94		18-OCT-94		18-OCT-94	
Depth:		2 - 5		0 - 2		2 - 5		0 - 2		2 - 5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	3.05		3.05		3.2		2.8		2.85	
Arsenic	mg/kg	4.8		1.85		5.6		4.4		5.1	
Barium	mg/kg										
Beryllium	mg/kg	.6		.6		.65		.55		.55	
Cadmium	mg/kg	.6		.6		.65		.55		.55	
Calcium	mg/kg										
Chromium	mg/kg	17		16		12.7		14		16	
Cobalt	mg/kg										
Copper	mg/kg	7.1		3.3		7.8		3.6		14	
Iron	mg/kg										
Lead	mg/kg	11.7		15		11.5		16		20	
Magnesium	mg/kg										
Manganese	mg/kg	305		268		282		300		1011	
Mercury	mg/kg	.15		.15		.16		.14		.145	
Nickel	mg/kg	26		21		22		16		31	
Potassium	mg/kg										
Selenium	mg/kg	2.45		2.45		2.55		2.2		2.3	
Silver	mg/kg	.6		.6		.65		.55		.55	
Sodium	mg/kg										
Thallium	mg/kg	3.05		3.05		3.2		2.8		2.85	
Vanadium	mg/kg										
Zinc	mg/kg	62		66		56		64		60	

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Sample Location:		PB-WA-S8		PB-WA-S8		PB-WA-S9		PB-WA-S9		WARP-DP01	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S8-0.0-2.0		PB-WA-S8-2.0-5.0		PB-WA-S9-0.0-2.0		PB-WA-S9-2.0-5.0		8100	
Sample Date:		18-OCT-94		18-OCT-94		18-OCT-94		18-OCT-94		23-JUN-98	
Depth:		0 - 2		2 - 5		0 - 2		2 - 5		0 - 2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg									6880	
Antimony	mg/kg	3		2.65		2.9		3.25		3.4	UJ
Arsenic	mg/kg	4.5		5.3		6.2		3.9		2.8	
Barium	mg/kg									11.4	U
Beryllium	mg/kg	.6		.55		.6		.65		.285	U
Cadmium	mg/kg	.6		1.4		.6		.65		.285	U
Calcium	mg/kg									1490	
Chromium	mg/kg	14		13		30		23		9.9	J
Cobalt	mg/kg									2.85	U
Copper	mg/kg	1.2		2.4		2.6		1.3		4.0	
Iron	mg/kg									10300	
Lead	mg/kg	13		7.4		7.8		7.9		3.6	J
Magnesium	mg/kg									1090	
Manganese	mg/kg	702		621		163		156		89.6	
Mercury	mg/kg	.15		.13		.145		.16		.019	U
Nickel	mg/kg	17		16		10.3		9.4		7.6	
Potassium	mg/kg									284.5	U
Selenium	mg/kg	2.4		2.1		2.35		2.6		.285	U
Silver	mg/kg	.6		.55		.6		.65		.55	U
Sodium	mg/kg									284.5	U
Thallium	mg/kg	3		2.65		2.9		3.25		.55	UJ
Vanadium	mg/kg									18.9	
Zinc	mg/kg	57		34		33		34		21.7	

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Sample Location:		WARP-DP01		WARP-DP01		WARP-DP02		WARP-DP02		WARP-DP02	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8110		8120		8140		8150		8160	
Sample Date:		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		4 - 6		8 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	9190		6010		17900		7540		14500	
Antimony	mg/kg	3.75	UJ	3.75	UJ	3.6	UJ	3.6	UJ	3.8	UJ
Arsenic	mg/kg	8.6		4.5		7.2		2.5		11.7	
Barium	mg/kg	40.3		27.9		124		32.1		75.3	
Beryllium	mg/kg	.315	U	.31	U	1.0		.3	U	0.70	
Cadmium	mg/kg	.315	U	.31	U	.3	U	.3	U	.315	U
Calcium	mg/kg	35700		67600		5930		3010		56600	
Chromium	mg/kg	16.1	J	10.9	J	20.8	J	12.1	J	22.2	J
Cobalt	mg/kg	8.5		6.2		16.2		3	U	10	
Copper	mg/kg	20.1		17.1		20.0		7.0		25.6	
Iron	mg/kg	19600		15000		26800		11500		26400	
Lead	mg/kg	8.1	J	7.1	J	13.5	J	4.8	J	10.8	J
Magnesium	mg/kg	14500		20700		4020		2110		15100	
Manganese	mg/kg	282		329		1190		92.5		423	
Mercury	mg/kg	.0205	U	.0205	U	0.061		.02	U	.021	U
Nickel	mg/kg	19.4		14.0		29.1		13.0		27.8	
Potassium	mg/kg	2010	J	1480	J	2490	J	1210	J	3370	J
Selenium	mg/kg	.315	U	.6	U	.3	U	.3	U	.65	U
Silver	mg/kg	.65	U	.6	U	.6	U	.6	U	.65	U
Sodium	mg/kg	314	U	310.5	U	300	U	301	U	317	U
Thallium	mg/kg	.65	UJ	1.25	UJ	.6	UJ	.6	UJ	1.25	UJ
Vanadium	mg/kg	28.0		20.5		37.7		17.8		34.6	
Zinc	mg/kg	51.2		40.0		87.4		33.9		68.1	

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Sample Location:		WARP-DP03		WARP-DP03		WARP-DP03		WARP-DP04		WARP-DP04	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8180		8190		8200		8220		8230	
Sample Date:		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98	
Depth:		0 - 2		4 - 6		8 - 10		0 - 2		4 - 6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	16500		7040		9400		17000		8640	
Antimony	mg/kg	3.55	UJ	3.55	UJ	3.75	UJ	3.5	UJ	3.35	UJ
Arsenic	mg/kg	8.1		6.8		5.8		6.1		4.5	
Barium	mg/kg	112		87.2		58.0		85.4		45.7	
Beryllium	mg/kg	0.76	J	.295	U	.315	U	0.78	J	.28	U
Cadmium	mg/kg	0.59		.295	U	.315	U	.29	U	.28	U
Calcium	mg/kg	2710		2200		40200		1900		1860	
Chromium	mg/kg	19.9	J	11.4	J	14.8	J	19.2	J	11.9	J
Cobalt	mg/kg	17.9		21.0		8.5		14.7		9.2	
Copper	mg/kg	21.4		15.1		20.3		21.9		12.7	
Iron	mg/kg	30200		19600		20100		23900		14500	
Lead	mg/kg	11.7		9.4		7.6		10.3		6.2	
Magnesium	mg/kg	3760		2020		10800		3220		1990	
Manganese	mg/kg	1340		495		372		915		267	
Mercury	mg/kg	.0195	U	.0195	U	.0205	U	.0195	U	.0185	U
Nickel	mg/kg	44.3		24.0		23.0		29.7		20.9	
Potassium	mg/kg	2970	J	941	J	2460	J	2510	J	1370	J
Selenium	mg/kg	.295	U	.295	U	.315	U	.29	U	.28	U
Silver	mg/kg	.6	U	.6	U	.65	U	.6	U	.55	U
Sodium	mg/kg	294.5	U	295	U	313	U	292.5	U	281	U
Thallium	mg/kg	.6	U	.6	U	.65	U	.6	U	.55	U
Vanadium	mg/kg	32.5	J	19.6	J	23.3	J	32.9	J	18.2	J
Zinc	mg/kg	111		64.1		54.7		88.1		53.8	

Sample Location:		WARP-DP04		WARP-DP05		WARP-DP05		WARP-DP05		WARP-DP06	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8240		8260		8270		8280		8300	
Sample Date:		23-JUN-98		16-JUN-98		16-JUN-98		16-JUN-98		23-JUN-98	
Depth:		8 - 10		0 - 2		4 - 6		8 - 10		0 - 2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	13400		8120		8840		9510		5600	
Antimony	mg/kg	3.8	UJ	3.35	U	3.65	U	3.65	U	3.35	UJ
Arsenic	mg/kg	11.2		4.8		4.6		6.7		2.3	
Barium	mg/kg	35.3		51.2		62.4		54.3		11.2	U
Beryllium	mg/kg	.32	U	.28	U	.305	U	.305	U	.28	U
Cadmium	mg/kg	.32	U	.28	U	.305	U	.305	U	.28	U
Calcium	mg/kg	40300		2390		54500		50400		1620	
Chromium	mg/kg	20.0	J	13.1		15.3		17.4		8.9	J
Cobalt	mg/kg	11.6		8.5		9.6		9.2		2.8	U
Copper	mg/kg	34.7		11.7		19.3		19.0		4.5	
Iron	mg/kg	27800		17600		17000		18200		10200	
Lead	mg/kg	12.3		6.1		10.5		8.4		2.8	J
Magnesium	mg/kg	11000		2150		23400		14800		1060	
Manganese	mg/kg	363		468		527		362		143	
Mercury	mg/kg	.021	U	.0185	U	.02	U	.02	U	.0185	U
Nickel	mg/kg	36.0		17.0		23.2		21.7		7.1	
Potassium	mg/kg	3570	J	813		1740		1730		280	U
Selenium	mg/kg	.32	U	.28	U	.305	U	.305	U	.28	U
Silver	mg/kg	.65	U	.55	U	.6	U	.6	U	.55	U
Sodium	mg/kg	317.5	U	280.5	U	305.5	U	304	U	280	U
Thallium	mg/kg	.65	U	.55	U	.6	U	.6	U	.55	UJ
Vanadium	mg/kg	24.7	J	24.1	J	27.1	J	25.9	J	17.9	
Zinc	mg/kg	80.0		40.4		53.6		53.4		21.1	

Sample Location:		WARP-DP06		WARP-DP06		WARP-DP07		WARP-DP07		WARP-DP07	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8310		8320		8340		8350		8360	
Sample Date:		23-JUN-98		23-JUN-98		25-JUN-98		25-JUN-98		25-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		4 - 6		8 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	8610		12100		11500		9160		10900	
Antimony	mg/kg	3.5	UJ	3.75	UJ	3.6	UJ	3.5	UJ	3.65	UJ
Arsenic	mg/kg	6.8		6.6		3.7		3.1		7.4	
Barium	mg/kg	31.3		82.3		69.7		43.3		55.4	
Beryllium	mg/kg	.29	U	.315	U	0.70		.29	U	0.65	
Cadmium	mg/kg	.29	U	.315	U	.3	U	.29	U	.305	U
Calcium	mg/kg	2530		55700		2700		2410		25000	
Chromium	mg/kg	15.5	J	17.9	J	15.8	J	14.1	J	17.1	J
Cobalt	mg/kg	7.9		12.8		9.0		7.3		13.8	
Copper	mg/kg	12.4		23.5		15.9		12.5		21.4	
Iron	mg/kg	17000		21500		16800		13900		20700	
Lead	mg/kg	7.1	J	11.6	J	10.1	J	6.9	J	11.6	J
Magnesium	mg/kg	1860		17700		2720		2340		5620	
Manganese	mg/kg	413		768		186		123		472	
Mercury	mg/kg	.0195	U	.0205	U	.0195	U	.0195	U	.02	U
Nickel	mg/kg	14.8		31.4		22.3		18.3		29.7	
Potassium	mg/kg	924	J	2860	J	1650	J	1650	J	2390	J
Selenium	mg/kg	.29	U	.65	U	.3	U	.29	U	.305	U
Silver	mg/kg	.6	U	.65	U	.6	U	.6	U	.6	U
Sodium	mg/kg	292.5	U	313.5	U	299	U	292	U	305.5	U
Thallium	mg/kg	.6	UJ	1.25	UJ	.6	UJ	.6	UJ	.6	UJ
Vanadium	mg/kg	25.4		30.8		21.1		20.4		24.2	
Zinc	mg/kg	39.3		62.2		70.5		57.5		75.6	

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Sample Location:		WARP-DP08		WARP-DP08		WARP-DP08		WARP-DP09		WARP-DP09	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8380		8390		8400		8420		8430	
Sample Date:		15-JUN-98		15-JUN-98		15-JUN-98		16-JUN-98		16-JUN-98	
Depth:		0 - 2		4 - 6		8 - 10		0 - 2		4 - 6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	4880		8740		5570		7610		6470	
Antimony	mg/kg	3.5	U	3.55	U	3.45	U	4.15	U	3.6	U
Arsenic	mg/kg	2.2		6.9		4.0		6.8		2.2	
Barium	mg/kg	11.6	U	43.8		11.55	U	53.9		41.3	
Beryllium	mg/kg	.29	U	.295	U	.29	U	.345	U	.3	U
Cadmium	mg/kg	.29	U	.295	U	.29	U	.345	U	.3	U
Calcium	mg/kg	1480		1810		1460		58600		1220	
Chromium	mg/kg	6.8		17.4		7.5		22.2		8.2	
Cobalt	mg/kg	2.9	U	7.4		2.9	U	3.45	U	3	U
Copper	mg/kg	2.9		10.4		6.9		18.5		4.9	
Iron	mg/kg	8460		22000		10000		14200		8490	
Lead	mg/kg	2.2		5.4		4.4		11.7		5.8	
Magnesium	mg/kg	289.5	U	1810		832		4510		2010	
Manganese	mg/kg	107		231		215		213		83.4	
Mercury	mg/kg	.019	U	.0195	U	.019	U	0.10		.0195	U
Nickel	mg/kg	7.5		17.0		10.8		10.6		7.4	
Potassium	mg/kg	289.5	U	643		289	U	346.5	U	299	U
Selenium	mg/kg	.29	U	.295	U	.29	U	.345	U	.3	U
Silver	mg/kg	.6	U	.6	U	.6	U	.7	U	.6	U
Sodium	mg/kg	289.5	U	297.5	U	289	U	346.5	U	299	U
Thallium	mg/kg	.6	U	.6	U	.6	U	.7	U	.6	U
Vanadium	mg/kg	15.8		30.0		17.8		21.1	J	14.2	J
Zinc	mg/kg	15.9		37.8		26.5		36.9		30.6	

Sample Location:		WARP-DP09		WARP-DP10		WARP-DP10		WARP-DP11		WARP-DP11	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8440		8460		8470		8500		8510	
Sample Date:		16-JUN-98		26-JUN-98		26-JUN-98		25-JUN-98		25-JUN-98	
Depth:		8 - 10		0 - 2		4 - 6		0 - 2		4 - 6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	11100		12300		12000		11300		5980	
Antimony	mg/kg	7.7		3.5	UJ	3.6	UJ	3.6	UJ	3.5	UJ
Arsenic	mg/kg	14.0		5.2		7.9		3.7		6.5	
Barium	mg/kg	78.2		77.4		80.3		72.9		35.5	
Beryllium	mg/kg	0.65		0.73		0.86		0.64		.29	U
Cadmium	mg/kg	.32	U	.29	U	.3	U	.3	U	.29	U
Calcium	mg/kg	7860		3260		2130		2600		1570	
Chromium	mg/kg	20.9		15.7	J	17.9	J	15.8	J	9.4	J
Cobalt	mg/kg	11.9		15.7		11.2		11.5		6.9	
Copper	mg/kg	24.2		16.5		20.4		12.3		10.4	
Iron	mg/kg	29000		20000		27000		18700		16800	
Lead	mg/kg	10.6		11.0	J	11.5	J	9.1	J	6.2	J
Magnesium	mg/kg	4980		2930		2850		3030		1580	
Manganese	mg/kg	405		681		243		375		114	
Mercury	mg/kg	.021	U	0.045		.02	U	.0195	U	.0195	U
Nickel	mg/kg	36.6		29.0		33.5		22.6		16.6	
Potassium	mg/kg	1160		1600	J	1340	J	1660	J	903	J
Selenium	mg/kg	.32	U	.29	U	.3	U	.3	U	.29	U
Silver	mg/kg	.65	U	.6	U	.6	U	.6	U	.6	U
Sodium	mg/kg	319.5	U	291.5	U	1270		298.5	U	292	U
Thallium	mg/kg	.65	U	.6	UJ	.6	UJ	.6	UJ	.6	UJ
Vanadium	mg/kg	27.5	J	22.4		24.6		21.1		13.9	
Zinc	mg/kg	72.5		74.6		94.6		75.4		42.4	

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Sample Location:		WARP-DP11		WARP-DP12		WARP-DP12		WARP-DP12		WARP-DP13	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8520		8540		8550		8560		8580	
Sample Date:		25-JUN-98		15-JUN-98		15-JUN-98		15-JUN-98		15-JUN-98	
Depth:		8 - 10		0 - 2		4 - 6		8 - 10		0 - 2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	11400		4720		5080		9320		11900	
Antimony	mg/kg	3.5	UJ	3.35	U	3.75	U	3.75	U	3.4	U
Arsenic	mg/kg	7.9		2.0		23.6		8.3		11.5	
Barium	mg/kg	51.5		24.8		39.3		54.5		82.0	
Beryllium	mg/kg	0.59		.28	U	.31	U	.31	U	0.67	
Cadmium	mg/kg	.29	U	.28	U	.31	U	.31	U	.285	U
Calcium	mg/kg	51000		757		18800		57200		16600	
Chromium	mg/kg	16.8	J	5.4		10.6		16.2		20.3	
Cobalt	mg/kg	10.1		2.8	U	8.2		8.9		11.1	
Copper	mg/kg	24.3		3.5		19.3		22.6		26.8	
Iron	mg/kg	22500		7190		23200		19500		27400	
Lead	mg/kg	8.2	J	2.9		6.4		9.8		11.3	
Magnesium	mg/kg	11300		684		6810		17400		8890	
Manganese	mg/kg	392		172		551		433		391	
Mercury	mg/kg	.019	U	.0185	U	.0205	U	.0205	U	.019	U
Nickel	mg/kg	30.2		8.6		24.9		23.9		29.1	
Potassium	mg/kg	3140	J	279.5	U	803		1860		1830	
Selenium	mg/kg	.29	U	.28	U	.31	U	.31	U	.285	U
Silver	mg/kg	.6	U	.55	U	.6	U	.6	U	.55	U
Sodium	mg/kg	290.5	U	279.5	U	311.5	U	311.5	U	284.5	U
Thallium	mg/kg	.6	UJ	.55	U	.6	U	.6	U	.55	U
Vanadium	mg/kg	24.2		10.1		22.3		25.9		31.0	
Zinc	mg/kg	58.9		22.9		55.0		60.6		69.9	

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Sample Location:		WARP-DP13		WARP-DP13		WARP-DP15		WARP-DP15		WARP-DP15	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8590		8600		8660		8670		8680	
Sample Date:		15-JUN-98		15-JUN-98		24-JUN-98		24-JUN-98		24-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		4 - 6		8 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	5910		13700		14300		11100		13800	
Antimony	mg/kg	3.5	U	3.7	U	3.6	UJ	3.55	UJ	3.5	UJ
Arsenic	mg/kg	3.1		15.3		9.3		3.7		7.6	
Barium	mg/kg	27.9		76.3		91.4		53.8		165	
Beryllium	mg/kg	.29	U	0.83		0.63	J	.295	U	0.64	J
Cadmium	mg/kg	.29	U	0.68		.3	U	.295	U	.295	U
Calcium	mg/kg	4680		3580		31400		2480		3480	
Chromium	mg/kg	10.3		22.2		19.7	J	13.0	J	12.9	J
Cobalt	mg/kg	6.0		18.4		13.0		6.2		16.2	
Copper	mg/kg	14.0		29.1		22.7		9.6		18.0	
Iron	mg/kg	10900		34000		24700		13400		24500	
Lead	mg/kg	4.9		14.0		10.7		5.9		13.2	
Magnesium	mg/kg	2050		4310		12200		2010		4220	
Manganese	mg/kg	231		780		781		269		1900	
Mercury	mg/kg	.019	U	.0205	U	.02	U	.0195	U	.0195	U
Nickel	mg/kg	10.3		45.0		32.1		13.6		40.8	
Potassium	mg/kg	289.5	U	1630		2640	J	1370	J	2070	J
Selenium	mg/kg	.29	U	.31	U	.3	U	.295	U	.295	U
Silver	mg/kg	.6	U	.6	U	.6	U	.6	U	.6	U
Sodium	mg/kg	289.5	U	1030		301	U	295.5	U	293	U
Thallium	mg/kg	.6	U	.6	U	.6	U	.6	U	.6	U
Vanadium	mg/kg	17.0		36.7		36.3	J	23.2	J	27.7	J
Zinc	mg/kg	27.2		82.9		63.4		45.3		75.7	

Sample Location:		WARP-DP16		WARP-DP16		WARP-DP16		WARP-DP17		WARP-DP17	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8700		8710		8720		8740		8750	
Sample Date:		24-JUN-98		24-JUN-98		24-JUN-98		25-JUN-98		25-JUN-98	
Depth:		0 - 2		4 - 6		8 - 10		0 - 2		4 - 6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	20600		12400		18400		11200		9420	
Antimony	mg/kg	7.4	J	3.7	UJ	3.85	UJ	3.5	UJ	3.65	UJ
Arsenic	mg/kg	11.4		11.0		9.5		5.1		11.6	
Barium	mg/kg	130		117		118		61.9		67.7	
Beryllium	mg/kg	1.2	J	.305	U	0.82	J	.295	U	.305	U
Cadmium	mg/kg	.3	U	.305	U	.32	U	.295	U	.305	U
Calcium	mg/kg	3760		31700		13300		1460		2240	
Chromium	mg/kg	25.4	J	15.8	J	22.7	J	14.8	J	15.5	J
Cobalt	mg/kg	17.1		13.0		15.0		11.5		15.5	
Copper	mg/kg	30.9		26.2		26.4		15.4		19.2	
Iron	mg/kg	36000		29200		31100		19800		26100	
Lead	mg/kg	11.4		9.1		10.1		10.6		9.0	
Magnesium	mg/kg	4870		10100		6970		2500	J	2530	J
Manganese	mg/kg	982		1280		1170		207		326	
Mercury	mg/kg	0.040		.02	U	.021	U	.0195	U	.02	U
Nickel	mg/kg	46.9		33.9		39.3		20.5		31.6	
Potassium	mg/kg	2590	J	1830	J	3240	J	898	J	1030	J
Selenium	mg/kg	.3	U	.305	U	.32	U	0.65		.305	U
Silver	mg/kg	.6	U	.6	U	.65	U	.6	U	.6	U
Sodium	mg/kg	681		306.5	U	726		292.5	U	858	
Thallium	mg/kg	.6	U	.6	U	.65	U	.6	U	.6	U
Vanadium	mg/kg	40.5	J	31.0	J	40.3	J	19.2		22.1	
Zinc	mg/kg	103		70.9		81.2		65.4		66.1	

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Sample Location:		WARP-DP17		WARP-DP18		WARP-DP18		WARP-DP18		WARP-DP19	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8760		8780		8790		8800		8820	
Sample Date:		25-JUN-98		25-JUN-98		25-JUN-98		25-JUN-98		24-JUN-98	
Depth:		8 - 10		0 - 2		4 - 6		8 - 10		0 - 2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	12500		10700		8670		21000		6680	
Antimony	mg/kg	3.6	UJ	3.4	UJ	3.4	UJ	4.05	UJ	3.35	UJ
Arsenic	mg/kg	10.0		5.3		4.1		4.9		2.1	
Barium	mg/kg	74.8		61.9		58.8		92.7		26.4	
Beryllium	mg/kg	0.74		0.59		.285	U	1.0		.28	U
Cadmium	mg/kg	.3	U	.285	U	.285	U	.34	U	.28	U
Calcium	mg/kg	2460		7330		4890		39100		1620	
Chromium	mg/kg	19.6	J	15.3	J	13.0	J	28.6	J	9.1	J
Cobalt	mg/kg	13.8		11.1		8.1		11.5		2.8	U
Copper	mg/kg	21.7		17.3		14.0		25.2		5.8	
Iron	mg/kg	26600		18400		15400		26000		10600	
Lead	mg/kg	8.7		9.6		7.6		11.0		3.4	
Magnesium	mg/kg	2920	J	4680	J	2860	J	10300	J	1290	
Manganese	mg/kg	362		453		261		374		184	
Mercury	mg/kg	.0195	U	.0185	U	.019	U	.0225	U	.0185	U
Nickel	mg/kg	31.1		23.5		20.4		35.9		9.8	
Potassium	mg/kg	1580	J	1270	J	1080	J	5630	J	742	J
Selenium	mg/kg	.3	U	.285	U	.285	U	.34	U	.28	U
Silver	mg/kg	.6	U	.55	U	.55	U	.7	U	.55	U
Sodium	mg/kg	952		283.5	U	284.5	U	339	U	280	U
Thallium	mg/kg	.6	U	.55	U	.55	U	.7	U	.55	U
Vanadium	mg/kg	27.5		23.0		17.8		37.2		19.8	J
Zinc	mg/kg	74.3		60.3		55.2		64.9		28.7	

Sample Location:		WARP-DP19		WARP-DP19		WARP-DP20		WARP-DP20		WARP-DP20	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8830		8840		8860		8870		8880	
Sample Date:		24-JUN-98		24-JUN-98		24-JUN-98		24-JUN-98		24-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		4 - 6		8 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	18000		17000		13000		10900		12000	
Antimony	mg/kg	3.65	UJ	3.85	UJ	3.4	UJ	3.45	UJ	3.5	UJ
Arsenic	mg/kg	9.4		9.8		8.5		7.0		4.6	
Barium	mg/kg	70.0		83.3		66.0		56.1		80.3	
Beryllium	mg/kg	0.83	J	0.75	J	.285	U	.285	U	.29	U
Cadmium	mg/kg	.305	U	.32	U	.285	U	.285	U	.29	U
Calcium	mg/kg	2600		34600		35600		23500		5120	
Chromium	mg/kg	23.3	J	25.1	J	16.7	J	16.1	J	16.9	J
Cobalt	mg/kg	19.0		14.5		11.9		7.8		10.1	
Copper	mg/kg	30.6		30.9		15.1	B	15.1	B	15.7	B
Iron	mg/kg	32000		30000		20900		19100		18800	
Lead	mg/kg	13.2		11.2		9.4		7.4		7.4	
Magnesium	mg/kg	4480		14700		9970		8670		3690	
Manganese	mg/kg	898		568		551		320		484	
Mercury	mg/kg	.02	U	.021	U	.0185	U	.019	U	.019	U
Nickel	mg/kg	42.3		37.9		19.3		18.6		28.7	
Potassium	mg/kg	2430	J	3960	J	2040	J	1350	J	1710	J
Selenium	mg/kg	.305	U	.32	U	.285	U	.285	U	.29	U
Silver	mg/kg	.6	U	.65	U	.55	U	.55	U	.6	U
Sodium	mg/kg	305	U	320	U	283	U	287.5	U	619	
Thallium	mg/kg	.6	U	.65	U	.55	U	.55	U	.6	U
Vanadium	mg/kg	38.9	J	37.3	J	35.0	J	29.1	J	24.1	J
Zinc	mg/kg	85.1		81.6		49.8		48.2		77.5	

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Sample Location:		PB-PR-S13	
Associated Site:		WARP	
Sample No:		PB-PR-S13-3.0-10.0	
Sample Date:		31-OCT-94	
Depth:		3 - 10	
GEN CHEMISTRY	Units	Result	Val Qlfr
Alkalinity	mg/kg	830	
Nitrate	mg/kg	150	
Phosphorous	mg/kg	31	
Sulfate	mg/kg	3330	
Total organic carbon	mg/kg	1990	

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Sample Location:		PB-BG-S1		PB-BG-S1		PB-BG-S2		PB-BG-S2		PB-BG-S3	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S1-0.5-3.0		PB-BG-S1-3.0-5.0		PB-BG-S2-0.5-3.0		PB-BG-S2-3.0-5.0		PB-BG-S3-0.5-3.0	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94		01-NOV-94	
Depth:		.5 - 3		3 - 5		.5 - 3		3 - 5		.5 - 3	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		.125		.125		.125		.125	
1,3-Dinitrobenzene	mg/kg	.125		.125		.125		.125		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-BG-S3		PB-BG-S4		PB-BG-S5		PB-BG-S5		PB-BG-S6	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S3-3.0-4.0		PB-BG-S4-0.5-3.0		PB-BG-S5-0.5-3.0		PB-BG-S5-3.0-5.0		PB-BG-S6-0.5-3.0	
Sample Date:		01-NOV-94		30-OCT-94		30-OCT-94		30-OCT-94		01-NOV-94	
Depth:		3 - 4		.5 - 3		.5 - 3		3 - 5		.5 - 3	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		.125		.125		.125		.125	
1,3-Dinitrobenzene	mg/kg	.125		.125		.125		.125		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

Sample Location:		PB-BG-S6		PB-BG-S7		PB-BG-S8		PB-BG-S9		PB-BG-S9	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-BG-S6-3.0-4.5		PB-BG-S7-0.5-3.0		PB-BG-S8-0.5-3.0		PB-BG-S9-0.5-3.0		PB-BG-S9-3.0-5.0	
Sample Date:		01-NOV-94		01-NOV-94		30-OCT-94		01-NOV-94		01-NOV-94	
Depth:		3 - 4.5		.5 - 3		.5 - 3		.5 - 3		3 - 5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		.125		.125		.125		.125	
1,3-Dinitrobenzene	mg/kg	.125		.125		.125		.125		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-PR-S1		PB-PR-S1		PB-PR-S10		PB-PR-S10		PB-PR-S10	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S1-0.0-2.0		PB-PR-S1-2.0-5.0		PB-PR-S10-0.0-3.0		PB-PR-S10-3.0-5.0		PB-PR-S10-5.0-10.0	
Sample Date:		31-OCT-94		31-OCT-94		29-OCT-94		29-OCT-94		29-OCT-94	
Depth:		0 - 2		2 - 5		0 - 3		3 - 5		5 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		.125		.125		2.8		5.2	
1,3-Dinitrobenzene	mg/kg	.125		.125		.125		1.6		2.5	
2,4,6-Trinitrotoluene	mg/kg	.125		0.3		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		0.4		.125		2.6		2.2	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-PR-S11		PB-PR-S11		PB-PR-S11		PB-PR-S12		PB-PR-S12	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S11-0.0-3.0		PB-PR-S11-3.0-5.0		PB-PR-S11-5.0-10.0		PB-PR-S12-0.0-3.0		PB-PR-S12-3.0-5.0	
Sample Date:		29-OCT-94		29-OCT-94		29-OCT-94		30-OCT-94		30-OCT-94	
Depth:		0 - 3		3 - 5		5 - 10		0 - 3		3 - 5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		.125		.125		.125		2.7	
1,3-Dinitrobenzene	mg/kg	.125		.125		.125		.125		1.1	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		1.2	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		0.3	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-PR-S12		PB-PR-S13		PB-PR-S13		PB-PR-S13		PB-PR-S13	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S12-5.0-10.0		PB-PR-S13-0.0-3.0		PB-PR-S13-3.0-5.0		PB-PR-S13-5.0-10.0		PB-PR-S13-0.0-0.5	
Sample Date:		30-OCT-94		31-OCT-94		31-OCT-94		31-OCT-94		11-DEC-94	
Depth:		5 - 10		0 - 3		3 - 5		5 - 10		0 - 0.5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	2.8		.125		.125		9.4		.125	
1,3-Dinitrobenzene	mg/kg	1.5		.125		.125		3.2		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		0.5		.125	
2,4-Dinitrotoluene	mg/kg	1.6		.125		0.4		5.2		.125	
2,6-Dinitrotoluene	mg/kg	0.3		.13		.13		0.5		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		0.5		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		0.7		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PB-PR-S14		PB-PR-S14		PB-PR-S14		PB-PR-S14		PB-PR-S15	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S14-0.0-3.0		PB-PR-S14-3.0-5.0		PB-PR-S14-5.0-10.0		PB-PR-S14-0.0-0.5		PB-PR-S15-0.0-3.0	
Sample Date:		07-NOV-94		07-NOV-94		07-NOV-94		11-DEC-94		30-OCT-94	
Depth:		0 - 3		3 - 5		5 - 10		0 - 0.5		0 - 3	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		58		18		.125		.125	
1,3-Dinitrobenzene	mg/kg	.125		6.4		6.7		.125		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		12000		340		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		.125		19		.125		0.6	
2,6-Dinitrotoluene	mg/kg	.13		.13		2.9		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		0.9		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		4.5		1.7		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		9.5		2		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PB-PR-S15		PB-PR-S15		PB-PR-S16		PB-PR-S16		PB-PR-S16	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S15-3.0-5.0		PB-PR-S15-5.0-10.0		PB-PR-S16-0.0-3.0		PB-PR-S16-3.0-5.0		PB-PR-S16-5.0-10.0	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94	
Depth:		3 - 5		5 - 10		0 - 3		3 - 5		5 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		23		.125		.125		14	
1,3-Dinitrobenzene	mg/kg	.125		6.6		.125		.125		4.3	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	0.3		14		.125		.125		8.9	
2,6-Dinitrotoluene	mg/kg	.13		2		.13		.13		1	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		1.1		.125		.125		0.8	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		0.9		.125		.125		0.6	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

Sample Location:		PB-PR-S17		PB-PR-S17		PB-PR-S17		PB-PR-S18		PB-PR-S18	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S17-0.0-2.0		PB-PR-S17-2.0-5.0		PB-PR-S17-0.0-0.5		PB-PR-S18-0.0-2.0		PB-PR-S18-2.0-5.0	
Sample Date:		31-OCT-94		31-OCT-94		15-DEC-94		30-OCT-94		30-OCT-94	
Depth:		0 - 2		2 - 5		0 - 0.5		0 - 2		2 - 5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	UJ	.125	UJ	.125		.125		.125	
1,3-Dinitrobenzene	mg/kg	.125	UJ	.125	UJ	.125		.125		.125	
2,4,6-Trinitrotoluene	mg/kg	.125	UJ	.125	UJ	.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125	UJ	.125	UJ	.125		.125		.125	
2,6-Dinitrotoluene	mg/kg	.13	UJ	.13	UJ	.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125	UJ	.125	UJ	.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125	UJ	.125	UJ	.125		.125		.125	
2-Nitrotoluene	mg/kg	.125	UJ	.125	UJ	.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125	UJ	.125	UJ	.125		.125		.125	
3-Nitrotoluene	mg/kg	.125	UJ	.125	UJ	.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125	UJ	.125	UJ	.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125	UJ	.125	UJ	.125		.125		.125	
4-Nitrotoluene	mg/kg	.125	UJ	.125	UJ	.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13	UJ	.13	UJ	.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-PR-S19		PB-PR-S19		PB-PR-S19		PB-PR-S19		PB-PR-S2	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S19-0.0-3.0		PB-PR-S19-3.0-5.0		PB-PR-S19-5.0-10.0		PB-PR-S19-0.0-0.5		PB-PR-S2-0.0-3.0	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		11-DEC-94		28-OCT-94	
Depth:		0 - 3		3 - 5		5 - 10		0 - 0.5		0 - 3	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		.125		1.5		.125		.125	
1,3-Dinitrobenzene	mg/kg	.125		.125		1.4		.125		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		.125		1		.125		.125	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

Sample Location:		PB-PR-S2		PB-PR-S2		PB-PR-S20		PB-PR-S20		PB-PR-S21	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S2-3.0-5.0		PB-PR-S2-5.0-10.0		PB-PR-S20-0.0-2.0		PB-PR-S20-2.0-5.0		PB-PR-S21-0.0-0.5	
Sample Date:		28-OCT-94		28-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94	
Depth:		3 - 5		5 - 10		0 - 2		2 - 5		0 - 0.5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	0.5		2.4		.125		.125		.125	
1,3-Dinitrobenzene	mg/kg	.125		0.3		.125		.125		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		0.3	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-PR-S22		PB-PR-S23		PB-PR-S24		PB-PR-S25		PB-PR-S26	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S22-0.0-0.5		PB-PR-S23-0.0-0.5		PB-PR-S24-0.0-0.5		PB-PR-S25-5.0-10.0		PB-PR-S26-5.0-10.0	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		29-OCT-94		29-OCT-94	
Depth:		0 - 0.5		0 - 0.5		0 - 0.5		5 - 10		5 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	0.4		.125		.125		.125		3.9	
1,3-Dinitrobenzene	mg/kg	.125		0.4		.125		.125		2.1	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	0.4		1		1.1		.125		1.1	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		0.3		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

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West Area Red Water Ponds
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Sample Location:		PB-PR-S27		PB-PR-S28		PB-PR-S29		PB-PR-S3		PB-PR-S3	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S27-5.0-10.0		PB-PR-S28-5.0-10.0		PB-PR-S29-2.0-5.0		PB-PR-S3-0.0-2.0		PB-PR-S3-2.0-5.0	
Sample Date:		30-OCT-94		07-NOV-94		31-OCT-94		30-OCT-94		30-OCT-94	
Depth:		5 - 10		5 - 10		2 - 5		0 - 2		2 - 5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	2.8		8.5		.125	UJ	.125		.125	
1,3-Dinitrobenzene	mg/kg	0.9		3.9		.125	UJ	.125		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		280		.125	UJ	.125		.125	
2,4-Dinitrotoluene	mg/kg	0.8		10		.125	UJ	.125		.125	
2,6-Dinitrotoluene	mg/kg	.13		1.8		.13	UJ	.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125	UJ	.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125	UJ	.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125	UJ	.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		1.1		.125	UJ	.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125	UJ	.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		0.8		.125	UJ	.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125	UJ	.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125	UJ	.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13	UJ	.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-PR-S30		PB-PR-S4		PB-PR-S4		PB-PR-S4		PB-PR-S5	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S30-0.0-0.5		PB-PR-S4-0.0-3.0		PB-PR-S4-3.0-5.0		PB-PR-S4-5.0-10.0		PB-PR-S5-0.0-3.0	
Sample Date:		30-OCT-94		30-OCT-94		30-OCT-94		30-OCT-94		28-OCT-94	
Depth:		0 - 0.5		0 - 3		3 - 5		5 - 10		0 - 3	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		1.7		12		6.8		.125	
1,3-Dinitrobenzene	mg/kg	0.4		0.8		3.2		2.1		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	0.9		1.1		5.7		2.8		.125	
2,6-Dinitrotoluene	mg/kg	.13		.13		0.5		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-PR-S5		PB-PR-S5		PB-PR-S6		PB-PR-S6		PB-PR-S6	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S5-3.0-5.0		PB-PR-S5-5.0-10.0		PB-PR-S6-0.0-3.0		PB-PR-S6-3.0-5.0		PB-PR-S6-5.0-10.0	
Sample Date:		28-OCT-94		28-OCT-94		29-OCT-94		29-OCT-94		29-OCT-94	
Depth:		3 - 5		5 - 10		0 - 3		3 - 5		5 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	0.7		0.4		0.7		13		18	
1,3-Dinitrobenzene	mg/kg	.125		.125		0.9		3.4		3.8	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		.125		2.1		8.7		7.6	
2,6-Dinitrotoluene	mg/kg	.13		.13		0.4		3.6		0.5	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		0.3		1	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		1.1		.13	
RDX	mg/kg										
Tetryl	mg/kg										

Sample Location:		PB-PR-S7		PB-PR-S7		PB-PR-S7		PB-PR-S8		PB-PR-S8	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S7-0.0-3.0		PB-PR-S7-3.0-5.0		PB-PR-S7-5.0-10.0		PB-PR-S8-0.0-2.0		PB-PR-S8-2.0-5.0	
Sample Date:		28-OCT-94		28-OCT-94		28-OCT-94		31-OCT-94		31-OCT-94	
Depth:		0 - 3		3 - 5		5 - 10		0 - 2		2 - 5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	0.5		6.6		1.3		.125	UJ	.125	UJ
1,3-Dinitrobenzene	mg/kg	0.3		2.1		0.5		.125	UJ	.125	UJ
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125	UJ	.125	UJ
2,4-Dinitrotoluene	mg/kg	0.4		3.4		0.3		.125	UJ	.125	UJ
2,6-Dinitrotoluene	mg/kg	.13		0.4		.13		.13	UJ	.13	UJ
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125	UJ	.125	UJ
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125	UJ	.125	UJ
2-Nitrotoluene	mg/kg	.125		.125		.125		.125	UJ	.125	UJ
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125	UJ	.125	UJ
3-Nitrotoluene	mg/kg	.125		.125		.125		.125	UJ	.125	UJ
4-Amino-2,6-dinitrotoluene	mg/kg	.125		0.3		.125		.125	UJ	.125	UJ
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125	UJ	.125	UJ
4-Nitrotoluene	mg/kg	.125		.125		.125		.125	UJ	.125	UJ
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13	UJ	.13	UJ
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-PR-S8		PB-PR-S9		PB-PR-S9		PB-PR-S9		PB-WA-S1	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-PR-S8-0.0-0.5		PR-PR-S9-0.0-3.0		PB-PR-S9-3.0-5.0		PB-PR-S9-5.0-10.0		PB-WA-S1-0.0-0.5	
Sample Date:		15-DEC-94		29-OCT-94		29-OCT-94		29-OCT-94		27-OCT-94	
Depth:		0 - 0.5		0 - 3		3 - 5		5 - 10		0 - 0.5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		1.1		6.6		4.9		.125	
1,3-Dinitrobenzene	mg/kg	.125		1.6		1.5		2.2		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		2.4		3.8		2		.125	
2,6-Dinitrotoluene	mg/kg	.13		0.8		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-WA-S10		PB-WA-S10		PB-WA-S11		PB-WA-S11		PB-WA-S12	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S10-3.0-5.0		PB-WA-S10-5.0-10.0		PB-WA-S11-0.0-2.0		PB-WA-S11-2.0-5.0		PB-WA-S12-0.0-2.0	
Sample Date:		27-OCT-94		27-OCT-94		25-OCT-94		25-OCT-94		25-OCT-94	
Depth:		3 - 5		5 - 10		0 - 2		2 - 5		0 - 2	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	5.5		1.1		.125		.125		.125	
1,3-Dinitrobenzene	mg/kg	2.3		0.5		.125		.125		.125	
2,4,6-Trinitrotoluene	mg/kg	0.4		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	5.1		.125		.125		.125		.125	
2,6-Dinitrotoluene	mg/kg	0.3		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		0.3		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	0.7		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

Sample Location:		PB-WA-S12		PB-WA-S13		PB-WA-S13		PB-WA-S13		PB-WA-S13	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S12-2.0-5.0		PB-WA-S13-0.0-3.0		PB-WA-S13-3.0-5.0		PB-WA-S13-5.0-10.0		PB-WA-S13-0.0-0.5	
Sample Date:		25-OCT-94		18-OCT-94		18-OCT-94		18-OCT-94		13-DEC-94	
Depth:		2 - 5		0 - 3		3 - 5		5 - 10		0 - 0.5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	0.6		.125		1.6		0.5		.125	
1,3-Dinitrobenzene	mg/kg	.125		.125		.15		.125		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		.125		0.6		.125		.125	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		0.3		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-WA-S14		PB-WA-S14		PB-WA-S15		PB-WA-S15		PB-WA-S16	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S14-0.0-2.0		PB-WA-S14-2.0-5.0		PB-WA-S15-0.0-2.0		PB-WA-S15-2.0-5.0		PB-WA-S16-0.0-2.0	
Sample Date:		25-OCT-94		25-OCT-94		24-OCT-94		24-OCT-94		18-OCT-94	
Depth:		0 - 2		2 - 5		0 - 2		2 - 5		0 - 2	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		0.4		.125		.125		.125	
1,3-Dinitrobenzene	mg/kg	.125		.125		.125		.125		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		0.3		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	0.4		0.3		.125		.125		.125	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		0.5		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

Sample Location:		PB-WA-S16		PB-WA-S17		PB-WA-S17		PB-WA-S17		PB-WA-S17	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S16-2.0-4.0		PB-WA-S17-0.0-3.0		PB-WA-S17-3.0-5.0		PB-WA-S17-5.0-10.0		PB-WA-S17-0.0-0.5	
Sample Date:		18-OCT-94		19-OCT-94		19-OCT-94		19-OCT-94		13-DEC-94	
Depth:		2 - 4		0 - 3		3 - 5		5 - 10		0 - 0.5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		.125		0.5		4.2		.125	
1,3-Dinitrobenzene	mg/kg	.125		.125		.125		1.9		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		0.3		.125		2.1		.125	
2,4-Dinitrotoluene	mg/kg	.125		.125		.125		3.3		.125	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		0.3		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		0.5		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		0.3		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-WA-S18		PB-WA-S18		PB-WA-S18		PB-WA-S19		PB-WA-S19	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S18-0.0-3.0		PB-WA-S18-3.0-5.0		PB-WA-S18-5.0-10.0		PB-WA-S19-0.0-2.0		PB-WA-S19-2.0-5.0	
Sample Date:		18-OCT-94		18-OCT-94		18-OCT-94		24-OCT-94		24-OCT-94	
Depth:		0 - 3		3 - 5		5 - 10		0 - 2		2 - 5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		0.9		0.9		.125		.125	
1,3-Dinitrobenzene	mg/kg	.125		0.3		.125		.125		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		0.7		0.3		.125		.125	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-WA-S2		PB-WA-S20		PB-WA-S21		PB-WA-S22		PB-WA-S23	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S2-0.0-0.5		PB-WA-S20-0.0-0.5		PB-WA-S21-0.0-2.0		PB-WA-S22-2.0-5.0		PB-WA-S23-0.0-0.5	
Sample Date:		27-OCT-94		29-OCT-94		17-OCT-94		18-OCT-94		29-OCT-94	
Depth:		0 - 0.5		0 - 0.5		0 - 2		2 - 5		0 - 0.5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		0.7		0.5		.125		0.5	
1,3-Dinitrobenzene	mg/kg	.125		0.3		.125		.125		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		0.4		.125		.125		0.4	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-WA-S24		PB-WA-S3		PB-WA-S4		PB-WA-S5		PB-WA-S5	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S24-5.0-10		PB-WA-S3-0.0-0.5		PB-WA-S4-0.0-0.5		PB-WA-S5-0.0-2.0		PB-WA-S5-2.0-5.0	
Sample Date:		19-OCT-94		27-OCT-94		29-OCT-94		17-OCT-94		17-OCT-94	
Depth:		5 - 10		0 - 0.5		0 - 0.5		0 - 2		2 - 5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	3.1		.125		.125		0.6		3	
1,3-Dinitrobenzene	mg/kg	1.5		.125		.125		.125		0.7	
2,4,6-Trinitrotoluene	mg/kg	3		.125		.125		.125		0.3	
2,4-Dinitrotoluene	mg/kg	3.8		.125		.125		0.3		1.3	
2,6-Dinitrotoluene	mg/kg	0.3		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	0.3		.125		.125		.125		0.4	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

Sample Location:		PB-WA-S6		PB-WA-S6		PB-WA-S7		PB-WA-S7		PB-WA-S8	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S6-0.0-2.0		PB-WA-S6-2.0-5.0		PB-WA-S7-0.0-2.0		PB-WA-S7-2.0-5.0		PB-WA-S8-0.0-2.0	
Sample Date:		17-OCT-94		17-OCT-94		18-OCT-94		18-OCT-94		18-OCT-94	
Depth:		0 - 2		2 - 5		0 - 2		2 - 5		0 - 2	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	0.3		4.2		.125		0.4		.125	
1,3-Dinitrobenzene	mg/kg	.125		2.4		.125		.125		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		3		.125		.125		.125	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		0.6		.125		0.3		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

Sample Location:		PB-WA-S8		PB-WA-S9		PB-WA-S9		WARP-DP01		WARP-DP01	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-S8-2.0-5.0		PB-WA-S9-0.0-2.0		PB-WA-S9-2.0-5.0		8100		8110	
Sample Date:		18-OCT-94		18-OCT-94		18-OCT-94		23-JUN-98		23-JUN-98	
Depth:		2 - 5		0 - 2		2 - 5		0 - 2		4 - 6	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		.125		.125		.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125		.125		.125		.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125					
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125					
2-Nitrotoluene	mg/kg	.125		.125		.125		.125	U	.125	U
3,4-Dinitrotoluene	mg/kg	.125		.125		.125					
3-Nitrotoluene	mg/kg	.125		.125		.125		.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125	U	.125	U
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125					
4-Nitrotoluene	mg/kg	.125		.125		.125					
HMX	mg/kg							.25	U	.25	U
Nitrobenzene	mg/kg	.13		.13		.13		.125	U	.125	U
RDX	mg/kg							.25	U	.25	U
Tetryl	mg/kg							.325	U	.325	U

Sample Location:		WARP-DP01		WARP-DP02		WARP-DP02		WARP-DP02		WARP-DP03	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8120		8140		8150		8160		8180	
Sample Date:		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98	
Depth:		8 - 10		0 - 2		4 - 6		8 - 10		0 - 2	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg										
2-Amino-4-nitrotoluene	mg/kg										
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3,4-Dinitrotoluene	mg/kg										
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2-nitrotoluene	mg/kg										
4-Nitrotoluene	mg/kg										
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Sample Location:		WARP-DP03		WARP-DP03		WARP-DP04		WARP-DP04		WARP-DP04	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8190		8200		8220		8230		8240	
Sample Date:		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		4 - 6		8 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	0.28		.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg										
2-Amino-4-nitrotoluene	mg/kg										
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3,4-Dinitrotoluene	mg/kg										
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2-nitrotoluene	mg/kg										
4-Nitrotoluene	mg/kg										
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Sample Location:		WARP-DP05		WARP-DP05		WARP-DP05		WARP-DP06		WARP-DP06	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8260		8270		8280		8300		8310	
Sample Date:		16-JUN-98		16-JUN-98		16-JUN-98		23-JUN-98		23-JUN-98	
Depth:		0 - 2		4 - 6		8 - 10		0 - 2		4 - 6	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg										
2-Amino-4-nitrotoluene	mg/kg										
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3,4-Dinitrotoluene	mg/kg										
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2-nitrotoluene	mg/kg										
4-Nitrotoluene	mg/kg										
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Plum Brook Ordnance Works
West Area Red Water Ponds
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Sample Location:		WARP-DP06		WARP-DP07		WARP-DP07		WARP-DP07		WARP-DP08	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8320		8340		8350		8360		8380	
Sample Date:		23-JUN-98		25-JUN-98		25-JUN-98		25-JUN-98		15-JUN-98	
Depth:		8 - 10		0 - 2		4 - 6		8 - 10		0 - 2	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg										
2-Amino-4-nitrotoluene	mg/kg										
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3,4-Dinitrotoluene	mg/kg										
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2-nitrotoluene	mg/kg										
4-Nitrotoluene	mg/kg										
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Sample Location:		WARP-DP08		WARP-DP08		WARP-DP09		WARP-DP09		WARP-DP09	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8390		8400		8420		8430		8440	
Sample Date:		15-JUN-98		15-JUN-98		16-JUN-98		16-JUN-98		16-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		4 - 6		8 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	0.31	
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	0.49	
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg										
2-Amino-4-nitrotoluene	mg/kg										
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3,4-Dinitrotoluene	mg/kg										
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2-nitrotoluene	mg/kg										
4-Nitrotoluene	mg/kg										
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

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Sample Location:		WARP-DP10		WARP-DP10		WARP-DP11		WARP-DP11		WARP-DP11	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8460		8470		8500		8510		8520	
Sample Date:		26-JUN-98		26-JUN-98		25-JUN-98		25-JUN-98		25-JUN-98	
Depth:		0 - 2		4 - 6		0 - 2		4 - 6		8 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	4.4		.125	U	.125	U	0.74	
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	0.38		.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	1.4		.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	1.5		.125	U	.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg										
2-Amino-4-nitrotoluene	mg/kg										
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3,4-Dinitrotoluene	mg/kg										
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2-nitrotoluene	mg/kg										
4-Nitrotoluene	mg/kg										
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Sample Location:		WARP-DP12		WARP-DP12		WARP-DP12		WARP-DP13		WARP-DP13	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8540		8550		8560		8580		8590	
Sample Date:		15-JUN-98		15-JUN-98		15-JUN-98		15-JUN-98		15-JUN-98	
Depth:		0 - 2		4 - 6		8 - 10		0 - 2		4 - 6	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg										
2-Amino-4-nitrotoluene	mg/kg										
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3,4-Dinitrotoluene	mg/kg										
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2-nitrotoluene	mg/kg										
4-Nitrotoluene	mg/kg										
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Plum Brook Ordnance Works
West Area Red Water Ponds
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Sample Location:		WARP-DP13		WARP-DP15		WARP-DP15		WARP-DP15		WARP-DP16	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8600		8660		8670		8680		8700	
Sample Date:		15-JUN-98		24-JUN-98		24-JUN-98		24-JUN-98		24-JUN-98	
Depth:		8 - 10		0 - 2		4 - 6		8 - 10		0 - 2	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	4.4		.125	U	.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.6	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.6	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	6.3		.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.6	U	.125	U	.125	U	.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg										
2-Amino-4-nitrotoluene	mg/kg										
2-Nitrotoluene	mg/kg	.6	U	.125	U	.125	U	.125	U	.125	U
3,4-Dinitrotoluene	mg/kg										
3-Nitrotoluene	mg/kg	.6	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.6	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2-nitrotoluene	mg/kg										
4-Nitrotoluene	mg/kg										
HMX	mg/kg	1.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.6	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	1.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	1.6	U	.325	U	.325	U	.325	U	.325	U

Sample Location:		WARP-DP16		WARP-DP16		WARP-DP17		WARP-DP17		WARP-DP17	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8710		8720		8740		8750		8760	
Sample Date:		24-JUN-98		24-JUN-98		25-JUN-98		25-JUN-98		25-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		4 - 6		8 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg										
2-Amino-4-nitrotoluene	mg/kg										
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3,4-Dinitrotoluene	mg/kg										
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2-nitrotoluene	mg/kg										
4-Nitrotoluene	mg/kg										
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Report Date: 09/19/00

Sample Location:		WARP-DP18		WARP-DP18		WARP-DP18		WARP-DP19		WARP-DP19	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8780		8790		8800		8820		8830	
Sample Date:		25-JUN-98		25-JUN-98		25-JUN-98		24-JUN-98		24-JUN-98	
Depth:		0 - 2		4 - 6		8 - 10		0 - 2		4 - 6	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	0.98		.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg										
2-Amino-4-nitrotoluene	mg/kg										
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3,4-Dinitrotoluene	mg/kg										
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2-nitrotoluene	mg/kg										
4-Nitrotoluene	mg/kg										
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		WARP-DP19		WARP-DP20		WARP-DP20		WARP-DP20	
Associated Site:		WARP		WARP		WARP		WARP	
Sample No:		8840		8860		8870		8880	
Sample Date:		24-JUN-98		24-JUN-98		24-JUN-98		24-JUN-98	
Depth:		8 - 10		0 - 2		4 - 6		8 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg								
2-Amino-4-nitrotoluene	mg/kg								
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
3,4-Dinitrotoluene	mg/kg								
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
4-Amino-2-nitrotoluene	mg/kg								
4-Nitrotoluene	mg/kg								
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		WARP-SD01		WARP-SD02		WARP-SD03		WARP-SD04		WARP-SD05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		11100		11110		11120		11130		11140	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
WET CHEMISTRY	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Total organic carbon	mg/kg	5430		3960		9650		5520		40200	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		WARP-SD06	
Associated Site:		WARP	
Sample No:		11150	
Sample Date:		05-NOV-98	
Depth:		0 - .5	
WET CHEMISTRY	Units	Result	Val Qlfr
Total organic carbon	mg/kg	93400	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		WARP-SD01		WARP-SD02		WARP-SD03		WARP-SD04		WARP-SD05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		11100		11110		11120		11130		11140	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
1,1,2,2-Tetrachloroethane	mg/kg	.0031	UJ	.003	UJ	.00345	UJ	.00305	UJ	.0065	UJ
1,1,2-Trichloroethane	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
1,1-Dichloroethane	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
1,1-Dichloroethene	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
1,2-Dichloroethane	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
1,2-Dichloroethene	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
1,2-Dichloropropane	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
2-Butanone	mg/kg	.0125	U	.012	U	.029	J	.012	U	.021	J
2-Hexanone	mg/kg	.0125	U	.012	U	.014	U	.012	U	.0265	U
4-Methyl-2-pentanone	mg/kg	.0125	U	.012	U	.014	U	.012	U	.0265	U
Acetone	mg/kg	.017	B	.012	R	.019	B	.0078	B	.11	J
Benzene	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
Bromodichloromethane	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
Bromoform	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
Bromomethane	mg/kg	.006	U	.006	U	.007	U	.006	U	.0135	U
Carbon disulfide	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
Carbon tetrachloride	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
Chlorobenzene	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
Chloroethane	mg/kg	.006	U	.006	U	.007	U	.006	U	.0135	U
Chloroform	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
Chloromethane	mg/kg	.006	U	.006	U	.007	U	.006	U	.0135	U
Dibromochloromethane	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
Ethylbenzene	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
Methylene chloride	mg/kg	.0056	B	.0057	B	.0066	B	.0059	B	.011	B
Styrene	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
Tetrachloroethene	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
Toluene	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
Total xylenes	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
Trichloroethene	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		WARP-SD06	
Associated Site:		WARP	
Sample No:		11150	
Sample Date:		05-NOV-98	
Depth:		0 - .5	
VOLATILES	Units	Result	Val Qlfr
1,1,1-Trichloroethane	mg/kg	.0125	U
1,1,2,2-Tetrachloroethane	mg/kg	.0125	UJ
1,1,2-Trichloroethane	mg/kg	.0125	U
1,1-Dichloroethane	mg/kg	.0125	U
1,1-Dichloroethene	mg/kg	.0125	U
1,2-Dichloroethane	mg/kg	.0125	U
1,2-Dichloroethene	mg/kg	.0125	U
1,2-Dichloropropane	mg/kg	.0125	U
2-Butanone	mg/kg	.0495	U
2-Hexanone	mg/kg	.0495	U
4-Methyl-2-pentanone	mg/kg	.0495	U
Acetone	mg/kg	.071	J
Benzene	mg/kg	.0125	U
Bromodichloromethane	mg/kg	.0125	U
Bromoform	mg/kg	.0125	U
Bromomethane	mg/kg	.0245	U
Carbon disulfide	mg/kg	.0125	U
Carbon tetrachloride	mg/kg	.0125	U
Chlorobenzene	mg/kg	.0125	U
Chloroethane	mg/kg	.0245	U
Chloroform	mg/kg	.0125	U
Chloromethane	mg/kg	.0245	U
Dibromochloromethane	mg/kg	.0125	U
Ethylbenzene	mg/kg	.0125	U
Methylene chloride	mg/kg	.02	B
Styrene	mg/kg	.0125	U
Tetrachloroethene	mg/kg	.0125	U
Toluene	mg/kg	.0125	U
Total xylenes	mg/kg	.0125	U
Trichloroeth	mg/kg	.0125	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		WARP-SD01		WARP-SD02		WARP-SD03		WARP-SD04		WARP-SD05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		11100		11110		11120		11130		11140	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	mg/kg	.006	U	.006	U	.007	U	.006	U	.0135	U
cis-1,3-Dichloropropene	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U
trans-1,3-Dichloropropene	mg/kg	.0031	U	.003	U	.00345	U	.00305	U	.0065	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		WARP-SD06	
Associated Site:		WARP	
Sample No:		11150	
Sample Date:		05-NOV-98	
Depth:		0 - .5	
VOLATILES	Units	Result	Val Qlfr
Vinyl chloride	mg/kg	.0245	U
cis-1,3-Dichloropropene	mg/kg	.0125	U
trans-1,3-Dichloropropene	mg/kg	.0125	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		WARP-SD01		WARP-SD02		WARP-SD03		WARP-SD04		WARP-SD05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		11100		11110		11120		11130		11140	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
1,2-Dichlorobenzene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
1,3-Dichlorobenzene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
1,4-Dichlorobenzene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
2,4,5-Trichlorophenol	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
2,4,6-Trichlorophenol	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
2,4-Dichlorophenol	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
2,4-Dimethylphenol	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
2,4-Dinitrophenol	mg/kg	1	U	.95	U	1.1	U	.95	U	2.15	U
2,4-Dinitrotoluene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
2,6-Dinitrotoluene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
2-Chloronaphthalene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
2-Chlorophenol	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
2-Methylnaphthalene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
2-Methylphenol	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
2-Nitroaniline	mg/kg	1	U	.95	U	1.1	U	.95	U	2.15	U
2-Nitrophenol	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
3,3'-Dichlorobenzidine	mg/kg	1	U	.95	U	1.1	U	.95	U	2.15	U
3-Nitroaniline	mg/kg	1	U	.95	U	1.1	U	.95	U	2.15	U
4,6-Dinitro-2-methylphenol	mg/kg	1	U	.95	U	1.1	U	.95	U	2.15	U
4-Bromophenyl phenyl ether	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
4-Chloro-3-methylphenol	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
4-Chloroaniline	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
4-Chlorophenyl phenyl ether	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
4-Methylphenol	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
4-Nitroaniline	mg/kg	1	U	.95	U	1.1	U	.95	U	2.15	U
4-Nitrophenol	mg/kg	1	U	.95	U	1.1	U	.95	U	2.15	U
Acenaphthene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Acenaphthylene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Anthracene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U

Report Date: 09/20/00

Sample Location:	WARP-SD06
Associated Site:	WARP
Sample No:	11150
Sample Date:	05-NOV-98
Depth:	0 - .5

SEMIVOLATILES	Units	Result	Val Qlfr
1,2,4-Trichlorobenzene	mg/kg	.8	U
1,2-Dichlorobenzene	mg/kg	.8	U
1,3-Dichlorobenzene	mg/kg	.8	U
1,4-Dichlorobenzene	mg/kg	.8	U
2,4,5-Trichlorophenol	mg/kg	.8	U
2,4,6-Trichlorophenol	mg/kg	.8	U
2,4-Dichlorophenol	mg/kg	.8	U
2,4-Dimethylphenol	mg/kg	.8	U
2,4-Dinitrophenol	mg/kg	3.95	U
2,4-Dinitrotoluene	mg/kg	.8	U
2,6-Dinitrotoluene	mg/kg	.8	U
2-Chloronaphthalene	mg/kg	.8	U
2-Chlorophenol	mg/kg	.8	U
2-Methylnaphthalene	mg/kg	.8	U
2-Methylphenol	mg/kg	.8	U
2-Nitroaniline	mg/kg	3.95	U
2-Nitrophenol	mg/kg	.8	U
3,3'-Dichlorobenzidine	mg/kg	3.95	U
3-Nitroaniline	mg/kg	3.95	U
4,6-Dinitro-2-methylphenol	mg/kg	3.95	U
4-Bromophenyl phenyl ether	mg/kg	.8	U
4-Chloro-3-methylphenol	mg/kg	.8	U
4-Chloroaniline	mg/kg	.8	U
4-Chlorophenyl phenyl ether	mg/kg	.8	U
4-Methylphenol	mg/kg	.8	U
4-Nitroaniline	mg/kg	3.95	U
4-Nitrophenol	mg/kg	3.95	U
Acenaphthene	mg/kg	.8	U
Acenaphthylene	mg/kg	.8	U
Anthracene	mg/kg	.8	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		WARP-SD01		WARP-SD02		WARP-SD03		WARP-SD04		WARP-SD05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		11100		11110		11120		11130		11140	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	mg/kg	.051	J	.2	U	.23	U	.2	U	.44	U
Benzo(a)pyrene	mg/kg	.053	J	.2	U	.23	U	.2	U	.44	U
Benzo(b)fluoranthene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Benzo(ghi)perylene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Benzo(k)fluoranthene	mg/kg	.052	J	.2	U	.23	U	.2	U	.44	U
Butyl benzyl phthalate	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Carbazole	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Chrysene	mg/kg	.06	J	.2	U	.23	U	.2	U	.44	U
Dibenz(a,h)anthracene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Dibenzofuran	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Diethyl phthalate	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Dimethyl phthalate	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Fluoranthene	mg/kg	.11	J	.2	U	.23	U	.047	J	.44	U
Fluorene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Hexachlorobenzene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Hexachlorobutadiene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Hexachlorocyclopentadiene	mg/kg	1	U	.95	U	1.1	U	.95	U	2.15	U
Hexachloroethane	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Indeno(1,2,3-cd)pyrene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Isophorone	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Naphthalene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Nitrobenzene	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Pentachlorophenol	mg/kg	1	U	.95	U	1.1	U	.95	U	2.15	U
Phenanthrene	mg/kg	.055	J	.2	U	.23	U	.2	U	.44	U
Phenol	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
Pyrene	mg/kg	.079	J	.2	U	.23	U	.2	U	.44	U
bis(2-Chloroethoxy)methane	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
bis(2-Chloroethyl)ether	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
bis(2-Chloroisopropyl)ether	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
bis(2-Ethylhexyl)phthalate	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U

Report Date: 09/20/00

Sample Location:		WARP-SD06	
Associated Site:		WARP	
Sample No:		11150	
Sample Date:		05-NOV-98	
Depth:		0 - .5	
SEMIVOLATILES	Units	Result	Val Qlfr
Benzo(a)anthracene	mg/kg	.8	U
Benzo(a)pyrene	mg/kg	.8	U
Benzo(b)fluoranthene	mg/kg	.8	U
Benzo(ghi)perylene	mg/kg	.8	U
Benzo(k)fluoranthene	mg/kg	.8	U
Butyl benzyl phthalate	mg/kg	.8	U
Carbazole	mg/kg	.8	U
Chrysene	mg/kg	.8	U
Dibenz(a,h)anthracene	mg/kg	.8	U
Dibenzofuran	mg/kg	.8	U
Diethyl phthalate	mg/kg	.8	U
Dimethyl phthalate	mg/kg	.8	U
Fluoranthene	mg/kg	.8	U
Fluorene	mg/kg	.8	U
Hexachlorobenzene	mg/kg	.8	U
Hexachlorobutadiene	mg/kg	.8	U
Hexachlorocyclopentadiene	mg/kg	3.95	U
Hexachloroethane	mg/kg	.8	U
Indeno(1,2,3-cd)pyrene	mg/kg	.8	U
Isophorone	mg/kg	.8	U
Naphthalene	mg/kg	.8	U
Nitrobenzene	mg/kg	.8	U
Pentachlorophenol	mg/kg	3.95	U
Phenanthrene	mg/kg	.8	U
Phenol	mg/kg	.8	U
Pyrene	mg/kg	.8	U
bis(2-Chloroethoxy)methane	mg/kg	.8	U
bis(2-Chloroethyl)ether	mg/kg	.8	U
bis(2-Chloroisopropyl)ether	mg/kg	.8	U
bis(2-Ethylhe thalate	mg/kg	.8	U

Plum Brook Ordnance Works
West Area Red Water Ponds
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Report Date: 09/20/00

Sample Location:		WARP-SD01		WARP-SD02		WARP-SD03		WARP-SD04		WARP-SD05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		11100		11110		11120		11130		11140	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
di-n-Octyl phthalate	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
n-Nitroso-di-n-propylamine	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U
n-Nitrosodiphenylamine	mg/kg	.205	U	.2	U	.23	U	.2	U	.44	U

Report Date: 09/20/00

Sample Location:	WARP-SD06		
Associated Site:	WARP		
Sample No:	11150		
Sample Date:	05-NOV-98		
Depth:	0 - .5		
SEMIVOLATILES	Units	Result	Val Qlfr
di-n-Butyl phthalate	mg/kg	.8	U
di-n-Octyl phthalate	mg/kg	.8	U
n-Nitroso-di-n-propylamine	mg/kg	.8	U
n-Nitrosodiphenylamine	mg/kg	.8	U

Plum Brook Ordnance Works
West Area Red Water Ponds
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Report Date: 09/20/00

Sample Location:		WARP-SD01		WARP-SD02		WARP-SD03		WARP-SD04		WARP-SD05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		11100		11110		11120		11130		11140	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
PEST/PCB	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	mg/kg	.0205	U	.02	U	.023	U	.02	U	.044	U
Aroclor 1221	mg/kg	.0205	U	.02	U	.023	U	.02	U	.044	U
Aroclor 1232	mg/kg	.0205	U	.02	U	.023	U	.02	U	.044	U
Aroclor 1242	mg/kg	.0205	U	.02	U	.023	U	.02	U	.044	U
Aroclor 1248	mg/kg	.0205	U	.02	U	.023	U	.02	U	.044	U
Aroclor 1254	mg/kg	.0205	U	.02	U	.023	U	.02	U	.044	U
Aroclor 1260	mg/kg	.0205	U	.02	U	.023	U	.02	U	.044	U

Report Date: 09/20/00

Sample Location:	WARP-SD06
Associated Site:	WARP
Sample No:	11150
Sample Date:	05-NOV-98
Depth:	0 - .5

PEST/PCB	Units	Result	Val Qlfr
Aroclor 1016	mg/kg	.08	U
Aroclor 1221	mg/kg	.08	U
Aroclor 1232	mg/kg	.08	U
Aroclor 1242	mg/kg	.08	U
Aroclor 1248	mg/kg	.08	U
Aroclor 1254	mg/kg	.08	U
Aroclor 1260	mg/kg	.08	U

Plum Brook Ordnance Works
West Area Red Water Ponds
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Sample Location:		PB-WA-SED1 WARP		PB-WA-SED1 WARP		PB-WA-SED2 WARP		PB-WA-SED2 WARP		PB-WA-SED3 WARP	
Associated Site:											
Sample No:		PB-WA-SED1-0.2-1.7		PB-WA-SED1-1.7-2.5		PB-WA-SED2-0.2-1.0		PB-WA-SED2-1-2		PB-WA-SED3-0.2-1.0	
Sample Date:		27-OCT-94		27-OCT-94		27-OCT-94		27-OCT-94		27-OCT-94	
Depth:		.2 - 1.7		1.7 - 2.5		.2 - 1		1 - 2		.2 - 1	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	3.4		3.2		3.95		3.05		3.25	
Arsenic	mg/kg	2.05		1.9		2.4		11.3		1.95	
Barium	mg/kg										
Beryllium	mg/kg	.7		.65		.8		.6		.65	
Cadmium	mg/kg	.7		.65		.8		.6		.65	
Calcium	mg/kg										
Chromium	mg/kg	11		17		22		17		16	
Cobalt	mg/kg										
Copper	mg/kg	1.35		1.3		1.6		3.2		1.3	
Iron	mg/kg										
Lead	mg/kg	19		15		17		12		16	
Magnesium	mg/kg										
Manganese	mg/kg	180		220		190		159		180	
Mercury	mg/kg	.17		.16		.2		.15		.16	
Nickel	mg/kg	12		23		19		20		16	
Potassium	mg/kg	1500									
Selenium	mg/kg	2.7		2.55		3.15		2.45		2.6	
Silver	mg/kg	.7		.65		.8		.6		.65	
Sodium	mg/kg										
Thallium	mg/kg	3.4		3.2		3.95		3.05		3.25	
Vanadium	mg/kg										
Zinc	mg/kg	46		74		94		70		57	

Plum Brook Ordnance Works
West Area Red Water Ponds
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Sample Location:		PB-WA-SED3		PB-WA-SED4		PB-WA-SED4		PB-WA-SED5		PB-WA-SED5	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-SED3-1.0-2.0		PB-WA-SED4-0.2-0.5		PB-WA-SED4-0.5-1.5		PB-WA-SED5-0.2-0.5		PB-WA-SED5-0.5-1.5	
Sample Date:		27-OCT-94		28-OCT-94		28-OCT-94		28-OCT-94		28-OCT-94	
Depth:		1 - 2		.2 - 0.5		.5 - 1.5		.2 - 0.5		.5 - 1.5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg										
Antimony	mg/kg	3.05		3.4		3		3.5		3.05	
Arsenic	mg/kg	5.2		2.05		4		4.2		7.2	
Barium	mg/kg										
Beryllium	mg/kg	.6		.7		.6		.7		.6	
Cadmium	mg/kg	.6		.7		.6		.7		.6	
Calcium	mg/kg										
Chromium	mg/kg	22		9.9		13		11.5		17	
Cobalt	mg/kg										
Copper	mg/kg	1.2		3.9		3.9		1.4		1.2	
Iron	mg/kg										
Lead	mg/kg	12		19		10.7		21		13	
Magnesium	mg/kg										
Manganese	mg/kg	220		149		262		169		329	
Mercury	mg/kg	.15		.17		.15		.175		.15	
Nickel	mg/kg	23		8.8		18		10.7		20	
Potassium	mg/kg										
Selenium	mg/kg	2.45		2.7		2.4		2.8		2.45	
Silver	mg/kg	.6		.7		.6		.7		.6	
Sodium	mg/kg										
Thallium	mg/kg	3.05		3.4		3		3.5		3.05	
Vanadium	mg/kg										
Zinc	mg/kg	73		36		50		44		62	

Sample Location:		PB-WA-SED6		PB-WA-SED6		PB-WA-SED7		WARP-SD01		WARP-SD02	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-SED6-0.2-1.3		PB-WA-SED6-1.3-1.7		PB-WA-SED7-0.2-1.0		11100		11110	
Sample Date:		28-OCT-94		28-OCT-94		27-OCT-94		05-NOV-98		05-NOV-98	
Depth:		.2 - 1.3		1.3 - 1.7		.2 - 1		0 - .5		0 - .5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg							3170		2450	
Antimony	mg/kg	3.4		3.15		4.05		3.75	UJ	3.6	UJ
Arsenic	mg/kg	2.05		1.9		2.4		5.4		3.5	
Barium	mg/kg							26.6		12.05	U
Beryllium	mg/kg	.7		.65		.8		.31	U	.3	U
Cadmium	mg/kg	.7		.65		.8		.31	U	.3	U
Calcium	mg/kg							10800		13900	
Chromium	mg/kg	14		19		10		6.7		5.3	
Cobalt	mg/kg							10.9		6.4	
Copper	mg/kg	1.35		1.25		1.6		13.7		8.8	
Iron	mg/kg							14900		9900	
Lead	mg/kg	16		13		16		9.7		6.5	
Magnesium	mg/kg							2110		2720	
Manganese	mg/kg	164		250		160		305		231	
Mercury	mg/kg	.17		.155		.2		.0205	U	.02	U
Nickel	mg/kg	14		21		13		23.0		13.7	
Potassium	mg/kg							311.5	U	301.5	U
Selenium	mg/kg	2.75		2.55		3.25		.31	U	.3	U
Silver	mg/kg	.7		.65		.8		.6	U	.6	U
Sodium	mg/kg							311.5	U	301.5	U
Thallium	mg/kg	3.4		3.15		4.05		.6	U	.6	U
Vanadium	mg/kg							3.1	U	3	U
Zinc	mg/kg	59		73		63		48.0		35.1	

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Sample Location:		WARP-SD03		WARP-SD04		WARP-SD05		WARP-SD06	
Associated Site:		WARP		WARP		WARP		WARP	
Sample No:		11120		11130		11140		11150	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	4260		3230		6880		9600	
Antimony	mg/kg	4.15	UJ	3.65	UJ	8	UJ	14.8	UJ
Arsenic	mg/kg	7.3		8.6		4.6		8.7	
Barium	mg/kg	36.0		34.8		65.0		49.25	U
Beryllium	mg/kg	.345	U	.305	U	.65	U	1.25	U
Cadmium	mg/kg	.345	U	.305	U	.65	U	1.25	U
Calcium	mg/kg	12300		16000		6710		74700	
Chromium	mg/kg	8.1		7.4		12.6		28.7	
Cobalt	mg/kg	10.6		10.8		6.65	U	12.3	U
Copper	mg/kg	15.0		9.8		15.2		24.5	
Iron	mg/kg	16500		24300		16000		18000	
Lead	mg/kg	9.4		8.1		22.6		32.1	
Magnesium	mg/kg	2520		2950		3130		6770	
Manganese	mg/kg	290		255		338		726	
Mercury	mg/kg	.023	U	.02	U	.044	U	.08	U
Nickel	mg/kg	24.4		18.3		15.2		24.5	
Potassium	mg/kg	821		303	U	665	U	1230	U
Selenium	mg/kg	.345	U	.305	U	.65	U	1.25	U
Silver	mg/kg	.7	U	.6	U	1.35	U	2.45	U
Sodium	mg/kg	346.5	U	303	U	665	U	1230	U
Thallium	mg/kg	.7	U	.6	U	1.35	U	2.45	U
Vanadium	mg/kg	3.45	U	3.05	U	6.65	U	25.0	
Zinc	mg/kg	58.4		45.3		54.4		77.0	

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West Area Red Water Ponds
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Sample Location:		PB-WA-SED1		PB-WA-SED7	
Associated Site:		WARP		WARP	
Sample No:		PB-WA-SED1-0.2-1.7		PB-WA-SED8-0.2-1.7	
Sample Date:		27-OCT-94		27-OCT-94	
Depth:		.2 - 1.7		.2 - 1.7	
GEN CHEMISTRY	Units	Result	Val Qlfr	Result	Val Qlfr
Alkalinity	mg/kg	680			
Nitrate	mg/kg	3.4			
Phosphorous	mg/kg	3.1			
Sulfate	mg/kg	84.5			
Total organic carbon	mg/kg	46		44	

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Sample Location:		PB-WA-SED1		PB-WA-SED1		PB-WA-SED2		PB-WA-SED2		PB-WA-SED3	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-SED1-0.2-1.7		PB-WA-SED1-1.7-2.5		PB-WA-SED2-0.2-1.0		PB-WA-SED2-1-2		PB-WA-SED3-0.2-1.0	
Sample Date:		27-OCT-94		27-OCT-94		27-OCT-94		27-OCT-94		27-OCT-94	
Depth:		.2 - 1.7		1.7 - 2.5		.2 - 1		1 - 2		.2 - 1	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		.125		.125		.125		.125	
1,3-Dinitrobenzene	mg/kg	.125		.125		.125		.125		.125	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13			
RDX	mg/kg										
Tetryl	mg/kg										

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Sample Location:		PB-WA-SED3		PB-WA-SED4		PB-WA-SED4		PB-WA-SED5		PB-WA-SED5	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-SED3-1.0-2.0		PB-WA-SED4-0.2-0.5		PB-WA-SED4-0.5-1.5		PB-WA-SED5-0.2-0.5		PB-WA-SED5-0.5-1.5	
Sample Date:		27-OCT-94		28-OCT-94		28-OCT-94		28-OCT-94		28-OCT-94	
Depth:		1 - 2		.2 - 0.5		.5 - 1.5		.2 - 0.5		.5 - 1.5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	0.6		.125		0.8		.125		0.6	
1,3-Dinitrobenzene	mg/kg	0.7		.125		0.3		.125		0.7	
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2,4-Dinitrotoluene	mg/kg	0.5		0.3		0.4		.125		0.7	
2,6-Dinitrotoluene	mg/kg	.13		.13		.13		.13		.13	
2-Amino-4,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
2-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3,4-Dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
3-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
4-Nitrotoluene	mg/kg	.125		.125		.125		.125		.125	
HMX	mg/kg										
Nitrobenzene	mg/kg	.13		.13		.13		.13		.13	
RDX	mg/kg										
Tetryl	mg/kg										

Sample Location:		PB-WA-SED6		PB-WA-SED6		PB-WA-SED7		WARP-SD01		WARP-SD02	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		PB-WA-SED6-0.2-1.3		PB-WA-SED6-1.3-1.7		PB-WA-SED7-0.2-1.0		11100		11110	
Sample Date:		28-OCT-94		28-OCT-94		27-OCT-94		05-NOV-98		05-NOV-98	
Depth:		.2 - 1.3		1.3 - 1.7		.2 - 1		0 - .5		0 - .5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125		.125		.125		.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125		0.7		.125		.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125		.125		.125		.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	0.4		0.7		.125		.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	0.4		.13		.13		.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg	.125		0.3		.125		.125	U	.125	U
2-Amino-4-nitrotoluene	mg/kg	.125		.125		.125					
2-Nitrotoluene	mg/kg	.125		.125		.125		.125	U	.125	U
3,4-Dinitrotoluene	mg/kg	.125		.125		.125					
3-Nitrotoluene	mg/kg	.125		.125		.125		.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125		.125		.125		.125	U	.125	U
4-Amino-2-nitrotoluene	mg/kg	.125		.125		.125					
4-Nitrotoluene	mg/kg	.125		.125		.125					
HMX	mg/kg							.25	U	.25	U
Nitrobenzene	mg/kg	.13		.13		.13		.125	U	.125	U
RDX	mg/kg							.25	U	.25	U
Tetryl	mg/kg							.325	U	.325	U

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Sample Location:		WARP-SD03		WARP-SD04		WARP-SD05		WARP-SD06	
Associated Site:		WARP		WARP		WARP		WARP	
Sample No:		11120		11130		11140		11150	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
2-Amino-4-nitrotoluene	mg/kg								
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
3,4-Dinitrotoluene	mg/kg								
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
4-Amino-2-nitrotoluene	mg/kg								
4-Nitrotoluene	mg/kg								
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04		WARP-SW05	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			12100		12110		12120		12130		12140	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
WATER QUALITY	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Hardness		ug/L	380000		408000		400000		420000		372000	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			WARP-SW06	
Associated Site:			WARP	
Sample No:			12150	
Sample Date:			05-NOV-98	
WATER QUALITY	Fltr	Units	Result	Val Qlfr
Hardness		ug/L	592000	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04		WARP-SW05	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			12100		12110		12120		12130		12140	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
VOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
1,1,2,2-Tetrachloroethane		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
1,1,2-Trichloroethane		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
1,1-Dichloroethane		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
1,1-Dichloroethene		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
1,2-Dichloroethane		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
1,2-Dichloroethene		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
1,2-Dichloropropane		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
2-Butanone		ug/L	2.5	R	2.5	R	2.5	R	2.5	R	2.5	R
2-Hexanone		ug/L	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
4-Methyl-2-pentanone		ug/L	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Acetone		ug/L	1.4	B	2.6	B	2.4	B	3.1	B	1.6	B
Benzene		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Bromodichloromethane		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Bromoform		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Bromomethane		ug/L	0.22	J	1	U	0.16	J	0.21	J	0.21	J
Carbon disulfide		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Carbon tetrachloride		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Chlorobenzene		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Chloroethane		ug/L	1	U	1	U	1	U	1	U	1	U
Chloroform		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Chloromethane		ug/L	1	U	1	U	1	U	1	U	1	U
Dibromochloromethane		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Ethylbenzene		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Methylene chloride		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Styrene		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Tetrachloroethene		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Toluene		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Total xylenes		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			WARP-SW06	
Associated Site:			WARP	
Sample No:			12150	
Sample Date:			05-NOV-98	
VOLATILES	Fltr	Units	Result	Val Qlfr
1,1,1-Trichloroethane		ug/L	.5	U
1,1,2,2-Tetrachloroethane		ug/L	.5	U
1,1,2-Trichloroethane		ug/L	.5	U
1,1-Dichloroethane		ug/L	.5	U
1,1-Dichloroethene		ug/L	.5	U
1,2-Dichloroethane		ug/L	.5	U
1,2-Dichloroethene		ug/L	.5	U
1,2-Dichloropropane		ug/L	.5	U
2-Butanone		ug/L	2.5	R
2-Hexanone		ug/L	2.5	U
4-Methyl-2-pentanone		ug/L	2.5	U
Acetone		ug/L	2.7	B
Benzene		ug/L	.5	U
Bromodichloromethane		ug/L	.5	U
Bromoform		ug/L	.5	U
Bromomethane		ug/L	0.16	J
Carbon disulfide		ug/L	.5	U
Carbon tetrachloride		ug/L	.5	U
Chlorobenzene		ug/L	.5	U
Chloroethane		ug/L	1	U
Chloroform		ug/L	.5	U
Chloromethane		ug/L	1	U
Dibromochloromethane		ug/L	.5	U
Ethylbenzene		ug/L	.5	U
Methylene chloride		ug/L	.5	U
Styrene		ug/L	.5	U
Tetrachloroethene		ug/L	.5	U
Toluene		ug/L	.5	U
Total xylenes		ug/L	.5	U

Report Date: 09/20/00

Sample Location:			WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04		WARP-SW05	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			12100		12110		12120		12130		12140	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
VOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Trichloroethene		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Vinyl chloride		ug/L	1	U	1	U	1	U	1	U	1	U
cis-1,3-Dichloropropene		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
trans-1,3-Dichloropropene		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			WARP-SW06	
Associated Site:			WARP	
Sample No:			12150	
Sample Date:			05-NOV-98	
VOLATILES	Fltr	Units	Result	Val Qlfr
Trichloroethene		ug/L	.5	U
Vinyl chloride		ug/L	1	U
cis-1,3-Dichloropropene		ug/L	.5	U
trans-1,3-Dichloropropene		ug/L	.5	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04		WARP-SW05	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			12100		12110		12120		12130		12140	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene		ug/L	5	U	5	U	5	U	5	U	5	U
1,2-Dichlorobenzene		ug/L	5	U	5	U	5	U	5	U	5	U
1,3-Dichlorobenzene		ug/L	5	U	5	U	5	U	5	U	5	U
1,4-Dichlorobenzene		ug/L	5	U	5	U	5	U	5	U	5	U
2,4,5-Trichlorophenol		ug/L	5	U	5	U	5	U	5	U	5	U
2,4,6-Trichlorophenol		ug/L	5	U	5	U	5	U	5	U	5	U
2,4-Dichlorophenol		ug/L	5	U	5	U	5	U	5	U	5	U
2,4-Dimethylphenol		ug/L	5	U	5	U	5	U	5	U	5	U
2,4-Dinitrophenol		ug/L	25	U	25	U	25	U	25	U	25	U
2,4-Dinitrotoluene		ug/L	5	U	5	U	5	U	5	U	5	U
2,6-Dinitrotoluene		ug/L	5	U	5	U	5	U	5	U	5	U
2-Chloronaphthalene		ug/L	5	U	5	U	5	U	5	U	5	U
2-Chlorophenol		ug/L	5	U	5	U	5	U	5	U	5	U
2-Methylnaphthalene		ug/L	5	U	5	U	5	U	5	U	5	U
2-Methylphenol		ug/L	5	U	5	U	5	U	5	U	5	U
2-Nitroaniline		ug/L	25	U	25	U	25	U	25	U	25	U
2-Nitrophenol		ug/L	5	U	5	U	5	U	5	U	5	U
3,3'-Dichlorobenzidine		ug/L	25	U	25	U	25	U	25	U	25	U
3-Nitroaniline		ug/L	25	U	25	U	25	U	25	U	25	U
4,6-Dinitro-2-methylphenol		ug/L	25	U	25	U	25	U	25	U	25	U
4-Bromophenyl phenyl ether		ug/L	5	U	5	U	5	U	5	U	5	U
4-Chloro-3-methylphenol		ug/L	5	U	5	U	5	U	5	U	5	U
4-Chloroaniline		ug/L	5	U	5	U	5	U	5	U	5	U
4-Chlorophenyl phenyl ether		ug/L	5	U	5	U	5	U	5	U	5	U
4-Methylphenol		ug/L	5	U	5	U	5	U	5	U	5	U
4-Nitroaniline		ug/L	25	U	25	U	25	U	25	U	25	U
4-Nitrophenol		ug/L	25	U	25	U	25	U	25	U	25	U
Acenaphthene		ug/L	5	U	5	U	5	U	5	U	5	U
Acenaphthylene		ug/L	5	U	5	U	5	U	5	U	5	U

Report Date: 09/20/00

Sample Location:			WARP-SW06	
Associated Site:			WARP	
Sample No:			12150	
Sample Date:			05-NOV-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr
1,2,4-Trichlorobenzene		ug/L	5	UJ
1,2-Dichlorobenzene		ug/L	5	UJ
1,3-Dichlorobenzene		ug/L	5	UJ
1,4-Dichlorobenzene		ug/L	5	UJ
2,4,5-Trichlorophenol		ug/L	5	UJ
2,4,6-Trichlorophenol		ug/L	5	UJ
2,4-Dichlorophenol		ug/L	5	UJ
2,4-Dimethylphenol		ug/L	5	UJ
2,4-Dinitrophenol		ug/L	25	UJ
2,4-Dinitrotoluene		ug/L	5	UJ
2,6-Dinitrotoluene		ug/L	5	UJ
2-Chloronaphthalene		ug/L	5	UJ
2-Chlorophenol		ug/L	5	UJ
2-Methylnaphthalene		ug/L	5	UJ
2-Methylphenol		ug/L	5	UJ
2-Nitroaniline		ug/L	25	UJ
2-Nitrophenol		ug/L	5	UJ
3,3'-Dichlorobenzidine		ug/L	25	UJ
3-Nitroaniline		ug/L	25	UJ
4,6-Dinitro-2-methylphenol		ug/L	25	UJ
4-Bromophenyl phenyl ether		ug/L	5	UJ
4-Chloro-3-methylphenol		ug/L	5	UJ
4-Chloroaniline		ug/L	5	UJ
4-Chlorophenyl phenyl ether		ug/L	5	UJ
4-Methylphenol		ug/L	5	UJ
4-Nitroaniline		ug/L	25	UJ
4-Nitrophenol		ug/L	25	UJ
Acenaphthene		ug/L	5	UJ
Acenaphthylene		ug/L	5	UJ

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04		WARP-SW05	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			12100		12110		12120		12130		12140	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Anthracene		ug/L	5	U	5	U	5	U	5	U	5	U
Benzo(a)anthracene		ug/L	5	U	5	U	5	U	5	U	5	U
Benzo(a)pyrene		ug/L	5	U	5	U	5	U	5	U	5	U
Benzo(b)fluoranthene		ug/L	5	U	5	U	5	U	5	U	5	U
Benzo(ghi)perylene		ug/L	5	U	5	U	5	U	5	U	5	U
Benzo(k)fluoranthene		ug/L	5	U	5	U	5	U	5	U	5	U
Butyl benzyl phthalate		ug/L	5	U	5	U	5	U	5	U	5	U
Carbazole		ug/L	5	U	5	U	5	U	5	U	5	U
Chrysene		ug/L	5	U	5	U	5	U	5	U	5	U
Dibenz(a,h)anthracene		ug/L	5	U	5	U	5	U	5	U	5	U
Dibenzofuran		ug/L	5	U	5	U	5	U	5	U	5	U
Diethyl phthalate		ug/L	5	U	5	U	5	U	5	U	5	U
Dimethyl phthalate		ug/L	5	U	5	U	5	U	5	U	5	U
Fluoranthene		ug/L	5	U	5	U	5	U	5	U	5	U
Fluorene		ug/L	5	U	5	U	5	U	5	U	5	U
Hexachlorobenzene		ug/L	5	U	5	U	5	U	5	U	5	U
Hexachlorobutadiene		ug/L	5	U	5	U	5	U	5	U	5	U
Hexachlorocyclopentadiene		ug/L	25	U	25	U	25	U	25	U	25	U
Hexachloroethane		ug/L	5	U	5	U	5	U	5	U	5	U
Indeno(1,2,3-cd)pyrene		ug/L	5	U	5	U	5	U	5	U	5	U
Isophorone		ug/L	5	U	5	U	5	U	5	U	5	U
Naphthalene		ug/L	5	U	5	U	5	U	5	U	5	U
Nitrobenzene		ug/L	5	U	5	U	5	U	5	U	5	U
Pentachlorophenol		ug/L	25	U	25	U	25	U	25	U	25	U
Phenanthrene		ug/L	5	U	5	U	5	U	5	U	5	U
Phenol		ug/L	6.9	B	4.0	B	4.5	B	1.4	B	1.7	B
Pyrene		ug/L	5	U	5	U	5	U	5	U	5	U
bis(2-Chloroethoxy)methane		ug/L	5	U	5	U	5	U	5	U	5	U
bis(2-Chloroethyl)ether		ug/L	5	U	5	U	5	U	5	U	5	U

Report Date: 09/20/00

Sample Location:			WARP-SW06	
Associated Site:			WARP	
Sample No:			12150	
Sample Date:			05-NOV-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr
Anthracene		ug/L	5	UJ
Benzo(a)anthracene		ug/L	5	UJ
Benzo(a)pyrene		ug/L	5	UJ
Benzo(b)fluoranthene		ug/L	5	UJ
Benzo(ghi)perylene		ug/L	5	UJ
Benzo(k)fluoranthene		ug/L	5	UJ
Butyl benzyl phthalate		ug/L	5	UJ
Carbazole		ug/L	5	UJ
Chrysene		ug/L	5	UJ
Dibenz(a,h)anthracene		ug/L	5	UJ
Dibenzofuran		ug/L	5	UJ
Diethyl phthalate		ug/L	5	UJ
Dimethyl phthalate		ug/L	5	UJ
Fluoranthene		ug/L	5	UJ
Fluorene		ug/L	5	UJ
Hexachlorobenzene		ug/L	5	UJ
Hexachlorobutadiene		ug/L	5	UJ
Hexachlorocyclopentadiene		ug/L	25	UJ
Hexachloroethane		ug/L	5	UJ
Indeno(1,2,3-cd)pyrene		ug/L	5	UJ
Isophorone		ug/L	5	UJ
Naphthalene		ug/L	5	UJ
Nitrobenzene		ug/L	5	UJ
Pentachlorophenol		ug/L	25	UJ
Phenanthrene		ug/L	5	UJ
Phenol		ug/L	2.2	B
Pyrene		ug/L	5	UJ
bis(2-Chloroethoxy)methane		ug/L	5	UJ
bis(2-Chloroethyl)		ug/L	5	UJ

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04		WARP-SW05	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			12100		12110		12120		12130		12140	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
bis(2-Chloroisopropyl)ether		ug/L	5	U	5	U	5	U	5	U	5	U
bis(2-Ethylhexyl)phthalate		ug/L	5	U	2.7	B	5	U	5	U	5	U
di-n-Butyl phthalate		ug/L	5	U	5	U	5	U	5	U	5	U
di-n-Octyl phthalate		ug/L	5	U	5	U	5	U	5	U	7.8	J
n-Nitroso-di-n-propylamine		ug/L	5	U	5	U	5	U	5	U	5	U
n-Nitrosodiphenylamine		ug/L	5	U	5	U	5	U	5	U	5	U

Report Date: 09/20/00

Sample Location:			WARP-SW06	
Associated Site:			WARP	
Sample No:			12150	
Sample Date:			05-NOV-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr
bis(2-Chloroisopropyl)ether		ug/L	5	UJ
bis(2-Ethylhexyl)phthalate		ug/L	1.7	B
di-n-Butyl phthalate		ug/L	5	UJ
di-n-Octyl phthalate		ug/L	5	UJ
n-Nitroso-di-n-propylamine		ug/L	5	UJ
n-Nitrosodiphenylamine		ug/L	5	UJ

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04		WARP-SW05	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			12100		12110		12120		12130		12140	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
PEST/PCB	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Aroclor 1221		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Aroclor 1232		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Aroclor 1242		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Aroclor 1248		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Aroclor 1254		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U
Aroclor 1260		ug/L	.5	U	.5	U	.5	U	.5	U	.5	U

Report Date: 09/20/00

Sample Location:			WARP-SW06	
Associated Site:			WARP	
Sample No:			12150	
Sample Date:			05-NOV-98	
PEST/PCB	Fltr	Units	Result	Val Qlfr
Aroclor 1016		ug/L	.5	U
Aroclor 1221		ug/L	.5	U
Aroclor 1232		ug/L	.5	U
Aroclor 1242		ug/L	.5	U
Aroclor 1248		ug/L	.5	U
Aroclor 1254		ug/L	.5	U
Aroclor 1260		ug/L	.5	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PB-WA-SW1		PB-WA-SW2		PB-WA-SW3		PB-WA-SW4		PB-WA-SW5	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			PB-WA-SW1		PB-WA-SW2		PB-WA-SW3		PB-WA-SW4		PB-WA-SW5	
Sample Date:			25-OCT-94		25-OCT-94		25-OCT-94		25-OCT-94		27-OCT-94	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum		ug/L										
Aluminum	Y	ug/L										
Antimony		ug/L	25		25		25		25		25	
Antimony	Y	ug/L	25		25		25		25		25	
Arsenic		ug/L	15		15		15		15		15	
Arsenic	Y	ug/L	15		15		15		15		15	
Barium		ug/L										
Barium	Y	ug/L										
Beryllium		ug/L	5		5		5		5		5	
Beryllium	Y	ug/L	5		5		5		5		5	
Cadmium		ug/L	5		5		5		5		5	
Cadmium	Y	ug/L	5		5		5		5		5	
Calcium		ug/L										
Calcium	Y	ug/L										
Chromium		ug/L	5		5		5		5		10	
Chromium	Y	ug/L	5		5		5		5		5	
Cobalt		ug/L										
Cobalt	Y	ug/L										
Copper		ug/L	10		10		10		10		10	
Copper	Y	ug/L	10		10		10		10		10	
Iron		ug/L										
Iron	Y	ug/L										
Lead		ug/L	12.5		12.5		77		12.5		12.5	
Lead	Y	ug/L	12.5		12.5		12.5		12.5		12.5	
Magnesium		ug/L										
Magnesium	Y	ug/L										
Manganese		ug/L	190		260		230		260		1600	
Manganese	Y	ug/L	150		210		210		200		1300	
Mercury		ug/L	.25		.25		.25		.25		.25	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PB-WA-SW7		WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			PB-WA-SW7		12100		12110		12120		12130	
Sample Date:			25-OCT-94		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum		ug/L			631	J	100	U	300	J	100	U
Aluminum	Y	ug/L			100	U	100	U	233		100	U
Antimony		ug/L	25		30	U	30	U	30	U	30	U
Antimony	Y	ug/L	25		30	U	30	U	30	U	30	U
Arsenic		ug/L	15		5	U	5	U	5	U	5	U
Arsenic	Y	ug/L	15		5	U	5	U	5	U	5	U
Barium		ug/L			100	U	100	U	100	U	100	U
Barium	Y	ug/L			100	U	100	U	100	U	100	U
Beryllium		ug/L	5		2.5	U	2.5	U	2.5	U	2.5	U
Beryllium	Y	ug/L	5		2.5	U	2.5	U	2.5	U	2.5	U
Cadmium		ug/L	5		2.5	U	2.5	U	2.5	U	2.5	U
Cadmium	Y	ug/L	5		2.5	U	2.5	U	2.5	U	2.5	U
Calcium		ug/L			107000		106000		106000		105000	
Calcium	Y	ug/L			104000		106000		104000		103000	
Chromium		ug/L	5		5	U	5	U	5	U	5	U
Chromium	Y	ug/L	5		5	U	5	U	5	U	5	U
Cobalt		ug/L			25	U	25	U	25	U	25	U
Cobalt	Y	ug/L			25	U	25	U	25	U	25	U
Copper		ug/L	10		12.5	U	12.5	U	12.5	U	12.5	U
Copper	Y	ug/L	10		12.5	U	12.5	U	12.5	U	12.5	U
Iron		ug/L			1300		126		747		646	
Iron	Y	ug/L			153		50	U	484		589	
Lead		ug/L	54		1.5	U	1.5	U	1.5	U	1.5	U
Lead	Y	ug/L	12.5		1.5	U	1.5	U	1.5	U	1.5	U
Magnesium		ug/L			26000		26500		26200		25800	
Magnesium	Y	ug/L			25600		26500		25700		25400	
Manganese		ug/L	240		890		30.6		261		126	
Manganese	Y	ug/L	230		218		7.5	U	97.2		107	
Mercury		ug/L	.25			U	.1	U	.1	U		U

Report Date: 09/20/00

Sample Location:			WARP-SW05		WARP-SW06	
Associated Site:			WARP		WARP	
Sample No:			12140		12150	
Sample Date:			05-NOV-98		05-NOV-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
Aluminum		ug/L	13800	J	12400	J
Aluminum	Y	ug/L	6340		11400	
Antimony		ug/L	30	U	30	U
Antimony	Y	ug/L	30	U	30	U
Arsenic		ug/L	20.2		21.8	
Arsenic	Y	ug/L	10.9		17.2	
Barium		ug/L	100	U	100	U
Barium	Y	ug/L	100	U	100	U
Beryllium		ug/L	2.5	U	2.5	U
Beryllium	Y	ug/L	2.5	U	2.5	U
Cadmium		ug/L	2.5	U	2.5	U
Cadmium	Y	ug/L	2.5	U	2.5	U
Calcium		ug/L	31100		115000	
Calcium	Y	ug/L	27600		71500	
Chromium		ug/L	17.4		23.3	J
Chromium	Y	ug/L	5	U	21.2	J
Cobalt		ug/L	25	U	25	U
Cobalt	Y	ug/L	25	U	25	U
Copper		ug/L	12.5	U	12.5	U
Copper	Y	ug/L	12.5	U	12.5	U
Iron		ug/L	21100		19000	
Iron	Y	ug/L	8630		15500	
Lead		ug/L	25.0		32.9	
Lead	Y	ug/L	7.2		20.4	J
Magnesium		ug/L	46500		50700	
Magnesium	Y	ug/L	44300		49100	
Manganese		ug/L	1150		1550	
Manganese	Y	ug/L	669		907	
Mercury		ug/L	.1	U	.1	U

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PB-WA-SW1		PB-WA-SW2		PB-WA-SW3		PB-WA-SW4		PB-WA-SW5	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			PB-WA-SW1		PB-WA-SW2		PB-WA-SW3		PB-WA-SW4		PB-WA-SW5	
Sample Date:			25-OCT-94		25-OCT-94		25-OCT-94		25-OCT-94		27-OCT-94	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Mercury	Y	ug/L	.25		.25		.25		.25		.25	
Nickel		ug/L	10		10		10		10		20	
Nickel	Y	ug/L	10		10		10		10		10	
Potassium		ug/L										
Potassium	Y	ug/L										
Selenium		ug/L	20		20		20		20		20	
Selenium	Y	ug/L	20		20		20		20		20	
Silver		ug/L	5		5		5		5		5	
Silver	Y	ug/L	5		5		5		5		5	
Sodium		ug/L										
Sodium	Y	ug/L										
Thallium		ug/L	25		25		25		25		25	
Thallium	Y	ug/L	25		25		25		25		25	
Vanadium		ug/L										
Vanadium	Y	ug/L										
Zinc		ug/L	10		10		43		46		70	
Zinc	Y	ug/L	20		23		10		10		10	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PB-WA-SW7		WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			PB-WA-SW7		12100		12110		12120		12130	
Sample Date:			25-OCT-94		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Mercury	Y	ug/L	.25		.1	U	.1	U	.1	U	.1	U
Nickel		ug/L	10		20	U	20	U	20	U	20	U
Nickel	Y	ug/L	10		20	U	20	U	20	U	20	U
Potassium		ug/L			9400		9730		9750		9910	
Potassium	Y	ug/L			8870		9340		9080		9370	
Selenium		ug/L	20		2.5	U	2.5	U	2.5	U	2.5	U
Selenium	Y	ug/L	20		2.5	U	2.5	U	2.5	U	2.5	U
Silver		ug/L	5		5	U	5	U	5	U	5	U
Silver	Y	ug/L	5	UJ	5	U	5	U	5	U	5	U
Sodium		ug/L			38200		39300		38300		39000	
Sodium	Y	ug/L			37400		38800		37200		37900	
Thallium		ug/L	25		5	U	5	U	5	U	5	U
Thallium	Y	ug/L	25		5	U	5	U	5	U	5	U
Vanadium		ug/L			25	U	25	U	25	U	25	U
Vanadium	Y	ug/L			25	U	25	U	25	U	25	U
Zinc		ug/L	26		27.0		10	U	10	U	10	U
Zinc	Y	ug/L	10		10	U	10	U	10	U	10	U

Report Date: 09/20/00

Sample Location:			WARP-SW05		WARP-SW06	
Associated Site:			WARP		WARP	
Sample No:			12140		12150	
Sample Date:			05-NOV-98		05-NOV-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
Mercury	Y	ug/L	.1	U	.1	U
Nickel		ug/L	20	U	20	U
Nickel	Y	ug/L	20	U	20	U
Potassium		ug/L	5590		5180	
Potassium	Y	ug/L	2500	U	5900	
Selenium		ug/L	2.5	U	2.5	U
Selenium	Y	ug/L	2.5	U	2.5	U
Silver		ug/L	5	U	5	U
Silver	Y	ug/L	5	U	5	U
Sodium		ug/L	104000		107000	
Sodium	Y	ug/L	103000		112000	
Thallium		ug/L	5	U	5	U
Thallium	Y	ug/L	5	U	5	U
Vanadium		ug/L	25	U	52.2	
Vanadium	Y	ug/L	25	U	25	U
Zinc		ug/L	84.8		92.5	
Zinc	Y	ug/L	42.3		68.0	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PB-WA-SW1		PB-WA-SW2		PB-WA-SW3		PB-WA-SW4		PB-WA-SW5	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			PB-WA-SW1		PB-WA-SW2		PB-WA-SW3		PB-WA-SW4		PB-WA-SW5	
Sample Date:			25-OCT-94		25-OCT-94		25-OCT-94		25-OCT-94		27-OCT-94	
GEN CHEMISTRY	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Total suspended solids		ug/L	17000		21000		21000		24000		220000	

Sample Location:			PB-WA-SW7	
Associated Site:			WARP	
Sample No:			PB-WA-SW7	
Sample Date:			25-OCT-94	
GEN CHEMISTRY	Fltr	Units	Result	Val Qlfr
Total suspended solids		ug/L	20000	

Plum Brook Ordnance Works
West Area Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PB-WA-SW1		PB-WA-SW2		PB-WA-SW3		PB-WA-SW4		PB-WA-SW5	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			PB-WA-SW1		PB-WA-SW2		PB-WA-SW3		PB-WA-SW4		PB-WA-SW5	
Sample Date:			25-OCT-94		25-OCT-94		25-OCT-94		25-OCT-94		27-OCT-94	
EXPLOSIVES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene		ug/L	.225		.225		.225		.225		.225	
1,3-Dinitrobenzene		ug/L	0.3		.075		.075		.075		.075	
2,4,6-Trinitrotoluene		ug/L	.32		.32		.32		.32		.32	
2,4-Dinitrotoluene		ug/L	0.5		.05		.05		.05		.05	
2,6-Dinitrotoluene		ug/L	.05		.05		.05		.05		0.8	
2-Amino-4,6-dinitrotoluene		ug/L	.08		.08		.08		.08		.08	
2-Amino-4-nitrotoluene		ug/L	.47		.47		.47		.47		.47	
2-Nitrotoluene		ug/L	.205		.205		.205		.205		.205	
3,4-Dinitrotoluene		ug/L	0.5		0.6		0.6		0.6		.105	
3-Nitrotoluene		ug/L	.7		2.3		2.4		2.5		54	
4-Amino-2,6-dinitrotoluene		ug/L	.785		.785		.785		.785		.785	
4-Amino-2-nitrotoluene		ug/L	.275		.275		0.6		.275		.275	
4-Nitrotoluene		ug/L	.31		.31		.31		.31		.31	
HMX		ug/L										
Nitrobenzene		ug/L	.325		.325		.325		.325		.325	
RDX		ug/L										
Tetryl		ug/L										

Sample Location:			PB-WA-SW7		WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			PB-WA-SW7		12100		12110		12120		12130	
Sample Date:			25-OCT-94		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
EXPLOSIVES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene		ug/L	.225		.1	U	.1	U	.1	U	.1	U
1,3-Dinitrobenzene		ug/L	.075		.1	U	.1	U	.1	U	.1	U
2,4,6-Trinitrotoluene		ug/L	.32		.1	U	.1	U	.1	U	.1	U
2,4-Dinitrotoluene		ug/L	.05		.1	U	.1	U	.1	U	.1	U
2,6-Dinitrotoluene		ug/L	.05		.1	U	.1	U	.1	U	.1	U
2-Amino-4,6-dinitrotoluene		ug/L	.08		.1	U	.1	U	.1	U	.1	U
2-Amino-4-nitrotoluene		ug/L	.47									
2-Nitrotoluene		ug/L	.205		.1	U	.1	U	.1	U	.1	U
3,4-Dinitrotoluene		ug/L	.105									
3-Nitrotoluene		ug/L	2.2		.1	U	.1	U	.1	U	.1	U
4-Amino-2,6-dinitrotoluene		ug/L	.785		.1	U	.1	U	.1	U	.1	U
4-Amino-2-nitrotoluene		ug/L	.275									
4-Nitrotoluene		ug/L	.31									
HMX		ug/L			.25	U	.25	U	.25	U	.25	U
Nitrobenzene		ug/L	.325		.1	U	.1	U	.1	U	.1	U
RDX		ug/L			.25	U	.25	U	.25	U	.25	U
Tetryl		ug/L			.1	U	.1	U	.1	U	.1	U

Report Date: 09/20/00

Sample Location:			WARP-SW05		WARP-SW06	
Associated Site:			WARP		WARP	
Sample No:			12140		12150	
Sample Date:			05-NOV-98		05-NOV-98	
EXPLOSIVES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene		ug/L	.1	U	.1	U
1,3-Dinitrobenzene		ug/L	.1	U	.1	U
2,4,6-Trinitrotoluene		ug/L	.1	U	.1	U
2,4-Dinitrotoluene		ug/L	.1	U	.1	U
2,6-Dinitrotoluene		ug/L	.1	U	.1	U
2-Amino-4,6-dinitrotoluene		ug/L	.1	U	.1	U
2-Amino-4-nitrotoluene		ug/L				
2-Nitrotoluene		ug/L	.1	U	.1	U
3,4-Dinitrotoluene		ug/L				
3-Nitrotoluene		ug/L	.1	U	.1	U
4-Amino-2,6-dinitrotoluene		ug/L	.1	U	.1	U
4-Amino-2-nitrotoluene		ug/L				
4-Nitrotoluene		ug/L				
HMX		ug/L	.25	U	.25	U
Nitrobenzene		ug/L	.1	U	.1	U
RDX		ug/L	.25	U	.25	U
Tetryl		ug/L	.1	U	.1	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP01		PRRP-DP02		PRRP-DP03		PRRP-DP04		PRRP-DP06	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7200		7260		7290		7320		7400	
Sample Date:		11-JUN-98		14-JUN-98		08-JUN-98		09-JUN-98		08-JUN-98	
Depth:		0 - 2		8 - 10		4 - 5		0 - 2		0 - 2	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
1,1,2,2-Tetrachloroethane	mg/kg	.0031	UJ	.00335	U	.00315	U	.003	UJ	.00295	U
1,1,2-Trichloroethane	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
1,1-Dichloroethane	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
1,1-Dichloroethene	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
1,2-Dichloroethane	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
1,2-Dichloroethene	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
1,2-Dichloropropane	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
2-Butanone	mg/kg	.0125	U	.0135	U	.0125	U	.012	U	.012	U
2-Hexanone	mg/kg	.0125	U	.0135	U	.0125	U	.012	U	.012	U
4-Methyl-2-pentanone	mg/kg	.0125	U	.0135	U	.0125	U	.012	U	.012	U
Acetone	mg/kg	.0125	R	.0135	U	.0125	U	.012	U	.012	U
Benzene	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
Bromodichloromethane	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
Bromoform	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
Bromomethane	mg/kg	.006	U	.0065	U	.0065	U	.006	U	.006	U
Carbon disulfide	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
Carbon tetrachloride	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
Chlorobenzene	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
Chloroethane	mg/kg	.006	U	.0065	U	.0065	U	.006	U	.006	U
Chloroform	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
Chloromethane	mg/kg	.006	U	.0065	U	.0065	U	.006	U	.006	U
Dibromochloromethane	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
Ethylbenzene	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
Methylene chloride	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
Styrene	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
Tetrachloroethene	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
Toluene	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
Total xylenes	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
Trichloroethene	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U

Plum Brook Ordnance Works

Pentolite Road Red Water Ponds

Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP07		PRRP-DP08		PRRP-DP09		PRRP-DP10		PRRP-DP11	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7450		7480		7530R		7560		7600	
Sample Date:		09-JUN-98		10-JUN-98		25-JUN-98		10-JUN-98		13-JUN-98	
Depth:		4 - 6		0 - 2		4 - 6		0 - 1		0 - 2	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
1,1,2,2-Tetrachloroethane	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	UJ
1,1,2-Trichloroethane	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
1,1-Dichloroethane	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
1,1-Dichloroethene	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
1,2-Dichloroethane	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
1,2-Dichloroethene	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
1,2-Dichloropropane	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
2-Butanone	mg/kg	.0125	U	.0115	U	.0125	U	.011	U	.0115	U
2-Hexanone	mg/kg	.0125	U	.0115	U	.0125	U	.011	U	.0115	U
4-Methyl-2-pentanone	mg/kg	.0125	U	.0115	U	.0125	U	.011	U	.0115	U
Acetone	mg/kg	.0082	J	.0115	U	.0125	U	.011	U	.0115	U
Benzene	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
Bromodichloromethane	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
Bromoform	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
Bromomethane	mg/kg	.006	U	.006	U	.006	U	.0055	U	.006	U
Carbon disulfide	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
Carbon tetrachloride	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
Chlorobenzene	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
Chloroethane	mg/kg	.006	U	.006	U	.006	U	.0055	U	.006	U
Chloroform	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
Chloromethane	mg/kg	.006	U	.006	U	.006	U	.0055	U	.006	U
Dibromochloromethane	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
Ethylbenzene	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
Methylene chloride	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
Styrene	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
Tetrachloroethene	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
Toluene	mg/kg	.00305	U	.0029	U	.0017	J	.0028	U	.0029	U
Total xylenes	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
Trichloroeth[illegible]	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	[illegible]29	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP12		PRRP-DP13		PRRP-DP14		PRRP-DP15		PRRP-DP16	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7650		7700		7720		7780		7820	
Sample Date:		11-JUN-98		12-JUN-98		11-JUN-98		12-JUN-98		12-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		8 - 10		8 - 10	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
1,1,2,2-Tetrachloroethane	mg/kg	.0031	UJ	.003	U	.0031	U	.00305	U	.00315	U
1,1,2-Trichloroethane	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
1,1-Dichloroethane	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
1,1-Dichloroethene	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
1,2-Dichloroethane	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
1,2-Dichloroethene	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
1,2-Dichloropropane	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
2-Butanone	mg/kg	.0125	U	.012	U	.0125	U	.012	U	.0125	U
2-Hexanone	mg/kg	.0125	U	.012	U	.0125	U	.012	U	.0125	U
4-Methyl-2-pentanone	mg/kg	.0125	U	.012	U	.0125	U	.012	U	.0125	U
Acetone	mg/kg	.0125	R	.012	U	.0125	U	.012	U	.0125	U
Benzene	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
Bromodichloromethane	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
Bromoform	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
Bromomethane	mg/kg	.006	U	.006	U	.006	U	.006	U	.0065	U
Carbon disulfide	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
Carbon tetrachloride	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
Chlorobenzene	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
Chloroethane	mg/kg	.006	U	.006	U	.006	U	.006	U	.0065	U
Chloroform	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
Chloromethane	mg/kg	.006	U	.006	U	.006	U	.006	U	.0065	U
Dibromochloromethane	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
Ethylbenzene	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
Methylene chloride	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.0021	J
Styrene	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
Tetrachloroethene	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
Toluene	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
Total xylenes	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
Trichloroethene	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP17		PRRP-DP18		PRRP-DP19		PRRP-DP20	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		7840		7880		7920		7980	
Sample Date:		10-JUN-98		11-JUN-98		12-JUN-98		13-JUN-98	
Depth:		0 - 2		0 - 2		0 - 2		8 - 10	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
1,1,2,2-Tetrachloroethane	mg/kg	.00275	U	.00285	U	.00275	U	.0031	UJ
1,1,2-Trichloroethane	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
1,1-Dichloroethane	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
1,1-Dichloroethene	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
1,2-Dichloroethane	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
1,2-Dichloroethene	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
1,2-Dichloropropane	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
2-Butanone	mg/kg	.011	U	.0115	U	.011	U	.0125	U
2-Hexanone	mg/kg	.011	U	.0115	U	.011	U	.0125	U
4-Methyl-2-pentanone	mg/kg	.011	U	.0115	U	.011	U	.0125	U
Acetone	mg/kg	.011	R	.0115	R	.011	U	.0125	U
Benzene	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
Bromodichloromethane	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
Bromoform	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
Bromomethane	mg/kg	.0055	U	.0055	U	.0055	U	.006	U
Carbon disulfide	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
Carbon tetrachloride	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
Chlorobenzene	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
Chloroethane	mg/kg	.0055	U	.0055	U	.0055	U	.006	U
Chloroform	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
Chloromethane	mg/kg	.0055	U	.0055	U	.0055	U	.006	U
Dibromochloromethane	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
Ethylbenzene	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
Methylene chloride	mg/kg	.00275	U	.00285	U	.0018	J	.0031	U
Styrene	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
Tetrachloroethene	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
Toluene	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
Total xylenes	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
Trichloroethe	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP01		PRRP-DP02		PRRP-DP03		PRRP-DP04		PRRP-DP06	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7200		7260		7290		7320		7400	
Sample Date:		11-JUN-98		14-JUN-98		08-JUN-98		09-JUN-98		08-JUN-98	
Depth:		0 - 2		8 - 10		4 - 5		0 - 2		0 - 2	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	mg/kg	.006	U	.0065	U	.0065	U	.006	U	.006	U
cis-1,3-Dichloropropene	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U
trans-1,3-Dichloropropene	mg/kg	.0031	U	.00335	U	.00315	U	.003	U	.00295	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP07		PRRP-DP08		PRRP-DP09		PRRP-DP10		PRRP-DP11	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7450		7480		7530R		7560		7600	
Sample Date:		09-JUN-98		10-JUN-98		25-JUN-98		10-JUN-98		13-JUN-98	
Depth:		4 - 6		0 - 2		4 - 6		0 - 1		0 - 2	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	mg/kg	.006	U	.006	U	.006	U	.0055	U	.006	U
cis-1,3-Dichloropropene	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U
trans-1,3-Dichloropropene	mg/kg	.00305	U	.0029	U	.0031	U	.0028	U	.0029	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP12		PRRP-DP13		PRRP-DP14		PRRP-DP15		PRRP-DP16	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7650		7700		7720		7780		7820	
Sample Date:		11-JUN-98		12-JUN-98		11-JUN-98		12-JUN-98		12-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		8 - 10		8 - 10	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	mg/kg	.006	U	.006	U	.006	U	.006	U	.0065	U
cis-1,3-Dichloropropene	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U
trans-1,3-Dichloropropene	mg/kg	.0031	U	.003	U	.0031	U	.00305	U	.00315	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP17		PRRP-DP18		PRRP-DP19		PRRP-DP20	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		7840		7880		7920		7980	
Sample Date:		10-JUN-98		11-JUN-98		12-JUN-98		13-JUN-98	
Depth:		0 - 2		0 - 2		0 - 2		8 - 10	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	mg/kg	.0055	U	.0055	U	.0055	U	.006	U
cis-1,3-Dichloropropene	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U
trans-1,3-Dichloropropene	mg/kg	.00275	U	.00285	U	.00275	U	.0031	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP01		PRRP-DP02		PRRP-DP03		PRRP-DP04		PRRP-DP06	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7200		7260		7290		7320		7400	
Sample Date:		11-JUN-98		14-JUN-98		08-JUN-98		09-JUN-98		08-JUN-98	
Depth:		0 - 2		8 - 10		4 - 5		0 - 2		0 - 2	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
1,2-Dichlorobenzene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
1,3-Dichlorobenzene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
1,4-Dichlorobenzene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
2,4,5-Trichlorophenol	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
2,4,6-Trichlorophenol	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
2,4-Dichlorophenol	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
2,4-Dimethylphenol	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
2,4-Dinitrophenol	mg/kg	10	U	1.05	U	10	U	.95	U	.95	U
2,4-Dinitrotoluene	mg/kg	2.05	U	.081	J	8.8		.2	U	.195	U
2,6-Dinitrotoluene	mg/kg	2.05	U	.22	U	.58	J	.2	U	.195	U
2-Chloronaphthalene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
2-Chlorophenol	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
2-Methylnaphthalene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
2-Methylphenol	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
2-Nitroaniline	mg/kg	10	U	1.05	U	10	U	.95	U	.95	U
2-Nitrophenol	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
3,3'-Dichlorobenzidine	mg/kg	10	U	1.05	U	10	U	.95	U	.95	U
3-Nitroaniline	mg/kg	10	U	1.05	U	10	U	.95	U	.95	U
4,6-Dinitro-2-methylphenol	mg/kg	10	U	1.05	U	10	U	.95	U	.95	U
4-Bromophenyl phenyl ether	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
4-Chloro-3-methylphenol	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
4-Chloroaniline	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
4-Chlorophenyl phenyl ether	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
4-Methylphenol	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
4-Nitroaniline	mg/kg	10	U	1.05	U	10	U	.95	U	.95	U
4-Nitrophenol	mg/kg	10	U	1.05	U	10	U	.95	U	.95	U
Acenaphthene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Acenaphthylene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Anthracene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP07		PRRP-DP08		PRRP-DP09		PRRP-DP10		PRRP-DP11	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7450		7480		7530R		7560		7600	
Sample Date:		09-JUN-98		10-JUN-98		25-JUN-98		10-JUN-98		13-JUN-98	
Depth:		4 - 6		0 - 2		4 - 6		0 - 1		0 - 2	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
1,2-Dichlorobenzene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
1,3-Dichlorobenzene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
1,4-Dichlorobenzene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
2,4,5-Trichlorophenol	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
2,4,6-Trichlorophenol	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
2,4-Dichlorophenol	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
2,4-Dimethylphenol	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
2,4-Dinitrophenol	mg/kg	1	U	.95	U	1	U	.9	U	.9	U
2,4-Dinitrotoluene	mg/kg	.205	U	.19	U	.056	J	.185	U	.16	J
2,6-Dinitrotoluene	mg/kg	.205	U	.19	U	.205	U	.185	U	.05	J
2-Chloronaphthalene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
2-Chlorophenol	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
2-Methylnaphthalene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
2-Methylphenol	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
2-Nitroaniline	mg/kg	1	U	.95	U	1	U	.9	U	.9	U
2-Nitrophenol	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
3,3'-Dichlorobenzidine	mg/kg	1	U	.95	U	1	U	.9	U	.9	U
3-Nitroaniline	mg/kg	1	U	.95	U	1	U	.9	U	.9	U
4,6-Dinitro-2-methylphenol	mg/kg	1	U	.95	U	1	U	.9	U	.9	U
4-Bromophenyl phenyl ether	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
4-Chloro-3-methylphenol	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
4-Chloroaniline	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
4-Chlorophenyl phenyl ether	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
4-Methylphenol	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
4-Nitroaniline	mg/kg	1	U	.95	U	1	U	.9	U	.9	U
4-Nitrophenol	mg/kg	1	U	.95	U	1	U	.9	U	.9	U
Acenaphthene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Acenaphthylene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Anthracene	mg/kg	.205	U	.19	U	.205	U	.185	U		U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP12		PRRP-DP13		PRRP-DP14		PRRP-DP15		PRRP-DP16	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7650		7700		7720		7780		7820	
Sample Date:		11-JUN-98		12-JUN-98		11-JUN-98		12-JUN-98		12-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		8 - 10		8 - 10	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
1,2-Dichlorobenzene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
1,3-Dichlorobenzene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
1,4-Dichlorobenzene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
2,4,5-Trichlorophenol	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
2,4,6-Trichlorophenol	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
2,4-Dichlorophenol	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
2,4-Dimethylphenol	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
2,4-Dinitrophenol	mg/kg	1	U	.95	U	1	U	.95	U	1	U
2,4-Dinitrotoluene	mg/kg	.205	U	.2	U	.205	U	.19	J	.0004	J
2,6-Dinitrotoluene	mg/kg	.205	U	.2	U	.205	U	.2	U	.049	J
2-Chloronaphthalene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
2-Chlorophenol	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
2-Methylnaphthalene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
2-Methylphenol	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
2-Nitroaniline	mg/kg	1	U	.95	U	1	U	.95	U	1	U
2-Nitrophenol	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
3,3'-Dichlorobenzidine	mg/kg	1	U	.95	U	1	U	.95	U	1	U
3-Nitroaniline	mg/kg	1	U	.95	U	1	U	.053	J	1	U
4,6-Dinitro-2-methylphenol	mg/kg	1	U	.95	U	1	U	.95	U	1	U
4-Bromophenyl phenyl ether	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
4-Chloro-3-methylphenol	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
4-Chloroaniline	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
4-Chlorophenyl phenyl ether	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
4-Methylphenol	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
4-Nitroaniline	mg/kg	1	U	.95	U	1	U	.95	U	1	U
4-Nitrophenol	mg/kg	1	U	.95	U	1	U	.95	U	1	U
Acenaphthene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Acenaphthylene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Anthracene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP17		PRRP-DP18		PRRP-DP19		PRRP-DP20	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		7840		7880		7920		7980	
Sample Date:		10-JUN-98		11-JUN-98		12-JUN-98		13-JUN-98	
Depth:		0 - 2		0 - 2		0 - 2		8 - 10	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	mg/kg	.185	U	.19	U	.18	U	.205	U
1,2-Dichlorobenzene	mg/kg	.185	U	.19	U	.18	U	.205	U
1,3-Dichlorobenzene	mg/kg	.185	U	.19	U	.18	U	.205	U
1,4-Dichlorobenzene	mg/kg	.185	U	.19	U	.18	U	.205	U
2,4,5-Trichlorophenol	mg/kg	.185	U	.19	U	.18	U	.205	U
2,4,6-Trichlorophenol	mg/kg	.185	U	.19	U	.18	U	.205	U
2,4-Dichlorophenol	mg/kg	.185	U	.19	U	.18	U	.205	U
2,4-Dimethylphenol	mg/kg	.185	U	.19	U	.18	U	.205	U
2,4-Dinitrophenol	mg/kg	.9	U	.9	U	.9	U	1	U
2,4-Dinitrotoluene	mg/kg	.185	U	.19	U	.18	U	.205	U
2,6-Dinitrotoluene	mg/kg	.185	U	.19	U	.18	U	.205	U
2-Chloronaphthalene	mg/kg	.185	U	.19	U	.18	U	.205	U
2-Chlorophenol	mg/kg	.185	U	.19	U	.18	U	.205	U
2-Methylnaphthalene	mg/kg	.185	U	.19	U	.18	U	.205	U
2-Methylphenol	mg/kg	.185	U	.19	U	.18	U	.205	U
2-Nitroaniline	mg/kg	.9	U	.9	U	.9	U	1	U
2-Nitrophenol	mg/kg	.185	U	.19	U	.18	U	.205	U
3,3'-Dichlorobenzidine	mg/kg	.9	U	.9	U	.9	U	1	U
3-Nitroaniline	mg/kg	.9	U	.9	U	.9	U	1	U
4,6-Dinitro-2-methylphenol	mg/kg	.9	U	.9	U	.9	U	1	U
4-Bromophenyl phenyl ether	mg/kg	.185	U	.19	U	.18	U	.205	U
4-Chloro-3-methylphenol	mg/kg	.185	U	.19	U	.18	U	.205	U
4-Chloroaniline	mg/kg	.185	U	.19	U	.18	U	.205	U
4-Chlorophenyl phenyl ether	mg/kg	.185	U	.19	U	.18	U	.205	U
4-Methylphenol	mg/kg	.185	U	.19	U	.18	U	.205	U
4-Nitroaniline	mg/kg	.9	U	.9	U	.9	U	1	U
4-Nitrophenol	mg/kg	.9	U	.9	U	.9	U	1	U
Acenaphthene	mg/kg	.185	U	.19	U	.18	U	.205	U
Acenaphthylene	mg/kg	.185	U	.19	U	.18	U	.205	U
Anthracene	mg/kg	.185	U	19	U	.18	U	.205	U

Report Date: 09/19/00

Sample Location:		PRRP-DP01		PRRP-DP02		PRRP-DP03		PRRP-DP04		PRRP-DP06	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7200		7260		7290		7320		7400	
Sample Date:		11-JUN-98		14-JUN-98		08-JUN-98		09-JUN-98		08-JUN-98	
Depth:		0 - 2		8 - 10		4 - 5		0 - 2		0 - 2	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Benzo(a)pyrene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Benzo(b)fluoranthene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Benzo(ghi)perylene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Benzo(k)fluoranthene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Butyl benzyl phthalate	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Carbazole	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Chrysene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Dibenz(a,h)anthracene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Dibenzofuran	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Diethyl phthalate	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Dimethyl phthalate	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Fluoranthene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Fluorene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Hexachlorobenzene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Hexachlorobutadiene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Hexachlorocyclopentadiene	mg/kg	10	U	1.05	U	10	U	.95	U	.95	U
Hexachloroethane	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Indeno(1,2,3-cd)pyrene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Isophorone	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Naphthalene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Nitrobenzene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Pentachlorophenol	mg/kg	10	U	1.05	U	10	U	.95	U	.95	U
Phenanthrene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Phenol	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
Pyrene	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
bis(2-Chloroethoxy)methane	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
bis(2-Chloroethyl)ether	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
bis(2-Chloroisopropyl)ether	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
bis(2-Ethylhexyl)phthalate	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP07		PRRP-DP08		PRRP-DP09		PRRP-DP10		PRRP-DP11	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7450		7480		7530R		7560		7600	
Sample Date:		09-JUN-98		10-JUN-98		25-JUN-98		10-JUN-98		13-JUN-98	
Depth:		4 - 6		0 - 2		4 - 6		0 - 1		0 - 2	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Benzo(a)pyrene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Benzo(b)fluoranthene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Benzo(ghi)perylene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Benzo(k)fluoranthene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Butyl benzyl phthalate	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Carbazole	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Chrysene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Dibenz(a,h)anthracene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Dibenzofuran	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Diethyl phthalate	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Dimethyl phthalate	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Fluoranthene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Fluorene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Hexachlorobenzene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Hexachlorobutadiene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Hexachlorocyclopentadiene	mg/kg	1	U	.95	U	1	U	.9	U	.9	U
Hexachloroethane	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Indeno(1,2,3-cd)pyrene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Isophorone	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Naphthalene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Nitrobenzene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Pentachlorophenol	mg/kg	1	U	.95	U	1	U	.9	U	.9	U
Phenanthrene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Phenol	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
Pyrene	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
bis(2-Chloroethoxy)methane	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
bis(2-Chloroethyl)ether	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
bis(2-Chloroisopropyl)ether	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
bis(2-Ethylhe[illegible] halate	mg/kg	.205	U	19	U	.205	U	.185	U		U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP12		PRRP-DP13		PRRP-DP14		PRRP-DP15		PRRP-DP16	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7650		7700		7720		7780		7820	
Sample Date:		11-JUN-98		12-JUN-98		11-JUN-98		12-JUN-98		12-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		8 - 10		8 - 10	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Benzo(a)pyrene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Benzo(b)fluoranthene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Benzo(ghi)perylene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Benzo(k)fluoranthene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Butyl benzyl phthalate	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Carbazole	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Chrysene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Dibenz(a,h)anthracene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Dibenzofuran	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Diethyl phthalate	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Dimethyl phthalate	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Fluoranthene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Fluorene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Hexachlorobenzene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Hexachlorobutadiene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Hexachlorocyclopentadiene	mg/kg	1	U	.95	U	1	U	.95	U	1	U
Hexachloroethane	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Indeno(1,2,3-cd)pyrene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Isophorone	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Naphthalene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Nitrobenzene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Pentachlorophenol	mg/kg	1	U	.95	U	1	U	.95	U	1	U
Phenanthrene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Phenol	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
Pyrene	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
bis(2-Chloroethoxy)methane	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
bis(2-Chloroethyl)ether	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
bis(2-Chloroisopropyl)ether	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
bis(2-Ethylhexyl)phthalate	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U

Report Date: 09/19/00

Sample Location:		PRRP-DP17		PRRP-DP18		PRRP-DP19		PRRP-DP20	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		7840		7880		7920		7980	
Sample Date:		10-JUN-98		11-JUN-98		12-JUN-98		13-JUN-98	
Depth:		0 - 2		0 - 2		0 - 2		8 - 10	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	mg/kg	.185	U	.19	U	.18	U	.205	U
Benzo(a)pyrene	mg/kg	.185	U	.19	U	.18	U	.205	U
Benzo(b)fluoranthene	mg/kg	.185	U	.19	U	.18	U	.205	U
Benzo(ghi)perylene	mg/kg	.185	U	.19	U	.18	U	.205	U
Benzo(k)fluoranthene	mg/kg	.185	U	.19	U	.18	U	.205	U
Butyl benzyl phthalate	mg/kg	.185	U	.19	U	.18	U	.205	U
Carbazole	mg/kg	.185	U	.19	U	.18	U	.205	U
Chrysene	mg/kg	.185	U	.19	U	.18	U	.205	U
Dibenz(a,h)anthracene	mg/kg	.185	U	.19	U	.18	U	.205	U
Dibenzofuran	mg/kg	.185	U	.19	U	.18	U	.205	U
Diethyl phthalate	mg/kg	.185	U	.19	U	.18	U	.205	U
Dimethyl phthalate	mg/kg	.185	U	.19	U	.18	U	.205	U
Fluoranthene	mg/kg	.185	U	.19	U	.18	U	.205	U
Fluorene	mg/kg	.185	U	.19	U	.18	U	.205	U
Hexachlorobenzene	mg/kg	.185	U	.19	U	.18	U	.205	U
Hexachlorobutadiene	mg/kg	.185	U	.19	U	.18	U	.205	U
Hexachlorocyclopentadiene	mg/kg	.9	U	.9	U	.9	U	1	U
Hexachloroethane	mg/kg	.185	U	.19	U	.18	U	.205	U
Indeno(1,2,3-cd)pyrene	mg/kg	.185	U	.19	U	.18	U	.205	U
Isophorone	mg/kg	.185	U	.19	U	.18	U	.205	U
Naphthalene	mg/kg	.185	U	.19	U	.18	U	.205	U
Nitrobenzene	mg/kg	.185	U	.19	U	.18	U	.205	U
Pentachlorophenol	mg/kg	.9	U	.9	U	.9	U	1	U
Phenanthrene	mg/kg	.185	U	.19	U	.18	U	.205	U
Phenol	mg/kg	.185	U	.19	U	.18	U	.205	U
Pyrene	mg/kg	.185	U	.19	U	.18	U	.205	U
bis(2-Chloroethoxy)methane	mg/kg	.185	U	.19	U	.18	U	.205	U
bis(2-Chloroethyl)ether	mg/kg	.185	U	.19	U	.18	U	.205	U
bis(2-Chloroisopropyl)ether	mg/kg	.185	U	.19	U	.18	U	.205	U
bis(2-Ethylhe halate	mg/kg	.185	U	19	U	.18	U	.205	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP01		PRRP-DP02		PRRP-DP03		PRRP-DP04		PRRP-DP06	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7200		7260		7290		7320		7400	
Sample Date:		11-JUN-98		14-JUN-98		08-JUN-98		09-JUN-98		08-JUN-98	
Depth:		0 - 2		8 - 10		4 - 5		0 - 2		0 - 2	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
di-n-Octyl phthalate	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
n-Nitroso-di-n-propylamine	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U
n-Nitrosodiphenylamine	mg/kg	2.05	U	.22	U	2.1	U	.2	U	.195	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP07		PRRP-DP08		PRRP-DP09		PRRP-DP10		PRRP-DP11	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7450		7480		7530R		7560		7600	
Sample Date:		09-JUN-98		10-JUN-98		25-JUN-98		10-JUN-98		13-JUN-98	
Depth:		4 - 6		0 - 2		4 - 6		0 - 1		0 - 2	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
di-n-Octyl phthalate	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
n-Nitroso-di-n-propylamine	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U
n-Nitrosodiphenylamine	mg/kg	.205	U	.19	U	.205	U	.185	U	.19	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP12		PRRP-DP13		PRRP-DP14		PRRP-DP15		PRRP-DP16	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7650		7700		7720		7780		7820	
Sample Date:		11-JUN-98		12-JUN-98		11-JUN-98		12-JUN-98		12-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		8 - 10		8 - 10	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
di-n-Octyl phthalate	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
n-Nitroso-di-n-propylamine	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U
n-Nitrosodiphenylamine	mg/kg	.205	U	.2	U	.205	U	.2	U	.205	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP17		PRRP-DP18		PRRP-DP19		PRRP-DP20	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		7840		7880		7920		7980	
Sample Date:		10-JUN-98		11-JUN-98		12-JUN-98		13-JUN-98	
Depth:		0 - 2		0 - 2		0 - 2		8 - 10	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	mg/kg	.185	U	.19	U	.18	U	.205	U
di-n-Octyl phthalate	mg/kg	.185	U	.19	U	.18	U	.205	U
n-Nitroso-di-n-propylamine	mg/kg	.185	U	.19	U	.18	U	.205	U
n-Nitrosodiphenylamine	mg/kg	.185	U	.19	U	.18	U	.205	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP01		PRRP-DP02		PRRP-DP03		PRRP-DP04		PRRP-DP06	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7200		7260		7290		7320		7400	
Sample Date:		11-JUN-98		14-JUN-98		08-JUN-98		09-JUN-98		08-JUN-98	
Depth:		0 - 2		8 - 10		4 - 5		0 - 2		0 - 2	
PEST/PCB	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	mg/kg	.0205	U	.022	U	.105	U	.02	UJ	.0195	U
Aroclor 1221	mg/kg	.0205	U	.022	U	.105	U	.02	UJ	.0195	U
Aroclor 1232	mg/kg	.0205	U	.022	U	.105	U	.02	UJ	.0195	U
Aroclor 1242	mg/kg	.0205	U	.022	U	.105	U	.02	UJ	.0195	U
Aroclor 1248	mg/kg	.0205	U	.022	U	.105	U	.02	UJ	.0195	U
Aroclor 1254	mg/kg	.0205	U	.022	U	.105	U	.02	UJ	.0195	U
Aroclor 1260	mg/kg	.0205	U	.022	U	.105	U	.02	UJ	.0195	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP07		PRRP-DP08		PRRP-DP09		PRRP-DP10		PRRP-DP11	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7450		7480		7530R		7560		7600	
Sample Date:		09-JUN-98		10-JUN-98		25-JUN-98		10-JUN-98		13-JUN-98	
Depth:		4 - 6		0 - 2		4 - 6		0 - 1		0 - 2	
PEST/PCB	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	mg/kg	.0205	U	.019	U	.0205	U	.0185	U	.019	U
Aroclor 1221	mg/kg	.0205	U	.019	U	.0205	U	.0185	U	.019	U
Aroclor 1232	mg/kg	.0205	U	.019	U	.0205	U	.0185	U	.019	U
Aroclor 1242	mg/kg	.0205	U	.019	U	.0205	U	.0185	U	.019	U
Aroclor 1248	mg/kg	.0205	U	.019	U	.0205	U	.0185	U	.019	U
Aroclor 1254	mg/kg	.0205	U	.019	U	.0205	U	.0185	U	.019	U
Aroclor 1260	mg/kg	.0205	U	.019	U	.0205	U	.0185	U	.019	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP12		PRRP-DP13		PRRP-DP14		PRRP-DP15		PRRP-DP16	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7650		7700		7720		7780		7820	
Sample Date:		11-JUN-98		12-JUN-98		11-JUN-98		12-JUN-98		12-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		8 - 10		8 - 10	
PEST/PCB	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	mg/kg	.0205	U	.02	U	.0205	U	.02	U	.0205	U
Aroclor 1221	mg/kg	.0205	U	.02	U	.0205	U	.02	U	.0205	U
Aroclor 1232	mg/kg	.0205	U	.02	U	.0205	U	.02	U	.0205	U
Aroclor 1242	mg/kg	.0205	U	.02	U	.0205	U	.02	U	.0205	U
Aroclor 1248	mg/kg	.0205	U	.02	U	.0205	U	.02	U	.0205	U
Aroclor 1254	mg/kg	.0205	U	.02	U	.0205	U	.02	U	.0205	U
Aroclor 1260	mg/kg	.0205	U	.02	U	.0205	U	.02	U	.0205	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP17		PRRP-DP18		PRRP-DP19		PRRP-DP20	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		7840		7880		7920		7980	
Sample Date:		10-JUN-98		11-JUN-98		12-JUN-98		13-JUN-98	
Depth:		0 - 2		0 - 2		0 - 2		8 - 10	
PEST/PCB	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	mg/kg	.0185	U	.019	U	.018	U	.0205	U
Aroclor 1221	mg/kg	.0185	U	.019	U	.018	U	.0205	U
Aroclor 1232	mg/kg	.0185	U	.019	U	.018	U	.0205	U
Aroclor 1242	mg/kg	.0185	U	.019	U	.018	U	.0205	U
Aroclor 1248	mg/kg	.0185	U	.019	U	.018	U	.0205	U
Aroclor 1254	mg/kg	.0185	U	.019	U	.018	U	.0205	U
Aroclor 1260	mg/kg	.0185	U	.019	U	.018	U	.0205	U

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Sample Location:		PRRP-DP01		PRRP-DP01		PRRP-DP01		PRRP-DP02		PRRP-DP02	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7200		7210		7220		7250		7260	
Sample Date:		11-JUN-98		11-JUN-98		11-JUN-98		14-JUN-98		14-JUN-98	
Depth:		0 - 2		4 - 6		8 - 10		4 - 6		8 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	9370		11500		10100		11200		11500	
Antimony	mg/kg	3.7	UJ	7.9	J	3.8	UJ	3.7	U	4	U
Arsenic	mg/kg	4.5	J	27.9	J	9.1	J	6.1		12.5	
Barium	mg/kg	84.3		239		88.5		61.5		91.9	
Beryllium	mg/kg	0.69		0.71		.315	U	0.68		.335	U
Cadmium	mg/kg	.31	U	.31	U	.315	U	.31	U	.335	U
Calcium	mg/kg	5740		35300		35600		3670		7720	
Chromium	mg/kg	14.7		9.0		17.7		20.4		20.8	
Cobalt	mg/kg	11.1		21.2		11.6		11.2		13.6	
Copper	mg/kg	22.6		34.5		23.3		14.5		25.8	
Iron	mg/kg	18000		34500		22500		21900		23800	
Lead	mg/kg	8.6		13.2		10.4		7.8		12.2	
Magnesium	mg/kg	2480		12500		13900		2590		5650	
Manganese	mg/kg	321		2230		706		315		521	
Mercury	mg/kg	.0205	U	.0205	U	.021	U	0.045		.022	U
Nickel	mg/kg	27.2		57.2		32.5		25.6		32.2	
Potassium	mg/kg	777		2330		1790		916		1630	
Selenium	mg/kg	0.84		.6	U	.315	U	0.69		0.82	
Silver	mg/kg	.6	UJ	.6	UJ	.65	UJ	.6	U	.65	U
Sodium	mg/kg	1240		1080		1050		310	U	333.5	U
Thallium	mg/kg	.6	UJ	1.25	UJ	.65	UJ	.6	U	.65	U
Vanadium	mg/kg	19.1		30.0		26.6		27.3	J	26.2	J
Zinc	mg/kg	78.5		83.1		65.9		64.6		70.3	

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP02		PRRP-DP03		PRRP-DP03		PRRP-DP04		PRRP-DP04	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7240R		7280		7290		7320		7330	
Sample Date:		22-JUN-98		08-JUN-98		08-JUN-98		09-JUN-98		09-JUN-98	
Depth:		0 - 2		0 - 2		4 - 5		0 - 2		4 - 6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	9210		6330		9580		7030		6990	
Antimony	mg/kg	3.45	UJ	3.3	U	3.8	U	3.6	U	3.8	U
Arsenic	mg/kg	5.0		5.4		9.7		6.6		5.4	
Barium	mg/kg	45.1		65.7		67.9		37.2		39.4	
Beryllium	mg/kg	.29	U	.275	U	.315	U	.3	U	.315	U
Cadmium	mg/kg	.29	U	.275	U	.315	U	.3	U	.315	U
Calcium	mg/kg	10300		2560		2600		2680		19800	
Chromium	mg/kg	13.3	J	8.7		15.7		15.5		12.4	
Cobalt	mg/kg	6.6		2.75	U	6.3		3	U	7.4	
Copper	mg/kg	12.6		8.4		18.7		7.0		13.3	
Iron	mg/kg	14300		14100		23700		16700		13900	
Lead	mg/kg	12.3	J	9.3	J	11.6	J	4.3	J	9.8	J
Magnesium	mg/kg	5150		1160		2810		1290		10700	
Manganese	mg/kg	234		320		338		144		292	
Mercury	mg/kg	0.040		.018	U	.021	U	.02	U	.021	U
Nickel	mg/kg	14.6		9.3		22.9		12.2		16.6	
Potassium	mg/kg	1460	J	274	U	968		301.5	U	864	
Selenium	mg/kg	.29	U	0.59		.315	U	.3	U	0.64	
Silver	mg/kg	.6	U	.55	U	.65	U	.6	U	.65	U
Sodium	mg/kg	288	U	274	U	3760		301.5	U	315.5	U
Thallium	mg/kg	.6	UJ	.55	U	.65	U	.6	U	.65	U
Vanadium	mg/kg	23.1		17.3	J	23.9	J	28.5	J	19.7	J
Zinc	mg/kg	45.5		34.2		61.3		30.6		43.7	

Report Date: 09/19/00

Sample Location:		PRRP-DP04		PRRP-DP05		PRRP-DP05		PRRP-DP05		PRRP-DP06	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7340		7370		7360R		7380R		7400	
Sample Date:		09-JUN-98		14-JUN-98		25-JUN-98		25-JUN-98		08-JUN-98	
Depth:		8 - 10		4 - 6		0 - 2		8 - 10		0 - 2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	8040		11300		6820		9040		6110	
Antimony	mg/kg	3.8	U	9.3		3.4	U	3.75	U	3.55	U
Arsenic	mg/kg	5.2		42.8		2.9		17.6		3.6	
Barium	mg/kg	50.5		128		27.6		115		11.9	U
Beryllium	mg/kg	.315	U	0.67		.285	U	.315	U	.295	U
Cadmium	mg/kg	.315	U	.315	U	.285	U	.315	U	.295	U
Calcium	mg/kg	61200		58500		1490		57800		945	
Chromium	mg/kg	14.1		18.4		9.3		14.4		10.9	
Cobalt	mg/kg	9.8		19.0		2.85	U	10.2		2.95	U
Copper	mg/kg	23.6		24.6		4.9		19.7		5.9	
Iron	mg/kg	18200		43700		9170		22700		13700	
Lead	mg/kg	10.3	J	10.6		5.5		8.0		3.5	J
Magnesium	mg/kg	19500		17400		1010		17100		885	
Manganese	mg/kg	327		797		127	J	731	J	166	
Mercury	mg/kg	.021	U	.021	U	.0185	U	.0205	U	.0195	U
Nickel	mg/kg	25.9		40.1		7.4		23.8		9.4	
Potassium	mg/kg	1580		2250		283	U	2190		297	U
Selenium	mg/kg	1.1		.315	U	.285	U	.315	U	.295	U
Silver	mg/kg	.65	U	.65	U	.55	U	.65	U	.6	U
Sodium	mg/kg	315	U	315.5	U	283	U	314	U	297	U
Thallium	mg/kg	.65	U	.65	U	.55	U	.65	U	.6	U
Vanadium	mg/kg	23.7	J	38.4	J	16.3	J	25.4	J	23.1	J
Zinc	mg/kg	56.9		104		24.9		52.1		22.6	

Report Date: 09/19/00

Sample Location:		PRRP-DP06		PRRP-DP06		PRRP-DP07		PRRP-DP07		PRRP-DP07	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7410		7420		7440		7450		7460	
Sample Date:		08-JUN-98		08-JUN-98		09-JUN-98		09-JUN-98		09-JUN-98	
Depth:		4 - 5		9 - 10		0 - 2		4 - 6		8 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	8710		7260		4120		8560		7960	
Antimony	mg/kg	3.7	U	3.75	U	3.2	U	3.7	U	3.7	U
Arsenic	mg/kg	9.1		5.3		2.5		6.3		6.5	
Barium	mg/kg	57.3		44.9		10.65	U	55.3		54.5	
Beryllium	mg/kg	.305	U	.315	U	.265	U	.305	U	.31	U
Cadmium	mg/kg	.305	U	.315	U	.265	U	.305	U	.31	U
Calcium	mg/kg	62300		43700		1420		62800		62000	
Chromium	mg/kg	15.9		14.4		6.1		14.3		13.0	
Cobalt	mg/kg	3.05	U	3.15	U	2.65	U	13.1		9.8	
Copper	mg/kg	26.2		15.2		4.3		20.3		23.9	
Iron	mg/kg	24200		15300		8330		17500		20000	
Lead	mg/kg	11.3	J	7.6	J	3.2	J	10.3	J	10.9	J
Magnesium	mg/kg	16000		12600		830		19100		19200	
Manganese	mg/kg	430		321		116		536		520	
Mercury	mg/kg	.02	U	.0205	U	.0175	U	.0205	U	.0205	U
Nickel	mg/kg	22.9		17.6		7.0		29.7		26.1	
Potassium	mg/kg	1380		1190		266	U	1720		1660	
Selenium	mg/kg	.305	U	.315	U	.265	U	.305	U	.31	U
Silver	mg/kg	.6	U	.65	U	.55	U	.6	U	.6	U
Sodium	mg/kg	306.5	U	313.5	U	266	U	307	U	308.5	U
Thallium	mg/kg	.6	U	.65	U	.55	U	.6	U	.6	U
Vanadium	mg/kg	27.1	J	21.8	J	12.9	J	24.4	J	22.9	J
Zinc	mg/kg	68.9		45.5		17.9		54.7		61.9	

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

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Sample Location:		PRRP-DP08		PRRP-DP08		PRRP-DP08		PRRP-DP09		PRRP-DP09	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7480		7490		7500		7520R		7530R	
Sample Date:		10-JUN-98		10-JUN-98		10-JUN-98		25-JUN-98		25-JUN-98	
Depth:		0 - 2		4 - 6		8 - 10		0 - 2		4 - 6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	4450		8700		7140		7220		4410	
Antimony	mg/kg	3.45	U	3.7	U	3.65	U	3.4	U	3.75	U
Arsenic	mg/kg	4.2		12.9		4.2		2.4		2.6	
Barium	mg/kg	11.55	U	42.5		47.4		24.3		12.45	U
Beryllium	mg/kg	.29	U	.305	U	.305	U	.28	U	.31	U
Cadmium	mg/kg	.29	U	.305	U	.305	U	.28	U	.31	U
Calcium	mg/kg	1820		57000		52200		1750		63200	
Chromium	mg/kg	10.6		14.6		12.6		8.8		9.2	
Cobalt	mg/kg	6.0		9.8		7.9		2.8	U	3.1	U
Copper	mg/kg	6.5		21.7		16.5		4.9		11.2	
Iron	mg/kg	13400		19400		16000		8430		9480	
Lead	mg/kg	3.1	J	9.2	J	7.6	J	5.1		4.9	
Magnesium	mg/kg	894		16800		15700		1110		16800	
Manganese	mg/kg	207		283		393		102	J	184	J
Mercury	mg/kg	.019	U	.02	U	.02	U	.0185	U	.0205	U
Nickel	mg/kg	7.9		25.7		19.6		6.3		8.4	
Potassium	mg/kg	289.5	U	1820		1580		281.5	U	1050	
Selenium	mg/kg	.29	U	.305	U	.305	U	.28	U	.6	U
Silver	mg/kg	.6	U	.6	U	.6	U	.55	U	.6	U
Sodium	mg/kg	289.5	U	306.5	U	305	U	281.5	U	311	U
Thallium	mg/kg	.6	U	.6	U	.6	U	.55	U	1.25	U
Vanadium	mg/kg	24.4	J	24.1	J	21.3	J	15.8	J	20.9	J
Zinc	mg/kg	21.7		64.8		46.6		22.5		24.8	

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Sample Location:		PRRP-DP09		PRRP-DP10		PRRP-DP10		PRRP-DP10		PRRP-DP11	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7540R		7560		7570		7580		7600	
Sample Date:		25-JUN-98		10-JUN-98		10-JUN-98		10-JUN-98		13-JUN-98	
Depth:		8 - 10		0 - 1		4 - 5		9 - 10		0 - 2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	4630		4620		9510		11600		6200	
Antimony	mg/kg	3.9	U	3.35	U	3.85	U	3.75	U	3.45	U
Arsenic	mg/kg	6.3		3.4		5.6		14.9		7.0	
Barium	mg/kg	26.5		11.15	U	81.5		90.9		39.4	
Beryllium	mg/kg	.325	U	.28	U	0.83		0.77		.29	U
Cadmium	mg/kg	.325	U	.28	U	.32	U	.315	U	.29	U
Calcium	mg/kg	58500		2440		4620		4510		17300	
Chromium	mg/kg	8.7		10.9		12.6		20.1		11.2	
Cobalt	mg/kg	3.25	U	2.8	U	3.2	U	10.2		7.4	
Copper	mg/kg	15.1		5.9		17.5		22.1		10.1	
Iron	mg/kg	10600		13700		16100		28700		14700	
Lead	mg/kg	6.3		3.2	J	11.3	J	14.3	J	7.9	
Magnesium	mg/kg	16900		920		2090		3970		6390	
Manganese	mg/kg	273	J	273		230		484		365	
Mercury	mg/kg	.0215	U	.0185	U	.0215	U	.0205	U	.019	U
Nickel	mg/kg	15.5		9.6		11.4		30.0		14.4	
Potassium	mg/kg	1200		279.5	U	322	U	1080		849	
Selenium	mg/kg	0.87		.28	U	0.71		.315	U	.29	U
Silver	mg/kg	.65	U	.55	U	.65	U	.65	U	.6	U
Sodium	mg/kg	324.5	U	279.5	U	4130		4280		741	
Thallium	mg/kg	.65	U	.55	U	.65	U	.65	U	.6	U
Vanadium	mg/kg	17.5	J	23.6	J	22.1	J	31.6	J	20.1	J
Zinc	mg/kg	35.5		24.4		49.7		72.7		39.1	

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Sample Location:		PRRP-DP11		PRRP-DP11		PRRP-DP12		PRRP-DP12		PRRP-DP12	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7610		7620		7640		7650		7660	
Sample Date:		13-JUN-98		13-JUN-98		11-JUN-98		11-JUN-98		11-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		4 - 6		8 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	8950		11200		9560		12000		12300	
Antimony	mg/kg	3.6	U	3.75	U	3.4	UJ	3.75	UJ	7.8	J
Arsenic	mg/kg	25.3		5.3		7.3	J	5.7	J	7.4	J
Barium	mg/kg	209		51.5		71.5		60.3		69.5	
Beryllium	mg/kg	0.66		.315	U	0.68		.31	U	.31	U
Cadmium	mg/kg	.3	U	.315	U	.285	U	.31	U	.31	U
Calcium	mg/kg	3380		61600		4310		37100		55600	
Chromium	mg/kg	11.0		19.0		14.0		19.7		20.0	
Cobalt	mg/kg	30.3		10.8		6.4		10.8		12.0	
Copper	mg/kg	13.1		23.3		10.4		26.7		25.4	
Iron	mg/kg	36200		20800		16000		22300		23200	
Lead	mg/kg	9.8		9.9		9.6		10.7		10.6	
Magnesium	mg/kg	2500		20500		1900		16600		19100	
Manganese	mg/kg	1640		457		337		306		521	
Mercury	mg/kg	.02	U	.0205	U	.019	U	.0205	U	.0205	U
Nickel	mg/kg	26.8		30.1		12.1		31.6		30.9	
Potassium	mg/kg	1060		2580		684		2430		2730	
Selenium	mg/kg	.6	U	.315	U	.285	U	.31	U	.31	U
Silver	mg/kg	.6	U	.65	U	.55	UJ	.6	UJ	.6	UJ
Sodium	mg/kg	1200		1520		285.5	U	312	U	311	U
Thallium	mg/kg	1.2	U	.65	U	.55	UJ	.6	UJ	.6	UJ
Vanadium	mg/kg	34.2	J	31.0	J	23.7		26.8		29.9	
Zinc	mg/kg	68.5		62.2		38.5		71.9		65.3	

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Sample Location:		PRRP-DP13		PRRP-DP13		PRRP-DP13		PRRP-DP14		PRRP-DP14	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7680		7690		7700		7720		7730	
Sample Date:		12-JUN-98		12-JUN-98		12-JUN-98		11-JUN-98		11-JUN-98	
Depth:		0 - 2		4 - 6		8 - 10		0 - 2		4 - 6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	7760		6380		5930		12700		9640	
Antimony	mg/kg	3.35	U	3.6	U	3.6	U	3.7	U	3.65	U
Arsenic	mg/kg	3.4		5.3		4.1		7.4		8.2	
Barium	mg/kg	11.1	U	29.2		42.4		49.6		39.0	
Beryllium	mg/kg	.28	U	.3	U	.3	U	0.69		.3	U
Cadmium	mg/kg	.28	U	.3	U	.3	U	.31	U	.3	U
Calcium	mg/kg	278	U	2100		67100		3010		4340	
Chromium	mg/kg	9.4		11.3		10.7		20.2		17.4	
Cobalt	mg/kg	2.8	U	7.0		7.2		8.3		8.4	
Copper	mg/kg	6.5		13.7		16.2		14.7		14.3	
Iron	mg/kg	11200		15400		13000		22900		20100	
Lead	mg/kg	4.1		5.1		7.7		6.8		6.5	
Magnesium	mg/kg	938		1560		25300		2310		2940	
Manganese	mg/kg	74.5		313		472		173		275	
Mercury	mg/kg	.0185	U	.02	U	.02	U	0.043		.02	U
Nickel	mg/kg	8.4		20.2		19.4		20.5		19.4	
Potassium	mg/kg	278	U	301	U	1330		771		713	
Selenium	mg/kg	.28	U	.3	U	.3	U	.31	U	.3	U
Silver	mg/kg	.55	U	.6	U	.6	U	.6	U	.6	U
Sodium	mg/kg	278	U	301	U	302	U	310	U	302.5	U
Thallium	mg/kg	.55	U	.6	U	.6	U	.6	U	.6	U
Vanadium	mg/kg	19.8		19.1		21.0		35.2		27.0	
Zinc	mg/kg	23.1		40.6		43.7		46.1		41.2	

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Sample Location:		PRRP-DP14		PRRP-DP15		PRRP-DP15		PRRP-DP15		PRRP-DP16	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7740		7760		7770		7780		7800	
Sample Date:		11-JUN-98		12-JUN-98		12-JUN-98		12-JUN-98		12-JUN-98	
Depth:		8 - 10		0 - 2		4 - 6		8 - 10		0 - 2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	8710		6680		8870		6010		7300	
Antimony	mg/kg	3.65	U	3.45	U	3.7	U	3.65	U	3.7	U
Arsenic	mg/kg	8.1		5.8		15.9		6.9		5.4	
Barium	mg/kg	64.8		34.9		176		41.5		30.4	
Beryllium	mg/kg	.305	U	.29	U	.31	U	.305	U	.31	U
Cadmium	mg/kg	.305	U	.29	U	.31	U	.305	U	.31	U
Calcium	mg/kg	53400		2880		53300		67400		7980	
Chromium	mg/kg	15.9		12.1		5.2		11.6		11.0	
Cobalt	mg/kg	10.3		5.8		26.7		9.0		3.1	U
Copper	mg/kg	21.1		7.0		24.6		19.3		11.2	
Iron	mg/kg	18700		14700		20500		18300		13300	
Lead	mg/kg	9.6		5.5		13.4		8.1		7.7	J
Magnesium	mg/kg	21100		1660		17200		20300		3100	
Manganese	mg/kg	506		93.2		2270		467		147	
Mercury	mg/kg	.02	U	.019	U	.0205	U	.02	U	.0205	U
Nickel	mg/kg	26.5		13.9		56.1		22.2		12.0	
Potassium	mg/kg	1850		288.5	U	1380		1370		308	U
Selenium	mg/kg	.305	U	.29	U	.6	U	.305	U	.31	U
Silver	mg/kg	.6	U	.6	U	.6	U	.6	U	.6	U
Sodium	mg/kg	304	U	288.5	U	310	U	1030		308	U
Thallium	mg/kg	.6	U	.6	U	1.25	U	.6	U	.6	U
Vanadium	mg/kg	25.2		23.0		26.7		19.3		21.4	J
Zinc	mg/kg	57.3		30.4		59.7		52.0		37.4	

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Sample Location:		PRRP-DP16		PRRP-DP16		PRRP-DP17		PRRP-DP17		PRRP-DP17	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7810		7820		7840		7850		7860	
Sample Date:		12-JUN-98		12-JUN-98		10-JUN-98		10-JUN-98		10-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		4 - 6		8 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	9850		9430		7140		5570		3320	
Antimony	mg/kg	3.3	U	3.75	U	3.3	UJ	3.6	UJ	3.65	UJ
Arsenic	mg/kg	9.7		4.8		2.3	J	3.1	J	4.5	J
Barium	mg/kg	59.5		47.5		11.05	U	11.95	U	12.2	U
Beryllium	mg/kg	0.55		.315	U	.275	U	.3	U	.305	U
Cadmium	mg/kg	.275	U	.315	U	.275	U	.3	U	.305	U
Calcium	mg/kg	3080		57600		817		1850		61500	
Chromium	mg/kg	17.5		16.8		10.8		15.5		7.3	
Cobalt	mg/kg	14.4		9.1		2.75	U	7.3		3.05	U
Copper	mg/kg	21.7		24.3		3.8		5.3		10.6	
Iron	mg/kg	22000		19300		13100		16400		8940	
Lead	mg/kg	10.7	J	10.5	J	3.3		2.9		4.3	
Magnesium	mg/kg	4020		18100		791		917		16200	
Manganese	mg/kg	437		303		104		323		252	
Mercury	mg/kg	.018	U	.0205	U	.0185	U	.0195	U	.02	U
Nickel	mg/kg	31.1		27.0		6.4		8.1		11.0	
Potassium	mg/kg	1210		1750		277	U	298.5	U	726	
Selenium	mg/kg	.275	U	.315	U	.275	U	.3	U	.305	U
Silver	mg/kg	.55	U	.65	U	.55	UJ	.6	UJ	.6	UJ
Sodium	mg/kg	1160		1090		277	U	298.5	U	305.5	U
Thallium	mg/kg	.55	U	.65	U	.55	UJ	.6	UJ	.6	UJ
Vanadium	mg/kg	23.3	J	26.1	J	23.4		29.3		15.0	
Zinc	mg/kg	67.2		64.2		21.3		22.7		31.6	

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Sample Location:		PRRP-DP18		PRRP-DP18		PRRP-DP18		PRRP-DP19		PRRP-DP19	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7880		7890		7900		7920		7930	
Sample Date:		11-JUN-98		11-JUN-98		11-JUN-98		12-JUN-98		12-JUN-98	
Depth:		0 - 2		4 - 6		8 - 10		0 - 2		4 - 6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	10700		7340		9140		2370		7060	
Antimony	mg/kg	3.45	UJ	3.85	UJ	3.75	UJ	3.3	U	3.6	U
Arsenic	mg/kg	4.0	J	27.3	J	5.8	J	14.1		4.7	
Barium	mg/kg	32.3		41.8		66.2		33.6		51.2	
Beryllium	mg/kg	.285	U	.32	U	.31	U	.275	U	.3	U
Cadmium	mg/kg	.285	U	.32	U	0.63		.275	U	.3	U
Calcium	mg/kg	1040		38400		61600		54000		56900	
Chromium	mg/kg	14.6		13.6		15.7		4.2		12.5	
Cobalt	mg/kg	6.2		8.7		10.6		2.75	U	8.7	
Copper	mg/kg	7.5		19.0		24.3		10.6		19.1	
Iron	mg/kg	17800		20000		20600		15900		16200	
Lead	mg/kg	5.6		7.6		9.6		3.2		8.5	
Magnesium	mg/kg	1120		12800		19200		11500		22500	
Manganese	mg/kg	158		300		534		658		495	
Mercury	mg/kg	.019	U	.021	U	.0205	U	.018	U	.02	U
Nickel	mg/kg	9.8		21.5		29.0		11.6		22.8	
Potassium	mg/kg	287	U	1310		1990		274.5	U	1490	
Selenium	mg/kg	.285	U	.32	U	.31	U	.275	U	.3	U
Silver	mg/kg	.55	UJ	.65	UJ	.6	UJ	.55	U	.6	U
Sodium	mg/kg	287	U	319.5	U	312	U	274.5	U	301.5	U
Thallium	mg/kg	.55	UJ	.65	UJ	.6	UJ	.55	U	.6	U
Vanadium	mg/kg	30.3		25.7		24.6		13.2		21.4	
Zinc	mg/kg	27.9		56.2		64.5		26.8		52.8	

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Sample Location:		PRRP-DP19		PRRP-DP20		PRRP-DP20		PRRP-DP20	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		7940		7960		7970		7980	
Sample Date:		12-JUN-98		13-JUN-98		13-JUN-98		13-JUN-98	
Depth:		8 - 10		0 - 2		4 - 6		8 - 10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	9590		5360		7580		10800	
Antimony	mg/kg	3.65	U	3.45	U	3.65	U	7.7	
Arsenic	mg/kg	4.9		3.6		4.7		5.5	
Barium	mg/kg	61.0		11.55	U	58.2		69.3	
Beryllium	mg/kg	.305	U	.29	U	.305	U	.31	U
Cadmium	mg/kg	.305	U	.29	U	.305	U	.31	U
Calcium	mg/kg	68000		2160		61900		70400	
Chromium	mg/kg	15.7		11.4		13.1		17.0	
Cobalt	mg/kg	9.4		5.8		9.3		11.3	
Copper	mg/kg	22.4		7.2		18.3		20.1	
Iron	mg/kg	19900		16000		18000		22500	
Lead	mg/kg	9.4		3.2		9.0		9.7	
Magnesium	mg/kg	21300		999		24600		20200	
Manganese	mg/kg	512		262		527		513	
Mercury	mg/kg	.02	U	.019	U	.02	U	.0205	U
Nickel	mg/kg	26.1		9.3		24.0		29.6	
Potassium	mg/kg	2330		289	U	1610		2640	
Selenium	mg/kg	.305	U	.29	U	.305	U	.31	U
Silver	mg/kg	.6	U	.6	U	.6	U	.6	U
Sodium	mg/kg	303.5	U	289	U	305.5	U	307.5	U
Thallium	mg/kg	.6	U	.6	U	.6	U	.6	U
Vanadium	mg/kg	26.2		27.6	J	23.8	J	28.6	J
Zinc	mg/kg	60.5		26.0		50.6		69.5	

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Sample Location:		PRRP-DP01		PRRP-DP01		PRRP-DP01		PRRP-DP02		PRRP-DP02	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7200		7210		7220		7250		7260	
Sample Date:		11-JUN-98		11-JUN-98		11-JUN-98		14-JUN-98		14-JUN-98	
Depth:		0 - 2		4 - 6		8 - 10		4 - 6		8 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	0.56		2.7		.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	0.38	
2,4-Dinitrotoluene	mg/kg	.125	U	0.96		0.29		.125	U	0.28	
2,6-Dinitrotoluene	mg/kg	.125	U	0.35		.125	U	.125	U	.125	U
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.195	U	.125	U	.125	U	.125	U
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Report Date: 09/19/00

Sample Location:		PRRP-DP02		PRRP-DP03		PRRP-DP03		PRRP-DP04		PRRP-DP04	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7240R		7280		7290		7320		7330	
Sample Date:		22-JUN-98		08-JUN-98		08-JUN-98		09-JUN-98		09-JUN-98	
Depth:		0 - 2		0 - 2		4 - 5		0 - 2		4 - 6	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	43		.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	9.3		.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	1.25	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	1.2		25		.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	1.25	U	.125	U	.125	U
2-Nitrotoluene	mg/kg	.125	U	.125	U	1.25	U	.125	U	.125	U
3-Nitrotoluene	mg/kg	.125	U	.125	U	1.25	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	1.25	U	.125	U	.125	U
HMX	mg/kg	.25	U	.25	U	2.5	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	1.25	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	2.5	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	3.25	U	.325	U	.325	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP04		PRRP-DP05		PRRP-DP05		PRRP-DP05		PRRP-DP06	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7340		7370		7360R		7380R		7400	
Sample Date:		09-JUN-98		14-JUN-98		25-JUN-98		25-JUN-98		08-JUN-98	
Depth:		8 - 10		4 - 6		0 - 2		8 - 10		0 - 2	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Sample Location:		PRRP-DP06		PRRP-DP06		PRRP-DP07		PRRP-DP07		PRRP-DP07	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7410		7420		7440		7450		7460	
Sample Date:		08-JUN-98		08-JUN-98		09-JUN-98		09-JUN-98		09-JUN-98	
Depth:		4 - 5		9 - 10		0 - 2		4 - 6		8 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	1.8		.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	1.1		.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP08		PRRP-DP08		PRRP-DP08		PRRP-DP09		PRRP-DP09	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7480		7490		7500		7520R		7530R	
Sample Date:		10-JUN-98		10-JUN-98		10-JUN-98		25-JUN-98		25-JUN-98	
Depth:		0 - 2		4 - 6		8 - 10		0 - 2		4 - 6	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP09		PRRP-DP10		PRRP-DP10		PRRP-DP10		PRRP-DP11	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7540R		7560		7570		7580		7600	
Sample Date:		25-JUN-98		10-JUN-98		10-JUN-98		10-JUN-98		13-JUN-98	
Depth:		8 - 10		0 - 1		4 - 5		9 - 10		0 - 2	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	1.3		.125	U	.125	U	18		.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	5.2		.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.6	U	0.27	
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	15		0.32	
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	1.7		.125	U
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.6	U	.125	U
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.6	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	1.1	U	2.7	
HMX	mg/kg	.25	U	.25	U	.25	U	1.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.6	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	1.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	1.6	U	.325	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP11		PRRP-DP11		PRRP-DP12		PRRP-DP12		PRRP-DP12	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7610		7620		7640		7650		7660	
Sample Date:		13-JUN-98		13-JUN-98		11-JUN-98		11-JUN-98		11-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		4 - 6		8 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	0.43		7.0		.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	0.43		5.8		.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	1.6		1.2		.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	0.29		0.30		.125	U	.125	U	.125	U
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Sample Location:		PRRP-DP13		PRRP-DP13		PRRP-DP13		PRRP-DP14		PRRP-DP14	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7680		7690		7700		7720		7730	
Sample Date:		12-JUN-98		12-JUN-98		12-JUN-98		11-JUN-98		11-JUN-98	
Depth:		0 - 2		4 - 6		8 - 10		0 - 2		4 - 6	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP14		PRRP-DP15		PRRP-DP15		PRRP-DP15		PRRP-DP16	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7740		7760		7770		7780		7800	
Sample Date:		11-JUN-98		12-JUN-98		12-JUN-98		12-JUN-98		12-JUN-98	
Depth:		8 - 10		0 - 2		4 - 6		8 - 10		0 - 2	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.25	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.25	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.25	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.25	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.25	U	.125	U
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.25	U	.125	U
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.25	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.25	U	.125	U
HMX	mg/kg	.25	U	.25	U	.25	U	.5	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.25	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.5	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.65	U	.325	U

Sample Location:		PRRP-DP16		PRRP-DP16		PRRP-DP17		PRRP-DP17		PRRP-DP17	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7810		7820		7840		7850		7860	
Sample Date:		12-JUN-98		12-JUN-98		10-JUN-98		10-JUN-98		10-JUN-98	
Depth:		4 - 6		8 - 10		0 - 2		4 - 6		8 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	1.9		.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	0.25		.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	0.50		.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	0.50		.125	U	.125	U	.125	U
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Report Date: 09/19/00

Sample Location:		PRRP-DP18		PRRP-DP18		PRRP-DP18		PRRP-DP19		PRRP-DP19	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7880		7890		7900		7920		7930	
Sample Date:		11-JUN-98		11-JUN-98		11-JUN-98		12-JUN-98		12-JUN-98	
Depth:		0 - 2		4 - 6		8 - 10		0 - 2		4 - 6	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U	.325	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Soils

Report Date: 09/19/00

Sample Location:		PRRP-DP19		PRRP-DP20		PRRP-DP20		PRRP-DP20	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		7940		7960		7970		7980	
Sample Date:		12-JUN-98		13-JUN-98		13-JUN-98		13-JUN-98	
Depth:		8 - 10		0 - 2		4 - 6		8 - 10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		PRRP-SD01		PRRP-SD02		PRRP-SD03		PRRP-SD04	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		11160		11170		11180		11190	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
WET CHEMISTRY	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Total organic carbon	mg/kg	33000		5450		17000		12000	J

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		PRRP-SD01		PRRP-SD02		PRRP-SD03		PRRP-SD04	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		11160		11170		11180		11190	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane	mg/kg	.0065	U	.00315	U	.00435	U	.0033	U
1,1,2,2-Tetrachloroethane	mg/kg	.0065	UJ	.00315	UJ	.00435	UJ	.0033	UJ
1,1,2-Trichloroethane	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
1,1-Dichloroethane	mg/kg	.0065	U	.00315	U	.00435	U	.0033	U
1,1-Dichloroethene	mg/kg	.0065	U	.00315	U	.00435	U	.0033	U
1,2-Dichloroethane	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
1,2-Dichloroethene	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
1,2-Dichloropropane	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
2-Butanone	mg/kg	.011	J	.0125	U	.01	J	.013	U
2-Hexanone	mg/kg	.026	U	.0125	U	.0175	UJ	.013	U
4-Methyl-2-pentanone	mg/kg	.026	U	.0125	U	.0175	UJ	.013	U
Acetone	mg/kg	.051	J	.0125	R	.049	J	.017	B
Benzene	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
Bromodichloromethane	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
Bromoform	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
Bromomethane	mg/kg	.0052	B	.0065	U	.0085	U	.0065	U
Carbon disulfide	mg/kg	.0065	U	.00315	U	.00435	U	.0033	U
Carbon tetrachloride	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
Chlorobenzene	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
Chloroethane	mg/kg	.013	U	.0065	U	.0085	U	.0065	U
Chloroform	mg/kg	.0065	U	.00315	U	.00435	U	.0033	U
Chloromethane	mg/kg	.013	U	.0065	U	.0085	U	.0065	U
Dibromochloromethane	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
Ethylbenzene	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
Methylene chloride	mg/kg	.013	B	.0056	B	.0069	B	.0059	B
Styrene	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
Tetrachloroethene	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
Toluene	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
Total xylenes	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
Trichloroethe	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		PRRP-SD01		PRRP-SD02		PRRP-SD03		PRRP-SD04	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		11160		11170		11180		11190	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Vinyl chloride	mg/kg	.013	U	.0065	U	.0085	U	.0065	U
cis-1,3-Dichloropropene	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U
trans-1,3-Dichloropropene	mg/kg	.0065	U	.00315	U	.00435	UJ	.0033	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		PRRP-SD01		PRRP-SD02		PRRP-SD03		PRRP-SD04	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		11160		11170		11180		11190	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene	mg/kg	.43	U	.21	U	.285	U	.22	U
1,2-Dichlorobenzene	mg/kg	.43	U	.21	U	.285	U	.22	U
1,3-Dichlorobenzene	mg/kg	.43	U	.21	U	.285	U	.22	U
1,4-Dichlorobenzene	mg/kg	.43	U	.21	U	.285	U	.22	U
2,4,5-Trichlorophenol	mg/kg	.43	U	.21	U	.285	U	.22	U
2,4,6-Trichlorophenol	mg/kg	.43	U	.21	U	.285	U	.22	U
2,4-Dichlorophenol	mg/kg	.43	U	.21	U	.285	U	.22	U
2,4-Dimethylphenol	mg/kg	.43	U	.21	U	.285	U	.22	U
2,4-Dinitrophenol	mg/kg	2.1	U	1	U	1.4	U	1.05	U
2,4-Dinitrotoluene	mg/kg	.43	U	.21	U	.285	U	.22	U
2,6-Dinitrotoluene	mg/kg	.43	U	.21	U	.285	U	.22	U
2-Chloronaphthalene	mg/kg	.43	U	.21	U	.285	U	.22	U
2-Chlorophenol	mg/kg	.43	U	.21	U	.285	U	.22	U
2-Methylnaphthalene	mg/kg	.43	U	.21	U	.285	U	.22	U
2-Methylphenol	mg/kg	.43	U	.21	U	.285	U	.22	U
2-Nitroaniline	mg/kg	2.1	U	1	U	1.4	U	1.05	U
2-Nitrophenol	mg/kg	.43	U	.21	U	.285	U	.22	U
3,3'-Dichlorobenzidine	mg/kg	2.1	U	1	U	1.4	U	1.05	U
3-Nitroaniline	mg/kg	2.1	U	1	U	1.4	U	1.05	U
4,6-Dinitro-2-methylphenol	mg/kg	2.1	U	1	U	1.4	U	1.05	U
4-Bromophenyl phenyl ether	mg/kg	.43	U	.21	U	.285	U	.22	U
4-Chloro-3-methylphenol	mg/kg	.43	U	.21	U	.285	U	.22	U
4-Chloroaniline	mg/kg	.43	U	.21	U	.285	U	.22	U
4-Chlorophenyl phenyl ether	mg/kg	.43	U	.21	U	.285	U	.22	U
4-Methylphenol	mg/kg	.43	U	.21	U	.285	U	.22	U
4-Nitroaniline	mg/kg	2.1	U	1	U	1.4	U	1.05	U
4-Nitrophenol	mg/kg	2.1	U	1	U	1.4	U	1.05	U
Acenaphthene	mg/kg	.43	U	.11	J	.285	U	.22	U
Acenaphthylene	mg/kg	.43	U	.21	U	.285	U	.22	U
Anthracene	mg/kg	.43	U	.077	J	.285	U	.029	J

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		PRRP-SD01		PRRP-SD02		PRRP-SD03		PRRP-SD04	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		11160		11170		11180		11190	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	mg/kg	.43	U	.21	U	.285	U	.084	J
Benzo(a)pyrene	mg/kg	.43	U	.21	U	.285	U	.096	J
Benzo(b)fluoranthene	mg/kg	.43	U	.21	U	.285	U	.1	J
Benzo(ghi)perylene	mg/kg	.43	U	.21	U	.285	U	.053	J
Benzo(k)fluoranthene	mg/kg	.43	U	.21	U	.285	U	.084	J
Butyl benzyl phthalate	mg/kg	.43	U	.21	U	.285	U	.22	U
Carbazole	mg/kg	.43	U	.18	J	.285	U	.22	U
Chrysene	mg/kg	.43	U	.21	U	.285	U	.11	J
Dibenz(a,h)anthracene	mg/kg	.43	U	.21	U	.285	U	.22	U
Dibenzofuran	mg/kg	.43	U	.06	J	.285	U	.22	U
Diethyl phthalate	mg/kg	.43	U	.21	U	.285	U	.22	U
Dimethyl phthalate	mg/kg	.43	U	.21	U	.285	U	.22	U
Fluoranthene	mg/kg	.43	U	.14	J	.285	U	.23	J
Fluorene	mg/kg	.43	U	.11	J	.285	U	.22	U
Hexachlorobenzene	mg/kg	.43	U	.21	U	.285	U	.22	U
Hexachlorobutadiene	mg/kg	.43	U	.21	U	.285	U	.22	U
Hexachlorocyclopentadiene	mg/kg	2.1	U	1	U	1.4	U	1.05	U
Hexachloroethane	mg/kg	.43	U	.21	U	.285	U	.22	U
Indeno(1,2,3-cd)pyrene	mg/kg	.43	U	.21	U	.285	U	.054	J
Isophorone	mg/kg	.43	U	.21	U	.285	U	.22	U
Naphthalene	mg/kg	.43	U	.21	U	.285	U	.22	U
Nitrobenzene	mg/kg	.43	U	.21	U	.285	U	.22	U
Pentachlorophenol	mg/kg	2.1	U	1	U	1.4	U	1.05	U
Phenanthrene	mg/kg	.43	U	.32	J	.285	U	.12	J
Phenol	mg/kg	.43	U	.21	U	.285	U	.22	U
Pyrene	mg/kg	.43	U	.11	J	.285	U	.16	J
bis(2-Chloroethoxy)methane	mg/kg	.43	U	.21	U	.285	U	.22	U
bis(2-Chloroethyl)ether	mg/kg	.43	U	.21	U	.285	U	.22	U
bis(2-Chloroisopropyl)ether	mg/kg	.43	U	.21	U	.285	U	.22	U
bis(2-Ethylhexyl)phthalate	mg/kg	.43	U	.21	U	.285	U	.22	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		PRRP-SD01		PRRP-SD02		PRRP-SD03		PRRP-SD04	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		11160		11170		11180		11190	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Butyl phthalate	mg/kg	.43	U	.21	U	.285	U	.22	U
di-n-Octyl phthalate	mg/kg	.43	U	.21	U	.285	U	.22	U
n-Nitroso-di-n-propylamine	mg/kg	.43	U	.21	U	.285	U	.22	U
n-Nitrosodiphenylamine	mg/kg	.43	U	.21	U	.285	U	.22	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		PRRP-SD01		PRRP-SD02		PRRP-SD03		PRRP-SD04	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		11160		11170		11180		11190	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
PEST/PCB	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016	mg/kg	.043	U	.021	U	.0285	U	.022	U
Aroclor 1221	mg/kg	.043	U	.021	U	.0285	U	.022	U
Aroclor 1232	mg/kg	.043	U	.021	U	.0285	U	.022	U
Aroclor 1242	mg/kg	.043	U	.021	U	.0285	U	.022	U
Aroclor 1248	mg/kg	.043	U	.021	U	.0285	U	.022	U
Aroclor 1254	mg/kg	.043	U	.021	U	.0285	U	.022	U
Aroclor 1260	mg/kg	.043	U	.021	U	.0285	U	.022	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		PRRP-SD01		PRRP-SD02		PRRP-SD03		PRRP-SD04	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		11160		11170		11180		11190	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	6020		2830		5130		3400	
Antimony	mg/kg	7.85	UJ	3.8	UJ	5.2	UJ	3.95	UJ
Arsenic	mg/kg	4.5		5.1		4.3		4.4	
Barium	mg/kg	53.4		12.65	U	48.1		30.9	
Beryllium	mg/kg	.65	U	.315	U	.435	U	.33	U
Cadmium	mg/kg	.65	U	.315	U	.435	U	.33	U
Calcium	mg/kg	96000		46300		62000		8110	
Chromium	mg/kg	11.5		6.3		10.4		6.8	
Cobalt	mg/kg	6.55	U	3.15	U	4.35	U	3.3	U
Copper	mg/kg	17.9		7.6		14.5		7.4	
Iron	mg/kg	16200		9620		13700		9330	
Lead	mg/kg	12.8		4.8		7.8		5.6	
Magnesium	mg/kg	10700		19300		13500		2710	
Manganese	mg/kg	865		421		404		104	
Mercury	mg/kg	.043	U	.021	U	.0285	U	.022	U
Nickel	mg/kg	18.6		9.5		17.9		10.4	
Potassium	mg/kg	655	U	315.5	U	1040		330	U
Selenium	mg/kg	.65	U	.315	U	.435	U	.33	U
Silver	mg/kg	1.3	U	.65	U	.85	U	.65	U
Sodium	mg/kg	655	U	315.5	U	432.5	U	330	U
Thallium	mg/kg	1.3	U	.65	U	.85	U	.65	U
Vanadium	mg/kg	17.4		12.9		14.2		7.9	
Zinc	mg/kg	73.3		23.2		58.4		42.1	

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Sediments

Report Date: 09/20/00

Sample Location:		PRRP-SD01		PRRP-SD02		PRRP-SD03		PRRP-SD04	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		11160		11170		11180		11190	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U
1,3-Dinitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U
2,4,6-Trinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
2,4-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
2,6-Dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
2-Amino-4,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
2-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
3-Nitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
4-Amino-2,6-dinitrotoluene	mg/kg	.125	U	.125	U	.125	U	.125	U
HMX	mg/kg	.25	U	.25	U	.25	U	.25	U
Nitrobenzene	mg/kg	.125	U	.125	U	.125	U	.125	U
RDX	mg/kg	.25	U	.25	U	.25	U	.25	U
Tetryl	mg/kg	.325	U	.325	U	.325	U	.325	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PRRP-SW01		PRRP-SW02		PRRP-SW03		PRRP-SW04	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			12160		12170		12180		12190	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
WATER QUALITY	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Hardness		ug/L	328000		284000		488000		432000	

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PRRP-SW01		PRRP-SW02		PRRP-SW03		PRRP-SW04	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			12160		12170		12180		12190	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
VOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,1,1-Trichloroethane		ug/L	.5	U	.5	U	.5	U	.5	U
1,1,2,2-Tetrachloroethane		ug/L	.5	U	.5	U	.5	U	.5	U
1,1,2-Trichloroethane		ug/L	.5	U	.5	U	.5	U	.5	U
1,1-Dichloroethane		ug/L	.5	U	.5	U	.5	U	.5	U
1,1-Dichloroethene		ug/L	.5	U	.5	U	.5	U	.5	U
1,2-Dichloroethane		ug/L	.5	U	.5	U	.5	U	.5	U
1,2-Dichloroethene		ug/L	.5	U	.5	U	.5	U	.5	U
1,2-Dichloropropane		ug/L	.5	U	.5	U	.5	U	.5	U
2-Butanone		ug/L	2.5	R	2.5	R	2.5	R	2.5	R
2-Hexanone		ug/L	2.5	U	2.5	U	2.5	U	2.5	U
4-Methyl-2-pentanone		ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Acetone		ug/L	2.5	B	1.7	B	2.5	B	1.2	B
Benzene		ug/L	.5	U	.5	U	.5	U	.5	U
Bromodichloromethane		ug/L	0.72	J	.5	U	.5	U	.5	U
Bromoform		ug/L	.5	U	.5	U	.5	U	.5	U
Bromomethane		ug/L	0.17	J	0.11	J	1	U	1	U
Carbon disulfide		ug/L	.5	U	.5	U	.5	U	.5	U
Carbon tetrachloride		ug/L	.5	U	.5	U	.5	U	.5	U
Chlorobenzene		ug/L	.5	U	.5	U	.5	U	.5	U
Chloroethane		ug/L	1	U	1	U	1	U	1	U
Chloroform		ug/L	3.5	B	0.55	B	.5	U	.5	U
Chloromethane		ug/L	1	U	1	U	1	U	1	U
Dibromochloromethane		ug/L	0.21	J	.5	U	.5	U	.5	U
Ethylbenzene		ug/L	.5	U	.5	U	.5	U	.5	U
Methylene chloride		ug/L	.5	U	.5	U	.5	U	.5	U
Styrene		ug/L	.5	U	.5	U	.5	U	.5	U
Tetrachloroethene		ug/L	.5	U	.5	U	.5	U	.5	U
Toluene		ug/L	.5	U	.5	U	.5	U	.5	U
Total xylenes		ug/L	.5	U		U	.5	U	.5	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PRRP-SW01		PRRP-SW02		PRRP-SW03		PRRP-SW04	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			12160		12170		12180		12190	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
VOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Trichloroethene		ug/L	.5	U	.5	U	.5	U	.5	U
Vinyl chloride		ug/L	1	U	1	U	1	U	1	U
cis-1,3-Dichloropropene		ug/L	.5	U	.5	U	.5	U	.5	U
trans-1,3-Dichloropropene		ug/L	.5	U	.5	U	.5	U	.5	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PRRP-SW01		PRRP-SW02		PRRP-SW03		PRRP-SW04	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			12160		12170		12180		12190	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,2,4-Trichlorobenzene		ug/L	5	U	5	U	5	U	5	U
1,2-Dichlorobenzene		ug/L	5	U	5	U	5	U	5	U
1,3-Dichlorobenzene		ug/L	5	U	5	U	5	U	5	U
1,4-Dichlorobenzene		ug/L	5	U	5	U	5	U	5	U
2,4,5-Trichlorophenol		ug/L	5	U	5	U	5	U	5	U
2,4,6-Trichlorophenol		ug/L	5	U	5	U	5	U	5	U
2,4-Dichlorophenol		ug/L	5	U	5	U	5	U	5	U
2,4-Dimethylphenol		ug/L	5	U	5	U	5	U	5	U
2,4-Dinitrophenol		ug/L	25	U	25	U	25	U	25	U
2,4-Dinitrotoluene		ug/L	5	U	5	U	5	U	5	U
2,6-Dinitrotoluene		ug/L	5	U	5	U	5	U	5	U
2-Chloronaphthalene		ug/L	5	U	5	U	5	U	5	U
2-Chlorophenol		ug/L	5	U	5	U	5	U	5	U
2-Methylnaphthalene		ug/L	5	U	5	U	5	U	5	U
2-Methylphenol		ug/L	5	U	5	U	5	U	5	U
2-Nitroaniline		ug/L	25	U	25	U	25	U	25	U
2-Nitrophenol		ug/L	5	U	5	U	5	U	5	U
3,3'-Dichlorobenzidine		ug/L	25	U	25	U	25	U	25	U
3-Nitroaniline		ug/L	25	U	25	U	25	U	25	U
4,6-Dinitro-2-methylphenol		ug/L	25	U	25	U	25	U	25	U
4-Bromophenyl phenyl ether		ug/L	5	U	5	U	5	U	5	U
4-Chloro-3-methylphenol		ug/L	5	U	5	U	5	U	5	U
4-Chloroaniline		ug/L	5	U	5	U	5	U	5	U
4-Chlorophenyl phenyl ether		ug/L	5	U	5	U	5	U	5	U
4-Methylphenol		ug/L	5	U	5	U	5	U	5	U
4-Nitroaniline		ug/L	25	U	25	U	25	U	25	U
4-Nitrophenol		ug/L	25	U	25	U	25	U	25	U
Acenaphthene		ug/L	5	U	5	U	5	U	5	U
Acenaphthylene		ug/L	5	U		U	5	U	5	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PRRP-SW01		PRRP-SW02		PRRP-SW03		PRRP-SW04	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			12160		12170		12180		12190	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Anthracene		ug/L	5	U	5	U	5	U	5	U
Benzo(a)anthracene		ug/L	5	U	5	U	5	U	5	U
Benzo(a)pyrene		ug/L	5	U	5	U	5	U	5	U
Benzo(b)fluoranthene		ug/L	5	U	5	U	5	U	5	U
Benzo(ghi)perylene		ug/L	5	U	5	U	5	U	5	U
Benzo(k)fluoranthene		ug/L	5	U	5	U	5	U	5	U
Butyl benzyl phthalate		ug/L	5	U	5	U	5	U	5	U
Carbazole		ug/L	5	U	5	U	5	U	5	U
Chrysene		ug/L	5	U	5	U	5	U	5	U
Dibenz(a,h)anthracene		ug/L	5	U	5	U	5	U	5	U
Dibenzofuran		ug/L	5	U	5	U	5	U	5	U
Diethyl phthalate		ug/L	5	U	5	U	5	U	5	U
Dimethyl phthalate		ug/L	5	U	5	U	5	U	5	U
Fluoranthene		ug/L	5	U	5	U	5	U	5	U
Fluorene		ug/L	5	U	5	U	5	U	5	U
Hexachlorobenzene		ug/L	5	U	5	U	5	U	5	U
Hexachlorobutadiene		ug/L	5	U	5	U	5	U	5	U
Hexachlorocyclopentadiene		ug/L	25	U	25	U	25	U	25	U
Hexachloroethane		ug/L	5	U	5	U	5	U	5	U
Indeno(1,2,3-cd)pyrene		ug/L	5	U	5	U	5	U	5	U
Isophorone		ug/L	5	U	5	U	5	U	5	U
Naphthalene		ug/L	5	U	5	U	5	U	5	U
Nitrobenzene		ug/L	5	U	5	U	5	U	5	U
Pentachlorophenol		ug/L	25	U	25	U	25	U	25	U
Phenanthrene		ug/L	5	U	5	U	5	U	5	U
Phenol		ug/L	2.2	B	1.9	B	2.3	B	5	U
Pyrene		ug/L	5	U	5	U	5	U	5	U
bis(2-Chloroethoxy)methane		ug/L	5	U	5	U	5	U	5	U
bis(2-Chloroethyl)ether		ug/L	5	U	5	U	5	U	5	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PRRP-SW01		PRRP-SW02		PRRP-SW03		PRRP-SW04	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			12160		12170		12180		12190	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
bis(2-Chloroisopropyl)ether		ug/L	5	U	5	U	5	U	5	U
bis(2-Ethylhexyl)phthalate		ug/L	5	U	2.1	B	5	U	5	U
di-n-Butyl phthalate		ug/L	5	U	5	U	5	U	5	U
di-n-Octyl phthalate		ug/L	5	U	5	U	5	U	5	U
n-Nitroso-di-n-propylamine		ug/L	5	U	5	U	5	U	5	U
n-Nitrosodiphenylamine		ug/L	5	U	5	U	5	U	5	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PRRP-SW01		PRRP-SW02		PRRP-SW03		PRRP-SW04	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			12160		12170		12180		12190	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
PEST/PCB	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aroclor 1016		ug/L	.5	U	.5	U	.5	U	.5	U
Aroclor 1221		ug/L	.5	U	.5	U	.5	U	.5	U
Aroclor 1232		ug/L	.5	U	.5	U	.5	U	.5	U
Aroclor 1242		ug/L	.5	U	.5	U	.5	U	.5	U
Aroclor 1248		ug/L	.5	U	.5	U	.5	U	.5	U
Aroclor 1254		ug/L	.5	U	.5	U	.5	U	.5	U
Aroclor 1260		ug/L	.5	U	.5	U	.5	U	.5	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PRRP-SW01		PRRP-SW02		PRRP-SW03		PRRP-SW04	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			12160		12170		12180		12190	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum		ug/L	778	J	530	J	3040	J	100	U
Aluminum	Y	ug/L	463		874		10200		100	U
Antimony		ug/L	30	U	30	U	30	U	30	U
Antimony	Y	ug/L	30	U	30	U	30	U	30	U
Arsenic		ug/L	5	U	5	U	5	U	5	U
Arsenic	Y	ug/L	5	U	5	U	5	U	5	U
Barium		ug/L	100	U	100	U	100	U	100	U
Barium	Y	ug/L	100	U	100	U	215		100	U
Beryllium		ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Beryllium	Y	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Cadmium		ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Cadmium	Y	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Calcium		ug/L	74200		71700		118000		97900	
Calcium	Y	ug/L	74000		71400		179000		98100	
Chromium		ug/L	5	U	5	U	5	U	5	U
Chromium	Y	ug/L	5	U	5	U	17.2		5	U
Cobalt		ug/L	25	U	25	U	25	U	25	U
Cobalt	Y	ug/L	25	U	25	U	25	U	25	U
Copper		ug/L	12.5	U	12.5	U	12.5	U	12.5	U
Copper	Y	ug/L	12.5	U	12.5	U	12.5	U	12.5	U
Iron		ug/L	1420		972		5790		948	
Iron	Y	ug/L	809		1260		16800		550	
Lead		ug/L	1.5	U	1.5	U	1.5	U	1.5	U
Lead	Y	ug/L	1.5	U	1.5	U	8.7		1.5	U
Magnesium		ug/L	16000		15800		37300		36800	
Magnesium	Y	ug/L	15700		15800		46700		36900	
Manganese		ug/L	245		261		404		67.1	
Manganese	Y	ug/L	144		249		649		34.4	
Mercury		ug/L	.1	U		U	.1	U	.1	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PRRP-SW01		PRRP-SW02		PRRP-SW03		PRRP-SW04	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			12160		12170		12180		12190	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Mercury	Y	ug/L	.1	U	.1	U	.1	U	.1	U
Nickel		ug/L	20	U	20	U	20	U	20	U
Nickel	Y	ug/L	20	U	20	U	20	U	20	U
Potassium		ug/L	2500	U	2500	U	2500	U	2500	U
Potassium	Y	ug/L	2500	U	2500	U	7130		2500	U
Selenium		ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Selenium	Y	ug/L	2.5	U	2.5	U	2.5	U	2.5	U
Silver		ug/L	5	U	5	U	5	U	5	U
Silver	Y	ug/L	5	U	5	U	5	U	5	U
Sodium		ug/L	24900		24700		13700		14800	
Sodium	Y	ug/L	25700		24500		15000		15300	
Thallium		ug/L	5	U	5	U	5	U	5	U
Thallium	Y	ug/L	5	U	5	U	5	U	5	U
Vanadium		ug/L	25	U	25	U	25	U	25	U
Vanadium	Y	ug/L	25	U	25	U	53.9		25	U
Zinc		ug/L	10	U	10	U	58.0		20.2	
Zinc	Y	ug/L	10	U	10	U	145		10	U

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds
Data Summary - Surface Waters

Report Date: 09/20/00

Sample Location:			PRRP-SW01		PRRP-SW02		PRRP-SW03		PRRP-SW04	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			12160		12170		12180		12190	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
EXPLOSIVES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene		ug/L	.1	U	.1	U	.1	U	.1	U
1,3-Dinitrobenzene		ug/L	.1	U	.1	U	.1	U	.1	U
2,4,6-Trinitrotoluene		ug/L	.1	U	.1	U	.1	U	.1	U
2,4-Dinitrotoluene		ug/L	.1	U	.1	U	.1	U	.1	U
2,6-Dinitrotoluene		ug/L	.1	U	.1	U	.1	U	.1	U
2-Amino-4,6-dinitrotoluene		ug/L	.1	U	.1	U	.1	U	.1	U
2-Nitrotoluene		ug/L	.1	U	.1	U	.1	U	.1	U
3-Nitrotoluene		ug/L	.1	U	.1	U	.1	U	.1	U
4-Amino-2,6-dinitrotoluene		ug/L	.1	U	.1	U	.1	U	.1	U
HMX		ug/L	.25	U	.25	U	.25	U	.25	U
Nitrobenzene		ug/L	.1	U	.1	U	.1	U	.1	U
RDX		ug/L	.25	U	.25	U	.25	U	.25	U
Tetryl		ug/L	.1	U	.1	U	.1	U	.1	U

APPENDIX F

BLANK EVALUATED ANALYTICAL DATA

PLUMBROOK
West Area Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		WARP-DP01		WARP-DP02		WARP-DP04		WARP-DP06		WARP-DP08	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8110		8140		8240		8300		8380	
Sample Date:		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98		15-JUN-98	
Depth:		4-6		0-2		8-10		0-2		0-2	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Acetone	ug/kg									35	
Methylene chloride	ug/kg									2.0	J
Toluene	ug/kg	2.2	J	1.8	J	2.5	J	2.3	J		

PLUMBROOK

West Area Red Water Pond

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 09/24/98

Sample Location:		WARP-DP11		WARP-DP12		WARP-DP13		WARP-DP15		WARP-DP17	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8500		8550		8580		8670		8750	
Sample Date:		25-JUN-98		15-JUN-98		15-JUN-98		24-JUN-98		25-JUN-98	
Depth:		0-2		4-6		0-2		4-6		4-6	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Acetone	ug/kg										
Methylene chloride	ug/kg			2.0	J	2.3	J				
Toluene	ug/kg	3.2	J					2.1	J	2.2	J

PLUMBROOK
West Area Red Water Pond
Soils (Surface and Deep)
Detected HIts Summary

Sample Location:		WARP-DP20	
Associated Site:		WARP	
Sample No:		8870	
Sample Date:		24-JUN-98	
Depth:		4-6	
VOLATILES	Units	Result	Val Qlfr
Acetone	ug/kg		
Methylene chloride	ug/kg		
Toluene	ug/kg	1.5	J

PLUMBROOK
West Area Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		WARP-DP09		WARP-DP11		WARP-DP13		WARP-DP20	
Associated Site:		WARP		WARP		WARP		WARP	
Sample No:		8430		8500		8580		8870	
Sample Date:		16-JUN-98		25-JUN-98		15-JUN-98		24-JUN-98	
Depth:		4-6		0-2		0-2		4-6	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4-Dinitrotoluene	ug/kg			43	J				
Acenaphthylene	ug/kg					41	J	40	J
Anthracene	ug/kg					230	J	120	J
Benzo(a)anthracene	ug/kg					400		170	J
Benzo(a)pyrene	ug/kg					390		140	J
Benzo(b)fluoranthene	ug/kg					300	J	140	J
Benzo(ghi)perylene	ug/kg					220	J	76	J
Benzo(k)fluoranthene	ug/kg					350	J	110	J
Chrysene	ug/kg					420		170	J
Fluoranthene	ug/kg	58	J			760		380	
Indeno(1,2,3-cd)pyrene	ug/kg					230	J	76	J
Phenanthrene	ug/kg					360	J	250	J
Pyrene	ug/kg	43	J			550		280	J

PLUMBROOK
West Area Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		WARP-DP01		WARP-DP01		WARP-DP01		WARP-DP02		WARP-DP02	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8100		8110		8120		8140		8150	
Sample Date:		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98	
Depth:		0-2		4-6		8-10		0-2		4-6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	6880		9190		6010		17900		7540	
Antimony	mg/kg										
Arsenic	mg/kg	2.8		8.6		4.5		7.2		2.5	
Barium	mg/kg			40.3		27.9		124		32.1	
Beryllium	mg/kg							1.0			
Cadmium	mg/kg										
Calcium	mg/kg	1490		35700		67600		5930		3010	
Chromium	mg/kg	9.9	J	16.1	J	10.9	J	20.8	J	12.1	J
Cobalt	mg/kg			8.5		6.2		16.2			
Copper	mg/kg	4.0		20.1		17.1		20.0		7.0	
Iron	mg/kg	10300		19600		15000		26800		11500	
Lead	mg/kg	3.6	J	8.1	J	7.1	J	13.5	J	4.8	J
Magnesium	mg/kg	1090		14500		20700		4020		2110	
Manganese	mg/kg	89.6		282		329		1190		92.5	
Mercury	mg/kg							0.061			
Nickel	mg/kg	7.6		19.4		14.0		29.1		13.0	
Potassium	mg/kg			2010	J	1480	J	2490	J	1210	J
Selenium	mg/kg										
Sodium	mg/kg										
Vanadium	mg/kg	18.9		28.0		20.5		37.7		17.8	
Zinc	mg/kg	21.7		51.2		40.0		87.4		33.9	

PLUMBROOK
West Area Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		WARP-DP02		WARP-DP03		WARP-DP03		WARP-DP03		WARP-DP04	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8160		8180		8190		8200		8220	
Sample Date:		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98		23-JUN-98	
Depth:		8-10		0-2		4-6		8-10		0-2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	14500		16500		7040		9400		17000	
Antimony	mg/kg										
Arsenic	mg/kg	11.7		8.1		6.8		5.8		6.1	
Barium	mg/kg	75.3		112		87.2		58.0		85.4	
Beryllium	mg/kg	0.70		0.76	J					0.78	J
Cadmium	mg/kg			0.59							
Calcium	mg/kg	56600		2710		2200		40200		1900	
Chromium	mg/kg	22.2	J	19.9	J	11.4	J	14.8	J	19.2	J
Cobalt	mg/kg	10		17.9		21.0		8.5		14.7	
Copper	mg/kg	25.6		21.4				20.3		21.9	
Iron	mg/kg	26400		30200		19600		20100		23900	
Lead	mg/kg	10.8	J	11.7		9.4		7.6		10.3	
Magnesium	mg/kg	15100		3760		2020		10800		3220	
Manganese	mg/kg	423		1340		495		372		915	
Mercury	mg/kg										
Nickel	mg/kg	27.8		44.3		24.0		23.0		29.7	
Potassium	mg/kg	3370	J	2970	J	941	J	2460	J	2510	J
Selenium	mg/kg										
Sodium	mg/kg										
Vanadium	mg/kg	34.6		32.5	J	19.6	J	23.3	J	32.9	J
Zinc	mg/kg	68.1		111		64.1		54.7		88.1	

PLUMBROOK
West Area Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		WARP-DP04		WARP-DP04		WARP-DP05		WARP-DP05		WARP-DP05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8230		8240		8260		8270		8280	
Sample Date:		23-JUN-98		23-JUN-98		16-JUN-98		16-JUN-98		16-JUN-98	
Depth:		4-6		8-10		0-2		4-6		8-10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	8640		13400		8120		8840		9510	
Antimony	mg/kg										
Arsenic	mg/kg	4.5		11.2		4.8		4.6		6.7	
Barium	mg/kg	45.7		35.3		51.2		62.4		54.3	
Beryllium	mg/kg										
Cadmium	mg/kg										
Calcium	mg/kg	1860		40300		2390		54500		50400	
Chromium	mg/kg	11.9	J	20.0	J	13.1		15.3		17.4	
Cobalt	mg/kg	9.2		11.6		8.5		9.6		9.2	
Copper	mg/kg			34.7		11.7		19.3		19.0	
Iron	mg/kg	14500		27800		17600		17000		18200	
Lead	mg/kg	6.2		12.3		6.1		10.5		8.4	
Magnesium	mg/kg	1990		11000		2150		23400		14800	
Manganese	mg/kg	267		363		468		527		362	
Mercury	mg/kg										
Nickel	mg/kg	20.9		36.0		17.0		23.2		21.7	
Potassium	mg/kg	1370	J	3570	J	813		1740		1730	
Selenium	mg/kg										
Sodium	mg/kg										
Vanadium	mg/kg	18.2	J	24.7	J	24.1	J	27.1	J	25.9	J
Zinc	mg/kg	53.8		80.0		40.4		53.6		53.4	

PLUMBROOK
West Area Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		WARP-DP06		WARP-DP06		WARP-DP06		WARP-DP07		WARP-DP07	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8300		8310		8320		8340		8350	
Sample Date:		23-JUN-98		23-JUN-98		23-JUN-98		25-JUN-98		25-JUN-98	
Depth:		0-2		4-6		8-10		0-2		4-6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	5600		8610		12100		11500		9160	
Antimony	mg/kg										
Arsenic	mg/kg	2.3		6.8		6.6		3.7		3.1	
Barium	mg/kg			31.3		82.3		69.7		43.3	
Beryllium	mg/kg							0.70			
Cadmium	mg/kg										
Calcium	mg/kg	1620		2530		55700		2700		2410	
Chromium	mg/kg	8.9	J	15.5	J	17.9	J	15.8	J	14.1	J
Cobalt	mg/kg			7.9		12.8		9.0		7.3	
Copper	mg/kg	4.5		12.4		23.5		15.9		12.5	
Iron	mg/kg	10200		17000		21500		16800		13900	
Lead	mg/kg	2.8	J	7.1	J	11.6	J	10.1	J	6.9	J
Magnesium	mg/kg	1060		1860		17700		2720		2340	
Manganese	mg/kg	143		413		768		186		123	
Mercury	mg/kg										
Nickel	mg/kg	7.1		14.8		31.4		22.3		18.3	
Potassium	mg/kg			924	J	2860	J	1650	J	1650	J
Selenium	mg/kg										
Sodium	mg/kg										
Vanadium	mg/kg	17.9		25.4		30.8		21.1		20.4	
Zinc	mg/kg	21.1		39.3		62.2		70.5		57.5	

PLUMBROOK
West Area Red Water Pond
Soils (Surface and Deep)
Detected HIts Summary

Report Date: 09/24/98

Sample Location:		WARP-DP07		WARP-DP08		WARP-DP08		WARP-DP08		WARP-DP09	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8360		8380		8390		8400		8420	
Sample Date:		25-JUN-98		15-JUN-98		15-JUN-98		15-JUN-98		16-JUN-98	
Depth:		8-10		0-2		4-6		8-10		0-2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	10900		4880		8740		5570		7610	
Antimony	mg/kg										
Arsenic	mg/kg	7.4		2.2		6.9		4.0		6.8	
Barium	mg/kg	55.4				43.8				53.9	
Beryllium	mg/kg	0.65									
Cadmium	mg/kg										
Calcium	mg/kg	25000		1480		1810		1460		58600	
Chromium	mg/kg	17.1	J	6.8		17.4		7.5		22.2	
Cobalt	mg/kg	13.8				7.4					
Copper	mg/kg	21.4		2.9		10.4		6.9		18.5	
Iron	mg/kg	20700		8460		22000		10000		14200	
Lead	mg/kg	11.6	J	2.2		5.4		4.4		11.7	
Magnesium	mg/kg	5620				1810		832		4510	
Manganese	mg/kg	472		107		231		215		213	
Mercury	mg/kg									0.10	
Nickel	mg/kg	29.7		7.5		17.0		10.8		10.6	
Potassium	mg/kg	2390	J			643					
Selenium	mg/kg										
Sodium	mg/kg										
Vanadium	mg/kg	24.2		15.8		30.0		17.8		21.1	J
Zinc	mg/kg	75.6		15.9		37.8		26.5		36.9	

PLUMBROOK
West Area Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		WARP-DP09		WARP-DP09		WARP-DP10		WARP-DP10		WARP-DP11	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8430		8440		8460		8470		8500	
Sample Date:		16-JUN-98		16-JUN-98		26-JUN-98		26-JUN-98		25-JUN-98	
Depth:		4-6		8-10		0-2		4-6		0-2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	6470		11100		12300		12000		11300	
Antimony	mg/kg			7.7							
Arsenic	mg/kg	2.2		14.0		5.2		7.9		3.7	
Barium	mg/kg	41.3		78.2		77.4		80.3		72.9	
Beryllium	mg/kg			0.65		0.73		0.86		0.64	
Cadmium	mg/kg										
Calcium	mg/kg	1220		7860		3260		2130		2600	
Chromium	mg/kg	8.2		20.9		15.7	J	17.9	J	15.8	J
Cobalt	mg/kg			11.9		15.7		11.2		11.5	
Copper	mg/kg	4.9		24.2		16.5		20.4		12.3	
Iron	mg/kg	8490		29000		20000		27000		18700	
Lead	mg/kg	5.8		10.6		11.0	J	11.5	J	9.1	J
Magnesium	mg/kg	2010		4980		2930		2850		3030	
Manganese	mg/kg	83.4		405		681		243		375	
Mercury	mg/kg					0.045					
Nickel	mg/kg	7.4		36.6		29.0		33.5		22.6	
Potassium	mg/kg			1160		1600	J	1340	J	1660	J
Selenium	mg/kg										
Sodium	mg/kg							1270			
Vanadium	mg/kg	14.2	J	27.5	J	22.4		24.6		21.1	
Zinc	mg/kg	30.6		72.5		74.6		94.6		75.4	

PLUMBROOK
West Area Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		WARP-DP11		WARP-DP11		WARP-DP12		WARP-DP12		WARP-DP12	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8510		8520		8540		8550		8560	
Sample Date:		25-JUN-98		25-JUN-98		15-JUN-98		15-JUN-98		15-JUN-98	
Depth:		4-6		8-10		0-2		4-6		8-10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	5980		11400		4720		5080		9320	
Antimony	mg/kg										
Arsenic	mg/kg	6.5		7.9		2.0		23.6		8.3	
Barium	mg/kg	35.5		51.5		24.8		39.3		54.5	
Beryllium	mg/kg			0.59							
Cadmium	mg/kg										
Calcium	mg/kg	1570		51000		757		18800		57200	
Chromium	mg/kg	9.4	J	16.8	J	5.4		10.6		16.2	
Cobalt	mg/kg	6.9		10.1				8.2		8.9	
Copper	mg/kg	10.4		24.3		3.5		19.3		22.6	
Iron	mg/kg	16800		22500		7190		23200		19500	
Lead	mg/kg	6.2	J	8.2	J	2.9		6.4		9.8	
Magnesium	mg/kg	1580		11300		684		6810		17400	
Manganese	mg/kg	114		392		172		551		433	
Mercury	mg/kg										
Nickel	mg/kg	16.6		30.2		8.6		24.9		23.9	
Potassium	mg/kg	903	J	3140	J			803		1860	
Selenium	mg/kg										
Sodium	mg/kg										
Vanadium	mg/kg	13.9		24.2		10.1		22.3		25.9	
Zinc	mg/kg	42.4		58.9		22.9		55.0		60.6	

PLUMBROOK
West Area Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		WARP-DP13		WARP-DP13		WARP-DP13		WARP-DP15		WARP-DP15	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8580		8590		8600		8660		8670	
Sample Date:		15-JUN-98		15-JUN-98		15-JUN-98		24-JUN-98		24-JUN-98	
Depth:		0-2		4-6		8-10		0-2		4-6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	11900		5910		13700		14300		11100	
Antimony	mg/kg										
Arsenic	mg/kg	11.5		3.1		15.3		9.3		3.7	
Barium	mg/kg	82.0		27.9		76.3		91.4		53.8	
Beryllium	mg/kg	0.67				0.83		0.63	J		
Cadmium	mg/kg					0.68					
Calcium	mg/kg	16600		4680		3580		31400		2480	
Chromium	mg/kg	20.3		10.3		22.2		19.7	J	13.0	J
Cobalt	mg/kg	11.1		6.0		18.4		13.0		6.2	
Copper	mg/kg	26.8		14.0		29.1		22.7			
Iron	mg/kg	27400		10900		34000		24700		13400	
Lead	mg/kg	11.3		4.9		14.0		10.7		5.9	
Magnesium	mg/kg	8890		2050		4310		12200		2010	
Manganese	mg/kg	391		231		780		781		269	
Mercury	mg/kg										
Nickel	mg/kg	29.1		10.3		45.0		32.1		13.6	
Potassium	mg/kg	1830				1630		2640	J	1370	J
Selenium	mg/kg										
Sodium	mg/kg					1030					
Vanadium	mg/kg	31.0		17.0		36.7		36.3	J	23.2	J
Zinc	mg/kg	69.9		27.2		82.9		63.4		45.3	

PLUMBROOK
West Area Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Sample Location:		WARP-DP15		WARP-DP16		WARP-DP16		WARP-DP16		WARP-DP17	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8680		8700		8710		8720		8740	
Sample Date:		24-JUN-98		24-JUN-98		24-JUN-98		24-JUN-98		25-JUN-98	
Depth:		8-10		0-2		4-6		8-10		0-2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	13800		20600		12400		18400		11200	
Antimony	mg/kg			7.4	J						
Arsenic	mg/kg	7.6		11.4		11.0		9.5		5.1	
Barium	mg/kg	165		130		117		118		61.9	
Beryllium	mg/kg	0.64	J	1.2	J			0.82	J		
Cadmium	mg/kg										
Calcium	mg/kg	3480		3760		31700		13300		1460	
Chromium	mg/kg	12.9	J	25.4	J	15.8	J	22.7	J	14.8	J
Cobalt	mg/kg	16.2		17.1		13.0		15.0		11.5	
Copper	mg/kg	18.0		30.9		26.2		26.4		15.4	
Iron	mg/kg	24500		36000		29200		31100		19800	
Lead	mg/kg	13.2		11.4		9.1		10.1		10.6	
Magnesium	mg/kg	4220		4870		10100		6970		2500	J
Manganese	mg/kg	1900		982		1280		1170		207	
Mercury	mg/kg			0.040							
Nickel	mg/kg	40.8		46.9		33.9		39.3		20.5	
Potassium	mg/kg	2070	J	2590	J	1830	J	3240	J	898	J
Selenium	mg/kg									0.65	
Sodium	mg/kg			681				726			
Vanadium	mg/kg	27.7	J	40.5	J	31.0	J	40.3	J	19.2	
Zinc	mg/kg	75.7		103		70.9		81.2		65.4	

PLUMBROOK
West Area Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		WARP-DP17		WARP-DP17		WARP-DP18		WARP-DP18		WARP-DP18	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8750		8760		8780		8790		8800	
Sample Date:		25-JUN-98		25-JUN-98		25-JUN-98		25-JUN-98		25-JUN-98	
Depth:		4-6		8-10		0-2		4-6		8-10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	9420		12500		10700		8670		21000	
Antimony	mg/kg										
Arsenic	mg/kg	11.6		10.0		5.3		4.1		4.9	
Barium	mg/kg	67.7		74.8		61.9		58.8		92.7	
Beryllium	mg/kg			0.74		0.59				1.0	
Cadmium	mg/kg										
Calcium	mg/kg	2240		2460		7330		4890		39100	
Chromium	mg/kg	15.5	J	19.6	J	15.3	J	13.0	J	28.6	J
Cobalt	mg/kg	15.5		13.8		11.1		8.1		11.5	
Copper	mg/kg	19.2		21.7		17.3		14.0		25.2	
Iron	mg/kg	26100		26600		18400		15400		26000	
Lead	mg/kg	9.0		8.7		9.6		7.6		11.0	
Magnesium	mg/kg	2530	J	2920	J	4680	J	2860	J	10300	J
Manganese	mg/kg	326		362		453		261		374	
Mercury	mg/kg										
Nickel	mg/kg	31.6		31.1		23.5		20.4		35.9	
Potassium	mg/kg	1030	J	1580	J	1270	J	1080	J	5630	J
Selenium	mg/kg										
Sodium	mg/kg	858		952							
Vanadium	mg/kg	22.1		27.5		23.0		17.8		37.2	
Zinc	mg/kg	66.1		74.3		60.3		55.2		64.9	

PLUMBROOK
West Area Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		WARP-DP19		WARP-DP19		WARP-DP19		WARP-DP20		WARP-DP20	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8820		8830		8840		8860		8870	
Sample Date:		24-JUN-98		24-JUN-98		24-JUN-98		24-JUN-98		24-JUN-98	
Depth:		0-2		4-6		8-10		0-2		4-6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	6680		18000		17000		13000		10900	
Antimony	mg/kg										
Arsenic	mg/kg	2.1		9.4		9.8		8.5		7.0	
Barium	mg/kg	26.4		70.0		83.3		66.0		56.1	
Beryllium	mg/kg			0.83	J	0.75	J				
Cadmium	mg/kg										
Calcium	mg/kg	1620		2600		34600		35600		23500	
Chromium	mg/kg	9.1	J	23.3	J	25.1	J	16.7	J	16.1	J
Cobalt	mg/kg			19.0		14.5		11.9		7.8	
Copper	mg/kg			30.6		30.9					
Iron	mg/kg	10600		32000		30000		20900		19100	
Lead	mg/kg	3.4		13.2		11.2		9.4		7.4	
Magnesium	mg/kg	1290		4480		14700		9970		8670	
Manganese	mg/kg	184		898		568		551		320	
Mercury	mg/kg										
Nickel	mg/kg	9.8		42.3		37.9		19.3		18.6	
Potassium	mg/kg	742	J	2430	J	3960	J	2040	J	1350	J
Selenium	mg/kg										
Sodium	mg/kg										
Vanadium	mg/kg	19.8	J	38.9	J	37.3	J	35.0	J	29.1	J
Zinc	mg/kg	28.7		85.1		81.6		49.8		48.2	

Sample Location:	WARP-DP20
Associated Site:	WARP
Sample No:	8880
Sample Date:	24-JUN-98
Depth:	8-10

METALS	Units	Result	Val Qlfr
Aluminum	mg/kg	12000	
Antimony	mg/kg		
Arsenic	mg/kg	4.6	
Barium	mg/kg	80.3	
Beryllium	mg/kg		
Cadmium	mg/kg		
Calcium	mg/kg	5120	
Chromium	mg/kg	16.9	J
Cobalt	mg/kg	10.1	
Copper	mg/kg		
Iron	mg/kg	18800	
Lead	mg/kg	7.4	
Magnesium	mg/kg	3690	
Manganese	mg/kg	484	
Mercury	mg/kg		
Nickel	mg/kg	28.7	
Potassium	mg/kg	1710	J
Selenium	mg/kg		
Sodium	mg/kg	619	
Vanadium	mg/kg	24.1	J
Zinc	mg/kg	77.5	

Sample Location:		WARP-DP03		WARP-DP09		WARP-DP10		WARP-DP11		WARP-DP13	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		8200		8440		8470		8520		8600	
Sample Date:		23-JUN-98		16-JUN-98		26-JUN-98		25-JUN-98		15-JUN-98	
Depth:		8-10		8-10		4-6		8-10		8-10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	ug/kg	280		310		4400		740		4400	
2,4,6-Trinitrotoluene	ug/kg					380					
2,4-Dinitrotoluene	ug/kg			490		1400				6300	
2,6-Dinitrotoluene	ug/kg					1500					

Sample Location:		WARP-DP18	
Associated Site:		WARP	
Sample No:		8800	
Sample Date:		25-JUN-98	
Depth:		8-10	
EXPLOSIVES	Units	Result	Val Qlfr
1,3,5-Trinitrobenzene	ug/kg	980	
2,4,6-Trinitrotoluene	ug/kg		
2,4-Dinitrotoluene	ug/kg		
2,6-Dinitrotoluene	ug/kg		

PLUMBROOK

West Area Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			WARP-DP02		WARP-DP08		WARP-DP09		WARP-DP11		WARP-DP13	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			8170		8410		8450		8530		8610	
Sample Date:			24-JUN-98		16-JUN-98		16-JUN-98		26-JUN-98		15-JUN-98	
VOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2-Butanone		ug/L										
Benzene		ug/L	0.15	J					0.13	J		
Carbon disulfide		ug/L			0.15	J						
Ethylbenzene		ug/L									0.19	J
Tetrachloroethene		ug/L			0.20	J	0.15	J				

PLUMBROOK

West Area Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			WARP-DP15		WARP-DP19	
Associated Site:			WARP		WARP	
Sample No:			8690		8850	
Sample Date:			26-JUN-98		26-JUN-98	
VOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
2-Butanone		ug/L	1.2	J	1.8	J
Benzene		ug/L				
Carbon disulfide		ug/L			0.18	J
Ethylbenzene		ug/L				
Tetrachloroethene		ug/L				

PLUMBROOK

West Area Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			WARP-DP09		WARP-DP13	
Associated Site:			WARP		WARP	
Sample No:			8450		8610	
Sample Date:			16-JUN-98		15-JUN-98	
TSS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
Total suspended solids		ug/L	85000		15000	

PLUMBROOK

West Area Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			WARP-DP09		WARP-DP13	
Associated Site:			WARP		WARP	
Sample No:			8450		8610	
Sample Date:			16-JUN-98		15-JUN-98	
TOC-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
Total organic carbon		ug/L	32000		36600	

PLUMBROOK

West Area Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:				WARP-DP09		WARP-DP13	
Associated Site:				WARP		WARP	
Sample No:				8450		8610	
Sample Date:				16-JUN-98		15-JUN-98	
TDS-W		Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
Total dissolved solids			ug/L	1710000		1260000	

PLUMBROOK

West Area Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			WARP-DP09		WARP-DP13	
Associated Site:			WARP		WARP	
Sample No:			8450		8610	
Sample Date:			16-JUN-98		15-JUN-98	
SULFATE-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
Sulfate		ug/L	305000		278000	

PLUMBROOK
West Area Red Water Pond
Groundwater
Detected Hits Summary

Sample Location:			WARP-DP04		WARP-DP09		WARP-DP11		WARP-DP13		WARP-DP16	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			8250B		8450		8530		8610		8730	
Sample Date:			25-JUN-98		16-JUN-98		26-JUN-98		15-JUN-98		25-JUN-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4-Dinitrotoluene		ug/L			60		1.8	J	660		60	J
2,6-Dinitrotoluene		ug/L			6.3	J			56	J	15	J
3-Nitroaniline		ug/L	3.2	J	5.1	J	2.1	J	15	J	43	J
4,6-Dinitro-2-methylphenol		ug/L			24	J						
4-Nitrophenol		ug/L			2.4	J						

Sample Location:			WARP-DP17	
Associated Site:			WARP	
Sample No:			8770	
Sample Date:			25-JUN-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr
2,4-Dinitrotoluene		ug/L	52	J
2,6-Dinitrotoluene		ug/L	18	J
3-Nitroaniline		ug/L	49	J
4,6-Dinitro-2-methylphenol		ug/L		
4-Nitrophenol		ug/L		

Sample Location:			WARP-DP13	
Associated Site:			WARP	
Sample No:			8610	
Sample Date:			15-JUN-98	
NITRATE-W	Fltr	Units	Result	Val Qlfr
Nitrate		ug/L	1600	

PLUMBROOK
West Area Red Water Pond
Groundwater
Detected Hits Summary

Report Date: 09/24/98

Sample Location:			WARP-DP02		WARP-DP04		WARP-DP07		WARP-DP09		WARP-DP11	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			8170		8250B		8370		8450		8530	
Sample Date:			24-JUN-98		25-JUN-98		26-JUN-98		16-JUN-98		26-JUN-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum		ug/L	13100		1240		51100		11100		59700	
Aluminum	Y	ug/L										
Antimony		ug/L										
Arsenic		ug/L	21.4						15.2		56.2	
Barium		ug/L					248				386	
Beryllium		ug/L										
Cadmium	Y	ug/L										
Calcium		ug/L	336000		569000		644000		230000		982000	
Calcium	Y	ug/L	211000		549000		364000		237000		395000	
Chromium		ug/L	28.8				91.6				96.8	
Chromium	Y	ug/L										
Cobalt		ug/L					68.4				85.2	
Cobalt	Y	ug/L										
Copper		ug/L	90.2				126				214	
Copper	Y	ug/L	42.1								67.0	
Iron		ug/L	39900		2650		123000		28500		137000	
Iron	Y	ug/L							120		121	
Lead		ug/L	14.4						11.8		68.3	
Lead	Y	ug/L							4.4			
Magnesium		ug/L	95100	J	234000	J	105000	J	219000		242000	J
Magnesium	Y	ug/L	62800	J	242000	J	71400	J	227000		80100	J
Manganese		ug/L	750		1410		3310		8610		4840	
Manganese	Y	ug/L	84.5		1450		480		8480		1070	
Mercury		ug/L									0.24	
Nickel		ug/L	61.5				220				249	
Nickel	Y	ug/L									62.0	
Potassium		ug/L	6880		17400		17100				20500	
Potassium	Y	ug/L			18200		6170				10200	
Selenium		ug/L										

PLUMBROOK
West Area Red Water Pond
Groundwater
Detected Hits Summary

Report Date: 09/24/98

Sample Location:			WARP-DP13		WARP-DP16		WARP-DP17	
Associated Site:			WARP		WARP		WARP	
Sample No:			8610		8730		8770	
Sample Date:			15-JUN-98		25-JUN-98		25-JUN-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum		ug/L	77200		206000		38500	
Aluminum	Y	ug/L			203		1350	
Antimony		ug/L			106			
Arsenic		ug/L	1780		111			
Barium		ug/L			773		217	
Beryllium		ug/L			9.5			
Cadmium	Y	ug/L			46.0			
Calcium		ug/L	315000		2680000		555000	
Calcium	Y	ug/L	156000		735000		301000	
Chromium		ug/L	127		296		58.7	
Chromium	Y	ug/L					32.9	
Cobalt		ug/L			264		173	
Cobalt	Y	ug/L			162		142	
Copper		ug/L			654		153	
Copper	Y	ug/L			117		94.6	
Iron		ug/L	153000		339000		73000	
Iron	Y	ug/L			373		2600	
Lead		ug/L	459		157		28.9	
Lead	Y	ug/L						
Magnesium		ug/L	86200		651000	J	178000	J
Magnesium	Y	ug/L			193000	J	145000	J
Manganese		ug/L	12600		9280		2470	
Manganese	Y	ug/L	7870		635		891	
Mercury		ug/L	0.65		0.47		0.25	
Nickel		ug/L			515		134	
Nickel	Y	ug/L			46.3			
Potassium		ug/L			33100		7640	
Potassium	Y	ug/L						
Selenium		ug/L	1790					

PLUMBROOK

West Area Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			WARP-DP02		WARP-DP04		WARP-DP07		WARP-DP09		WARP-DP11	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			8170		8250B		8370		8450		8530	
Sample Date:			24-JUN-98		25-JUN-98		26-JUN-98		16-JUN-98		26-JUN-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Sodium		ug/L	408000		81800		182000		44300		503000	
Sodium	Y	ug/L	443000		114000		185000		44800		614000	
Thallium		ug/L										
Vanadium		ug/L	62.0				125				161	
Zinc		ug/L	123		22.1		411				467	
Zinc	Y	ug/L										

PLUMBROOK
West Area Red Water Pond
Groundwater
Detected Hits Summary

Report Date: 09/24/98

Sample Location:			WARP-DP13		WARP-DP16		WARP-DP17	
Associated Site:			WARP		WARP		WARP	
Sample No:			8610		8730		8770	
Sample Date:			15-JUN-98		25-JUN-98		25-JUN-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Sodium		ug/L	187000		907000		1060000	
Sodium	Y	ug/L	192000		1040000		993000	
Thallium		ug/L	1770					
Vanadium		ug/L			381		113	
Zinc		ug/L	397		1260		265	
Zinc	Y	ug/L			28.2			

PLUMBROOK

West Area Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			WARP-DP09		WARP-DP13	
Associated Site:			WARP		WARP	
Sample No:			8450		8610	
Sample Date:			16-JUN-98		15-JUN-98	
HARDNESS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
Hardness		ug/L	1400000		960000	

PLUMBROOK

West Area Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			WARP-DP06		WARP-DP08		WARP-DP09		WARP-DP11		WARP-DP12	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			8330		8410		8450		8530		8570	
Sample Date:			23-JUN-98		16-JUN-98		16-JUN-98		26-JUN-98		15-JUN-98	
EXPLOSIVES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene		ug/L					9.4		7.2			
1,3-Dinitrobenzene		ug/L	0.20		0.74		8.6				0.69	
2,4,6-Trinitrotoluene		ug/L							7.1			
2,4-Dinitrotoluene		ug/L			2.3		28				2.0	
2,6-Dinitrotoluene		ug/L			0.28		2.7				0.25	

PLUMBROOK

West Area Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			WARP-DP13		WARP-DP15		WARP-DP16		WARP-DP17		WARP-DP19	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			8610		8690		8730		8770		8850	
Sample Date:			15-JUN-98		26-JUN-98		25-JUN-98		25-JUN-98		26-JUN-98	
EXPLOSIVES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene		ug/L	680				40		32			
1,3-Dinitrobenzene		ug/L	270								0.24	
2,4,6-Trinitrotoluene		ug/L										
2,4-Dinitrotoluene		ug/L	950		1.1				22			
2,6-Dinitrotoluene		ug/L										

Sample Location:			WARP-DP09		WARP-DP13	
Associated Site:			WARP		WARP	
Sample No:			8450		8610	
Sample Date:			16-JUN-98		15-JUN-98	
ALKALINITY	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
Alkalinity		ug/L	1000000		643000	

PLUMBROOK

Pentolite Road Red Water Pond

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 09/24/98

Sample Location:		PRRP-DP07		PRRP-DP09		PRRP-DP16		PRRP-DP19	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		7450		7530R		7820		7920	
Sample Date:		09-JUN-98		25-JUN-98		12-JUN-98		12-JUN-98	
Depth:		4-6		4-6		8-10		0-2	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Acetone	ug/kg	8.2	J						
Methylene chloride	ug/kg					2.1	J	1.8	J
Toluene	ug/kg			1.7	J				

PLUMBROOK

Pentolite Road Red Water Pond

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 09/24/98

Sample Location:		PRRP-DP02		PRRP-DP03		PRRP-DP09		PRRP-DP11		PRRP-DP15	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7260		7290		7530R		7600		7780	
Sample Date:		14-JUN-98		08-JUN-98		25-JUN-98		13-JUN-98		12-JUN-98	
Depth:		8-10		4-5		4-6		0-2		8-10	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4-Dinitrotoluene	ug/kg	81	J	8800		56	J	160	J	190	J
2,6-Dinitrotoluene	ug/kg			580	J			50	J		
3-Nitroaniline	ug/kg									53	J

PLUMBROOK

Pentolite Road Red Water Pond

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 09/24/98

Sample Location:		PRRP-DP16	
Associated Site:		PRRP	
Sample No:		7820	
Sample Date:		12-JUN-98	
Depth:		8-10	
SEMIVOLATILES	Units	Result	Val Qlfr
2,4-Dinitrotoluene	ug/kg	0.40	J
2,6-Dinitrotoluene	ug/kg	49	J
3-Nitroaniline	ug/kg		

PLUMBROOK
Pentolite Road Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		PRRP-DP01		PRRP-DP01		PRRP-DP01		PRRP-DP02		PRRP-DP02	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7200		7210		7220		7250		7260	
Sample Date:		11-JUN-98		11-JUN-98		11-JUN-98		14-JUN-98		14-JUN-98	
Depth:		0-2		4-6		8-10		4-6		8-10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	9370		11500		10100		11200		11500	
Antimony	mg/kg			7.9	J						
Arsenic	mg/kg	4.5	J	27.9	J	9.1	J	6.1		12.5	
Barium	mg/kg	84.3		239		88.5		61.5		91.9	
Beryllium	mg/kg	0.69		0.71				0.68			
Cadmium	mg/kg										
Calcium	mg/kg	5740		35300		35600		3670		7720	
Chromium	mg/kg	14.7		9.0		17.7		20.4		20.8	
Cobalt	mg/kg	11.1		21.2		11.6		11.2		13.6	
Copper	mg/kg	22.6		34.5		23.3		14.5		25.8	
Iron	mg/kg	18000		34500		22500		21900		23800	
Lead	mg/kg	8.6		13.2		10.4		7.8		12.2	
Magnesium	mg/kg	2480		12500		13900		2590		5650	
Manganese	mg/kg	321		2230		706		315		521	
Mercury	mg/kg							0.045			
Nickel	mg/kg	27.2		57.2		32.5		25.6		32.2	
Potassium	mg/kg	777		2330		1790		916		1630	
Selenium	mg/kg	0.84						0.69		0.82	
Sodium	mg/kg	1240		1080		1050					
Vanadium	mg/kg	19.1		30.0		26.6		27.3	J	26.2	J
Zinc	mg/kg	78.5		83.1		65.9		64.6		70.3	

PLUMBROOK

Pentolite Road Red Water Pond

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 09/24/98

Sample Location:		PRRP-DP02		PRRP-DP03		PRRP-DP03		PRRP-DP04		PRRP-DP04	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7240R		7280		7290		7320		7330	
Sample Date:		22-JUN-98		08-JUN-98		08-JUN-98		09-JUN-98		09-JUN-98	
Depth:		0-2		0-2		4-5		0-2		4-6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	9210		6330		9580		7030		6990	
Antimony	mg/kg										
Arsenic	mg/kg	5.0		5.4		9.7		6.6		5.4	
Barium	mg/kg	45.1		65.7		67.9		37.2		39.4	
Beryllium	mg/kg										
Cadmium	mg/kg										
Calcium	mg/kg	10300		2560		2600		2680		19800	
Chromium	mg/kg	13.3	J	8.7		15.7		15.5		12.4	
Cobalt	mg/kg	6.6				6.3				7.4	
Copper	mg/kg	12.6		8.4		18.7		7.0		13.3	
Iron	mg/kg	14300		14100		23700		16700		13900	
Lead	mg/kg	12.3	J	9.3	J	11.6	J	4.3	J	9.8	J
Magnesium	mg/kg	5150		1160		2810		1290		10700	
Manganese	mg/kg	234		320		338		144		292	
Mercury	mg/kg	0.040									
Nickel	mg/kg	14.6		9.3		22.9		12.2		16.6	
Potassium	mg/kg	1460	J			968				864	
Selenium	mg/kg			0.59						0.64	
Sodium	mg/kg					3760					
Vanadium	mg/kg	23.1		17.3	J	23.9	J	28.5	J	19.7	J
Zinc	mg/kg	45.5		34.2		61.3		30.6		43.7	

PLUMBROOK

Pentolite Road Red Water Pond

Soils (Surface and Deep)

Detected Hits Summary

Report Date: 09/24/98

Sample Location:		PRRP-DP04		PRRP-DP05		PRRP-DP05		PRRP-DP05		PRRP-DP06	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7340		7370		7360R		7380R		7400	
Sample Date:		09-JUN-98		14-JUN-98		25-JUN-98		25-JUN-98		08-JUN-98	
Depth:		8-10		4-6		0-2		8-10		0-2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	8040		11300		6820		9040		6110	
Antimony	mg/kg			9.3							
Arsenic	mg/kg	5.2		42.8		2.9		17.6		3.6	
Barium	mg/kg	50.5		128		27.6		115			
Beryllium	mg/kg			0.67							
Cadmium	mg/kg										
Calcium	mg/kg	61200		58500		1490		57800		945	
Chromium	mg/kg	14.1		18.4		9.3		14.4		10.9	
Cobalt	mg/kg	9.8		19.0				10.2			
Copper	mg/kg	23.6		24.6		4.9		19.7		5.9	
Iron	mg/kg	18200		43700		9170		22700		13700	
Lead	mg/kg	10.3	J	10.6		5.5		8.0		3.5	J
Magnesium	mg/kg	19500		17400		1010		17100		885	
Manganese	mg/kg	327		797		127	J	731	J	166	
Mercury	mg/kg										
Nickel	mg/kg	25.9		40.1		7.4		23.8		9.4	
Potassium	mg/kg	1580		2250				2190			
Selenium	mg/kg	1.1									
Sodium	mg/kg										
Vanadium	mg/kg	23.7	J	38.4	J	16.3	J	25.4	J	23.1	J
Zinc	mg/kg	56.9		104		24.9		52.1		22.6	

PLUMBROOK
Pentolite Road Red Water Pond
Soils (Surface and Deep)
Detected HIts Summary

Report Date: 09/24/98

Sample Location:		PRRP-DP06		PRRP-DP06		PRRP-DP07		PRRP-DP07		PRRP-DP07	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7410		7420		7440		7450		7460	
Sample Date:		08-JUN-98		08-JUN-98		09-JUN-98		09-JUN-98		09-JUN-98	
Depth:		4-5		9-10		0-2		4-6		8-10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	8710		7260		4120		8560		7960	
Antimony	mg/kg										
Arsenic	mg/kg	9.1		5.3		2.5		6.3		6.5	
Barium	mg/kg	57.3		44.9				55.3		54.5	
Beryllium	mg/kg										
Cadmium	mg/kg										
Calcium	mg/kg	62300		43700		1420		62800		62000	
Chromium	mg/kg	15.9		14.4		6.1		14.3		13.0	
Cobalt	mg/kg							13.1		9.8	
Copper	mg/kg	26.2		15.2		4.3		20.3		23.9	
Iron	mg/kg	24200		15300		8330		17500		20000	
Lead	mg/kg	11.3	J	7.6	J	3.2	J	10.3	J	10.9	J
Magnesium	mg/kg	16000		12600		830		19100		19200	
Manganese	mg/kg	430		321		116		536		520	
Mercury	mg/kg										
Nickel	mg/kg	22.9		17.6		7.0		29.7		26.1	
Potassium	mg/kg	1380		1190				1720		1660	
Selenium	mg/kg										
Sodium	mg/kg										
Vanadium	mg/kg	27.1	J	21.8	J	12.9	J	24.4	J	22.9	J
Zinc	mg/kg	68.9		45.5		17.9		54.7		61.9	

PLUMBROOK
Pentolite Road Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		PRRP-DP08		PRRP-DP08		PRRP-DP08		PRRP-DP09		PRRP-DP09	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7480		7490		7500		7520R		7530R	
Sample Date:		10-JUN-98		10-JUN-98		10-JUN-98		25-JUN-98		25-JUN-98	
Depth:		0-2		4-6		8-10		0-2		4-6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	4450		8700		7140		7220		4410	
Antimony	mg/kg										
Arsenic	mg/kg	4.2		12.9		4.2		2.4		2.6	
Barium	mg/kg			42.5		47.4		24.3			
Beryllium	mg/kg										
Cadmium	mg/kg										
Calcium	mg/kg	1820		57000		52200		1750		63200	
Chromium	mg/kg	10.6		14.6		12.6		8.8		9.2	
Cobalt	mg/kg	6.0		9.8		7.9					
Copper	mg/kg	6.5		21.7		16.5		4.9		11.2	
Iron	mg/kg	13400		19400		16000		8430		9480	
Lead	mg/kg	3.1	J	9.2	J	7.6	J	5.1		4.9	
Magnesium	mg/kg	894		16800		15700		1110		16800	
Manganese	mg/kg	207		283		393		102	J	184	J
Mercury	mg/kg										
Nickel	mg/kg	7.9		25.7		19.6		6.3		8.4	
Potassium	mg/kg			1820		1580				1050	
Selenium	mg/kg										
Sodium	mg/kg										
Vanadium	mg/kg	24.4	J	24.1	J	21.3	J	15.8	J	20.9	J
Zinc	mg/kg	21.7		64.8		46.6		22.5		24.8	

PLUMBROOK

Pentolite Road Red Water Pond

Soils (Surface and Deep)

Detected Hits Summary

Sample Location:		PRRP-DP09		PRRP-DP10		PRRP-DP10		PRRP-DP10		PRRP-DP11	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7540R		7560		7570		7580		7600	
Sample Date:		25-JUN-98		10-JUN-98		10-JUN-98		10-JUN-98		13-JUN-98	
Depth:		8-10		0-1		4-5		9-10		0-2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	4630		4620		9510		11600		6200	
Antimony	mg/kg										
Arsenic	mg/kg	6.3		3.4		5.6		14.9		7.0	
Barium	mg/kg	26.5				81.5		90.9		39.4	
Beryllium	mg/kg					0.83		0.77			
Cadmium	mg/kg										
Calcium	mg/kg	58500		2440		4620		4510		17300	
Chromium	mg/kg	8.7		10.9		12.6		20.1		11.2	
Cobalt	mg/kg							10.2		7.4	
Copper	mg/kg	15.1		5.9		17.5		22.1		10.1	
Iron	mg/kg	10600		13700		16100		28700		14700	
Lead	mg/kg	6.3		3.2	J	11.3	J	14.3	J	7.9	
Magnesium	mg/kg	16900		920		2090		3970		6390	
Manganese	mg/kg	273	J	273		230		484		365	
Mercury	mg/kg										
Nickel	mg/kg	15.5		9.6		11.4		30.0		14.4	
Potassium	mg/kg	1200						1080		849	
Selenium	mg/kg	0.87				0.71					
Sodium	mg/kg					4130		4280		741	
Vanadium	mg/kg	17.5	J	23.6	J	22.1	J	31.6	J	20.1	J
Zinc	mg/kg	35.5		24.4		49.7		72.7		39.1	

PLUMBROOK
Pentolite Road Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		PRRP-DP11		PRRP-DP11		PRRP-DP12		PRRP-DP12		PRRP-DP12	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7610		7620		7640		7650		7660	
Sample Date:		13-JUN-98		13-JUN-98		11-JUN-98		11-JUN-98		11-JUN-98	
Depth:		4-6		8-10		0-2		4-6		8-10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	8950		11200		9560		12000		12300	
Antimony	mg/kg									7.8	J
Arsenic	mg/kg	25.3		5.3		7.3	J	5.7	J	7.4	J
Barium	mg/kg	209		51.5		71.5		60.3		69.5	
Beryllium	mg/kg	0.66				0.68					
Cadmium	mg/kg										
Calcium	mg/kg	3380		61600		4310		37100		55600	
Chromium	mg/kg	11.0		19.0		14.0		19.7		20.0	
Cobalt	mg/kg	30.3		10.8		6.4		10.8		12.0	
Copper	mg/kg	13.1		23.3		10.4		26.7		25.4	
Iron	mg/kg	36200		20800		16000		22300		23200	
Lead	mg/kg	9.8		9.9		9.6		10.7		10.6	
Magnesium	mg/kg	2500		20500		1900		16600		19100	
Manganese	mg/kg	1640		457		337		306		521	
Mercury	mg/kg										
Nickel	mg/kg	26.8		30.1		12.1		31.6		30.9	
Potassium	mg/kg	1060		2580		684		2430		2730	
Selenium	mg/kg										
Sodium	mg/kg	1200		1520							
Vanadium	mg/kg	34.2	J	31.0	J	23.7		26.8		29.9	
Zinc	mg/kg	68.5		62.2		38.5		71.9		65.3	

PLUMBROOK
Pentolite Road Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		PRRP-DP13		PRRP-DP13		PRRP-DP13		PRRP-DP14		PRRP-DP14	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7680		7690		7700		7720		7730	
Sample Date:		12-JUN-98		12-JUN-98		12-JUN-98		11-JUN-98		11-JUN-98	
Depth:		0-2		4-6		8-10		0-2		4-6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	7760		6380		5930		12700		9640	
Antimony	mg/kg										
Arsenic	mg/kg	3.4		5.3		4.1		7.4		8.2	
Barium	mg/kg			29.2		42.4		49.6		39.0	
Beryllium	mg/kg							0.69			
Cadmium	mg/kg										
Calcium	mg/kg			2100		67100		3010		4340	
Chromium	mg/kg	9.4		11.3		10.7		20.2		17.4	
Cobalt	mg/kg			7.0		7.2		8.3		8.4	
Copper	mg/kg	6.5		13.7		16.2		14.7		14.3	
Iron	mg/kg	11200		15400		13000		22900		20100	
Lead	mg/kg	4.1		5.1		7.7		6.8		6.5	
Magnesium	mg/kg	938		1560		25300		2310		2940	
Manganese	mg/kg	74.5		313		472		173		275	
Mercury	mg/kg							0.043			
Nickel	mg/kg	8.4		20.2		19.4		20.5		19.4	
Potassium	mg/kg					1330		771		713	
Selenium	mg/kg										
Sodium	mg/kg										
Vanadium	mg/kg	19.8		19.1		21.0		35.2		27.0	
Zinc	mg/kg	23.1		40.6		43.7		46.1		41.2	

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Pentolite Road Red Water Pond
Soils (Surface and Deep)
Detected Hits Summary

Report Date: 09/24/98

Sample Location:		PRRP-DP14		PRRP-DP15		PRRP-DP15		PRRP-DP15		PRRP-DP16	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7740		7760		7770		7780		7800	
Sample Date:		11-JUN-98		12-JUN-98		12-JUN-98		12-JUN-98		12-JUN-98	
Depth:		8-10		0-2		4-6		8-10		0-2	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	8710		6680		8870		6010		7300	
Antimony	mg/kg										
Arsenic	mg/kg	8.1		5.8		15.9		6.9		5.4	
Barium	mg/kg	64.8		34.9		176		41.5		30.4	
Beryllium	mg/kg										
Cadmium	mg/kg										
Calcium	mg/kg	53400		2880		53300		67400		7980	
Chromium	mg/kg	15.9		12.1		5.2		11.6		11.0	
Cobalt	mg/kg	10.3		5.8		26.7		9.0			
Copper	mg/kg	21.1		7.0		24.6		19.3		11.2	
Iron	mg/kg	18700		14700		20500		18300		13300	
Lead	mg/kg	9.6		5.5		13.4		8.1		7.7	J
Magnesium	mg/kg	21100		1660		17200		20300		3100	
Manganese	mg/kg	506		93.2		2270		467		147	
Mercury	mg/kg										
Nickel	mg/kg	26.5		13.9		56.1		22.2		12.0	
Potassium	mg/kg	1850				1380		1370			
Selenium	mg/kg										
Sodium	mg/kg							1030			
Vanadium	mg/kg	25.2		23.0		26.7		19.3		21.4	J
Zinc	mg/kg	57.3		30.4		59.7		52.0		37.4	

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Pentolite Road Red Water Pond
Soils (Surface and Deep)
Detected HIts Summary

Sample Location:		PRRP-DP16		PRRP-DP16		PRRP-DP17		PRRP-DP17		PRRP-DP17	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7810		7820		7840		7850		7860	
Sample Date:		12-JUN-98		12-JUN-98		10-JUN-98		10-JUN-98		10-JUN-98	
Depth:		4-6		8-10		0-2		4-6		8-10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	9850		9430		7140		5570		3320	
Antimony	mg/kg										
Arsenic	mg/kg	9.7		4.8		2.3	J	3.1	J	4.5	J
Barium	mg/kg	59.5		47.5							
Beryllium	mg/kg	0.55									
Cadmium	mg/kg										
Calcium	mg/kg	3080		57600		817		1850		61500	
Chromium	mg/kg	17.5		16.8		10.8		15.5		7.3	
Cobalt	mg/kg	14.4		9.1				7.3			
Copper	mg/kg	21.7		24.3		3.8		5.3		10.6	
Iron	mg/kg	22000		19300		13100		16400		8940	
Lead	mg/kg	10.7	J	10.5	J	3.3		2.9		4.3	
Magnesium	mg/kg	4020		18100		791		917		16200	
Manganese	mg/kg	437		303		104		323		252	
Mercury	mg/kg										
Nickel	mg/kg	31.1		27.0		6.4		8.1		11.0	
Potassium	mg/kg	1210		1750						726	
Selenium	mg/kg										
Sodium	mg/kg	1160		1090							
Vanadium	mg/kg	23.3	J	26.1	J	23.4		29.3		15.0	
Zinc	mg/kg	67.2		64.2		21.3		22.7		31.6	

Sample Location:		PRRP-DP18		PRRP-DP18		PRRP-DP18		PRRP-DP19		PRRP-DP19	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7880		7890		7900		7920		7930	
Sample Date:		11-JUN-98		11-JUN-98		11-JUN-98		12-JUN-98		12-JUN-98	
Depth:		0-2		4-6		8-10		0-2		4-6	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	10700		7340		9140		2370		7060	
Antimony	mg/kg										
Arsenic	mg/kg	4.0	J	27.3	J	5.8	J	14.1		4.7	
Barium	mg/kg	32.3		41.8		66.2		33.6		51.2	
Beryllium	mg/kg										
Cadmium	mg/kg					0.63					
Calcium	mg/kg	1040		38400		61600		54000		56900	
Chromium	mg/kg	14.6		13.6		15.7		4.2		12.5	
Cobalt	mg/kg	6.2		8.7		10.6				8.7	
Copper	mg/kg	7.5		19.0		24.3		10.6		19.1	
Iron	mg/kg	17800		20000		20600		15900		16200	
Lead	mg/kg	5.6		7.6		9.6		3.2		8.5	
Magnesium	mg/kg	1120		12800		19200		11500		22500	
Manganese	mg/kg	158		300		534		658		495	
Mercury	mg/kg										
Nickel	mg/kg	9.8		21.5		29.0		11.6		22.8	
Potassium	mg/kg			1310		1990				1490	
Selenium	mg/kg										
Sodium	mg/kg										
Vanadium	mg/kg	30.3		25.7		24.6		13.2		21.4	
Zinc	mg/kg	27.9		56.2		64.5		26.8		52.8	

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Pentolite Road Red Water Pond
Soils (Surface and Deep)
Detected HIts Summary

Sample Location:		PRRP-DP19		PRRP-DP20		PRRP-DP20		PRRP-DP20	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		7940		7960		7970		7980	
Sample Date:		12-JUN-98		13-JUN-98		13-JUN-98		13-JUN-98	
Depth:		8-10		0-2		4-6		8-10	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	9590		5360		7580		10800	
Antimony	mg/kg							7.7	
Arsenic	mg/kg	4.9		3.6		4.7		5.5	
Barium	mg/kg	61.0				58.2		69.3	
Beryllium	mg/kg								
Cadmium	mg/kg								
Calcium	mg/kg	68000		2160		61900		70400	
Chromium	mg/kg	15.7		11.4		13.1		17.0	
Cobalt	mg/kg	9.4		5.8		9.3		11.3	
Copper	mg/kg	22.4		7.2		18.3		20.1	
Iron	mg/kg	19900		16000		18000		22500	
Lead	mg/kg	9.4		3.2		9.0		9.7	
Magnesium	mg/kg	21300		999		24600		20200	
Manganese	mg/kg	512		262		527		513	
Mercury	mg/kg								
Nickel	mg/kg	26.1		9.3		24.0		29.6	
Potassium	mg/kg	2330				1610		2640	
Selenium	mg/kg								
Sodium	mg/kg								
Vanadium	mg/kg	26.2		27.6	J	23.8	J	28.6	J
Zinc	mg/kg	60.5		26.0		50.6		69.5	

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Pentolite Road Red Water Pond

Soils (Surface and Deep)

Detected HIts Summary

Sample Location:		PRRP-DP01		PRRP-DP01		PRRP-DP02		PRRP-DP03		PRRP-DP03	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7210		7220		7260		7280		7290	
Sample Date:		11-JUN-98		11-JUN-98		14-JUN-98		08-JUN-98		08-JUN-98	
Depth:		4-6		8-10		8-10		0-2		4-5	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	ug/kg	560		2700						43000	
1,3-Dinitrobenzene	ug/kg									9300	
2,4,6-Trinitrotoluene	ug/kg					380					
2,4-Dinitrotoluene	ug/kg	960		290		280		1200		25000	
2,6-Dinitrotoluene	ug/kg	350									
4-Amino-2,6-dinitrotoluene	ug/kg										

Sample Location:		PRRP-DP06		PRRP-DP09		PRRP-DP10		PRRP-DP11		PRRP-DP11	
Associated Site:		PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:		7420		7540R		7580		7600		7610	
Sample Date:		08-JUN-98		25-JUN-98		10-JUN-98		13-JUN-98		13-JUN-98	
Depth:		9-10		8-10		9-10		0-2		4-6	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	ug/kg	1800		1300		18000				430	
1,3-Dinitrobenzene	ug/kg					5200				430	
2,4,6-Trinitrotoluene	ug/kg							270			
2,4-Dinitrotoluene	ug/kg	1100				15000		320		1600	
2,6-Dinitrotoluene	ug/kg					1700				290	
4-Amino-2,6-dinitrotoluene	ug/kg							2700			

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Pentolite Road Red Water Pond
Soils (Surface and Deep)
Detected HIts Summary

Sample Location:		PRRP-DP11		PRRP-DP16	
Associated Site:		PRRP		PRRP	
Sample No:		7620		7820	
Sample Date:		13-JUN-98		12-JUN-98	
Depth:		8-10		8-10	
EXPLOSIVES	Units	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene	ug/kg	7000		1900	
1,3-Dinitrobenzene	ug/kg	5800		250	
2,4,6-Trinitrotoluene	ug/kg				
2,4-Dinitrotoluene	ug/kg	1200		500	
2,6-Dinitrotoluene	ug/kg	300		500	
4-Amino-2,6-dinitrotoluene	ug/kg				

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Pentolite Road Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP02		PRRP-DP03		PRRP-DP04		PRRP-DP05		PRRP-DP07	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7270		7310		7350		7390		7470	
Sample Date:			14-JUN-98		08-JUN-98		09-JUN-98		14-JUN-98		10-JUN-98	
VOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2-Butanone		ug/L			24	J						
2-Hexanone		ug/L			1.8	J						
Acetone		ug/L			20	J						
Benzene		ug/L			0.14	J						
Carbon disulfide		ug/L					0.26	J				
Ethylbenzene		ug/L			0.19	J						
Tetrachloroethene		ug/L	0.14	J	0.22	J			0.26	J	0.17	J
Total xylenes		ug/L			0.88	J						
Trichloroethene		ug/L									0.43	J

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Pentolite Road Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP08		PRRP-DP12		PRRP-DP19	
Associated Site:			PRRP		PRRP		PRRP	
Sample No:			7510		7670		7950	
Sample Date:			10-JUN-98		11-JUN-98		13-JUN-98	
VOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2-Butanone		ug/L						
2-Hexanone		ug/L						
Acetone		ug/L						
Benzene		ug/L						
Carbon disulfide		ug/L	0.16	J	0.16	J		
Ethylbenzene		ug/L						
Tetrachloroethene		ug/L					0.13	J
Total xylenes		ug/L						
Trichloroethene		ug/L	0.16	J				

PLUMBROOK

Pentolite Road Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP03		PRRP-DP09		PRRP-DP11		PRRP-DP20	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			7310		7550		7630		7990	
Sample Date:			08-JUN-98		14-JUN-98		14-JUN-98		14-JUN-98	
TSS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Total suspended solids		ug/L	110000		12000		34000		6000	

PLUMBROOK

Pentolite Road Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP02		PRRP-DP03		PRRP-DP09		PRRP-DP11		PRRP-DP20	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7270		7310		7550		7630		7990	
Sample Date:			14-JUN-98		08-JUN-98		14-JUN-98		14-JUN-98		14-JUN-98	
TOC-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Total organic carbon		ug/L	19300		6600000		671000		3060000		1800	

PLUMBROOK

Pentolite Road Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP02		PRRP-DP03		PRRP-DP04		PRRP-DP09		PRRP-DP11	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7270		7310		7350		7550		7630	
Sample Date:			14-JUN-98		08-JUN-98		09-JUN-98		14-JUN-98		14-JUN-98	
TDS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Total dissolved solids		ug/L	1410000		15000000		401000		4370000		22100000	

PLUMBROOK

Pentolite Road Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP20	
Associated Site:			PRRP	
Sample No:			7990	
Sample Date:			14-JUN-98	
TDS-W	Fltr	Units	Result	Val Qlfr
Total dissolved solids		ug/L	276000	

PLUMBROOK

Pentolite Road Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP02		PRRP-DP03		PRRP-DP04		PRRP-DP09		PRRP-DP11	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7270		7310		7350		7550		7630	
Sample Date:			14-JUN-98		08-JUN-98		09-JUN-98		14-JUN-98		14-JUN-98	
SULFATE-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Sulfate		ug/L	574000		10000000		22700		1150000		3730000	

Sample Location:			PRRP-DP20	
Associated Site:			PRRP	
Sample No:			7990	
Sample Date:			14-JUN-98	
SULFATE-W	Fltr	Units	Result	Val Qlfr
Sulfate		ug/L	24700	

PLUMBROOK

Pentolite Road Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP01		PRRP-DP03		PRRP-DP05		PRRP-DP08		PRRP-DP10	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7230		7310		7390		7510		7590	
Sample Date:			12-JUN-98		08-JUN-98		14-JUN-98		10-JUN-98		10-JUN-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4-Dinitrophenol		ug/L	8.3	J	5800	D					5900	D
2,4-Dinitrotoluene		ug/L	20		9200	D			2.8	J	4100	D
2,6-Dinitrotoluene		ug/L	3.3	J	550						390	
2-Nitroaniline		ug/L	3.2	J								
2-Nitrophenol		ug/L										
3-Nitroaniline		ug/L	88									
4,6-Dinitro-2-methylphenol		ug/L			2300						1700	
4-Nitrophenol		ug/L			290	J					210	J
Naphthalene		ug/L					1.9	J				
bis(2-Ethylhexyl)phthalate		ug/L										

PLUMBROOK

Pentolite Road Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP11		PRRP-DP12		PRRP-DP14		PRRP-DP15		PRRP-DP16	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7630		7670		7750		7790		7830	
Sample Date:			14-JUN-98		11-JUN-98		12-JUN-98		12-JUN-98		13-JUN-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2,4-Dinitrophenol		ug/L									22	J
2,4-Dinitrotoluene		ug/L	380	J			2.5	J	80	J	35	
2,6-Dinitrotoluene		ug/L									6.2	J
2-Nitroaniline		ug/L									1.3	J
2-Nitrophenol		ug/L									2.1	J
3-Nitroaniline		ug/L										
4,6-Dinitro-2-methylphenol		ug/L							830	J		
4-Nitrophenol		ug/L									5.0	J
Naphthalene		ug/L										
bis(2-Ethylhexyl)phthalate		ug/L			10		3.2	J				

PLUMBROOK

Pentolite Road Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP17		PRRP-DP19	
Associated Site:			PRRP		PRRP	
Sample No:			7870		7950	
Sample Date:			11-JUN-98		13-JUN-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
2,4-Dinitrophenol		ug/L				
2,4-Dinitrotoluene		ug/L	1.5	J	2.3	J
2,6-Dinitrotoluene		ug/L				
2-Nitroaniline		ug/L				
2-Nitrophenol		ug/L				
3-Nitroaniline		ug/L				
4,6-Dinitro-2-methylphenol		ug/L				
4-Nitrophenol		ug/L				
Naphthalene		ug/L				
bis(2-Ethylhexyl)phthalate		ug/L				

Sample Location:			PRRP-DP03		PRRP-DP09		PRRP-DP11	
Associated Site:			PRRP		PRRP		PRRP	
Sample No:			7310		7550		7630	
Sample Date:			08-JUN-98		14-JUN-98		14-JUN-98	
NITRATE-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Nitrate		ug/L	465000		16900		350000	J

PLUMBROOK
Pentolite Road Red Water Pond
Groundwater
Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP01		PRRP-DP02		PRRP-DP03		PRRP-DP04		PRRP-DP05	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7230		7270		7310		7350		7390	
Sample Date:			12-JUN-98		14-JUN-98		08-JUN-98		09-JUN-98		14-JUN-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum		ug/L	52900		52200		88400		280000		32700	
Antimony		ug/L										
Arsenic		ug/L			63.3				305	J	53.9	
Arsenic	Y	ug/L							13.4			
Barium		ug/L							1680			
Barium	Y	ug/L										
Beryllium		ug/L										
Cadmium		ug/L										
Calcium		ug/L	432000		221000		683000		1530000		606000	
Calcium	Y	ug/L	207000		193000		542000		90900		274000	
Chromium		ug/L	112		113		208		561		82.6	
Chromium	Y	ug/L										
Cobalt		ug/L					2610					
Cobalt	Y	ug/L					3090					
Copper		ug/L	277				1410		669			
Copper	Y	ug/L					1600					
Iron		ug/L	125000		100000		200000		679000		98200	
Iron	Y	ug/L			150		7480		166			
Lead		ug/L	58.3	J	42.6		96.7	J	292	J	48.4	
Lead	Y	ug/L										
Magnesium		ug/L	101000		66300		172000		616000		204000	
Magnesium	Y	ug/L	52800		44400		139000		25300		96100	
Manganese		ug/L	4040		1120		39600		12400		3240	
Manganese	Y	ug/L	1680		257		42700		39.3		818	
Mercury		ug/L			0.23				0.55			
Nickel		ug/L					2380		740			
Nickel	Y	ug/L					2760					
Potassium		ug/L							31500			
Sodium		ug/L	788000		266000		5930000				107000	

PLUMBROOK
Pentolite Road Red Water Pond
Groundwater
Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP07		PRRP-DP08		PRRP-DP09		PRRP-DP10		PRRP-DP11	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7470		7510		7550		7590		7630	
Sample Date:			10-JUN-98		10-JUN-98		14-JUN-98		10-JUN-98		14-JUN-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum		ug/L	69000		178000		56800		78300		4820	
Antimony		ug/L			118	J						
Arsenic		ug/L			259	J						
Arsenic	Y	ug/L	11.0									
Barium		ug/L	556		1210							
Barium	Y	ug/L										
Beryllium		ug/L			8.8							
Cadmium		ug/L			6.5							
Calcium		ug/L	650000		863000		873000		662000		848000	
Calcium	Y	ug/L	66500		58000		269000		681000		745000	
Chromium		ug/L	114		273		141		223			
Chromium	Y	ug/L									495	
Cobalt		ug/L	77.6		208				5610		3360	
Cobalt	Y	ug/L							6660		3030	
Copper		ug/L	194		472		438		2800		1530	
Copper	Y	ug/L					311		3260		2000	
Iron		ug/L	176000		468000		134000		202000		15500	
Iron	Y	ug/L	190		116				15300		5870	
Lead		ug/L	86.2	J	323	J	67.1					
Lead	Y	ug/L					31.5					
Magnesium		ug/L	217000		253000		195000		326000		249000	
Magnesium	Y	ug/L	15800		12900		73600		348000		218000	
Manganese		ug/L	4310		11800		4050		55100		35300	
Manganese	Y	ug/L	71.4				1120		62400		31300	
Mercury		ug/L			0.20		0.29					
Nickel		ug/L	191		521		407		5040		1950	
Nickel	Y	ug/L							5820		1970	
Potassium		ug/L	12300		22700							
Sodium		ug/L	7060				707000		9410000		[illegible]00	

PLUMBROOK
Pentolite Road Red Water Pond
Groundwater
Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP12		PRRP-DP13		PRRP-DP14		PRRP-DP15		PRRP-DP16	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7670		7710		7750		7790		7830	
Sample Date:			11-JUN-98		12-JUN-98		12-JUN-98		12-JUN-98		13-JUN-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum		ug/L	170000		7220		7970				15500	
Antimony		ug/L	105	J								
Arsenic		ug/L	238	J	11.1	J						
Arsenic	Y	ug/L										
Barium		ug/L	896									
Barium	Y	ug/L										
Beryllium		ug/L	8.5									
Cadmium		ug/L										
Calcium		ug/L	926000		249000		281000				283000	
Calcium	Y	ug/L	98800		189000		405000		780000		212000	
Chromium		ug/L	277		16.0		105					
Chromium	Y	ug/L										
Cobalt		ug/L	172								668	
Cobalt	Y	ug/L							1290		784	
Copper		ug/L	515		27.7						510	
Copper	Y	ug/L							531		568	
Iron		ug/L	426000		18800		27500				40200	
Iron	Y	ug/L	125		237		2400		3240		1950	
Lead		ug/L	202	J	9.5	J	38.1	J	33.0	J		
Lead	Y	ug/L										
Magnesium		ug/L	313000		71900		83800				88000	
Magnesium	Y	ug/L	25100		53800		143000		260000		67700	
Manganese		ug/L	6460		496		927				2080	
Manganese	Y	ug/L	150		108		454		1460		1700	
Mercury		ug/L	0.32									
Nickel		ug/L	490								468	
Nickel	Y	ug/L							2370		441	
Potassium		ug/L	21600									
Sodium		ug/L	5960		29700		79400				1180000	

Sample Location:			PRRP-DP17		PRRP-DP18		PRRP-DP19		PRRP-DP20	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			7870		7910		7950		7990	
Sample Date:			11-JUN-98		12-JUN-98		13-JUN-98		14-JUN-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum		ug/L	38600				118000		13400	
Antimony		ug/L					77.8	J		
Arsenic		ug/L			584	J	122	J	31.3	
Arsenic	Y	ug/L					22.9		16.9	
Barium		ug/L	218				1020			
Barium	Y	ug/L					237			
Beryllium		ug/L					5.5			
Cadmium		ug/L								
Calcium		ug/L	1270000				787000		300000	
Calcium	Y	ug/L	55000		244000		63400		58800	
Chromium		ug/L	65.8				176		26.9	
Chromium	Y	ug/L								
Cobalt		ug/L					140			
Cobalt	Y	ug/L								
Copper		ug/L	106				334		33.2	
Copper	Y	ug/L								
Iron		ug/L	87000				266000		31500	
Iron	Y	ug/L			1260		119		456	
Lead		ug/L			320	J	142	J	21.6	
Lead	Y	ug/L								
Magnesium		ug/L	286000				240000		75900	
Magnesium	Y	ug/L	13200		80300		16400		14300	
Manganese		ug/L	3280				5940		1220	
Manganese	Y	ug/L	22.4		252		28.4		78.4	
Mercury		ug/L			0.25					
Nickel		ug/L	113				338			
Nickel	Y	ug/L								
Potassium		ug/L	6430				20800			
Sodium		ug/L	6010				14500		6480	

PLUMBROOK
Pentolite Road Red Water Pond
Groundwater
Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP01		PRRP-DP02		PRRP-DP03		PRRP-DP04		PRRP-DP05	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7230		7270		7310		7350		7390	
Sample Date:			12-JUN-98		14-JUN-98		08-JUN-98		09-JUN-98		14-JUN-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Sodium	Y	ug/L	1130000		288000		7260000				119000	
Vanadium		ug/L							821			
Zinc		ug/L	374		299		597		2010		279	
Zinc	Y	ug/L							21.6			

PLUMBROOK

Pentolite Road Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP07		PRRP-DP08		PRRP-DP09		PRRP-DP10		PRRP-DP11	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7470		7510		7550		7590		7630	
Sample Date:			10-JUN-98		10-JUN-98		14-JUN-98		10-JUN-98		14-JUN-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Sodium	Y	ug/L	5490				754000		12600000		3210000	
Vanadium		ug/L	212		438							
Zinc		ug/L	525		1550		441		736			
Zinc	Y	ug/L	77.7		26.5				225		1100	

Sample Location:			PRRP-DP12		PRRP-DP13		PRRP-DP14		PRRP-DP15		PRRP-DP16	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7670		7710		7750		7790		7830	
Sample Date:			11-JUN-98		12-JUN-98		12-JUN-98		12-JUN-98		13-JUN-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Sodium	Y	ug/L			33500		256000		2560000		1450000	
Vanadium		ug/L	391		52.3		877		1000			
Zinc		ug/L	1350		76.0							
Zinc	Y	ug/L										

PLUMBROOK

Pentolite Road Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP17		PRRP-DP18		PRRP-DP19		PRRP-DP20	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			7870		7910		7950		7990	
Sample Date:			11-JUN-98		12-JUN-98		13-JUN-98		14-JUN-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Sodium	Y	ug/L			140000		11500		6810	
Vanadium		ug/L	163		101		288		76.5	
Zinc		ug/L	341				799		151	
Zinc	Y	ug/L	28.7							

Sample Location:			PRRP-DP02		PRRP-DP03		PRRP-DP04		PRRP-DP09		PRRP-DP11	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7270		7310		7350		7550		7630	
Sample Date:			14-JUN-98		08-JUN-98		09-JUN-98		14-JUN-98		14-JUN-98	
HARDNESS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Hardness		ug/L	780000		3400000		940000		1640000		2440000	

Sample Location:			PRRP-DP20	
Associated Site:			PRRP	
Sample No:			7990	
Sample Date:			14-JUN-98	
HARDNESS-W	Fltr	Units	Result	Val Qlfr
Hardness		ug/L	670000	

Sample Location:			PRRP-DP01		PRRP-DP03		PRRP-DP04		PRRP-DP06		PRRP-DP07	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7230		7310		7350		7430		7470	
Sample Date:			12-JUN-98		08-JUN-98		09-JUN-98		09-JUN-98		10-JUN-98	
EXPLOSIVES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene		ug/L										
1,3-Dinitrobenzene		ug/L			4800		0.28		10		0.42	
2,4-Dinitrotoluene		ug/L	10		6800		0.47		31		0.82	
2,6-Dinitrotoluene		ug/L							5.1			
Tetryl		ug/L										

Sample Location:			PRRP-DP08		PRRP-DP10		PRRP-DP11		PRRP-DP12		PRRP-DP13	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7510		7590		7630R		7670		7710	
Sample Date:			10-JUN-98		10-JUN-98		25-JUN-98		11-JUN-98		12-JUN-98	
EXPLOSIVES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene		ug/L					600					
1,3-Dinitrobenzene		ug/L	1.2		2100		840		1.3		1.6	
2,4-Dinitrotoluene		ug/L	1.4		2200		150		2.3		2.4	
2,6-Dinitrotoluene		ug/L	0.28		400				0.35		0.36	
Tetryl		ug/L									0.20	

Sample Location:			PRRP-DP17		PRRP-DP18	
Associated Site:			PRRP		PRRP	
Sample No:			7870		7910	
Sample Date:			11-JUN-98		12-JUN-98	
EXPLOSIVES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr
1,3,5-Trinitrobenzene		ug/L				
1,3-Dinitrobenzene		ug/L	6.4		1.1	
2,4-Dinitrotoluene		ug/L	8.9		2.4	
2,6-Dinitrotoluene		ug/L	1.7		0.36	
Tetryl		ug/L				

PLUMBROOK

Pentolite Road Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP03		PRRP-DP09		PRRP-DP11	
Associated Site:			PRRP		PRRP		PRRP	
Sample No:			7310		7550		7630	
Sample Date:			08-JUN-98		14-JUN-98		14-JUN-98	
CYANIDE	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Cyanide, total		ug/L	780		23		400	

Sample Location:			PRRP-DP02		PRRP-DP04		PRRP-DP20	
Associated Site:			PRRP		PRRP		PRRP	
Sample No:			7270		7350		7990	
Sample Date:			14-JUN-98		09-JUN-98		14-JUN-98	
CHLORIDE-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Chloride		ug/L	9800		2300		2300	

PLUMBROOK

Pentolite Road Red Water Pond

Groundwater

Detected Hits Summary

Report Date: 09/24/98

Sample Location:			PRRP-DP02		PRRP-DP03		PRRP-DP04		PRRP-DP09		PRRP-DP11	
Associated Site:			PRRP		PRRP		PRRP		PRRP		PRRP	
Sample No:			7270		7310		7350		7550		7630	
Sample Date:			14-JUN-98		08-JUN-98		09-JUN-98		14-JUN-98		14-JUN-98	
ALKALINITY	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Alkalinity		ug/L	450000		1500000		263000		476000		864000	

Sample Location:			PRRP-DP20	
Associated Site:			PRRP	
Sample No:			7990	
Sample Date:			14-JUN-98	
ALKALINITY	Fltr	Units	Result	Val Qlfr
Alkalinity		ug/L	155000	

PLUM BROOK

Surface Water - WARP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:			WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04		WARP-SW05	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			12100		12110		12120		12130		12140	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
WATER QUALITY	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Hardness		ug/L	380000		408000		400000		420000		372000	

PLUM BROOK

Surface Water - WARP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:			WARP-SW06	
Associated Site:			WARP	
Sample No:			12150	
Sample Date:			05-NOV-98	
WATER QUALITY	Fltr	Units	Result	Val Qlfr
Hardness		ug/L	592000	

PLUM BROOK

Surface Water - WARP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:			WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04		WARP-SW05	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			12100		12110		12120		12130		12140	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
VOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Bromomethane		ug/L	0.22	J			0.16	J	0.21	J	0.21	J

PLUM BROOK

Surface Water - WARP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:			WARP-SW06	
Associated Site:			WARP	
Sample No:			12150	
Sample Date:			05-NOV-98	
VOLATILES	Fltr	Units	Result	Val Qlfr
Bromomethane		ug/L	0.16	J

PLUM BROOK

Surface Water - WARP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:			WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04		WARP-SW05	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			12100		12110		12120		12130		12140	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
di-n-Octyl phthalate		ug/L									7.8	J

PLUM BROOK

Surface Water - WARP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:			WARP-SW06	
Associated Site:			WARP	
Sample No:			12150	
Sample Date:			05-NOV-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr
di-n-Octyl phthalate		ug/L		

PLUM BROOK
Surface Water - WARP
Detected Hits Summary

Report Date: 03/02/99

Sample Location:			WARP-SW01		WARP-SW02		WARP-SW03		WARP-SW04		WARP-SW05	
Associated Site:			WARP		WARP		WARP		WARP		WARP	
Sample No:			12100		12110		12120		12130		12140	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum		ug/L	631	J			300	J			13800	J
Aluminum	Y	ug/L					233				6340	
Arsenic		ug/L									20.2	
Arsenic	Y	ug/L									10.9	
Calcium		ug/L	107000		106000		106000		105000		31100	
Calcium	Y	ug/L	104000		106000		104000		103000		27600	
Chromium		ug/L									17.4	
Chromium	Y	ug/L										
Iron		ug/L	1300		126		747		646		21100	
Iron	Y	ug/L	153				484		589		8630	
Lead		ug/L									25.0	
Lead	Y	ug/L									7.2	
Magnesium		ug/L	26000		26500		26200		25800		46500	
Magnesium	Y	ug/L	25600		26500		25700		25400		44300	
Manganese		ug/L	890		30.6		261		126		1150	
Manganese	Y	ug/L	218				97.2		107		669	
Potassium		ug/L	9400		9730		9750		9910		5590	
Potassium	Y	ug/L	8870		9340		9080		9370			
Sodium		ug/L	38200		39300		38300		39000		104000	
Sodium	Y	ug/L	37400		38800		37200		37900		103000	
Vanadium		ug/L										
Zinc		ug/L	27.0								84.8	
Zinc	Y	ug/L									42.3	

PLUM BROOK
Surface Water - WARP
Detected Hits Summary

Report Date: 03/02/99

Sample Location:			WARP-SW06	
Associated Site:			WARP	
Sample No:			12150	
Sample Date:			05-NOV-98	
METALS-W	Fltr	Units	Result	Val Qlfr
Aluminum		ug/L	12400	J
Aluminum	Y	ug/L	11400	
Arsenic		ug/L	21.8	
Arsenic	Y	ug/L	17.2	
Calcium		ug/L	115000	
Calcium	Y	ug/L	71500	
Chromium		ug/L	23.3	J
Chromium	Y	ug/L	21.2	J
Iron		ug/L	19000	
Iron	Y	ug/L	15500	
Lead		ug/L	32.9	
Lead	Y	ug/L	20.4	J
Magnesium		ug/L	50700	
Magnesium	Y	ug/L	49100	
Manganese		ug/L	1550	
Manganese	Y	ug/L	907	
Potassium		ug/L	5180	
Potassium	Y	ug/L	5900	
Sodium		ug/L	107000	
Sodium	Y	ug/L	112000	
Vanadium		ug/L	52.2	
Zinc		ug/L	92.5	
Zinc	Y	ug/L	68.0	

PLUM BROOK

Sediment - WARP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:		WARP-SD01		WARP-SD02		WARP-SD03		WARP-SD04		WARP-SD05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		11100		11110		11120		11130		11140	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
WET CHEMISTRY	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Total organic carbon	mg/kg	5430		3960		9650		5520		40200	

PLUM BROOK

Sediment - WARP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:		WARP-SD06	
Associated Site:		WARP	
Sample No:		11150	
Sample Date:		05-NOV-98	
Depth:		0 - .5	
WET CHEMISTRY	Units	Result	Val Qlfr
Total organic carbon	mg/kg	93400	

PLUM BROOK

Sediment - WARP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:		WARP-SD03		WARP-SD05		WARP-SD06	
Associated Site:		WARP		WARP		WARP	
Sample No:		11120		11140		11150	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
2-Butanone	ug/kg	29	J	21	J		
Acetone	ug/kg			110	J	71	J

PLUM BROOK

Sediment - WARP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:		WARP-SD01		WARP-SD04	
Associated Site:		WARP		WARP	
Sample No:		11100		11130	
Sample Date:		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr
Benzo(a)anthracene	ug/kg	51	J		
Benzo(a)pyrene	ug/kg	53	J		
Benzo(k)fluoranthene	ug/kg	52	J		
Chrysene	ug/kg	60	J		
Fluoranthene	ug/kg	110	J	47	J
Phenanthrene	ug/kg	55	J		
Pyrene	ug/kg	79	J		

PLUM BROOK

Sediment - WARP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:		WARP-SD01		WARP-SD02		WARP-SD03		WARP-SD04		WARP-SD05	
Associated Site:		WARP		WARP		WARP		WARP		WARP	
Sample No:		11100		11110		11120		11130		11140	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5		0 - .5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	3170		2450		4260		3230		6880	
Arsenic	mg/kg	5.4		3.5		7.3		8.6		4.6	
Barium	mg/kg	26.6				36.0		34.8		65.0	
Calcium	mg/kg	10800		13900		12300		16000		6710	
Chromium	mg/kg	6.7		5.3		8.1		7.4		12.6	
Cobalt	mg/kg	10.9		6.4		10.6		10.8			
Copper	mg/kg	13.7		8.8		15.0		9.8		15.2	
Iron	mg/kg	14900		9900		16500		24300		16000	
Lead	mg/kg	9.7		6.5		9.4		8.1		22.6	
Magnesium	mg/kg	2110		2720		2520		2950		3130	
Manganese	mg/kg	305		231		290		255		338	
Nickel	mg/kg	23.0		13.7		24.4		18.3		15.2	
Potassium	mg/kg					821					
Vanadium	mg/kg										
Zinc	mg/kg	48.0		35.1		58.4		45.3		54.4	

PLUM BROOK
Sediment - WARP
Detected Hits Summary

Report Date: 03/02/99

Sample Location:	WARP-SD06
Associated Site:	WARP
Sample No:	11150
Sample Date:	05-NOV-98
Depth:	0 - .5

METALS	Units	Result	Val Qlfr
Aluminum	mg/kg	9600	
Arsenic	mg/kg	8.7	
Barium	mg/kg		
Calcium	mg/kg	74700	
Chromium	mg/kg	28.7	
Cobalt	mg/kg		
Copper	mg/kg	24.5	
Iron	mg/kg	18000	
Lead	mg/kg	32.1	
Magnesium	mg/kg	6770	
Manganese	mg/kg	726	
Nickel	mg/kg	24.5	
Potassium	mg/kg		
Vanadium	mg/kg	25.0	
Zinc	mg/kg	77.0	

PLUM BROOK

Surface Water - PRRP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:			PRRP-SW01		PRRP-SW02		PRRP-SW03		PRRP-SW04	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			12160		12170		12180		12190	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
WATER QUALITY	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Hardness		ug/L	328000		284000		488000		432000	

PLUM BROOK

Surface Water - PRRP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:			PRRP-SW01		PRRP-SW02		PRRP-SW03		PRRP-SW04	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			12160		12170		12180		12190	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
VOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Bromodichloromethane		ug/L	0.72	J						
Bromomethane		ug/L	0.17	J	0.11	J				
Dibromochloromethane		ug/L	0.21	J						

PLUM BROOK

Surface Water - PRRP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:			PRRP-SW01		PRRP-SW02		PRRP-SW03	
Associated Site:			PRRP		PRRP		PRRP	
Sample No:			12160		12170		12180	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98	
SEMIVOLATILES	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr

PLUM BROOK

Surface Water - PRRP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:			PRRP-SW01		PRRP-SW02		PRRP-SW03		PRRP-SW04	
Associated Site:			PRRP		PRRP		PRRP		PRRP	
Sample No:			12160		12170		12180		12190	
Sample Date:			05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
METALS-W	Fltr	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum		ug/L	778	J	530	J	3040	J		
Aluminum	Y	ug/L	463		874		10200			
Barium	Y	ug/L					215			
Calcium		ug/L	74200		71700		118000		97900	
Calcium	Y	ug/L	74000		71400		179000		98100	
Chromium	Y	ug/L					17.2			
Iron		ug/L	1420		972		5790		948	
Iron	Y	ug/L	809		1260		16800		550	
Lead	Y	ug/L					8.7			
Magnesium		ug/L	16000		15800		37300		36800	
Magnesium	Y	ug/L	15700		15800		46700		36900	
Manganese		ug/L	245		261		404		67.1	
Manganese	Y	ug/L	144		249		649		34.4	
Potassium	Y	ug/L					7130			
Sodium		ug/L	24900		24700		13700		14800	
Sodium	Y	ug/L	25700		24500		15000		15300	
Vanadium	Y	ug/L					53.9			
Zinc		ug/L					58.0		20.2	
Zinc	Y	ug/L					145			

PLUM BROOK

Sediment - PRRP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:		PRRP-SD01		PRRP-SD02		PRRP-SD03		PRRP-SD04	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		11160		11170		11180		11190	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
WET CHEMISTRY	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Total organic carbon	mg/kg	33000		5450		17000		12000	J

PLUM BROOK

Sediment - PRRP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:		PRRP-SD01		PRRP-SD03	
Associated Site:		PRRP		PRRP	
Sample No:		11160		11180	
Sample Date:		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5	
VOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr
2-Butanone	ug/kg	11	J	10	J
Acetone	ug/kg	51	J	49	J

PLUM BROOK

Sediment - PRRP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:		PRRP-SD02		PRRP-SD04	
Associated Site:		PRRP		PRRP	
Sample No:		11170		11190	
Sample Date:		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5	
SEMIVOLATILES	Units	Result	Val Qlfr	Result	Val Qlfr
Acenaphthene	ug/kg	110	J		
Anthracene	ug/kg	77	J	29	J
Benzo(a)anthracene	ug/kg			84	J
Benzo(a)pyrene	ug/kg			96	J
Benzo(b)fluoranthene	ug/kg			100	J
Benzo(ghi)perylene	ug/kg			53	J
Benzo(k)fluoranthene	ug/kg			84	J
Carbazole	ug/kg	180	J		
Chrysene	ug/kg			110	J
Dibenzofuran	ug/kg	60	J		
Fluoranthene	ug/kg	140	J	230	J
Fluorene	ug/kg	110	J		
Indeno(1,2,3-cd)pyrene	ug/kg			54	J
Phenanthrene	ug/kg	320	J	120	J
Pyrene	ug/kg	110	J	160	J

PLUM BROOK

Sediment - PRRP

Detected Hits Summary

Report Date: 03/02/99

Sample Location:		PRRP-SD01		PRRP-SD02		PRRP-SD03		PRRP-SD04	
Associated Site:		PRRP		PRRP		PRRP		PRRP	
Sample No:		11160		11170		11180		11190	
Sample Date:		05-NOV-98		05-NOV-98		05-NOV-98		05-NOV-98	
Depth:		0 - .5		0 - .5		0 - .5		0 - .5	
METALS	Units	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr	Result	Val Qlfr
Aluminum	mg/kg	6020		2830		5130		3400	
Arsenic	mg/kg	4.5		5.1		4.3		4.4	
Barium	mg/kg	53.4				48.1		30.9	
Calcium	mg/kg	96000		46300		62000		8110	
Chromium	mg/kg	11.5		6.3		10.4		6.8	
Copper	mg/kg	17.9		7.6		14.5		7.4	
Iron	mg/kg	16200		9620		13700		9330	
Lead	mg/kg	12.8		4.8		7.8		5.6	
Magnesium	mg/kg	10700		19300		13500		2710	
Manganese	mg/kg	865		421		404		104	
Nickel	mg/kg	18.6		9.5		17.9		10.4	
Potassium	mg/kg					1040			
Vanadium	mg/kg	17.4		12.9		14.2		7.9	
Zinc	mg/kg	73.3		23.2		58.4		42.1	

APPENDIX G

GEOTECHNICAL TESTING DATA

GEO·ENVIRONMENTAL
DRILLING COMPANY, INC.

July 27, 1998

Mr. Michael Stangberg
IT Corporation
312 Directors Drive
Knoxville, Tennessee 37923-3211

RE: Geotechnical Testing Laboratory Reports
NASA Plumbrook Site
Sandusky, Ohio
GEO Project No. G98-2234
IT Project No. 7737701

Dear Mr. Stangberg:

Enclosed please find the original copy of the geotechnical testing laboratory reports for the second group of samples submitted for testing. The chain-of-custody/request-for-analysis form is attached for these samples.

If you have any questions, please contact me at your earliest convenience at (412) 371-6551.

Thank you.

Sincerely,

Geo-Environmental Drilling Company, Inc.

Deborah Ann Weible, P.G., CWD
President & General Manager

Attachments Laboratory Report
Chain-Of-Custody/Request-For-Analysis Form

82234208.LTR

GEO-ENVIRONMENTAL DRILLING COMPANY, INC. *Environmental and Geotechnical Drilling Services*
11101 Frankstown Road
Pittsburgh, PA 15235-3096
tel: 412/ 371-6551
fax: 412/ 371-1027

Relinquished by: John Vandenburg IT Corp 1450 / 6-16-98

Received by: JC Beal 1450 16-98 GEO-ENVIRONMENTAL

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD (cont.)*

Reference Document No.[30] _____

Page____of ____

Project Name PBOW - PRRP

Project No. 773701.03000000

Samples Shipment Date _____

ONE CONTAINER PER LINE

Sample Number[14]	Sample Description/Type[15]	Date/Time Collected[16]	Container Type[17]	Sample Volume[18]	Preservative[19]	Requested Testing Program[20]	Condition on Receipt[21]	Disposal Record No.[22]
OW-98-PRRP-DP23-Geot-0204	Soil	6-13-98	2x15" Acetate Sleeve	2x15"	None	Moisture Content (D2216)		
OW-98-PRRP-DP23-Geot-0608		6-13-98				Atterberg Limits (D4318)	FOR LAB USE ONLY	
OW-98-PRRP-DP23-Geot-1012		6-13-98				Sieve Analysis		
						USCS Classification, For All Samples		
OW-98-PRRP-DP22-Geot-0204		6-13-98					FOR LAB USE ONLY	
OW-98-PRRP-DP22-Geot-0608		6-13-98						
OW-98-PRRP-DP22-Geot-1012		6-13-98					FOR LAB USE ONLY	
OW-98-PRRP-DP21-Geot-0204		6-13-98					FOR LAB USE ONLY	
OW-98-PRRP-DP21-Geot-0608		6-13-98						
OW-98-PRRP-DP21-Geot-0810		6-13-98						
							FOR LAB USE ONLY	
OW-98-PRRP-DP25-Geot-0204		6-13-98						
OW-98-PRRP-DP25-Geot-0608		6-13-98						
OW-98-PRRP-DP25-Geot-1012		6-13-98						
OW-98-PRRP-DP24-Geot-0204		6-13-98					FOR LAB USE ONLY	
OW-98-PRRP-DP24-Geot-0608		6-13-98						
OW-98-PRRP-DP24-Geot-1012		6-13-98						

White: To accompany samples

Yellow: Field copy

*See back of form for special instructions.

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LABORATORY TEST REPORT

July 24, 1998

Project No. 98178-01

Ms. Deb Weible
Geoenvironmental Drilling Co.
11101 Frankstown Rd.
Pgh., PA 15235

RE: Soils Testing – PBOW-WARP

Transmitted herein are the results of the soils testing performed for Geoenvironmental Drilling verified on the Project Verification Form, submitted July 13, 1998. The testing was performed in accordance with the ASTM methods listed on the enclosed data sheets. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

Disclaimer

The test results are believed to be representative of the samples submitted but are indicative only of the specimens which were evaluated. Geotechnics has no direct knowledge of the origin of the samples, implies no position with regard to the disposition of the test results, i.e., pass/fail, and makes no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization of the Client and Geotechnics. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please do not hesitate to contact our office.

Respectively submitted,

David R. Backstrom
Laboratory Director

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MOISTURE CONTENT

ASTM D 2216 (SOP-S1)

Client	GEO-ENVIRONMENTAL DRILLING
Client Reference	PBOW-WARP
Project No.	98178-01

Lab ID	.001	.002	.003	.004	.005
Boring No.	PBOW-98-Warp	PBOW-98-Warp	PBOW-98-Warp	PBOW-98-Warp	PBOW-98-Warp
Depth (ft)	NA	NA	NA	NA	NA
Sample No.	DP21-geot-0204	DP21-geot-0608	DP21-geot-1012	DP22-geot-0204	DP22-geot-0608
Tare Number	573	544	560	579	700
Wt. of Tare & WS (gm)	243.29	219.45	230.99	216.09	203.38
Wt. of Tare & DS (gm)	222.77	191.8	201.5	187.28	176.63
Wt. of Tare (gm)	82.55	84.79	82.75	84	76.01
Wt. of Water (gm)	20.52	27.65	29.49	28.81	26.75
Wt. of DS (gm)	140.22	107.01	118.75	103.28	100.62
Water Content (%)	**14.6**	**25.8**	**24.8**	**27.9**	**26.6**

Lab ID	.006	.007	.008	.009	.010
Boring No.	PBOW-98-Warp	PBOW-98-Warp	PBOW-98-Warp	PBOW-98-Warp	PBOW-98-Warp
Depth (ft)	NA	NA	NA	NA	NA
Sample No.	DP22-geot-1012	DP23-geot-0204	DP23-geot-0608	DP23-geot-1012	DP24-geot-0204
Tare Number	546	1730	677	Z10	566
Wt. of Tare & WS (gm)	179.23	227.51	193.21	203.85	211
Wt. of Tare & DS (gm)	168.52	198.52	169.37	177.01	188.47
Wt. of Tare (gm)	86.17	82.02	74.51	85.91	84.79
Wt. of Water (gm)	10.71	28.99	23.84	26.84	22.53
Wt. of DS (gm)	82.35	116.5	94.86	91.1	103.68
Water Content (%)	**13.0**	**24.9**	**25.1**	**29.5**	**21.7**

Notes : *NA*

Tested By *BL* *Date* *7/14/98* *Checked By* LB *Date* 7-17-98

DCN: CT-S1 DATE 6-30-98 REVISION: 2

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MOISTURE CONTENT

ASTM D 2216 (SOP-S1)

Client	GEO-ENVIRONMENTAL DRILLING
Client Reference	PBOW-WARP
Project No.	98178-01

Lab ID	.011	.012
Boring No.	PBOW-98-Warp	PBOW-98-Warp
Depth (ft)	NA	NA
Sample No.	DP24-geot-0608	DP24-geot-1012
Tare Number	728	1723
Wt. of Tare & WS (gm)	222.86	218.25
Wt. of Tare & DS (gm)	198.75	199.53
Wt. of Tare (gm)	86.61	83.56
Wt. of Water (gm)	24.11	18.72
Wt. of DS (gm)	112.14	115.97
Water Content (%)	**21.5**	**16.1**

Notes : *NA*

Tested By *BL* *Date* *7/14/98* *Checked By* LB *Date* 7-17-98

DCN: CT-S1 DATE 6-30-98 REVISION: 2

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SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP21-GEOT-0204
Lab ID	98178-01.001	Soil Color	**BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**

USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND (NON-PLASTIC FINES)***

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 C:\MSOFFICE\EXCEL\PrintQ\[H117.xls]Sheet1

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP21-GEOT-0204
Lab ID	98178-01.001	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1662	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	528.00	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	464.30	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	98.36	Weight of Tare (gm)	NA
Weight of Water (gm)	63.70	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	365.94	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**17.4**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	365.94
Dry Weight - 3/4" Sample (gm)	236.1	Weight of minus #200 material (gm)	129.81
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	236.13
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.54	0.15	0.15	99.85	**99.85**
#20	0.850	3.91	1.07	1.22	98.78	**98.78**
#40	0.425	4.42	1.21	2.42	97.58	**97.58**
#60	0.250	7.65	2.09	4.51	95.49	**95.49**
#140	0.106	170.80	46.67	51.19	48.81	**48.81**
#200	0.075	48.81	13.34	64.53	35.47	**35.47**
Pan	-	129.81	35.47	100.00	-	-

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP21-GEOT-0204
Lab ID	98178-01.001	Visual Description	**BROWN SILT**
			(MInus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By TO *Date* 7/22/98 *Checked By* LB *Date* 7-22-98

DCN: CT-S4B DATE: 7-11-97 REVISION : 2

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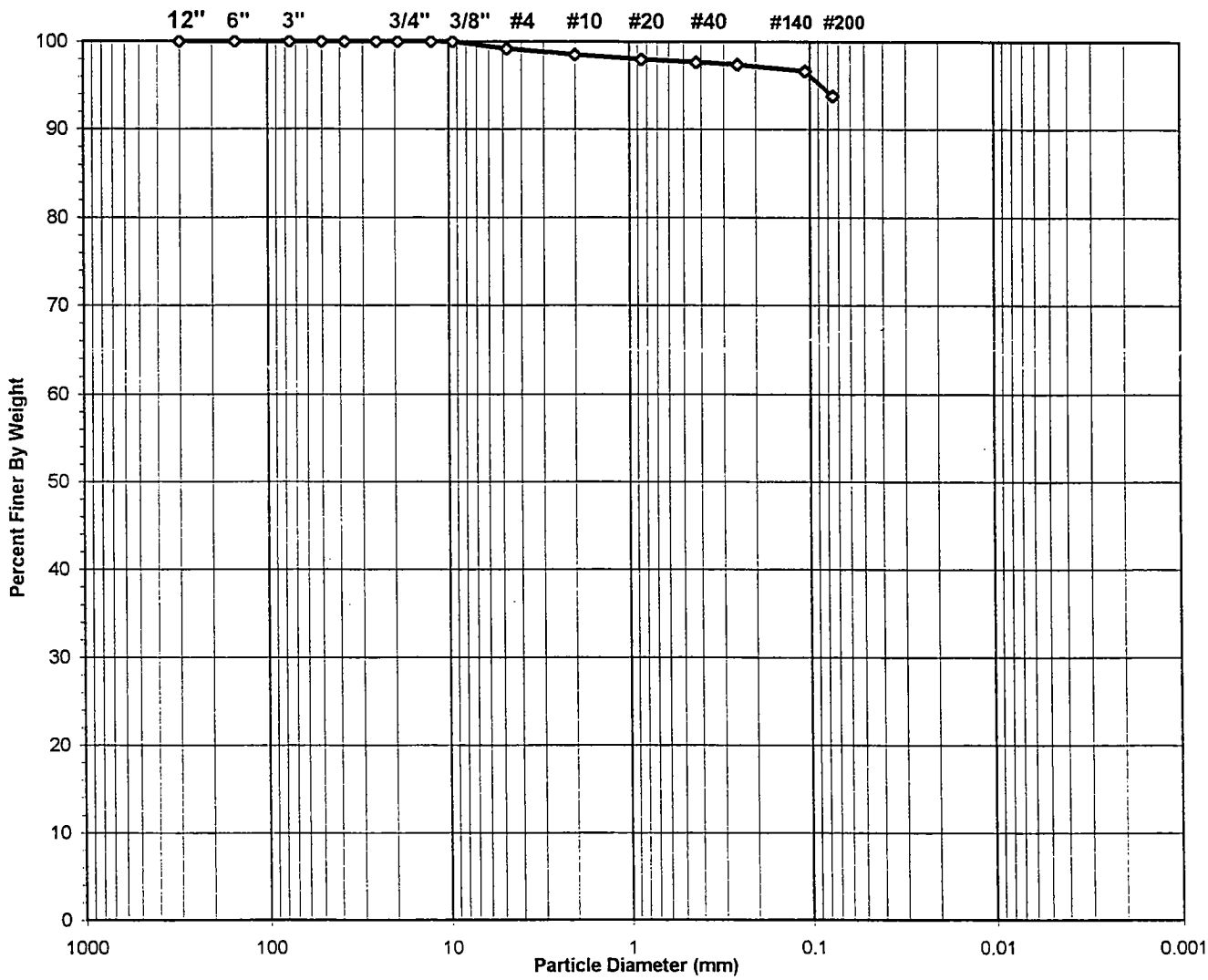
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP21-GEOT-0608
Lab ID	98178-01.002	Soil Color	**GRAYISH BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY***

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[H118.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP21-GEOT-0608
Lab ID	98178-01.002	Soil Color	**GRAYISH BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	846	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	611.70	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	514.90	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	103.23	Weight of Tare (gm)	NA
Weight of Water (gm)	96.80	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	411.67	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**23.5**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	411.67
Dry Weight - 3/4" Sample (gm)	25.5	Weight of minus #200 material (gm)	386.15
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	25.52
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	3.17	0.77	0.77	99.23	**99.23**
#10	2.00	2.79	0.68	1.45	98.55	**98.55**
#20	0.850	2.21	0.54	1.98	98.02	**98.02**
#40	0.425	1.32	0.32	2.31	97.69	**97.69**
#60	0.250	1.08	0.26	2.57	97.43	**97.43**
#140	0.106	3.15	0.77	3.33	96.67	**96.67**
#200	0.075	11.80	2.87	6.20	93.80	**93.80**
Pan	-	386.15	93.80	100.00	-	-

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP21-GEOT-0608
Lab ID	98178-01.002	Soil Description	**GRAYISH BROWN LEAN CLAY**

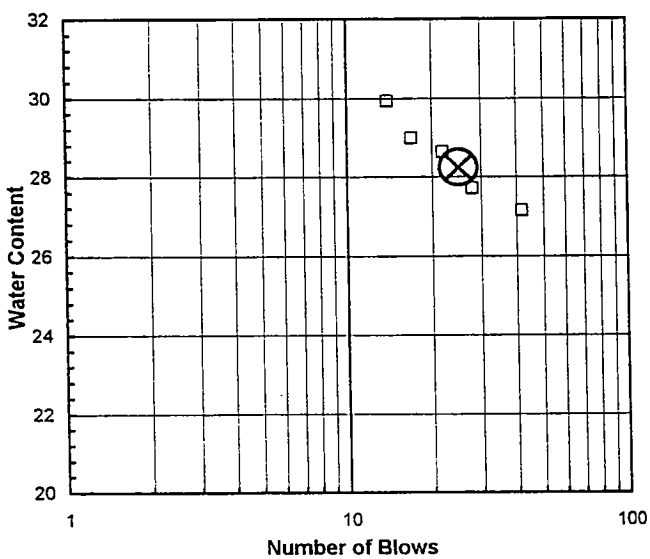
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	MULTIPOINT
Tare Number	57	2280	2278	96	82	
Wt. of Tare & WS (gm)	39.02	35.83	39.90	38.35	42.68	
Wt. of Tare & DS (gm)	34.04	31.39	34.12	33.44	37.14	
Wt. of Tare (gm)	15.68	15.36	13.92	16.49	18.62	
Wt. of Water (gm)	4.98	4.44	5.78	4.91	5.54	
Wt. of DS (gm)	18.36	16.03	20.2	16.95	18.52	
Moisture Content (%)	**27.1**	**27.7**	**28.6**	**29.0**	**29.9**	
Number of Blows	**42**	**28**	**22**	**17**	**14**	

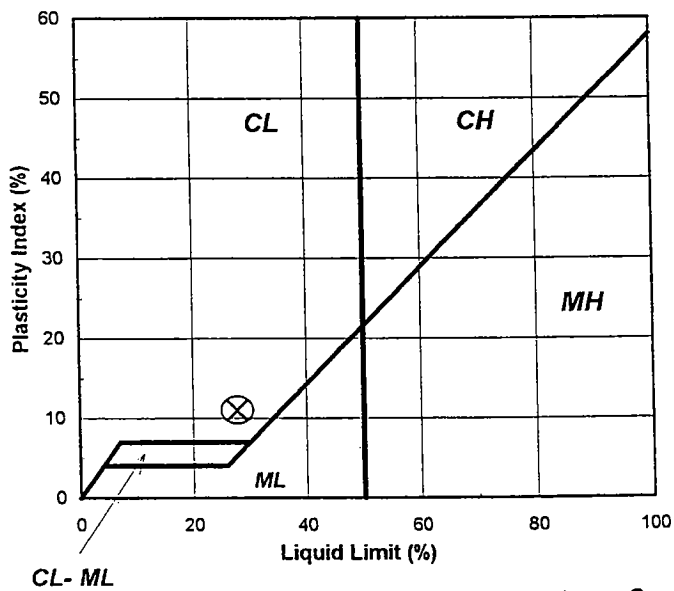
Plastic Limit Test	**1**	**2**	**3**
Tare Number	2302	2300	2301
Wt. of Tare & WS (gm)	25.99	22.67	25.89
Wt. of Tare & DS (gm)	25.07	21.75	24.98
Wt. of Tare (gm)	19.89	16.39	19.79
Wt. of Water (gm)	0.92	0.92	0.91
Wt. of DS (gm)	5.18	5.36	5.19
Moisture Content (%)	**17.8**	**17.2**	**17.5**

Test Results	
Liquid Limit (%)	**28**
Plastic Limit (%)	**17**
Plasticity Index (%)	**11**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By TO *Date* 7/22/98 *Checked By* LB *Date* 7-24-98

page 1 of 1 DCN: CT-S4 DATE: 1/13/98 REVISION: 3 *CE\EXCEL\PrintQ\[H107.xls]Sheet1*

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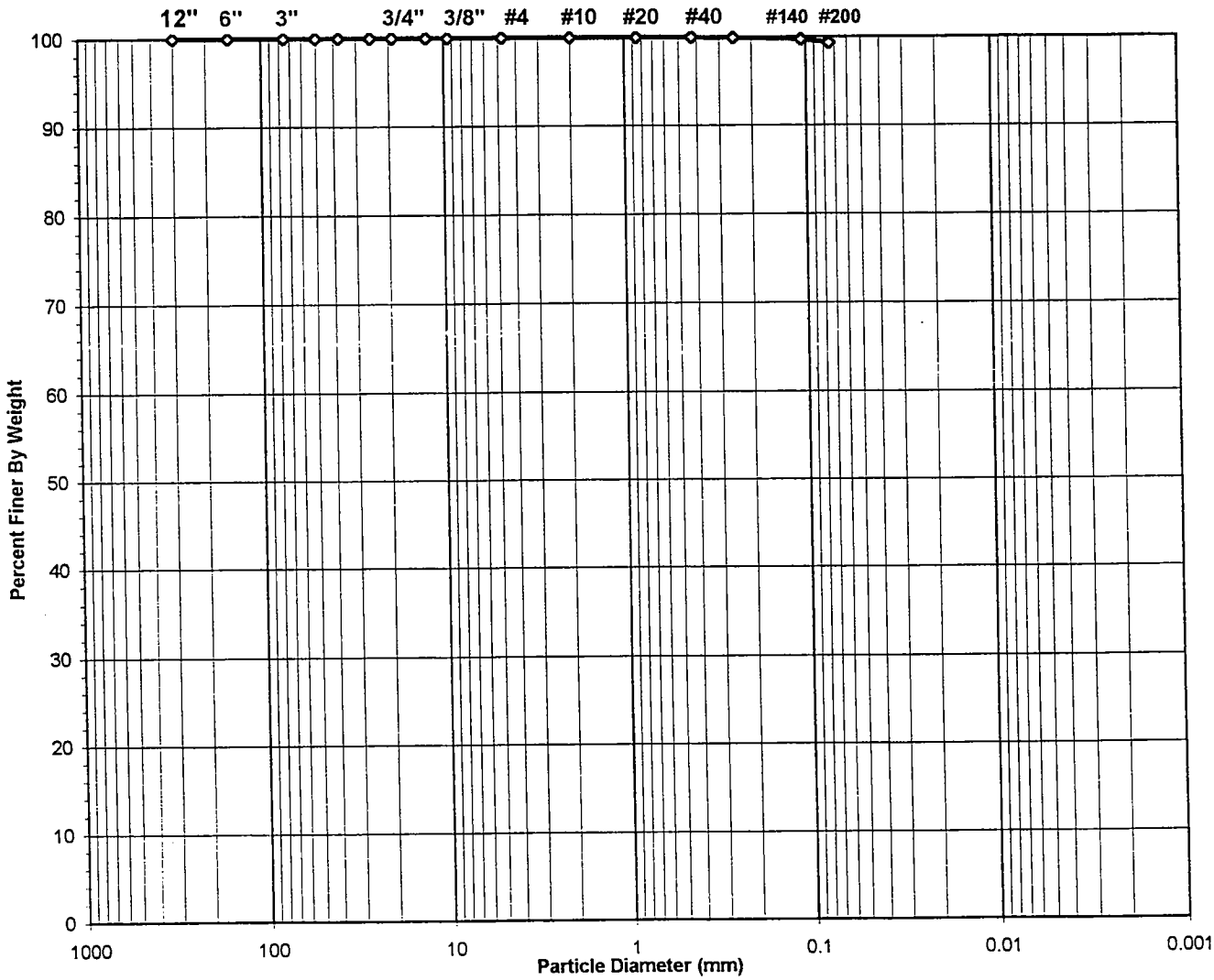
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP21-GEOT-1012
Lab ID	98178-01.003	Soil Color	**BROWNISH GRAY**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY***

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[H119.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP21-GEOT-1012
Lab ID	98178-01.003	Soil Color	**BROWNISH GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2497	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	640.90	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	531.50	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	99.65	Weight of Tare (gm)	NA
Weight of Water (gm)	109.40	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	431.85	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**25.3**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	431.85
Dry Weight - 3/4" Sample (gm)	2.8	Weight of minus #200 material (gm)	429.07
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	2.78
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.00	0.00	0.00	100.00	**100.00**
#20	0.850	0.04	0.01	0.01	99.99	**99.99**
#40	0.425	0.09	0.02	0.03	99.97	**99.97**
#60	0.250	0.13	0.03	0.06	99.94	**99.94**
#140	0.106	0.99	0.23	0.29	99.71	**99.71**
#200	0.075	1.53	0.35	0.64	99.36	**99.36**
Pan	-	429.07	99.36	100.00	-	-

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP21-GEOT-1012
Lab ID	98178-01.003	Soil Description	**BROWNISH GRAY LEAN CLAY**

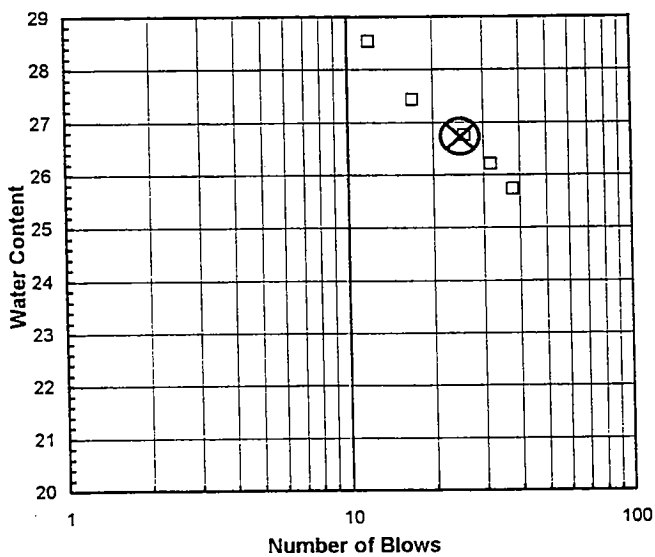
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	2032	2029	2229	2039	2033	MULTIPOINT
Wt. of Tare & WS (gm)	37.95	39.23	42.17	36.92	41.16	
Wt. of Tare & DS (gm)	33.29	34.73	37.65	32.07	36.61	
Wt. of Tare (gm)	15.17	17.55	20.75	14.38	20.66	
Wt. of Water (gm)	4.66	4.5	4.52	4.85	4.55	
Wt. of DS (gm)	18.12	17.18	16.9	17.69	15.95	
Moisture Content (%)	**25.7**	**26.2**	**26.7**	**27.4**	**28.5**	
Number of Blows	**38**	**32**	**26**	**17**	**12**	

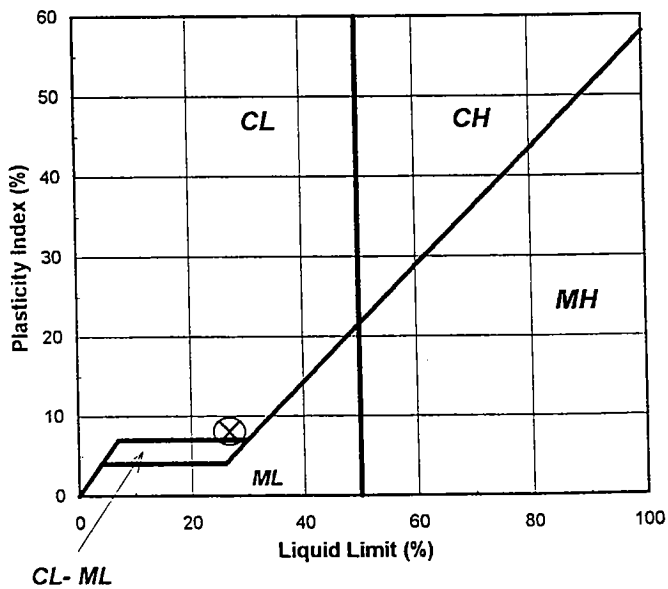
Plastic Limit Test	**1**	**2**	**3**
Tare Number	117	2280	38
Wt. of Tare & WS (gm)	22.67	22.57	25.41
Wt. of Tare & DS (gm)	21.62	21.42	24.27
Wt. of Tare (gm)	16.04	15.37	18.16
Wt. of Water (gm)	1.05	1.15	1.14
Wt. of DS (gm)	5.58	6.05	6.11
Moisture Content (%)	**18.8**	**19.0**	**18.7**

Test Results	
Liquid Limit (%)	**27**
Plastic Limit (%)	**19**
Plasticity Index (%)	**8**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By *DBB* *Date* *7/21/98* *Checked By* LB *Date* 7-22-98

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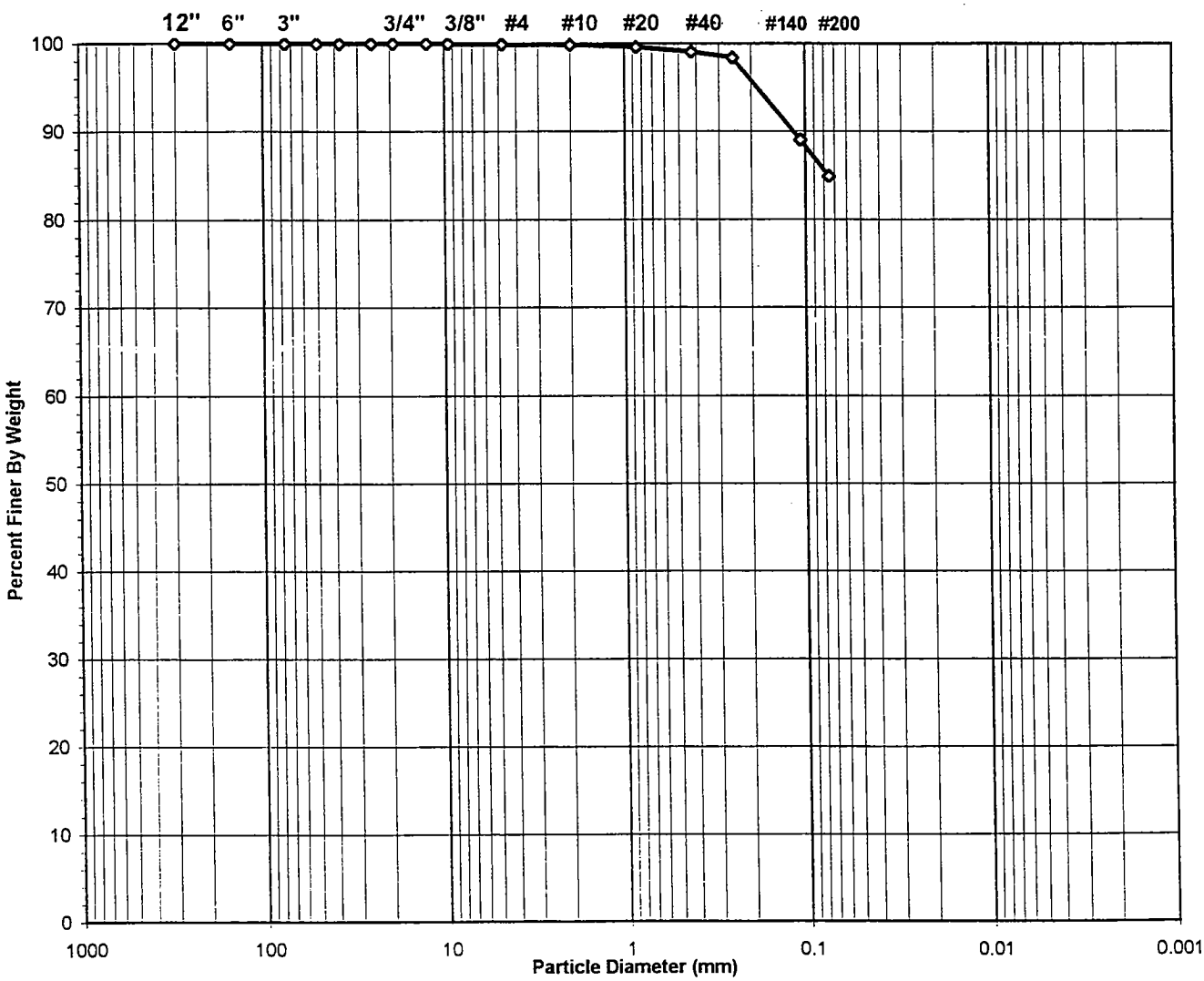
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP22-GEOT-0204
Lab ID	98178-01.004	Soil Color	**BROWN**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY WITH SAND***

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 C:\MSOFFICE\EXCEL\PrintQ\[H120.xls]Sheet1

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP22-GEOT-0204
Lab ID	98178-01.004	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1636	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	488.50	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	410.70	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	98.79	Weight of Tare (gm)	NA
Weight of Water (gm)	77.80	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	311.91	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**24.9**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	311.91
Dry Weight - 3/4" Sample (gm)	47.2	Weight of minus #200 material (gm)	264.76
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	47.15
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.28	0.09	0.09	99.91	**99.91**
#10	2.00	0.19	0.06	0.15	99.85	**99.85**
#20	0.850	0.81	0.26	0.41	99.59	**99.59**
#40	0.425	1.64	0.53	0.94	99.06	**99.06**
#60	0.250	1.97	0.63	1.57	98.43	**98.43**
#140	0.106	29.36	9.41	10.98	89.02	**89.02**
#200	0.075	12.90	4.14	15.12	84.88	**84.88**
Pan	-	264.76	84.88	100.00	-	-

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP22-GEOT-0204
Lab ID	98178-01.004	Soil Description	**BROWN LEAN CLAY**

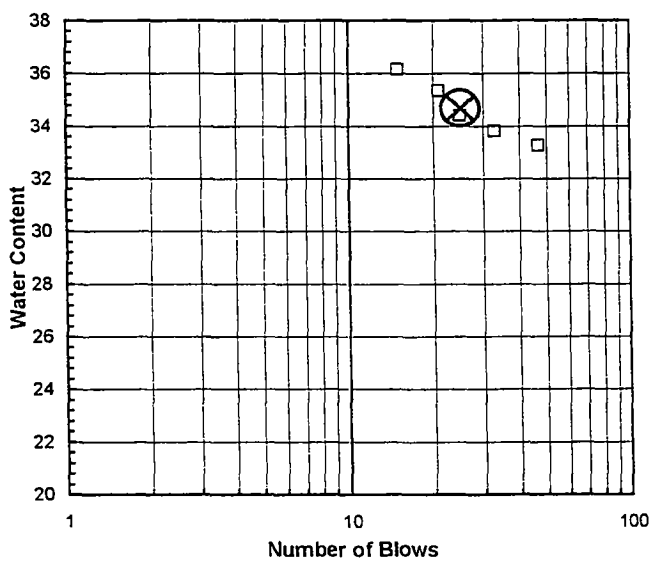
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	70	109	112	75	35	M U L T I P O I N T
Wt. of Tare & WS (gm)	27.73	26.41	29.88	26.37	37.83	
Wt. of Tare & DS (gm)	24.96	23.56	26.58	23.59	32.36	
Wt. of Tare (gm)	16.62	15.13	16.98	15.72	17.22	
Wt. of Water (gm)	2.77	2.85	3.3	2.78	5.47	
Wt. of DS (gm)	8.34	8.43	9.6	7.87	15.14	
Moisture Content (%)	**33.2**	**33.8**	**34.4**	**35.3**	**36.1**	
Number of Blows	**47**	**33**	**25**	**21**	**15**	

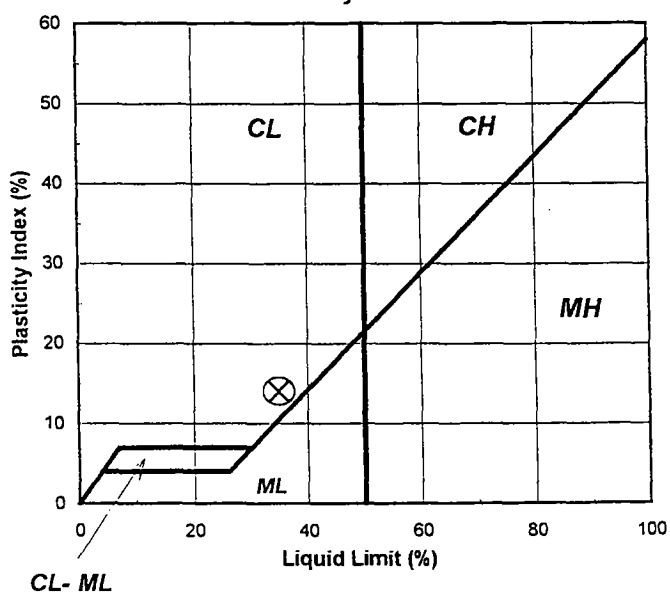
Plastic Limit Test	**1**	**2**	**3**
Tare Number	117	38	64
Wt. of Tare & WS (gm)	22.31	24.43	22.94
Wt. of Tare & DS (gm)	21.20	23.32	21.86
Wt. of Tare (gm)	16.03	18.17	16.79
Wt. of Water (gm)	1.11	1.11	1.08
Wt. of DS (gm)	5.17	5.15	5.07
Moisture Content (%)	**21.5**	**21.6**	**21.3**

Test Results	
Liquid Limit (%)	**35**
Plastic Limit (%)	**21**
Plasticity Index (%)	**14**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By TO *Date* 7/22/98 *Checked By* LB *Date* 7-24-98

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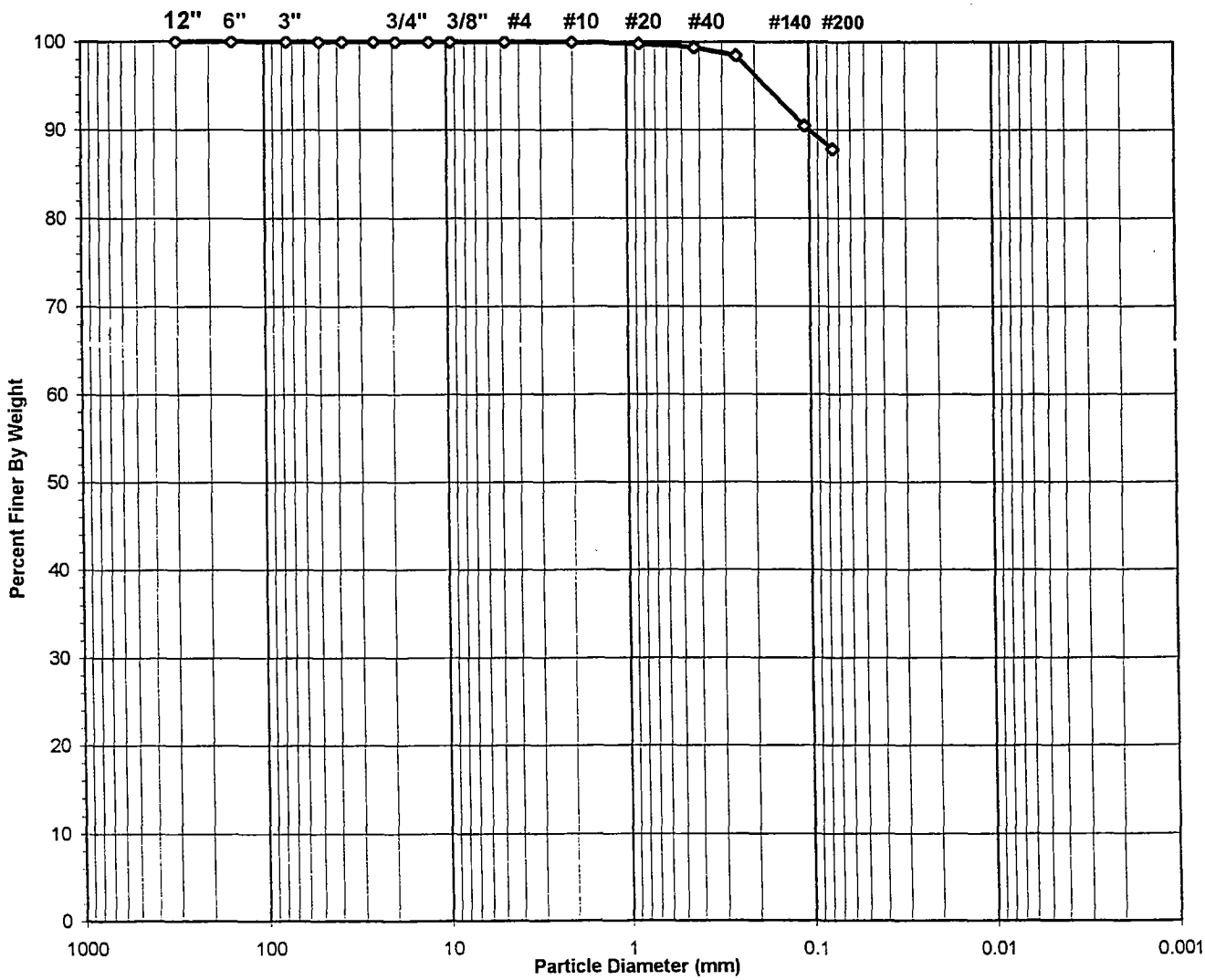
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP22-GEOT-0608
Lab ID	98178-01.005	Soil Color	**BROWN**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY***

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP22-GEOT-0608
Lab ID	98178-01.005	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1003	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	614.40	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	513.60	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	104.39	Weight of Tare (gm)	NA
Weight of Water (gm)	100.80	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	409.21	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**24.6**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	409.21
Dry Weight - 3/4" Sample (gm)	49.9	Weight of minus #200 material (gm)	359.33
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	49.88
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.13	0.03	0.03	99.97	**99.97**
#20	0.850	0.63	0.15	0.19	99.81	**99.81**
#40	0.425	1.81	0.44	0.63	99.37	**99.37**
#60	0.250	3.63	0.89	1.52	98.48	**98.48**
#140	0.106	32.59	7.96	9.48	90.52	**90.52**
#200	0.075	11.09	2.71	12.19	87.81	**87.81**
Pan	-	359.33	87.81	100.00	-	-

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP22-GEOT-0608
Lab ID	98178-01.005	Soil Description	**BROWN LEAN CLAY**

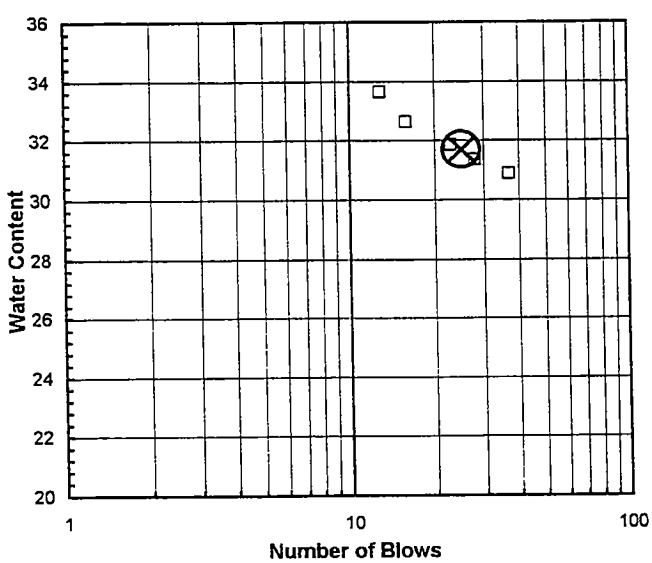
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	MULTIPOINT
Tare Number	2234	1886	1877	2230	2297	
Wt. of Tare & WS (gm)	37.45	36.87	37.20	28.99	30.39	
Wt. of Tare & DS (gm)	32.42	31.95	31.95	26.32	28.02	
Wt. of Tare (gm)	16.12	16.25	15.46	18.13	20.97	
Wt. of Water (gm)	5.03	4.92	5.25	2.67	2.37	
Wt. of DS (gm)	16.3	15.7	16.49	8.19	7.05	
Moisture Content (%)	**30.9**	**31.3**	**31.8**	**32.6**	**33.6**	
Number of Blows	**37**	**28**	**23**	**16**	**13**	

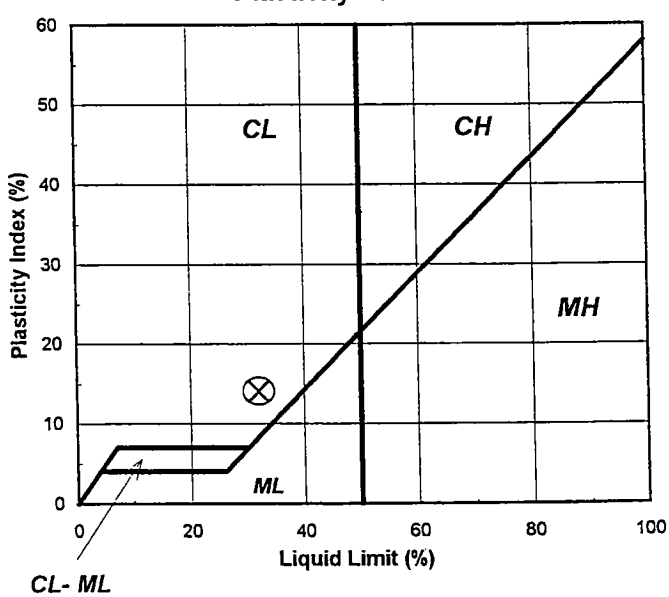
Plastic Limit Test	**1**	**2**	**3**
Tare Number	2271	54	110
Wt. of Tare & WS (gm)	22.76	22.61	23.69
Wt. of Tare & DS (gm)	21.88	21.66	22.79
Wt. of Tare (gm)	16.71	16.51	17.69
Wt. of Water (gm)	0.88	0.95	0.9
Wt. of DS (gm)	5.17	5.15	5.1
Moisture Content (%)	**17.0**	**18.4**	**17.6**

Test Results	
Liquid Limit (%)	**32**
Plastic Limit (%)	**18**
Plasticity Index (%)	**14**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



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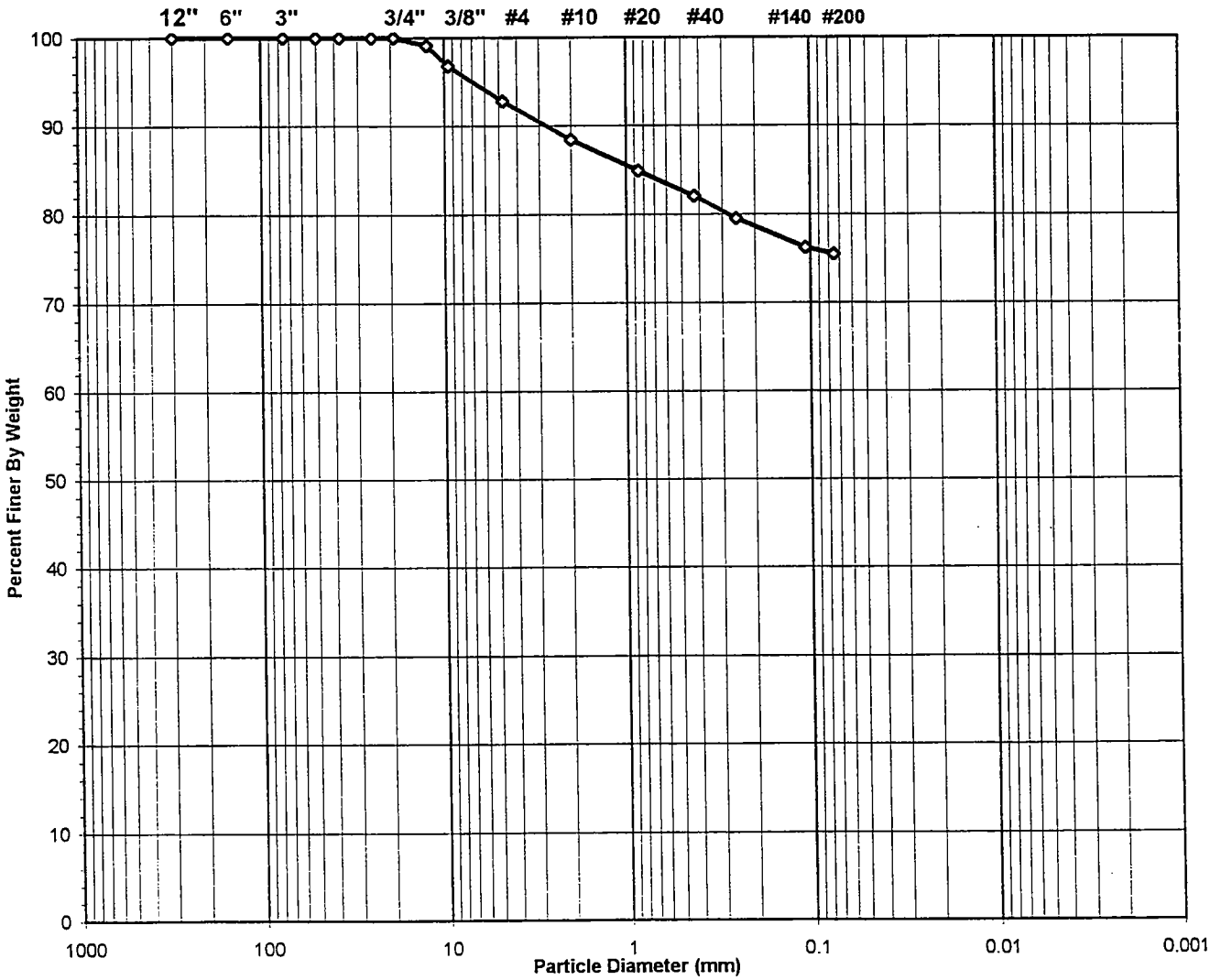
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP22-GEOT-1012
Lab ID	98178-01.006	Soil Color	**GRAY**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY WITH SAND***

Tested By TM Date 7/14/98 Checked By LB Date 7-24-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[H122.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP22-GEOT-1012
Lab ID	98178-01.006	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2467	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	617.70	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	557.90	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	99.47	Weight of Tare (gm)	NA
Weight of Water (gm)	59.80	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	458.43	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**13.0**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	458.43
Dry Weight - 3/4" Sample (gm)	112.6	Weight of minus #200 material (gm)	345.84
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	112.59
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	4.01	0.87	0.87	99.13	**99.13**
3/8"	9.50	10.59	2.31	3.18	96.82	**96.82**
#4	4.75	18.45	4.02	7.21	92.79	**92.79**
#10	2.00	19.86	4.33	11.54	88.46	**88.46**
#20	0.850	16.43	3.58	15.13	84.87	**84.87**
#40	0.425	12.95	2.82	17.95	82.05	**82.05**
#60	0.250	11.54	2.52	20.47	79.53	**79.53**
#140	0.106	15.27	3.33	23.80	76.20	**76.20**
#200	0.075	3.49	0.76	24.56	75.44	**75.44**
Pan	-	345.84	75.44	100.00	-	-

Tested By TM Date 7/14/98 Checked By LB Date 7-24-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP22-GEOT-1012
Lab ID	98178-01.006	Soil Description	**GRAY LEAN CLAY**

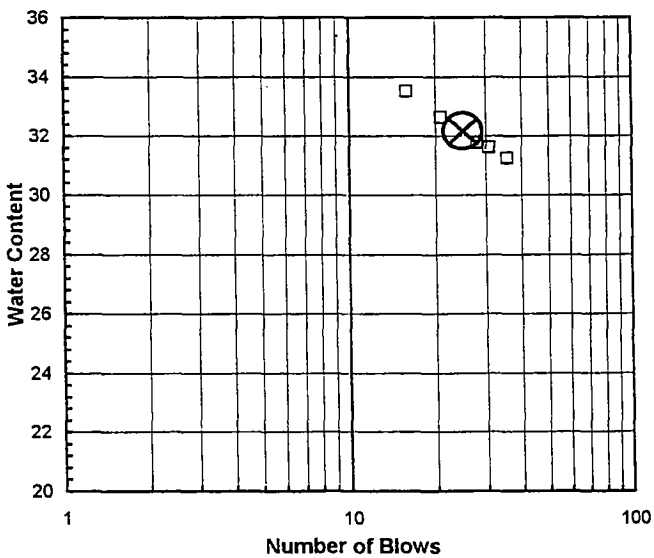
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	2281	113	50	81	48	M
Wt. of Tare & WS (gm)	38.61	38.15	41.24	41.29	41.52	U
Wt. of Tare & DS (gm)	32.76	32.43	35.69	35.28	35.45	L
Wt. of Tare (gm)	14.01	14.32	18.21	16.85	17.33	T
Wt. of Water (gm)	5.85	5.72	5.55	6.01	6.07	I
Wt. of DS (gm)	18.75	18.11	17.48	18.43	18.12	P
						O
Moisture Content (%)	**31.2**	**31.6**	**31.8**	**32.6**	**33.5**	I
Number of Blows	**36**	**31**	**28**	**21**	**16**	N
						T

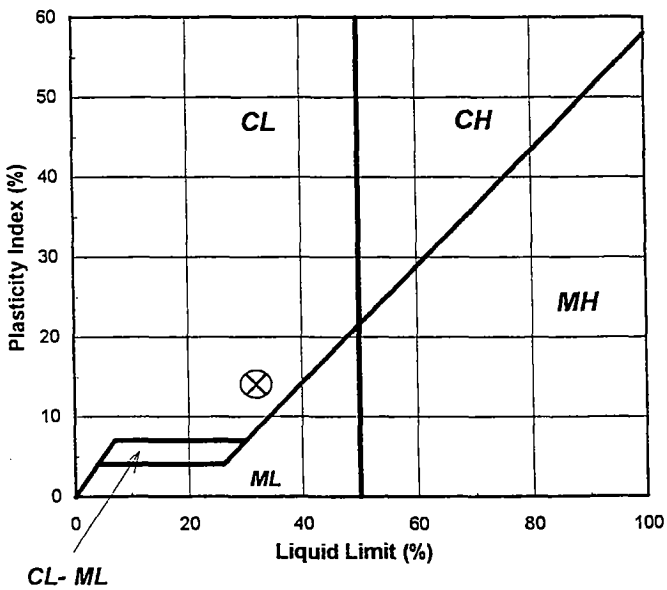
Plastic Limit Test	**1**	**2**	**3**
Tare Number	83	54	40
Wt. of Tare & WS (gm)	21.70	22.80	23.88
Wt. of Tare & DS (gm)	20.78	21.86	22.90
Wt. of Tare (gm)	15.56	16.50	17.42
Wt. of Water (gm)	0.92	0.94	0.98
Wt. of DS (gm)	5.22	5.36	5.48
Moisture Content (%)	**17.6**	**17.5**	**17.9**

Test Results	
Liquid Limit (%)	**32**
Plastic Limit (%)	**18**
Plasticity Index (%)	**14**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



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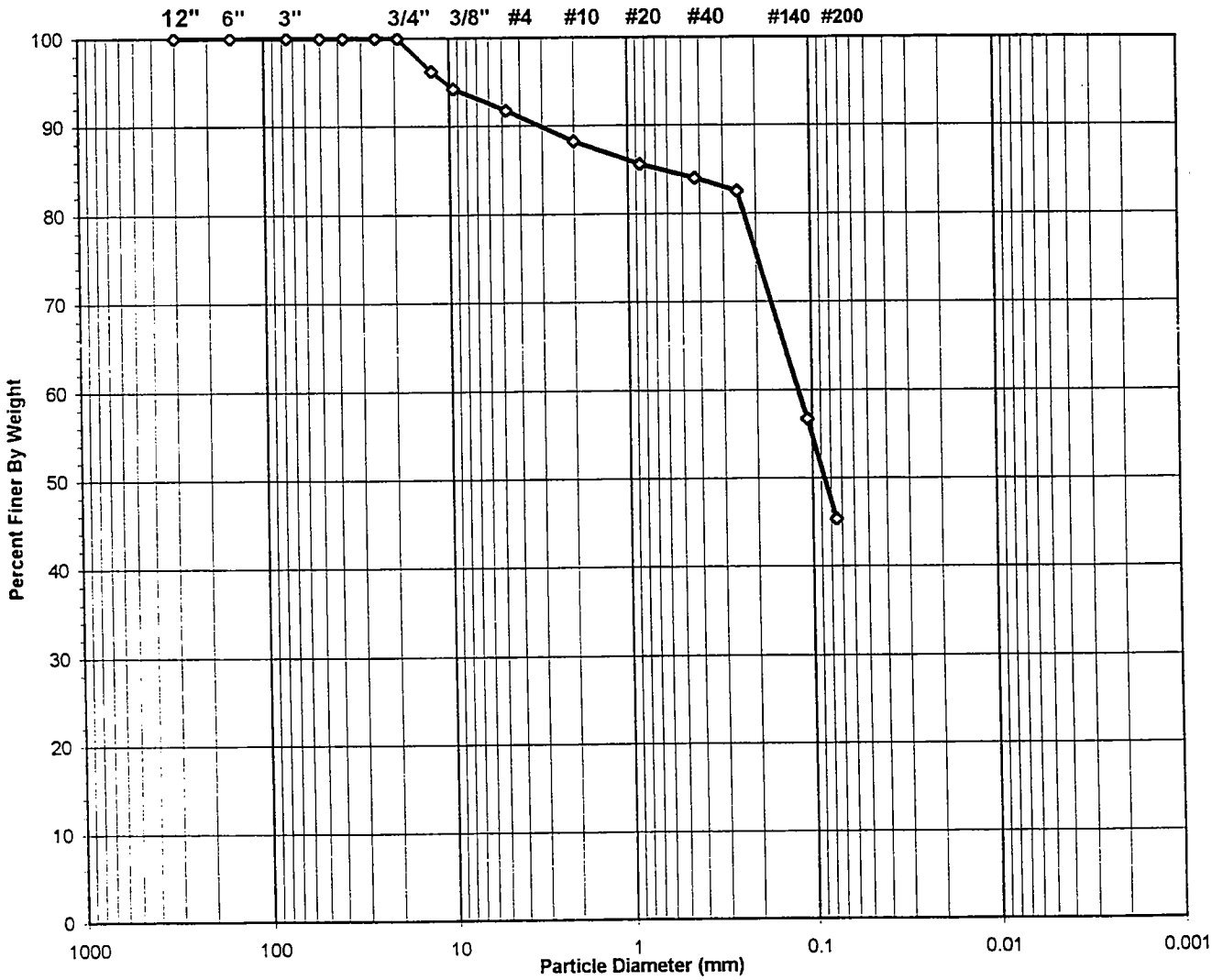
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP23-GEOT-0204
Lab ID	98178-01.007	Soil Color	**BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***SC, TESTED***

USCS Classification ***CLAYEY SAND***

Tested By BL Date 7/14/98 Checked By UB Date 7-24-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[H123.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP23-GEOT-0204
Lab ID	98178-01.007	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1088	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	530.00	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	439.00	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	93.16	Weight of Tare (gm)	NA
Weight of Water (gm)	91.00	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	345.84	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**26.3**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	345.84
Dry Weight - 3/4" Sample (gm)	188.9	Weight of minus #200 material (gm)	156.91
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	188.93
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	13.16	3.81	3.81	96.19	**96.19**
3/8"	9.50	6.93	2.00	5.81	94.19	**94.19**
#4	4.75	8.44	2.44	8.25	91.75	**91.75**
#10	2.00	12.28	3.55	11.80	88.20	**88.20**
#20	0.850	9.05	2.62	14.42	85.58	**85.58**
#40	0.425	5.58	1.61	16.03	83.97	**83.97**
#60	0.250	4.97	1.44	17.47	82.53	**82.53**
#140	0.106	89.32	25.83	43.29	56.71	**56.71**
#200	0.075	39.20	11.33	54.63	45.37	**45.37**
Pan	-	156.91	45.37	100.00	-	-

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP23-GEOT-0204
Lab ID	98178-01.007	Soil Description	**BROWN LEAN CLAY**

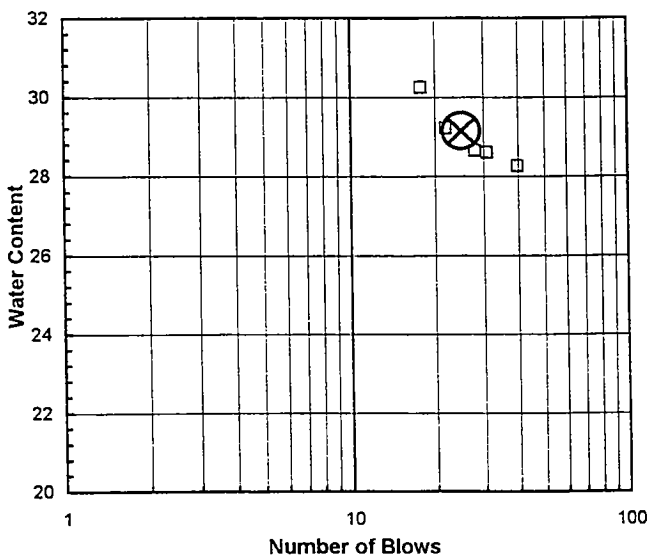
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	2233	2314	2317	2252	2036	M U L T I P O I N T
Wt. of Tare & WS (gm)	38.84	42.07	37.94	39.17	42.69	
Wt. of Tare & DS (gm)	34.18	36.77	32.95	34.32	36.74	
Wt. of Tare (gm)	17.68	18.23	15.52	17.71	17.06	
Wt. of Water (gm)	4.66	5.3	4.99	4.85	5.95	
Wt. of DS (gm)	16.5	18.54	17.43	16.61	19.68	
Moisture Content (%)	**28.2**	**28.6**	**28.6**	**29.2**	**30.2**	
Number of Blows	**40**	**31**	**28**	**22**	**18**	

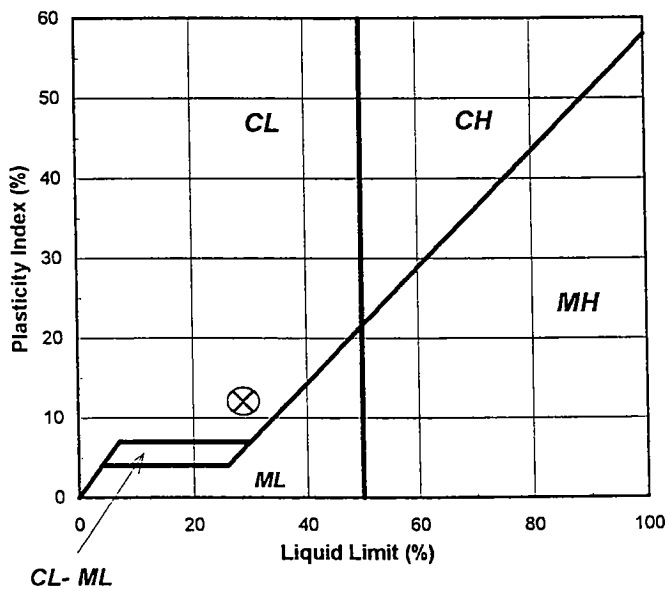
Plastic Limit Test	**1**	**2**	**3**
Tare Number	88	2285	83
Wt of Tare & WS (gm)	28.71	23.96	21.56
Wt. of Tare & DS (gm)	27.78	23.06	20.67
Wt. of Tare (gm)	22.29	17.75	15.55
Wt. of Water (gm)	0.93	0.9	0.89
Wt. of DS (gm)	5.49	5.31	5.12
Moisture Content (%)	**16.9**	**16.9**	**17.4**

Test Results	
Liquid Limit (%)	**29**
Plastic Limit (%)	**17**
Plasticity Index (%)	**12**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



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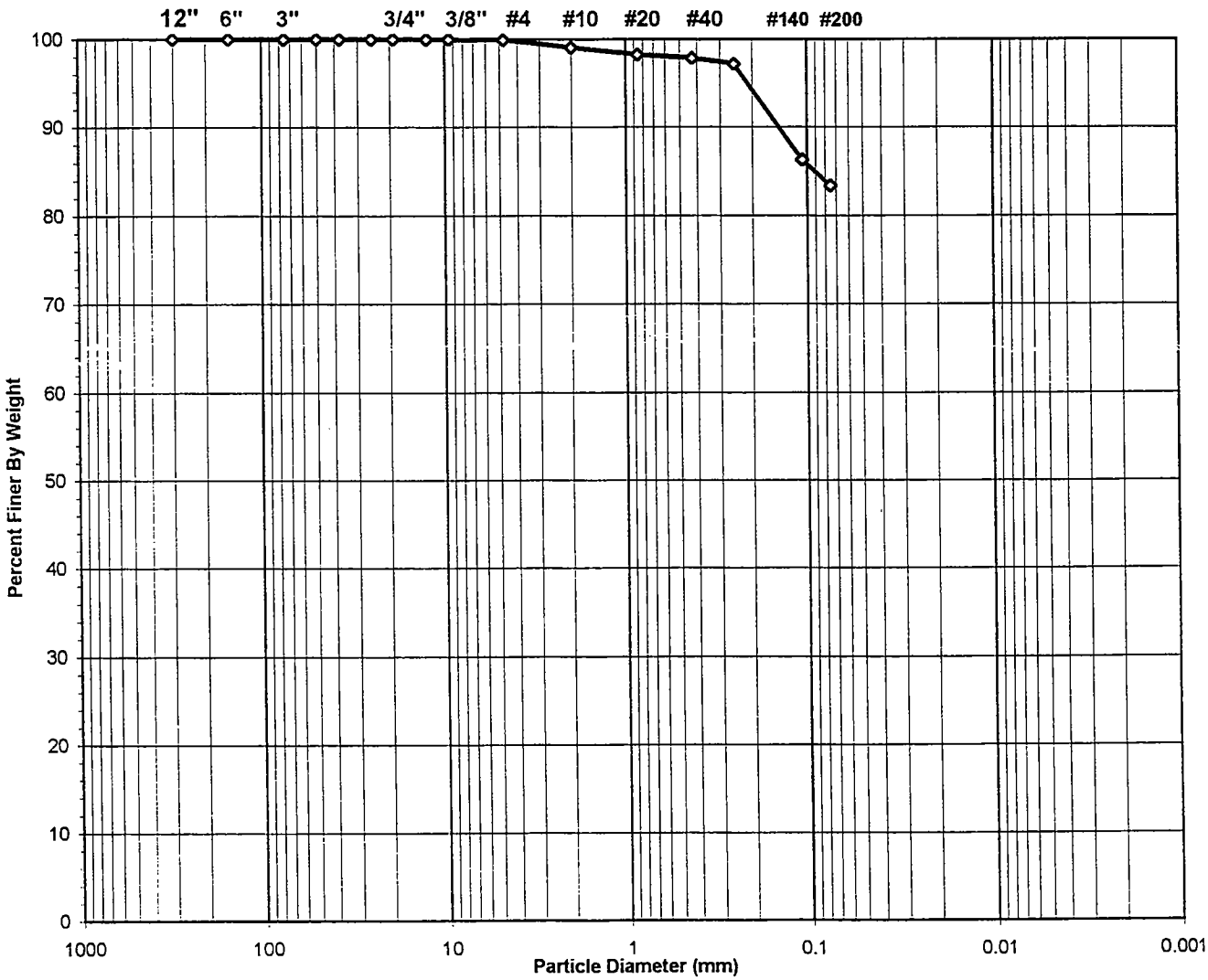
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP23-GEOT-0608
Lab ID	98178-01.008	Soil Color	**GRAYISH BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY WITH SAND***

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP23-GEOT-0608
Lab ID	98178-01.008	Soil Color	**GRAYISH BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1919	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	771.50	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	636.70	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	102.39	Weight of Tare (gm)	NA
Weight of Water (gm)	134.80	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	534.31	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**25.2**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	534.31
Dry Weight - 3/4" Sample (gm)	88.8	Weight of minus #200 material (gm)	445.52
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	88.79
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.28	0.05	0.05	99.95	**99.95**
#10	2.00	4.56	0.85	0.91	99.09	**99.09**
#20	0.850	4.33	0.81	1.72	98.28	**98.28**
#40	0.425	2.35	0.44	2.16	97.84	**97.84**
#60	0.250	3.46	0.65	2.80	97.20	**97.20**
#140	0.106	58.35	10.92	13.72	86.28	**86.28**
#200	0.075	15.46	2.89	16.62	83.38	**83.38**
Pan	-	445.52	83.38	100.00	-	-

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP23-GEOT-0608
Lab ID	98178-01.008	Soil Description	**GRAYISH BROWN LEAN CLAY**

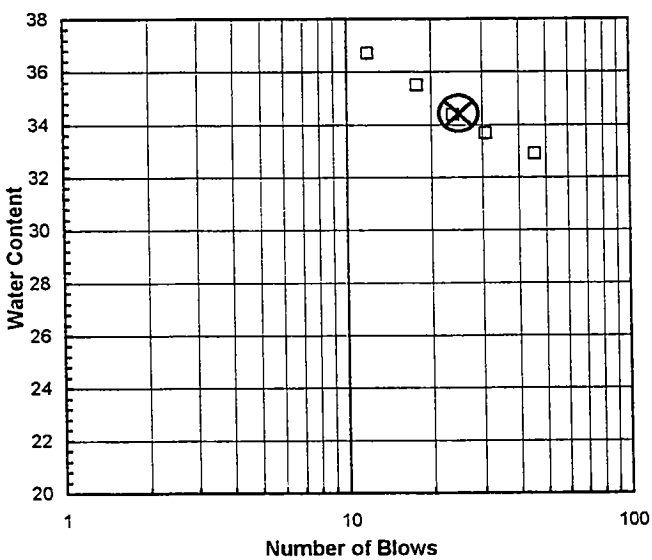
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	MULTIPOINT
Tare Number	59	40	65	106	52	
Wt. of Tare & WS (gm)	40.76	41.66	40.99	37.80	40.85	
Wt. of Tare & DS (gm)	34.94	35.56	35.01	31.87	34.64	
Wt. of Tare (gm)	17.23	17.43	17.60	15.15	17.71	
Wt. of Water (gm)	5.82	6.1	5.98	5.93	6.21	
Wt. of DS (gm)	17.71	18.13	17.41	16.72	16.93	
Moisture Content (%)	**32.9**	**33.6**	**34.3**	**35.5**	**36.7**	
Number of Blows	**46**	**31**	**24**	**18**	**12**	

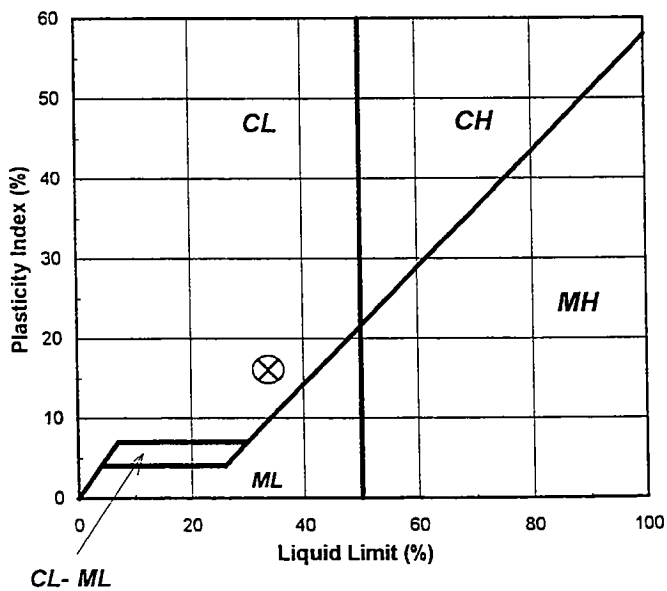
Plastic Limit Test	**1**	**2**	**3**
Tare Number	2322	23	1859
Wt. of Tare & WS (gm)	22.57	24.13	21.65
Wt. of Tare & DS (gm)	21.58	23.17	20.70
Wt. of Tare (gm)	16.21	17.93	15.57
Wt. of Water (gm)	0.99	0.96	0.95
Wt. of DS (gm)	5.37	5.24	5.13
Moisture Content (%)	**18.4**	**18.3**	**18.5**

Test Results	
Liquid Limit (%)	**34**
Plastic Limit (%)	**18**
Plasticity Index (%)	**16**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



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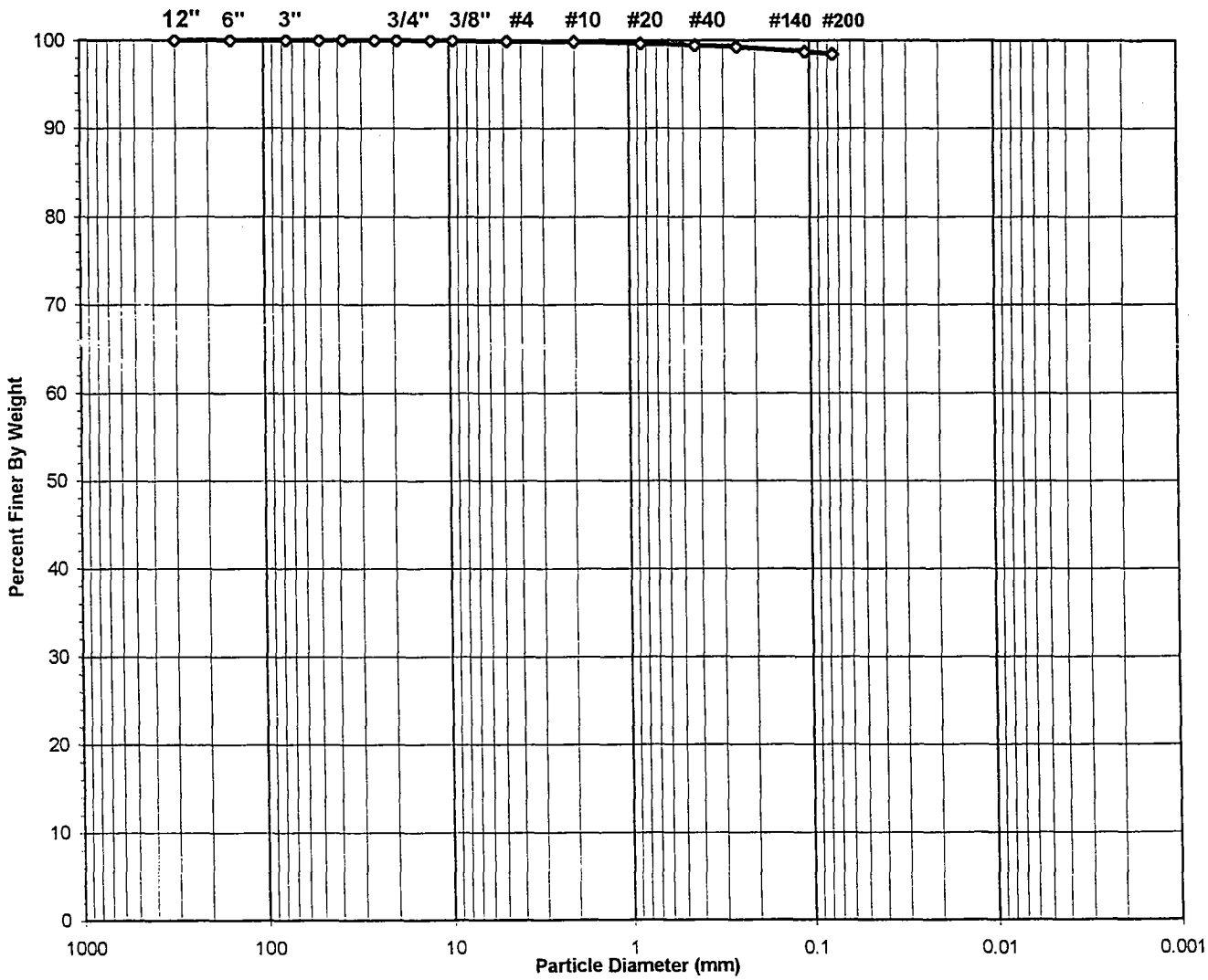
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP23-GEOT-1012
Lab ID	98178-01.009	Soil Color	**BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY***

Tested By BL Date 7/14/98 Checked By UB Date 7-24-98

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP23-GEOT-1012
Lab ID	98178-01.009	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1683	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	525.50	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	429.10	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	101.08	Weight of Tare (gm)	NA
Weight of Water (gm)	96.40	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	328.02	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**29.4**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	328.02
Dry Weight - 3/4" Sample (gm)	5.1	Weight of minus #200 material (gm)	322.97
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	5.05
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.22	0.07	0.07	99.93	**99.93**
#10	2.00	0.19	0.06	0.12	99.88	**99.88**
#20	0.850	0.59	0.18	0.30	99.70	**99.70**
#40	0.425	0.73	0.22	0.53	99.47	**99.47**
#60	0.250	0.74	0.23	0.75	99.25	**99.25**
#140	0.106	1.59	0.48	1.24	98.76	**98.76**
#200	0.075	0.99	0.30	1.54	98.46	**98.46**
Pan	-	322.97	98.46	100.00	-	-

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP23-GEOT-1012
Lab ID	98178-01.009	Soil Description	**BROWN LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

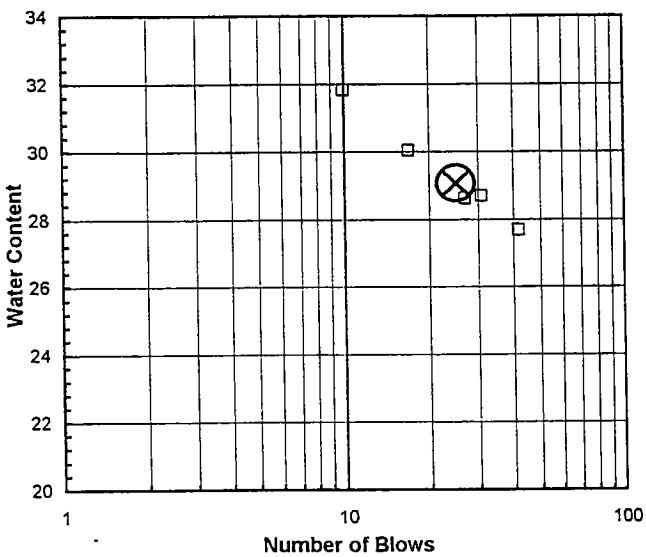
(Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	2306	2055	2253	2245	2250	MULTIPOINT
Wt. of Tare & WS (gm)	38.14	39.82	41.36	37.12	37.92	
Wt. of Tare & DS (gm)	33.31	35.12	36.42	32.16	32.65	
Wt. of Tare (gm)	15.85	18.73	19.15	15.63	16.08	
Wt. of Water (gm)	4.83	4.7	4.94	4.96	5.27	
Wt. of DS (gm)	17.46	16.39	17.27	16.53	16.57	
Moisture Content (%)	**27.7**	**28.7**	**28.6**	**30.0**	**31.8**	
Number of Blows	**42**	**31**	**27**	**17**	**10**	

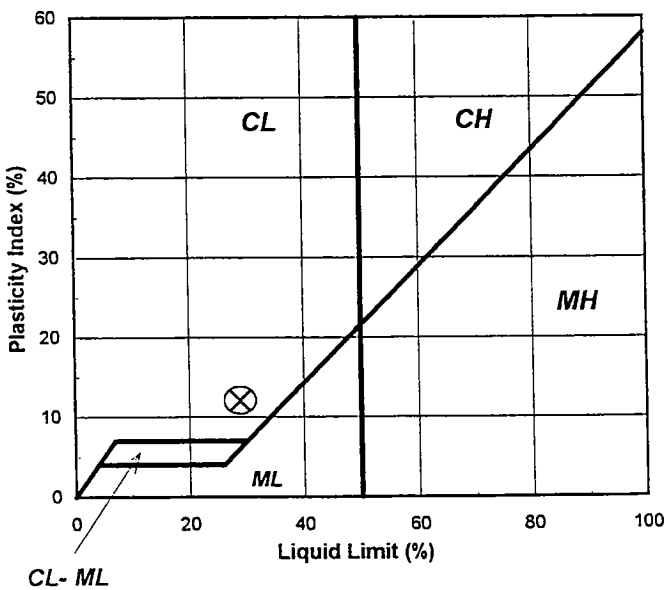
Plastic Limit Test	**1**	**2**	**3**
Tare Number	70	109	57
Wt. of Tare & WS (gm)	22.79	21.55	22.32
Wt. of Tare & DS (gm)	21.88	20.62	21.34
Wt. of Tare (gm)	16.63	15.15	15.68
Wt. of Water (gm)	0.91	0.93	0.98
Wt. of DS (gm)	5.25	5.47	5.66
Moisture Content (%)	**17.3**	**17.0**	**17.3**

Test Results	
Liquid Limit (%)	**29**
Plastic Limit (%)	**17**
Plasticity Index (%)	**12**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



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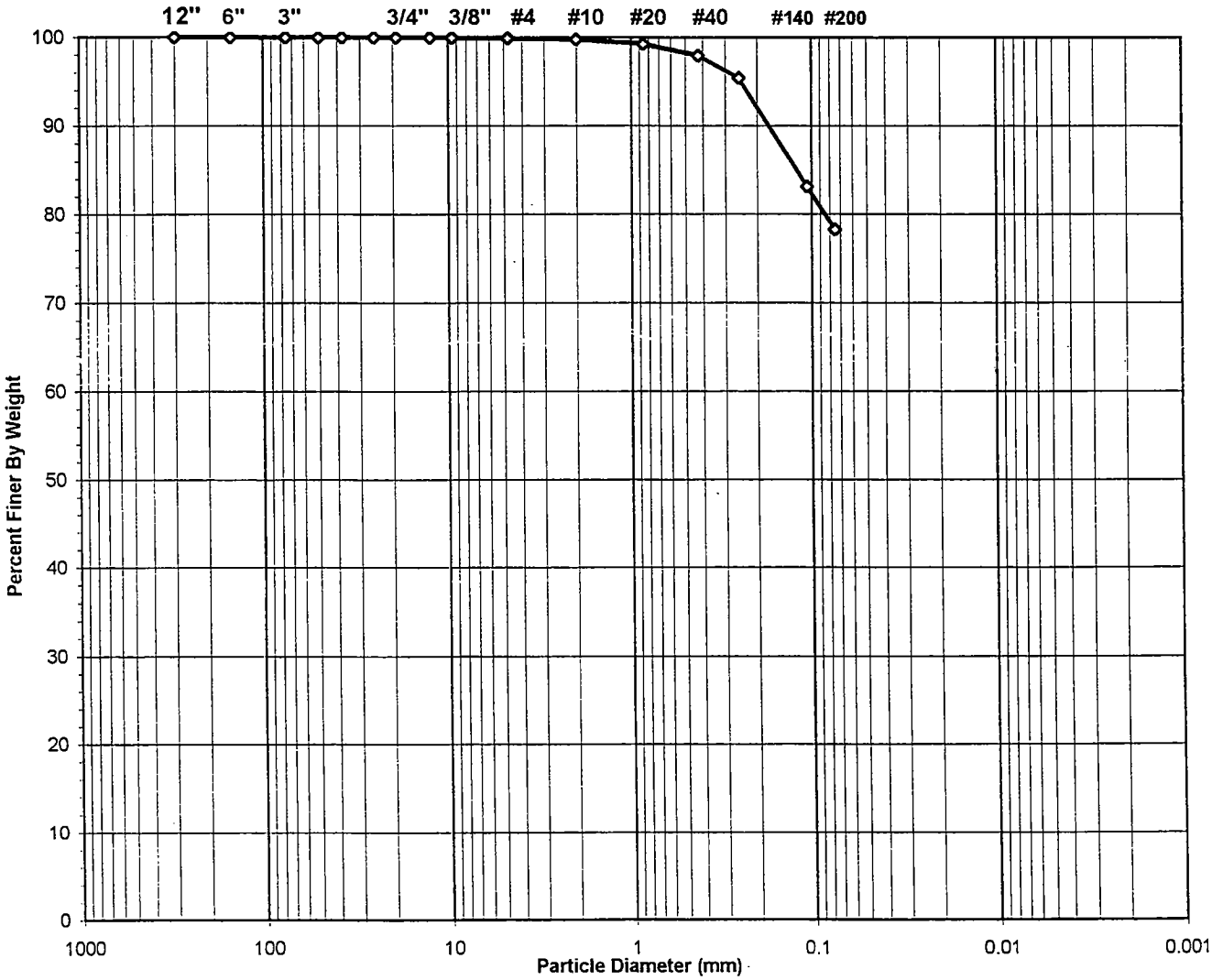
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP24-GEOT-0204
Lab ID	98178-01.010	Soil Color	**BROWN**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY WITH SAND***

Tested By TM Date 7/14/98 Checked By UB Date 7-24-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 C:\MSOFFICE\EXCEL\PrintQ\[H126.xls]Sheet1

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP24-GEOT-0204
Lab ID	98178-01.010	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	501	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	722.00	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	621.50	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	107.17	Weight of Tare (gm)	NA
Weight of Water (gm)	100.50	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	514.33	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**19.5**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	514.33
Dry Weight - 3/4" Sample (gm)	111.8	Weight of minus #200 material (gm)	402.58
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	111.75
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.29	0.06	0.06	99.94	**99.94**
#10	2.00	0.81	0.16	0.21	99.79	**99.79**
#20	0.850	2.59	0.50	0.72	99.28	**99.28**
#40	0.425	6.87	1.34	2.05	97.95	**97.95**
#60	0.250	12.92	2.51	4.57	95.43	**95.43**
#140	0.106	63.29	12.31	16.87	83.13	**83.13**
#200	0.075	24.98	4.86	21.73	78.27	**78.27**
Pan	-	402.58	78.27	100.00	-	-

Tested By TM Date 7/14/98 Checked By LB Date 7-24-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP24-GEOT-0204
Lab ID	98178-01.010	Soil Description	**BROWN LEAN CLAY**

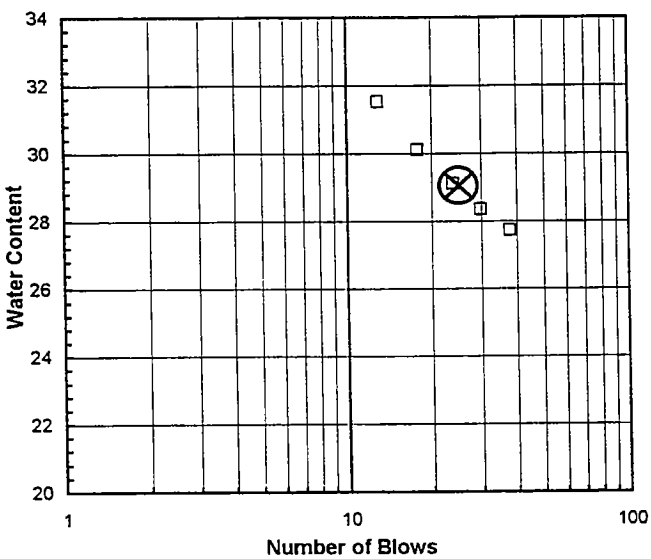
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	2057	2234	2247	2248	2290	MULTIPOINT
Wt. of Tare & WS (gm)	39.43	36.23	37.46	37.69	40.41	
Wt. of Tare & DS (gm)	35.08	31.79	32.93	32.89	35.02	
Wt. of Tare (gm)	19.38	16.12	17.36	16.94	17.91	
Wt. of Water (gm)	4.35	4.44	4.53	4.8	5.39	
Wt. of DS (gm)	15.7	15.67	15.57	15.95	17.11	
Moisture Content (%)	**27.7**	**28.3**	**29.1**	**30.1**	**31.5**	
Number of Blows	**38**	**30**	**24**	**18**	**13**	

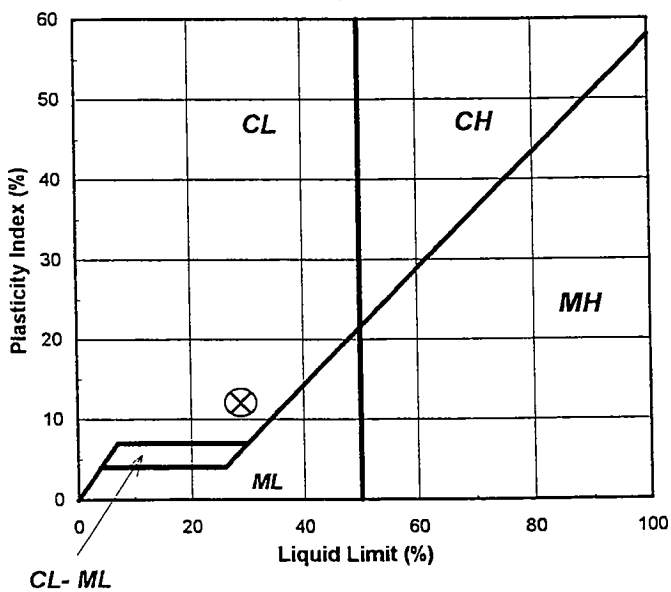
Plastic Limit Test	**1**	**2**	**3**
Tare Number	2300	2311	2319
Wt. of Tare & WS (gm)	22.45	21.38	25.18
Wt. of Tare & DS (gm)	21.55	20.51	24.16
Wt. of Tare (gm)	16.37	15.31	18.07
Wt. of Water (gm)	0.9	0.87	1.02
Wt. of DS (gm)	5.18	5.2	6.09
Moisture Content (%)	**17.4**	**16.7**	**16.7**

Test Results	
Liquid Limit (%)	**29**
Plastic Limit (%)	**17**
Plasticity Index (%)	**12**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By *BS* *Date* *7/17/98* *Checked By* LB *Date* 7-20-98

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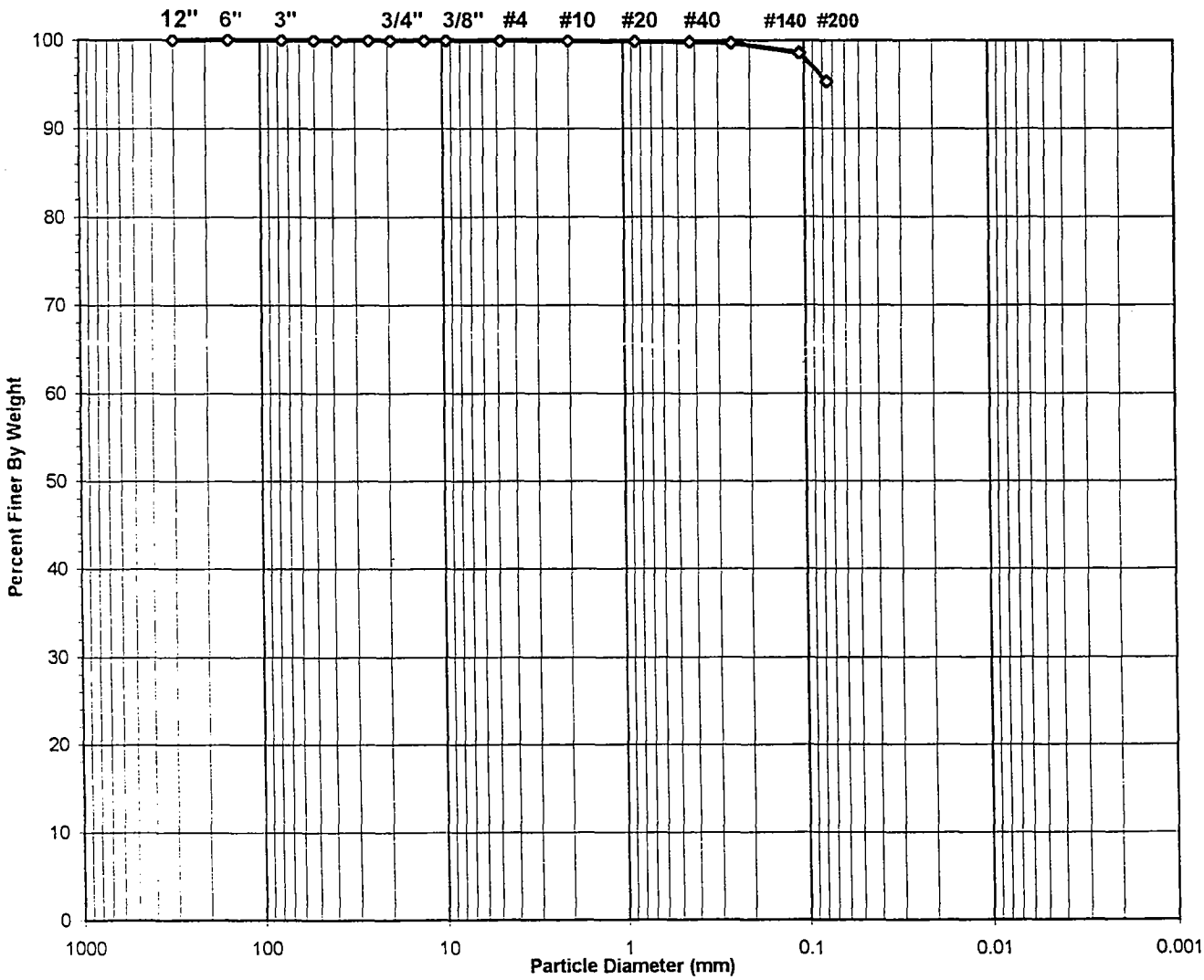
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP24-GEOT-0608
Lab ID	98178-01.011	Soil Color	**BROWN**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY***

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[H127.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP24-GEOT-0608
Lab ID	98178-01.011	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1018	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	536.40	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	458.90	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	100.51	Weight of Tare (gm)	NA
Weight of Water (gm)	77.50	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	358.39	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**21.6**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	358.39
Dry Weight - 3/4" Sample (gm)	16.8	Weight of minus #200 material (gm)	341.62
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	16.77
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.10	0.03	0.03	99.97	**99.97**
#20	0.850	0.07	0.02	0.05	99.95	**99.95**
#40	0.425	0.28	0.08	0.13	99.87	**99.87**
#60	0.250	0.41	0.11	0.24	99.76	**99.76**
#140	0.106	4.24	1.18	1.42	98.58	**98.58**
#200	0.075	11.67	3.26	4.68	95.32	**95.32**
Pan	-	341.62	95.32	100.00	-	-

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP24-GEOT-0608
Lab ID	98178-01.011	Soil Description	**BROWN LEAN CLAY**

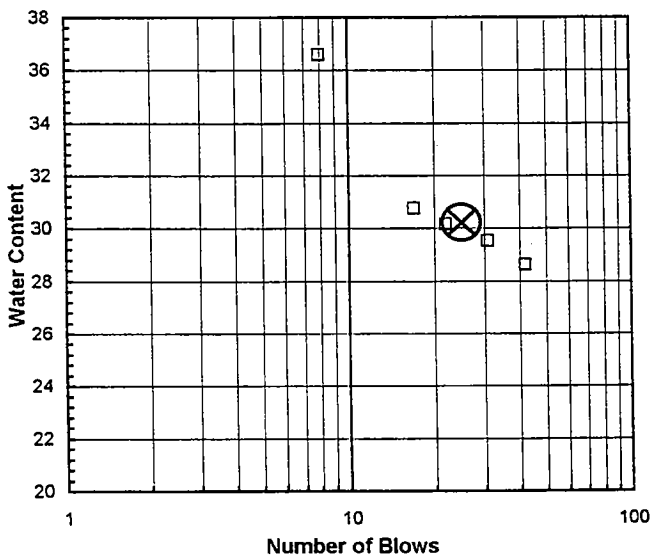
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	2225	2045	2040	2047	1881	M
Wt. of Tare & WS (gm)	40.71	41.08	36.91	36.46	35.66	U
Wt. of Tare & DS (gm)	36.17	36.06	31.93	31.55	30.25	L
Wt. of Tare (gm)	20.30	19.04	15.40	15.57	15.46	T
Wt. of Water (gm)	4.54	5.02	4.98	4.91	5.41	I
Wt. of DS (gm)	15.87	17.02	16.53	15.98	14.79	P
						O
Moisture Content (%)	**28.6**	**29.5**	**30.1**	**30.7**	**36.6**	I
Number of Blows	**42**	**31**	**22**	**17**	**8**	N
						T

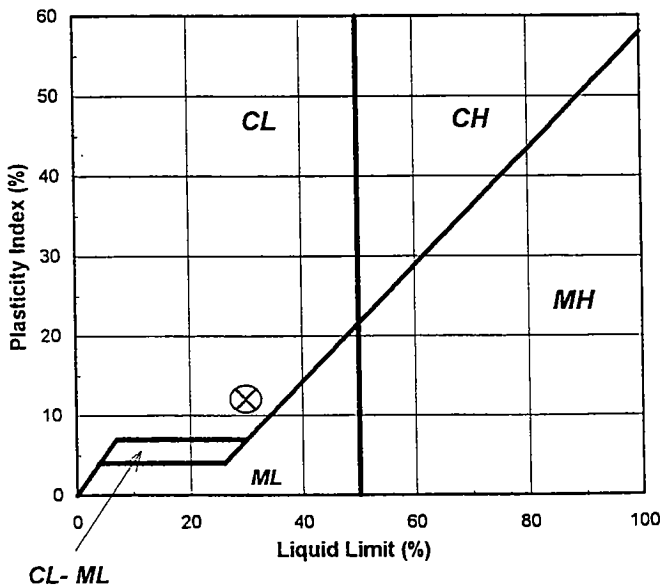
Plastic Limit Test	**1**	**2**	**3**
Tare Number	35	2278	75
Wt. of Tare & WS (gm)	23.66	20.18	22.03
Wt. of Tare & DS (gm)	22.70	19.24	21.09
Wt. of Tare (gm)	17.24	13.92	15.73
Wt. of Water (gm)	0.96	0.94	0.94
Wt. of DS (gm)	5.46	5.32	5.36
Moisture Content (%)	**17.6**	**17.7**	**17.5**

Test Results	
Liquid Limit (%)	**30**
Plastic Limit (%)	**18**
Plasticity Index (%)	**12**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By *DBB* *Date* *7/21/98* *Checked By* LB *Date* 7-22-98

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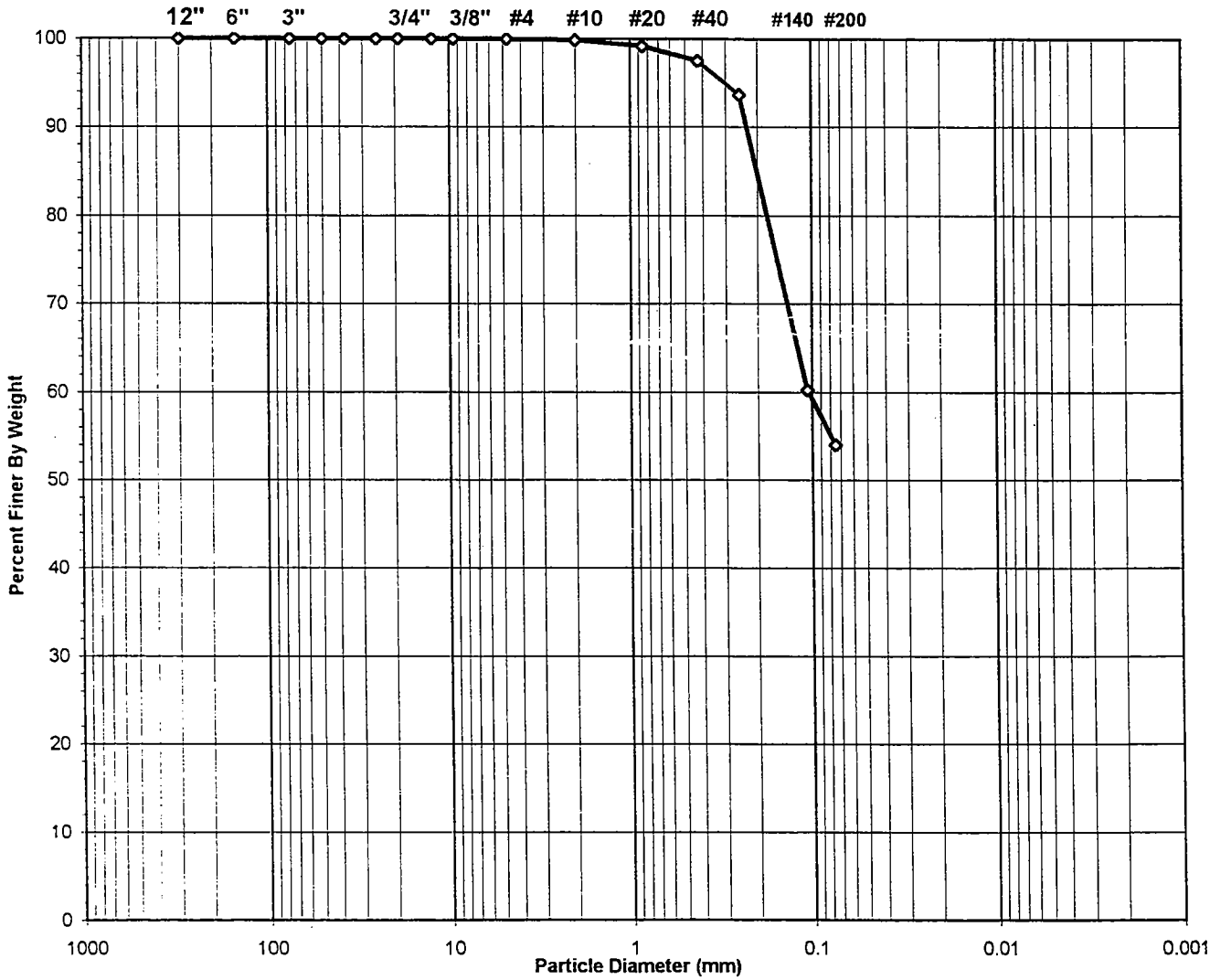
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP24-GEOT-1012
Lab ID	98178-01.012	Soil Color	**BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol ***CL, TESTED***

USCS Classification ***SANDY LEAN CLAY***

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP24-GEOT-1012
Lab ID	98178-01.012	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	864	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	630.30	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	560.60	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	99.04	Weight of Tare (gm)	NA
Weight of Water (gm)	69.70	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	461.56	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**15.1**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	461.56
Dry Weight - 3/4" Sample (gm)	212.3	Weight of minus #200 material (gm)	249.24
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	212.32
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.74	0.16	0.16	99.84	**99.84**
#20	0.850	2.82	0.61	0.77	99.23	**99.23**
#40	0.425	7.72	1.67	2.44	97.56	**97.56**
#60	0.250	17.93	3.88	6.33	93.67	**93.67**
#140	0.106	154.43	33.46	39.79	60.21	**60.21**
#200	0.075	28.68	6.21	46.00	54.00	**54.00**
Pan	-	249.24	54.00	100.00	-	-

Tested By BL Date 7/14/98 Checked By LB Date 7-24-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-WARP
Client Reference	PBOW-WARP	Depth (ft)	NA
Project No.	98178-01	Sample No.	DP24-GEOT-1012
Lab ID	98178-01.012	Soil Description	**BROWN LEAN CLAY**

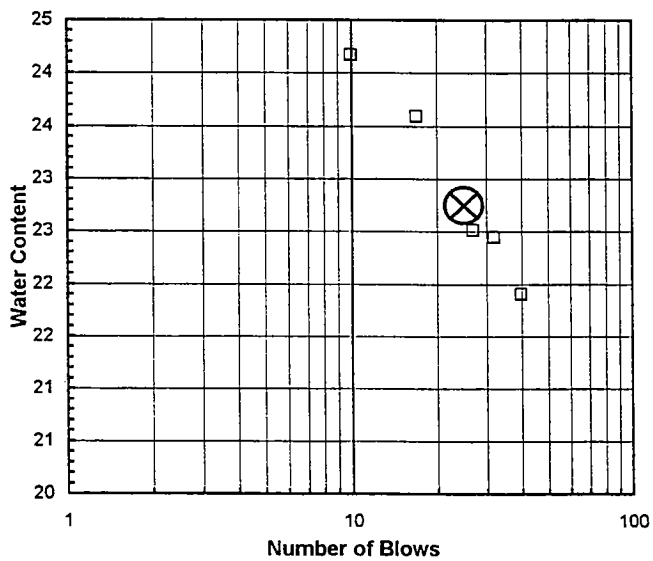
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	2023	1797	2042	2315	1898	MULTIPOINT
Wt. of Tare & WS (gm)	37.46	38.30	37.97	39.04	38.99	
Wt. of Tare & DS (gm)	33.82	34.33	34.20	34.95	34.79	
Wt. of Tare (gm)	17.20	16.64	17.45	17.61	17.41	
Wt. of Water (gm)	3.64	3.97	3.77	4.09	4.2	
Wt. of DS (gm)	16.62	17.69	16.75	17.34	17.38	
Moisture Content (%)	**21.9**	**22.4**	**22.5**	**23.6**	**24.2**	
Number of Blows	**40**	**32**	**27**	**17**	**10**	

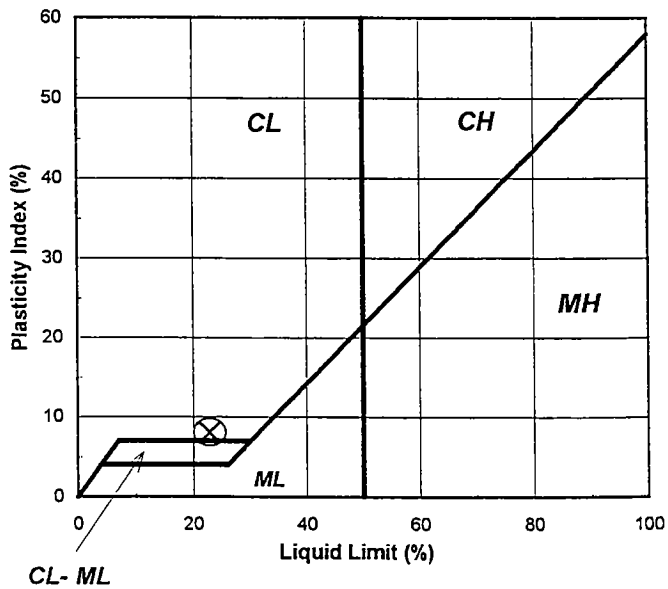
Plastic Limit Test	**1**	**2**	**3**
Tare Number	112	96	82
Wt. of Tare & WS (gm)	23.50	23.04	25.71
Wt. of Tare & DS (gm)	22.63	22.17	24.77
Wt. of Tare (gm)	16.99	16.50	18.62
Wt. of Water (gm)	0.87	0.87	0.94
Wt. of DS (gm)	5.64	5.67	6.15
Moisture Content (%)	**15.4**	**15.3**	**15.3**

Test Results	
Liquid Limit (%)	**23**
Plastic Limit (%)	**15**
Plasticity Index (%)	**8**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By DBB *Date* 7/21/98 *Checked By* LB *Date* 7-22-98

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GEO-ENVIRONMENTAL
DRILLING COMPANY, INC.

July 12, 1998

Mr. Michael Stangberg
IT Corporation
312 Directors Drive
Knoxville, Tennessee 37923-3211

RE: Geotechnical Testing Laboratory Reports
NASA Plumbrook Site
Sandusky, Ohio
GEO Project No. G98-2234
IT Project No. 7737701

Dear Mr. Stangberg:

Enclosed please find the original copy of the geotechnical testing laboratory reports for the first group of samples submitted for testing. The chain-of-custody/request-for-analysis form is attached for these samples. The testing results for the second group of samples will follow shortly.

If you have any questions, please contact me at your earliest convenience at (412) 371-6551.

Thank you.

Sincerely,

Geo-Environmental Drilling Company, Inc.

Deborah Ann Weible, P.G., CWD
President & General Manager

Attaxhments Laboratory Report
Chain-Of-Custody/Request-For-Analysis Form

82234194.LTR

GEO-ENVIRONMENTAL DRILLING COMPANY, INC. *Environmental and Geotechnical Drilling Services*
11101 Frankstown Road
Pittsburgh, PA 15235-3096
tel: 412/ 371-6551
fax: 412/ 371-1027

[redacted]

Chain o[redacted] Custody Record

Quanter[redacted]

QUA-4124

Client	Project Manager: Mike Spangberg	Date	Chain Of Custody Number: 30091
Address	Telephone Number (Area Code)/Fax Number: (423) 690-3211	Lab Number	Page 1 of 2
City / State / Zip Code	Site Contact: Mike Spangberg - IT Corp.		
Project Name: PBOW-WARP	Carrier/Waybill Number		
Contract/Purchase Order/Quote No.			

Sample I.D. No. and Description	Date	Time	Sample Type	Total Volume	Containers Type	Containers No.	Preservative	Condition on Receipt	Moisture Content	Atterberg Limits	Sieve Analysis	USCS Classification							
PBOW-98-WARP-DP21-GEOT-0204	6-23-98		Soil		Acetate Liner	1	None		✓	✓	✓	✓							
PBOW-98-WARP-DP21-GEOT-0608	↓								✓	✓	✓	✓							
PBOW-98-WARP-DP21-GEOT-1012									✓	✓	✓	✓							
PBOW-98-WARP-DP22-GEOT-0204	6-25-98								✓	✓	✓	✓							
PBOW-98-WARP-DP22-GEOT-0608	↓								✓	✓	✓	✓							
PBOW-98-WARP-DP22-GEOT-1012									✓	✓	✓	✓							
PBOW-98-WARP-DP23-GEOT-0204	6-13-98								✓	✓	✓	✓							
PBOW-98-WARP-DP23-GEOT-0608	↓								✓	✓	✓	✓							
PBOW-98-WARP-DP23-GEOT-1012									✓	✓	✓	✓							
PBOW-98-WARP-DP24-GEOT-0204	6-24-98								✓	✓	✓	✓							
PBOW-98-WARP-DP24-GEOT-0608									✓	✓	✓	✓							
PBOW-98-WARP-DP24-GEOT-1012	↓		↓		↓	↓	↓		✓	✓	✓	✓							

S[redacted]S

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For ____ Months

Turn Around Time Required: ☒ Normal ☐ Rush

QC Level: ☐ I. ☐ II. ☐ III.

Project Specific (Specify): Call Proj Mngr. if uncertain

	Date	Time		Date	Time
1. Relinquished By: John Vogeding / IT Corp.	6-26-98	1700	1. Received By: Scott BEAL	6-26-98	1200
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Stays with Sample; CANARY - Returned to Client with Report; PINK - Field Copy

Geotechnics

LABORATORY TEST REPORT

July 8, 1998

Project No. 98167-01

Ms. Deb Weible
Geoenvironmental Drilling Co.
11101 Frankstown Rd.
Pgh., PA 15235

RE: Soils Testing – PBOW-PRRP

Transmitted herein are the results of the soils testing performed for Geoenvironmental Drilling verified on the Project Verification Form, submitted June 26, 1998. The testing was performed in accordance with the ASTM methods listed on the enclosed data sheets. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

Disclaimer

The test results are believed to be representative of the samples submitted but are indicative only of the specimens which were evaluated. Geotechnics has no direct knowledge of the origin of the samples, implies no position with regard to the disposition of the test results, i.e., pass/fail, and makes no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization of the Client and Geotechnics. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please do not hesitate to contact our office.

Respectively submitted,

David R. Backstrom
Laboratory Director

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MOISTURE CONTENT

ASTM D 2216 (SOP-S1)

Client	GEO-ENVIRONMENTAL DRILLING
Client Reference	PBOW-PRRP
Project No.	98167-01

Lab ID	.001	.002	.003	.004	.005
Boring No.	PBOW-98-PRRP	PBOW-98-PRRP	PBOW-98-PRRP	PBOW-98-PRRP	PBOW-98-PRRP
Depth (ft)	NA	NA	NA	NA	NA
Sample No.	DP23-Geot-0204	DP23-Geot-0608	DP23-GeoT-1012	DP22-Geot-0204	DP22-Geot-0608
Tare Number	551	1740	563	1735	1709
Wt. of Tare & WS (gm)	152.17	168.17	171.29	198.94	188.6
Wt. of Tare & DS (gm)	142.78	153.72	153.61	176.27	167.31
Wt. of Tare (gm)	84.51	83.54	82.61	82.17	83.24
Wt. of Water (gm)	9.39	14.45	17.68	22.67	21.29
Wt. of DS (gm)	58.27	70.18	71	94.1	84.07
Water Content (%)	**16.1**	**20.6**	**24.9**	**24.1**	**25.3**

Lab ID	.006	.007	.008	.009	.010
Boring No.	PBOW-98-PRRP	PBOW-98-PRRP	PBOW-98-PRRP	PBOW-98-PRRP	PBOW-98-PRRP
Depth (ft)	NA	NA	NA	NA	NA
Sample No.	DP22-Geot-1012	DP21-Geot-0204	DP21-Geot-0608	DP21-Geot-0810	DP25-Geot-0204
Tare Number	1724	1722	1691	1698	565
Wt. of Tare & WS (gm)	167.17	187.6	183.85	189.52	167.31
Wt. of Tare & DS (gm)	151.07	170.95	166.02	169.54	149.13
Wt. of Tare (gm)	83.03	81.65	83.56	81.37	83.07
Wt. of Water (gm)	16.1	16.65	17.83	19.98	18.18
Wt. of DS (gm)	68.04	89.3	82.46	88.17	66.06
Water Content (%)	**23.7**	**18.6**	**21.6**	**22.7**	**27.5**

Notes : *NA*

Tested By *MV* *Date* *6/30/98* *Checked By* LB *Date* 7-1-98

DCN: CT-S1 DATE 6-30-98 REVISION: 2

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MOISTURE CONTENT

ASTM D 2216 (SOP-S1)

Client	GEO-ENVIRONMENTAL DRILLING
Client Reference	PBOW-PRRP
Project No.	98167-01

Lab ID	.011	.012	.013	.014	.015
Boring No.	PBOW-98-PRRP	PBOW-98-PRRP	PBOW-98-PRRP	PBOW-98-PRRP	PBOW-98-PRRP
Depth (ft)	NA	NA	NA	NA	NA
Sample No.	DP25-Geot-0608	DP25-Geot-1012	DP24-GeoT-0204	DP24-Geot-0608	DP24-Geot-1012
Tare Number	1128	564	577	1718	729
Wt. of Tare & WS (gm)	180.2	185.75	167.88	176.11	187.6
Wt. of Tare & DS (gm)	160.79	164.19	151.3	158.2	167.79
Wt. of Tare (gm)	84.27	82.49	84.58	82.31	86.58
Wt. of Water (gm)	19.41	21.56	16.58	17.91	19.81
Wt. of DS (gm)	76.52	81.7	66.72	75.89	81.21
Water Content (%)	**25.4**	**26.4**	**24.9**	**23.6**	**24.4**

Notes : *NA*

Tested By *MV* *Date* *6/30/98* *Checked By* LB *Date* 7-1-98

DCN: CT-S1 DATE 6-30-98 REVISION: 2

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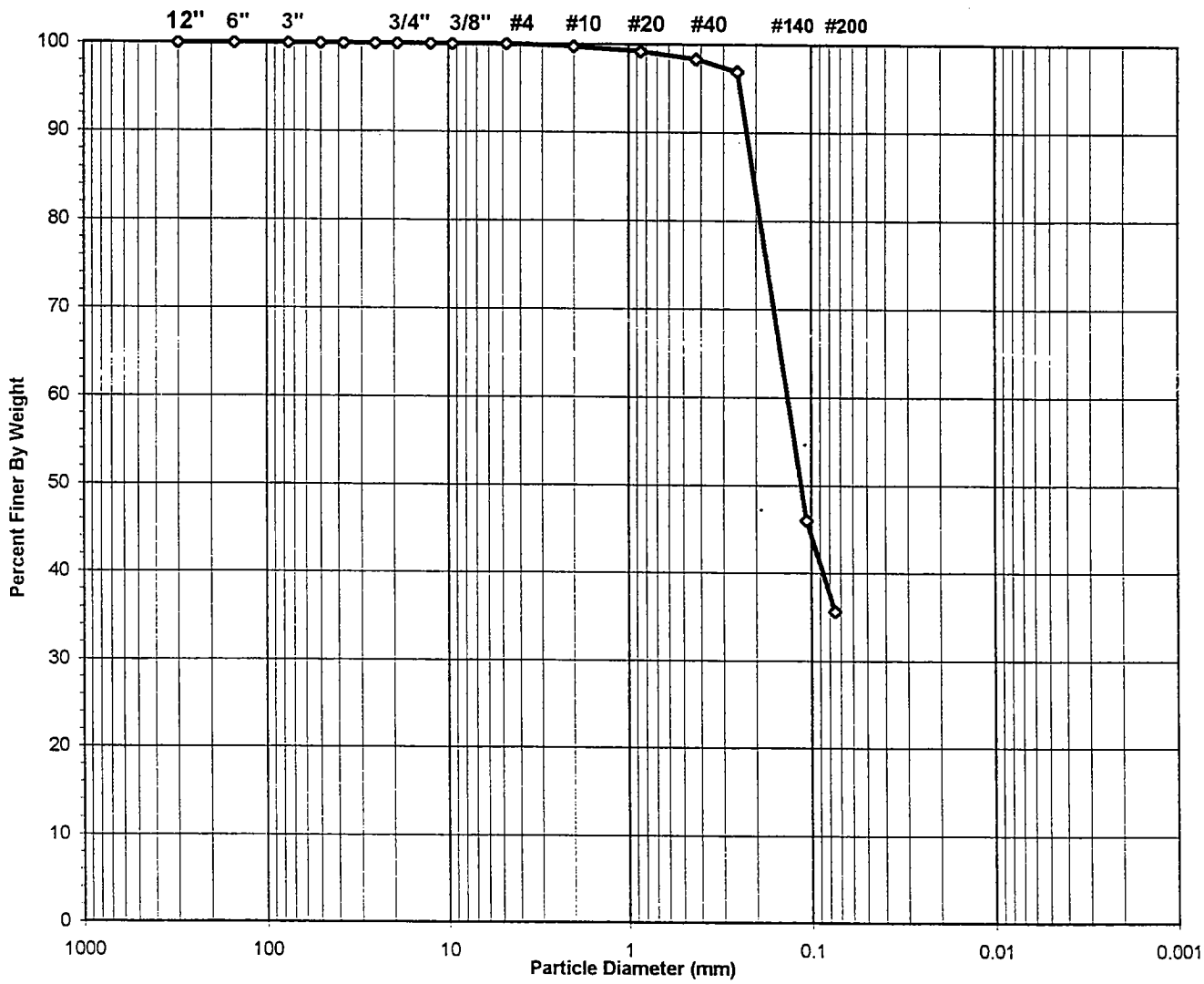
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP23-GEOT-0204
Lab ID	98167-01.001	Soil Color	**BROWN**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND (NON-PLASTIC FINES)***

Tested By MV Date 6/30/98 Checked By LB Date 7-8-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP23-GEOT-0204
Lab ID	98167-01.001	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2479	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	517.60	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	461.70	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	101.47	Weight of Tare (gm)	NA
Weight of Water (gm)	55.90	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	360.23	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**15.5**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	360.23
Dry Weight - 3/4" Sample (gm)	231.9	Weight of minus #200 material (gm)	128.37
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	231.86
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	1.05	0.29	0.29	99.71	**99.71**
#20	0.850	1.80	0.50	0.79	99.21	**99.21**
#40	0.425	3.23	0.90	1.69	98.31	**98.31**
#60	0.250	5.03	1.40	3.08	96.92	**96.92**
#140	0.106	183.35	50.90	53.98	46.02	**46.02**
#200	0.075	37.40	10.38	64.36	35.64	**35.64**
Pan	-	128.37	35.64	100.00	-	-

Tested By MV Date 6/30/98 Checked By LB Date 7-8-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP23-GEOT-0204
Lab ID	98167-01.001	Visual Description	**BROWN SILT**
			(MInus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By BS *Date* 7/6/98 *Checked By* LB *Date* 7-8-98

DCN: CT-S4B DATE: 7-11-97 REVISION : 2

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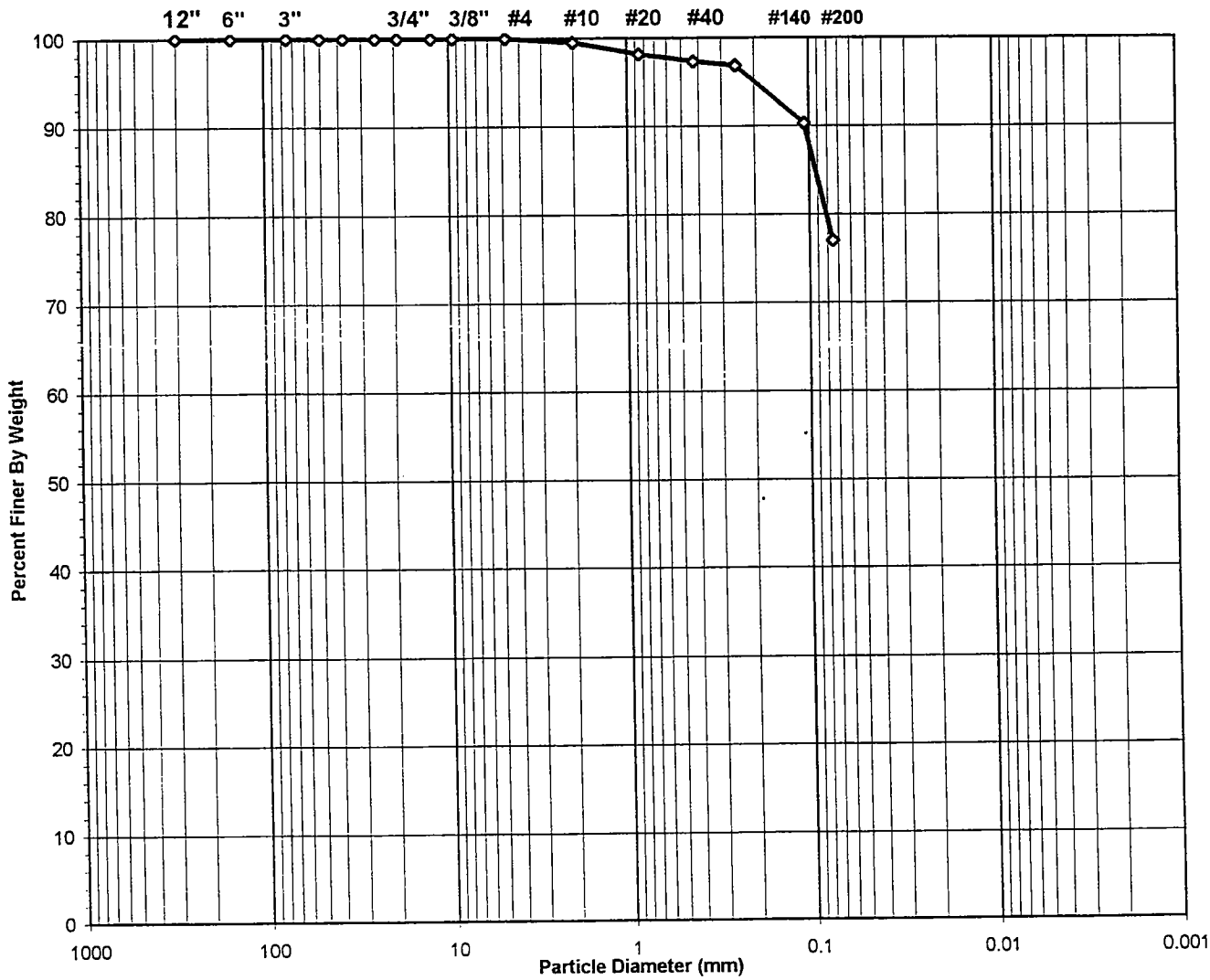
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP23-GEOT-0608
Lab ID	98167-01.002	Soil Color	**BROWN**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY WITH SAND***

Tested By MV Date 6/30/98 Checked By CB Date 7-3-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 C:\MSOFFICE\EXCEL\PrintQ\[F130.xls]Sheet1

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP23-GEOT-0608
Lab ID	98167-01.002	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2489	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	512.40	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	443.90	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	99.92	Weight of Tare (gm)	NA
Weight of Water (gm)	68.50	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	343.98	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**19.9**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	343.98
Dry Weight - 3/4" Sample (gm)	79.2	Weight of minus #200 material (gm)	264.79
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	79.19
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	1.51	0.44	0.44	99.56	**99.56**
#20	0.850	4.70	1.37	1.81	98.19	**98.19**
#40	0.425	2.97	0.86	2.67	97.33	**97.33**
#60	0.250	1.56	0.45	3.12	96.88	**96.88**
#140	0.106	22.68	6.59	9.72	90.28	**90.28**
#200	0.075	45.77	13.31	23.02	76.98	**76.98**
Pan	-	264.79	76.98	100.00	-	-

Tested By MV Date 6/30/98 Checked By LB Date 7-3-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP23-GEOT-0608
Lab ID	98167-01.002	Soil Description	**BROWN LEAN CLAY**

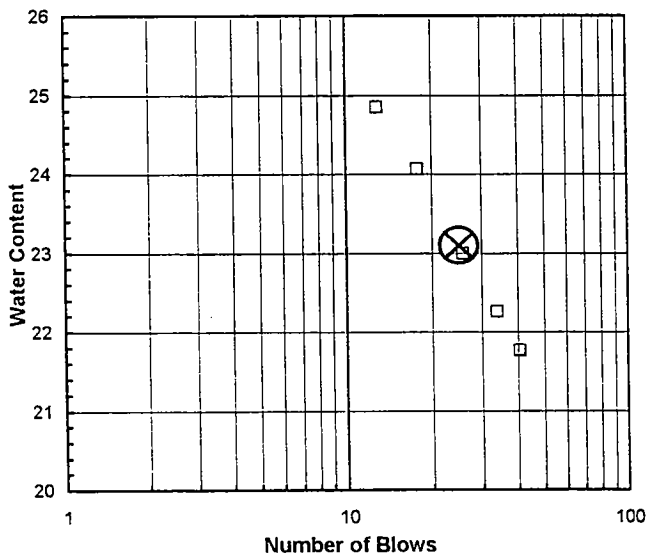
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	1886	2023	2039	2062	2293	M
Wt. of Tare & WS (gm)	41.10	39.01	38.23	42.41	45.43	U
Wt. of Tare & DS (gm)	36.66	35.04	33.77	37.87	40.21	L
Wt. of Tare (gm)	16.25	17.20	14.37	19.00	19.20	T
Wt. of Water (gm)	4.44	3.97	4.46	4.54	5.22	I
Wt. of DS (gm)	20.41	17.84	19.4	18.87	21.01	P
						O
Moisture Content (%)	**21.8**	**22.3**	**23.0**	**24.1**	**24.8**	I
Number of Blows	**41**	**34**	**26**	**18**	**13**	N T

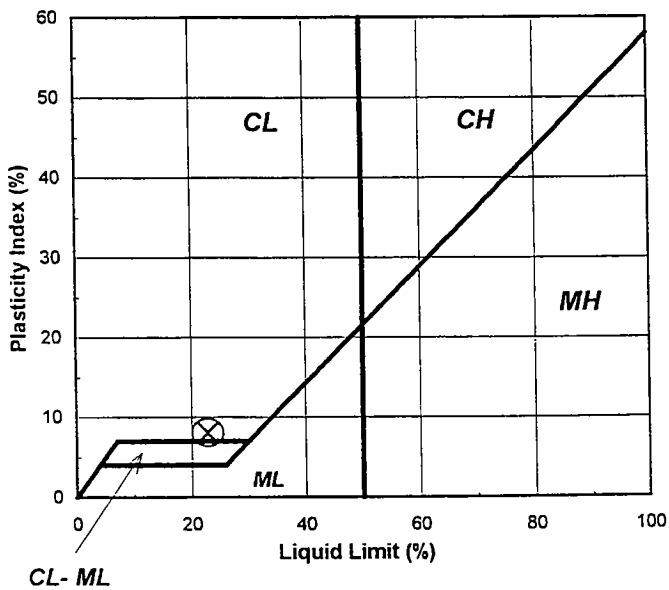
Plastic Limit Test	**1**	**2**	**3**
Tare Number	2302	2316	2320
Wt. of Tare & WS (gm)	26.04	25.62	23.92
Wt. of Tare & DS (gm)	25.23	24.80	23.03
Wt. of Tare (gm)	19.88	19.52	17.21
Wt. of Water (gm)	0.81	0.82	0.89
Wt. of DS (gm)	5.35	5.28	5.82
Moisture Content (%)	**15.1**	**15.5**	**15.3**

Test Results	
Liquid Limit (%)	**23**
Plastic Limit (%)	**15**
Plasticity Index (%)	**8**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By BS *Date* 7/6/98 *Checked By* LB *Date* 7-8-98

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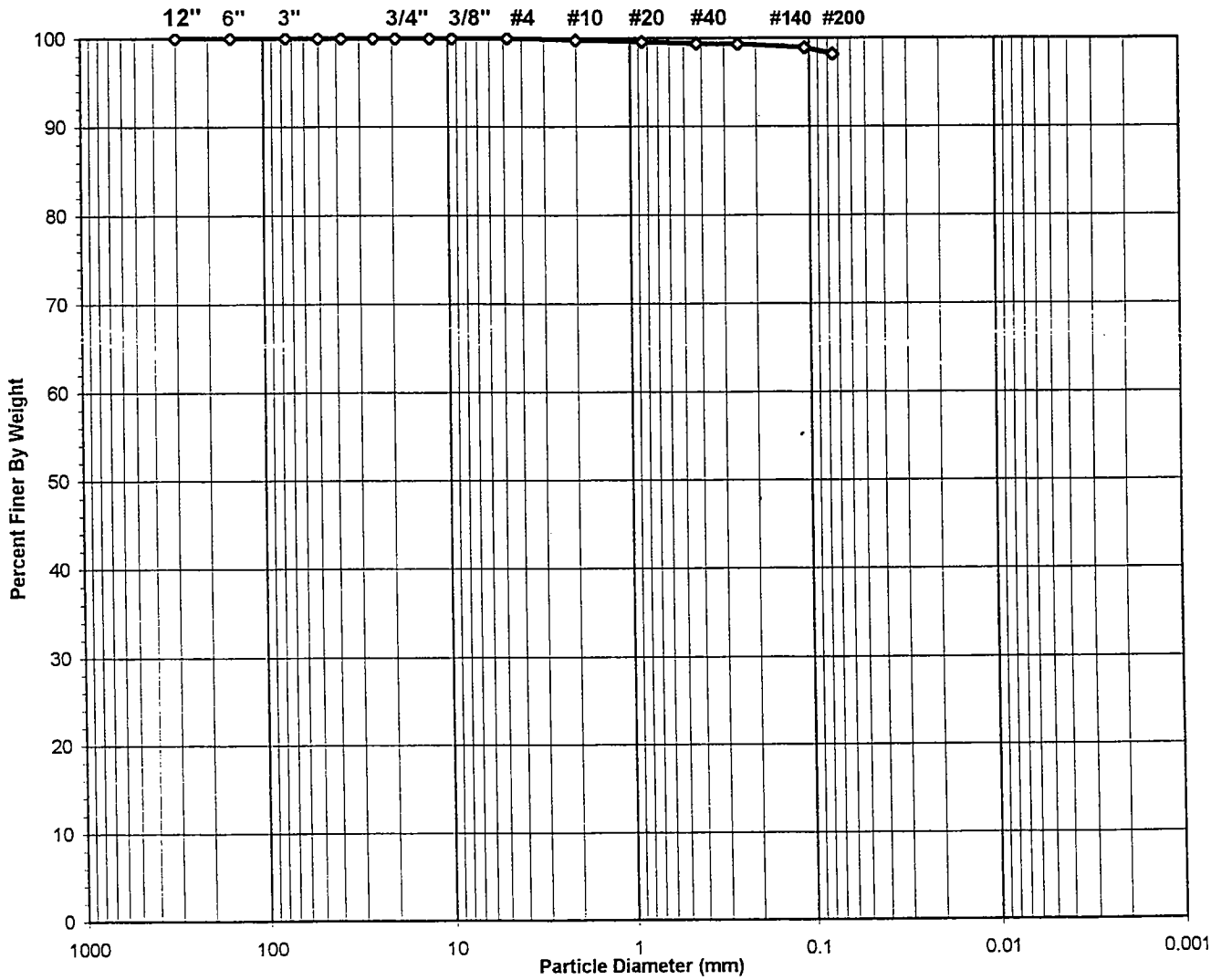
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP23-GEOT-1012
Lab ID	98167-01.003	Soil Color	**BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY***

Tested By MV Date 6/30/98 Checked By LB Date 7-3-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[F131.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP23-GEOT-1012
Lab ID	98167-01.003	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	525	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	546.20	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	457.40	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	101.57	Weight of Tare (gm)	NA
Weight of Water (gm)	88.80	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	355.83	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**25.0**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	355.83
Dry Weight - 3/4" Sample (gm)	6.5	Weight of minus #200 material (gm)	349.33
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	6.50
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.74	0.21	0.21	99.79	**99.79**
#20	0.850	0.78	0.22	0.43	99.57	**99.57**
#40	0.425	0.51	0.14	0.57	99.43	**99.43**
#60	0.250	0.41	0.12	0.69	99.31	**99.31**
#140	0.106	1.41	0.40	1.08	98.92	**98.92**
#200	0.075	2.65	0.74	1.83	98.17	**98.17**
Pan	-	349.33	98.17	100.00	-	-

Tested By MV Date 6/30/98 Checked By LB Date 7-3-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP23-GEOT-1012
Lab ID	98167-01.003	Soil Description	**BROWN LEAN CLAY**

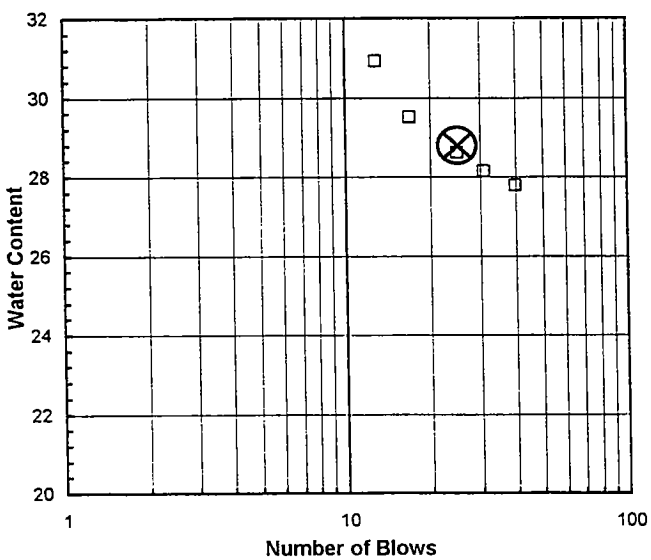
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	2025	2032	2053	2063	2226	M
Wt. of Tare & WS (gm)	35.55	35.38	39.50	34.56	37.58	U
Wt. of Tare & DS (gm)	31.05	30.94	34.76	29.73	32.81	L
Wt. of Tare (gm)	14.85	15.16	18.19	13.35	17.38	T
Wt. of Water (gm)	4.5	4.44	4.74	4.83	4.77	I
Wt. of DS (gm)	16.2	15.78	16.57	16.38	15.43	P
						O
Moisture Content (%)	**27.8**	**28.1**	**28.6**	**29.5**	**30.9**	I
Number of Blows	**40**	**31**	**25**	**17**	**13**	N
						T

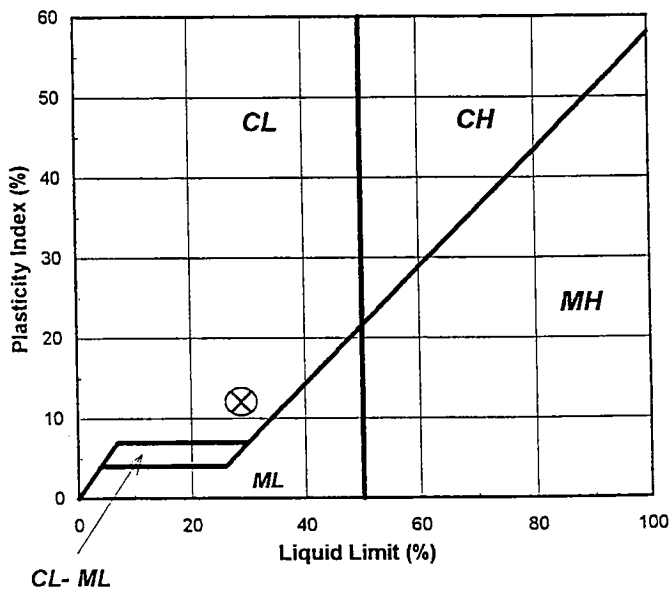
Plastic Limit Test	**1**	**2**	**3**
Tare Number	2230	2233	2247
Wt. of Tare & WS (gm)	24.58	23.78	23.71
Wt. of Tare & DS (gm)	23.67	22.91	22.80
Wt. of Tare (gm)	18.13	17.69	17.34
Wt. of Water (gm)	0.91	0.87	0.91
Wt. of DS (gm)	5.54	5.22	5.46
Moisture Content (%)	**16.4**	**16.7**	**16.7**

Test Results	
Liquid Limit (%)	**29**
Plastic Limit (%)	**17**
Plasticity Index (%)	**12**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By *BS* *Date* *7/6/98* *Checked By* LB *Date* 7-8-98

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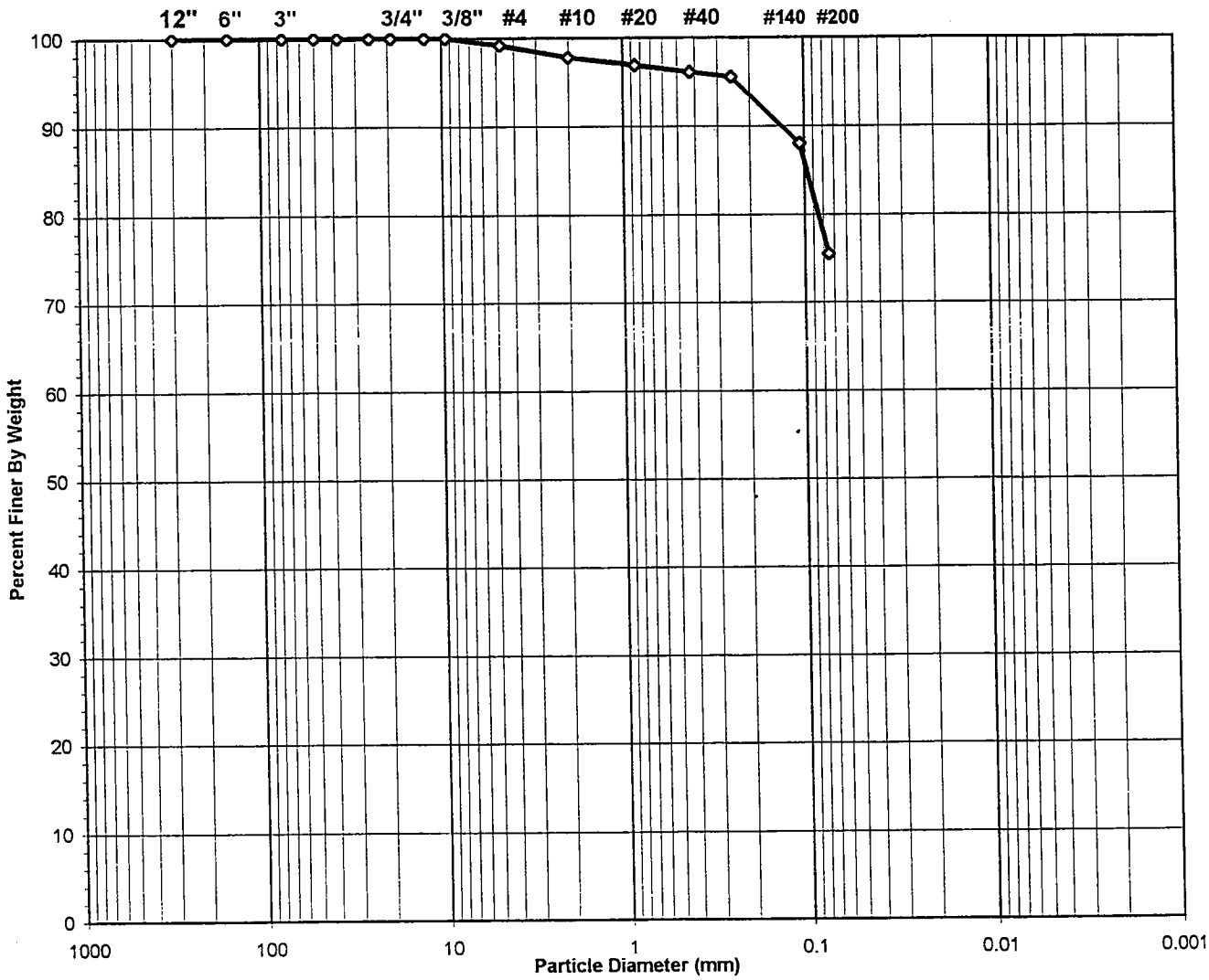
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP22-GEOT-0204
Lab ID	98167-01.004	Soil Color	**BROWN**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***CL-ML, TESTED***

USCS Classification ***SILTY CLAY WITH SAND***

Tested By MV Date 6/30/98 Checked By LB Date 7-8-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 C:\MSOFFICE\EXCEL\PrintQ\[F132.xls]Sheet1

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP22-GEOT-0204
Lab ID	98167-01.004	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1642	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	446.80	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	379.08	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	101.26	Weight of Tare (gm)	NA
Weight of Water (gm)	67.72	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	277.82	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**24.4**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	277.82
Dry Weight - 3/4" Sample (gm)	68.0	Weight of minus #200 material (gm)	209.79
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	68.03
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	2.29	0.82	0.82	99.18	**99.18**
#10	2.00	3.86	1.39	2.21	97.79	**97.79**
#20	0.850	2.39	0.86	3.07	96.93	**96.93**
#40	0.425	2.09	0.75	3.83	96.17	**96.17**
#60	0.250	1.56	0.56	4.39	95.61	**95.61**
#140	0.106	21.10	7.59	11.98	88.02	**88.02**
#200	0.075	34.74	12.50	24.49	75.51	**75.51**
Pan	-	209.79	75.51	100.00	-	-

Tested By MV Date 6/30/98 Checked By LB Date 7-8-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP22-GEOT-0204
Lab ID	98167-01.004	Soil Description	**BROWN SILTY CLAY**

***Note:** The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.*

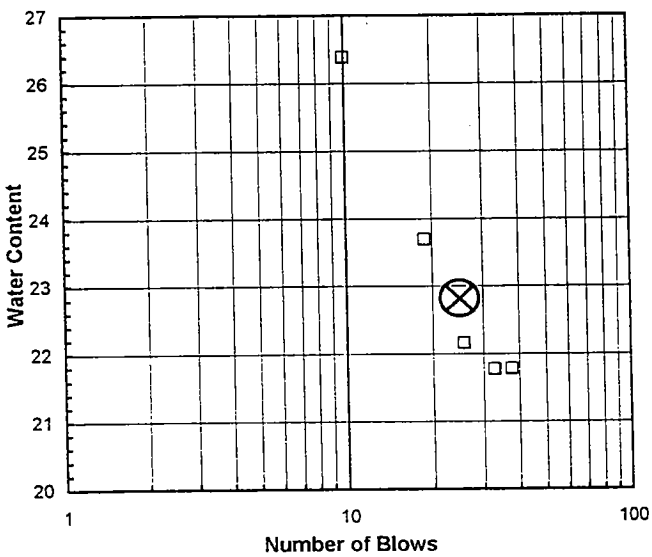
(Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	MULTIPOINT
Tare Number	1797	1877	1882	1888	2034	
Wt. of Tare & WS (gm)	42.97	39.85	45.87	39.36	41.93	
Wt. of Tare & DS (gm)	38.26	35.49	41.04	35.25	37.37	
Wt. of Tare (gm)	16.63	15.46	19.24	17.90	20.08	
Wt. of Water (gm)	4.71	4.36	4.83	4.11	4.56	
Wt. of DS (gm)	21.63	20.03	21.8	17.35	17.29	
Moisture Content (%)	**21.8**	**21.8**	**22.2**	**23.7**	**26.4**	
Number of Blows	**38**	**33**	**26**	**19**	**10**	

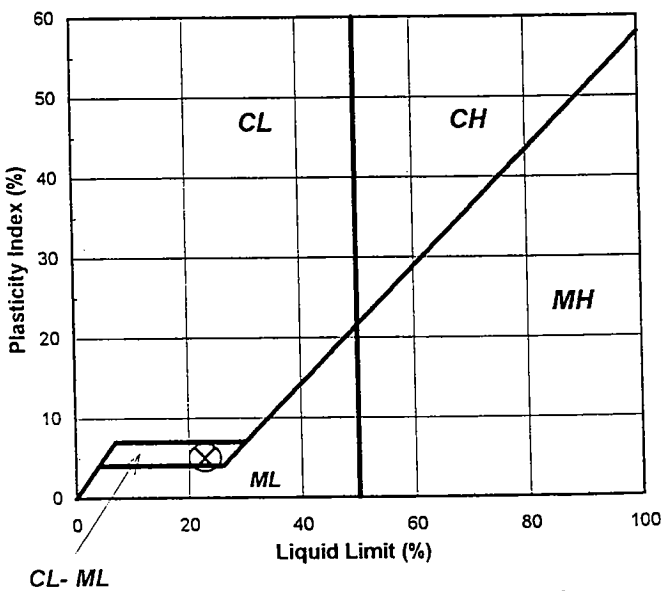
Plastic Limit Test	**1**	**2**	**3**
Tare Number	2036	2045	2052
Wt. of Tare & WS (gm)	23.33	25.01	22.45
Wt. of Tare & DS (gm)	22.39	24.11	21.50
Wt. of Tare (gm)	17.06	19.01	16.26
Wt. of Water (gm)	0.94	0.9	0.95
Wt. of DS (gm)	5.33	5.1	5.24
Moisture Content (%)	**17.6**	**17.6**	**18.1**

Test Results	
Liquid Limit (%)	**23**
Plastic Limit (%)	**18**
Plasticity Index (%)	**5**
USCS Symbol	**CL-ML**

Flow Curve



Plasticity Chart



Tested By BS *Date* 7/6/98 *Checked By* LB *Date* 7-8-98

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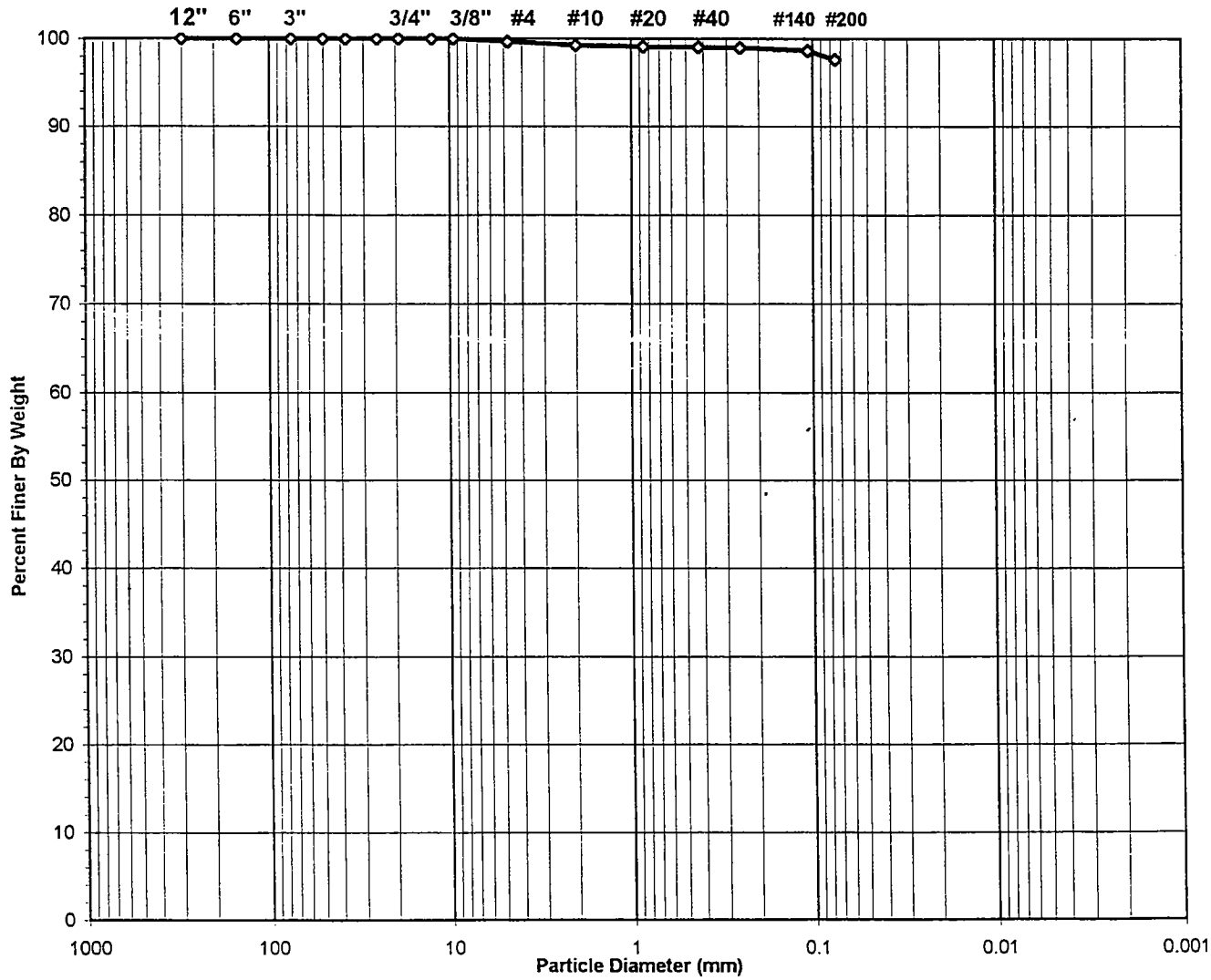
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP22-GEOT-0608
Lab ID	98167-01.005	Soil Color	**BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY***

Tested By MV Date 6/30/98 Checked By LB Date 7-3-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[F133.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP22-GEOT-0608
Lab ID	98167-01.005	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2461	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	546.90	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	459.50	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	101.12	Weight of Tare (gm)	NA
Weight of Water (gm)	87.40	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	358.38	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**24.4**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	358.38
Dry Weight - 3/4" Sample (gm)	8.4	Weight of minus #200 material (gm)	349.99
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	8.39
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	1.08	0.30	0.30	99.70	**99.70**
#10	2.00	1.63	0.45	0.76	99.24	**99.24**
#20	0.850	0.43	0.12	0.88	99.12	**99.12**
#40	0.425	0.19	0.05	0.93	99.07	**99.07**
#60	0.250	0.16	0.04	0.97	99.03	**99.03**
#140	0.106	1.22	0.34	1.31	98.69	**98.69**
#200	0.075	3.68	1.03	2.34	97.66	**97.66**
Pan	-	349.99	97.66	100.00	-	-

Tested By MV Date 6/30/98 Checked By LB Date 7-3-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP22-GEOT-0608
Lab ID	98167-01.005	Soil Description	**BROWN LEAN CLAY**

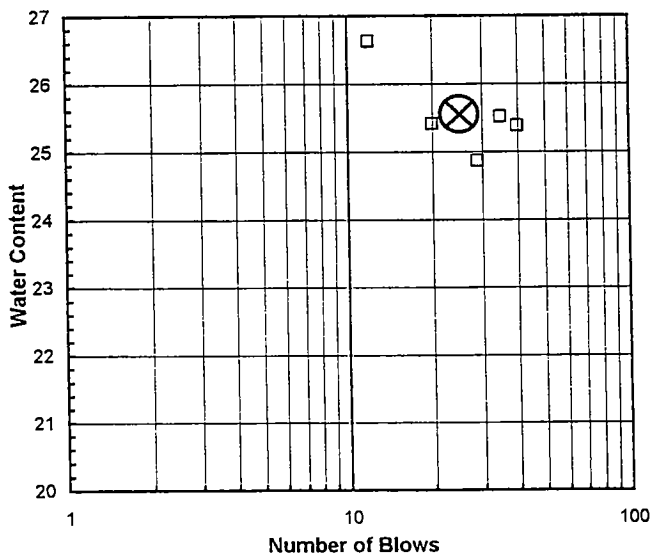
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	2047	2052	2035	2042	2037	M
Wt. of Tare & WS (gm)	37.39	36.44	34.48	28.56	28.88	U
Wt. of Tare & DS (gm)	32.80	32.35	30.30	26.30	26.51	L
Wt. of Tare (gm)	15.56	16.25	13.48	17.44	17.17	T
Wt. of Water (gm)	4.59	4.09	4.18	2.26	2.37	I
Wt. of DS (gm)	17.24	16.1	16.82	8.86	9.34	P
						O
Moisture Content (%)	**26.6**	**25.4**	**24.9**	**25.5**	**25.4**	I
Number of Blows	**12**	**20**	**29**	**35**	**40**	N
						T

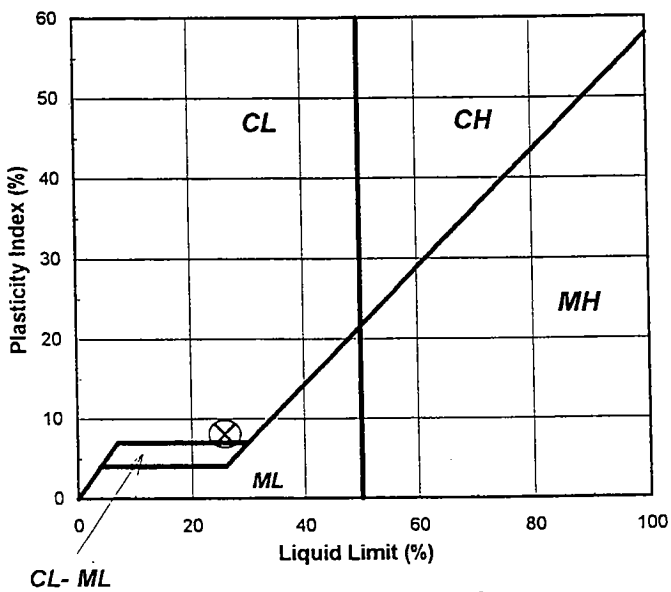
Plastic Limit Test	**1**	**2**	**3**
Tare Number	1881	2036	2055
Wt. of Tare & WS (gm)	21.98	23.48	24.83
Wt. of Tare & DS (gm)	20.92	22.50	23.89
Wt. of Tare (gm)	15.45	17.06	18.73
Wt. of Water (gm)	0.96	0.98	0.94
Wt. of DS (gm)	5.47	5.44	5.16
Moisture Content (%)	**17.6**	**18.0**	**18.2**

Test Results	
Liquid Limit (%)	**26**
Plastic Limit (%)	**18**
Plasticity Index (%)	**8**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



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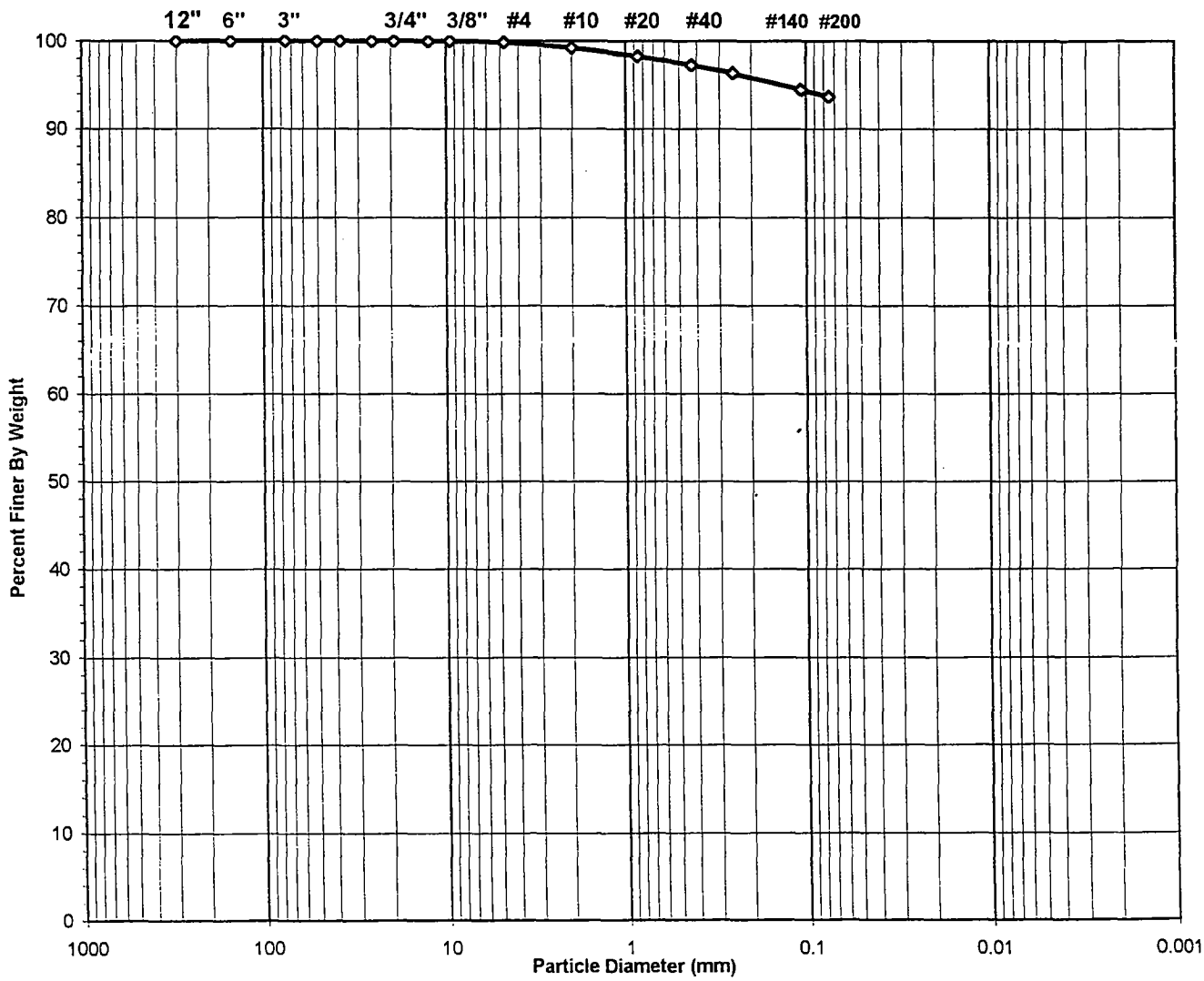
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP22-GEOT-1012
Lab ID	98167-01.006	Soil Color	**GRAY**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY***

Tested By MV Date 6/30/98 Checked By LB Date 7-3-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[F134.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP22-GEOT-1012
Lab ID	98167-01.006	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2443	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	578.00	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	482.20	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	100.01	Weight of Tare (gm)	NA
Weight of Water (gm)	95.80	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	382.19	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**25.1**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	382.19
Dry Weight - 3/4" Sample (gm)	24.1	Weight of minus #200 material (gm)	358.08
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	24.11
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.45	0.12	0.12	99.88	**99.88**
#10	2.00	2.32	0.61	0.72	99.28	**99.28**
#20	0.850	3.85	1.01	1.73	98.27	**98.27**
#40	0.425	3.87	1.01	2.74	97.26	**97.26**
#60	0.250	3.59	0.94	3.68	96.32	**96.32**
#140	0.106	7.13	1.87	5.55	94.45	**94.45**
#200	0.075	2.90	0.76	6.31	93.69	**93.69**
Pan	-	358.08	93.69	100.00	-	-

Tested By MV Date 6/30/98 Checked By LB Date 7-3-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP22-GEOT-1012
Lab ID	98167-01.006	Soil Description	**GRAY LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

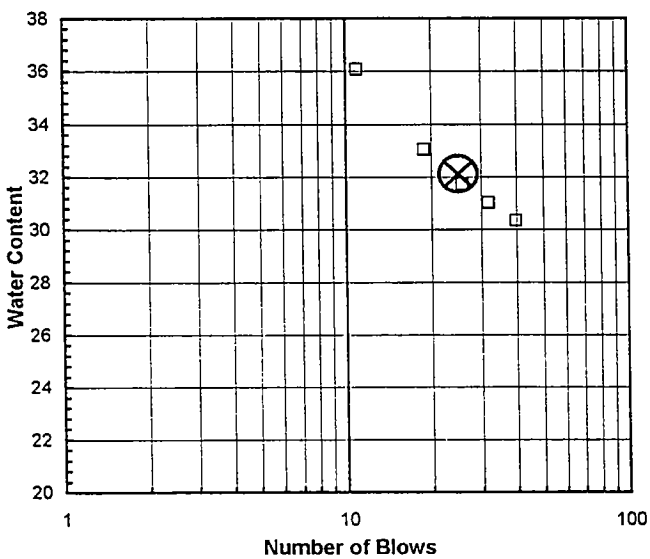
(Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	1792	2026	2031	2040	2232	M U L T I P O I N T
Wt. of Tare & WS (gm)	36.04	41.29	38.25	35.58	38.48	
Wt. of Tare & DS (gm)	31.16	36.38	33.28	30.57	32.90	
Wt. of Tare (gm)	15.07	20.54	17.60	15.40	17.42	
Wt. of Water (gm)	4.88	4.91	4.97	5.01	5.58	
Wt. of DS (gm)	16.09	15.84	15.68	15.17	15.48	
Moisture Content (%)	**30.3**	**31.0**	**31.7**	**33.0**	**36.0**	
Number of Blows	**40**	**32**	**26**	**19**	**11**	

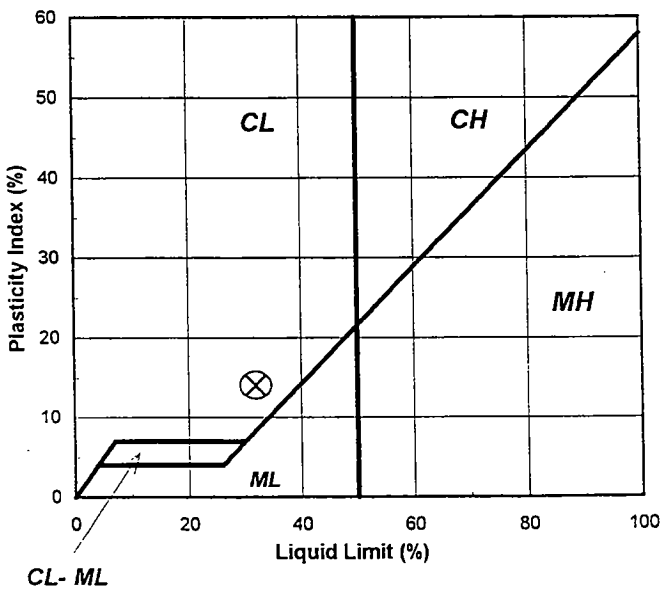
Plastic Limit Test	**1**	**2**	**3**
Tare Number	2250	2296	2299
Wt. of Tare & WS (gm)	21.09	25.17	22.91
Wt. of Tare & DS (gm)	20.29	24.22	21.94
Wt. of Tare (gm)	16.07	19.06	16.52
Wt. of Water (gm)	0.8	0.95	0.97
Wt. of DS (gm)	4.22	5.16	5.42
Moisture Content (%)	**19.0**	**18.4**	**17.9**

Test Results	
Liquid Limit (%)	**32**
Plastic Limit (%)	**18**
Plasticity Index (%)	**14**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By BS *Date* 7/6/98 *Checked By* LB *Date* 7-8-98

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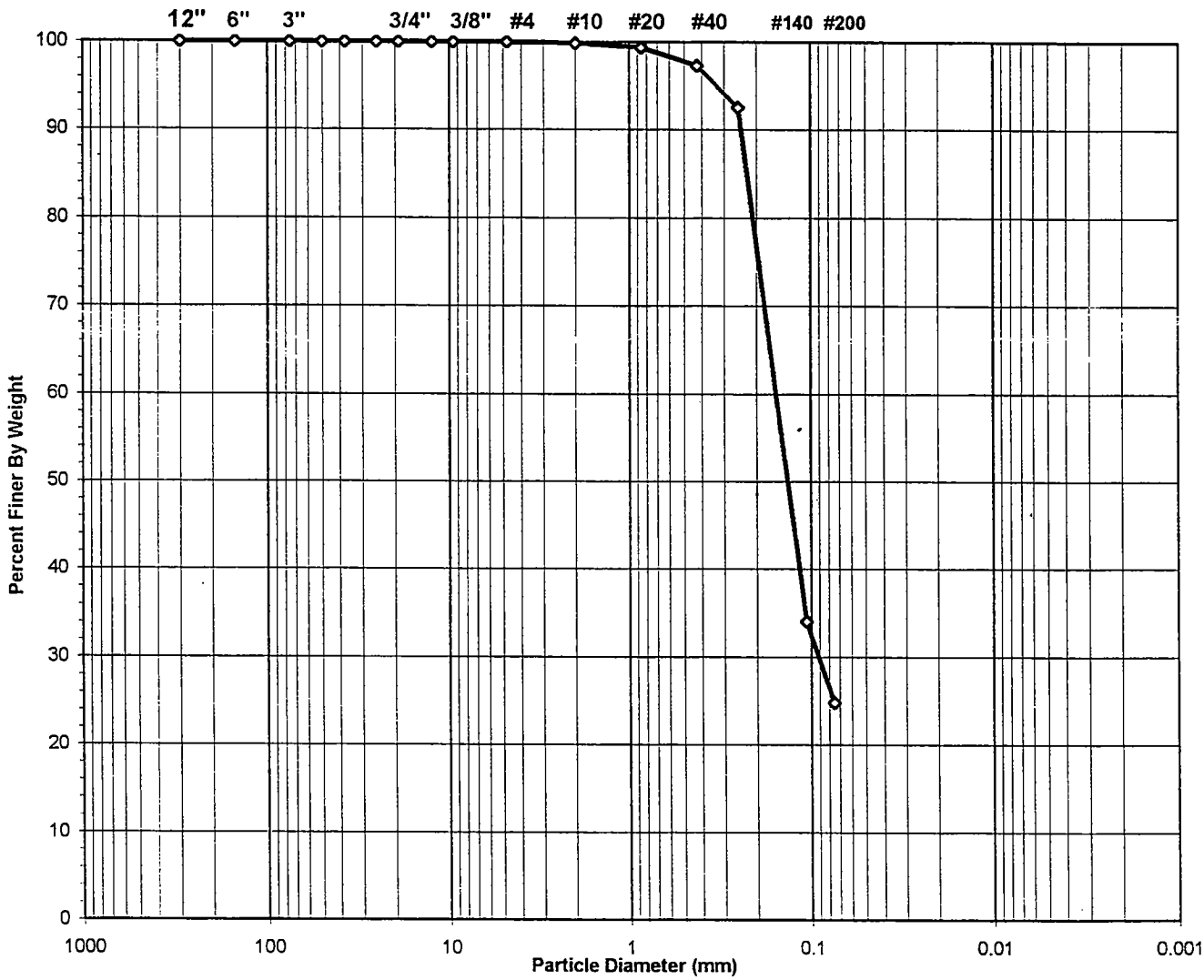
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP21-GEOT-0204
Lab ID	98167-01.007	Soil Color	**BROWN**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND (NON-PLASTIC FINES)***

Tested By MV Date 6/30/98 Checked By UB Date 7-8-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP21-GEOT-0204
Lab ID	98167-01.007	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1646	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	499.80	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	439.90	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	98.66	Weight of Tare (gm)	NA
Weight of Water (gm)	59.90	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	341.24	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**17.6**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	341.24
Dry Weight - 3/4" Sample (gm)	256.6	Weight of minus #200 material (gm)	84.61
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	256.63
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.42	0.12	0.12	99.88	**99.88**
#20	0.850	1.69	0.50	0.62	99.38	**99.38**
#40	0.425	7.03	2.06	2.68	97.32	**97.32**
#60	0.250	16.30	4.78	7.46	92.54	**92.54**
#140	0.106	199.62	58.50	65.95	34.05	**34.05**
#200	0.075	31.57	9.25	75.21	24.79	**24.79**
Pan	-	84.61	24.79	100.00	-	-

Tested By MV Date 6/30/98 Checked By LB Date 7-8-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP21-GEOT-0204
Lab ID	98167-01.007	Visual Description	**BROWN SILT**
			(Minus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By TO *Date* 7/7/98 *Checked By* LB *Date* 7-8-98

page 1 of 1 DCN: CT-S4B DATE: 7-11-97 REVISION : 2 *C:\MSOFFICE\EXCEL\PrintQ\[G5.xls]Sheet1*

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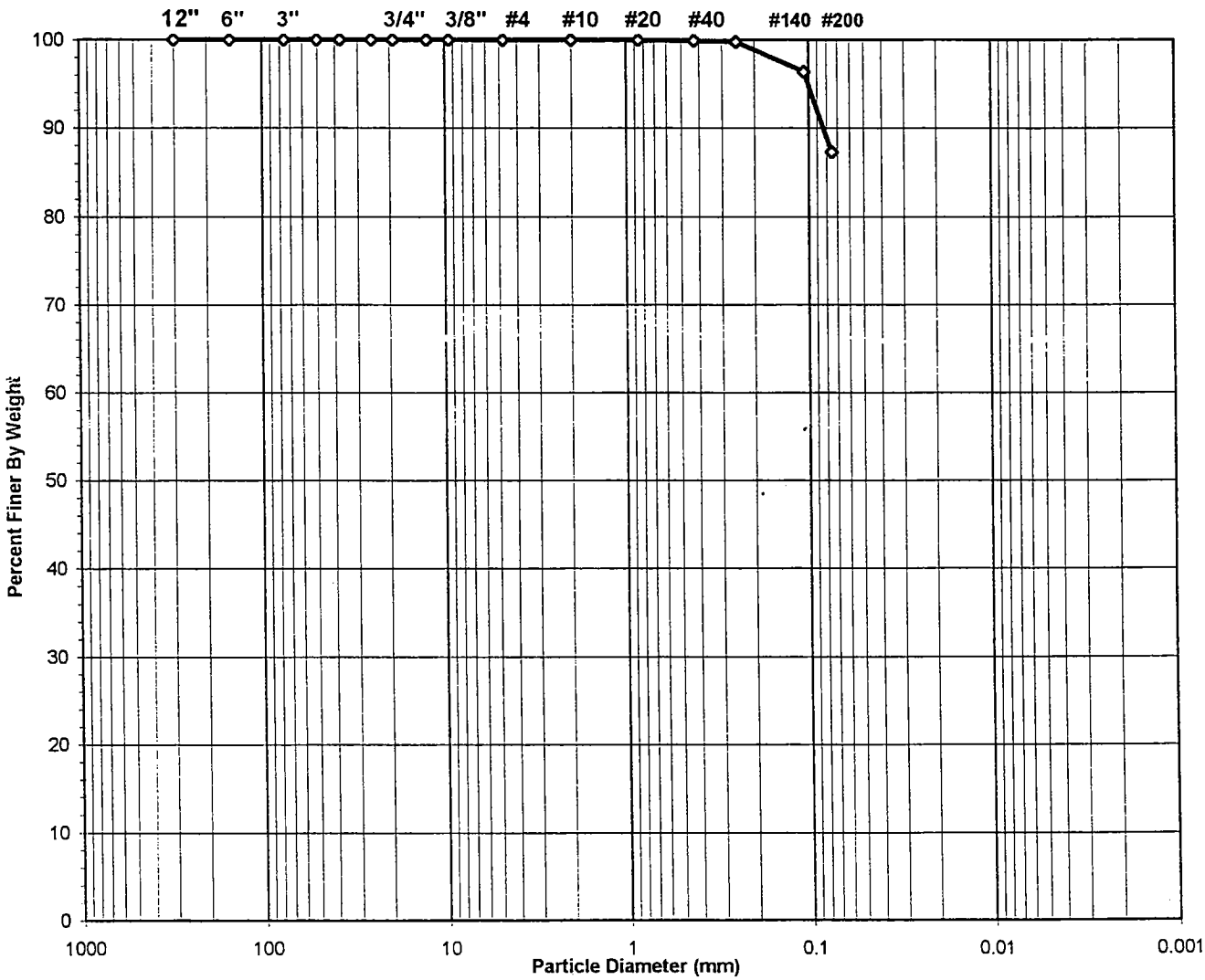
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP21-GEOT-0608
Lab ID	98167-01.008	Soil Color	**GRAYISH BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***CL-ML, TESTED***

USCS Classification ***SILTY CLAY***

Tested By MV Date 6/30/98 Checked By LB Date 7-8-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[F136.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP21-GEOT-0608
Lab ID	98167-01.008	Soil Color	**GRAYISH BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	502	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	512.00	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	441.40	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	104.77	Weight of Tare (gm)	NA
Weight of Water (gm)	70.60	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	336.63	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**21.0**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	336.63
Dry Weight - 3/4" Sample (gm)	42.8	Weight of minus #200 material (gm)	293.87
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	42.76
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.00	0.00	0.00	100.00	**100.00**
#20	0.850	0.07	0.02	0.02	99.98	**99.98**
#40	0.425	0.14	0.04	0.06	99.94	**99.94**
#60	0.250	0.36	0.11	0.17	99.83	**99.83**
#140	0.106	11.51	3.42	3.59	96.41	**96.41**
#200	0.075	30.68	9.11	12.70	87.30	**87.30**
Pan	-	293.87	87.30	100.00	-	-

Tested By MV Date 6/30/98 Checked By UB Date 7-8-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP21-GEOT-0608
Lab ID	98167-01.008	Soil Description	**GRAYISH BROWN SILTY CLAY**

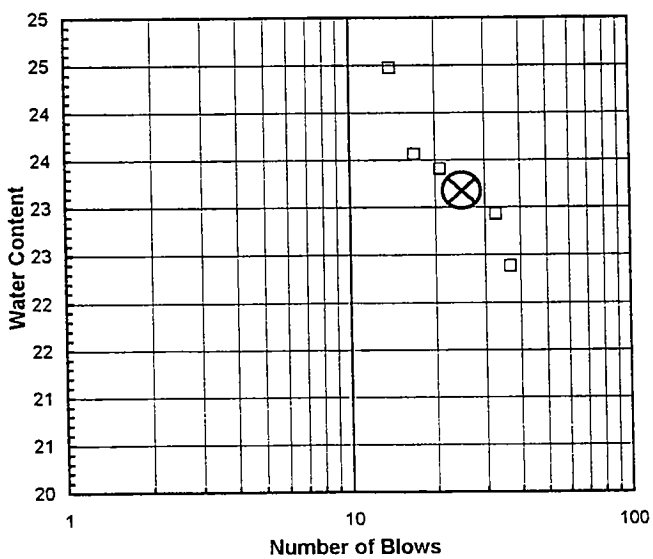
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	40	26	48	93	91	MULTIPOINT
Wt. of Tare & WS (gm)	39.09	41.38	42.81	38.66	41.47	
Wt. of Tare & DS (gm)	35.13	36.72	37.98	34.66	36.45	
Wt. of Tare (gm)	17.43	16.39	17.34	17.68	15.93	
Wt. of Water (gm)	3.96	4.66	4.83	4	5.02	
Wt. of DS (gm)	17.7	20.33	20.64	16.98	20.52	
Moisture Content (%)	**22.4**	**22.9**	**23.4**	**23.6**	**24.5**	
Number of Blows	**37**	**33**	**21**	**17**	**14**	

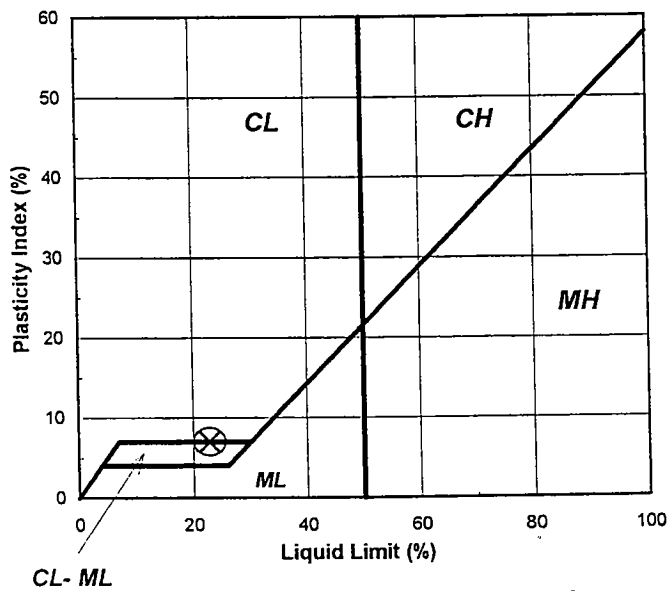
Plastic Limit Test	**1**	**2**	**3**
Tare Number	2316	2317	2252
Wt. of Tare & WS (gm)	25.88	22.55	24.17
Wt. of Tare & DS (gm)	25.03	21.61	23.30
Wt. of Tare (gm)	19.52	15.54	17.72
Wt. of Water (gm)	0.85	0.94	0.87
Wt. of DS (gm)	5.51	6.07	5.58
Moisture Content (%)	**15.4**	**15.5**	**15.6**

Test Results	
Liquid Limit (%)	**23**
Plastic Limit (%)	**16**
Plasticity Index (%)	**7**
USCS Symbol	**CL-ML**

Flow Curve



Plasticity Chart



Tested By TO *Date* *7/7/98* *Checked By* LB *Date* 7-8-98

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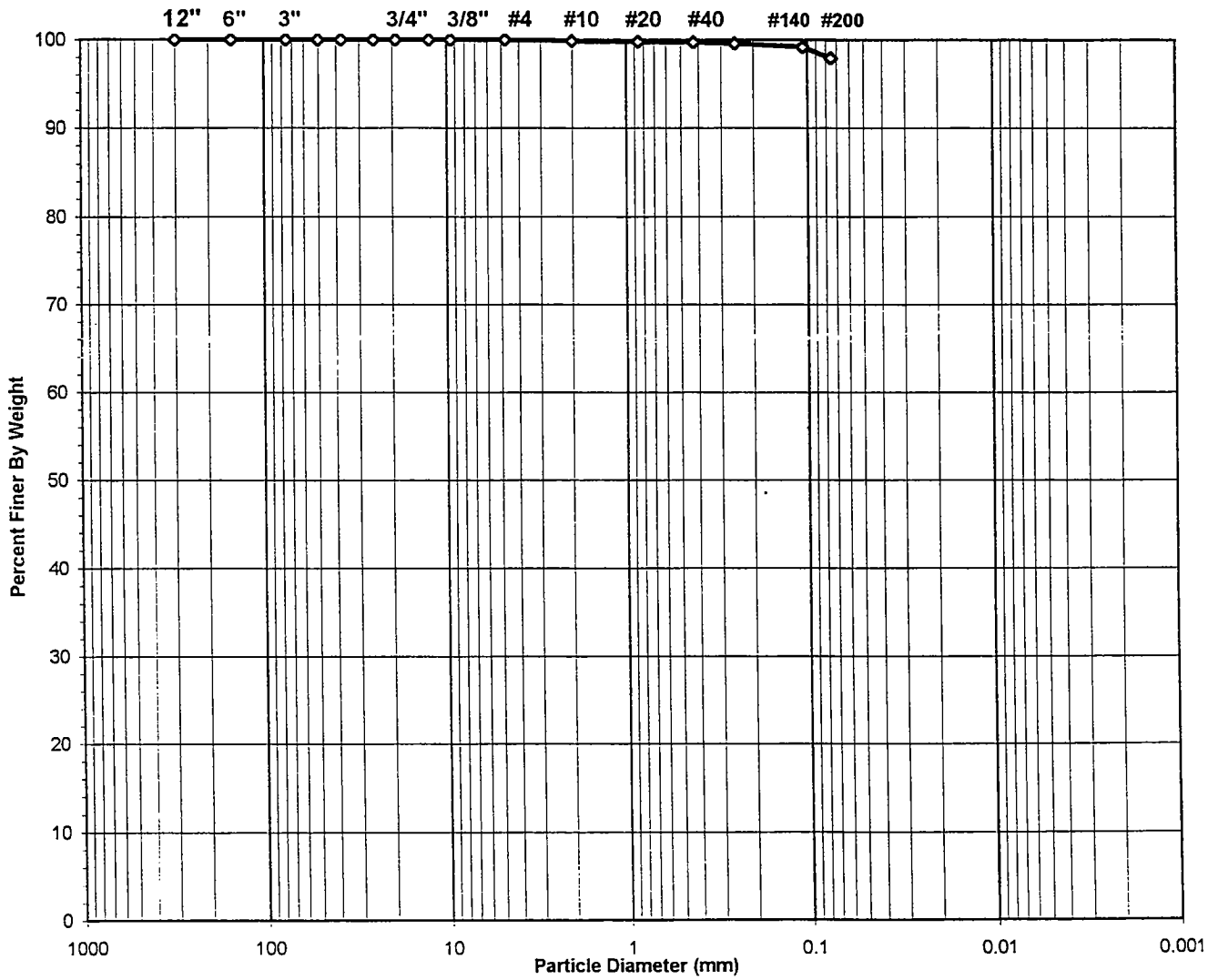
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP21-GEOT-0810
Lab ID	98167-01.009	Soil Color	**GRAY**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY***

Tested By MV Date 6/30/98 Checked By LB Date 7-3-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\F137.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP21-GEOT-0810
Lab ID	98167-01.009	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1658	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	574.70	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	485.30	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	92.06	Weight of Tare (gm)	NA
Weight of Water (gm)	89.40	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	393.24	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**22.7**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	393.24
Dry Weight - 3/4" Sample (gm)	8.0	Weight of minus #200 material (gm)	385.22
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	8.02
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.46	0.12	0.12	99.88	**99.88**
#20	0.850	0.41	0.10	0.22	99.78	**99.78**
#40	0.425	0.28	0.07	0.29	99.71	**99.71**
#60	0.250	0.34	0.09	0.38	99.62	**99.62**
#140	0.106	1.77	0.45	0.83	99.17	**99.17**
#200	0.075	4.76	1.21	2.04	97.96	**97.96**
Pan	-	385.22	97.96	100.00	-	-

Tested By MV Date 6/30/98 Checked By LB Date 7-3-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP21-GEOT-0810
Lab ID	98167-01.009	Soil Description	**GRAY LEAN CLAY**

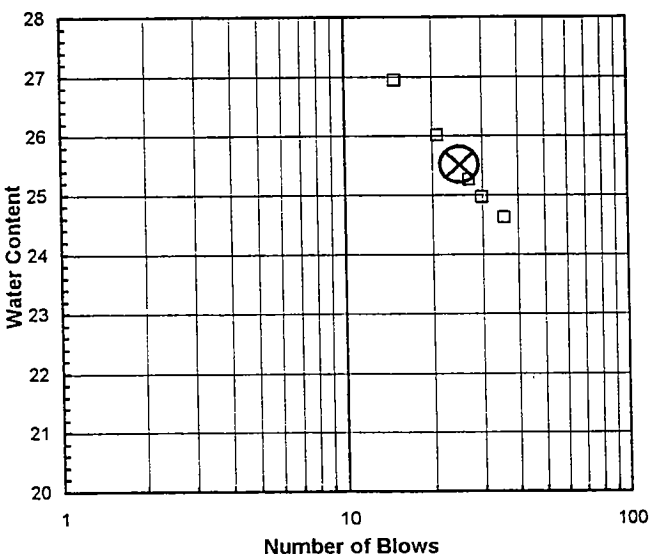
***Note:** The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.* (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	71	436	103	110	88	MULTIPOINT
Wt. of Tare & WS (gm)	39.17	38.45	38.84	40.65	40.03	
Wt. of Tare & DS (gm)	35.03	34.12	34.25	35.91	34.48	
Wt. of Tare (gm)	18.21	16.77	16.07	17.68	13.87	
Wt. of Water (gm)	4.14	4.33	4.59	4.74	5.55	
Wt. of DS (gm)	16.82	17.35	18.18	18.23	20.61	
Moisture Content (%)	**24.6**	**25.0**	**25.2**	**26.0**	**26.9**	
Number of Blows	**36**	**30**	**27**	**21**	**15**	

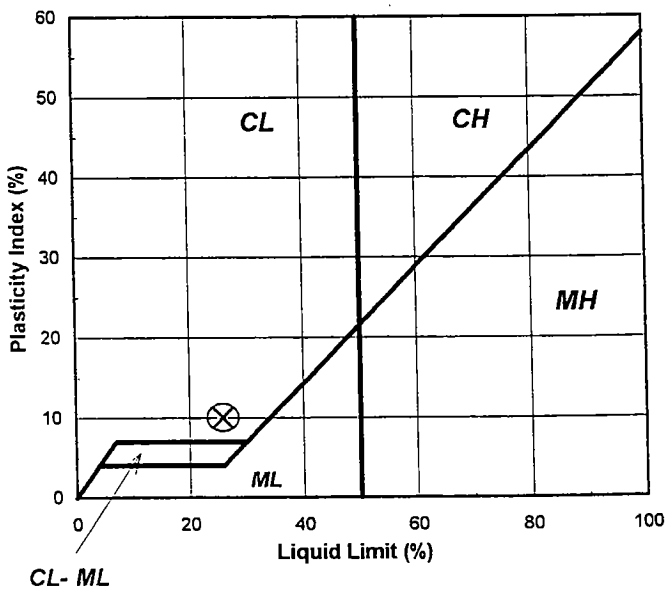
Plastic Limit Test	**1**	**2**	**3**
Tare Number	2319	2299	2291
Wt. of Tare & WS (gm)	24.21	22.83	23.66
Wt. of Tare & DS (gm)	23.36	21.94	22.81
Wt. of Tare (gm)	18.07	16.53	17.46
Wt. of Water (gm)	0.85	0.89	0.85
Wt. of DS (gm)	5.29	5.41	5.35
Moisture Content (%)	**16.1**	**16.5**	**15.9**

Test Results	
Liquid Limit (%)	**26**
Plastic Limit (%)	**16**
Plasticity Index (%)	**10**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



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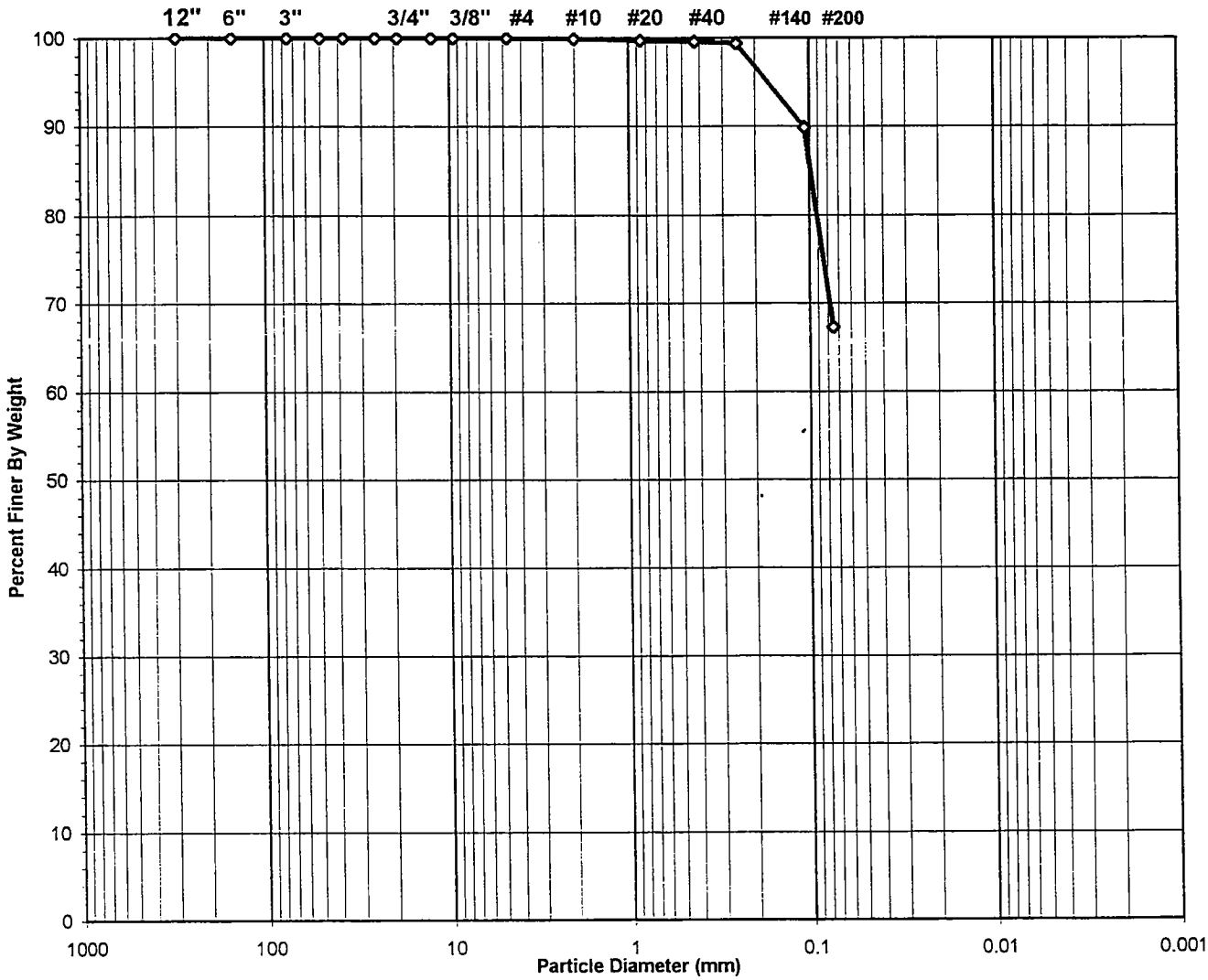
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP25-GEOT-0204
Lab ID	98167-01.010	Soil Color	**BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol ***ML, TESTED***

USCS Classification ***SANDY SILT (NON-PLASTIC FINES)***

Tested By MV Date 6/30/98 Checked By LB Date 7-8-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[F138.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP25-GEOT-0204
Lab ID	98167-01.010	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2447	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	545.30	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	455.30	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	100.21	Weight of Tare (gm)	NA
Weight of Water (gm)	90.00	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	355.09	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**25.3**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	355.09
Dry Weight - 3/4" Sample (gm)	116.2	Weight of minus #200 material (gm)	238.88
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	116.21
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.20	0.06	0.06	99.94	**99.94**
#20	0.850	0.66	0.19	0.24	99.76	**99.76**
#40	0.425	0.57	0.16	0.40	99.60	**99.60**
#60	0.250	0.58	0.16	0.57	99.43	**99.43**
#140	0.106	33.96	9.56	10.13	89.87	**89.87**
#200	0.075	80.24	22.60	32.73	67.27	**67.27**
Pan	-	238.88	67.27	100.00	-	-

Tested By MV Date 6/30/98 Checked By LB Date 7-8-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP25-GEOT-0204
Lab ID	98167-01.010	Visual Description	**BROWN SILT**
			(MInus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By BS *Date* 7/6/98 *Checked By* LB *Date* 7-8-98

DCN: CT-S4B DATE: 7-11-97 REVISION : 2

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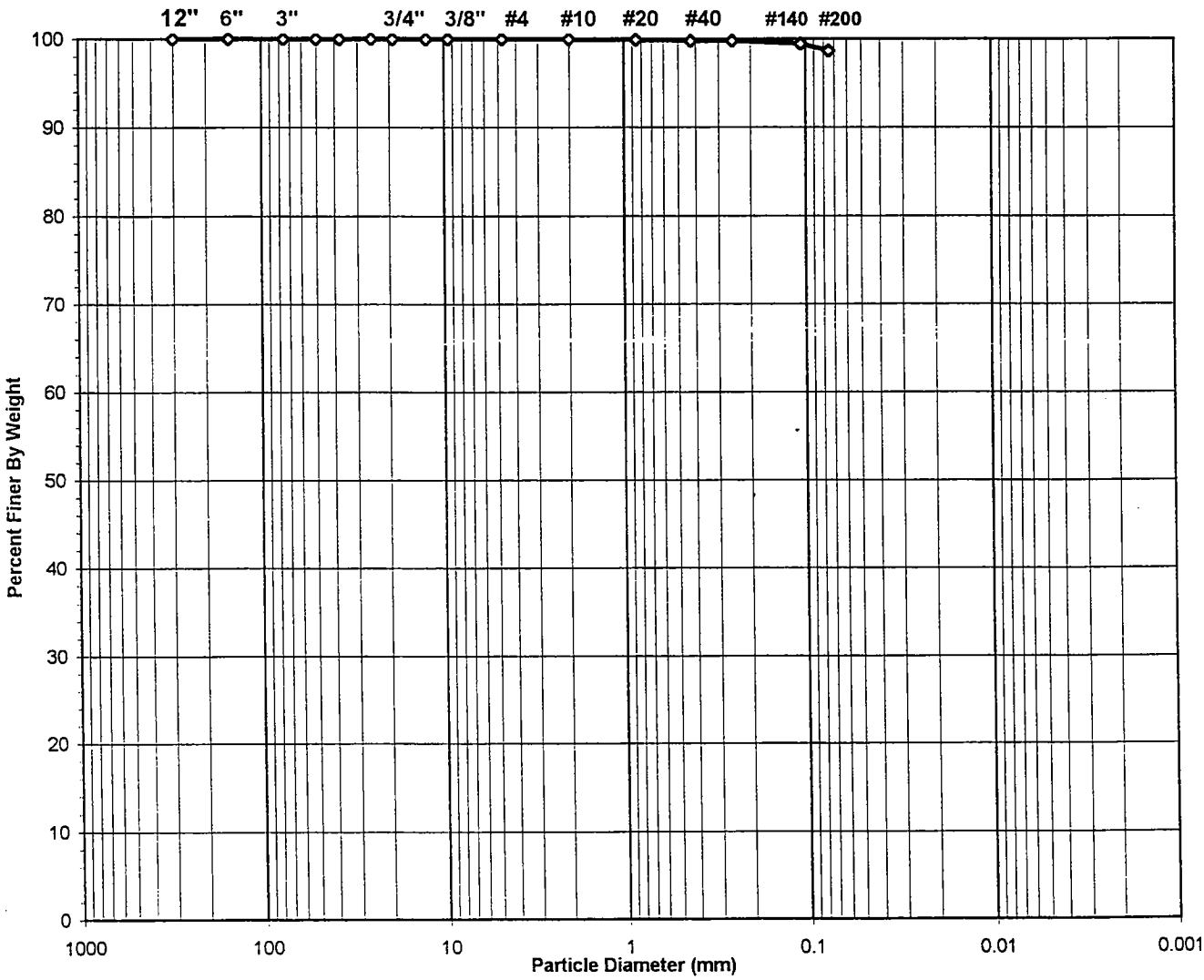
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP25-GEOT-0608
Lab ID	98167-01.011	Soil Color	**GRAY**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY***

Tested By MV Date 6/30/98 Checked By LB Date 7-3-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[F139.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP25-GEOT-0608
Lab ID	98167-01.011	Soil Color	**GRAY**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2460	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	569.70	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	477.20	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	101.15	Weight of Tare (gm)	NA
Weight of Water (gm)	92.50	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	376.05	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**24.6**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	376.05
Dry Weight - 3/4" Sample (gm)	5.1	Weight of minus #200 material (gm)	370.96
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	5.09
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.11	0.03	0.03	99.97	**99.97**
#20	0.850	0.25	0.07	0.10	99.90	**99.90**
#40	0.425	0.28	0.07	0.17	99.83	**99.83**
#60	0.250	0.20	0.05	0.22	99.78	**99.78**
#140	0.106	1.16	0.31	0.53	99.47	**99.47**
#200	0.075	3.09	0.82	1.35	98.65	**98.65**
Pan	-	370.96	98.65	100.00	-	-

Tested By MV Date 6/30/98 Checked By LB Date 7-3-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP25-GEOT-0608
Lab ID	98167-01.011	Soil Description	**GRAY LEAN CLAY**

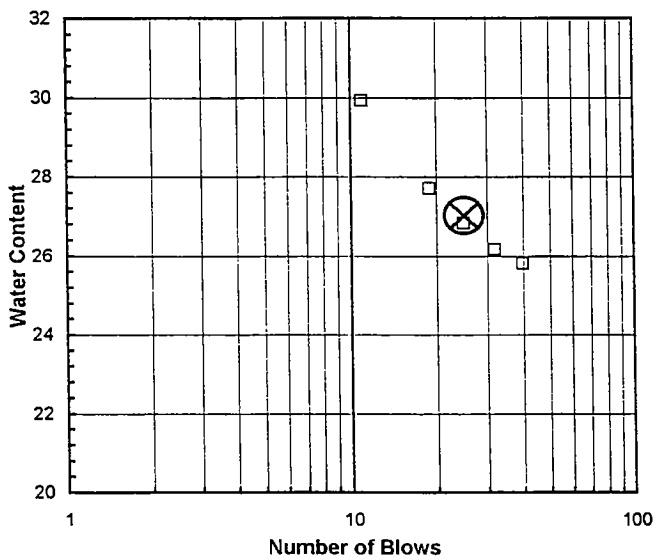
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	2225	2228	2235	2236	2238	MULTIPOINT
Wt. of Tare & WS (gm)	40.48	37.91	38.58	34.82	42.14	
Wt. of Tare & DS (gm)	36.34	33.59	34.04	30.44	36.59	
Wt. of Tare (gm)	20.29	17.07	17.11	14.62	18.03	
Wt. of Water (gm)	4.14	4.32	4.54	4.38	5.55	
Wt. of DS (gm)	16.05	16.52	16.93	15.82	18.56	
Moisture Content (%)	**25.8**	**26.2**	**26.8**	**27.7**	**29.9**	
Number of Blows	**40**	**32**	**25**	**19**	**11**	

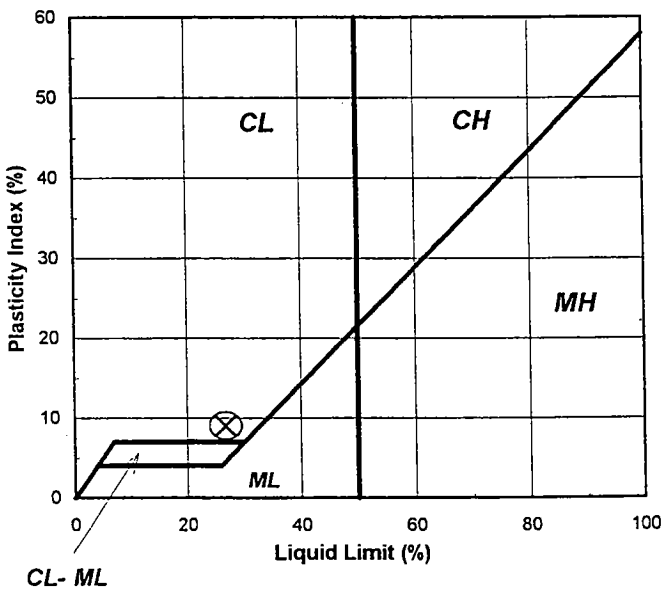
Plastic Limit Test	**1**	**2**	**3**
Tare Number	2247	2301	2302
Wt. of Tare & WS (gm)	23.99	26.11	27.02
Wt. of Tare & DS (gm)	22.98	25.15	25.95
Wt. of Tare (gm)	17.34	19.80	19.87
Wt. of Water (gm)	1.01	0.96	1.07
Wt. of DS (gm)	5.64	5.35	6.08
Moisture Content (%)	**17.9**	**17.9**	**17.6**

Test Results	
Liquid Limit (%)	**27**
Plastic Limit (%)	**18**
Plasticity Index (%)	**9**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By BS *Date* 7/7/98 *Checked By* LB *Date* 7-8-98

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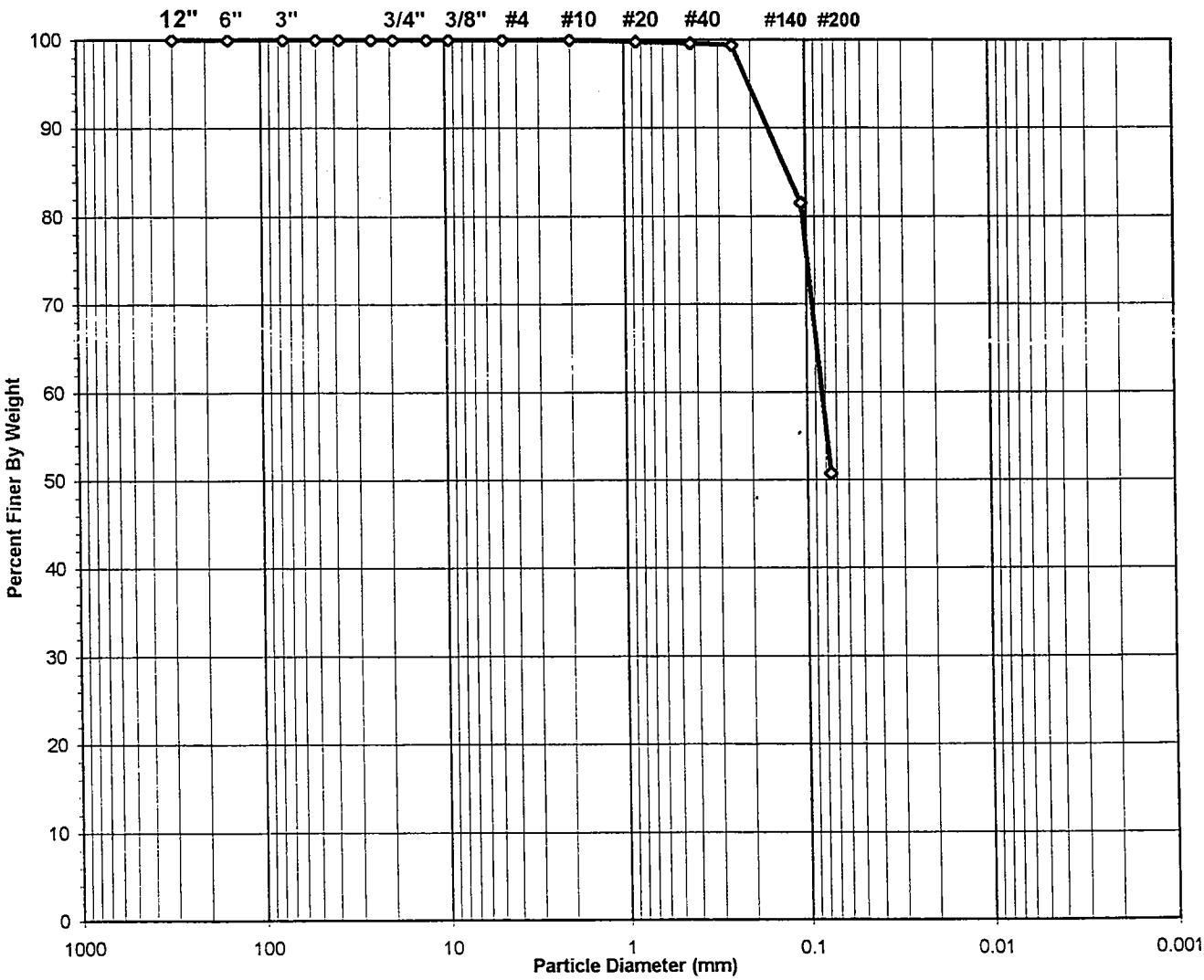
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP25-GEOT-1012
Lab ID	98167-01.012	Soil Color	**BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol ***ML, TESTED***

USCS Classification ***SANDY SILT (NON-PLASTIC FINES)***

Tested By MV Date 6/30/98 Checked By LB Date 7-8-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP25-GEOT-1012
Lab ID	98167-01.012	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1653	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	401.00	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	337.81	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	99.39	Weight of Tare (gm)	NA
Weight of Water (gm)	63.19	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	238.42	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**26.5**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	238.42
Dry Weight - 3/4" Sample (gm)	117.5	Weight of minus #200 material (gm)	120.88
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	117.54
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.04	0.02	0.02	99.98	**99.98**
#20	0.850	0.36	0.15	0.17	99.83	**99.83**
#40	0.425	0.53	0.22	0.39	99.61	**99.61**
#60	0.250	0.44	0.18	0.57	99.43	**99.43**
#140	0.106	42.69	17.91	18.48	81.52	**81.52**
#200	0.075	73.48	30.82	49.30	50.70	**50.70**
Pan	-	120.88	50.70	100.00	-	-

Tested By MV Date 6/30/98 Checked By LB Date 7-8-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP25-GEOT-1012
Lab ID	98167-01.012	Visual Description	**BROWN SILT**
			(Minus No. 40 sieve material, Airdried)

NON - PLASTIC MATERIAL

Tested By BS *Date* 7/7/98 *Checked By* LB *Date* 7-8-98

page 1 of 1 DCN: CT-S4B DATE: 7-11-97 REVISION : 2 *C:\MSOFFICE\EXCEL\PrintQ\[G7.xls]Sheet1*

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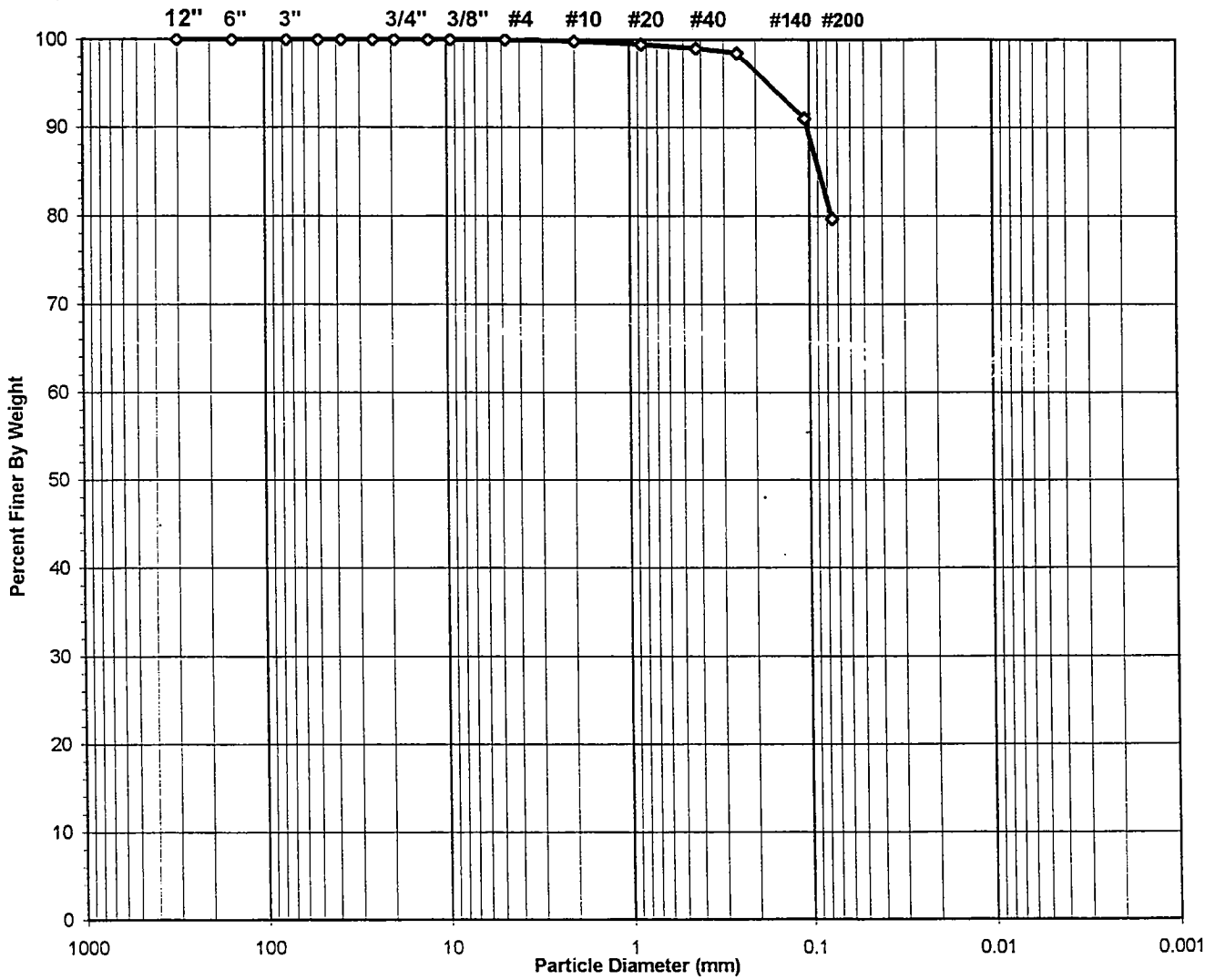
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP24-GEOT-0204
Lab ID	98167-01.013	Soil Color	**BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY WITH SAND***

Tested By MV Date 6/30/98 Checked By LB Date 7-3-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[F141.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP24-GEOT-0204
Lab ID	98167-01.013	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	2491	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	577.70	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	485.30	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	100.03	Weight of Tare (gm)	NA
Weight of Water (gm)	92.40	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	385.27	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**24.0**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	385.27
Dry Weight - 3/4" Sample (gm)	78.5	Weight of minus #200 material (gm)	306.77
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	78.50
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated **Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.67	0.17	0.17	99.83	**99.83**
#20	0.850	1.26	0.33	0.50	99.50	**99.50**
#40	0.425	1.98	0.51	1.01	98.99	**98.99**
#60	0.250	1.93	0.50	1.52	98.48	**98.48**
#140	0.106	28.87	7.49	9.01	90.99	**90.99**
#200	0.075	43.79	11.37	20.38	79.62	**79.62**
Pan	-	306.77	79.62	100.00	-	-

Tested By MV Date 6/30/98 Checked By LB Date 7-3-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP24-GEOT-0204
Lab ID	98167-01.013	Soil Description	**BROWN LEAN CLAY**

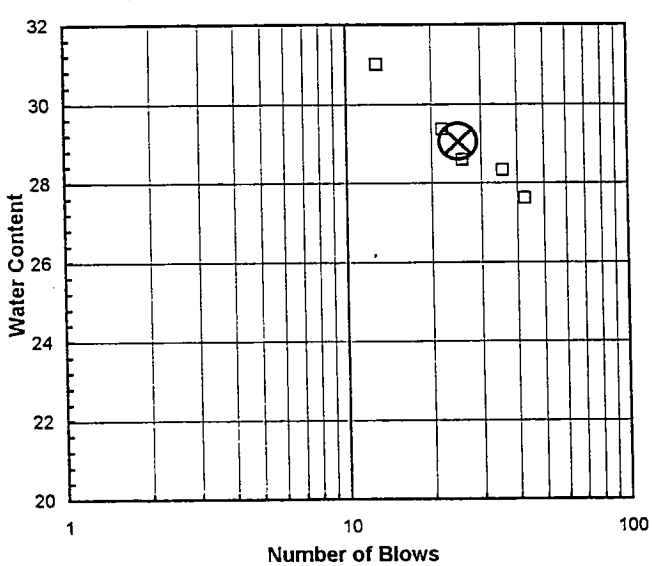
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	MULTIPOINT
Tare Number	2032	1901	2023	2292	2050	
Wt. of Tare & WS (gm)	37.30	42.79	39.95	40.05	41.02	
Wt. of Tare & DS (gm)	32.51	37.80	34.89	34.77	36.06	
Wt. of Tare (gm)	15.15	20.17	17.18	16.78	20.05	
Wt. of Water (gm)	4.79	4.99	5.06	5.28	4.96	
Wt. of DS (gm)	17.36	17.63	17.71	17.99	16.01	
Moisture Content (%)	**27.6**	**28.3**	**28.6**	**29.3**	**31.0**	
Number of Blows	**43**	**36**	**26**	**22**	**13**	

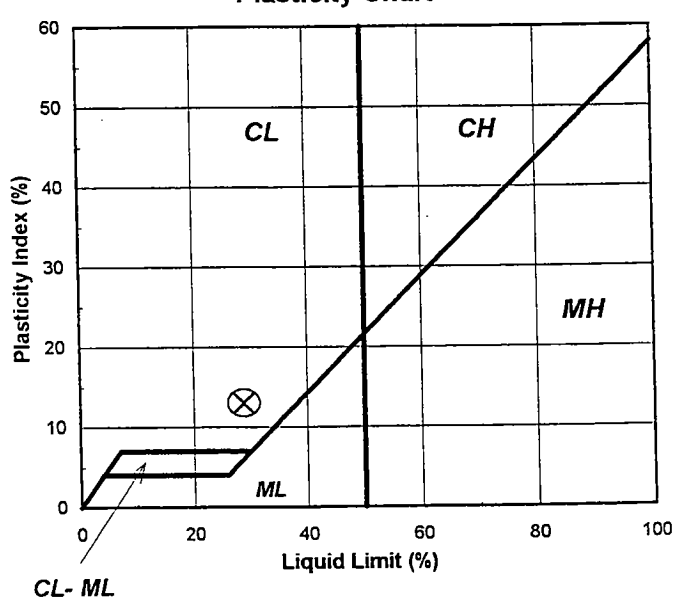
Plastic Limit Test	**1**	**2**	**3**
Tare Number	109	94	82
Wt. of Tare & WS (gm)	21.31	26.95	24.28
Wt. of Tare & DS (gm)	20.48	26.12	23.42
Wt. of Tare (gm)	15.14	20.81	17.95
Wt. of Water (gm)	0.83	0.83	0.86
Wt. of DS (gm)	5.34	5.31	5.47
Moisture Content (%)	**15.5**	**15.6**	**15.7**

Test Results	
Liquid Limit (%)	**29**
Plastic Limit (%)	**16**
Plasticity Index (%)	**13**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



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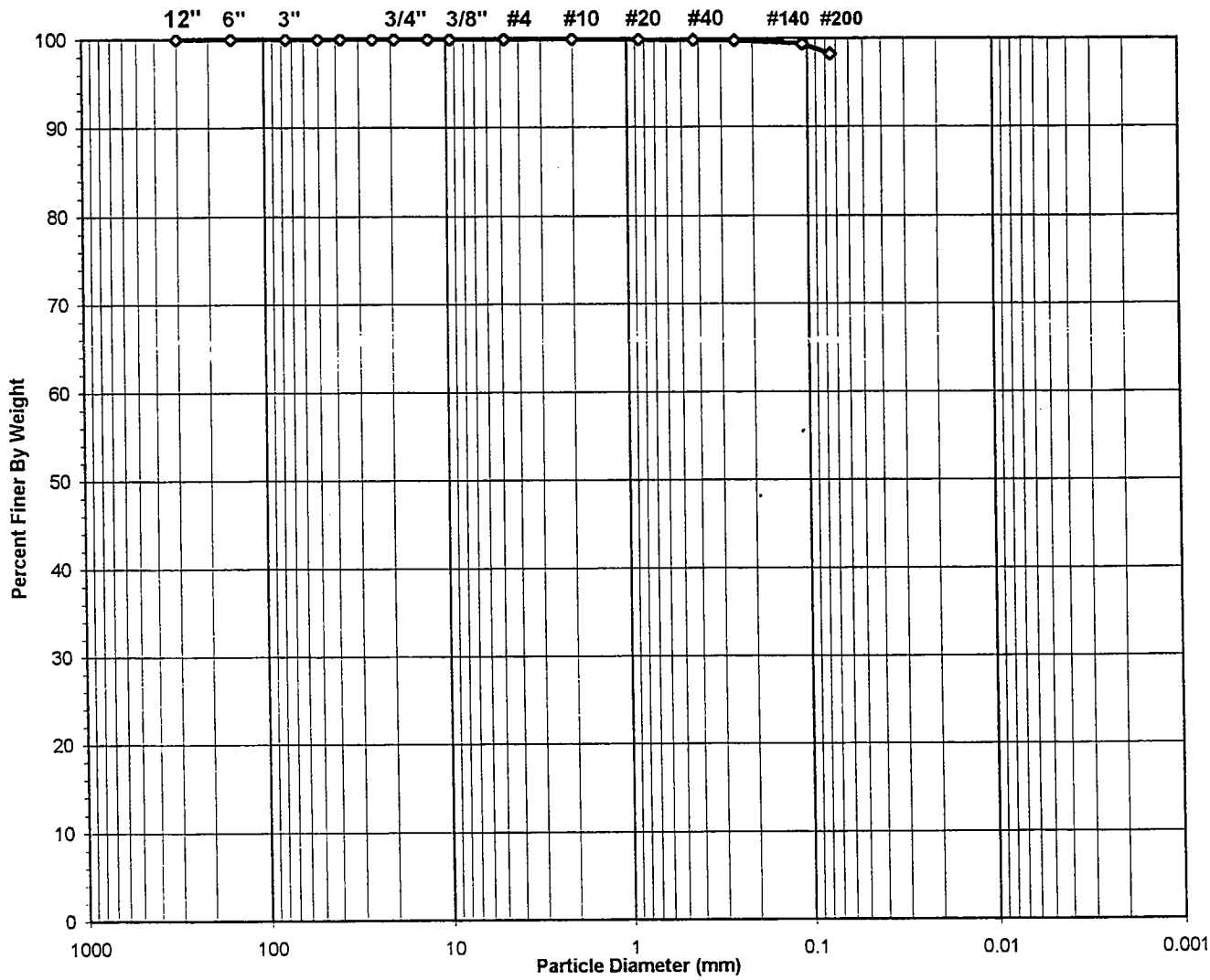
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP24-GEOT-0608
Lab ID	98167-01.014	Soil Color	**BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***CL-ML, TESTED***

USCS Classification ***SILTY CLAY***

Tested By MV Date 6/30/98 Checked By LB Date 7-8-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[F142.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP24-GEOT-0608
Lab ID	98167-01.014	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1053	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	664.80	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	557.90	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	104.36	Weight of Tare (gm)	NA
Weight of Water (gm)	106.90	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	453.54	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**23.6**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	453.54
Dry Weight - 3/4" Sample (gm)	7.7	Weight of minus #200 material (gm)	445.80
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	7.74
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.07	0.02	0.02	99.98	**99.98**
#20	0.850	0.27	0.06	0.07	99.93	**99.93**
#40	0.425	0.28	0.06	0.14	99.86	**99.86**
#60	0.250	0.34	0.07	0.21	99.79	**99.79**
#140	0.106	1.88	0.41	0.63	99.37	**99.37**
#200	0.075	4.90	1.08	1.71	98.29	**98.29**
Pan	-	445.80	98.29	100.00	-	-

Tested By MV Date 6/30/98 Checked By LB Date 7-8-98

DCN: CT-S3A DATE 6-25-98 REVISION: 2

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP24-GEOT-0608
Lab ID	98167-01.014	Soil Description	**BROWN SILTY CLAY**

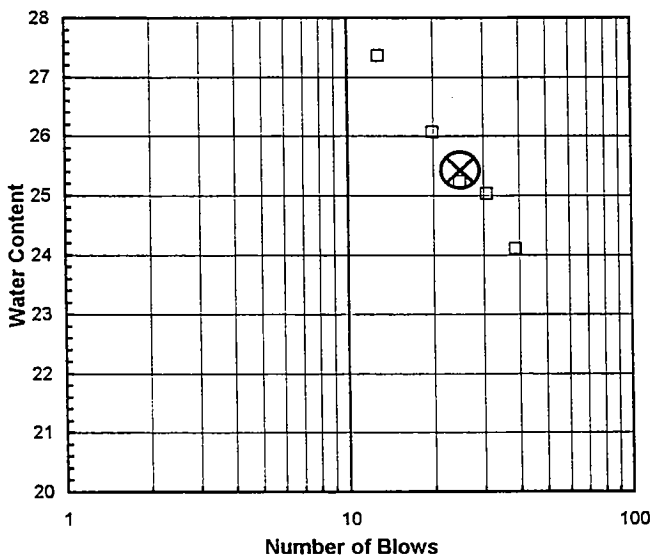
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	
Tare Number	1792	1859	1886	2026	2034	M U L T I P O I N T
Wt. of Tare & WS (gm)	37.55	40.06	40.87	41.09	45.65	
Wt. of Tare & DS (gm)	33.19	35.16	35.91	36.84	40.16	
Wt. of Tare (gm)	15.09	15.58	16.25	20.53	20.09	
Wt. of Water (gm)	4.36	4.9	4.96	4.25	5.49	
Wt. of DS (gm)	18.1	19.58	19.66	16.31	20.07	
Moisture Content (%)	**24.1**	**25.0**	**25.2**	**26.1**	**27.4**	
Number of Blows	**39**	**31**	**25**	**20**	**13**	

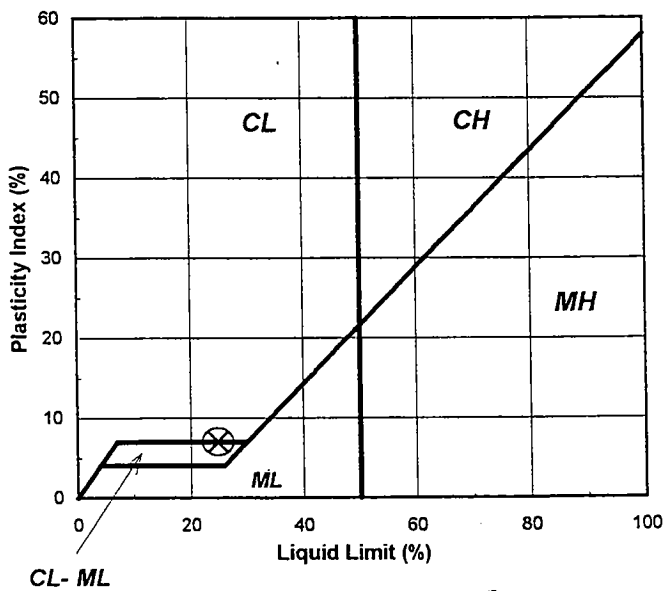
Plastic Limit Test	**1**	**2**	**3**
Tare Number	2040	2053	2062
Wt. of Tare & WS (gm)	21.70	24.36	25.03
Wt. of Tare & DS (gm)	20.75	23.41	24.10
Wt. of Tare (gm)	15.39	18.19	19.00
Wt. of Water (gm)	0.95	0.95	0.93
Wt. of DS (gm)	5.36	5.22	5.1
Moisture Content (%)	**17.7**	**18.2**	**18.2**

Test Results	
Liquid Limit (%)	**25**
Plastic Limit (%)	**18**
Plasticity Index (%)	**7**
USCS Symbol	**CL-ML**

Flow Curve



Plasticity Chart



Tested By BS *Date* 7/7/98 *Checked By* LB *Date* 7-8-98

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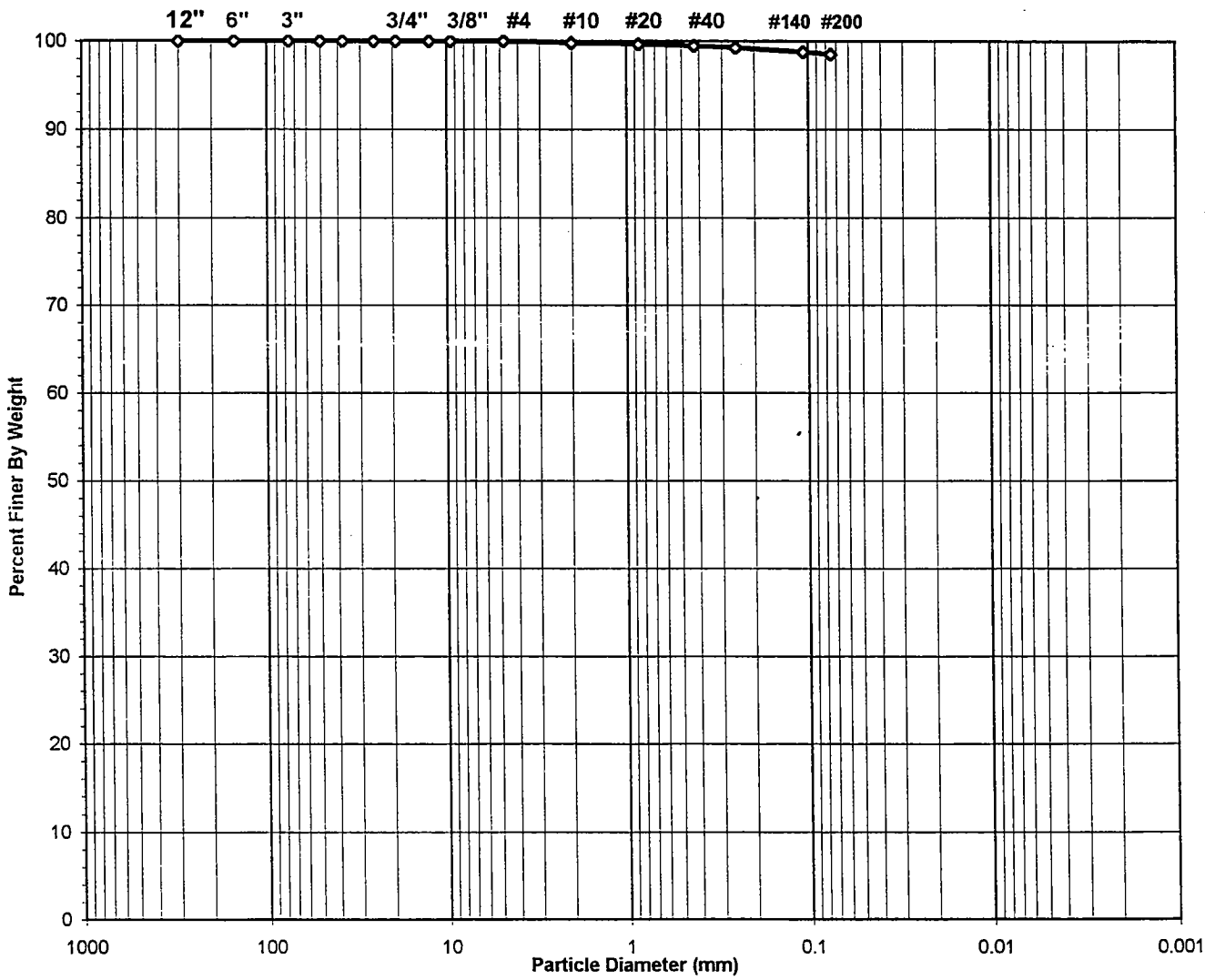
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP24-GEOT-1012
Lab ID	98167-01.015	Soil Color	**GRAY**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification ***LEAN CLAY***

Tested By MV Date 6/30/98 Checked By LB Date 7-8-98

 DCN: CT-S3A DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\F143.xls]Sheet1*

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ATTERBERG LIMIT

ASTM D 4318-96 (SOP - S4)

Client	GEO-ENVIRONMENTAL DRILLING	Boring No.	PBOW-98-PRRP
Client Reference	PBOW-PRRP	Depth (ft)	NA
Project No.	98167-01	Sample No.	DP24-GEOT-1012
Lab ID	98167-01.015	Soil Description	**GRAY LEAN CLAY**

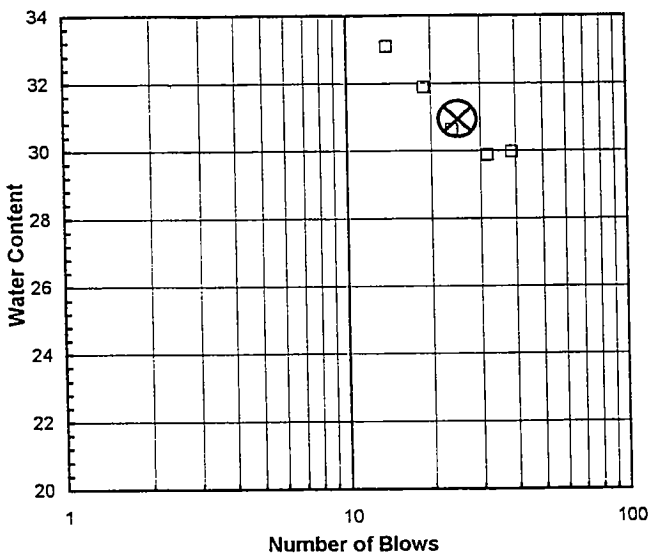
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**	**4**	**5**	MULTIPOINT
Tare Number	1882	1883	1898	2024	2025	
Wt. of Tare & WS (gm)	40.07	34.87	38.14	35.16	40.01	
Wt. of Tare & DS (gm)	35.27	29.59	33.28	29.68	33.76	
Wt. of Tare (gm)	19.24	11.90	17.40	12.48	14.86	
Wt. of Water (gm)	4.8	5.28	4.86	5.48	6.25	
Wt. of DS (gm)	16.03	17.69	15.88	17.2	18.9	
Moisture Content (%)	**29.9**	**29.8**	**30.6**	**31.9**	**33.1**	
Number of Blows	**39**	**32**	**24**	**19**	**14**	

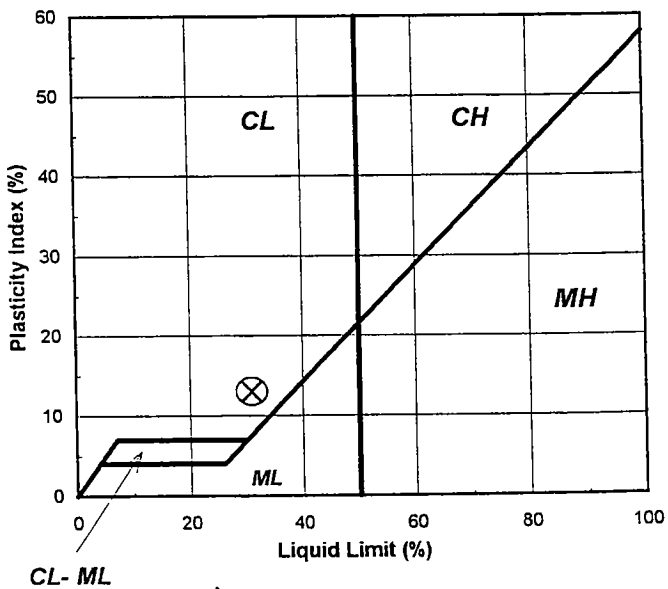
Plastic Limit Test	**1**	**2**	**3**
Tare Number	2031	2063	2320
Wt. of Tare & WS (gm)	23.74	19.48	23.66
Wt. of Tare & DS (gm)	22.81	18.55	22.67
Wt. of Tare (gm)	17.61	13.35	17.21
Wt. of Water (gm)	0.93	0.93	0.99
Wt. of DS (gm)	5.2	5.2	5.46
Moisture Content (%)	**17.9**	**17.9**	**18.1**

Test Results	
Liquid Limit (%)	**31**
Plastic Limit (%)	**18**
Plasticity Index (%)	**13**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



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APPENDIX H

ADDITIONAL HUMAN HEALTH RISK ASSESSMENT INFORMATION

APPENDIX H.1

CALCULATION OF PRG CONCENTRATIONS FOR CHEMICALS WITHOUT VALUES TABULATED BY EPA REGION 9

Appendix H.1

Calculation of PRG Concentrations for Chemicals Without Values Tabulated by EPA Region 9

Preliminary remedial goals (PRG) are not available in the U.S. Environmental Protection Agency (EPA) (1999) Region 9 PRG tables for all of the chemicals identified in various media at the RWP Areas. PRGs can be derived using the EPA (1999) Region IX methodology and chemical-specific variable values (such as toxicity values) from approved sources. The chemicals, their chemical-specific values and their documentation, and the derived PRGs are as follows.

Chemical	RfDo (mg/kg-day)	RfDi (mg/kg-day)	PEF (m^3/kg)	VFs (m^3/kg)	Soil PRG (mg/kd)	Tap water PRG (µg/L)	Ambient Air PRG (µg/m^3)
2-Amino-4,6-dinitrotoluene	6E-5[a]	6E-5[b]	1.32E+9[c]	NA[d]	3.7E+0 nc	2.2E+0 nc	NA
4-Amino-2,6-dinitrotoluene	6E-5[a]	6E-5[b]	1.32E+9[c]	NA[d]	3.7E+0 nc	2.2E+0 nc	NA
3-Nitroaniline	3E-4[e]	3E-4[b]	1.32E+9[c]	NA[d]	1.8E+1 nc	1.1E+1 nc	NA
Benzo(g,h,i)perlyene	3E-2[f]	3E-2[b]	1.32E+9[c]	NA[d]	2.3E+3 nc	1.8E+2 nc	NA
Phenanthrene	3E-2[f]	3E-2[b]	1.32E+9[c]	NA[d]	2.3E+3 nc	1.8E+2 nc	NA
Acenaphthylene	6E-2[g]	6E-2[b]	1.32E+9[c]	NA[g]	3.7E+3 nc	3.7E+2 nc	2.2E+2 nc[g]

RfDo = oral reference dose; RfDi = inhalation reference dose; PEF = particulate emission factor; VFs = volatilization-from-soil factor; PRG = preliminary remediation goal calculated by the EPA (1999) methodology; NA = not applicable; nc = based on a noncancer hazard index of 1.0.

[a]U.S. Environmental Protection Agency (EPA), 1993, ***Risk Assessment Issue Paper for: Derivation of Oral RfD for 2-Amino-4,6-Dinitrotoluene (CASRN 35572-78-2) and 4-Amino-2,6-Dinitrotoluene (CASRN 19406-51-0) By Analogy to 2,4,6-Trinitrotoluene, Systemic Toxicity Assessment***, National Center for Environmental Assessment, Cincinnati, OH, 23 February.
[b]The oral RfD is adopted for inhalation exposure for organic, but not inorganic, chemicals (U.S. Environmental Protection Agency (EPA), 1999, ***Region 9 Preliminary Remediation Goals (PRGs) 1999***, online, 1 October).
[c]Default from EPA (1999).
[d]VFs is evaluated only for readily volatile organic compounds; the compound of interest is assumed to be semivolatile or a non-volatile metal.
[e]Please see toxicity profile for nitroanilines (Appendix H.3).
[f]The verified RfDo for pyrene was used as a surrogate RfDo for this chemical.
[g]Acenaphthene was used as a surrogate for this chemical.

APPENDIX H.2

WEST AREA RED WATER PONDS, CHROMIUM IN SURFACE SOIL COMPARED WITH CHROMIUM IN BACKGROUND SOIL

Appendix H.2

West Area Red Water Ponds
Chromium in Surface Soil Compared to Chromium in Background Soil

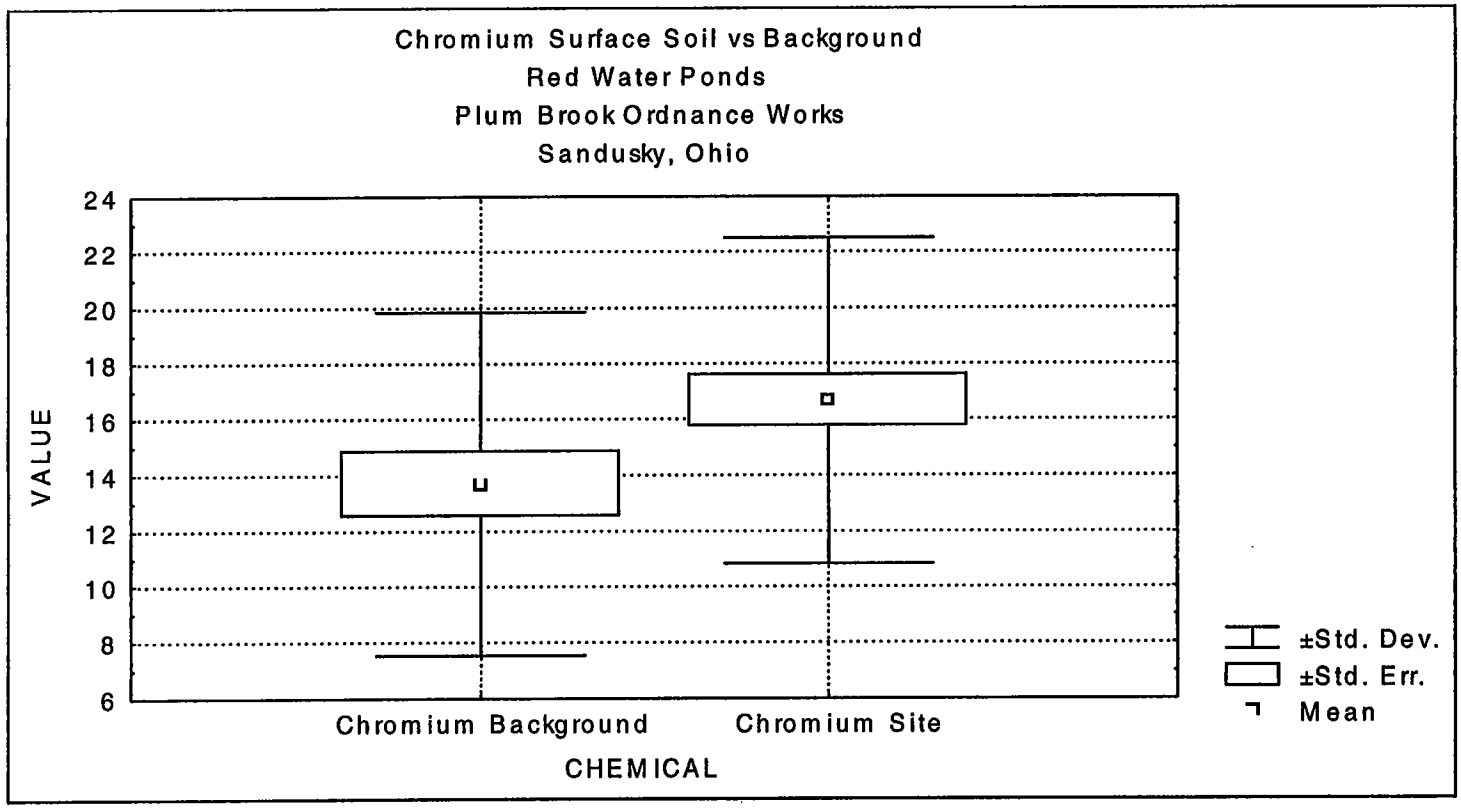
STAT. Mann-Whitney U Test (bkgdtest2.sta)
NONPAR By variable CHEMICAL
STATS Group 1: 100-Chromium Group 2: 101-Chromiu1

variable	Rank Sum Crbkg	Rank Sum Crsite	U	Z	p-level	Z adjusted	p-level	Valid N Crbkg	Valid N Crsite
VALUE	707.5000	1503.500	356.5000	-2.14563	.031910	-2.14726	.031780	26	40

STAT. Mann-Whitney U Test (bkgdtest2.sta)
NONPAR By variable CHEMICAL
STATS Group 1: 100-Chromium Group 2: 101-Chromiu1

variable	2*1sided exact p
VALUE	.031212

Chromium concentrations in site data do not appear to be drawn from same population as chromium in background data set.


Chromium Surface Soil vs Background
Red Water Ponds
Plum Brook Ordnance Works
Sandusky, Ohio
VALUE
24
22
20
18
16
14
12
10
8
6
Chromium Background
Chromium Site
CHEMICAL
±Std. Dev.
±Std. Err.
Mean

APPENDIX H.3

TOXICOLOGICAL PROFILES FOR THE CHEMICALS OF POTENTIAL CONCERN, RED WATER PONDS AREA

Appendix H.3

Toxicological Profiles for the Chemicals of Potential Concern Red Water Ponds Areas

INTRODUCTION

Toxicological profiles are presented for each chemical for which documentation of chemical-specific values is required. The doubly hyphenated number in parentheses following the chemical name is its unique Chemical Abstract Service (CAS) registration number. The CAS number may be located in the profile title, or, in the case of multiple isomers or members of a chemical class, in the introductory text or the table that provides the physical properties.

Toxicological profiles contain brief descriptions of the nature of the adverse effects associated with the chemical. It is important to note that a discussion of adverse effects without a discussion of dose is incomplete and potentially misleading, because virtually any chemical may be toxic at some dose, and many chemicals (e.g., nutritionally required minerals, vitamins, amino acids, etc.) enhance human health at some low dose. An ever growing and compelling body of evidence suggests that many environmental contaminants also enhance health at low doses (Hart and Frame, 1996).

When sufficient data are available, the EPA Integrated Risk Information System (IRIS) presents the EPA's verified chronic toxicity values for threshold, or noncancer, effects, and for cancer risk (EPA, 2000). The toxicity values for noncancer effects include a reference dose (RfD) expressed in milligrams per kilogram per day (mg/kg-day) for chronic oral exposure, and a reference concentration (RfC), in milligrams per cubic meter (mg/m^3), for chronic inhalation exposure. The inhalation RfC in units of mg/m^3 may be converted to an equivalent inhalation RfD by assuming continuous chronic exposure of humans with a body weight of 70 kg and an inhalation rate of 20 m^3/day. In other words, the RfC expressed as mg/m^3 is multiplied by the inhalation rate of 20 m^3/day, and the result is divided by the body weight of 70 kg to yield an inhalation RfD expressed as mg/kg-day.

RfDs and RfCs are usually derived from empirical benchmark doses (BMD) or concentrations called no-observed-effect levels (NOEL) or no-observed-adverse-effect levels (NOAEL) from animal toxicity or human epidemiology studies. If the data do not permit identifying a NOEL or NOAEL, a lowest-observed-adverse-effect level (LOAEL) or lowest-effect level (LEL) may be used. A frank-effect level (FEL), e.g., mortality, shortened life span or serious physiologic, neurologic or behavioral disturbances, is generally considered an inappropriate benchmark from which to develop an RfD or RfC. Some RfD and RfC derivations employ a BMD that is a statistically estimated dose for humans at which some low proportion of the population may experience some minimally adverse effect. A BMD at which 10 percent of the population may be expected to respond is expressed as BMD_{10}. The RfD or RfC is derived by dividing the

benchmark level (e.g., NOAEL or BMD_{10}) by a series of uncertainty and modifying factors, which collectively are designated the uncertainty factor (UF).

For cancer effects, IRIS presents a verified EPA cancer weight-of-evidence group classification that reflects qualitatively the likelihood that the chemical is carcinogenic to humans. IRIS also presents a slope factor (SF) for oral exposure, expressed as the risk per mg/kg-day ingested dose, and a unit risk factor (URF) for inhalation exposure, expressed as the risk per microgram per cubic meter ($\mu g/m^3$) in ambient air. These quantitative estimates are generally provided for chemicals in EPA weight-of-evidence Groups A and B and C, if the data are adequate. The SF or URF is usually estimated as an upper bound on the slope of the dose- or concentration-response curve from animal toxicity or human epidemiology studies. The inhalation URF in units of risk per $\mu g/m^3$ may be converted to an equivalent inhalation SF in units of risk per mg/kg-day by assuming continuous lifetime exposure of humans with a body weight to 70 kg and an inhalation rate of 20 m^3/day. In other words, the URF expressed as risk per $\mu g/m^3$ is divided by the inhalation rate of 20 m^3/day, and multiplied by the assumed body weight of 70 kg and a conversion factor of 1000 $\mu g/mg$.

Toxicity values are not estimated for acute toxicity and acute exposure is not evaluated in the risk assessment. Nonetheless, the levels associated with acute lethality and data regarding the effects of acute exposure to levels higher than ordinarily observed in chronic environmental exposure provide additional perspective regarding the toxicity of the chemical. Therefore, information regarding acute toxicity, when available, is included in the profiles. Lethality data for laboratory animals are generally expressed as the oral dose associated with lethality of 50 percent of an exposed population (LD_{50}) or the concentration in air associated with lethality of 50 percent of an exposed population (LC_{50}). Occasionally the dose associated with lethality in a low percentage of an exposed population (LD_{LO}) is presented.

The toxicity profiles also provide documentation for physical constants that are important for chemical transport modeling, such as molecular weight (MW) in grams per mole (g/mole), the log of the octanol/water partition coefficient (log K_{ow}), Henry's law constant (H) in atmosphere-cubic meter/mole (atm-m^3/mole), the soil/water partition coefficient (K_d) in liters per kilogram (L/kg) for metals, the log of the soil/organic carbon partition coefficient (log K_{oc}) (unitless) for organic chemicals, diffusivity in air (D_a) in square centimeters per second (cm^2/s), diffusivity in water (D_w) in cm^2/s, vapor pressure (VP) in atmospheres (atm), and solubility in water (S) in milligrams per liter (mg/L). In addition, organic chemicals are designated as volatile organic compounds (VOC) or semivolatile organic compounds (SVOC) based on their propensity to volatilize from environmental media. Chemicals designated as VOCs generally have a MW less than 200 g/mole and H greater than 1E-5 atm-m^3/mole (EPA, 1991).

The physical constants generally are taken from the most reliable source (i.e., the source that provides the highest level of documentation). Values for interrelated properties are usually taken from the same source (e.g., H is often estimated from VP and S; therefore, the same source is generally used for all three property values). When one source provides several values for a given property, professional judgement is used to select the most appropriate. Obvious outliers may be dropped from consideration. The average or the midpoint of a range of values may be selected. K_d values for metals and K_{oc} values for ionizing organic compound are based on a

default pH of 6.8 (EPA, 1996) if the data are available. VP, S and H values are limited to those provided for normal ambient temperatures (0 to 30°C), but the temperatures reported in the original sources are not presented in the toxicity profile, nor is any attempt made to extrapolate K, VP or S to any default temperature.

When values for H were not located, they were calculated as follows, provided the requisite information was available (EPA, 1998):

$$H = \frac{VP \cdot MW}{S}$$

where:

H	=	Henry's law constant (atm-m^3/mole, calculated)
VP	=	vapor pressure (atm)
MW	=	molecular weight (g/mole)
S	=	solubility in water (mg/L).

When values for D_a were not located, they were calculated as follows (EPA, 1998):

$$D_a = \frac{1.9}{MW^{2/3}}$$

where:

D_a	=	diffusivity in air (cm^2/s, calculated)
MW	=	molecular weight (g/mole).

When values for D_w were not located, they were calculated as follows (EPA, 1998):

$$D_w = \frac{22E-5}{MW^{2/3}}$$

where:

D_w	=	diffusivity in water (cm^2/s, calculated)
MW	=	molecular weight (g/mole).

When values for K_{oc} were not located, they were calculated as follows for phthalates and polyaromatic aromatic hydrocarbons (PAH) provided log K_{ow} was available (EPA, 1998):

$$\log K_{oc} = 0.97 \log K_{ow} - 0.094$$

where:

K_{oc}	=	soil/organic carbon partition coefficient (unitless, calculated)
K_{ow}	=	octanol/water partition coefficient (unitless).

K_{oc} for other organic chemicals was calculated as follows provided log K_{ow} was available (EPA, 1998):

$$\log K_{oc} = 0.78 \log K_{ow} + 0.151$$

where:

K_{oc}	=	soil/organic carbon partition coefficient (unitless, calculated)
K_{ow}	=	octanol/water partition coefficient (unitless).

The toxicity profiles also present the predominant sources of release to the environment as well as a qualitative description of the fate of the chemical in air, surface water and sediment, and soil. No attempt is made to present quantitative data because environmental fate is usually highly dependent on climatic conditions and the characteristics of the medium to which the chemical is released, which may differ from location to location and change from time to time. The source and fate information may provide perspective regarding the likelihood that the chemical's presence is related to site activities, that the chemical will migrate across media, or that the chemical will persist at toxicologically significant levels.

Biotransfer factors are provided for chemicals for which food-chain pathways may be significant, which includes many inorganic chemicals and those organic chemicals that are highly lipophilic and persist in the environment. High lipophilicity is indicated by a log K_{ow} greater than 3 (Lyman et al., 1990). Lipophilicity enhances partitioning to biomedia and passage across biological membranes. Persistence in the environment is evidence that the chemical might resist biotransformation and, therefore, remain in edible tissues at toxicologically significant concentrations. VOCs tend to be mobile and labile (i.e., subject to rapid and extensive biotransformation and excretion), and generally do not participate significantly in food-chain pathways. Therefore, biotransfer factors are not estimated for VOCs. Some of the SVOCs, however, are highly lipophilic. They may persist or yield metabolites that are significant toxicants in their own right. For example, the organochlorine pesticide DDT is metabolized by mammals to DDE, which is similar in carcinogenic potency to the parent compound. Biotransfer factors are generally estimated for SVOCs that have log K_{ow} values greater than 3.

The biotransfer factors of interest are water-to-fish bioconcentration factors (BCF) or biota-sediment accumulation factors (BSAF), soil-to-plant biotransfer factors (Bp), cattle ingestion-to-beef factors (Bb) and cattle ingestion-to-milk factors (Bm). Separate soil-to-plant biotransfer factors are available for the reproductive parts of plants (e.g., fruits, seeds) and the vegetative parts of plants (e.g., stems, leaves) for inorganic and some organic chemicals. Soil-to-plant factors for the reproductive parts of plants are designated Bpr; soil-to-plant factors for the vegetative parts of plants are designated Bpv.

BCF values are adopted from empirical data when the data are clearly the best choice (i.e., similar results in multiple species of fin fish). When the empirical data are few or inconsistent,

BCFs for inorganic chemicals are taken from various sources. BCF values for organic chemicals are estimated from the following equation (Devillers et al., 1996):

$$\log BCF = 0.910 \log K_{ow} - 1.975 \log(6.8E-7K_{ow} + 1) - 0.786$$

where:

BCF	=	bioconcentration factor (L/kg, calculated)
K_{ow}	=	octanol/water partition coefficient (unitless).

The Bintein and Devillers model (Devillers et al., 1996) is selected over simpler models adopted by the EPA largely because the Bintein and Devillers approach has undergone scrutiny since first published (Bintein and Devillers, 1993), and considerable effort was expended to validate the model; i.e., to compare modeled and empirical results. The Bintein and Devillers model is probably more realistic than simpler models for chemicals with higher log K_{ow} values. BSAF values are chosen instead of BCFs for those very highly lipophilic chemicals such as the polychlorinated biphenyls (PCB), polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDF) and selected organochlorine pesticides expected to partition almost entirely to benthic sediment.

Soil-to-plant biotransfer factors (Bp) for SVOCs are estimated by a simple model by Travis and Arms (1988), which is based only on log K_{ow}:

$$\log Bp = 1.588 - 0.578 \log K_{ow}$$

where:

Bp	=	soil-to-plant biotransfer factor (unitless, calculated)
K_{ow}	=	octanol/water partition coefficient (unitless).

Separate biotransfer factors are not estimated for the reproductive parts of plants (Bpr) and the vegetative parts of plants (Bpv).

Cattle ingestion-to-beef factors (Bb) for SVOCs are estimated by a simple model by Travis and Arms (1988), which is based only on log K_{ow}:

$$\log Bb = -7.6 + \log K_{ow}$$

where:

Bb	=	cattle ingestion-to-beef biotransfer factor (days/kg, calculated)
K_{ow}	=	octanol/water partition coefficient (unitless).

Cattle ingestion-to-milk factors (Bm) for SVOCs are estimated by a simple model by Travis and Arms (1988), which is based only on log K_{ow}:

$$\log Bb = -8.10 + \log K_{ow}$$

where:

Bm	=	cattle ingestion-to-milk biotransfer factor (days/kg, calculated)
K_{ow}	=	octanol/water partition coefficient (unitless).

The toxicity profiles provide documentation for the gastrointestinal (GI) absorption factor (GAF), which is used to develop the dermal RfD and SF, the dermal absorption factor (ABS), which describes the extent of dermal uptake from soil, and the permeability coefficient (PC) and tau (τ), which are used to estimate the rate of dermal uptake from water. Usually PC and τ are taken from EPA (1992), unless EPA (1992) provides no values, or professional judgement suggests that a log K_{ow} value other than the one provided by EPA (1992) is clearly more appropriate. In these cases, PC is calculated as follows (EPA, 1992):

where:

$$\log(PC) = -2.72 + 0.71(\log K_{ow}) - 0.0061(MW)$$

where:

PC	=	permeability coefficient (centimeters per hour [cm/hour], calculated)
K_{ow}	=	octanol/water partition coefficient (unitless)
MW	=	molecular weight,

and τ is calculated as follows (EPA, 1992):

$$\tau = \frac{L_{sc}}{6 \cdot 10^{(-2.72 - 0.0061 * MW)}}$$

where:

τ	=	time for concentration of contaminant in stratum corneum to reach steady state (hours, calculated)
L_{sc}	=	effective thickness of the stratum corneum (1E-3 cm)
MW	=	molecular weight.

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INORGANIC CHEMICALS

ALUMINUM (7429-90-5)

Aluminum is a naturally occurring **metal** (ATSDR, 1992). It is the third most abundant element in nature, constituting approximately 8 percent of the earth's crust. Aluminum is highly reactive; thus, is always found in combination with other substances such as oxygen, floride or silica. Aluminum is used in a wide variety of applications, including packaging, kitchen utensils, auto bodies and components, airplanes and building components (Elinder and Sjogren, 1986). It is also used in cosmetics, food additives and some pharmaceuticals and cosmetics. Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	K_d (L/kg)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
26.98	NA	NA	ND	NA	NA	NA	I[a]

NA = not applicable; ND = no data; I = insoluble in hot or cold water
[a]Hazardous Substance Data Bank (HSDB), 1999, National Library of Medicine, on line.

Aluminum is one of the few elements for which natural release far outweighs anthropogenic release (ATSDR, 1992; HSDB, 2000). The predominant natural process is the weathering and release of dust from soil and rocks into the air. Major anthropogenic sources include aluminum mining and smelting, coal combustion, and other mining or industrial activities that process crustal materials. Aluminum exists in the air as particulates that, presumably, are subject to wet and dry deposition.

Aluminum is deposited on soil from the atmosphere (ATSDR, 1992). Other anthropogenic sources include wastes from mines, smelters and coal combustion. Aluminum in soil exists in several soluble and insoluble forms, depending on pH and the nature of the minerals and organic material present in the soil. Generally, increasing acidity (decreasing pH) mobilizes aluminum and facilitates leaching.

Aluminum exists naturally in water in several hydrated and complexed forms (ATSDR, 1992). Sources include solution from surrounding soil, precipitation, and runoff and erosion from soil. The extent to which aluminum in water settles out is highly variable and depends on pH and the other constituents present in the water with which aluminum may form compounds and complexes. Generally an equilibrium is established between soluble and insoluble forms.

Acid conditions in soil mobilize aluminum for uptake by plants, but the extent of uptake and the distribution between the roots and the aerial parts is highly dependent on the species of plant (ATSDR, 1992). Bioconcentration in fish is largely a function of water quality (e.g., pH and total organic carbon). Highest concentrations of aluminum are generally found in the gills and lowest concentrations are found in edible muscle tissue. Concentrations decrease as the fish pass through the larval and juvenile stages. Therefore, the bioconcentration of aluminum in edible fish tissues is not expected to represent a toxicologically significant source to humans, and the lack of quantitative data (see table below) is not considered an important source of uncertainty in risk assessment.

Biotransfer factors for aluminum are compiled below:

BCF (L/kg)	Bpr (unitless)	Bpv (unitless)	Bb (unitless)	Bm (unitless)
ND	6.5E-4[a]	4.0E-3[a]	1.5E-3[a]	2.0E-4[a]

ND = no data.
[a]Baes, C.F., R.D. Sharp, A.L. Sjoreen, R.W. Shor, 1984, ***A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture***, Health and Safety Division, Oak Ridge National Laboratory, ORNL-5786, September.

Dietary intake accounts for the majority of human exposure to aluminum (Elinder and Sjogren, 1986); pharmaceuticals and medical procedures (e.g., dialysis treatment for kidney failure) are important sources of exposure for some individuals. A recent review (EPA, 1994) summarizes GI uptake in animals treated with single oral doses of aluminum chloride ranging from less than

one percent (rabbits) to 27 percent (rats). The data indicate that dose and the animal species may be more important than chemical form in determining the extent of GI absorption. Human GI absorption data range from 0.1 to 0.3 percent, but the chemical form and dose were not reported. These observations suggest that GI absorption by rodents may exceed absorption by rabbits or humans. The toxicokinetic study selected for derivation of the gastrointestinal absorption factor (GAF) should approximate, as closely as possible, the conditions of the critical study (the study upon which the toxicity value is based). The provisional oral RfD is based on a study in mice with aluminum lactate in the diet. The toxicokinetic study most adequately reflecting the conditions of the key study (rodents, oral exposure, soluble form of aluminum) is the study that identified GI absorption of 27 percent in rats. Therefore, the absorption factor of 0.27 observed in rats is chosen as the GAF for this evaluation.

Data were not located regarding the extent of dermal absorption of aluminum from soil. The OEPA (1998) default soil absorption factor ABS for metals of 0.01 is chosen for this evaluation. The EPA (1992) default PC of metals of 1E-3 cm/hour is selected for aluminum.

Aluminum is relatively nontoxic via oral exposure to physiologically normal humans, but recently concern has arisen regarding neurological effects, including Alzheimer's disease and similar forms of dementia (EPA, 1994). Much of this concern stems from studies with large oral doses of soluble aluminum salts (e.g., aluminum hydroxide) and from medical procedures that bypass the GI absorption barrier. A review of several animal studies with many different forms of aluminum identified the developing infant as potentially the most sensitive member of the human population. A provisional chronic oral RfD of 1E+0 mg/kg-day was derived from a LOAEL of 100 mg/kg-day for minimal and equivocal neurological effects in the offspring of mice. The nervous system is the target organ for oral exposure to aluminum. (The nervous system rather than the CNS is chosen as the target organ because it cannot be stated unequivocally that some of the neurologic effects observed do not involve the peripheral nerves.) The mice were fed diets fortified with aluminum lactate throughout gestation and lactation. An uncertainty factor of 100 was used. Confidence in the oral RfD is low.

Occupational exposure to aluminum metal dust and aluminum oxide is associated with pulmonary fibrosis and related respiratory effects such as cough, emphysema, pneumonia and decreased pulmonary function (ACGIH, 1991; EPA, 1997). The toxicity of occupational exposure to dusts of aluminum pyro powders is somewhat higher, and occupational exposure to salts such as the sulfate and chloride may yield hydrolysis to the corresponding acids. Pulmonary effects were also observed in animals exposed to powders and dusts of metallic aluminum and various aluminum compounds.

Results of testing Canadian gold and uranium miners prophylactically treated with aluminum oxide powders to prevent silicosis associated aluminum exposure with impaired cognitive performance (EPA, 1997). The likelihood of cognitive impairment was directly related to the duration of exposure. Neurological performance was also impaired in aluminum foundry workers exposed to fumes and aluminum dust (4.6 to 11.5 mg aluminum/m^3) for a mean of 12 years. Other studies also implicate aluminum as a cause of neurological impairment and neurophysical effects in exposed smelter workers and aluminum welders. A provisional inhalation RfC is based on the LOAEL of 4.6 mg aluminum/m^3 in the study of foundry workers

described above. The lower end of the exposure concentration adjusted for intermittent exposure is 1.64 mg/m^3. Application of an uncertainty factor of 300 yields an RfC of 5E-3 mg/m^3, which is equivalent to an inhalation RfD of 1.4E-3 mg/kg-day. Confidence in the inhalation RfC is medium. The nervous system is the target organ for inhalation exposure to aluminum.

Data were not located regarding the carcinogenicity of exposure to aluminum.

References for Aluminum

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U.S. Environmental Protection Agency (EPA), 1997, ***Risk Assessment Issue Paper for: Derivation of Provisional Inhalation RfC for Aluminum (CASRN 7429-90-5)***, National Center for Environmental Assessment, Cincinnati, OH, June 20.

ANTIMONY (7440-36-0)

Antimony is a naturally occurring brittle **metal** that is not readily fabricated (ATSDR, 1992). It is alloyed with lead and other metals, imparting hardness, mechanical strength, corrosion resistance, electrochemical stability, and decreasing the coefficient of friction. Major applications include its use in grid metal in acid storage batteries, solder, sheet metal and pipe, bearing metal, castings and type metal. Antimony trioxide is used as a fire retardant in plastics and textiles. Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	K_d (L/kg)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
121.75	NA	NA	ND	NA	NA	NA	I[a]

NA = not applicable; ND = no data; I = insoluble in hot or cold water
[a] Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.

Antimony is naturally present in the earth's crust and is released to the environment in windblown dust, from volcanic eruptions, sea spray, forest fires, and biogenic sources (HSDB, 2000). The majority of antimony released to the environment arises from anthropogenic sources, including nonferrous metal mining, smelting and refining, and the production, use and disposal of antimony alloys and compounds. Coal combustion and refuse and sludge combustion are other major anthropogenic sources of antimony.

Antimony released to the atmosphere adsorbs to small particles, which may travel great distances before gravitational settling or removal (ATSDR, 1992; HSDB, 2000). Removal is primarily by wet and dry deposition. Antimony released to surface water generally sorbs to particulates and settles out in the benthic sediment. The fate of antimony released to soil depends on the form released and the nature of the soil. Generally, antimony sorbs strongly to soil and sediment, the extent correlated with the content of iron, manganese, and aluminum in the soil with which it coprecipitates as hydroxylated oxides. There appears to be little potential for mobility (leaching) in most soils, except that antimony in landfills or in sewage sludge applied to sandy soil may exhibit considerable mobility. Also, pH excursions substantially above or below neutrality may release antimony from soil or sediment.

Biotransfer factors for antimony are compiled below:

BCF (L/kg)	Bpr (unitless)	Bpv (unitless)	Bb (days/kg)	Bm (days/kg)
1[a]	3.0E-2[b]	2.0E-1[b]	1.0E-3[b]	1.0E-4[b]

ND = no data.
[a]U.S. Environmental Protection Agency (EPA), 1986, ***Superfund Public Health Evaluation Manual***, Office of Emergency and Remedial Response, Washington, DC, OSWER Directive 9285-4-1, EPA/540/1-86/060, PB87-183125, October.
[b]Baes, C.F., R.D. Sharp, A.L. Sjoreen, R.W. Shor, 1984, ***A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture***, Health and Safety Division, Oak Ridge National Laboratory, ORNL-5786, September.

Estimates of the GI absorption of antimony tartrate and antimony trichloride by animals range from two to seven percent (ATSDR, 1992); ten percent is recommended as a reference value for humans for GI absorption of antimony tartrate. Although empirical data are lacking, one percent is recommend for other forms of antimony. The key study for development of the chronic oral

RfD used potassium antimony tartrate (EPA, 2000); therefore, the GAF of ten percent (0.1) is chosen for this evaluation.

Data were not located regarding the extent of dermal uptake of antimony from soil. The default ABS of 0.01 for metals (OEPA, 1998) is used herein. The EPA (1992) default PC of metals of 1E-3 cm/hour is selected for antimony.

Acute intoxication from ingestion of large doses of antimony induces GI disturbances, dehydration and cardiac effects in humans (Iffland, 1988). Chronic effects from occupational exposure include irritation of the respiratory tract, pneumoconiosis, pustular eruptions of the skin called "antimony spots", allergic contact dermatitis, and cardiac effects, including abnormalities of the ECG and myocardial changes. Cardiac effects were also observed in rats and rabbits exposed by inhalation for six weeks and in animals (dogs, and possibly other species) treated by intravenous injection (Elinder and Friberg, 1986). The data are not sufficient for estimation of an inhalation RfD.

Chronic oral exposure studies in laboratory animals include two briefly reported lifetime drinking water studies in rats and mice (EPA, 2000). The only dose tested, 5 parts per million (ppm) potassium antimony tartrate, resulted in reduced longevity in both species and in reduced mean heart weight in the rats. EPA (2000) verified an RfD of 4E-4 mg/kg-day for chronic oral exposure to antimony from the LOAEL of 5 ppm potassium antimony tartrate (0.35 mg antimony/kg body weight-day) in the lifetime study in rats. An uncertainty factor of 1000 was applied; factors of 10 each for inter- and intraspecies variation and to estimate a no-observed-adverse-effect level (NOAEL) from a LOAEL. Confidence in the oral RfD is low. The heart is considered a likely target organ for chronic oral exposure of humans.

Data were not located regarding the carcinogenicity of antimony to humans. Antimony fed to rats did not produce an excess of tumors (Goyer, 1991), but a high frequency of lung tumors was observed in rats exposed by inhalation to antimony trioxide for one year (Elinder and Friberg, 1986). Antimony is classified in EPA cancer weight-of-evidence Group D (not classifiable as to carcinogenicity to humans) (EPA, 1987).

References for Antimony

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U.S. Environmental Protection Agency (EPA), 1987, ***Health Effects Assessment for Antimony and Compounds***, Prepared by Office of Health and Environmental Assessment, Cincinnati, OH, for the Office of Solid Waste and Emergency Response, Washington, DC. EPA/600/8-88/018, NTIS PB 88-179445.

U.S. Environmental Protection Agency (EPA), 1992, ***Dermal Exposure Assessment: Principles and Applications***, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, January.

U.S. Environmental Protection Agency (EPA), 2000, ***Integrated Risk Information System (IRIS)***, On-line, Environmental Criteria and Assessment Office, Cincinnati, OH.

ARSENIC (7440-38-2)

Arsenic is a natural **metalloid** that occurs in both inorganic and organic forms (ATSDR, 1993). Inorganic arsenic is more toxic than organic forms. Major uses in the U.S. include its incorporation into wood preservatives and other agricultural chemicals. Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	K_d (L/kg)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
74.92 (element)	NA	NA	2.9E+1[a]	NA	NA	Note 1[b]	Note 2[b]

NA = not applicable
Note 1: Variable: inorganic arsenic compounds are not likely to volatilize; some organic arsenic compounds are low-boiling liquids or gases at normal temperatures.
Note 2: Variable: inorganic arsenic compounds range from practically insoluble to freely miscible in water; most organic arsenic compounds are not readily soluble, most arsenic acid compounds are soluble to freely miscible.
[a]U.S. Environmental Protection Agency (EPA), 1996, ***Soil Screening Guidance: Users Guide***, Office of Solid Waste and Emergency Response, Washington, DC, Publication 9355.4-23, April.
[b]Agency for Toxic Substances and Disease Registry, (ATSDR), 1993, ***Update Toxicological Profile for Arsenic***, U.S. Public Health Service, Atlanta, Georgia, April.

The major source of arsenic release to the environment is from copper, zinc and lead smelting operations (HSDB, 2000). Releases also occur from several other industries that use arsenic.

Arsenic occurs in the air as a combination of trivalent and pentavalent forms almost entirely adsorbed to small particles that permit dispersion over long distances (ATSDR, 1993). Removal is largely by wet and dry deposition. Arsenic in surface water can undergo a variety of transformations and exist in several soluble forms. Sorption to sediment is often an important removal process, but biotransformation in sediment may return soluble forms to the water. Arsenic in soil generally exists as insoluble forms sorbed to clay or organic matter or complexed with calcium or iron. Mobility is low and leaching is not generally significant.

Biotransfer factors for arsenic are compiled below:

BCF (L/kg)	Bpr (unitless)	Bpv (unitless)	Bb (days/kg)	Bm (days/kg)
20[a]	6.0E-3[b]	4.0E-2[b]	2.0E-3[b]	6.0E-5[b]

[a]U.S. Environmental Protection Agency (EPA), 1998, ***Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Volume Two***, Peer Review Draft, Office of Solid Waste and Emergency Response, Washington, DC, EPA530-D-98-001B, July.
[b]Baes, C.F., R.D. Sharp, A.L. Sjoreen, R.W. Shor, 1984, ***A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture***, Health and Safety Division, Oak Ridge National Laboratory, ORNL-5786, September.

Several studies confirm that soluble inorganic arsenic compounds and organic arsenic compounds are nearly completely (>90%) absorbed from the GI tract in both animals and humans (Ishinishi et al., 1986). The absorption efficiency of insoluble inorganic arsenic compounds depends on particle size and stomach pH. The GAF of 0.95 (EPA, 1993) is adopted for this evaluation.

Data regarding the dermal uptake of arsenic were not located. The default ABS of 0.01 for metals (OEPA, 1998) is used herein. The EPA (1992) default PC for metals of 1E-3 cm/hour is selected for arsenic.

Inorganic arsenic may be an essential nutrient, exerting beneficial effects on growth, health and feed conversion efficiency (Underwood, 1977). A lethal dose of arsenic trioxide in humans is 70-180 mg (≈50-140 mg arsenic (Ishinishi et al., 1986). Acute oral exposure of humans to high doses of arsenic produces liver swelling, skin lesions, disturbed heart function and neurological effects. The only noncancer effects in humans clearly attributable to chronic oral exposure to arsenic are dermal hyperpigmentation and keratosis, as revealed by studies of several hundred Chinese exposed to naturally occurring arsenic in well water (EPA, 2000). Similar effects were observed in persons exposed to high levels of arsenic in water in Utah and the northern part of Mexico. EPA (2000) verified an RfD of 3E-4 mg/kg-day for chronic oral exposure, based on a NOAEL of 8E-4 mg/kg-day for hyperpigmentation and kertatosis of the skin from the Chinese data. An uncertainty factor of 3 was applied. An increased incidence of Blackfoot disease was also observed, which may not be related to arsenic alone. Goyer (1991) describes black-foot

disease as a peripheral vascular disorder manifested as acrocyanosis and Raynaud's disease, which may progress to gangrene. Confidence in the RfD is medium. EPA (2000) notes that the skin is the more sensitive target organ. Nonetheless, in keeping with EPA (1989) guidance regarding selection of target organ, both the skin and peripheral vascular system are selected as target organs for prolonged oral exposure to arsenic.

Occupational (predominantly inhalation) exposure is also associated with neurological deficits, anemia, and vascular effects (Ishinishi et al., 1986), but concomitant exposure to other chemicals cannot be ruled out. The data are not sufficient for estimation of an inhalation RfC.

Inorganic arsenic is clearly a carcinogen in humans. Inhalation exposure is associated with increased risk of lung cancer in persons employed as smelter workers, in arsenical pesticide applicators, and in a population residing near a pesticide manufacturing plant (EPA, 2000). Oral exposure to high levels in well water is associated with increased risk of skin cancer (EPA, 2000). Extensive animal testing with various forms of arsenic given by many routes of exposure to several species, however, has not demonstrated the carcinogenicity of arsenic. EPA (2000) classified inorganic arsenic in cancer weight-of-evidence Group A (human carcinogen), and recommended an oral SF of 1.5E+0 per mg/kg-day, based on the incidence of skin cancer in the Chinese study. EPA (2000) noted that the uncertainties associated with the oral unit risk are considerably less than those for most carcinogens, so that the unit risk might be reduced an order of magnitude. An inhalation URF of 4E-3 per $\mu g/m^3$, equivalent to an inhalation SF of 1.5E+1 per mg/kg-day, was derived for inorganic arsenic from the incidence of lung cancer in occupationally exposed men.

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U.S. Environmental Protection Agency (EPA), 2000, ***Integrated Risk Information System (IRIS)***, On-line, Environmental Criteria and Assessment Office, Cincinnati, OH.

CHROMIUM

Chromium is a naturally occurring **metal** (7440-47-3). It occurs in several valence states; chromium (III) (16065-83-1) and chromium (VI) (18540-29-9) are the forms most commonly encountered in the environment. Chromium is used largely in the metallurgical, refractory and chemical industries (ATSDR, 1998). The largest amount is used in the metallurgical industry in various steels and nonferrous alloys. The second largest use is by the chemical industry in such products as pigments, metal finishing, leather tanning and wood treatment. Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	K_d (L/kg)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
52.00 (element)	NA	NA	1.8E+6 (CrIII) 1.9E+1 (CrVI)[a]	NA	NA	ND	Note 1[b]

NA = not applicable, ND = no data.
Note 1: Chromium compounds vary from insoluble to soluble.
[a]U.S. Environmental Protection Agency (EPA), 1996, ***Soil Screening Guidance: Users Guide***, Office of Solid Waste and Emergency Response, Washington, DC, Publication 9355.4-23, April.
[b]Agency for Toxic Substances and Disease Registry, (ATSDR), 1998, ***Toxicological Profile for Chromium***, U.S. Public Health Service, Atlanta, Georgia, July.

Chromium is released into the atmosphere from natural gas, oil and coal combustion, and from use by the industries mentioned above (ATSDR, 1998). Other sources include wind transport from road dust, cement producing plants, the wearing down of asbestos brake linings from automobiles, incineration of municipal refuse and sewage sludge, exhaust emission from automotive catalytic converters, and emissions from cooling towers that use chromium

compounds as rust inhibitors. Chromium from these sources exists in a particulate form that may travel great distances from the point of emissions; wet and dry deposition account for the majority of removal from air. Most chromium released to surface water eventually adsorbs to particles and becomes deposited in bottom sediment, but small quantities may remain in the water in both soluble and insoluble forms. Chromium in aquatic media is unlikely to bioaccumulate significantly. Chromium in soil is present mainly as insoluble oxides that are unlikely to be mobile to any significant extent. Soluble forms may also be present, depending on the form of the chemical released, that may be quite mobile in soil.

Biotransfer factors for chromium are compiled below:

BCF (L/kg)	Bpr (unitless)	Bpv (unitless)	Bb (days/kg)	Bm (days/kg)
16[a]	4.5E-3[b]	7.5E-3[b]	5.5E-3[b]	1.5E-3[b]

ND = no data.
[a]U.S. Environmental Protection Agency (EPA), 1986, ***Superfund Public Health Evaluation Manual***, Office of Emergency and Remedial Response, Washington, DC, OSWER Directive 9285-4-1, EPA/540/1-86/060, PB87-183125, October.
[b]Baes, C.F., R.D. Sharp, A.L. Sjoreen, R.W. Shor, 1984, ***A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture***, Health and Safety Division, Oak Ridge National Laboratory, ORNL-5786, September.

A review of several studies suggests that 0.4 to 14.5 percent of orally administered chromium is absorbed by the GI tract of humans, but valence and chemical form and nutritional status (fed vs fasting) appear to influence efficiency of absorption (ATSDR, 1998). The toxicity studies on which the oral RfDs on IRIS for chromium (III) and chromium (VI) are based were performed with rats. The oral RfD for chromium (III) is based on dietary exposure; the oral RfD for chromium (VI) is based on drinking water exposure. Ingestion in both cases is expected to have been gradual throughout the day. Studies reviewed by ATSDR (1998) suggest that GI absorption in rats approximates 1 percent. A GAF of 0.01 VI is selected for this evaluation.

Quantitative data regarding dermal absorption of chromium were not located; therefore, the default ABS of 0.01 (OEPA, 1998) is adopted. The EPA (1992) empirically determined PC of 1E-3 cm/hour for sodium dichromate is selected for chromium compounds for this evaluation.

Chromium (III) is an essential nutrient involved in maintenance of normal fat, cholesterol and glucose metabolism (ATSDR, 1998). EPA (2000) verified an RfD of 1.5E+0 mg/kg-day for chronic oral exposure to chromium (III) by applying an uncertainty factor of 1000 to a NOEL of 1800 g/kg (1.468 mg/kg body weight/day) as an average total ingested dose in a dietary study in which rats were given 600 feedings of chromic oxide baked into bread. No other dose levels were tested. Confidence in the RfD is low. No target organ was identified for the toxicity of oral exposure to chromium (III).

EPA (2000) verified an RfD for chronic oral exposure to chromium (VI) of 3E-3 mg/kg-day based on a NOAEL of 25 mg/L (2.5 mg/kg body weight/day) in the drinking water of rats exposed for one year. An uncertainty factor of 900 was applied. Confidence in the oral RfD is low.

The data summarized by EPA (2000) are insufficient to identify a mechanism of toxicity or target organ(s) for chronic oral exposure to chromium (VI). Data from other sources, however, are sufficient to identify potential target organs. Goyer (1991) reported that renal tubular necrosis is the major effect in humans from ingestion of chromium compounds. The context, however, suggests that this effect is associated with acute exposure to high doses (e.g., accidental or attempted suicide ingestion); therefore, the kidney is not an acceptable candidate as a target organ for chronic oral exposure. Furthermore, a review of human and animal studies by EPA (1998a) did not implicate the kidney as a target organ for chronic oral exposure. EPA (1998a), however, reported GI effects in a cohort of 155 Chinese villagers who consumed water from a well located adjacent to a chromium alloy plant. Symptoms included oral ulcers, diarrhea, abdominal pain, indigestion and leukocytosis with a left shift. The dose rate of chromium (VI) was estimated at 0.57 mg/kg-day, nearly 200 times the oral RfD. It is likely that the GI symptoms reflect the irritant nature of chromium (VI).

EPA (1998a) also reviewed several reproductive studies. An early and inadequately conducted study reported no effects in rats fed a diet containing 0.125 percent K_2CrO_4. A diet containing 0.25 percent resulted in "subnormal condition" (including rough coat) and "subnormal" offspring; a diet containing 0.5 percent resulted in diarrhea and sterility. Assuming rats consume food equivalent to 5 percent of their body weight each day (EPA, 1980), dietary levels of 0.125, 0.25 and 0.5 percent correspond to chromium (VI) dose rates of 17, 33, and 67 mg/kg/day, respectively. A well controlled study reported slightly decreased erythrocyte size and hemoglobin content in rats and mice of either sex fed diets containing 400 ppm K_2CrO_4. The effects were interpreted as "suggestive of a potential bone marrow/erythroid response." The 400 ppm diet is equivalent to a chromium (VI) dose rates of 6.4 mg/kg-day in rats (EPA, 1998a) and approximately 11 mg/kg-day in mice, assuming that mice consume food equivalent to 10 percent of their body weight/day (EPA, 1980). In addition, cytoplasmic vacuolization of hepatocytes was observed in mice fed diets containing 50, 100 or 400 ppm K_2CrO_4, but it is not clear if either the incidence or intensity occurred in a dose-related manner. The 50 ppm diet, the lowest associated with hepatocellular vacuolization, is equivalent to a chromium (VI) intake rate of approximately 1.3 mg/kg-day. A subsequent study reported decreased erythrocyte hemoglobin content in female mice fed a diet containing 100 ppm K_2CrO_4, equivalent to a chromium (VI) dose rate of 6.0 mg/kg-day.

The GI signs reported in humans are clearly an indication of adverse effects; therefore, the GI tract is selected as a target organ. The mechanism of toxicity is assumed to be the irritation induced by tissue contact with chromium (VI). The slight hematologic changes observed in rats and mice and the hepatocellular vacuolization observed in mice do not appear to be sufficiently threatening to be considered adverse. They do, however, suggest that the bone marrow and the liver may be target organs as dose increases. Therefore, target organs selected for chronic oral exposure to chromium (VI) include the GI tract, bone marrow and liver.

The oral RfD for chromium (VI) is 500-fold lower than the oral RfD for chromium (III). No adverse effects, however, were observed for ingestion exposure to either chromium (VI) or chromium (III). The difference in the oral RfDs, therefore, arises solely from the available data, and does not reflect differences in the chronic toxicity of ingestion exposure to low levels of chromium (VI) and chromium (III). Furthermore, recent investigations reveal that ingested chromium (VI) is rapidly and virtually completely reduced to chromium (III) in the acid milieu of the stomach before reaching the blood stream (Kerger et al., 1997; Finley et al., 1997). Since there is no evidence of differences in toxicity, and since chromium (VI) is readily converted to chromium (III), the verified oral RfD of 1.5E+0 mg/kg-day for chromium (III) is likely to be sufficiently protective for chronic ingestion of chromium in either valence state, and is selected as the oral RfD for total chromium for this evaluation.

Inhalation (occupational) exposure to chromium may induce respiratory symptoms, changes in lung function and irritation, erosion or perforation of the nasal septum, depending in part on the exposure level (EPA, 1993). No adverse effects were observed in workers exposed to 1E-3 mg/m^3 for 0.2 to 23.6 years (average 2.5 years). EPA (1998b, 2000) reviewed several human and animal studies, and determined that effects observed from inhalation exposure to chromium (VI) are not relevant to exposure to chromium (III). EPA (1998c) concluded that chromium (VI) is the only species of concern for inhalation exposure to chromium.

EPA (2000) developed separate chronic inhalation RfC values for human exposure to chromic acid mists and dissolved chromium (VI) aerosols, and for exposure to chromium (VI) particulates. A verified inhalation RfC of 8E-6 mg/m^3 for chromic acid mists and dissolved chromium (VI) aerosols is based on an adjusted LOAEL of 7.14E-4 mg/m^3 associated with atrophy of the nasal septum in occupationally exposed humans. An uncertainty factor of 90 was used. Confidence in the inhalation RfC is low. The upper respiratory tract is considered the target organ for inhalation exposure to chromic acid mists and dissolved chromium (VI) aerosols. The RfC is equivalent to an inhalation RfD of 2.3E-6 mg/kg-day.

Inhalation exposure to chromium (VI) particulates is associated with pneumocyte toxicity; i.e., with effects on the lungs themselves. EPA (2000) derived an RfC of 1E-4 mg/m^3 for chronic inhalation exposure to chromium (VI) particulates from an adjusted benchmark concentration of 3.4E-2 mg/m^3 associated with altered enzyme activity in bronchioalveolar lavage fluid from rats exposed to sodium dichromate dust intermittently for up to 90 days. An uncertainty factor of 300 was used. Confidence in the RfC is medium. The RfC is equivalent to a chronic inhalation RfD of 2.9E-5 mg/kg-day. The lung is considered to be the target organ for chronic inhalation exposure to chromium (VI) particulates.

EPA (1998c) notes that exposure to chromic acid mists and dissolved chromium (VI) aerosols is likely to be restricted to occupational settings and that most environmental exposures would involve exposure to chromium (VI) particulates. Chromium in soil was not speciated regarding valence in TNT Area B soil. Therefore, the inhalation RfC for chromium particulates of 1E-4 mg/m^3 equivalent to an inhalation RfD of 2.9E-5 mg/kg-day, will be used in this evaluation.

Chromium (VI) is classified in cancer weight-of-evidence group A based on the consistent finding of lung cancer in epidemiologic studies of occupationally exposed workers in chromate

production and the chrome pigment industry (EPA, 2000). There is no evidence that oral exposure to chromium (VI) induces cancer. An inhalation URF of 1.2E-2 per ug/m^3 equivalent to an inhalation SF of 4.2E+1 per mg/kg-day was based on increased risk of lung cancer deaths in chromate production workers.

References for Chromium

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U.S. Environmental Protection Agency (EPA), 1998c, ***Combustion Technical Assistance Center (CTAC) Request No. 77: Information Regarding Chromium (III) and (VI) for Site-Specific Risk Assessment***, National Center for Environmental Assessment, Cincinnati, OH, 5 October.

U.S. Environmental Protection Agency (EPA), 2000, ***Integrated Risk Information System (IRIS)***, National Center for Environmental Assessment, Cincinnati, OH, on line.

LEAD (7439-92-1)

Lead is a naturally occurring **metal** used in the manufacture of batteries, ammunition, and other metal products (ATSDR, 1993). Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	K_d (L/kg)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
207.2 (element)	NA	NA	ND	NA	NA	ND	9.9E+3[a]

NA = not applicable, ND = no data.
[a] Value for lead chloride as a typical lead salt (Agency for Toxic Substances and Disease Registry, [ATSDR], 1993, ***Update Toxicological Profile for Lead***, Draft for Public Comment, U.S. Public Health Service, Atlanta, Georgia, April.)

Lead may enter the environment during mining, ore processing, smelting, refining, use, recycling or disposal (ATSDR, 1993; HSDB, 2000). Emission from automobile exhaust was at one time the largest source of atmospheric lead. Natural sources are minor compared with anthropogenic sources. Generally the form of lead that enters the atmosphere is not known. However, metallic lead may be released from smelting and refining plants. Lead in air exists attached to small particles that may travel great distances before removal by wet or dry deposition. Lead deposited on or released to soil generally remains in the top 2 to 5 cm where it remains relatively immobile, although a small percentage may be present in soluble forms that are subject to leaching. Acid conditions increase the potential for leaching. Lead released to surface water tends to form salts that are only sparingly soluble. Deposition in bed sediment is the primary removal mechanism, although biomethylation may mobilize lead and return it to the water column. Soil and sediment act as sinks for anthropogenic releases of lead.

Lead in fish is localized in the mucus on the epidermis, the dermis, and scales so that the edible portions do not pose a hazard to human health (HSDB, 2000). Therefore, the BCF listed below probably overstates the danger to humans. Lead does not biomagnify through the aquatic or terrestrial food chains (ATSDR, 1993). Biotransfer factors for lead are compiled below:

BCF (L/kg)	Bpr (unitless)	Bpv (unitless)	Bb (days/kg)	Bm (days/kg)
49[a]	9.0E-3[b]	4.5E-2[b]	3.0E-4[b]	2.5E-4[b]

ND = no data.
[a]U.S. Environmental Protection Agency (EPA), 1986, ***Superfund Public Health Evaluation Manual***, Office of Emergency and Remedial Response, Washington, DC, OSWER Directive 9285-4-1, EPA/540/1-86/060, PB87-183125, October.
[b]Baes, C.F., R.D. Sharp, A.L. Sjoreen, R.W. Shor, 1984, ***A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture***, Health and Safety Division, Oak Ridge National Laboratory, ORNL-5786, September.

Studies in humans indicate that an average of 10 percent of ingested lead is absorbed, but estimates as high as 40% were obtained in some individuals (Tsuchiya, 1986). Nutritional factors have a marked effect on GI absorption efficiency. Children absorb ingested lead more efficiently than adults; absorption efficiencies up to 53% were recorded for children three months to eight years of age. Similar results were obtained for laboratory animals; absorption efficiencies of 5-10% were obtained for adults and ≥50% were obtained for young animals. Data were not located regarding dermal uptake of lead from soil. For purposes of this evaluation, the GAF of 0.1 (EPA, 1993) and the default ABS of 0.01 (OEPA, 1998) were chosen. The EPA (1992) recommended PC for lead compounds of 4E-6 cm/hour based on empirical data with lead acetate is used in this evaluation.

The noncancer toxicity of lead to humans has been well characterized through decades of medical observation and scientific research (EPA, 2000). The principal effects of acute oral exposure are gastrointestinal colic with diffuse paroxysmal abdominal pain (probably due to vagal irritation), anemia, and, in severe cases, acute encephalopathy, particularly in children (Tsuchiya, 1986). The primary effects of long-term exposure are neurological and hematological. Limited occupational data indicate that long-term exposure to lead may induce kidney damage. The principal target organs of lead toxicity are the nervous system and the erythrocyte. Some of the effects on the blood, particularly changes in levels of certain blood enzymes, and subtle neurobehavioral changes in children, appear to occur at levels so low as to be considered non-threshold effects. In part for this reason the EPA (1990, 2000) considered inappropriate the derivation of an RfD for chronic oral exposure.

The Integrated Exposure, Uptake Biokinetic Model (IEUBK) Version 0.99D (EPA, 1994a) is generally used to evaluate lead in children, the most sensitive receptor. The IEUBK model integrates lead uptake from inhalation, drinking water, diet, soil and dust ingestion, and ingestion of incidental sources such as chips of lead-based paint, and estimates blood lead concentrations over the first seven years of a child's life. Generally, it is considered that childhood blood lead levels below 10 µg/dL reflect minimal likelihood of adverse effects from exposure to lead. Since it is plausible that children could be present under most residential site-use scenarios, it is appropriate to use the IEUBK to establish target levels for lead in soil for residential use. EPA (1994b) used the IEUBK to estimate a lead concentration of 400 mg/kg in bare soil to which

children might be regularly exposed as the level below which further evaluation and exposure-reduction action is not necessary.

The IEUBK, however, does not address lead concentrations in media to which adults may be exposed in a non-residential site-use scenario. EPA (1996) adopted a model similar to the IEUBK to estimate blood lead concentrations in adult women in an occupational exposure scenario. The pregnant woman is assumed to be the member of the adult population most sensitive to exposure to lead because of the potential for developmental effects on the fetus. The EPA (1996) adult blood lead model estimates a lead concentration in soil of approximately 880 mg/kg as the level below which the 95th percentile fetal blood lead concentration would not exceed 10 µg/dL.

EPA (2000) classified lead in cancer weight-of-evidence Group B2 (probable human carcinogen), based on inadequate evidence in humans and sufficient animal evidence. The human data consist of several epidemiologic occupational studies that yield confusing results. All the studies lacked quantitative exposure date and failed to control for smoking and concomitant exposure to other possibly carcinogenic metals. Rat and mouse bioassays showed statistically significant increases in renal tumors following dietary and subcutaneous exposure to several soluble lead salts. Various lead compounds were observed to induce chromosomal alterations in vivo and in vitro, sister chromatid exchange in exposed workers and cell transformation in Syrian hamster embryo cells, to enhance simian adenovirus induction, and to alter molecular processes that regulate gene expression. EPA (2000) declined to estimate risk for oral exposure to lead because many factors (e.g., age, general health, nutritional status, existing body burden and duration of exposure) influence the bioavailability of ingested lead, introducing a great deal of uncertainty into any estimate of risk.

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U.S. Environmental Protection Agency (EPA), 2000, ***Integrated Risk Information System (IRIS)***, On-line, Environmental Criteria and Assessment Office, Cincinnati, OH.

MANGANESE (7439-96-5)

Manganese is a naturally occurring **metal** used in the manufacture of steel, and in other metallurgical processes, batteries, and various manganese-containing chemicals (Keen and Leach, 1988). Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	K_d (L/kg)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
54.94 (element)	NA	NA	ND	NA	NA	ND	Note1[a]

NA = not applicable, ND = no data.
Note 1: Manganous chloride as a typical manganese salt: 7.23E+5.
[a]Agency for Toxic Substances and Disease Registry, (ATSDR), 1992, ***Toxicological Profile for Manganese***, U.S. Public Health Service, Atlanta, Georgia, July.

Anthropogenic sources of atmospheric manganese include metal processing, disposal of manganese-containing materials, resuspension of manganese-containing soil dust, and formerly, the combustion of gasoline containing manganese anti-knock ingredients (ATSDR, 1992; HSDB, 2000). Manganese exists in the air bound to particles; dry deposition is the primary removal mechanism, although wet deposition may also be significant. Manganese in water exists as any number of sparingly soluble salts that attach to suspended sediment. Sedimentation is the

primary removal process. Soluble forms also exist and may be released from sediment. The extent of absorption to constituents of soil is highly variable. Low concentrations may occur in an irreversibly "fixed" form to clay, but higher concentrations often manifest considerable mobitity.

Biotransfer factors for manganese are compiled below:

BCF (L/kg)	Bpr (unitless)	Bpv (unitless)	Bb (unitless)	Bm (unitless)
See below	5.0E-2[a]	2.5E-1[a]	4.0E-4[a]	3.5E-4[a]

[a]Baes, C.F., R.D. Sharp, A.L. Sjoreen, R.W. Shor, 1984, ***A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture***, Health and Safety Division, Oak Ridge National Laboratory, ORNL-5786, September.

Manganese in aquatic systems tends to bioaccumulate more strongly in plants and lower trophic levels, and less strongly in edible fish. ATSDR (1992) reports BCFs of 10,000 to 20, 000 L/kg for marine and freshwater plants, 2500 to 6300 L/kg for phytoplankton, 300 to 5500 L/kg for marine algae, 800 to 830 L/kg for intertidal mussels, and 100 to 600 L/kg reported for fin fish. BCF values of 815 L/kg are recommended for shellfish and 350 L/kg are recommended for fin fish.

Keen and Leach (1988) and ATSDR (1992) reviewed the empirical data and reported that approximately three to five percent of dietary manganese is absorbed, regardless of the amount present in the diet. EPA (2000) selected five percent as a rough approximation of the extent of GI absorption. This value (0.05) is selected as the GAF for manganese.

The ABS of 0.01 is an OEPA (1998) default for metals for which empirical data are lacking. The EPA (1992) default PC of 1E-3 cm/hour for metals is used in this evaluation.

Manganese is nutritionally required in humans for normal growth and health (EPA, 2000). Humans exposed to approximately 0.8 mg manganese/kg-day in drinking water (28 mg/L) exhibited lethargy, increased muscle tonus, tremor and mental disturbances. The elderly appeared to be more sensitive than children. Oral treatment of laboratory rodents induces biochemical changes in the brain, but rodents do not exhibit the neurological signs exhibited by humans. Occupational exposure to high concentrations in air induce a generally typical spectrum of neurological effects, and increased incidence of pneumonia (ACGIH, 1991).

EPA (2000) derived an oral RfD for manganese of 1.4E-1 mg/kg-day from a NOAEL of 1.4E-1 mg/kg-day for neurologic effects from human dietary studies and an uncertainty factor of 1. Confidence in the RfD is medium. The oral RfD of 1.4E-1 mg/kg-day will be used for dietary items other than drinking water. EPA (2000) recommends that a modifying factor of 3 should be used to adjust the RfD for use when oral exposure involves drinking water and non-dietary

ingestion. The oral RfD resulting from application of the modifying factor, 4.7E-2 mg/kg-day, will be used for drinking water and incidental ingestion of non-dietary items, and will serve as the basis for developing the dermal RfD. The CNS is the target organ for chronic oral exposure to manganese.

EPA (2000) presents a verified chronic inhalation RfC of 5E-5 mg/m^3 (equivalent to an inhalation RfD of 1.4E-5 mg/kg-day) based on a LOAEL for neurological effects in occupationally exposed humans and an uncertainty factor of 1000. Confidence in the RfC is medium. The CNS is the target organ for inhalation exposure to manganese.

EPA (2000) classified manganese in cancer weight-of-evidence Group D (not classifiable as to carcinogenicity to humans). Quantitative cancer risk estimates are not derived for Group D chemicals.

References for Manganese

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ORGANIC CHEMICALS

ACETONE (67-64-1)

Acetone is a **VOC** used principally as an intermediate in chemical synthesis and as a solvent in a wide variety of applications (ATSDR, 1992; HSDB, 2000). Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
58.08	-0.22[a]	3.88E-5[b]	-0.24[b]	1.24E-1[b]	1.14E-5[b]	2.99E-1[a]	Miscible[b]

[a]U.S. Environmental Protection Agency (EPA), 1994, ***Technical Background Document for Soil Screening Guidance***, Review Draft, Office of Solid Waste and Emergency Response, Washington, DC, Publication No. 9355.4-17, EPA540/R-94/106, PB95-963532, November.
[b]U.S. Environmental Protection Agency (EPA), 1996, ***Soil Screening Guidance: Users Guide***, Office of Solid Waste and Emergency Response, Washington, DC, Publication 9355.4-23, April.

Acetone's production and use as a solvent in many applications may result in its release to the environment through various waste streams (HSDB, 2000). Its use as an extracting reagent and starting material or intermediate in the manufacture of chemical products will also lead to its release to the environment. Other important sources include vehicular exhaust, tobacco smoke, wood burning and pulping, refuse and polyethylene combustion, off-gassing from petroleum storage, and landfills (ATSDR, 1992). Acetone occurs naturally as a metabolic byproduct of plants and animals and is released into the atmosphere by animals, plants, and in volcanoes and forest fires. Municipal and industrial discharge to landfills may lead to soil contamination and, by leaching, groundwater contamination.

Acetone is expected to exist in the ambient atmosphere solely as a vapor, based on its high vapor pressure (ATSDR, 1992; HSDB, 2000). Vapor-phase acetone is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals and by photodecomposition by sunlight. Half-life estimates range from 22 to 80 days, suggesting the potential for long distance transport in the atmosphere. Acetone is expected to have very high mobility in soils based upon its low K_{oc}, indicating that the compound will leach readily to groundwater. Volatilization from moist or dry soil surfaces is expected to be a major transport process for acetone. Acetone is expected to biodegrade under aerobic and anaerobic conditions. Acetone in water is not expected to adsorb to suspended solids or sediment. Volatilization from water surfaces is expected to be an important environmental fate process. Acetone is not expected to participate significantly in food-chain pathways; therefore, biotransfer factors are not provided.

Acetone is "rapidly and almost completely absorbed" following oral administration to laboratory animals (ATSDR, 1992). Inhalation and urinary excretion studies with radiolabeled acetone orally administered to rats indicate GI absorption of at least 74 to 83 percent of the dose. This estimate does not account for C14 retained in the body. The upper end of the empirical range, 0.83, is selected as the GAF for this evaluation. Application of neat compound to the skin of humans results in fairly rapid absorption, as reflected in increased blood concentrations of acetone.

Data regarding dermal uptake from soil, however, were not located. The OEPA (1998) default ABS of 0.1 for organic chemicals is adopted for this evaluation. From the molecular weight and log K_{ow} provided above, a PC of 5.88E-4 cm/hour and a τ of 1.98E-1 hours are estimated by the method of EPA (1992).

Studies of workers exposed to acetone reveal irritation of the ocular and respiratory tract mucosa, and, at high concentrations, central nervous system (CNS) effects (ACGIH, 1991). Rats exposed by inhalation to high concentrations exhibit narcosis and slight decreases in organ and body weight, compared with controls, but no clinicopathological or histopathological evidence of organ damage. The data, however, are insufficient for derivation of an inhalation RfC for acetone.

Oral LD_{50} values for adult rats range from 5.8 to 10.7 g/kg, indicating that the acute toxicity of acetone is low (ATSDR, 1992). Prolonged oral exposure toxicity data are limited to a comprehensive 90-day gavage study in rats, in which 100 mg/kg-day was a NOEL and 500 mg/kg-day was a LOAEL associated with increased liver and kidney weight and tubular nephropathy (EPA, 2000). A verified RfD for chronic oral exposure of 1E-1 mg/kg-day was derived by applying an uncertainty factor of 1000 to the NOEL of 100 mg/kg-day. Confidence in the RfD is low. The liver and kidney are both considered to be target organs for prolonged oral exposure to acetone.

Acetone is classified as a cancer weight-of-evidence Group D compound (not classifiable as to carcinogenicity to humans), based on a lack of human or animal carcinogenicity data (EPA, 2000). Quantitative cancer potency estimates are not available for Group D chemicals.

References for Acetone

Agency for Toxic Substances and Disease Registry, (ATSDR), 1992, ***Toxicological Profile for Acetone***, Draft for Public Comment, U.S. Public Health Service, Atlanta, Georgia.

American Conference of Governmental Industrial Hygienists (ACGIH), 1991, ***Documentation of the Threshold Limit Values and Biological Exposure Indices***, Sixth Edition, ACGIH, Cincinnati, OH, pp. 10-11.

Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.

Ohio Environmental Protection Agency (OEPA), 1998, ***U.S. NASA Plum Brook, Erie County, Ohio LD#: 322-0552, Risk Assessment Work Plans***, letter from R.E. Nabors, Site Coordinator, to L.S. Ingram, Department of the Army, June 22.

U.S. Environmental Protection Agency (EPA), 1992, ***Dermal Exposure Assessment: Principles and Applications***, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, January.

U.S. Environmental Protection Agency (EPA), 2000, ***Integrated Risk Information System (IRIS)***, National Center for Environmental Assessment, Cincinnati, OH, on line.

AMINODINITROTOLUENES (ADNT)

The ADNTs, 2-amino-4,6-dinitrotoluene (35572-78-2) and 4-amino-2,6-dinitrotoluene (1946-51-0) are **SVOCs** that are present in environmental media presumably as microbial reduction

products of 2,4,6-trinitrotoluene (TNT) (ATSDR, 1993; HSDB, 2000). Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
Note[a]							
197.17	1.60[b]	4.57E-7[b]	3.20[b]	5.61E-2[c]	6.8E-6[d]	2.62E-7[b]	1.30E+2[b]

[a]The values provided herein (except for molecular weight and diffusivity in air) are for 2,4,6-trinitrotoluene, which is adopted as a surrogate based on structural similarity.
[b]Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.
[c]Calculated as described in Introduction to the Toxicity Profiles.
[d]Montgomery, J.H., 1996, ***Groundwater Chemicals Desk Reference, Second Edition***, Lewis Publishers, New York, pp. 1043-1044.

The ADNTs may be released to the environment as degradation products of TNT or similar compounds (HSDB, 2000).

Data regarding the environmental fate of the ADNTs were not located in the available literature. It is assumed, however, that the ADNTs may behave similarly to TNT because of the structural similarity of these compounds. Under this assumption, the ADNTs are likely to persist in soil; hydrolysis and volatilization are unlikely to be significant (HSDB, 2000). They are likely to occur almost entirely in the vapor phase in the atmosphere, and may be subject to direct photolysis and photochemical degradation.

The capability of microorganisms to biotransform TNT under aerobic conditions in water is well established; however, reduction rates under aerobic conditions are very slow (HSDB, 2000). It is unclear the extent to which the ADNTs may be subject to further microbial reduction. Photolysis, which is the most important removal process for TNT in surface water, may also be significant for the ADNTs. Hydrolysis and volatilization are not significant for TNT and also are not expected to be significant for the ADNTs. The extent of adsorption to suspended or benthic sediment is expected to be moderate.

Generally TNT is not expected to bioconcentrate in aquatic systems or participate significantly in food chain pathways under normal environmental conditions (HSDB, 2000). It is assumed that the ADNTs will not bioconcentrate significantly and biotransfer factors are not estimated.

Data regarding the extent of GI absorption of the ADNTs were not located in the available literature. ATSDR (1993) summarized the results of toxicokinetic studies in which a single oral dose of radiolabeled TNT was given to rats, mice, dogs and rabbits, and radiolabel was quantified in various body compartments 24 hours after dosing. The appearance of red pigment in the urine of the rats and mice indicated that absorption is rapid. Urinary recovery accounted for approximately 60 percent of the dose in rats, mice and dogs, and 74 percent of the dose in rabbits. The extent of urinary recovery may serve as a conservative estimate of the extent of GI

absorption. Assuming that the ADNTs may be absorbed to the same extent as TNT, the GAF for TNT of 0.6 is also adopted for the ADNTs.

Data regarding the extent of dermal uptake of the ADNTs from soil were not located. The OEPA (1998) default ABS of 0.1 for organic chemicals is adopted for this evaluation. A PC of 1.07E-3 cm/hour and a τ of 2.12E+0 hours are estimated from the data provided above by the method of EPA (1992).

Data regarding the acute toxicity of oral exposure to the ADNTs are limited to LD_{50} values. Oral LD_{50} values in rats and mice are summarized below (EPA, 1993a):

Oral LD_{50} Values in Rats (mg/kg)		
Chemical	Males	Females
TNT	1010	820
2-Amino-4,6-dinitrotoluene	2240	1394
4-Amino-2,6-dinitrotoluene	1360	959
Oral LD_{50} Values in Mice (mg/kg)		
TNT	1009	1014
2-Amino-4,6-dinitrotoluene	1522	1722
4-Amino-2,6-dinitrotoluene	1342	1495

The data suggest that the acute toxicity of the ADNTs is not greater than TNT.

Data were not located regarding the chronic oral toxicity of the ADNTs. EPA (1993a) evaluated the toxicity of TNT and the 2,4-dinitrotoluene, and concluded that TNT is the more appropriate surrogate for the ADNTs. A verified oral RfD for TNT of 5E-4 mg/kg-day is based on a LOAEL for liver effects of 0.5 mg/kg-day in a 26-week feeding study in dogs (EPA, 2000). An uncertainty factor of 1000 was applied to the LOAEL to derive the oral RfD. Data reviewed by ATSDR (1993) clearly identifies the erythrocyte (methemoglobinemia and hemolytic anemia) as another target for low-level exposure of mice, rats and dogs to TNT. Target organs for TNT; therefore, include the liver and erythrocyte. EPA (1993a) estimated a LOAEL for the ADNTs of 0.58 mg/kg-day by adjusting the TNT LOAEL of 0.5 mg/kg-day by the difference in molecular weight (MW) (i.e., MW of TNT divided by MW of ADNT). Application of an uncertainty factor of 10,000 yields a provisional RfD for chronic oral exposure of the ADNTs of 5.8E-5 mg/kg-day, which is rounded to 6E-5 mg/kg-day. The liver and erythrocyte are assumed to be the target organs for prolonged oral exposure to the ADNTs. Confidence in the provisional oral RfD is low.

EPA (1993b) classified the ADNTs in EPA cancer weight-of-evidence Group D, not classifiable as to carcinogenicity in humans, to reflect a total lack of human or animal data.

References for Aminodinitrotoluenes

Agency for Toxic Substances and Disease Registry (ATSDR), 1993, ***Toxicological Profile for 2,4,6-Trinitrotoluene***, Draft for Public Comment, U.S. Department of Health and Human Services, May.

Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.

Ohio Environmental Protection Agency (OEPA), 1998, ***U.S. NASA Plum Brook, Erie County, Ohio LD#: 322-0552, Risk Assessment Work Plans***, letter from R.E. Nabors, Site Coordinator, to L.S. Ingram, Department of the Army, June 22.

U.S. Environmental Protection Agency (EPA), 1992, ***Dermal Exposure Assessment: Principles and Applications***, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, January.

U.S. Environmental Protection Agency (EPA), 1993a, ***Risk Assessment Issue Paper for: Derivation of Oral RfD for 2-Amino-4,6-Dinitrotoluene (CASRN 35572-78-2) and 4-Amino-2,6-Dinitrotoluene (CASRN 19406-51-0) By Analogy to 2,4,6-Trinitrotoluene Systemic Toxicity Assessment***, National Center for Environmental Assessment, Cincinnati, OH, 23 February.

U.S. Environmental Protection Agency (EPA), 1993b, ***Risk Assessment Issue Paper for: Carcinogenicity of 2-Amino-4,6-Dinitrotoluene (CASRN 35572-78-2) and 4-Amino-2,6-Dinitrotoluene (CASRN 19406-51-0)*** , National Center for Environmental Assessment, Cincinnati, OH, 23 February.

U.S. Environmental Protection Agency (EPA), 2000, ***Integrated Risk Information System (IRIS)***, National Center for Environmental Assessment, Cincinnati, OH, on line.

AMINONITROTOLUENES

Several aminonitrotoluene isomers are possible; isomers for which CAS registry numbers are available include 2-amino-4-nitrotoluene (2-methyl-5-nitroaniline, 5-nitro-o-toluidine) (99-55-8), 2-amino-6-nitrotoluene (603-83-8), 3-amino-4-nitrotoluene (578-46-1), 4-amino-2-nitrotoluene (119-32-4) and 4-amino-3-nitrotoluene (89-62-3) (Howard and Neal, 1992). 2-Amino-4-nitrotoluene is used primarily as a chemical intermediate in the production of some azoic and diazo pigments (HSDB, 2000). Data regarding the uses of the other members of this class of organic compounds were not located. Henry's Law constants are not available for the aminonitrotoluenes; however, they are considered to be **SVOCs** because of their structural similarity to the dinitrotoluenes, which are also considered to be SVOCs. Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
2-Amino-4-nitrotoluene							
152.16	1.96[a]	ND	2.44[a]	6.67E-2[b]	7.72E-6[b]	1.71E-8[a]	ND
2-Amino-6-nitrotoluene							
152.16	ND	ND	ND	6.67E-2[b]	7.72E-6[b]	ND	ND
3-Amino-4-nitrotoluene							
152.16	ND	ND	ND	6.67E-2[b]	7.72E-6[b]	ND	ND
4-Amino-2-nitrotoluene							
152.16	ND	ND	ND	6.67E-2[b]	7.72E-6[b]	ND	ND
4-Amino-3-nitrotoluene							
152.16	ND	ND	ND	6.67E-2[b]	7.72E-6[b]	ND	ND

ND = no data.
[a]Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.
[b]Calculated as described in Introduction to Toxicological Profiles.

Data regarding the release and environmental behavior of the aminonitrotoluenes are limited to 2-amino-4-nitrotoluene. However, it is likely that all the aminonitrotoluenes behave similarly in the environment. 2-Amino-4-nitrotoluene may be released to the environment during its manufacture and use as a dye intermediate and it may be released in the effluent from the manufacture of 2,4,6-trinitrotoluene (HSDB, 2000). It may also be formed in the environment as a result of anaerobic biodegradation of 2,4-dinitrotoluene. The compound also occurs naturally, and has been identified as a volatile flavor component of Idaho Russet Burbank baked potatoes.

2-Amino-4-nitrotoluene released to soil is not expected to hydrolyze (HSDB, 2000). 2-Amino-4-nitrotoluene is expected to have low mobility in soil due to covalent bonding to humates in soil, although estimated K_{oc} values suggest that it would be moderate mobility. Therefore, leaching to groundwater may be important, especially in soils with low humate content. Volatilization from dry soil surfaces is not expected to be a significant removal process.

2-Amino-4-nitrotoluene is not expected to hydrolyze in water (HSDB, 2000). Reaction with alkyl peroxy radicals may be a significant removal process; a half-life of 14 days has been estimated for this reaction. The potential exists for direct photolysis in sunlight, and the presence of algae may accelerate photochemical degradation. Adsorption to suspended solids and sediments by chemical bonding is expected to be significant.

2-Amino-4-nitrotoluene in air is expected to react with hydroxyl radicals (estimated vapor phase half-life of about 8 hours) and has the potential to undergo direct photolysis (HSDB, 2000). The compound is not expected to travel long distances in the atmosphere because of its relatively short residence time in air.

The relatively low log K_{ow} for 2-amino-4-nitrotoluene suggests that the compound is unlikely to bioconcentrate or bioaccumulate significantly (HSDB, 2000); therefore, biotransfer factors are not estimated for the aminonitrotoluenes.

Data regarding the GI absorption of the aminonitrotoluenes were not located in the available literature. However, as noted above, the aminonitrotoluene and dinitrotoluenes are similar in chemical structure. Empirical data using rats and mice indicates that the dinitrotoluenes are rapidly and essentially completely absorbed from the GI tract (ATSDR, 1997; EPA, 1992a, HSDB, 2000). Assuming that the aminonitrotoluenes behave similarly, a GAF of 1 is selected for the aminonitrotoluenes.

Data regarding the extent of dermal uptake of the aminonitrotoluenes from soil were not located. The OEPA (1998) default ABS of 0.1 for organic chemicals is adopted for this evaluation. From the data compiled above and the EPA (1992b) method, a PC of 5.54E-3 cm/hour and a τ of 7.41E-1 hours are estimated for 2-amino-4-nitrotoluene, which is applied to all the aminonitrotoluenes.

A 78-week dietary study in rats and mice provided information that was used to address the potential carcinogenicity of 2-amino-4-nitrotoluene (EPA, 1987). Data regarding the noncancer effects were not reported in sufficient depth to permit estimation of an RfD for chronic oral exposure.

Data regarding the effects of inhalation exposure to 2-amino-4-nitrotoluene were not located in the available literature. Inhalation and dermal exposure are expected to be significant in the occupational setting where the compound is produced or used (HSDB, 2000). The data are insufficient for developing an inhalation RfC.

EPA (1987, 1997) classified 2-amino-4-nitrotoluene in cancer weight-of-evidence Group C – possible human carcinogen – based on an increased incidence of liver carcinomas in male and female mice in the 78-week dietary study mentioned above. There was no evidence of carcinogenicity in the rats in the same study. Although the compound has a history of occupational exposure, there is no evidence to suggest a carcinogenic role in humans. An oral SF of 3.3E-2 per mg/kg-day was estimated from the liver carcinoma data in mice. The data are insufficient to develop potency factors for inhalation exposure.

<u>References for Aminonitrotoluenes</u>

Agency for Toxic Substances and Disease Registry, (ATSDR), 1997, ***Update Toxicological Profile for 2,4-Dinitrotoluene and 2,6-Dinitrotoluene***, Draft for Public Comment, U.S. Department of Health and Human Services, Atlanta, GA, September.

Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.

Howard, P.H. and M. Neal, 1992, ***Dictionary if Chemical Names and Synonyms***, Lewis Publishers, Chelsea, MI.

Ohio Environmental Protection Agency (OEPA), 1998, ***U.S. NASA Plum Brook, Erie County, Ohio LD#: 322-0552, Risk Assessment Work Plans***, letter from R.E. Nabors, Site Coordinator, to L.S. Ingram, Department of the Army, June 22.

U.S. Environmental Protection Agency (EPA), 1987, ***Health and Environmental Effects Profile for 2-Methyl-5-Nitroaniline***, Prepared by the Office of Health and Environmental Assessment for the Office of Solid Waste and Emergency Response, Washington, DC.

U.S. Environmental Protection Agency (EPA), 1992a, ***Health Advisory for 2,4- and 2,6-Dinitrotoluene (DNT)***, Health and Ecological Criteria Division, Office of Water, Washington, DC.

U.S. Environmental Protection Agency (EPA), 1992b, ***Dermal Exposure Assessment: Principles and Applications***, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, January.

U.S. Environmental Protection Agency (EPA), 1997, ***Health Effects Assessment Summary Tables, FY 1997 Update***, Office of Solid Waste and Emergency Response, Washington, DC, 9200.6-303(97-1), EPA 540/R-97-036, PB97-921199.

DINITROBENZENES

The dinitrobenzenes are **SVOCs** that exist in three isomeric forms: 1,2-dinitrobenzene (ortho- or o- dinitrobenzene), 1,3-dinitrobenzene (meta- or m-dinitrobenzene), and 1,4-dinitrobenzene (para- or p-dinitrobenzene). The dinitrobenzenes are used in organic synthesis, particularly in the manufacture of dyes, in explosives, and as a camphor substitute in the production of celluloids (ACGIH, 1991; Lewis, 1997; HSDB, 2000). 1,3-Dinitrobenzene, the isomer most frequently encountered in the environment, is also used in the preparation of m-phenylenediamine, in the detection of 17-ketosteroids, in the production of aminocresols and other aromatic amines (HSDB, 2000). Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
1,2-Dinitrobenzene (528-29-0)							
168.11	1.58[a]	2.33E-6[b,c]	1.47[b]	6.24E-2[d]	7.9E-6[a]	5.13E-6[b,c]	1.32E+2[a]
1,3-Dinitrobenzene (99-65-0)							
168.11	1.49[a]	2.33E-6[b]	1.39[b]	6.24E-2[d]	7.9E-6[a]	5.13E-6[b]	5.0E+2[a]
1,-4-Dinitrobenzene (100-25-4)							
168.11	1.48[a]	4.79E-7[a]	1.36[b]	6.24E-2[d]	7.9E-6[a]	2.96E-7[a]	8.0E+1[a]

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)

ND = no data.
[a]Montgomery, J.H., 1996, ***Groundwater Chemicals Desk Reference, Second Edition***, Lewis Publishers, New York, pp. 421-426.
[b]Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.
[c]Value for 1,3-dinitrobenzene used as a surrogate (HSDB, 2000).
[d]Calculated as described in Introduction to Toxicity Profiles.

Environmental release of the dinitrobenzenes may result from their use as intermediates in organic syntheses, during the production of 2,4,6-trinitrotoluene (TNT) and in the production of dyes (ATSDR, 1993; HSDB, 2000). Its presence in environmental media at former ordnance works may reflect its formation as a degradation product of TNT. Dinitrobenzene released to soil may adsorb to clay but adsorption to soils that are not predominantly clay is expected to be weak. Therefore, the dinitrobenzenes are expected to be mobile or highly mobile in soil and may readily leach to groundwater. Volatilization from soil surfaces may occur but this expected to be slow. Reduction to aromatic amines may occur under anaerobic conditions.

The dinitrobenzenes are expected to exist largely in the vapor phase in air (ATSDR, 1993). These chemicals are expected to react with photochemically generated hydroxyl radicals with an estimated half-life of 14.15 hours (HSDB, 2000). Direct photolysis in the atmosphere may also occur, but a rate cannot be estimated.

The dinitrobenzenes may biodegrade in water and volatilization may occur, but these removal processes are expected to be slow (HSDB, 2000). Direct photolysis may also occur, but rate data are not available. Information was not located regarding partitioning to sediment.

The low log K_{ow} values for these compounds suggest that bioconcentration or bioaccumulation are unlikely to be important (HSDB, 2000). Empirical data for 1,4-dinitrobenzene supports this assumption; therefore, biotransfer factors are not estimated for the dinitrobenzenes.

Of the three dinitrobenzenes, toxicokinetic data are available only for the 1,3-isomer. Rabbits and rats treated with a single oral dose of radiolabeled 1,3-dinitrobenzene excreted 63 to 80 percent of the radioactivity in the urine within 48 hours (ATSDR, 1993). This observation suggests that absorption from the GI tract is rapid; the 63 to 80 percent urinary excretion can be adopted as a minimal estimate of the extent of absorption. A GAF of 0.8 is adopted for all the dinitrobenzenes for the purposes of this evaluation.

The dinitrobenzenes are readily absorbed through the skin, either as solid, liquid, or vapor. However, data regarding the extent of dermal uptake from soil were not located. In the absence of empirical data, the OEPA (1998) default ABS of 0.1 for organic compounds is selected for this evaluation. From the MW and log K_{ow} values given above and the EPA (1992) method, PC and τ values are estimated as follows:

Chemical	PC (cm/hour)	τ (hours)
1,2-Dinitrobenzene	2.38E-3	9.28E-1
1,3-Dinitrobenzene	2.05E-3	9.28E-1
1,4-Dinitrobenzene	2.02E-3	9.28E-1

Acute oral LD_{50} values are limited to an LD_{50} of 83 mg/kg for 1,3-dinitrobenzene in rats (ATSDR, 1993; Montgomery, 1997; HSDB, 2000). Acute exposure is associated with cyanosis resulting from the oxidation of hemoglobin to methemoglobin in the erythrocytes. Methemoglobin is unable to release oxygen to the tissues resulting in tissue anoxia. Doses approximately one-half the oral LD_{50} are also associated with testicular degeneration and impaired fertility.

Prolonged oral exposure of laboratory animals to 1,3-dinitrobenzene is associated with reduced blood hemoglobin concentrations,equivocal evidence of neurotoxicity and testicular degeneration (ATSDR, 1993; EPA, 2000). EPA (2000) verified an RfD for chronic oral exposure of 1E-4 mg/kg-day based on a NOAEL of 3 ppm (0.4 mg/kg-day) in a 16-week drinking water study in male and female rats. An uncertainty factor of 3000 was applied to the NOAEL to derive the RfD. The LOAEL, 8 ppm, was associated with increased spleen weights, an indication of accelerated erythrocyte turnover. The concentration of 20 ppm was associated with decreased body weight gain in females, decreased hemoglobin concentrations and testicular atrophy in males, and splenic enlargement and hemosiderin deposits in both rats of either sex. The erythrocyte and testis are considered the target organs for prolonged oral exposure to 1,3-dinitrobenzene. Effects on the spleen are judged to be secondary to erythrocyte destruction. Confidence in the verified oral RfD is low.

Data regarding the toxicity of prolonged oral exposure to the other dinitrobenzene isomers was not located in the available literature. EPA (1997) derived a provisional oral RfD of 4E-4 mg/kg-day for 1,2-dinitrobenzene and 1,4-dinitrobenzene by analogy to 1,3-dinitrobenzene. Although it is not entirely clear, it appears that EPA (1997) applied an uncertainty factor of 1000 to the NOAEL of 0.4 mg/kg-day for 1,3-dinitrobenzene described above. Justification for using an uncertainty factor of 1000, rather than 3000, was not presented; however, HSDB (2000) notes that the meta isomer is the most important toxicologically, especially as a methemoglobin former.

Human (occupational) exposure to the dinitrobenzenes is associated with effects on the liver, aplastic anemia, yellowing of the skin, cornea and conjunctiva, and several overt symptoms including headache, burning pain and paresthesias in the feet, ankles, hands, and forearms, cyanosis, visual disturbance, central scotomas, bad taste, burning mouth, and dry throat (ACGIH, 1991; HSDB, 2000). The skin, conjunctiva, and ocular fundus may show bluish discoloration from formation of methemoglobin. Vision has been affected in numerous cases of occupational exposure. The vision fields have been slightly contracted, and visual acuity has been much reduced, with central scotomas, particularly for red and green. Partial optic atrophy has been

observed in some cases. Dermal exposure is thought to play a major role in the effects associated with occupational exposure (ACGIH, 1991). The data are insufficient for development of an inhalation RfC for any of the dinitrobenzenes.

EPA (2000) classifies 1,3-dinitrobenzene in weight-of-evidence cancer Group D – not classifiable as to human carcinogenicity because of a lack of relevant human or animal data. Data regarding the carcinogenicity of 1,2- or 1,4-dinitrobenzene were not located, and these isomers were not assigned to a cancer weight-of-evidence group. URFs and SFs are not available for any of the dinitrobenzenes.

References for Dinitrobenzene

Agency for Toxic Substances and Disease Registry (ATSDR), 1993, ***Toxicological Profile for 1,3-Dinitrobenzene and 1,3,5-Trinitrobenzene***, Draft for Public Comment, U.S. Department of Health and Human Services, May.

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U.S. Environmental Protection Agency (EPA), 2000, ***Integrated Risk Information System (IRIS)***, National Center for Environmental Assessment, Cincinnati, OH, on line.

DINITROTOLUENE (DNT)

The dinitrotoluenes are **SVOCs** that are used predominantly as intermediates in the production of polyurethanes, dyes, rubber, plastics, toluidines, toluenediisocyanates, flexible and rigid foams, surface coatings, and other organic chemicals (ATSDR, 1997; HSDB, 2000). Another use is as a gelatinizing and waterproofing agent in the production of explosives. The dinitrotoluenes may appear in environmental media as break down products of 2,4,6-trinitrotoluene. Isomers include 2,3-, 2,4-, 2,5-, 2,6-, 3,4- and 3,5-dinitrotoluene. The compounds of most interest in environmental exposure include 2,4- and 2,6-dinitrotoluene. Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
2,3-Dinitrotoluene (602-01-7)							
182.1	2.0[a]	ND	2.46[a]	5.91E-2[b]	6.85E-6[b]	ND	ND
2,4-Dinitrotoluene (121-14-2)							
182.1	1.98[c]	9.27E-8[d]	1.98[d]	2.03E-1[d]	7.06E-6[d]	2.29E-7[e]	2.70E+2[d]
2,5-Dinitrotoluene (619-15-8)							
182.1	2.0[a]	ND	2.46[a]	5.91E-2[b]	6.85E-6[b]	ND	ND
2,6-Dinitrotoluene (606-20-2)							
182.1	1.72[c]	7.46E-7[d]	1.84[d]	3.27E-2[d]	7.26E-6[d]	7.47E-7[e]	1.82E+2[d]
3,4-Dinitrotoluene (610-39-9)							
182.1	2.0[a]	ND	2.46[a]	5.91E-2[b]	6.85E-6[b]	ND	ND
3,5-Dinitrotoluene (618-85-9)							
182.1	2.28[a]	3.97E-7[a]	2.62[a]	5.91E-2[b]	6.85E-6[b]	ND	ND

ND = no data.
[a]Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.
[b]Calculated as described in Introduction to the Toxicity Profiles.
[c]U.S. Environmental Protection Agency (EPA), 1992, ***Dermal Exposure Assessment: Principles and Applications***, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, January.
[d]U.S. Environmental Protection Agency (EPA), 1996, ***Soil Screening Guidance: Users Guide***, Office of Solid Waste and Emergency Response, Washington, DC, Publication 9355.4-23, April.
[e]U.S. Environmental Protection Agency (EPA), 1994, ***Technical Background Document for Soil Screening Guidance***, Review Draft, Office of Solid Waste and Emergency Response, Washington, DC, Publication No. 9355.4-17, EPA540/R-94/106, PB95-963532, November.

The physical properties of 2,4-dinitrotoluene can be used for the dinitrotoluene mixture (25321-14-6) and for isomers where chemical-specific data are not available.

The dinitrotoluenes are released into the environment in waste streams from processes in which they are manufactured or used (ATSDR, 1997; HSDB, 2000). They may also be present as products of 2,4,6-trinitrotoluene degradation. Dinitrotoluenes released to soil are expected to have moderate mobility and may leach to groundwater. No information on biodegradation in soil was found; however, biodegradation may be an important fate process in soil based on the observation that all dinitrotoluene isomers are metabolized in surface water to which yeast extract was added. Dinitrotoluenes are not expected to hydrolyze in soils.

Dinitrotoluenes released to water, may sorb weakly to moderately to sediment (ATSDR, 1997; HSDB, 2000). Evaporation from water is not expected to be an important transport process.

Biodegradation may be an important fate process in water, as indicated above. Dinitrotoluenes in water may be susceptible to photolysis, based on the behavior of 2,4- and 2-6-dinitrotoluene, which had photolytic half-lives ranging from 2.7 to 43 hours (2,4-dinitrotoluene) or 0.2 hours (2,6-dinitrotoluene) in various water environments.

Dinitrotoluenes released to the atmosphere may be susceptible to direct and indirect photolysis (ATSDR, 1997; HSDB, 2000). The estimated vapor phase half-life in the atmosphere is 8 hours. Data regarding the partitioning of the dinitrotoluenes between particulate and vapor phase were not located.

Bioconcentration of the dinitrotoluenes is expected to be negligible (ATSDR, 1997); therefore, biotransfer factors are not estimated.

The rapid disappearance of radioactivity from the small intestine of rats following oral administration of radiolabeled 2,4- or 2,6-dinitrotoluene suggests that absorption from the GI tract is rapid and essentially complete (ATSDR, 1997; EPA, 1992a). Species differences in the excretion of dinitrotoluene, however, confound quantification of the extent of GI absorption. Fecal excretion and the GI tract (tissue + contents) accounted for 9.2 to 17.3 percent of the dose of radioactivity 24 hours after administration of radiolabeled 2,4-dinitrotoluene to rats, rabbits, dogs and monkeys, and 83.1 to 85 percent in mice in the same study (EPA, 1992a). Biliary excretion appears to have been more important in mice than in the other species tested. Somewhat different results were obtained in another study. The elimination and metabolism of a single oral 100 mg/kg dose of 2,4-dinitrotoluene (2,4-dinitrotoluene) in A/J mice was examined (HSDB, 2000). Four hours after oral administration, only 28.5% of the dose was excreted in the urine, which increased to 66% after 8 hours. Elimination via the feces was minimal (< 2.1% of the dose), suggesting that GI absorption is virtually complete. Together, the data for the 2,4-isomer suggest that the GI absorption of the dinitrotoluenes is virtually complete; the GAF of 1 is adopted for the dinitrotoluenes for this evaluation.

Data regarding dermal uptake from soil were not located; therefore, the OEPA (1998) default ABS of 0.1 for organic chemicals is chosen. PC and τ values are estimated as follows:

Chemical	PC (cm/hour)	τ (hours)
2,3-Dinitrotoluene	3.88E-3[a]	1.13E+0[a]
2,4-Dinitrotoluene	3.8E-3[b]	1.1E+0[b]
2,5-Dinitrotoluene	3.88E-3[a]	1.13E+0[a]
2,6-Dinitrotoluene	2.5E-3[b]	1.1E+0[b]
3,4-Dinitrotoluene	3.88E-3[a]	1.13E+0[a]
3,5-Dinitrotoluene	6.14E-3[a]	1.13E+0[a]

[a]Estimated from the data compiled above by the method of EPA (1992b).
[b]Taken from EPA (1992b).

Data regarding the toxicity of oral exposure to 2,3-dinitrotoluene is limited to the statement that the 2,4-, 2,6- and 3,4-isomers are more toxic to rats than the 2,3- or 2,5-isomers.

Acute oral exposure to 2,4-dinitrotoluene induces methemoglobinemia; dogs appear to be more sensitive than rats, which are more sensitive than mice (ATSDR, 1997). Oral LD_{50} values include 270 mg/kg for rats and 1630 mg/kg for mice. Subchronic or chronic oral exposure to 2,4-dinitrotoluene in rats is associated with depressed weight gain, reticulocytosis and splenic hemosiderosis, and decreased spermatogenesis (HSDB, 2000). Some rats had widespread and stiff-legged gaits and demyelination in the cerebellum and brain stem. A verified chronic oral RfD of 2E-3 mg/kg-day for 2,4-dinitrotoluene is based on neurotoxicity, hematologic effects and biliary tract hyperplasia in dogs given capsules containing the test substance for 2 years (EPA, 2000). Progressive paralysis, accompanied by degenerative lesions in the central nervous system, were observed in dogs treated with 10 mg/kg-day. Hematologic effects, including methemoglobinemia and its sequelae, were observed in dogs treated with 1.5 mg/kg-day, which is the LOAEL for this study. No adverse effects were observed in dogs treated with 0.2 mg/kg-day. Application of an uncertainty factor of 100 to the NOAEL of 0.2 mg/kg-day yields an RfD of 2E-3 mg/kg-day. Confidence in the RfD is high. The CNS, erythrocyte and liver appear to be the target organs for prolonged oral exposure, at least in dogs.

HSDB (2000) reports oral LD_{50} values for 2,5-dinitrotoluene of 707 mg/kg for rats and 1231 mg/kg for mice. Data regarding the effects of prolonged oral exposure were not reported.

Oral LD_{50} values for 2,6-dinitrotoluene for rats (665 mg/kg) and mice (714 mg/kg) are similar. Dogs, however, appear to be more sensitive than rodents in subchronic studies. A provisional oral RfD of 1E-3 mg/kg-day for 2,6-dinitrotoluene is based on a 13-week dietary study with 2,6-dinitrotoluene in dogs (EPA, 1997). The NOAEL in this study was 4 mg/kg-day, somewhat higher than the LOAEL for 2,4-dinitrotoluene. An uncertainty factor of 3000 was applied. The CNS, erythrocyte, liver and kidney appear to be the target organs for prolonged oral exposure to 2,6-dinitrotoluene. The oral data in dogs suggest that the 2,6-isomer is somewhat less toxic than the 2,4-isomer for prolonged oral exposure. The oral RfD for the 2,6-isomer, however, is less than the oral RfD for the 2,4-isomer. This apparent contradiction is an artifact of the lesser quality data base for 2,6-dinitrotoluene and, consequently, the higher uncertainty factor used to derive the RfD for the 2,6-isomer.

The verified oral RfD of 2E-3 mg/kg-day for 2,4-dinitrotoluene can be used for the other dinitrotoluene isomers for which data are not available.

Occupational studies indicate that acute exposure to dinitrotoluene causes methemoglobinemia, which produces headache, irritability, dizziness, weakness, nausea, vomiting, dyspnea, drowsiness, unconsciousness and, in extreme cases, death (ACGIH, 1991). Occupational exposure may lead to increased risk of ischemic heart disease, possibly arising from decreased

oxygen-carrying capacity of the blood. The data are insufficient to develop inhalation RfCs for the dinitrotoluene isomers.

EPA (2000) classified the 2,4-/2,6-dinitrotoluene mixture in EPA cancer weight-of-evidence Group B2 (probably human carcinogen) on the basis of multiple tumor types in male and female rats and renal tumors in male mice in several dietary studies. Occupational data provide no evidence of carcinogenicity, but the studies reviewed lack the power to reveal small differences in cancer risk (ACGIH, 1991). EPA (2000) verified an oral SF of 6.8E-1 per mg/kg-day for exposure to the 2,4-/2,6-dinitrotoluene mixture based on an increased incidence of a variety of tumors in female rats. The test material contained about 98 percent 2,4-dinitrotoluene and 2 percent 2,6-dinitrotoluene. Other studies suggest that much of the carcinogenicity of the mixture is the result of the 2,6-isomer. The B2 classification and the oral SF of 6.8E-1 per mg/kg-day are used in this evaluation for both 2,4- and 2,6-dinitrotoluene and the 2,4-/2,6-dinitrotoluene mixture. The data are insufficient for development of potency factors for inhalation exposure. Data are not available regarding the carcinogenicity of the other dinitrotoluene isomers.

References for Dinitrotoluenes

Agency for Toxic Substances and Disease Registry, (ATSDR), 1997, ***Update Toxicological Profile for 2,4-Dinitrotoluene and 2,6-Dinitrotoluene***, Draft for Public Comment, U.S. Department of Health and Human Services, Atlanta, GA, September.

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METHYLENE CHLORIDE (DICHLOROMETHANE) (75-09-2)

Methylene chloride is a **VOC** used predominantly as a paint remover and as a solvent and flammability depressant in aerosol products such as coatings, paint removers, hair sprays, room deodorants, herbicides and insecticides (ATSDR, 1993). Methylene chloride is also used in the foam blowing of polyurethanes, in metal degreasing, stripping and degreasing of electronic components, in resin production, photographic film splicing, adhesive production, and other solvent, cleaning and thinning applications. Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
84.9	1.25[a]	2.19E-3[b]	1.07[b]	1.01E-1[b]	1.17E-5[b]	4.87E-1[c]	1.30E+4[b]

[a]U.S. Environmental Protection Agency (EPA), 1992, ***Dermal Exposure Assessment: Principles and Applications***, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, January.
[b]U.S. Environmental Protection Agency (EPA), 1996, ***Soil Screening Guidance: Users Guide***, Office of Solid Waste and Emergency Response, Washington, DC, Publication 9355.4-23, April.
[c]U.S. Environmental Protection Agency (EPA), 1994, ***Technical Background Document for Soil Screening Guidance***, Review Draft, Office of Solid Waste and Emergency Response, Washington, DC, Publication No. 9355.4-17, EPA540/R-94/106, PB95-963532, November.

Methylene chloride is highly volatile; therefore, most environmental releases are to the atmosphere (ATSDR, 1993). Large amounts (several hundred million pounds) are released each year during its industrial and consumer use. Methylene chloride exists solely as a vapor in air and may travel long distances before removal. It is subject to reaction with photochemically generated hydroxyl radicals with a half-life of a few months. It is also subject to direct photolysis (HSDB, 2000).

Methylene chloride released to soil will be highly mobile and will infiltrate or leach to greater depths or to groundwater (ATSDR, 1993; HSDB, 2000). Some will also volatilize. Methylene chloride released to water will be rapidly lost primarily by volatilization. It is not expected to partition to sediment. It is subject to hydrolysis and biodegradation, but these processes are less significant than volatilization. Methylene chloride is not expected to participate significantly in food-chain pathways; therefore, biotransfer factors are not provided.

Animal studies indicate that methylene chloride is readily absorbed from the GI tract (ATSDR, 1993). The GAF of 1.0 suggested by Jones and Owen (1989) is consistent with the ATSDR (1993) summary and is used in this evaluation.

Data were not located for dermal uptake of methylene chloride from soil. The OEPA (1998) default ABS of 0.1 for organic chemicals is adopted for this evaluation. EPA (1992) provides a PC of 4.5E-3 cm/hour and a τ of 2.9E-1 hours for methylene chloride.

Oral LD_{50} values in rats and mice approximate 2 g/kg, suggesting that the acute toxicity of methylene chloride is moderate (ATSDR, 1993). Prolonged oral exposure induces liver lesions in laboratory animals. EPA (2000) verified an RfD for chronic oral exposure of 6E-2 mg/kg-day by applying an uncertainty factor of 100 to a NOAEL of about 6 mg/kg-day in a two-year drinking water study in rats. The LOAEL, about 55 mg/kg-day, was associated with histopathologic lesions in the liver. Confidence in the RfD is medium. The liver is the target organ for oral exposure to methylene chloride. In addition, metabolism of the dihalogenated methanes is known to yield carbon monoxide, which combines with hemoglobin to form carboxyhemoglobin in the erythrocytes. Carboxyhemoglobin is incapable of transporting oxygen to the tissues. This mechanism of toxicity should also be considered when combining hazard indices for simultaneous exposure to multiple chemicals.

Occupational exposure to high concentrations of methylene chloride is associated with a wide variety of neurological dysfunction and elevated blood levels of carbon monoxide (a metabolite of methylene chloride) and carboxyhemoglobin (ACGIH, 1991). Chronic inhalation exposure of laboratory animals induces liver effects. EPA (1997) derived a provisional inhalation RfC of 3E+0 mg/m^3 based on a NOAEL of 695 mg/m^3 in a two-year intermittent exposure study in rats. An uncertainty factor of 100 was used. Higher levels were associated with unspecified effects on the liver. The RfC is equivalent to an inhalation RfD of 8.6E-1 mg/kg-day. The liver is considered the target organ for prolonged inhalation exposure. In addition, metabolism of the dihalogenated methanes is known to yield carbon monoxide, which combines with hemoglobin to form carboxyhemoglobin in the erythrocytes. Carboxyhemoglobin is incapable of transporting oxygen to the tissues. This mechanism of toxicity should also be considered when combining hazard indices for simultaneous exposure to multiple chemicals.

Methylene chloride is classified in EPA cancer weight-of-evidence Group B2 (probable human carcinogen), based on inadequate human data and sufficient evidence of carcinogenicity in animals (EPA, 2000). Animal inhalation studies showed increased incidence of hepatocellular neoplasms and alveolar/bronchiolar neoplasms in male and female mice, mammary tumors in rats of either sex, salivary gland sarcomas in male rats and leukemia in female rats. Oral studies were inconclusive. An oral SF of 7.5E-3 per mg/kg-day was based on the incidence of liver tumors in two inhalation studies in mice. An inhalation URF of 4.7E-7 per ug/m^3 was based on the incidence of liver and lung tumors in one inhalation study. The inhalation URF is equivalent to 1.6E-3 per mg/kg-day.

References for Methylene Chloride

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Jones, TD. and BA Owen, 1989, ***Health Risks from Mixtures of Radionuclides and Chemicals in Drinking Water***, Oak Ridge National Laboratory, Oak Ridge, TN, ORNL-6533.

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NITROANILINES

There are three nitroaniline isomers: 2-nitroaniline (o-nitroaniline), 3-nitroaniline (m-nitroaniline) and 4-nitroaniline (p-nitroaniline). The nitroanilines are **SVOCs** used as chemical intermediates for the synthesis of a wide range of red, yellow and orange pigments and dyes (HSDB, 2000). 2-nitroaniline is also used in the synthesis of photographic antifogging agents, and 2- and 4-nitroaniline are used in the synthesis of phenylenediamine coccidiostats for treatment of poultry. 3-nitroaniline is used also in the production of 3-amnoacetanilide. 4-nitroaniline is also used to improve the fastness of dyes, and as an intermediate in the synthesis of antioxidants and gasoline gum inhibitors. Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
2-Nitroaniline (88-74-4)							
138.13	1.85[a]	1.81E-8[a]	1.79[a]	ND	7.8E-6[b]	1.16E-6[a]	1.47E+3[a]
3-Nitroaniline (99-09-2)							
138.13	1.37[a]	7.2E-9[a]	1.94[a]	ND	7.8E-6[b]	4.76E-8[a]	9.10E+2[a]
4-Nitroaniline (100-01-6)							
138.13	1.39[a]	1.81E-8[a]	1.93[a]	ND	7.8E-6[b]	4.21E-9[a]	2.80E+2[a]

ND = no data.
[a]Hazardous Substance Data Bank (HSDB), 1999, National Library of Medicine, on line.
[b]Montgomery, J.H., 1996, ***Groundwater Chemicals Desk Reference, Second Edition***, Lewis Publishers, New York, pp. 757-764.

2-Nitroaniline may be released to the environment in waste effluents generated at sites of its commercial production or use as a chemical intermediate (HSDB, 2000). It may also occur as a microbial decomposition product of dinitrobenzene. 3-Nitroaniline may be released to the

environment from process and waste emissions involved in its production or use as a chemical intermediate. 4-Nitroaniline may be released to the environment from process and waste emissions involved in its production or use as a chemical intermediate and through stack emissions from hazardous waste incineration.

The nitroanilines released to the atmosphere are expected to exist in the vapor phase and degrade rapidly (estimated half-life of 14 hours to 1.2 days) by reaction with photochemically produced hydroxyl radicals (HSDB, 2000). Nitroanilines released to soil may undergo covalent bonding to humic materials, which may convert these compounds to a latent form that remains relatively immobile in soil. If this covalent bonding does not occur, the nitroanilines are expected to leach readily through soils. Photodegradation may occur on soil surfaces exposed to sunlight. Volatilization of the nitroanilines is not expected to be important in either moist or dry soils.

Nitroanilines will covalently bind with humic materials in the water column and sediments (HSDB, 2000). Photodegradation in the aquatic environment may be possible, but hydrolysis, volatilization, and biodegradation are not expected to be important removal processes.

Empirical data suggest that the nitroanilines have little potential for bioconcentration or bioaccumulation (HSDB, 2000). Therefore, biotransfer factors are not estimated for this class of compounds.

The fate of radiolabelled 4-nitroaniline was studied in male and female Sprague-Dawley rats treated by gavage with 6.10-7.76 mg/kg (HSDB, 2000). Urine, feces, and expired air were collected at intervals of 0-8, 8-16, 16-24, 24-48, and 48-72 hours following dosing. Animals were sacrificed at 72 hours following dosing. The majority of the radioactivity was found in the urine (98.24 to 97.96 percent of the dose) and most of this was excreted in the 0-8 hour period. The amount of radioactivity found in the feces ranged from 3.78 to 5.83 percent of the dose. The total amount of radioactivity found in the expired air ranged from 0.01 to 0.07 percent of the dose. These data suggest that the nitroanilines are nearly completely absorbed from the GI tract; a GAF of 0.95 is adopted for the nitroanilines.

3-Nitroaniline is readily absorbed through intact skin (HSDB, 2000); however, data regarding dermal uptake from soil were not located. The OEPA (1998) default ABS of 0.1 for organic chemicals is selected for this evaluation. PC and τ values are developed from the data compiled above by the EPA (1992) method as follows:

Chemical	PC (cm/hour)	τ (hours)
2-Nitroaniline	5.64E-3	6.09E-1
3-Nitroaniline	2.57E-3	6.09E-1
4-Nitroaniline	2.66E-3	6.09E-1

Oral LD_{50} values for 2-nitroaniline include 1600 to 3650 mg/kg in rats, 2350 mg/kg in guinea pigs and 1070 mg/kg in mice (HSDB, 2000; Montgomery, 1996), suggesting that the acute toxicity is low. Prolonged oral exposure to 2-nitroaniline is associated with methemoglobinemia. EPA (no date #1) provides a provisional oral RfD for 2-nitroaniline of 3E-4 mg/kg-day by applying an additional uncertainty factor of 10 to a provisional oral RfD for 4-nitroaniline of 3E-3 mg/kg-day (EPA, no date #2). Confidence in the key study and data base for 4-nitroaniline are considered high. EPA (no date #1) declined to describe confidence in the provisional oral RfD for 2-nitroaniline, but notes that it is probably unnecessarily conservative because the evidence suggests that 4-nitroaniline is more potent than 2-nitroaniline. The provisional oral RfD for 4-nitroaniline is described below. The target organ for prolonged oral exposure to 2-nitroaniline is the erythrocyte; oxidation of hemoglobin to methemoglobin is the mechanism of toxicity.

Oral LD_{50} values for 3-nitroaniline include 535 to 900 mg/kg in rats, 540 mg/kg in guinea pigs and 308 mg/kg in mice (HSDB, 2000; Montgomery, 1996), suggesting that the acute toxicity of 3-nitroaniline is somewhat greater than 2-nitroaniline. 3-Nitroaniline induces methemoglobinemia in rats (HSDB, 2000). EPA (no date #2) provides a provisional oral RfD for 3-nitroaniline of 3E-4 mg/kg-day by applying an additional uncertainty factor of 10 to a provisional oral RfD for 4-nitroaniline of 3E-3 mg/kg-day. Confidence in the provisional oral RfD for 3-nitroaniline is low. The target organ for prolonged oral exposure to 3-nitroaniline is the erythrocyte; oxidation of hemoglobin to methemoglobin is the mechanism of toxicity.

Oral LD_{50} values for 4-nitroaniline include 750 mg/kg in rats, 450 mg/kg in guinea pigs and 810 mg/kg in mice (Montgomery, 1996), suggesting that the acute toxicity of 4-nitroaniline is somewhat greater than 2-nitroaniline. Prolonged oral exposure to 4-nitroaniline is associated with methemoglobinemia, with hemolytic anemia and increased hematopoiesis as common sequellae (EPA, no date # 2). Rats appear to be more sensitive than mice. A 2-year gavage study in rats identified 0.25 mg/kg-day as a NOAEL and 1.5 mg/kg-day as a LOAEL, with increased mortality at 9 mg/kg-day, the highest dose rate tested. The LOAEL was associated with increased blood methemoglobin concentration, decreased blood hemoglobin concentration, decreased erythrocyte count and increased reticulocyte count. Brown pigment deposits (probably hemosiderin associated with erythrocyte destruction) were observed in the liver and spleen. Application of an uncertainty factor of 100 to the NOAEL yields a provisional oral RfD for 4-nitroaniline of 3E-3 mg/kg-day. Confidence in the oral RfD is high. The target organ for prolonged oral exposure to 4-nitroaniline is the erythrocyte; oxidation of hemoglobin to methemoglobin is the mechanism of toxicity.

Occupational exposure to the nitroanilines is associated with methemoglobinemia and possibly liver damage (HSDB, 2000). A provisional inhalation RfC of 2E-4 mg/m^3 for 2-nitroaniline is based on a LOAEL of 9.8 mg/m^3 in a 4-week intermittent inhalation study in male rats (EPA, 1997). The LOAEL was associated with methemoglobinemia and increased hematocrit. An uncertainty factor of 10,000 was applied. The inhalation RfC is equivalent to an inhalation RfD of 5.7E-5 mg/kg-day. The target organ for prolonged inhalation exposure to 2-nitroaniline is the erythrocyte; oxidation of hemoglobin to methemoglobin is the mechanism of toxicity.

The EPA has not evaluated the carcinogenicity of the nitroanilines.

References for Nitroanilines

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U.S. Environmental Protection Agency (EPA), 1992, ***Dermal Exposure Assessment: Principles and Applications***, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, January.

U.S. Environmental Protection Agency (EPA), 1997, ***Health Effects Assessment Summary Tables, FY 1997 Update***, Office of Solid Waste and Emergency Response, Washington, DC, 9200.6-303(97-1), EPA 540/R-97-036, PB97-921199.

POLYAROMATIC HYDROCARBONS (PAHs)

The PAHs regularly observed in environmental media include acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, carbazole, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene and pyrene. All are **SVOCs** except acenaphthene, acenaphthylene and naphthalene, which are **VOCs**. PAHs are the products of incomplete combustion of fossil fuels or other organic matter, hence include both natural and anthropogenic sources (ATSDR, 1993a). Naphthalene is used in the synthesis of phthalic anhydride, the insecticide carbaryl, leather tanning agents and surface active agents, and is a component of diesel and other fuel oils (ATSDR, 1993b). The PAHs are ubiquitous, arising from natural combustion, the widespread practice of fossil fuel combustion, and wide dissemination via wind currents. Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
Acenaphthene (83-32-9)							
154.21	3.98[a]	1.46E-4[b]	3.66[a]	6.61E-2[c]	6.4E-6[b]	2.9E-11[a]	I[a]

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
Acenaphthylene (208-96-8)							
154.2	4.07[a]	1.45E-3[a]	1.40[a]	6.61E-2[c]	6.6E-6[b]	3.82E-5[a]	3.93+0[a]
Anthracene (120-12-7)							
178.2	4.45[a]	8.6E-5[a]	4.15[a]	3.24E-2[d]	7.74E-6[d]	2.2E-8[a]	I[a]
Benzo(a)anthracene (56-55-3)							
228.29	5.66[e]	1E-6[a]	5.30[a]	5.10E-2[d]	9.00E-6[d]	2.9E-11[a]	I[a]
Benzo(a)pyrene (50-32-8)							
252.3	6.16[e]	4.9E-7[a]	6.74[a]	4.30E-2[d]	9.00E-6[d]	7.4E-12[a]	3.8E-3[a]
Benzo(b)fluoranthene (205-99-2)							
252.3	6.12[e]	1.22E-5[a]	5.74[a]	2.26E-2[d]	5.56E-6[d]	1.3E-9[a]	I[a]
Benzo(k)fluoranthene. (207-08-9)							
252.3	6.06[a]	3.87E-5[a]	5.74[a]	2.26E-2[d]	5.56E-6[d]	6.6E-10[a]	I[a]
Benzo(g,h,i)perylene (191-24-2)							
276.34	6.50[a]	1.44E-7[a]	6.20[a]	4.48E-2[c]	4.9E-6[b]	1.4E-13[a]	2.6E-3[a]
Carbazole (86-74-8)							
167.20	3.57[f]	1.53E-8[d]	3.53[d]	3.90E-2[d]	7.03E-6[d]	3.50E-7[f]	7.48E+0[d]
Chrysene (218-01-9)							
228.3	5.66[e]	1.05E-6[a]	5.30[a]	2.48E-2[d]	6.21E-6[d]	8.3E-12[a]	I[a]
Dibenzo(a,h)anthracene (53-70-3)							
278.35	6.84[e]	7.3E-8[a]	6.52[a]	2.02E-2[d]	5.18E-6[d]	8.2E-12[a]	5E-7[a]
Fluoranthene (206-44-0)							
202.26	4.95[e]	6.5E-6[a]	4.58[a]	3.02E-2[d]	6.35E-6[d]	6.6E-9[a]	2.06E-1[d]
Fluorene (86-73-7)							
166.2	4.18[a]	6.4E-5[a]	3.86[a]	3.63E-2[d]	7.88E-6[d]	9.3E-7[a]	1.83E+0[a]
Indeno(1,2,3-cd)pyrene (193-39-5)							
276.3	6.58[e]	6.95E-8[a]	6.20[a]	1.90E-2[d]	5.66E-6[d]	1.3E-12[a]	6.23E-2[a]
Naphthalene (91-20-3)							
128.19	3.30[e]	4.6E-4[f]	2.97[g]	5.90E-2[d]	7.50E-6[d]	1.14E-4[g]	3.17E+1[g]
Phenanthrene (85-01-8)							
178.2	4.57[e]	2.26E-4[a]	4.15[a]	6.00E-2[c]	5.9E-6[b]	1.3E-6[a]	I[a]

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
Pyrene (129-00-0)							
202.3	4.88[a]	5.1E-6[a]	4.58[a]	2.72E-2[d]	7.24E-6[d]	3.3E-9[a]	I[a]

I = virtually insoluble in water.
[a]Agency for Toxic Substances and Disease Registry (ATSDR), 1993a, ***Update Toxicological Profile for Polycyclic Aromatic Hydrocarbons (PAHs)***, Draft for Public Comment, U.S. Department of Health and Human Services, Atlanta, Georgia, October.
[b]Montgomery, J.H., 1996, ***Groundwater Chemicals Desk Reference, Second Edition***, Lewis Publishers, New York.
[c]Calculated as described in Introduction to the Toxicity Profiles.
[d]U.S. Environmental Protection Agency (EPA), 1996, ***Soil Screening Guidance: Users Guide***, Office of Solid Waste and Emergency Response, Washington, DC, Publication 9355.4-23, April.
[e]U.S. Environmental Protection Agency (EPA), 1992, ***Dermal Exposure Assessment: Principles and Applications***, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, January.
[f]U.S. Environmental Protection Agency (EPA), 1994, ***Technical Background Document for Soil Screening Guidance***, Review Draft, Office of Solid Waste and Emergency Response, Washington, DC, Publication No. 9355.4-17, EPA540/R-94/106, PB95-963532, November.
[g] Agency for Toxic Substances and Disease Registry, (ATSDR), 1993b, ***Update Toxicological Profile for Naphthalene***, Draft for Public Comment, U.S. Public Health Service, Atlanta, Georgia, October.

The PAHs are products of incomplete combustion; natural sources include volcanoes and forest fires (ATSDR, 1993a,b; HSDB, 2000). There is some evidence for biosynthesis by plants, bacteria and algae. Some of the PAHs occur naturally in fossil fuels. Anthropogenic releases to the environment, primarily to the atmosphere, greatly outweigh the natural sources and include any processes that involve incomplete combustion of fossil fuels and organic matter, including wood-burning for home heat (the predominant source), cigarette smoke, gasoline engine exhaust, diesel engine exhaust, and fuel oil emissions. Other sources include various crude oils, fresh and used motor oils, gasolines, charcoal-broiled foods, processed foods, various oils, margarine, butter and fats, fruits, vegetables, and cereals, roasted coffee and tea. Naphthalene is released during its manufacture and processes that involve its use (e.g., vaporization from moth balls). PAHs exist in the atmosphere as both gases and particulates, the proportion depending on the vapor pressure of the individual chemical. They may travel short or long distances before removal from the air. Wet and dry deposition accounts for removal of the particulates. Vapor forms are subject to chemical oxidation processes in the air.

The predominant sources of PAHs to surface water are deposition from the atmosphere, industrial and sewage effluent and oil spills (ATSDR, 1993a,b). Runoff and erosion can also contribute PAHs to surface water bodies. Depending on solubility and vapor pressure, volatilization is a significant fate process for some of the PAHs in surface water. Adsorption to sediment is another significant removal process. Low molecular weight PAHs (acenaphthene,

acenaphthylene, anthracene, fluorene, naphthalene, phenanthrene) are subject to chemical degradation and biodegradation. Naphthalene is relatively water soluble and may remain largely in solution. PAHs in sediment may biodegrade or accumulate in living organisms.

Deposition is the principal source of PAHs in soil (ATSDR, 1993a,b). Other sources include industrial activities, disposal of sewage sludge, and leaching from coal storage sites. Most PAHs sorb to soil constituents because of their low solubility and high affinity for organic matter. Volatilization is an important removal process for the low molecular weight compounds. Some of the low molecular weight compounds, particularly naphthalene, may leach fairly rapidly to groundwater.

The propensity for the PAHs to participate in food-chain pathways is chemical specific, depending largely on the tendency for biodegradation or biotransformation (ATSDR, 1993a,b; HSDB, 2000). Biotransfer factors for the PAHs are compiled below:

BCF (L/kg)	Bpr[a,b] (unitless)	Bpv[a,b] (unitless)	Bb[a] (days/kg)	Bm[a] (days/kg)
Acenaphthene				
400[c]	1.94E-1	1.94E-1	2.40E-4	7.59E-5
Acenaphthylene				
272[d]	1.72E-1	1.72E-1	2.95E-4	9.33E-5
Anthracene				
675[c]	1.04E-1	1.04E-1	7.08E-4	2.24E-4
Benzo(a)anthracene				
350[e]	2.07E-2	2.07E-2	1.15E-2	3.63E-3
Benzo(a)pyrene				
480[e]	1.07E-2	1.07E-2	3.63E-2	1.15E-2
Benzo(b)fluoranthene				
2800[f]	1.12E-2	1.12E-2	3.31E-2	1.05E-2
Benzo(k)fluoranthene				
17,100[a]	1.22E-2	1.22E-2	2.88E-2	9.12E-3
Benzo(g,h,i)perylene				
14,000[a]	6.78E-3	6.78E-3	7.94E-2	2.51E-2
Carbazole				

BCF (L/kg)	Bpr[a,b] (unitless)	Bpv[a,b] (unitless)	Bb[a] (days/kg)	Bm[a] (days/kg)
500[g]	3.35E-1	3.35E-1	9.33E-5	2.95E-5
Chrysene				
700[f]	2.07E-2	2.07E-2	1.15E-2	3.63E-3
Dibenzo(a,h)anthracene				
10[e]	4.31E-3	4.31E-3	1.74E-1	5.50E-2
Fluoranthene				
4000[h]	5.33E-2	5.33E-2	2.24E-3	7.08E-4
Fluorene				
1500[h]	1.49E-1	1.49E-1	3.80E-4	1.20E-4
Indeno(1,2,3-cd)pyrene				
12,800[a]	6.09E-3	6.09E-3	9.55E-2	3.02E-2
Naphthalene				
ND[i]	4.79E-1	4.79E-1	5.01E-5	1.58E-5
Phenanthrene				
2250[a]	8.84E-2	8.84E-2	9.33E-4	2.95E-4
Pyrene				
785[h]	5.85E-2	5.85E-2	1.91E-3	6.03E-4

BCF (L/kg)	Bpr[a,b] (unitless)	Bpv[a,b] (unitless)	Bb[a] (days/kg)	Bm[a] (days/kg)

ND = no data.
[a]Calculated as described in Introduction to the Toxicity Profiles.
[b]The methodology for estimating biotransfer of organic chemicals to plants does not differentiate vegetative and reproductive portions.
[c]Empirical data in Bluegill Sunfish (Lepomis macrochirus) from Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.
[d]Estimated value from Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.
[e]Empirical data in golden ide fish (Leuciscus idus melanotus) from Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.
[f]Empirical data in clams from Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.
[g]Empirical data in guppies (Poecilia reticulata), from Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.
[h]Empirical data in fathead minnows, from Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.
[i]It is assumed that VOCs are labile and do not bioconcentrate significantly.

The BCFs for acenaphthylene, indeno(1,2,3-cd)pyrene, naphthalene and phenanthrene may be overestimated because the PAHs are generally readily metabolized by vertebrates, reducing the potential for bioconcentration (ATSDR, 1993a; HSDB, 2000). The BCF for benzo(b)fluoranthene is probably overestimated for fin fish because fin fish biotransform and eliminate PAHs much more readily than invertebrates.

Jones and Owen (1989) report that the GI absorption of naphthalene is 100 percent. The GAF of 1.0 from the Jones and Owen (1989) compilation is adopted for naphthalene. Toxicokinetic studies of several PAHs summarized by ATSDR (1993a) provide limited quantitative information regarding the extent of GI absorption. Qualitatively, these studies indicate that absorption is incomplete. A study of benzo(a)pyrene in rats suggested that GI absorption ranges from 38 to 58 percent. The GAF of 0.5 (Jones and Owen, 1989), near the midpoint of the range from the rat study, is selected for benzo(a)pyrene and the other PAHs for which quantitative data are not available. A study in rats reported absorption efficiency for anthracene ranging from 53 to 74 percent; 0.7 is selected as the GAF for this evaluation. GI absorption of pyrene, chrysene and dibenzo(a,h)anthracene is described as high; a GAF of 0.8 is assumed for these compounds.

Anecdotal evidence from using cloth diapers stored in contact with naphthalene indicates that naphthalene is absorbed by the skin, but quantitative data are not available (ATSDR, 1993b). Empirical data with pure compound dissolved or suspended in vehicles suggest that dermal uptake of benzo(a)pyrene is extensive (ATSDR, 1993a), but data regarding absorption from soil were not located. Lacking suitable empirical data for dermal uptake from soil, the OEPA (1998) default ABS of 0.1 for organic chemicals is chosen for the PAHs. PC and τ values are estimated as follows:

Chemical	PC (cm/hour)	τ (hours)
Acenaphthene	1.46E-1[a]	7.63E-1[a]
Acenaphthylene	1.69E-1[a]	7.63E-1[a]
Anthracene	2.25E-1[a]	1.07E+0[a]
Benzo(a)anthracene	8.1E-1[b]	2.23E+0[b]
Benzo(a)pyrene	1.2E+0[b]	2.9E+0[b]
Benzo(b)fluoranthene	1.2E+0[b]	3.03E+0[b]
Benzo(k)fluoranthene	1.11E+0[a]	3.03E+0[a]
Benzo(g,h,i)perylene	1.62E+0[a]	4.24E+0[a]
Carbazole	6.23E-2[a]	9.16E-1[a]
Chrysene	8.1E-1[b]	2.2E+0[b]
Dibenzo(a,h)anthracene	2.7E+0[b]	4.4E+0[b]
Fluoranthene	3.6E-1[b]	1.5E+0[b]
Fluorene	1.71E-1[a]	9.03E-1[a]
Indeno(1,2,3-cd)pyrene	1.9E+0[b]	4.2E+0[b]
Naphthalene	6.9E-2[b]	5.3E-1[b]
Phenanthrene	2.3E-1[b]	1.1E+0[b]
Pyrene	3.24E-1[a]	1.50E+0[a]

[a]Estimated by the method of U.S. Environmental Protection Agency (EPA), 1992, ***Dermal Exposure Assessment: Principles and Applications***, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, January.
[b]Taken from U.S. Environmental Protection Agency (EPA), 1992, ***Dermal Exposure Assessment: Principles and Applications***, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, January.

Data regarding the toxicity of acute oral exposure to the PAHs are generally scarce. Prolonged oral exposure to the PAHs is associated with a number of renal, hematologic and other effects, depending on the compound. However, data regarding prolonged exposure are not available for some PAHs, requiring the use of surrogates for development of toxicity values. Many of the PAHs for which toxicity data are not available are classified in EPA cancer weight-of-evidence Group D – not classifiable as to carcinogenicity to humans (EPA, 2000). It is inappropriate to develop cancer potency estimates for these PAHs because EPA (1986) determined that potency

estimates are developed only for chemicals in Groups A, B and C. Therefore, surrogates are used only to develop toxicity values for the noncancer effects.

Generally surrogates are chosen on the basis of the following hierarchy:

- Toxicological similarity (effects and dose-response relationship).
- Toxicokinetic similarity, assuming that likeness in absorption, distribution and especially products of biotransformation suggests toxicological similarity.
- Structural similarity, assuming that likeness in structure suggests similarity in toxicokinetics.

Selection of defensible surrogates for the PAHs is compromised because toxicological and toxicokinetic data are virtually non-existent, and the structural similarities are not very convincing, which imparts a great deal of uncertainty to the effort. Therefore, the most defensible approach for some of the PAHs is to select the most conservative surrogate; i.e., the PAH with the smallest verified oral RfD, which happens to be pyrene.

Subchronic (90 day) gavage treatment of mice with acenaphthene is associated with histopathologic evidence of liver hypertrophy. A verified RfD of 6E-2 mg/kg-day for chronic oral exposure was derived from the NOAEL of 175 mg/kg-day and an uncertainty factor of 3000 (EPA, 2000). The LOAEL in this study was 350 mg/kg-day. Confidence in the RfD is low. The liver is considered the target organ for prolonged oral exposure to acenaphthene.

A verified RfD of 3E-1 mg/kg-day for chronic oral exposure to anthracene was derived from a NOEL of 1000 mg/kg-day, the highest dose tested, in a 90-day gavage study in mice (EPA, 2000). An uncertainty factor of 3000 was applied. Confidence in the RfD is low. The data are inadequate to identify a target organ for prolonged oral exposure to anthracene.

Subchronic exposure to fluoranthene induces liver and kidney effects and hematologic alterations in orally treated mice (EPA, 2000). A verified RfD of 4E-2 mg/kg-day for chronic oral exposure was derived from a NOAEL of 125 mg/kg-day in a 13-week gavage study. The LOAEL was 250 mg/kg-day in this study. An uncertainty factor of 3000 was applied. Confidence in the oral RfD is low. The kidney, liver and blood cells are chosen as the target organs for prolonged oral exposure to fluoranthene.

Subchronic exposure to fluorene induces hemolytic anemia in orally treated mice (EPA, 2000). A verified RfD of 4E-2 mg/kg-day for chronic oral exposure was derived from a NOAEL of 125 mg/kg-day in a 13-week gavage study. The LOAEL was 250 mg/kg-day in this study. An uncertainty factor of 3000 was applied. Confidence in the oral RfD is low. The erythrocyte is the target organ for prolonged oral exposure to fluorene.

Single-dose LD_{50} values for naphthalene include 533 to 710 mg/kg for mice and 2200 to 2400 mg/kg for rats, establishing the mouse as more sensitive to the lethal effects of acute oral exposure (ATSDR, 1993b). Decreased terminal body weights, accompanied by a remarkable

absence of hematological and histopathological effects, were observed in rats treated by gavage for 13 weeks (EPA, 2000). The LOAEL in this study was 142 mg/kg-day associated with greater than 10 percent reduction in terminal body weights. The NOAEL was 71 mg/kg-day. The high dose rate, 286 mg/kg-day was a FEL associated with increased mortality. Application of an uncertainty factor of 3000 to the NOAEL of 71 mg/kg-day yields the verified oral RfD of 2E-2 mg/kg-day. Confidence in the RfD is low.

Adults, children and neonates exposed to moth balls have exhibited hemolytic anemia, evidence of liver disease and neurological deficits (EPA, 1993a, 1998). The liver effects and neurological deficits may be secondary to hemolytic anemia and reduced oxygen-carrying capacity of the blood. Hemolytic anemia and cataract formation have been seen also in orally exposed humans (EPA, 1998). The data suggest that the erythrocyte may be the most sensitive tissue in humans. Among commonly used species of laboratory mammals, hemolytic anemia is seen only in dogs (EPA, 1998). Cataracts are seen in several laboratory mammals, but only at relatively high doses. The key study identifies reduced body weight as the critical effect in rats. Rats, however, do not exhibit hemolytic anemia, and exhibit cataracts only at very high doses, suggesting that rats may not be a totally acceptable model for the toxicity of naphthalene to humans. Therefore, based on the effects observed in humans, the erythrocyte is selected as the target organ for prolonged oral exposure to naphthalene. Reduced body weight is also included as a "target organ" because this was the only endpoint observed in rats in the critical study with naphthalene.

EPA (1993a, 2000) reported a 2-year study in which mice were exposed to naphthalene vapors for 6 hours/day on 5 days/week. Inflammation of the nasal and olfactory epithelium was the most consistently observed sign; granulomatous lesions were also observed in the lungs. There was equivocal evidence of hematologic involvement. The lowest exposure concentration, 10 ppm, was a LOAEL for the nasal effects, which are considered the critical effects of inhalation exposure. The LOAEL is equivalent to a human equivalent concentration of 9.3 mg/m^3 (EPA, 2000). Application of an uncertainty factor of 3000 yields a verified RfC of 3E-3 mg/m^3, which is equivalent to an inhalation RfD of 8.6E-4 mg/kg-day. The nasal and olfactory epithelia are the target organ for inhalation exposure to naphthalene. Confidence in the RfC is medium.

Subchronic exposure to pyrene induces mild renal tubular degeneration and reduced kidney weight in orally treated mice (EPA, 2000). A verified RfD of 3E-2 mg/kg-day for chronic oral exposure was derived from a NOAEL of 75 mg/kg-day in a 13-week gavage study. The LOAEL was 125 mg/kg-day in this study. An uncertainty factor of 3000 was applied. Confidence in the oral RfD is low. The kidney tubule is chosen as the target organ for chronic oral exposure to pyrene.

Data regarding the effects of chronic or subchronic exposure to acenaphthylene were not located in the available literature. Acenaphthene is adopted as a reasonable surrogate for acenaphthylene based on structural similarity, since the surrogate differs from the principal chemical only in the presence of two hydrogen atoms and the absence of a double bond. Therefore, the oral RfD of 6E-2 mg/kg-day for acenaphthene is adopted as the oral RfD for chronic exposure to acenaphthylene. The liver, which is the target organ for acenaphthene, is adopted for oral exposure to acenaphthylene.

Data regarding the effects of chronic or subchronic exposure to benzo(g,h,i)perylene were not located in the available literature. Pyrene is adopted as a reasonable surrogate for benzo(g,h,i)perylene based somewhat on structural similarity, but more on the selection of a conservative approach as justified above. Therefore, the oral RfD of 3E-2 mg/kg-day for pyrene is adopted as the oral RfD for chronic exposure to benzo(g,h,i)perylene. The kidney tubule, which is the target organ for pyrene, is adopted for oral exposure to benzo(g,h,i)perylene.

Relevant data regarding chronic or subchronic exposure to phenanthrene were not located. Potential surrogates based on similarity in chemical structure include anthracene and pyrene. Pyrene is selected as the surrogate only because it is the more conservative choice. Therefore, the oral RfD of 3E-2 mg/kg-day for pyrene is adopted as the oral RfD for chronic exposure to phenanthrene. The kidney tubule, which is the target organ for pyrene, is adopted for oral exposure to phenanthrene.

Acenaphthylene, anthracene, benzo(g,h,i)perylene, fluoranthene, fluorene, phenanthrene and pyrene are classified in EPA cancer weight-of-evidence Group D (not classifiable as to carcinogenicity to humans) because of a lack of human data and inadequate animal data (EPA, 2000). Data regarding the carcinogenicity of acenaphthene were not located. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, carbazole, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene are classified in EPA weight-of-evidence Group B2 (probable human carcinogens) (EPA, 1997, 2000). Benzo(a)pyrene is the most extensively studied member of the class, inducing tumors in tissues at the point of contact of virtually all laboratory species tested by all routes of exposure. Although epidemiology studies suggested that complex mixtures that contain PAHs (coal tar, soots, coke oven emissions, cigarette smoke) are carcinogenic to humans, the carcinogenicity cannot be attributed to PAHs alone because of the presence of other potentially carcinogenic substances in these mixtures (ATSDR, 1993a). In addition, recent investigations showed that the PAH fraction of roofing tar, cigarette smoke and coke oven emissions accounted for only 0.1-8% of the total mutagenic activity in *Salmonella* of the unfractionated complex mixture (Lewtas, 1988). Aromatic amines, nitrogen heterocyclic compounds, highly oxygenated quinones, diones, and nitrooxygenated compounds, none of which would be expected to arise from in vivo metabolism of PAHs, probably accounts for the majority of the mutagenicity of coke oven emissions and cigarette smoke. Furthermore, coal tar, which contains a mixture of many PAHs, has a long history of use in the clinical treatment of a variety of skin disorders in humans (ATSDR, 1993a).

Because of the lack of human cancer data, assignment of individual PAHs to EPA cancer weight-of-evidence groups is based largely on the results of animal studies with large doses of purified compound (EPA, 2000). Frequently, unnatural routes of exposure, including implants of the test chemical in beeswax and trioctanoin in the lungs of female rats, intratracheal instillation, and subcutaneous or intraperitoneal injection, were used.

EPA (2000) verified a SF for oral exposure to benzo(a)pyrene of 7.3E+0 per mg/kg-day, based on several dietary studies in mice and rats. Recent reevaluations of the carcinogenicity and mutagenicity of the Group B2 PAHs suggest that there are large differences between individual PAHs in cancer potency (Krewski et al., 1989). Based on the available cancer and mutagenicity data, and assuming that there is a constant relative potency between different carcinogens across

different bioassay systems and that the PAHs under consideration have similar dose-response curves, EPA (1993b) adopted relative potency values for several PAHs. These values and the corresponding oral SFs, based on a relative potency for benzo(a)pyrene of 1.0, are presented below.

Relative Potencies and Slope Factors for PAHs				
PAH	Relative Potency	Oral Slope Factor (/mg/kg-day)	Inhalation	
			Unit Risk (/µg/m^3)	Slope Factor (/mg/kg-day)
Benzo[a]pyrene	1.0	7.3E+0	8.8E-4	3.1E+0
Benzo[a]anthracene	0.1	7.3E-1	8.8E-5	3.1E-1
Benzo[b]fluoranthene	0.1	7.3E-1	8.8E-5	3.1E-1
Benzo[k]fluoranthene	0.01	7.3E-2	8.8E-6	3.1E-2
Chrysene	0.001	7.3E-3	8.8E-7	3.1E-3
Dibenzo[a,h]anthracene	1.0	7.3E+0	8.8E-4	3.1E+0
Indeno[1,2,3-cd]pyrene	0.1	7.3E-1	8.8E-5	3.1E-1

Although the EPA has not verified SFs for Group B2 PAHs other than benzo(a)pyrene, the SFs above represent reasonable estimates based on the data available. The relative potency approach employed here meets criteria considered to be desirable for this type of analysis (Lewtas, 1988). For example, the chemicals compared have similar chemical structures and would be expected to have similar toxicokinetic fate in mammalian systems. In addition, the available data suggest that the Group B2 PAHs have a similar mechanism of action, inducing frameshift mutations in *Salmonella* and tumor initiation in the mouse skin painting assay. Similar noncancer effects (minor changes in the blood, liver, kidneys) of the Group D PAHs support the hypothesis of a common mechanism of toxicity. Finally, the same endpoints of toxicity, i.e., potency in various cancer assays, and related data, were used to derive the relative potency values (Krewski et al., 1989). The oral SF for benzo(a)pyrene of 7.3E+0 per mg/kg-day, and the SFs presented above for the other Group B2 PAHs are adopted for the purposes of this evaluation.

A recent EPA (1994) evaluation of the inhalation cancer data suggests adoption of an inhalation SF for benzo(a)pyrene of 3.1E+0 per mg/kg-day, based on the incidence of upper respiratory and digestive tract tumors in hamsters. Applying the relative potency estimates presented above yield the inhalation SFs for the other Group B2 PAHs presented above.

Carbazole was not investigated in the relative potency investigations described above. EPA (1997) presents a provisional oral SF of 2E-2 per mg/kg-day based on the incidence of liver tumors in a 96-week dietary study in mice. The location of primary tumors distal to the point of contact (the GI tract) suggests a mechanism of toxicity different from benzo(a)pyrene and the

other Group B2 PAHs discussed above. The data are inadequate for estimation of an inhalation URF or SF for carbazole.

References for PAHs

Agency for Toxic Substances and Disease Registry, (ATSDR), 1993a, ***Update Toxicological Profile for Polycyclic Aromatic Hydrocarbons (PAHs)***, Draft for Public Comment, U.S. Public Health Service, Atlanta, Georgia, October.

Agency for Toxic Substances and Disease Registry, (ATSDR), 1993b, ***Update Toxicological Profile for Naphthalene***, Draft for Public Comment, U.S. Public Health Service, Atlanta, Georgia, October.

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U.S. Environmental Protection Agency (EPA), 1986, "Guidelines for Carcinogen Risk Assessment," ***Federal Register*** 51(185): 33992-34003.

Krewski, D., T. Thorslund and J. Withey, 1989, "Carcinogenic Risk Assessment of Complex Mixtures," ***Toxicology and Industrial Health***, 5: 851-867.

Lewtas, J., 1988, "Genotoxicity of Complex Mixtures: Strategies for the Identification and Comparative Assessment of Airborne Mutagens and Carcinogens from Combustion Sources," ***Fundamental and Applied Toxicology***, 10: 571-589.

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U.S. Environmental Protection Agency (EPA), 1992, ***Dermal Exposure Assessment: Principles and Applications***, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, January.

U.S. Environmental Protection Agency (EPA), 1993a, ***Risk Assessment Issue Paper for: Derivation of a Subchronic RfC for Naphthalene (CASRN 91-20-3)***, National Center for Environmental Assessment, Cincinnati, Ohio, March 12.

U.S. Environmental Protection Agency (EPA), 1993b, ***Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons***, Office of Health and Environmental Assessment, Cincinnati, OH, EPA/600/R-93/089.

U.S. Environmental Protection Agency (EPA), 1994, ***Risk Assessment Issue Paper: Status of Inhalation Cancer Unit Risk for Benzo(a)Pyrene (CAS No. 50-32-8)***, National Center for Environmental Assessment, Cincinnati, OH, November 18.

U.S. Environmental Protection Agency (EPA), 1997, ***Health Effects Assessment Summary Tables, FY 1997 Update***, Office of Solid Waste and Emergency Response, Washington, DC, 9200.6-303(97-1), EPA 540/R-97-036, PB97-921199.

U.S. Environmental Protection Agency (EPA), 1998, ***Toxicological Review of Naphthalene (CAS No. 91-20-3) In Support of Summary Information on the Integrated Risk Information System (IRIS)***, August.

U.S. Environmental Protection Agency (EPA), 2000, ***Integrated Risk Information System (IRIS)***, National Center for Environmental Assessment, Cincinnati, OH, on line.

TOLUENE

Toluene is a **VOC** that is back-blended into gasoline to improve octane rating, used to produce benzene, used as a solvent in paints, coatings, adhesives, inks and cleaning agents, and used in the synthesis of a wide range of organic chemicals (ATSDR, 1994; HSDB, 2000). Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
92.1	2.73[a]	6.63E-3[b]	2.26[b]	8.70E-2[b]	8.60E-6[b]	3.71E-2[c]	3.10E+2[b]

[a]U.S. Environmental Protection Agency (EPA), 1992, ***Dermal Exposure Assessment: Principles and Applications***, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, January.
[b]U.S. Environmental Protection Agency (EPA), 1996, ***Soil Screening Guidance: Users Guide***, Office of Solid Waste and Emergency Response, Washington, DC, Publication 9355.4-23, April.
[c]U.S. Environmental Protection Agency (EPA), 1994, ***Technical Background Document for Soil Screening Guidance***, Review Draft, Office of Solid Waste and Emergency Response, Washington, DC, Publication No. 9355.4-17, EPA540/R-94/106, PB95-963532, November.

Large amounts of toluene are released into the atmosphere each year, principally from the production, transport and use of gasoline (ATSDR, 1994; HSDB, 2000). Other major sources include volatilization of toluene-based solvents and thinners, and motor vehicle exhaust. Considerable amounts are discharged into waterways or spilled on land during the storage, transport and disposal of fuels and oils.

Toluene in the atmosphere will exist predominantly in the vapor phase , where it is subject to reaction with photochemically produced hydroxyl radicals (ATSDR, 1994; ATSDR, 2000). It is also subject to reaction with various oxidizing agents in the atmosphere, but these reactions are

far less significant. Wet deposition is another important process for removal of toluene from the atmosphere. Toluene is expected to be moderately to highly mobile in soil and may leach to groundwater. Volatilization is another important removal process for toluene near the surface of the soil. Biodegradation may also be significant in soil. Toluene in water will be lost by both volatilization to the atmosphere and biodegradation. Whic process predominates will depend on water temperature, mixing conditions and the existence of acclimated microorganisms at the site. The compound is not expected to sorb significantly to sediment or suspended organic matter in water. Toluene theoretically may be expected to bioconcentrate because of its lipophilicity (ATSDR, 1994), but empirical data show that it is subject to rapid biotransformation, which greatly reduces this tendency. Overall, biotransfer is not expected to be significant and biotransfer factors are not provided.

ATSDR (1994) reviewed data regarding the mechanism of absorption and concluded that toluene was readily absorbed from the GI tract, but provided no quantitative estimates. Jones and Owen (1989), however, reported an absorption efficiency of 1.0. This value is consistent with rapid absorption of lipophilic solvents and is adopted as the GAF for this evaluation. ATSDR (1994) noted that binding to soil slowed GI absorption but did not decrease the overall extent of GI absorption.

In the absence of quantitative data, the default ABS of 0.1 for organic compounds recommended by OEPA (1998) is adopted for this evaluation. EPA (1992) provides a PC of 4.5E-2 cm/hour and a τ of 3.2E-1 hours, which are used herein.

Acute inhalation (glue sniffing, solvent abuse, industrial accidents) or ingestion exposure to high levels of toluene induces CNS dysfunction and narcosis (ATSDR, 1994). Acute oral LD_{50} values include 2.6 to 7.5 g/kg in rats (HSDB, 2000). Acute ingestion is associated with lesions in the heart, liver, lungs and kidneys (ATSDR, 1994). Prolonged oral exposure to lower levels is associated with pathological changes in the liver, kidney and brain. Changes in liver and kidney weights were observed in rats treated by gavage for 13 weeks at a dose rate of 446 mg/kg-day (EPA, 2000). The NOAEL in this study was 223 mg/kg-day. Application of an uncertainty factor of 1000 yields a verified RfD of 2E-1 mg/kg-day for oral exposure. Confidence in the RfD is medium. The liver and kidney and brain are considered the target organs for oral exposure to toluene.

Prolonged (occupational) inhalation exposure to toluene at concentrations near 100 ppm induces upper respiratory tract irritation and CNS dysfunction (EPA, 2000). The CNS effects appear to be the more sensitive endpoint, and serve as the basis for a verified inhalation RfC of 4E-1 mg/m^3. The RfC is based on an exposure-adjusted LOAEL of 119 mg/m^3 and an uncertainty factor of 300. The RfC is equivalent to an inhalation RfD of 1.1E-1 mg/kg-day. Confidence in the RfC is medium. The CNS and upper respiratory tract are the target organs for inhalation exposure to toluene.

EPA (2000) verified toluene as a cancer weight-of-evidence Group D compound (not classifiable as to carcinogenicity to humans) based on a lack of human data and inadequate animal testing data.

References for Toluene

Agency for Toxic Substances and Disease Registry, (ATSDR), 1994, ***Update Toxicological Profile for Toluene***, U.S. Public Health Service, Atlanta, Georgia, May.

Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.

Jones, TD. and BA Owen, 1989, ***Health Risks from Mixtures of Radionuclides and Chemicals in Drinking Water***, Oak Ridge National Laboratory, Oak Ridge, TN, ORNL-6533.

U.S. Environmental Protection Agency (EPA), 1992, ***Dermal Exposure Assessment: Principles and Applications***, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, January.

Ohio Environmental Protection Agency (OEPA), 1998, ***U.S. NASA Plum Brook, Erie County, Ohio LD#: 322-0552, Risk Assessment Work Plans***, letter from R.E. Nabors, Site Coordinator, to L.S. Ingram, Department of the Army, June 22.

U.S. Environmental Protection Agency (EPA), 2000, ***Integrated Risk Information System (IRIS)***, National Center for Environmental Assessment, Cincinnati, OH, on line.

TRINITROBENZENES (TNB)

There are three TNB isomers; however, 1,3,5-TNB is the isomer most often found in environmental media. It is used as an explosive, being less sensitive to impact, but more powerful and brisant than 2,4,6-trinitrotoluene (TNT) (Budavari, 1989). The TNBs are considered to be **SVOCs** because of their MWs and Henry's Law constants. Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
1,2,3-Trinitrobenzene							
213.11	ND	ND	ND	5.33E-2[a]	6.17E-6[a]	ND	ND
1,2,4-Trinitrobenzene							
213.11	ND	ND	ND	5.33E-2[a]	6.17E-6[a]	ND	ND
1,3,5-Trinitrobenzene (99-35-4)							
213.11	1.18[a]	3.08E-9[b]	2.15[b]	5.33E-2[a]	6.17E-6[a]	4.21E-9[b]	3.4E+2[b]

ND = no data.
[a]Calculated as described in Introduction to Toxicological Profiles.
[b]Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.

Data regarding the release and environmental behavior of the TNBs are limited to 1,3,5-TNB. It is likely that all the TNBs behave similarly in the environment. 1,3,5-TNB may be released to the environment primarily in wastewater from the manufacture of TNT or from the disposal of some TNT wastes (HSDB, 2000). It may also appear in environmental media as a product of TNT degradation.

1,3,5-TNB is expected to be moderately to highly mobile in soil (HSDB, 2000). The compound has the potential to photolyze on soil surfaces. Volatilization from soil surfaces is predicted to be an insignificant removal process. Insufficient data are available to predict the significance of biodegradation in soil.

1,3,5-TNB in water is likely to be subject to direct photolysis when exposed to sunlight (HSDB, 2000). Volatilization is not expected to be environmentally important removal processes. The compound may exhibit moderate to low adsorption to suspended solids and sediments. Insufficient data are available to predict the significance of biodegradation in water.

Based on its vapor pressure, 1,3,5-TNB is expected to exist partly in the vapor phase and partly adsorbed onto particulate matter in the atmosphere (HSDB, 2000). It may be subject to direct photolysis in the air. Its water solubility suggests that wet deposition may be a potential removal process.

The relatively low log K_{ow} and relatively high water solubility of 1,3,5-TNB suggest that the potential for bioconcentration or bioaccumulation is low. Therefore, biotransfer factors are not developed for the TNBs.

Data regarding the extent of GI absorption of the TNBs were not located in the available literature. ATSDR (1993) summarized the results of toxicokinetic studies in which a single oral dose of radiolabeled TNT was given to rats, mice, dogs and rabbits, and radiolabel was quantified in various body compartments 24 hours after dosing. The appearance of red pigment in the urine of the rats and mice indicated that absorption is rapid. Urinary recovery accounted for approximately 60 percent of the dose in rats, mice and dogs, and 74 percent of the dose in rabbits. The extent of urinary recovery may serve as a conservative estimate of the extent of GI absorption. Assuming that the TNBs may be absorbed to the same extent as TNT, the GAF for TNT of 0.6 is also adopted for the TNBs.

Data regarding the extent of dermal uptake of the TNBs from soil were not located. The OEPA (1998) default ABS of 0.1 for organic chemicals is selected for this evaluation. From the data compiled above and the EPA (1992) method, a PC of 6.57E-4 cm/hour and a τ of 1.75E+0 hours are estimated for 1,3,5-TNB, which is applied to all the TNB isomers.

Data regarding the effects of acute oral exposure to the TNBs were not located in the available literature. A verified RfD for chronic oral exposure to 1,3,5-TNB of 3E-2 mg/kg-day is based on a NOAEL of 2.68 mg/kg-day in a 2-year dietary study in rats (EPA, 1999). The LOAEL, 13.31 mg/kg-day, estimated from the highest dietary concentration tested (300 ppm) was associated with methhemoglobinemia accompanied by splenic erythroid cell hyperplasia. An uncertainty factor of 100 was used. Confidence in the RfD is medium. The erythrocyte is the target organ

for prolonged oral exposure to 1,3,5-TNB. The oral RfD for 1,3,5-TNB may also be applied to the other TNBs because the chemicals are structurally similar and chemical-specific data are not available.

Data regarding the toxicity of inhalation exposure to the TNBs were not located in the available literature; an inhalation RfC cannot be developed for any of the TNBs.

Data regarding the carcinogenicity of the TNBs were not located in the available literature. The TNBs are not assigned to a cancer weight-of-evidence group, and URFs and SFs are not available.

References for Trinitrobenzenes

Agency for Toxic Substances and Disease Registry (ATSDR), 1993, ***Toxicological Profile for 2,4,6-Trinitrotoluene***, Draft for Public Comment, U.S. Department of Health and Human Services, May.

Budavari, S, Ed., 1989, ***The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals***, Eleventh Edition, Merck & Co., Rahway, NJ.

Ohio Environmental Protection Agency (OEPA), 1998, ***U.S. NASA Plum Brook, Erie County, Ohio LD#: 322-0552, Risk Assessment Work Plans***, letter from R.E. Nabors, Site Coordinator, to L.S. Ingram, Department of the Army, June 22.

U.S. Environmental Protection Agency (EPA), 1992, ***Dermal Exposure Assessment: Principles and Applications***, Interim Report, Office of Research and Development, Washington, DC, EPA/600/8-91/011B, January.

U.S. Environmental Protection Agency (EPA), 1999, ***Integrated Risk Information System (IRIS)***, National Center for Environmental Assessment, Cincinnati, OH, on line.

2,4,6-TRINITROTOLUENE (TNT) (118-96-7)

TNT is an **SVOC** classified as a high explosive and is used as a military explosive in bombs and grenades (ATSDR, 1993). It has found wide use in filling shells and airborne detonation bombs because it can withstand the shock of ejection from a gun barrel but can be exploded on impact with a detonator mechanism. It is used as a pure compound or combined with other explosive chemicals for military application. Small amounts are used in industrial explosives. Minor applications include use as a chemical intermediate in the manufacture of dyestuffs and photographic chemicals. Relevant physical properties are compiled below:

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)
227.13	1.60[a]	4.57E-7[a]	3.20[a]	ND	6.8E-6[b]	2.62E-7[a]	1.30E+2[b]

MW (g/mole)	log K_{ow} (unitless)	H (atm-m^3/mole)	log K_{oc} (unitless)	D_a (cm^2/s)	D_w (cm^2/s)	VP (atm)	S (mg/L)

ND = no data.
[a]Hazardous Substance Data Bank (HSDB), 2000, National Library of Medicine, on line.
[b]Montgomery, J.H., 1996, ***Groundwater Chemicals Desk Reference, Second Edition***, Lewis Publishers, New York, pp. 1043-1044.

TNT may be released to the environment in wastewater and air effluents from its production and use as a military explosive and propellant, and during the disposal or open detonation of outdated or unwanted munitions (ATSDR, 1993; HSDB, 2000). The behavior of TNT in the environment is expected to be controlled largely by its relatively high water solubility and relatively low vapor pressure. In addition, photolysis yields a large number of degradation products, many of which are persistent in environmental media.

Although low, the vapor pressure of TNT is sufficient to suggest that the compound will exist largely in the vapor phase in the atmosphere, where it is expected to be subject to photolysis (HSDB, 2000). Its solubility in water suggests that wet deposition may be a significant removal process.

TNT on the surface of soil is subject to photolysis (ATSDR, 1993; HSDB, 2000). Mobility in soil is expected to be low to moderate. Large quantities released to soil (e.g., from former munitions production works) may result in substantial concentrations in groundwater. TNT in soil is subject to degradation to a number of nitro reduction products (amino compounds, mono- and dinitro compounds).

TNT in surface water is subject to photolysis; volatilization and hydrolysis are not expected to be significant (ATSDR, 1993; HSDB, 2000). Photolysis gives rise to the persistent red or pink water condition frequently observed with TNT contamination. Biodegradation occurs too slowly to be an important removal process. TNT and some of its degradation products will partition moderately to sediment or suspended particles in water.

Bioconcentration or bioaccumulation are not expected to be significant for TNT (ATSDR, 1993; HSDB, 2000); therefore, biotransfer factors are not developed.

Pharmacokinetic data are limited to studies of oral administration of radiolabeled compound to several species followed by collection and measurement of radioactivity in urine, gastrointestinal tract (including contents) and feces (ATSDR, 1993). Total recovery from these compartments ranged from 92 to 104 percent, suggesting little metabolism to radioactive metabolites that were exhaled. The percent of the dose recovered in the urine is adopted as a minimal estimate of GI absorption, because the extent of biliary excretion and enterohepatic recirculation has not been investigated. Urinary recovery averaged 60 percent in rats, mice and dogs, and approximately 74 percent in rabbits. The 60 percent recovery in the urine of dogs is selected as the GAF for this evaluation.

Studies indicate that TNT is rapidly absorbed through the skin of occupationally exposed humans, but quantitative data were not located (ATSDR, 1993). Dermal absorption ranged from 17 to 68 percent of a single dose of radioactivity in studies using laboratory animals exposed for 24 hours to radiolabeled compound. Absorption appeared to be more complete in rabbits and mice than in rats and dogs, suggesting that species differences are significant. Data were not located regarding the dermal uptake of TNT from soil, which would account for the matrix effect, or the ability of soil to bind the chemical and retard its dermal uptake. In the absence of quantitative data, the default ABS of 0.1 for organic compounds recommended by OEPA (1998) is adopted for this evaluation. A PC of 1.07E-3 cm/hour and a τ of 2.12E+0 hours are estimated from the data provided above by the method of EPA (1992).

Information regarding the inhalation toxicity of TNT are limited to occupational studies, which probably also include dermal exposure, generally associated with the manufacture of explosives for World War I and World War II (ATSDR, 1993). Effects attributed to occupational exposure include deaths from liver disease and aplastic anemia, anemia, dermatitis and cataracts. The data are insufficient to derive an RfC for inhalation exposure to TNT.

The critical effect of prolonged oral exposure of animals to TNT is liver damage (EPA, 2000). Dogs appear to be more sensitive than rats or mice. A verified RfD for chronic oral exposure of 5E-4 mg/kg-day was derived from a LOAEL of 0.5 mg/kg-day associated with hepatic swelling and hepatocytomegaly in a 26-week feeding study in dogs. An uncertainty factor of 1000 was applied. Hemosiderosis, evidence of erythrocyte destruction, was observed in dogs treated at a dose rate as low as 2 mg/kg-day (ATSDR, 1993). Confidence in the oral RfD is medium.

Although the key study is described as a comprehensive and well designed subchronic study, only effects on the liver were reported by EPA (2000), presumably because the liver effects were the critical effects upon which the oral RfD is based. Specifically, observations regarding clinical chemistry, hematology, urinalyses, periodic electrocardiography and ophthalmic examinations were not reported. Additional information, however, indicates that anemia is one of the major signs of TNT toxicity consistently observed in rats, mice and dogs (ATSDR, 1993). TNT and/or its metabolites induce the oxidation of intracellular hemoglobin to methemoglobin, which results in erythrocytic hemolysis. Hemolytic anemia is followed by a compensatory response manifested primarily as reticulocytosis. Effects on the testes, including irreversible atrophy and decreased reproductive performance, apparently secondary to altered zinc and copper nutrition, are observed in rats treated with much higher dose rates (e.g., 125 mg/kg-day).

Target organs at or near the threshold for toxicity include the erythrocyte and liver. Effects on the erythrocyte arise from the oxidation of hemoglobin to methemoglobin, which is consistently observed with exposure to inorganic nitrates and nitrites, as well as with many other nitroaromatic compounds (HSDB, 2000). Mild effects on the liver occur at slightly lower doses; the mechanism of hepatotoxicity has not been elucidated. Effects on the testes at higher levels probably arise from reduced levels of circulating ceruloplasmin, which is necessary for proper zinc nutrition at the cellular level.

TNT is classified in EPA weight-of-evidence Group C (possible human carcinogen) on the basis of positive mutagenicity studies and dietary studies that showed an increased incidence of urinary

bladder tumors in rats (EPA, 2000). Human data are inadequate. An oral SF of 3E-2 per mg/kg-day is based on the incidence of bladder tumors in female rats in a 24-month dietary study. The data are inadequate for potency estimation for inhalation exposure.

References for 2,4,6-Trinitrotoluene

Agency for Toxic Substances and Disease Registry, (ATSDR), 1993, ***Toxicological Profile for 2,4,6-Trinitrotoluene***, Draft for Public Comment, U.S. Public Health Service, Atlanta, GA, May.

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APPENDIX I

ECOLOGICAL REFERENCE INFORMATION

APPENDIX I.1

TABLE I-1, VASCULAR PLANT SPECIES OBSERVED ON SITE

Table I-1

Vascular Plant Species Observed On Site
Plum Brook Ordnance Works
Oxford and Perkins Townships, Ohio

Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
Acer negundo	box-elder maple	Frequent		Stream banks, ditches,	1
*Acer platanoides	Norway maple	Occasional		Disturbed woods	1
Acer rubrum	red maple	Common		Dry to moist woods	1, 2a, 2b
Acer saccharum	Sugar maple	Occasional		Dry to moist woods	2a
*Achillea millefolium	Yarrow	Frequent		Dry fields, roadsides, and	1, 2a, 2b
Agalinis purpurea	purple false-foxglove	Frequent		Moist openings and	1
Agrimonia parviflora	southern agrimony	Frequent		Moist fields and ditches	1, 2a, 2b
*Agropyron repens	Quack grass	Frequent		Old fields and roadsides	2b
Agrostis hyemalis	Ticklegrass	Occasional		Dry, grassy fields and	1
*Agrostis gigantea	Redtop	Common		Moist fields, ditches, and	1
Agrostis perennans	autumn bent-grass	Frequent		Dry woods and borders	1
Alisma subcordatum	water-plantain	Occasional		Ponds and ditches	1, 2b
*Alliaria petiolata	garlic mustard	Frequent		Dry to moist wood lots	1, 2a, 2b
*Allium canadense	Field garlic	Frequent		Dry to moist woods	2a
Ambrosia artemisiifolia	common ragweed	Frequent		Dry fields and roadsides	1
Ambrosia trifida	giant ragweed	Occasional		Dry fields and roadsides	1
Andropogon gerardii	big bluestem	Frequent		Dry to moist fields and	1
*Andropogon virginicus	broom-sedge	Occasional		Dry fields and roadsides	1, 2b
Antennaria parlinii	pussy-toes	Occasional		Dry fields and openings,	1
*Anthoxanthum odoratum	vernal-grass	Occasional		Dry fields and openings,	1
Apocynum cannabinum	Dogbane	Frequent		Dry to moist fields and	1
Apocynum sibiricum	Dogbane	Common		Dry to moist fields and	2b
*Arabidopsis thaliana	mouse-ear cress	Occasional		Road berms and about	1
*Arctium minus	Burdock	Occasional		Disturbed fields and	1
Arenaria lateriflora	grove sandwort	Rare	T	Woods along Ransom	1
Arisaema triphyllum	Jack-in-the-pulpit	Rare		Moist to dry woods	2a

Table I-1

Vascular Plant Species Observed On Site
Plum Brook Ordnance Works
Oxford and Perkins Townships, Ohio

Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
Aristida dichotoma	Churchmouse grass	Occasional		Dry fields and openings	1
Aristida longespica	slimspike triple-	Common		Dry fields and openings	1
Aristida oligantha	prairie triple-awned	Occasional		Dry openings and	1
*Artemisia ludoviciana	white sage	Occasional		Grassy roadsides	1
Asclepias hirtella	prairie milkweed	Common		Dry to moist openings	1
Asclepias sullivantii	Sullivant's milkweed	Rare		Moist field along Patrol	1
Asclepias syriaca	common milkweed	Frequent		Dry to moist fields and	1, 2a, 2b
Asclepias tuberosa	butterfly-weed	Occasional		Dry openings and	1
Aster ericoides	white heath aster	Rare		Grassy strip along Patrol	1
Aster laevis	smooth aster	Rare		White oak grove on Taft	1
Aster lateriflorus	calico aster	Common		Moist woods and thickets	1
Aster novae-angliae	New England aster	Occasional		Dry fields and roadsides	1
Aster pilosus	common white aster	Common		Dry fields, roadsides, and	1
Aster umbellatus	flat-top aster	Frequent		Dry to moist fields and	1
Baptisia lactea	prairie false indigo	Occasional	P	Dry openings in bunker	1
Baptisia tinctoria	yellow false indigo	Occasional		Dry openings in bunker	1
*Berberis thunbergii	Japanese barberry	Occasional		Woodland borders	1, 2a
Bidens coronata	northern tickseed-	Common		Moist fields and ditches	1
Boehmeria cylindrica	false nettle	Occasional		Ponds and ditches	1
*Brassica nigra	black mustard	Occasional		Roadsides	1, 2b
*Bromus inermis	smooth brome	Frequent		Dry to moist fields and	1
*Bromus tectorum	downy chess	Occasional		Dry openings and	1
Cacalia atriplicifolia	pale Indian-plantain	Occasional		Dry fields and roadsides	1
Calamagrostis canadensis	blue-joint	Occasional		Moist fields and ditches	1
Callitriche heterophylla	water-starwort	Occasional		Pond margins and	1
*Campsis radicans	trumpet-vine	Occasional		Disturbed openings and	1

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Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
*Capsella bursa-pastoris	shepherd's-purse	Occasional		Roadsides and about	1
*Cardamine hirsuta	bitter-cress	Occasional		Roadsides and about	1
*Carduus nutans	musk-thistle	Occasional		Dry fields and roadsides	1, 2a, 2b
Carex aggregata	sedge	Occasional		Moist woods	2a
Carex alata	broad-winged sedge	Rare	P	Grassy field along Patrol	1
Carex amphibola	NA	Occasional		Thickets and woods	1, 2a
Carex annectens	NA	Occasional		Moist, grassy fields	1
Carex annectens	yellow-fruited sedge	Occasional		Moist, grassy fields	1
Carex blanda	NA	Frequent		Moist woods	1
Carex cephaloidea	thin-leaf sedge	Rare	E	Woods border along	1
Carex complanata	NA	Frequent		Dry fields and woods	1
Carex conoidea	field sedge	Rare	T	Grassy depression along	1
Carex cristatella	NA	Occasional		Moist fields and ditches	1
Carex festucacea	fescue sedge	Occasional		Moist, grassy fields	1
Carex gracillima	NA	Occasional		Moist woods	1, 2a
Carex granularis	meadow sedge	Common		Moist, grassy fields and	1
Carex hirtifolia	NA	Rare		Disturbed oak woods	1
Carex hystericina	Bottlebrush sedge	Rare		Moist depression along	1
Carex jamesii	sedge	Rare		Moist woods	2a
Carex lanuginosa	sedge	frequent		Moist to dry woods	2b
Carex lupulina	Hop sedge	occasional		Wet meadows	2b
Carex pensylvanica	Pennsylvania sedge	Common		Dry woods	1
Carex rosea	NA	Frequent		Dry to moist woods	1, 2a
Carex scoparia	NA	Frequent		Moist, grassy fields	1, 2b
Carex stipata	NA	Frequent		Moist fields and ditches	1
Carex stricta	tussock sedge	Occasional		Moist fields and ditches	1, 2a

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Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
Carex swanii	Swan's sedge	Occasional		Dry, grassy fields	1
Carex tribuloides	NA	Occasional		Moist, grassy fields and	1, 2b
Carex umbellata	NA	Occasional		Well-drained, grassy	1
Carex vulpinoidea	fox sedge	Common		Moist fields, ditches, and	1, 2b
Carya laciniosa	Shellbark hickory	Occasional		Moist to dry woods	2a, 2b
Carya ovata	shagbark hickory	Rare		Sandy soil along fence at	1
Celtis occidentalis	Hackberry	Occasional		dry to moist woods and	1, 2a
Cephalanthus occidentalis	Buttonbush	Occasional		Moist depressions and	1
Cerastium arvense	field chickweed	Rare		White oak grove along	1
*Cerastium fontanum	mouse-ear chickweed	Frequent		Road berms and about	1
*Cerastium semidecandrum	NA	Occasional		Road berms and about	1
*Chaenorrhinum minus	dwarf snapdragon	Occasional		Road berms and about	1
Chamaecrista fasciculata	partridge-pea	Occasional		Dry openings on shale	1
*Chrysanthemum	ox-eye daisy	Frequent		Dry to moist fields and	1, 2a, 2b
*Cichorium intybus	Chicory	Occasional		Roadsides	1
Circaea lutetiana	Southern broad-	Frequent		Woods	2a, 2b
*Cirsium arvense	Canada thistle	Common		Disturbed fields and	1, 2a, 2b
Cirsium discolor	prairie thistle	Frequent		Grassy fields and	1
*Cirsium vulgare	bull thistle	Frequent		Disturbed fields and	1, 2b
Clinopodium vulgaris	wild basil	Occasional		Dry roadsides and	1
Collinsonia canadensis	Horse balm	2a-C		Upland wooded areas	2a, 2b
*Confolvulus arvensis	field bindweed	Occasional		Disturbed fields and	1, 2b
*Convallaria majalis	lily-of-the-valley	Rare		Grassy field along	1
Conyza canadensis	Horseweed	Frequent		Dry fields and roadsides	1
Cornus amomum	swamp dogwood	Frequent		Moist fields and thickets	1
Cornus drummondii	rough-leaved	Frequent		Moist borders, thickets,	1, 2a, 2b

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Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
Cornus florida	flowering dogwood	Occasional		Woodland borders and	1
Cornus racemosa	gray dogwood	Frequent		Dry fields and roadsides	1
*Coronilla varia	crown-vetch	Occasional		Grassy fields and	1, 2b
Crataegus mollis	downy hawthorn	Frequent		Thickets and woodland	1
Crataegus punctata	dotted hawthorn	Frequent		Thickets and woodland	1
Cryptotaenia canadensis	honewort	Occasional		Dry to moist woods	1
Cuscuta gronovii	dodder	Frequent		Moist fields and ditches	1
*Cyperus esculentus	yellow nutgrass	Occasional		Moist, disturbed openings	1
Cyperus strigosus	umbrella-sedge	Frequent		Moist openings, ponds,	1
*Dactylis glomerata	orchard-grass	Occasional		Dry to moist fields and	1, 2a, 2b
Danthonia spicata	poverty-grass	Occasional		Dry openings over shale	1
Datura stramonium	jimson-weed	Occasional		Disturbed openings and	1
*Daucus carota	wild carrot	Frequent		Dry fields and roadsides	1, 2a
*Dianthus armeria	Deptford pink	Occasional		Dry openings and	1, 2a, 2b
Diodia teres	buttonweed	Occasional		Dry openings over shale	1
Dioscorea villosa	Wild yam root	Occasional		Dry to moist woods	2b
*Dipsacus fullonum	common teasel	Frequent		Dry, disturbed openings	1, 2b
*Draba verna	early whitlow-wort	Occasional		Dry roadsides and about	1
Dryopteris carthusiana	spinulose woodfern	Frequent		Moist woods and shaded	1
*Eleagnus umbellata	autumn-olive	Occasional		Roadsides and woodland	1, 2a
Eleocharis acicularis	needle spikerush	Frequent		Margins of artificial pond	1
Eleocharis erythropoda	red-footed spikerush	Occasional		Moist openings and	1
Eleocharis obtusa	NA	Common		Moist openings and	1
Eleocharis smallii	Small's spikerush	Frequent		Margins of artificial pond	1
Eleocharis tenuis	NA	Frequent		Moist openings and	1
Elymus virginica	Wild rye	Frequent		Moist to dry woods	2a, 2b

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Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
*Elytrigia repens	quack-grass	Frequent		Dry fields and roadsides	1
Equisetum arvense	horsetail	Frequent		Moist openings,	1, 2b
Equisetum hyemale	scouring-rush	Occasional		Moist roadsides and	1
Eragrostis frankii	NA	Occasional		Moist openings and	1
Eragrostis spectabilis	showy lovegrass	Occasional		Dry to moist fields	1
Erechtites hieracifolia	Pilewort	Common, 2b-		Disturbed woods,	1, 2b
Erigeron annuus	fleabane	frequent		Old fields	2b
Erigeron philadelphicus	Philadelphia fleabane	Frequent		Roadsides and borders	1, 2a
Erigeron strigosus	smooth fleabane	Occasional		Dry openings and	1
Eupatorium perfoliatum	Boneset	Occasional		Moist fields, ponds, and	1
Eupatorium purpureum	purple joe-pye-weed	Occasional		Borders of moist woods	1
Euphorbia corollata	Flowering spurge	Occasional		Dry fields	1
Euphorbia maculata	Prostrate spurge	Occasional		Dry openings, road	1
Euthamia graminifolia	grass-leaved	Common		Dry to moist fields and	1, 2b
*Festuca elatior	tall fescue	Occasional		Roadsides and grassy	1, 2a, 2b
*Festuca obtusa	Fescue	Common		Old fields	2b
Fragaria virginiana	wild strawberry	Frequent		Dry to moist fields and	1, 2a, 2b
Fraxinus americana	white ash	Frequent		Dry to moist woods and	1
Fraxinus pensylvanica	green ash	Frequent		Moist woods and stream	1, 2a, 2b
Galine aparine	Cleavers	Occasional		Moist woods and borders	1, 2a
Galium circaezans	wild licorice	Rare		Dry woods along angling	1
Galium pilosum	Bedstraw	Occasional		Woods	2a, 2b
Galium tinctorium	Southern bedstraw	Rare		Moist depression along	1
Geranium maculatum	Wild geranium	Occasional		Moist to dry woods	2a, 2b
Geum laciniatum	Avens	Occasional		Moist woods	2b
Geum vernum	spring avens	Occasional		Moist woods and borders	1

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Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
Geum virginianum	white avens	Occasional		Woods borders and	1
*Glechoma hederacea	ground-ivy	Frequent		Moist openings,	1, 2a
Gleditsia triacanthos	honey-locust	Occasional		Dry to moist woods and	1, 2a
Glyceria striata	manna-grass	Occasional		Moist woods and about	1, 2a
Gnaphalium obtusifolium	Cudweed	Frequent		Dry openings on shale	1
Gratiola virginiana	round-fruited hedge-	Rare	P	ca 20 plants; moist,	1
Hedyotis caerula	Bluets	Occasional		Dry openings and	1
Helenium flexuosum	Southern	Occasional		Moist, open ground and	1
Helianthus mollis	ashy sunflower	Rare	T	ca 200 plants in grassy	1
Hibiscus moscheutos	rose-mallow	Rare		Moist swale along	1
*Hieracium piloselloides	king-devil	Frequent		Dry openings on shale	1
Hypericum gentianoides	orange-grass	Frequent		Dry openings	1
Hypericum gymnanthum	least St. John's-wort	Rare	E	ca 50 plants; moist, open	1
Hypericum majus	tall St. John's-wort	Rare	P	Moist, shaded ground by	1
Hypericum mutilum	little St. John's-wort	Frequent		Moist openings, ponds,	1
*Hypericum perforatum	dotted St. John's-wort	Frequent		Disturbed fields and	1, 2b
Hypoxis hirsuta	yellow-eyed-grass	Occasional		Grassy fields	1
Impatiens sp.	Jewelweed	Occasional		Moist woods	2a
*Inula helenium	Elecampane	Rare		Moist roadside along Taft	1
Ipomoea pandurata	wild sweet-potato	Occasional		Dry openings over shale	1
Iris versicolor	Northern blue flag	Occasional		Moist woods and ditches	1
Isanthus brachiatus	false pennyroyal	Rare		Moist opening on	1
Juglans nigra	black walnut	Rare		A few young trees at	1, 2b
Juncus acuminatus	NA	Common		Moist openings and	1
Juncus biflorus	NA	Occasional		Moist openings and	1
Juncus brachycarpus	NA	Occasional		Moist openings	1

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Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
Juncus canadensis	Canada rush	Frequent		Moist openings	1
Juncus dudleyi	Dudley's rush	Frequent		Moist openings	1
Juncus effusus	Common rush	Frequent		Moist openings, ponds,	1, 2b
Juncus marginatus	NA	Occasional		Moist openings	1
Juncus tenuis	path rush	Frequent		Dry openings, road	1
*Lamium purpureum	dead-nettle	Frequent		Disturbed fields,	1
Leersia oryzoides	rice cutgrass	Occasional		Moist fields and ditches	1
Leersia virginica	White grass	Frequent		Moist woods	2a
Lemna minor	little duckweed	Occasional		Ponds and standing	1, 2a
*Lepidium campestre	field-cress	Occasional		Roadsides and about	1
Lepidium virginicum	poor man's pepper	Frequent		Roadsides, disturbed	1
Lespedeza capitata	bush-clover	Occasional		Dry fields	1
Leucospora multifida	NA	Rare		Moist opening on	1
Liatris scariosa var. novae-	northern blazing-star	Rare		Dry ground along Patrol	1
Liatris spicata	spiked blazing-star	Occasional		Moist openings	1
*Linaria vulgaris	butter-and-eggs	Occasional		Roadsides and about	1
Lindera benzoin	spicebush	Occasional		Moist woods	2a
Lindernia dubia	false pimpernel	Occasional		Moist openings, ditches,	1
Linum medium	wild flax	Frequent		Dry to moist openings	1
Linum virginianum	Virginia flax	Rare		About pond in northern	1
*Lonicera maackii	Amur honeysuckle	Rare		Roadsides and thickets	1
*Lonicera morrowii	Asiatic honeysuckle	Frequent		Thickets, borders, and	1
*Lonicera tatarica	Tatarian honeysuckle	Frequent		Thickets, borders, and	1
*Lotus corniculatus	bird's-foot trefoil	Occasional		Grassy fields and road	1
Ludwigia alternifolia	rattlebox	Occasional		Ponds and ditches	1
Ludwigia palustris	water-purslane	Frequent		Ponds and ditches	1

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Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
Ludwigia polycarpa	NA	Rare		Moist, shaded ground by	1
Lycopus americanus	American water-	Frequent, 2b-O		Ponds and ditches	1, 2b
Lycopus uniflorus	northern water-	Frequent		Moist woods and shaded	1
*Lysimachia nummularia	moneywort	Frequent		Moist woods, wet	2a
Lysimachia terrestris	swamp loosestrife	Occasional		Moist openings	1
Lythrum alatum	prairie loosestrife	Occasional		Moist openings	1, 2b
Maclura pomifera	osage-orange	Occasional		Disturbed woods and	1
*Matricaria matricarioides	pineapple-weed	Occasional		Roadsides and about	1
*Medicago lupulina	Black medic	Occasional		Old fields and disturbed	2a
*Melilotus alba	white sweet-clover	Occasional		Disturbed fields and	1
*Melilotus officinalis	yellow sweet-clover	Occasional		Disturbed fields and	1
Mimulus ringens	monkey-flower	Occasional		Moist openings and	1
Monarda fistulosa	bergamont	Occasional		Grassy fields	1
Muhlenbergia frondosa	muhly grass	Frequent		Moist fields and ditches	1
Najas flexilis	northern naiad	Occasional		Artificial ponds	1
*Najas minor	Eurasian naiad	Frequent		Artificial ponds	1
*Nepeta cataria	catnip	Occasional		Roadsides and weedy	1, 2b
Nyssa sylvatica	blackgum	Occasional		Thickets and woods	1
Oenothera biennis	evening-primrose	Frequent		Dry fields, roadsides, and	1
Oenothera tetragona	northern sundrops	Frequent		Moist, grassy fields	1
Onoclea sensibilis	Sensitive fern	frequent		Wet areas	2b
Osmunda cinnamomea	cinnamon fern	Rare		Depressions in moist	1
Osmunda regalis	royal fern	Occasional		Depressions in moist	1
*Oxalis europea	Sorrel	2a-O, 2b-F		Old fields and disturbed	2a, 2b
Oxalis violacea	purple wood-sorrel	Occasional		Drier oak woods and	1
Panicum flexile	wiry witch-grass	Rare		Moist opening on	1

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Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
Panicum lanuginosum	hairy panic-grass	Frequent		Dry, grassy fields and	1, 2b
Panicum oligosanthes	sand panic-grass	Occasional		Dry, grassy fields	1
Panicum rigidulum	stiff panic-grass	Frequent		Moist openings and	1
Panicum virgatum	switch-grass	Occasional		Dry fields	1
Parietaria pensylvanica	pellitory	Occasional		Dry, disturbed wood lots	1
Paronychia fastigata	forked chickweed	Occasional		Dry woods and borders	1
Parthenocissus	Virginia-creeper	Occasional		Dry to moist woods	1, 2a, 2b
Parthenocissus vitacea	grape-woodbine	Rare		Dry opening north of	1
*Pastinaca sativa	wild parsnip	Occasional		Roadsides	1
Penstemon digitalis	tall white beard-	Frequent		Grassy fields and	1, 2a, 2b
Phalaris arundinacea	reed canary-grass	Common		Moist fields and ditches	1, 2a, 2b
*Phleum pratense	timothy	Frequent		Disturbed fields and	1, 2b
Phragmites australis	reed-grass	Occasional,		Moist openings and	1, 2b
Phryma leptostachya	lopseed	Rare		Edge of woods along	1
Phytolacca americana	pokeberry	Occasional		Moist woods and borders	1
Pilea pumila	Canada clearweed	Occasional		Moist woods	2a
*Plantago lanceolata	English plantain	Frequent		Disturbed openings and	1, 2b
*Plantago major	broad-leaved plantain	Frequent		Road berms and about	1, 2a
Platanthera lacera	ragged fringe-orchid	Rare		Ditch along south Patrol	1
Platanus occidentalis	sycamore	Occasional		Moist woods and stream	1, 2a
*Poa annua	early bluegrass	Common		Road berms and about	1
*Poa compressa	Canada bluegrass	Frequent		Dry openings, especially	1
Podophyllum peltatum	may-apple	Occasional		Dry to moist woods	1, 2b
Polygala sanguinea	blood milkwort	Frequent		Moist openings	1
Polygala verticillata	whorled milkwort	Occasional		Moist openings	1
*Polygonum caespitosum	NA	Rare		Moist, shaded ground in	1

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Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
*Polygonum hydropiper	water-pepper	Occasional		Margins of ponds	1
Polygonum	false water-pepper	Occasional		Wet ditches and pond	1
Polygonum sagittatum	arrow-leaved	Occasional		Moist thickets and ditches	1
Polygonum scandens	climbing false	Occasional		Thickets and roadsides	1
Polygonum virginianum	Virginia knotweed	Frequent		Moist to dry woods	2a, 2b
Populus deltoides	cottonwood	Frequent		Moist woods, borders,	1, 2a, 2b
Potamogeton diversifolius	snailseed pondweed	Frequent		Artificial ponds	1
Potamogeton foliosus	leafy pondweed	Occasional		Artificial ponds	1
Potamogeton nodosus	longleaf pondweed	Occasional		Artificial ponds	1
Potentilla simplex	cinquefoil	Frequent		Dry openings and	1
Prunella vulgaris	self-heal	Occasional		Roadsides and about	1
Prunus americana	wild plum	Occasional		Thickets and roadsides	1
*Prunus avium	Sweet cherry	Occasional		Dry woods	2b
Prunus serotina	wild black cherry	Frequent		Dry to moist woods and	1, 2a, 2b
Pycnanthemum tenuifolium	narrow-leaved	Frequent		Moist openings,	1, 2b
Pycnanthemum virginianum	Virginia mountain-	Occasional		Moist openings and	1
Pyrus coronaria	crab-apple	Frequent		Thickets and borders	1
Quercus alba	white oak	Occasional		Dry woods and sandy	1, 2a, 2b
Quercus bicolor	swamp white oak	Frequent		Moist woodlands	1
Quercus imbricaria	shingle oak	Frequent		Moist to dry woodlands	1, 2a
Quercus macrocarpa	bur oak	Rare		ca 5 trees on sandy ridge	1, 2a
Quercus palustris	pin oak	Common		Moist woods	1, 2a
Quercus rubra	Red oak	Occasional		Dry woods	2b
Ratibida pinnata	green-headed	Occasional		Roadsides and dry fields	1
Rhexia virginica	Virginia meadow-	Occasional	P	Moist openings and pond	1
Rhus glabra	Smooth sumac	Rare		Old fields and disturbed	2a

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Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
Rosa carolina	pasture rose	Occasional		Dry fields	1
*Rosa multiflora	multiflora rose	Occasional		Disturbed openings,	1, 2a, 2b
Rosa setigera	prairie rose	Rare		Grassy roadside and	1
Rotala ramosior	toothcup	Occasional		Moist openings and about	1
Rubus allegheniensis	blackberry	Occasional		Woods, fields, and	2b
Rubus flagellaris	dewberry	Frequent		Dry openings and	1, 2a, 2b
Rubus occidentalis	Black raspberry	Occasional		Dry woods, and borders	2b
Rudbeckia hirta	black-eyed susan	Frequent		Dry fields and roadsides	1
*Rumex acetosella	red sorrel	Occasional		Dry openings over shale	1
*Rumex crispus	curly dock	Occasional		Roadsides and about	1, 2b
Sagittaria latifolia	broad-leaved	Occasional		Ponds and ditches	1, 2b
Salix amygdaloides	peachleaf willow	Occasional		Ditches and about ponds	1
Salix discolor	pussy willow	Occasional		Moist openings, ponds,	1
Salix exigua	sandbar willow	Frequent		Moist openings, stream	1
Salix nigra	black willow	Comm. (1,2b)		Moist woods, stream	1, 2a, 2b
Sambucus canadensis	elder-berry	Frequent		Moist openings, stream	1
*Saponaria officinalis	soapwort	Frequent		Dry fields, roadsides, and	1
Sassafras albidum	sassafras	Occasional		Dry woods and borders	1
Schizachyrium scoparium	little bluestem	Frequent		Dry fields and roadsides	1
Scirpus acutus	hardstem bulrush	Rare		Moist depression west of	1
Scirpus atrovirens	dark green bulrush	Common, 2b-F		Moist openings,	1, 2b
Scirpus cyperinus	woolgrass	Occasional		About artificial ponds	1, 2b
Scirpus fluviatilis	river bulrush	Rare		Moist depression west of	1
Scirpus pendulus	NA	Occasional		Moist openings	1
Scirpus validus	softstem bulrush	Occasional		Moist openings, ponds,	1
Scleria triglomerata	tall nut-rush	Rare	P	Moist swale in northern	1

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Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
Scutellaria lateriflora	mad-dog skullcap	Occasional		Moist depressions and	1
Senecio aureus	golden ragwort	Occasional		Moist woods borders	1
*Setaria faberi	nodding foxtail-grass	Occasional		Grassy roadsides in the	1
*Setaria viridis	green foxtail-grass	Frequent		Dry roadsides and about	1
Silphium terebinthinaceum	prairie-dock	Rare		Dry openings at crossing	1
Sisyrinchium albidum	prairie blue-eyed-	Frequent		Grassy fields	1
Sisyrinchium angustifolium	common blue-eyed-	Frequent		Grassy fields	1, 2b
Smilax rotundifolia	greenbriar	Occasional		Moist to dry woods	2a
*Solanum caroliniense	horse-nettle	Occasional		Dry openings and	1, 2b
*Solanum dulcamara	bittersweet-	Occasional		Roadsides, ditches,	1
Solidago canadensis	Canada goldenrod	Common		Grassy fields	1
Solidago juncea	early goldenrod	Frequent		Dry to moist fields and	1
Solidago nemoralis	gray goldenrod	Common		Dry fields and roadsides	1
Solidago riddellii	Riddell's goldenrod	Rare		Moist opening over	1
Sparganium eurycarpum	giant bur-reed	Rare		Wet ditch along Ransom	1
Spartina pectinata	prairie cord-grass	Frequent		Moist depressions, fields,	1
Spiranthes ochroleuca	creamy ladies'-	Occasional		Ditches and moist	1
Sporobolus asper	tall dropseed	Rare		A single stand in dry	1
Sporobolus neglectus	NA	Frequent		Dry openings and road	1
Stellaria longifolia	long-leaved stitchwort	Occasional		Moist, grassy fields	1
*Stellaria media	chickweed	Common		Road berms and about	1
Symphoricarpos orbiculatus	coralberry	Occasional		Thickets, woods borders,	1
*Taraxacum officinalis	dandelion	Frequent		Roadsides and about	1
Teucrium canadense	American germander	Occasional		Moist openings	1
Thelypteris palustris	marsh fern	Occasional		Moist depressions and	1
Tilia americana	American basswood	Occasional		Woods	2a, 2b

Table I-1

Vascular Plant Species Observed On Site
Plum Brook Ordnance Works
Oxford and Perkins Townships, Ohio

Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
Toxicodendron radicans	Poison ivy	Occasional		Upland and facultative	2a, 2b
Tradescantia ohioensis	Ohio spiderwort	Occasional		Old fields	2b
*Tragopogon pratensis	Yellow goatsbeard	Rare		Old fields	2b
Triadenum virgnianum	pink St. John's-wort	Rare		Moist swale in northern	1
Tridens flavus	purpletop	Occasional		Moist fields and	1
*Trifolium pratense	red clover	Occasional		Grassy fields and	1
*Trifolium repens	common white clover	Common		Grassy roadsides and	1
Typha latifolia	broad-leaved cat-tail	Frequent		Moist openings, ponds,	1, 2b
Ulmus americana	American elm	Occasional		Moist woods and stream	1, 2a, 2b
Ulmus rubra	slippery elm	Occasional		Moist woods and stream	1, 2a
Urtica dioica var. procera	American stinging	Occasional		Moist fields and openings	1, 2a, 2b
*Verbascum blattaria	moth-mullein	Occasional		Disturbed fields and	1, 2b
*Verbascum thapsus	common mullein	Frequent		Disturbed fields	1, 2b
Verbena hastata	purple vervain	Frequent		Moist fields, stream	1
Verbena simplex	prairie vervain	Rare		A single stand in dry	1
Verbena urticifolia	white vervain	Occasional		Moist woods borders and	1
Verbesina alternifolia	wingstem	Frequent		Moist woods borders,	1, 2a
Vernonia gigantea	tall ironweed	Occasional		Dry to moist fields	1
*Veronica officinalis	common speedwell	Occasional		Dry openings on shale	1, 2a
*Veronica serpyllifolia	thyme-leaved	Occasional		Roadsides and about	1
Viburnum lentago	nannyberry	Frequent		Moist thickets and	1
Viola lanceolata	lance-leaved violet	Frequent	P	Ditches and moist	1
Viola sagittata	arrow-leaved violet	Frequent		Grassy fields and dry	1

Table I-1

Vascular Plant Species Observed On Site
Plum Brook Ordnance Works
Oxford and Perkins Townships, Ohio

Scientific Name	Common Name	Relative Frequency[a]	Rank[b]	Habitat	Observed On Site[c]
Viola sororia	common blue violet	Common		Grassy fields, roadsides,	1, 2a
Vitis riparia	riverbank grape	Frequent		Woods borders, thickets,	1, 2a, 2b
Vitis vulpina	fox grape	Occasional		Woods borders and	1
Zanichellia palustris	horned pondweed	Rare		Artificial pond west of	1

[a]Common = Species which occur in large numbers throughout.
Frequent = Species regularly encountered, but occurring in lesser numbers than common ones.
Occasional = Species found in several places, but never present in large numbers.
Rare = Species found in few places and in low numbers.
[B]T = Ohio Threatened Species
P = Ohio Potentially Threatened Species
E = Ohio Endangered Species
[c]1 = Biological Inventory of Plum Brook Station (Ohio Department of Natural Resources, 1994).
2 = IT site reconnaissance June 15 through 17, 1998 (2a = recorded at West Area Red Water Ponds Subsite; 2b = recorded at Pentolite Road Red Water Ponds Subsite).
*Non-native species.

APPENDIX I.2

TABLE I-2, THREATENED AND ENDANGERED SPECIES SUMMARY TABLE

Table I-2

Threatened and Endangered Species Summary Table
Plum Brook Ordnance Works, Sandusky, Ohio

Species	Rank	Approx. Distance from Subsites:		Habitat	Comments
		West Area Red Water Ponds	Pentolite Rd Red Water Ponds		
Grove sandwort (*Arenaria lateriflora*)	T	2-mi NE	3/4-mi NNE	Damp open woods, also dry woods and roadsides.	Slender stemmed annual herb, flowers late Apr - mid Aug, fruit May-Aug. 5 white entire petals. similar to plate 47 (Audubon).
Thin-leaved sedge (*Carex cephaloidea*)	E	1.5-mi NE	2/3-mi W	Moist open areas, fens, wet prairies, meadows, borders. 23 other sedge spp at PBOW.	Found at woods border along Pentolite road N. of reactor. Pgs 90-94 in Magee.
Field sedge (*Carex conoidea*)	T	3-mi SE and at ESBSNP	2-mi SSE and at ESBSNP	Moist open areas, fens, wet prairies, meadows, borders. 23 other sedge spp at PBOW.	Loosely tufted perennial from short rootstalk, fruit May - June. Grassy depression along Taft Rd. S. of N. Magazine Rd.
Least St. John's wort (*Hypericum gymnanthus*)	E	3-mi E and at ESBSNP	1.5-mi SE and at ESBSNP	Moist to wet sandy, muddy or peaty low grounds, in full sun.	Perennial herb to 9 dm, flowering late June - Sept, fruit July - Sept. 5 yellow petals. Mature flower or fruit needed for positive ID. Moist open ground along Patrol Rd. S of Fox Rd. Similar to *H. canadense* - pg. 170 in Magee. Plate 352 in Audubon for similar spp.

Table I-2

Threatened and Endangered Species Summary Table
Plum Brook Ordnance Works, Sandusky, Ohio

Species	Rank	Approx. Distance from Subsites:		Habitat	Comments
		West Area Red Water Ponds	Pentolite Rd Red Water Ponds		
Ashy sunflower (*Helianthus mollis*)	T	3.5-mi E	2-mi SE	Well-drained sunny openings, dry prairie, RR edges, roadsides, woods borders and clearings.	Herbaceous perennial, overlapping yellow ray flowers, flowering Aug - Sept, cinereous pubescence and sessile clasping leaves. Grassy field S, SW of Fox and Patrol Rds. Plate 286 Audubon for similar spp.
Dwarf bulrush (*Lipocarpha micrantha*; syn *Hemicarpha micrantha*)	T	1-mi SE and at ESBSNP	2-mi SW and at ESBSNP	Open moist areas, usually in sandy substrates, fields, sand pits, lake margins, ditches.	Tufted annual, fertile culms 2-15 cm, fruiting July-Oct. Similar to Scirpus - see pgs. 85-87 in Magee.
Twisted yellow-eyed-grass (*Xyris torta*)	T	1 1/4-mi S (ESBSNP)	2 1/4-mi SW (ESBSNP)	Dry to moist openings on sandy or clayey soils, fields, ditches, seepage banks, pond margins, disturbed areas.	Rosette-forming hergaceous perennial from a bulbous base, flowering July - Aug. Non-flowering specimens difficult to ID. flowering scape 15-100 cm. Erect narrow twisted needle-like leaves, pg. 823 Audubon.

Table I-2

Threatened and Endangered Species Summary Table
Plum Brook Ordnance Works, Sandusky, Ohio

Species	Rank	Approx. Distance from Subsites:		Habitat	Comments
		West Area Red Water Ponds	Pentolite Rd Red Water Ponds		
Flat-leaved rush (*Juncus platyphyllus)*	E	1 1/4-mi S (ESBSNP)	2 1/4-mi SW (ESBSNP)	Dry to moist, open to semi-open areas, sandy, acid soils, lakeshores, steambanks, mud flats, floodplains, wet meadows, roadsides.	Perennial herb 1.5 - 10 dm, in dense tussocks with grass-like leaves, small brownish flowers June - Sept, fruiting July - Oct, similar spp Plate 395 in Audubon. Mature fruits or flowers needed for positive ID.
Bushy aster (*Aster dumosus*)	T	1 1/4-mi S (ESBSNP)	2 1/4-mi SW (ESBSNP)	Dry to moist, sandy open sites, marshy ground, scrubby fields, thickets, disturbed habitats.	Perennial herb, to 1 m, Plate 100 in Audubon, flowering Aug - Oct, fruiting Sept - Nov. Mature flowers needed for ID.
Prairie false indigo (*Baptisia lactea*)	P	3-mi ESE	1 3/4-mi ESE	Wet to dry, open to semi-shaded, upland woods, prairies, along streams, along RR tracks	Perennial herb to 1.5 m, flowering May - June, fruiting July - Sept. White flowers, similar spp Plate 146 Audubon.
Broad-winged sedge (*Carex alata*)	P	3 3/4-mi-ESE	2 3/4-mi SE	Moist areas, in sun to semi-shade, meadows, woods borders, lake margins, bogs, fens.	Tufted perennial from a short blackish, fibrillose rootstalk, fertile culms 2 -12 dm, fruiting June - July. ID is difficult.

Table I-2

Threatened and Endangered Species Summary Table
Plum Brook Ordnance Works, Sandusky, Ohio

Species	Rank	Approx. Distance from Subsites:		Habitat	Comments
		West Area Red Water Ponds	Pentolite Rd Red Water Ponds		
Round-fruited hedge-hyssop (*Gratiola virginiana*)	P	2 1/2-mi ESE	1 1/2-mi ESE	Wet areas, stream margins, pools, ditches, shade or semi-shade.	Herbaceous weak-stemmed annual, 104 dm, flowering May - Oct. Mature fruit or flower needed for positive ID.
Tall St. John's wort (*Hypericum majus*)	P	2 1/2-mi ESE	1 1/2-mi SSE	Sandy or mucky shores of lakes or streams, meadows, marshes.	Perennial herb, 8-32 cm, flowers and fruits July -Sept. Fruits and roots needed for positive ID. Plate 352 in Audubon for similar spp.
Virginia meadow beauty (*Rhexia virginica*)	P	1-mi SE (+ 2 other locs further away)	1 1/3-mi SE (+ 2 other locs further away)	Wet sands and peats.	Several pink flowers in broad, terminal clusters on 4-sided slightly winged stem. Flowering July -Sept, Audubon Plate 477.
Tall nut rush (*Scleria triglomerata*)	P	2.5-mi ESE	1.0-mi SE	Moist swale	Northern bunker area
Lance-leaved violet (*Viola lanceolata*)	P	1.5-mi SE (+ 7 other locs further away)	1 1/3-mi SSW (+ 7 other locs further away)	Open, moist sandy areas in pastures, meadows, prairie remnants, bog margins, acidic soils.	Stemless perennial herb to 1.5 dm, flowering early May - early June, fruiting May - June. Mature flowers, fruits needed for positive ID. Audubon Plate 597 for similar spp.

Table I-2

Threatened and Endangered Species Summary Table
Plum Brook Ordnance Works, Sandusky, Ohio

Species	Rank	Approx. Distance from Subsites:		Habitat	Comments
		West Area Red Water Ponds	Pentolite Rd Red Water Ponds		
Sedge wren (*Cistothorus platensis*) also called short-billed marsh wren	E	Nest 1-mi WNW; 2 birds seen near subsite in June 1994.	Nest 0.3-mi SW of site and E and W of site; 8 birds seen near subsite in June 1994.	Wet meadows, grassy marshes, old grassy fields. Globular nests hidden at base of vegetation.	Six nesting sites ID's by ODNR DNAP. Buffy, streaked crown, streaked back, no white eye line. Plate 47 in Peterson. Unique song: *chap chap chap chapper-rrrr.* Nests July - Sept.
Winter wren (*Troglodytes troglodytes*)	E	-	-	Rare migrant seen at station, typically inhabitants of ground cover of northern U.S. coniferous and mixed forests, in Ohio only found in cool hemlock forests, usually along streams.	Very small round dark wren, brownish heavily barred belly and stubby tail (similar to house wren). Plate 47 in Peterson. Song: high tinkling warbles and trills or hard two-syllabled *kip kip.*
Cattle egret (*Bublucus ibis*)	T	-	-	Rare visitor observed in short grass areas of station, typically found in pastures.	Small white egret.
Black-crowned night heron (*Nycticorax nycticorax*)	T	8.5-mi NNW	8.5-mi NNW	Regular visitor at ponds, streams, and ditches of station, typically found near water and wetlands. Small nesting colony on small Sandusky Bay Island.	Chunky short-legged heron, adult is black-backed, pale gray or white below. Call is flat *guok* or *guark*, in evenings. Plate 21 in Peterson.

Table I-2

Threatened and Endangered Species Summary Table
Plum Brook Ordnance Works, Sandusky, Ohio

Species	Rank	Approx. Distance from Subsites:		Habitat	Comments
		West Area Red Water Ponds	Pentolite Rd Red Water Ponds		
Trumpeter swan (*Cygnus buccinator*)	E	-	-	Rare migrant seen flying toward lake at the station.	Large swan.
Upland sandpiper (plover) (*Bartramia longicauda*)	T	2 1/4-mi SE	1 1/2-mi SSE	Rare in grassy areas of station, typically found in 1-2 ft. high grasses of fields and prairies.	Large, streaked buffy-brown shore-bird, 'pigeon-headed', voice: *kip-ip-ip-ip*. Plates 23, 30 in Peterson.
Indiana bat (*Myotis sodalis*)	E	-	-	Inhabit caves near streams and exfoliated bark such as shagbark hickory.	Similar appearance to little brown myotis.

ESBSNP = Erie Sand Barrens State Nature Preserve
T = Threatened (Ohio)
E = Endangered (Ohio)
P = Potentially Threatened (Ohio)
ODNR = Ohio Department of Natural Resources
DNAP = Division of Natural Areas and Preserves

APPENDIX I.3

LETTERS FROM BOTANICAL EXPERT

APPENDIX J

ECOLOGICAL TOXICITY PROFILES

Appendix J

Ecological Toxicity Profiles For Plum Brook Ordnance Site

J.1.0 Introduction

A large variety of both inorganic and organic chemicals have been measured in environmental media at Plum Brook Ordnance Site at concentrations in excess of background measurements. Discussed in this appendix is toxicity information related to each of the chemicals of potential ecological concern that were identified as being risk drivers (i.e., contributing a large percentage of the total hazard index for a particular receptor, or exceeding surface water or sediment quality criteria standards for the protection of aquatic life). General toxicity information is presented for plants, wildlife, and freshwater aquatic biota. Much of the information was obtained from biological and toxicological databases, such as the Hazardous Substance Database (NLM, 1996), Registry of Toxic Effects of Chemical Substances (RTECS, 1998), Integrated Risk Information System (EPA, 1996) and from wildlife hazard reports published by the U.S. Fish and Wildlife Service (i.e., Eisler, 1993).

J.1.1 Inorganics

J.1.1.1 Aluminum

Plants

Aluminum appears to be essential for the growth of some plant species (Kabata-Pendias and Pendias, 1992). Concentrations in the foliage of crop plants are usually less than 300 milligrams (mg) per kilogram (kg) (dry weight) (Bollard, 1983). Higher concentrations of aluminum are usually detected in older rather than younger leaves (Bollard, 1983). Some species of plants, such as the cranberry (*Vaccinium macrocarpon*), are able to tolerate high concentrations of aluminum (Medappa and Dana, 1968, as cited in Foy, 1974). Generally, acid-soil plants (calcifuges) are more tolerant to aluminum than calcareous-soil plants (calcicoles) (Clymo, 1962; Grime and Hodgson, 1969, as cited in Foy, 1974). Because flower color in *Hydrangea macrophylla* is related to aluminum concentrations (blue flowers contain higher concentrations than pink flowers) (Asen et al., 1963, as cited in Foy, 1974), *Hydrandea* can serve as useful indicators of soluble aluminum concentrations in soil.

Difference in the toxicity of aluminum to plants is closely linked to the differential uptake and transport of calcium (Foy, 1974). Interactions of aluminum with potassium, silicon, and organic acids have also been reported (Foy, 1974). According to Foy (1974), aluminum toxicity in plants usually does not occur in soils with pH values above 5.5. Toxicity is, however, common and adverse at soil pH values below 5.0 (Foy, 1974). The addition of nitrogenous fertilizers to soil increases the toxicity of aluminum to plants by displacing exchangeable aluminum into soil solution and lowering soil pH (Foy, 1974). Tissue aluminum concentrations that may result in a 10 percent reduction in crop yield range from 40 to 280 mg/kg (dry weight) (Macnicol and Beckett, 1985). A soil concentration of 50 mg/kg (dry weight) has been proposed by Will and Suter (1994) as a benchmark screening value for aluminum phytotoxicity. Signs of aluminum toxicity in plants include overall stunting of growth, the presence of dark green leaves, purpling of stems, death of leaf tips, and coralloid and damaged root systems (Kabata-Pendias and Pendias, 1992).

Wildlife

Aluminum is not an essential element for animal growth and development. Limited data exist on the concentrations and effects of aluminum on wildlife. Most absorbed aluminum is eliminated through the kidney (Kovalchik et al., 1978, as cited in NLM, 1996).

Data do not exist on the effects of aluminum on wild mammals. Laboratory studies have shown inhalation of aluminum dust to induce infections and diseases of the lung (Browning, 1969, as cited in NLM, 1996). A derived chronic no observable adverse effect level (NOAEL) of 0.043 mg/kg per day (/d) has been reported for laboratory rats exposed to aluminum (EPA, 1996). Based on laboratory data on aluminum toxicity in laboratory mice, Opresko et al. (1994) estimated chronic oral NOAELS to be 2.138 mg/kg/d for the white-footed mouse and 0.369 mg/kg/d for the red fox. Sample et al (1996) suggests a NOAEL of 1.93 mg/kg per day for mice. The drinking water NOAELs for these species were estimated to be 7.127 and 4.374 mg/L, respectively.

There is a greater amount of information on the toxicity of aluminum to birds than on the toxicity of aluminum to mammals. Dietary ingestion of aluminum at concentrations of approximately 1,400 mg/kg produced declines in inorganic phosphorus levels in blood and resulted in the development of severe rickets in chickens (Browning, 1969, as cited in NLM, 1996). No adverse effects were observed in black ducks (*Anas rubripes*) fed diets containing 1,000 mg/kg aluminum as aluminum sulfate over a period of 12 days (Sparling, 1990). Diets with low calcium and phosphorus concentrations adversely affected the response of the ducks to aluminum (Sparling,

1990). Reduced consumption of diets containing 5,000 mg/kg aluminum has also been observed (Sparling, 1990). An estimated acute LD_{50} (lethal dose that will result in 50 percent deaths in the test population) of 111 mg/kg is reported for exposure of birds to aluminum (Schafer et al., 1983). Based on avian test data, extrapolated NOAELs for chronic exposure of avian species to aluminum sulfate are 45.17 mg/kg/d for the great blue heron and 57.9 mg/kg/d for the red-tailed hawk (Opresko et al., 1994). Sample et al. (1996) suggests a NOAEL for the ringed dove of 110 mg/kg per day. Drinking water NOAELs for these species were 1.02 and 1.018 g/L, respectively.

Aquatic Life

Bioconcentration of aluminum has been reported for several freshwater species. A bioconcentration factor for daphnids exposed to aluminum is 574 (Cowgill and Burns, 1975, as cited in Wren and Stephenson, 1991). Crayfish have been reported to have a bioconcentration factor for aluminum of 1305 (Malley et al., 1987, as cited in Wren and Stephenson, 1991). Forester (1980, as cited in Havlik and Marking, 1987) reported aluminum concentrations in the mollusc *Anodonta grandis* collected from acid-stressed lakes to be as high as 1,500 mg/kg.

Federal Water Quality Criteria exist for the protection of freshwater aquatic life from exposure to aluminum phosphide (EPA, 1996). The values for acute and chronic exposure to aluminum are 750 and 87 micrograms (µg) per liter (L), respectively (EPA, 1996). The lowest chronic values of aluminum reported in the literature for fish and *Daphnia* are 3,290 and 1,900 μg/L, respectively (Suter and Mabrey, 1994). The test EC_{20} (the concentration that will result in a specified effect on 20 percent of the test population) for fish can be used as a benchmark indicative of production within a population. It is the highest tested concentration causing less than 20 percent reduction in either the weight of young fish per initial female fish in a life cycle or partial life-cycle test or the weight of young per egg in an early life-stage test (Suter and Mabrey, 1994). The value for aluminum is 4,700 μg/L (Suter and Mabrey, 1994). A similar value can be determined for daphnids, which reflects the highest tested concentration causing less than 20 percent reduction in the product of growth, fecundity, and survivorship in a chronic test with a daphnid species. The EC_{20} benchmark for exposure of daphnids to aluminum is 540 μg/L (Suter and Mabrey, 1994).

J.1.1.2 Antimony

Plants

Data on the effects of antimony concentrations in soil to plant life are not readily available from the reviewed literature.

Animals

Effects from antimony exposure on benthic community composition have been detected at levels between 3.2 and 150 mg/kg (Long and Morgan, 1990). Data on antimony suggest an effects range-low (ER-L) of 2 mg/kg, and an effects range-medium (ER-M) of 25 mg/kg.

A derived no observable adverse effect level (NOAEL) of 0.125 mg/kg per day has been reported for laboratory mice exposed to antimony (Sample et al, 1996). For birds, data on the toxic effects of antimony were not readily available from the reviewed text.

Aquatic Life

The toxic effects of antimony to aquatic life are not readily available from reviewed literature.

J.1.1.3 Calcium

Calcium is a soft, silvery white metallic element found most widely in rocks, such as chalk, limestone, and marble. Calcium is an alkaline earth metal and is the fifth most abundant element in the earth's crust. Calcium is the most abundanat mineral element in the animal body, with ninety-nine percent of it occurring in bone and teeth (McDowell, 1992).

Plants

Calcium is present in the tissues of plants at varying concentrations, dependent on the species. However, data on the toxicity of calcium to plants was not readily available from literature reviewed.

Animals

Calcium is an essential nutrient for the proper development of animals. It is one of the most abundant mineral elements in the animal body. Deficiency of calcium in animal diets results in development of rickets (McDowell, 1992).

Data do not exist on the effects of calcium on wild animals. Laboratory studies have linked the deficiency of calcium in the diets of pigs, cattle, and poultry to the development of rickets. Studies suggest that dietary calcium is not toxic when single large doses are consumed by animals. Under normal conditions, it is absorbed according to need, and the excess is excreted; nonetheless, an excess of calcium in the diet can pose adverse health effects in tested species. A derived no observable adverse effect level (NOAEL) of 1,053 mg/kg per day has been derived from data reported by McDowell (1992) for laboratory rabbits exposed to calcium (Appendix N).

For birds, a NOAEL of 2,833 mg/kg per day has been derived from data reported by McDowell (1992) for poultry (Appendix N).

Aquatic Life

The effects of calcium to aquatic life are not readily available from reviewed literature.

J.1.1.4 Iron

Iron is silvery-white or gray and is somewhat magnetic. It is the second most abundant metal in the earth's crust, after aluminum, making up approximately 5% of the earth's crust. Iron is alloyed with other metals to form steel. Iron is a transition metal and is a component of every living organism (McDowell, 1992).

Plants

Data on the effects of iron concentrations in soil to plant life are not readily available from the reviewed literature.

Animals

Iron is an essential nutrient for the proper development of animals. It is essential for the normal formation of blood. Deficiencies of iron in the diet produces anemia.

Data do not exist on the effects of iron on wild animals. Iron toxicity is seldom a problem in domestic animals, but as with all other nutrients, a dietary excess can be detrimental. A derived no observable adverse effect level (NOAEL) of 26 mg/kg per day has been estimated based on data reported by McDowell (1992) for laboratory rabbits exposed to calcium (Appendix N). For birds, a NOAEL of 50 mg/kg per day was derived from data reported for poultry by McDowell (1992) (Appendix N).

Aquatic Life

The effects of iron to aquatic life are limited. A federal ambient water quality criterion for protection of aquatic biota is 1 milligram per liter (mg/L) for chronic exposure (EPA, 1986).

J.1.1.5 Magnesium

Magnesium is an alkaline earth metal and is one of the most plentiful elements in the earth's crust (2.1% by weight). Magnesium is a silver white metal found in sea water and in all plants and animals. All living organisms require magnesium (McDowell, 1992).

Plants

Data on the effects of magnesium concentrations in soil to plant life are not readily available from the reviewed literature.

Animals

Magnesium is an essential nutrient for the proper development of animals. Deficiencies of magnesium in the diet produces vasodialation, hyperirritability, convulsions, and death. Lactation tetany or grass tetany in cows is associated with magnesium deficiency.

Data do not exist on the effects of magnesium on wild animals. Tests have shown that toxic effects from magnesium can include lethargy, disturbance in locomotion, diarrhea, lowered feed intake performance, drowsiness, and death. A derived no observable adverse effect level (NOAEL) of 158 mg/kg per day has been estimated based on data reported by McDowell (1992) for laboratory rabbits exposed to calcium (Appendix N). For birds, a NOAEL of 150 mg/kg per day has been estimated based on data reported by McDowell (1992) for poultry (Appendix N).

Aquatic Life

The effects of magnesium to aquatic life are limited. A lowest effect concentration of 82 mg/L is reported for magnesium by Sutter and Mabrey (1994) for *Daphnia*.

J.1.1.6 Phosphorus

Phosphorus is the second most abundant mineral element in the animal body. Phosphorus is a highly reactive element and does not occur free in nature, because of this property. It is present in about 0.12 percent of the earth's crust. All living organisms require phosphorus (McDowell, 1992).

Plants

Data on the effects of phosphorus concentrations in soil to plant life are not readily available from the reviewed literature.

Animals

Phosphorus is an essential nutrient required for the proper development of animals. Deficiencies of phosphorus in the diet is related to the development of rickets (McDowell, 1992).

Data do not exist on the effects of phosphorus on wild animals. Phosphorus is not considered toxic when a single large dose is consumed by animals; however, prolonged consumption of

phosphorus-rich diets may cause severe metabolic problems. A derived no observable adverse effect level (NOAEL) of 526 mg/kg per day has been estimated based on data reported by McDowell (1992) for laboratory rabbits exposed to calcium (Appendix N). For birds, a NOAEL of 400 mg/kg per day was estimated based on data reported by McDowell (1992) for poultry (Appendix N).

J.1.2 Organic Compounds

J.1.2.1 Carbazole

Carbazole, also known as 9-azafluorene and dibenzopyrrole, is a coal conversion by-product (NLM, 1996). Very little data exist on this compound.

Plants

Data on carbazole concentrations in plants were not found in the literature. Phytotoxicity data on carbazole could also not be located.

Wildlife

Data on concentrations of carbazole in mammalian and avian wildlife species could not be found in the open literature.

There is limited evidence that suggests carbazole is carcinogenic in rats at an oral dose of 504 mg/kg over a six-week period (RTECS, 1996). The oral LD_{50} in rats exposed to carbazole is expected to be greater than 5,000 mg/kg (NLM, 1996). An oral LD_{50} in mice was reported at 200 mg/kg per day (RTECS, 1998). In rats and rabbits, the compound is metabolized to 3-hydroxycarbazole.

Aquatic Life

Aquatic toxicity data for carbazole were not found in the literature. Federal Water Quality Criteria do not exist for the protection of freshwater aquatic life from acute and chronic exposure to carbazole (EPA, 1986; EPA, 1992).

J.1.2.2 1,3-Dinitrobenzene

Little information is available for 1,3-dinitrobenzene. Information provided is for Nitrobenzene. Nitrobenzene is produced commercially as a precursor to aniline (NLM, 1996). It may enter the environment through air emissions and in wastewater (NLM, 1996). It may also form in the

atmosphere from photochemical reactions of benzene with nitrogen oxides (EPA, 1980i, as cited in NLM, 1996). Nitrobenzene is expected to leach into groundwater and to biodegrade (NLM, 1996). In aquatic environments, nitrobenzene is expected to degrade with a small fraction adsorbed to sediment (Davis et al., 1983, as cited in NLM, 1996).

Plants

Information on the concentration of nitrobenzene in wild flora or phytotoxicity data on nitrobenzene could not be found in the literature.

Wildlife

Specific data on the toxicity of nitrobenzene to wildlife do not exist. Laboratory studies have shown the main toxic effect of nitrobenzene is the formation of methemoglobin, with the risk of death from respiratory failure (Browning, 1965, as cited in NLM, 1996). A depression of the central nervous system and accompanied weight loss and marked cyanosis has been noted in rabbits exposed to nitrobenzene (Browning, 1965, as cited in NLM, 1996). An acute oral dose of 200 mg/kg has been shown to be fatal to rabbits (Browning, 1965, as cited in NLM, 1996). The oral LD_{50} value for rats exposed to nitrobenzene is 640 mg/kg (Budavari, 1989, as cited in NLM, 1996). An oral LD_{50} for rates exposed to 1,3-dinitrobenzene is 59.5 mg/kg per day (RTECS, 1998). The main metabolite of nitrobenzene in the urine of rabbits and guinea pigs has been found to be p-aminophenol (Browning, 1965, as cited in NLM, 1996). Nitrobenzene has been shown to be teratogenic in rats (EPA, 1984, as cited in NLM, 1996).

Aquatic Life

Data on concentrations of nitrobenzene in aquatic organisms could not be found in the literature. Bioconcentration of nitrobenzene in aquatic biota is not expected to be significant (NLM, 1996).

Data on the toxicity nitrobenzene to freshwater biota are limited primarily to fish studies. Forty-eight-hour LC_{50} values for bluegill sunfish (*Lepomis macrochirus*) and fathead minnows (*Pimephales promelas*) exposed to nitrobenzene are 42.6 and 156 mg/L, respectively (EPA, 1980i, and Holcombe et al., 1984, as cited in NLM, 1996). A concentration of 13 mg/L has been noted as the nominal 21-day no observed effect concentration for *Daphnia* exposed to nitrobenzene (Kuhn et al., 1989, as cited in NLM, 1996). A toxicity threshold of 1.9 mg/L has been reported for algae (*Microcystis quadricauda*) exposed to nitrobenzene (Verschueren, 1983, as cited in NLM, 1996). Federal Water Quality Criteria do not exist for the protection of freshwater aquatic life from exposure to nitrobenzene (EPA, 1996). A value of 27,000 μg/L, however, has been listed by EPA (1996) as the acute lowest effect level in freshwater systems.

J.1.2.3 4-Amino-2,6-Dinitrotoluene

Little information is available for 4-amino-2,6-Dinitrotoluene. Information provided is for dinitrotoluene (DNT). DNT compounds are used in organic synthesis, dyes, explosives, and in isocyanate production (NLM, 1996). 2,6 DNT is expected to be slightly mobile in soils (NLM, 1996). Biodegradation of 2,6-DNT is expected to occur in soils (NLM, 1996). In aquatic environments, 2,6-DNT will have a slight tendency to adsorb to sediments, suspended solids, and biota (NLM, 1996). Volatilization of 2,6-DNT and 2,4-DNT from water is relatively low; however, photolysis is a significant removal mechanism for the compound (NLM, 1996).

Plants

Concentrations of DNTs in field-collected plants and phytotoxicity data on plants exposed to dinitrotoluenes could not be located in the literature.

Wildlife

As with plants, data on concentrations of dinitrotoluenes in mammalian and avian wildlife species could not be found in the open literature. The liver and small intestine are the major sites of 2,6-DNT and 2,4-DNT metabolism (Schut et al., 1983, and Rickert et al., 1983, as cited in NLM, 1996).

Large differences exist in the toxicity of the various dinitrotoluene isomers in laboratory mammals (ACGIH, 1980, as cited in NLM, 1996). The 2,4-, 2,6- and 3,4- dinitrotoluene isomers have been found to be the most toxic DNT isomers to rats (ACGIH, 1980, as cited in NLM, 1996). Adverse reproductive effects have been documented in rats exposed to 2,4-DNT (NLM, 1996). Inhalation of fumes or dust containing 2,4-DNT may produce changes in blood chemistry (EPA, 1980g, as cited in NLM, 1996). Experimentally determined LD_{50} values for rats and mice orally exposed to 2,6-DNT are 117 and 621 mg/kg, respectively (NLM, 1996). LD_{50} values for rats, mice, and guinea pigs orally exposed to 2,4-DNT are 268; 790; and 1,300 mg/kg, respectively (NLM, 1996). No observable effects were observed in rats exposed to 2,4-DNT at 0.57 and 0.71 mg/kg/d (Ellis et al., 1978, as cited in NLM, 1996). 2,6-DNT and 2,4-DNT have been shown to be mutagenic (NLM, 1996). Laboratory studies have found 2,4-DNT to be carcinogenic (NLM, 1996). 2,6-DNT has been shown to be a potent hepatocarcinogen in laboratory rats (Dixit et al., 1986, as cited in NLM, 1996). Signs of 2,6-DNT poisoning that have been noted in laboratory mammals include decreased appetite, weight loss, and inhibition of muscular coordination (EPA, 1980g, as cited in NLM, 1996). Signs of 2,4-DNT toxicity in rats include changes in body weight and behavior, humpback, and jerky incoordination (Kozuka

et al., 1979, as cited in NLM, 1996). An LD_{50} value for rats exposed to 4-amino-2,6-DNT is 959 mg/kg (RTECS, 1998).

Aquatic Life

Limited data exist on concentrations of dinitrotoluenes in freshwater biota. A bioconcentration factor of 5,225 has been measured for algae exposed to 2,6-DNT in a model waste stabilization pond (Davis et al., 1981, as cited in NLM, 1996). The EPA has estimated a bioconcentration factor of 3.8 for aquatic organisms that contain about 7.6 percent lipid (EPA, 1980g, as cited in NLM, 1996).

Aquatic toxicity data for dinitrotoluenes are limited. Federal Water Quality Criteria do not exist for the protection of freshwater aquatic life from acute and chronic exposure to 2,6-DNT or 2,4-DNT (EPA, 1986; EPA, 1992). Concentrations of 2,4-DNT as low as 330 and 230 μg/L are toxic to freshwater aquatic life following acute and chronic exposure, respectively (EPA, 1986).

J.1.2.4 Polycyclic Aromatic Hydrocarbons

Polycyclic aromatic hydrocarbons (PAH) comprise a group of compounds containing two or more fused benzene rings. Although thousands of different PAHs are known to exist, 13 are of great environmental concern. These include acenaphthalene, anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene. PAHs are ubiquitous in nature, occurring from both natural and anthropogenic sources. PAHs present in surface waters are expected to undergo hydrolysis. In general, these compounds have low water solubilities and therefore partition into sediments (Sims and Overcash, 1983).

Plants

Some PAHs are synthesized by plants at very low concentrations (Sims and Overcash, 1983). Background concentrations of specific PAH compounds usually range from 22 to 88 μg/kg (dry weight) in tree leaves, 48 to 66 μg/kg (dry weight) in cereal crop plants, 0.05 to 50 μg/kg (dry weight) in leafy vegetables, 0.01 to 6 μg/kg (dry weight) in underground vegetables, and 0.02 to 0.04 μg/kg (dry weight) in fruits (Sims and Overcash, 1983). In general, PAH concentrations are usually greater in aboveground plant parts than in belowground parts and are greater on plant surfaces than within internal tissues (Edwards, 1983, as cited in Eisler, 1987b). Lower-molecular-weight PAHs are taken up from soil by plants more readily than higher-molecular-weight PAHs (Eisler, 1987b). Plant-to-soil concentration ratios for total PAHs have been

reported to range from 0.001 to 0.183 (Wang and Meresz, 1981, as cited in Edwards, 1989). According to Edwards (1983, as cited in Talmage and Walton, 1990), plant-to-soil concentration ratios for benzo(a)pyrene are usually low, ranging from 0.0001 to 0.33. Atmospheric deposition is believed to be the usual source of PAHs in plants, not uptake from soil (Sims and Overcash, 1983). The waxy surface of some plant leaves and fruits can concentrate PAHs through surface adsorption (EPA, 1980j, as cited in NLM, 1996). Mosses have been recommended as good indicators of regional PAH air pollution (Herrmann and Hubner, 1984, as cited in Eisler, 1987b). Some species of bacteria and fungi can degrade specific PAH compounds (Eisler, 1987b; Sims and Overcash, 1983).

Limited data exist on the phytotoxicity of PAHs to plants. Benzo(b)fluoranthene concentrations of 6,254 μg/kg in soil were reported to reduce stem growth in wheat but did not affect rye plants (Sims and Overcash, 1983). Dry-leaf mass was slightly reduced, and total dry yield was reduced by 11 percent in the wheat plants exposed to the elevated benzo(b)fluoranthene concentration. Benzo(a)pyrene and benzo(b)fluoranthene soil concentrations of up to 18,000 μg/kg do not appear to be severely toxic to higher plants (Sims and Overcash, 1983). There is some evidence that low concentrations of some PAHs may actually stimulate plant growth (Edwards, 1989).

Wildlife

Concentrations of PAH compounds in wild mammals and birds could not be found in the open literature. Exposure to PAHs can occur via inhalation, ingestion, or dermal exposure. Most of the PAHs taken in the body are not accumulated but are oxidized, and the metabolites are excreted (Sittig, 1985, as cited in NLM, 1996). In fact, most PAH compounds are detoxified and excreted from the body (Doull et al., 1986, as cited in NLM, 1996). PAHs are metabolized in vertebrates by a group of enzymes known as mixed-function oxidase in the liver. Some of the intermediate metabolites have been identified as mutagenic, carcinogenic, and teratogenic (Sims and Overcash, 1983).

In most cases, tissue damage from exposure to PAH compounds usually occurs at dose levels that would be expected to induce carcinomas (Eisler, 1987b). The toxic response to a PAH compound is a function of the specific compound, the dose, and the route of exposure. Unsubstituted aromatic PAHs with less than four condensed rings have not been shown to be tumorigenic (Eisler, 1987b). Many PAHs with from four to six rings are carcinogenic (Eisler, 1987b). Compounds such as 7,12-dimethylbenz(a)anthracene and benzo(a)pyrene can induce skin tumors following dermal exposure (Weisburger and Williams, 1980). One isomer of the benzo(a)pyrene metabolite 7,8-dihydrodiol 9,10-epoxide is a very potent carcinogen to newborn

mice (Slaga et al., 1978, as cited in Eisler, 1987b). Some PAH compounds may act in a synergistic or cocarcinogenic manner when combined (Eisler, 1987b).

Studies have not been conducted on the toxicity of PAH compounds to wildlife. A few laboratory studies on rodents have revealed acute oral toxicities of PAHs are greatest for benzo(a)pyrene, followed in decreasing order of toxicity by phenanthrene, naphthalene, and fluoranthene (Sims and Overcash, 1983). LD_{50} values range from 50 mg/kg body weight to 2,000 mg/kg body weight (Sims and Overcash, 1983). Chronic oral doses that result in the production of cancer are lowest for 7,12-dimethylbenz(a)anthracene at a dose of 4.0×10^{-5} to 2.5×10^{-4} mg/kg body weight (Eisler, 1987b). Benzo(a)pyrene concentrations of 0.002 mg/kg body weight and anthracene concentrations of 3,300 mg/kg body weight will also result in cancer following chronic oral exposure to the specific compound (Eisler, 1987b). Based on an estimated laboratory mouse oral NOAEL of 1.0 mg/kg/d for benzo(a)pyrene, Opresko et al. (1994) estimated wildlife NOAELs for benzo(a)pyrene of 1.11 mg/kg/d for the white-footed mouse, 0.296 mg/kg/d for the cottontail rabbit, and 0.191 mg/kg/d for the red fox. Calculated chronic NOAELs for mammalian wildlife exposed to benzo(a)pyrene in drinking water only range from 1.91 to 7.76 mg/L (Opresko et al., 1994).

Aquatic Life

Bioconcentration factors have been reported for aquatic biota exposed to PAHs under laboratory conditions (Eisler, 1987b). Bioconcentration factors for *Daphnia* exposed to specific PAH compounds for a period of at least 24 hours range from 131 for naphthalene to 134,248 for benzo(a)pyrene (Eisler, 1987b). Water to liver bioconcentration factors for freshwater fish exposed to benzo(a)pyrene for a minimum of eight days range from 182 for rainbow trout (*Salmo gairdneri*) to 1,375 for Northern pike (*Esox lucius*) (Eisler, 1987b). There is little evidence for bioaccumulation and biomagnification of PAHs in the aquatic environment (Eisler, 1987b).

The toxicity of PAH compounds to fish is also related to the solubility of the compound in water. Toxicity to aquatic biota also increases as the molecular weight of the PAH compound and the degree of alkyl substitutions on the aromatic ring increase (Eisler, 1987b). The toxicity of PAHs to aquatic organisms is very species-specific and related to the organisms' ability to metabolize and excrete the compound (Eisler, 1987b). Because many species of fish are able to metabolize benzo(a)pyrene to reactive intermediates that have mutagenic and carcinogenic properties, the presence of tumors in fish from PAH-contaminated environments is often related to exposure to PAHs (Eisler, 1987b). Other toxic responses that have been noted in aquatic biota exposed to PAHs include inhibited reproduction in daphnids, delayed emergence of larval midges, decreased

respiration and heart rate in mussels, inhibition of photosynthesis in algae and aquatic macrophytes, and liver enlargement in fish (Eisler, 1987b).

A few Federal Water Quality Criteria exist for the protection of freshwater aquatic life. These are an acute value of 3,980 μg/L for fluoroanthene, an acute value of 30 μg/L and chronic value of 6.3 μg/L for phenanthrene, and an acute value of 2,300 μg/L and a chronic value of 620 μg/L for naphthalene (EPA, 1996). Suter and Mabrey (1994), however, have derived acute and chronic advisory values for freshwater biota exposed to PAHs. These are presented in Table J-1. Also presented in Table J-1 are the lowest chronic values of specific PAHs reported in the literature for fish and daphnids (Suter and Mabrey, 1994). The test EC_{20} for fish can be used as a benchmark indicative of production within a population. It is the highest tested concentration of a specific PAH causing less than 20 percent reduction in either the weight of young fish per initial female fish in a life cycle or partial life-cycle test or the weight of young per egg in an early life-stage test (Suter and Mabrey, 1994). A similar value can be determined for daphnids, which reflects the highest tested concentration of a PAH causing less than 20 percent reduction in the product of growth, fecundity, and survivorship in a chronic test with a daphnid species (Suter and Mabrey, 1994) (Table J-1).

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Table J-1

Benchmarks Screening Values for Freshwater Biota Exposed to Polycyclic Aromatic Hydrocarbons Where No Federal Criteria Exist[a]

Plum Brook Ordnance Works, Sandusky, Ohio

PAH[b]	Advisory Value (µg/L)		Lowest Chronic Value (µg/L)		Lowest Test EC_{20} Value (µg/L)	
	Acute	Chronic	Fish	Daphnids	Fish	Daphnids
Acenaphthene	—	—	74	6,646	<197	—
Anthracene	0.024	0.0013	0.09	<2.1	0.35	>8.2
Benzo(a)anthracene	0.49	0.027	—	0.65	—	—
Benzo(a)pyrene	0.24	0.014	—	0.30	>2.99	—

[a]Benchmark screening values obtained from Suter and Mabrey, 1994.
[b]PAH = Polycyclic aromatic hydrocarbons.

APPENDIX K

ASSESSMENT RECEPTOR PROFILES

Appendix K
Assessment Receptor Profiles

Eastern Cottontail ***(Sylvilagus floridanus)***

These medium-size grazing herbivores are found over most of the eastern half of the United States and southern Canada, and have been widely introduced into the western U.S. (EPA, 1993). The eastern cottontail is unique to the genus because of the large variety of habitats that it occupies, including glades and woodlands, deserts, swamps, prairies, hardwood forests, rain forests, and boreal forests (EPA, 1993). Open grassy areas are generally are used for grazing at night, whereas dense, heavy cover typically is used for shelter during the day (EPA, 1993). During the summer seasons these rabbits consume herbaceous plants (*e.g.* grasses, clover, timothy, and alfalfa), whereas winter diet typically consists of woody vines, shrubs and trees (*e.g.*. birch, maple, and apple) (EPA, 1993). Home range is 3 to 20 acres, with larger ranges in the summer and smaller ranges in the winter (Burt and Grossenheider, 1980). Populations fluctuate from 1 to 4 cottontail per four acres to several per acre in winter conditions (Burt and Grossenheider, 1980). The eastern cottontail breeds from February through September and usually produces 3 to 4 litters per year of 1 to 9 young (usually 4 to 5), however this rabbit's death rate vies with its birth rate, and few rabbits live for more than one year (Whitaker, 1995). The average longevity is 1.25 years (EPA, 1993).

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Deer Mouse *(Peromyscus maniculatus)*

This medium-sized mouse is found in the eastern United States from the Hudson Bay to Pennsylvania, the southern Appalachians, central Arkansas and central Texas. In the west it is found from Mexico to the south Yukon and Northwest Territories (Whitaker, 1995). Deer mice habitat includes nearly every dry land habitat within its range, including forest, grasslands, or a mixture of the two (Burt and Grossenheider, 1980). Nocturnal and active year-round, these mice construct nests in the ground, trees, stumps, and buildings (Burt and Grossenheider, 1980). Omnivorous, the deer mouse feeds on nuts and seeds (e.g., jewel weed and black cherry pits), fruits, beetles, caterpillars, and other insects. Deer mice may cache their food during the fall and winter in the more northern parts of their range (EPA, 1993). Home range is 0.15 to 3 acres (Burt and Grossenheider, 1980; EPA, 1993). Density of populations is 4 to 12 mice per acre, and average life span is two years in the wild (Burt and Grossenheider, 1980). The breeding season is from February to November, depending on latitude. Three to five young are born in each of two to four litters per year (Burt and Grossenheider, 1980). They are greyish to reddish-brown with a white belly, with a distinctly short-haired, bicolor tail (Whitaker, 1995). Weight range is 14.8 (EPA, 1993) to 33 grams (Whitaker, 1995).

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Great Blue Heron *(Ardea herodias)*

The great blue heron is the largest member of its group in North America (99 to 132 centimeters) (EPA, 1993; Bull and Farrand, 1995). It ranges from coastal Alaska, and Nova Scotia south to Mexico (Bull and Farrand, 1995). Habitat of this heron includes both fresh and marine waters, including freshwater lakes and rivers, brackish marshes, lagoons, mangroves, and coastal wetlands, particularly where small fish are plentiful (EPA, 1993). Great blues tend to nest in dense colonies, or heronries. The location of the heronry is generally close to foraging grounds, and tall trees are preferred over shorter trees or bushes for nest sites. Fish are the preferred prey, but the heron will also eat crustaceans, amphibians, reptiles, insects, birds, and mammals. Foraging home range may be as great as 24 kilometers, and population densities along streams and rivers rang from 2.3 to 3.6 birds per kilometer (EPA, 1993). Once a year the female will lay 2 to 7 eggs (Bull and Farrand, 1995), and the first year mortality rate is approximately 64 percent (EPA, 1993).

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Red-Tailed Hawk ***(Buteo jamacensis)***

This carnivorous hawk is one of the most common and widespread members of the genus *Buteo* in the continental United States and Canada (Brown and Amadon, 1968). Red-tailed hawks live in a variety of habitats, such as farmlands, woodlands, mountains, and deserts, as long as there is open country interdispersed with woods, bluffs, or streamside trees. They are primarily carnivorous, feeding on (greater than 85 percent) small rodents, as well as fish. Other prey items include amphibians, reptiles, crayfish, and other birds (Adamcik et al., 1979; Ehrlich et al., 1988). Home range has been reported as approximately 66.8 acres, with a population density of 0.16 pairs per acre (Janes, 1984), although EPA (1993) reports an average territory size of 842 hectares (2,080 acres). Breeding population density is one nest per 0.009 acre or one individual per 0.004 acre. Body weight for male red-tails is 1,028.6 to 1,142.9 grams, and for females 1,371.4 to 1,600 grams (Brown and Amadon, 1968), although EPA (1993) reports an average body weight of 957 grams. They typically mate for life or until one of the pair dies, with pairs clinging to territories year after year (Austing, 1964).

References:

Adamcik, R. S., A. W. Todd, and L. B. Keith, 1979, "Demographic and Dietary Responses of Red-Tailed Hawks During a Snowshoe Hare Fluctuation," ***Canadian Field Naturalist***, Vol. 93, pp. 16-27.

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Ehrlich, P. R., D. S. Dobkin, and D. Wheye, 1988, ***The Birder's Handbook: A field guide to the Natural History of North American Birds***, Simon and Shuster, Inc., New York.

Janes, S. W., 1984, "Influences of Territory Composition and Interspecific Competition on Red-Tailed Hawk Reproductive Success," ***Ecology***, 65:862-870.

U.S. Environmental Protection Agency (EPA), 1993, ***Wildlife Exposure Factors Handbook***, Office of Health and Environmental Assessment, Office of Research and Development, EPA/600/R93/187a.

Raccoon *(Procyon lotor)*

Raccoons are native only in the Americas. Their range extends from the southern edge of the southern provinces of Canada and most of the United States, except for portions of the Rocky Mountain states, central Nevada, and Utah (Whitaker, 1995). The raccoon weighs from 3 to 15 kg (Merritt, 1987: EPA, 1993) and has a head and body length of 46 to 71 centimeters and a tail length of 20 to 30 centimeters (Burt and Grossenheider, 1980). The raccoon is nocturnal and solitary, except when breeding or caring for its young. During particularly cold spells, the raccoon may sleep for several days at a time but does not hibernate (Whitaker, 1995). The raccoon is found along lakes near wooded areas or rock cliffs (Burt and Grossenheider, 1980), but prefers wooded streams (Whitaker, 1995). The raccoon is highly omnivorous and is an opportunistic feeder, consuming virtually any animal or plant matter that is available (Merritt, 1987: EPA, 1993). Animal matter predominates the diet during the spring and early summer; plant matter predominates during late summer, autumn, and winter (Merritt, 1987: EPA, 1993). The home range of the raccoon extends up to 3.2 km across, but usually it is less than 1.6 km. Population densities range from one per acre (highest) to one per 15 acres (considered high) (Burt and Grossenheider, 1980). Captive raccoons live for approximately 14 years (Burt and Grossenheider, 1980). Average body weight is 5.1 kg (EPA, 1993).

References:

Burt, W. H., and R. P. Grossenheider, 1980, "A Field Guide to Mammals," ***Peterson Field Guide Series***, Hougton Mifflin Co., Boston.

Merritt, J. F., 1987, ***Guide to the Mammals of Pennsylvania***, University of Pittsburgh Press, Pennsylvania.

U.S. Environmental Protection Agency (EPA), 1993, ***Wildlife Exposure Factors Handbook, Volume I of II***, Office of Health and Environmental Assessment, Office of Research and Development, EPA/600/R93/187a.

Whitaker Jr., J. O., 1995, ***The Audubon Society Field Guide to North American Mammals***, Alfred A. Knopf, Inc., New York.

Short-tailed Shrew (*Blarina brevicauda*)

This shrew is the largest found in North America. It is solid grey above and below, with a short tail, and weighs between 15 and 29 grams (Whitaker, 1995). Total length of this shrew is 76 to 102 millimeters (Burt and Grossenheider, 1980). The range of this shrew extends from southeastern Canada and the northeastern U.S. to Nebraska, Missouri, Kentucky, and in the mountains to Alabama (Whitaker, 1995). Preferable habitat for the shrew includes forests, grasslands, marshes, and brushy areas. It will make a nest of dry leaves, grass, and hair beneath logs, stumps, rocks, or debris (Burt and Grossenheider, 1980). This underground tunneler may burrow as deep as six feet, and has a voracious appetite, eating one half of its own body weight per day of earthworms, other terrestrial vertebrates, and sometimes young mice (Whitaker, 1995). Mean population densities range from 5.7, in the winter, to 28 per acre in the summer (EPA, 1993). Their home range varies from 0.5 to 1 acre (Burt and Grossenheider, 1980). Longevity is typically around 20 months (EPA, 1993), with 5 to 8 young born to each of 2 to 3 litters (Burt and Grossenheider, 1980).

References:

Burt, W. H. and R. P. Grossenheider, 1980, "A Field Guide to Mammals," ***Peterson Field Guide Series***, Hougton Mifflin Co., Boston.

U.S. Environmental Protection Agency (EPA), 1993, ***Wildlife Exposure Factors Handbook***, Office of Health and Environmental Assessment, Office of Research and Development, EPA/600/R93/187a.

Whitaker Jr., J. O., 1995, ***The Audubon Society Field Guide to North American Mammals***, Alfred A. Knopf, Inc., New York.

White-tailed Deer *(Odocoileus virginianus)*

The white-tailed deer is a member of the Family Cervidae. They are large, even-toed, hoofed mammals with long legs. Their coat is predominantly light brown or chestnut colored, with the underparts being white. Deer are primarily herbivorous grazers and browsers, constantly moving from one food source to the next. The deer's diet changes seasonally. When available, farm crops such as winter wheat, corn, alfalfa, soy beans, and hay are important components of the species diet. Other top food items include wild crab apples, sumac, grasses, green briar, clover, jewelweed, acorns, and dogwood. In regions where the climate varies from season to season, deer may make annual migrations of 10 to 20 miles in the search for food. However, in Ohio, deer typically have rather small home ranges (2 to 3 square miles) and are reluctant to leave this range. The average weight for the species is 88 kilograms for males and 61 kilograms for females. Breeding season ranges from November through February, with the young offspring born in May and early June. Virtually all yearling and adult does conceive each year, and in Ohio usually carry twins. Triplets and quadruplets have also been recorded Gottschang (1981).

References:

Gottschang, J. L., 1981, ***A Guide to the Mammals of Ohio***, The Ohio State University Press, pp. 143-149.

Marsh Wren ***(Cistothorus palustris)***

The marsh wren is a small bird (4 to 4.5 inches in length) which inhabits freshwater cattail marshes and salt marshes. Nesting pairs are not likely to occupy other habitats and the species avoids the wet meadow and sedge meadow habitats preferred by sedge wrens. Marsh wrens breed throughout most of the northern half of the United States and in coastal areas as far south as Florida. The species eats mostly insects, and occasionally snails and other invertebrates. The average body weight is 0.01 kilograms, and the average home range for the species is 0.054 hectares. Because the species is polygamous, there may be more females than males inhabiting a breeding marsh. Densities as high as 120 birds per hectare have been recorded (US EPA, 1993). Marsh wrens' nests are globular structures placed at heights of 2 to 5 feet in dense vegetation. The males commonly build dummy nests in addition to the one where the eggs will be laid (Peterjohn and Rice, 1991).

References:

US EPA, Office of Research and Development, 1993, ***Wildlife Exposure Factors Handbook***, EPA/600/R-93/187a.

Peterjohn, B. G., and Rice, D. L., 1991, ***The Ohio Breeding Bird Atlas***, The Ohio Department of Natural Resources.

APPENDIX L

GLOSSARY OF TERMS (ECOLOGICAL)

Appendix L

Glossary of Terms

Bioconcentration. For aquatic organisms, bioconcentration is the uptake and retention of a substance by an aquatic organism from the surrounding water through gill membranes or other external body surfaces. Terrestrial bioconcentration focuses on uptake and retention of contaminants from the surrounding medium on the organism level (as by the earthworm, for example).

Bioaccumulation. This refers to the uptake and retention of a substance by an aquatic organism from its surrounding medium and food (EPA, 1995b). Terrestrial bioaccumulation, as with aquatic bioaccumulation, is defined as an organism's uptake and retention of a substance from its surrounding medium and food.

Biomagnification. This refers to the process by which tissue concentrations of bioaccumulated toxic substances increase as the substances pass up through two or more trophic levels. The definition of this term is similar for both terrestrial and aquatic organisms.

APPENDIX M

ECOLOGICAL RISK CHARACTERIZATION SPREADSHEETS

Plum Brook Ordnance Works
West Area Red Water Ponds

Chemical Data

Chemical Name	Surface Soil Conc. (mg/kg)	Total Soil Conc. (mg/kg)	Water Conc. (mg/L)	log Kow (organics)	Soil-to-Plant TF	Shallow-rooted Plant Conc. (mg/kgdw)	Deep-rooted Plant Conc. (mg/kgdw)	Soil-to-Invert. BAF	Invert. Conc. (mg/kgdw)	Food-to-Muscle TF
Organics										
Acetone	1.20E-02	1.20E-02		-2.40E-01	5.33E+01	6.40E-01	6.40E-01	1.16E+01	1.40E-01	1.04E-08
Anthracene	2.00E-01	2.00E-01		4.45E+00	1.04E-01	2.07E-02	2.07E-02	2.00E+01	4.00E+00	7.28E-04
Benzo(a)anthracene	2.00E-01	2.00E-01		5.61E+00	2.22E-02	4.43E-03	4.43E-03	2.28E+01	4.57E+00	1.15E-02
Benzo(b)fluoranthene	2.00E-01	2.00E-01		6.06E+00	1.22E-02	2.43E-03	2.43E-03	2.40E+01	4.81E+00	3.35E-02
Benzo(g,h,i)perylene	2.00E-01	2.00E-01		6.51E+00	6.69E-03	1.34E-03	1.34E-03	2.53E+01	5.07E+00	9.77E-02
Benzo(k)fluoranthene	2.00E-01	2.00E-01		6.06E+00	1.22E-02	2.43E-03	2.43E-03	2.40E+01	4.81E+00	3.35E-02
Bromomethane			2.10E-04	1.09E+00	9.08E+00	0.00E+00	0.00E+00	1.36E+01	0.00E+00	2.46E-07
Chrysene	2.00E-01	2.00E-01		5.61E+00	2.22E-02	4.43E-03	4.43E-03	2.28E+01	4.57E+00	1.15E-02
Di-n-octyl phthalate			7.80E-03	5.22E+00	3.72E-02	0.00E+00	0.00E+00	2.18E+01	0.00E+00	4.54E-03
Fluoranthene	2.00E-01	2.00E-01		4.90E+00	5.70E-02	1.14E-02	1.14E-02	2.10E+01	4.21E+00	2.12E-03
Indeno(1,2,3-cd)pyrene	2.00E-01	2.00E-01		6.51E+00	6.69E-03	1.34E-03	1.34E-03	2.53E+01	5.07E+00	9.77E-02
Phenanthrene	2.00E-01	2.00E-01		4.45E+00	1.04E-01	2.07E-02	2.07E-02	2.00E+01	4.00E+00	7.28E-04
Pyrene	2.00E-01	2.00E-01		4.90E+00	5.70E-02	1.14E-02	1.14E-02	2.10E+01	4.21E+00	2.12E-03
1,3-DNB	1.25E-01	1.25E-01	3.00E-04	1.49E+00	5.33E+00	6.66E-01	6.66E-01	1.42E+01	1.78E+00	6.37E-07
4-Amino-2,6-DNT	1.25E-01	1.25E-01		2.00E+00	2.70E+00	3.38E-01	3.38E-01	1.51E+01	1.88E+00	2.14E-06
4-Amino-2-nitrotoluene			6.00E-04	2.00E+00	2.70E+00	0.00E+00	0.00E+00	1.51E+01	0.00E+00	2.14E-06
2,4-DNT	1.25E-01	1.25E-01		1.98E+00	2.78E+00	3.47E-01	3.47E-01	1.50E+01	1.88E+00	2.04E-06
2,6-DNT		1.30E-01	8.00E-04	2.28E+00	1.86E+00	0.00E+00	2.42E-01	1.56E+01	0.00E+00	4.17E-06
3,4-DNT		1.25E-01	6.00E-04	2.28E+00	1.86E+00	0.00E+00	2.33E-01	1.56E+01	0.00E+00	4.17E-06
Nitrobenzene				1.87E+00	3.21E+00	0.00E+00	0.00E+00	1.48E+01	0.00E+00	1.57E-06
3-Nitrotoluene			5.40E-02	2.43E+00	1.53E+00	0.00E+00	0.00E+00	1.58E+01	0.00E+00	5.96E-06
1,3,5-TNB	1.25E-01	1.25E-01		1.18E+00	8.05E+00	1.01E+00	1.01E+00	1.37E+01	1.71E+00	3.05E-07
2,4,6-TNT	1.25E-01	1.25E-01		2.00E+00	2.70E+00	3.38E-01	3.38E-01	1.51E+01	1.88E+00	2.14E-06
Inorganics										
Aluminum			1.38E+01	---	NA	0.00E+00	0.00E+00	NA	0.00E+00	NA
Antimony				---	5.60E-04	0.00E+00	0.00E+00	1.00E+00	0.00E+00	4.00E-05
Beryllium	6.00E-01	6.00E-01		---	5.80E-03	3.48E-03	3.48E-03	1.00E+00	6.00E-01	1.00E-03
Calcium				---	1.90E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	2.00E-03
Iron			2.11E+01	---	NA	0.00E+00	0.00E+00	NA	0.00E+00	NA
Lead			7.70E-02	---	NA	0.00E+00	0.00E+00	NA	0.00E+00	NA
Magnesium			5.07E+01	---	7.80E-01	0.00E+00	0.00E+00	1.00E+00	0.00E+00	2.00E-02
Manganese			1.60E+00	---	NA	0.00E+00	0.00E+00	NA	0.00E+00	NA
Potassium				---	7.80E-01	0.00E+00	0.00E+00	1.00E+00	0.00E+00	2.00E-02
Sodium	2.99E+02	2.99E+02	1.07E+02	---	6.50E-02	1.94E+01	1.94E+01	1.00E+00	2.99E+02	8.00E-02
Vanadium			5.22E-02	---	NA	0.00E+00	0.00E+00	NA	0.00E+00	NA

Plum Brook Ordnance Works
West Area Red Water Ponds

Toxicity Data

Chemical Name	Mammals NOAEL (mg/kg/d)	Mammals Test Species	Mammals Body Wt. (kg)	Birds NOAEL (mg/kg/d)	Birds Test Species	Birds Body Wt. (kg)
Organics						
Acetone	1.00E+01	rat	0.35	--	--	--
Anthracene	1.00E+00	mouse	0.03	--	--	--
Benzo(a)anthracene	1.00E+00	mouse	0.03	--	--	--
Benzo(b)fluoranthene	1.00E+00	mouse	0.03	--	--	--
Benzo(g,h,i)perylene	1.00E+00	mouse	0.03	--	--	--
Benzo(k)fluoranthene	1.00E+00	mouse	0.03	--	--	--
Bromomethane	2.14E+00	rat	0.35	--	--	--
Chrysene	1.00E+00	mouse	0.03	--	--	--
Di-n-octyl phthalate	4.70E+02	rat	0.35	--	--	--
Fluoranthene	1.25E+02	mouse	0.03	--	--	--
Indeno(1,2,3-cd)pyrene	1.00E+00	mouse	0.03	--	--	--
Phenanthrene	1.00E+00	mouse	0.03	--	--	--
Pyrene	7.50E+01	mouse	0.03	--	--	--
1,3-DNB	5.95E-01	rat	0.35	--	--	--
4-Amino-2,6-DNT	9.59E+00	rat	0.35	3.20E-02	unknown	1
4-Amino-2-nitrotoluene	6.86E+01	rat	0.35	3.20E-02	unknown	1
2,4-DNT	2.68E+00	rat	0.35	--	--	--
2,6-DNT	1.77E+00	rat	0.35	--	--	--
3,4-DNT	8.07E+00	rat	0.35	--	--	--
Nitrobenzene	2.30E-01	mouse	0.03	--	--	--
3-Nitrotoluene	1.07E+01	rat	0.35	--	--	--
1,3,5-TNB	2.75E+00	rat	0.35	--	--	--
2,4,6-TNT	7.95E+00	rat	0.35	--	--	--
Inorganics						
Aluminum	1.93E+00	mouse	0.03	1.10E+02	ringed dove	0.155
Antimony	1.25E-01	mouse	0.03	--	--	--
Beryllium	6.60E-01	rat	0.35	--	--	--
Calcium	1.05E+03	rabbit	3.8	2.83E+03	Jap. quail	0.072
Iron	2.60E+01	rabbit	3.8	5.00E+01	poultry	1.6
Lead	8.00E+00	rat	0.35	3.85E+00	Am. Kestrel	0.13
Magnesium	1.58E+02	rabbit	3.8	1.50E+02	poultry	1.6
Manganese	8.80E+01	rat	0.35	9.77E+02	Jap. Quail	0.072
Potassium	1.58E+03	rabbit	3.8	1.00E+03	poultry	1.6
Sodium	1.58E+03	rabbit	3.8	1.00E+03	poultry	1.6
Vanadium	2.10E-01	rat	0.26	1.14E+01	mallard duck	1.17

Plum Brook Ordnance Site
West Area Red Water Ponds

Omnivorous Rodent: **Deer mouse *(Peromyscus manicalatus)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (soil)	Foraging Factor (sw)	Soil Intake (mg/kg-d)	Soil Intake Hazard Quotient	Plant Intake (mg/kg-d)	Plant Intake Hazard Quotient	Invert. Intake (mg/kg-d)	Invert. Intake Hazard Quotient	Soil/Plant/Invert. Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index	Tissue Conc. mg/kg(dw)
Organics																
Acetone	2.21E+01	8.00E+00	2.76E+00	1.00E+00	1.00E+00	4.62E-05	1.68E-05	7.38E-02	2.68E-02	1.03E-02	3.74E-03	3.05E-02	0.00E+00	0.00E+00	3.05E-02	1.03E-08
Anthracene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	7.70E-04	5.16E-03	2.39E-03	1.61E-02	2.95E-01	1.98E+00	2.00E+00	0.00E+00	0.00E+00	2.00E+00	2.54E-03
Benzo(a)anthracene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	7.70E-04	5.16E-03	5.11E-04	3.43E-03	3.37E-01	2.26E+00	2.27E+00	0.00E+00	0.00E+00	2.27E+00	4.55E-02
Benzo(b)fluoranthene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	7.70E-04	5.16E-03	2.81E-04	1.88E-03	3.55E-01	2.38E+00	2.39E+00	0.00E+00	0.00E+00	2.39E+00	1.40E-01
Benzo(g,h,i)perylene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	7.70E-04	5.16E-03	1.54E-04	1.03E-03	3.74E-01	2.51E+00	2.51E+00	0.00E+00	0.00E+00	2.51E+00	4.29E-01
Benzo(k)fluoranthene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	7.70E-04	5.16E-03	2.81E-04	1.88E-03	3.55E-01	2.38E+00	2.39E+00	0.00E+00	0.00E+00	2.39E+00	1.40E-01
Bromomethane	4.72E+00	8.00E+00	5.90E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.12E-05	5.29E-05	5.29E-05	8.99E-11
Chrysene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	7.70E-04	5.16E-03	5.11E-04	3.43E-03	3.37E-01	2.26E+00	2.27E+00	0.00E+00	0.00E+00	2.27E+00	4.55E-02
Di-n-octyl phthalate	1.04E+03	8.00E+00	1.30E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.16E-03	8.95E-06	8.95E-06	6.17E-05
Fluoranthene	1.49E+02	8.00E+00	1.86E+01	1.00E+00	1.00E+00	7.70E-04	4.13E-05	1.32E-03	7.06E-05	3.11E-01	1.67E-02	1.68E-02	0.00E+00	0.00E+00	1.68E-02	7.77E-03
Indeno(1,2,3-cd)pyrene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	7.70E-04	5.16E-03	1.54E-04	1.03E-03	3.74E-01	2.51E+00	2.51E+00	0.00E+00	0.00E+00	2.51E+00	4.29E-01
Phenanthrene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	7.70E-04	5.16E-03	2.39E-03	1.61E-02	2.95E-01	1.98E+00	2.00E+00	0.00E+00	0.00E+00	2.00E+00	2.54E-03
Pyrene	8.95E+01	8.00E+00	1.12E+01	1.00E+00	1.00E+00	7.70E-04	6.89E-05	1.32E-03	1.18E-04	3.11E-01	2.78E-02	2.79E-02	0.00E+00	0.00E+00	2.79E-02	7.77E-03
1,3-DNB	1.31E+00	8.00E+00	1.64E-01	1.00E+00	1.00E+00	4.81E-04	2.94E-03	7.69E-02	4.69E-01	1.31E-01	7.99E-01	1.27E+00	4.46E-05	2.72E-04	1.27E+00	1.56E-06
4-Amino-2,6-DNT	2.11E+01	8.00E+00	2.64E+00	1.00E+00	1.00E+00	4.81E-04	1.82E-04	3.90E-02	1.48E-02	1.39E-01	5.26E-02	6.75E-02	0.00E+00	0.00E+00	6.75E-02	4.48E-06
4-Amino-2-nitrotoluene	1.51E+02	8.00E+00	1.89E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.92E-05	4.72E-06	4.72E-06	2.24E-09
2,4-DNT	5.91E+00	8.00E+00	7.39E-01	1.00E+00	1.00E+00	4.81E-04	6.52E-04	4.01E-02	5.42E-02	1.39E-01	1.88E-01	2.43E-01	0.00E+00	0.00E+00	2.43E-01	4.29E-06
2,6-DNT	3.90E+00	8.00E+00	4.88E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E-04	2.44E-04	2.44E-04	5.81E-09
3,4-DNT	1.78E+01	8.00E+00	2.22E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.92E-05	4.01E-05	4.01E-05	4.36E-09
Nitrobenzene	2.74E-01	8.00E+00	3.43E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Nitrotoluene	2.36E+01	8.00E+00	2.95E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.03E-03	2.72E-03	2.72E-03	5.60E-07
1,3,5-TNB	6.06E+00	8.00E+00	7.58E-01	1.00E+00	1.00E+00	4.81E-04	6.35E-04	1.16E-01	1.53E-01	1.26E-01	1.67E-01	3.21E-01	0.00E+00	0.00E+00	3.21E-01	8.68E-07
2,4,6-TNT	1.75E+01	8.00E+00	2.19E+00	1.00E+00	1.00E+00	4.81E-04	2.20E-04	3.90E-02	1.78E-02	1.39E-01	6.34E-02	8.14E-02	0.00E+00	0.00E+00	8.14E-02	4.48E-06
Inorganics																
Aluminum	2.30E+00	8.00E+00	2.88E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.05E+00	7.13E+00	7.13E+00	0.00E+00
Antimony	1.49E-01	8.00E+00	1.86E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	1.46E+00	8.00E+00	1.82E-01	1.00E+00	1.00E+00	2.31E-03	1.27E-02	4.02E-04	2.21E-03	4.43E-02	2.43E-01	2.58E-01	0.00E+00	0.00E+00	2.58E-01	5.50E-04
Calcium	4.22E+03	8.00E+00	5.27E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	1.04E+02	8.00E+00	1.30E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.14E+00	2.41E-01	2.41E-01	0.00E+00
Lead	1.76E+01	8.00E+00	2.21E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-02	5.19E-03	5.19E-03	0.00E+00
Magnesium	6.32E+02	8.00E+00	7.91E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.54E+00	9.53E-02	9.53E-02	1.77E+00
Manganese	1.94E+02	8.00E+00	2.43E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.38E-01	9.80E-03	9.80E-03	0.00E+00
Potassium	6.32E+03	8.00E+00	7.90E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	6.32E+03	8.00E+00	7.90E+02	1.00E+00	1.00E+00	1.15E+00	1.46E-03	2.24E+00	2.83E-03	2.20E+01	2.79E-02	3.22E-02	1.59E+01	2.01E-02	5.23E-02	3.87E+01
Vanadium	4.30E-01	8.00E+00	5.37E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.76E-03	1.44E-01	1.44E-01	0.00E+00
TOTAL							**6.02E-02**		**7.86E-01**		**1.98E+01**	**2.07E+01**		**7.65E+00**	**2.83E+01**	

Body Weight (kg)	0.0148
Water Intake (L/d)	0.0022
Food Intake (kg(dw)/d)	0.0028
Soil Intake (kg/d)	0.000057
Plant intake (kg(dw)/d) -- 61% of diet	0.001708
Invertebrate intake (kg(dw)/d) -- 39% of diet	0.001092

Plum Brook Ordnance Works
West Area Red Water Ponds

Opportunistic Omnivore: **Raccoon *(Procyon lotor)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (soil)	Foraging Factor (sw)	Soil Intake (mg/kg-d)	Soil Intake Hazard Quotient	Plant Intake (mg/kg-d)	Plant Intake Hazard Quotient	Invert. Intake (mg/kg-d)	Invert. Intake Hazard Quotient	Mouse Intake (mg/kg-d)	Mouse Intake Hazard Quotient	Total Intake Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index
Organics																	
Acetone	5.12E+00	8.00E+00	6.40E-01	1.00E+00	1.00E+00	2.82E-05	4.41E-05	1.37E-02	2.14E-02	2.14E-03	3.34E-03	2.61E-11	4.08E-11	2.48E-02	0.00E+00	0.00E+00	2.48E-02
Anthracene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	4.71E-04	1.36E-02	4.44E-04	1.28E-02	6.11E-02	1.77E+00	6.47E-06	1.87E-04	1.79E+00	0.00E+00	0.00E+00	1.79E+00
Benzo(a)anthracene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	4.71E-04	1.36E-02	9.49E-05	2.74E-03	6.98E-02	2.02E+00	1.16E-04	3.35E-03	2.04E+00	0.00E+00	0.00E+00	2.04E+00
Benzo(b)fluoranthene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	4.71E-04	1.36E-02	5.21E-05	1.51E-03	7.36E-02	2.12E+00	3.56E-04	1.03E-02	2.15E+00	0.00E+00	0.00E+00	2.15E+00
Benzo(g,h,i)perylene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	4.71E-04	1.36E-02	2.86E-05	8.27E-04	7.75E-02	2.24E+00	1.09E-03	3.16E-02	2.28E+00	0.00E+00	0.00E+00	2.28E+00
Benzo(k)fluoranthene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	4.71E-04	1.36E-02	5.21E-05	1.51E-03	7.36E-02	2.12E+00	3.56E-04	1.03E-02	2.15E+00	0.00E+00	0.00E+00	2.15E+00
Bromomethane	1.10E+00	8.00E+00	1.37E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.29E-13	1.67E-12	1.67E-12	1.77E-05	1.29E-04	1.29E-04
Chrysene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	4.71E-04	1.36E-02	9.49E-05	2.74E-03	6.98E-02	2.02E+00	1.16E-04	3.35E-03	2.04E+00	0.00E+00	0.00E+00	2.04E+00
Di-n-octyl phthalate	2.41E+02	8.00E+00	3.01E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.57E-07	5.23E-09	5.23E-09	6.58E-04	2.19E-05	2.19E-05
Fluoranthene	3.46E+01	8.00E+00	4.33E+00	1.00E+00	1.00E+00	4.71E-04	1.09E-04	2.44E-04	5.64E-05	6.44E-02	1.49E-02	1.98E-05	4.58E-06	1.50E-02	0.00E+00	0.00E+00	1.50E-02
Indeno(1,2,3-cd)pyrene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	4.71E-04	1.36E-02	2.86E-05	8.27E-04	7.75E-02	2.24E+00	1.09E-03	3.16E-02	2.28E+00	0.00E+00	0.00E+00	2.28E+00
Phenanthrene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	4.71E-04	1.36E-02	4.44E-04	1.28E-02	6.11E-02	1.77E+00	6.47E-06	1.87E-04	1.79E+00	0.00E+00	0.00E+00	1.79E+00
Pyrene	2.08E+01	8.00E+00	2.60E+00	1.00E+00	1.00E+00	4.71E-04	1.81E-04	2.44E-04	9.40E-05	6.44E-02	2.48E-02	1.98E-05	7.63E-06	2.51E-02	0.00E+00	0.00E+00	2.51E-02
1,3-DNB	3.05E-01	8.00E+00	3.81E-02	1.00E+00	1.00E+00	2.94E-04	7.73E-03	1.43E-02	3.75E-01	2.72E-02	7.14E-01	3.96E-09	1.04E-07	1.10E+00	2.53E-05	6.64E-04	1.10E+00
4-Amino-2,6-DNT	4.91E+00	8.00E+00	6.14E-01	1.00E+00	1.00E+00	2.94E-04	4.79E-04	7.24E-03	1.18E-02	2.88E-02	4.70E-02	1.14E-08	1.86E-08	5.92E-02	0.00E+00	0.00E+00	5.92E-02
4-Amino-2-nitrotoluene	3.51E+01	8.00E+00	4.39E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.71E-12	1.30E-12	1.30E-12	5.06E-05	1.15E-05	1.15E-05
2,4-DNT	1.37E+00	8.00E+00	1.71E-01	1.00E+00	1.00E+00	2.94E-04	1.72E-03	7.43E-03	4.33E-02	2.87E-02	1.68E-01	1.09E-08	6.38E-08	2.13E-01	0.00E+00	0.00E+00	2.13E-01
2,6-DNT	9.06E-01	8.00E+00	1.13E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-11	1.31E-10	1.31E-10	6.75E-05	5.96E-04	5.96E-04
3,4-DNT	4.13E+00	8.00E+00	5.16E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.11E-11	2.15E-11	2.15E-11	5.06E-05	9.80E-05	9.80E-05
Nitrobenzene	6.37E-02	8.00E+00	7.96E-03	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Nitrotoluene	5.49E+00	8.00E+00	6.86E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E-09	2.08E-09	2.08E-09	4.55E-03	6.64E-03	6.64E-03
1,3,5-TNB	1.41E+00	8.00E+00	1.76E-01	1.00E+00	1.00E+00	2.94E-04	1.67E-03	2.16E-02	1.23E-01	2.62E-02	1.49E-01	2.21E-09	1.26E-08	2.73E-01	0.00E+00	0.00E+00	2.73E-01
2,4,6-TNT	4.07E+00	8.00E+00	5.09E-01	1.00E+00	1.00E+00	2.94E-04	5.78E-04	7.24E-03	1.42E-02	2.88E-02	5.66E-02	1.14E-08	2.24E-08	7.14E-02	0.00E+00	0.00E+00	7.14E-02
Inorganics																	
Aluminum	5.34E-01	8.00E+00	6.68E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.16E+00	1.74E+01	1.74E+01
Antimony	3.46E-02	8.00E+00	4.33E-03	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	3.38E-01	8.00E+00	4.22E-02	1.00E+00	1.00E+00	1.41E-03	3.34E-02	7.45E-05	1.76E-03	9.18E-03	2.17E-01	1.40E-06	3.32E-05	2.53E-01	0.00E+00	0.00E+00	2.53E-01
Calcium	9.78E+02	8.00E+00	1.22E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	2.42E+01	8.00E+00	3.02E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.78E+00	5.89E-01	5.89E-01
Lead	4.09E+00	8.00E+00	5.12E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.49E-03	1.27E-02	1.27E-02
Magnesium	1.47E+02	8.00E+00	1.83E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.50E-03	2.45E-04	2.45E-04	4.27E+00	2.33E-01	2.33E-01
Manganese	4.50E+01	8.00E+00	5.63E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E-01	2.40E-02	2.40E-02
Potassium	1.47E+03	8.00E+00	1.83E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	1.47E+03	8.00E+00	1.83E+02	1.00E+00	1.00E+00	7.02E-01	3.83E-03	4.15E-01	2.27E-03	4.57E+00	2.49E-02	9.87E-02	5.38E-04	3.15E-02	9.02E+00	4.92E-02	8.07E-02
Vanadium	9.98E-02	8.00E+00	1.25E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.40E-03	3.53E-01	3.53E-01
TOTAL							**1.59E-01**		**6.28E-01**		**1.77E+01**		**9.16E-02**	**1.86E+01**		**1.87E+01**	**3.73E+01**

Body Weight (kg)	5.1
Water intake (L/d)	0.43
Food intake (kg(dw)/d)	0.26
Soil intake (kg/d)	0.012
Mouse Intake (kg(dw)/d) -- 5 % of diet	0.013
Plant intake (kg(dw)/d) -- 42% of diet	0.1092
Invertebrate intake (kg(dw)/d) -- 30% of diet	0.078

Plum Brook Ordnance Works
West Area Red Water Ponds

Herbivorous Rodent: **Eastern Cottontail *(Sylvilagus floridanus)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (soil)	Foraging Factor (sw)	Soil Intake (mg/kg-d)	Soil Intake Hazard Quotient	Plant Intake (mg/kg-d)	Plant Hazard Quotient	Soil/Plant Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index	Tissue Conc. mg/kg(dw)
Organics														
Acetone	1.34E+01	8.00E+00	1.67E+00	1.00E+00	1.00E+00	6.36E-05	3.81E-05	5.42E-02	3.25E-02	3.25E-02	0.00E+00	0.00E+00	3.25E-02	1.96E-08
Anthracene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	1.06E-03	1.17E-02	1.76E-03	1.95E-02	3.12E-02	0.00E+00	0.00E+00	3.12E-02	7.11E-05
Benzo(a)anthracene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	1.06E-03	1.17E-02	3.76E-04	4.16E-03	1.59E-02	0.00E+00	0.00E+00	1.59E-02	5.72E-04
Benzo(b)fluoranthene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	1.06E-03	1.17E-02	2.06E-04	2.29E-03	1.40E-02	0.00E+00	0.00E+00	1.40E-02	1.47E-03
Benzo(g,h,i)perylene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	1.06E-03	1.17E-02	1.13E-04	1.26E-03	1.30E-02	0.00E+00	0.00E+00	1.30E-02	3.98E-03
Benzo(k)fluoranthene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	1.06E-03	1.17E-02	2.06E-04	2.29E-03	1.40E-02	0.00E+00	0.00E+00	1.40E-02	1.47E-03
Bromomethane	2.86E+00	8.00E+00	3.57E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.04E-05	5.71E-05	5.71E-05	1.74E-10
Chrysene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	1.06E-03	1.17E-02	3.76E-04	4.16E-03	1.59E-02	0.00E+00	0.00E+00	1.59E-02	5.72E-04
Di-n-octyl phthalate	6.28E+02	8.00E+00	7.85E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.58E-04	9.66E-06	9.66E-06	1.19E-04
Fluoranthene	9.03E+01	8.00E+00	1.13E+01	1.00E+00	1.00E+00	1.06E-03	9.39E-05	9.67E-04	8.56E-05	1.79E-04	0.00E+00	0.00E+00	1.79E-04	1.49E-04
Indeno(1,2,3-cd)pyrene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	1.06E-03	1.17E-02	1.13E-04	1.26E-03	1.30E-02	0.00E+00	0.00E+00	1.30E-02	3.98E-03
Phenanthrene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	1.06E-03	1.17E-02	1.76E-03	1.95E-02	3.12E-02	0.00E+00	0.00E+00	3.12E-02	7.11E-05
Pyrene	5.42E+01	8.00E+00	6.77E+00	1.00E+00	1.00E+00	1.06E-03	1.56E-04	9.67E-04	1.43E-04	2.99E-04	0.00E+00	0.00E+00	2.99E-04	1.49E-04
1,3-DNB	7.95E-01	8.00E+00	9.93E-02	1.00E+00	1.00E+00	6.63E-04	6.67E-03	5.65E-02	5.69E-01	5.76E-01	2.92E-05	2.93E-04	5.76E-01	1.26E-06
4-Amino-2,6-DNT	1.28E+01	8.00E+00	1.60E+00	1.00E+00	1.00E+00	6.63E-04	4.14E-04	2.87E-02	1.79E-02	1.83E-02	0.00E+00	0.00E+00	1.83E-02	2.18E-06
4-Amino-2-nitrotoluene	9.16E+01	8.00E+00	1.15E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.83E-05	5.09E-06	5.09E-06	4.33E-09
2,4-DNT	3.58E+00	8.00E+00	4.47E-01	1.00E+00	1.00E+00	6.63E-04	1.48E-03	2.94E-02	6.58E-02	6.73E-02	0.00E+00	0.00E+00	6.73E-02	2.13E-06
2,6-DNT	2.36E+00	8.00E+00	2.95E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.77E-05	2.63E-04	2.63E-04	1.12E-08
3,4-DNT	1.08E+01	8.00E+00	1.35E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.83E-05	4.33E-05	4.33E-05	8.43E-09
Nitrobenzene	1.66E-01	8.00E+00	2.08E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Nitrotoluene	1.43E+01	8.00E+00	1.79E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.25E-03	2.93E-03	2.93E-03	1.08E-06
1,3,5-TNB	3.67E+00	8.00E+00	4.59E-01	1.00E+00	1.00E+00	6.63E-04	1.44E-03	8.54E-02	1.86E-01	1.87E-01	0.00E+00	0.00E+00	1.87E-01	9.09E-07
2,4,6-TNT	1.06E+01	8.00E+00	1.33E+00	1.00E+00	1.00E+00	6.63E-04	4.99E-04	2.87E-02	2.16E-02	2.21E-02	0.00E+00	0.00E+00	2.21E-02	2.18E-06
Inorganics														
Aluminum	1.39E+00	8.00E+00	1.74E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E+00	7.69E+00	7.69E+00	0.00E+00
Antimony	9.03E-02	8.00E+00	1.13E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	8.81E-01	8.00E+00	1.10E-01	1.00E+00	1.00E+00	3.18E-03	2.89E-02	2.95E-04	2.68E-03	3.15E-02	0.00E+00	0.00E+00	3.15E-02	1.21E-04
Calcium	2.55E+03	4.00E+00	6.38E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	6.30E+01	4.00E+00	1.58E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.05E+00	1.30E-01	1.30E-01	0.00E+00
Lead	1.07E+01	8.00E+00	1.34E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.48E-03	5.60E-03	5.60E-03	0.00E+00
Magnesium	3.83E+02	4.00E+00	9.58E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.93E+00	5.14E-02	5.14E-02	3.42E+00
Manganese	1.18E+02	8.00E+00	1.47E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-01	1.06E-02	1.06E-02	0.00E+00
Potassium	3.83E+03	4.00E+00	9.57E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	3.83E+03	4.00E+00	9.57E+02	1.00E+00	1.00E+00	1.58E+00	1.65E-03	1.65E+00	1.72E-03	3.37E-03	1.04E+01	1.09E-02	1.42E-02	3.78E+01
Vanadium	2.60E-01	8.00E+00	3.25E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.07E-03	1.56E-01	1.56E-01	0.00E+00
TOTAL							**1.35E-01**		**9.52E-01**	**1.09E+00**		**8.06E+00**	**9.15E+00**	

Body Weight (kg)	1.132
Water Intake (L/d)	0.11
Food Intake (kg(dw)/d)	0.096
Soil Intake (kg/d)	0.006
Plant Intake (kg(dw)/d) -- 100% of diet	0.096

Plum Brook Ordnance Works
West Area Red Water Ponds

Insectivorous mammal: **Short-tailed shrew *(Blarina brevicauda)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (soil)	Foraging Factor (sw)	Soil Intake (mg/kg-d)	Soil Intake Hazard Quotient	Invert. Intake (mg/kg-d)	Invert. Intake Hazard Quotient	Soil/Invert. Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index	Tissue Conc. mg/kg(dw)
Organics														
Acetone	3.51E+01	8.00E+00	4.39E+00	1.00E+00	1.00E+00	6.64E-04	1.51E-04	7.45E-02	1.70E-02	1.71E-02	0.00E+00	0.00E+00	1.71E-02	4.15E-09
Anthracene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	1.11E-02	4.66E-02	2.13E+00	8.97E+00	9.02E+00	0.00E+00	0.00E+00	9.02E+00	8.27E-03
Benzo(a)anthracene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	1.11E-02	4.66E-02	2.44E+00	1.03E+01	1.03E+01	0.00E+00	0.00E+00	1.03E+01	1.49E-01
Benzo(b)fluoranthene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	1.11E-02	4.66E-02	2.57E+00	1.08E+01	1.08E+01	0.00E+00	0.00E+00	1.08E+01	4.58E-01
Benzo(g,h,i)perylene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	1.11E-02	4.66E-02	2.70E+00	1.14E+01	1.14E+01	0.00E+00	0.00E+00	1.14E+01	1.41E+00
Benzo(k)fluoranthene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	1.11E-02	4.66E-02	2.57E+00	1.08E+01	1.08E+01	0.00E+00	0.00E+00	1.08E+01	4.58E-01
Bromomethane	7.52E+00	8.00E+00	9.40E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.22E-05	3.43E-05	3.43E-05	4.21E-11
Chrysene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	1.11E-02	4.66E-02	2.44E+00	1.03E+01	1.03E+01	0.00E+00	0.00E+00	1.03E+01	1.49E-01
Di-n-octyl phthalate	1.65E+03	8.00E+00	2.06E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-03	5.80E-06	5.80E-06	2.88E-05
Fluoranthene	2.38E+02	8.00E+00	2.97E+01	1.00E+00	1.00E+00	1.11E-02	3.73E-04	2.24E+00	7.56E-02	7.60E-02	0.00E+00	0.00E+00	7.60E-02	2.54E-02
Indeno(1,2,3-cd)pyrene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	1.11E-02	4.66E-02	2.70E+00	1.14E+01	1.14E+01	0.00E+00	0.00E+00	1.14E+01	1.41E+00
Phenanthrene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	1.11E-02	4.66E-02	2.13E+00	8.97E+00	9.02E+00	0.00E+00	0.00E+00	9.02E+00	8.27E-03
Pyrene	1.43E+02	8.00E+00	1.78E+01	1.00E+00	1.00E+00	1.11E-02	6.21E-04	2.24E+00	1.26E-01	1.27E-01	0.00E+00	0.00E+00	1.27E-01	2.54E-02
1,3-DNB	2.09E+00	8.00E+00	2.61E-01	1.00E+00	1.00E+00	6.92E-03	2.65E-02	9.47E-01	3.63E+00	3.65E+00	4.60E-05	1.76E-04	3.65E+00	3.23E-06
4-Amino-2,6-DNT	3.37E+01	8.00E+00	4.21E+00	1.00E+00	1.00E+00	6.92E-03	1.64E-03	1.00E+00	2.39E-01	2.40E-01	0.00E+00	0.00E+00	2.40E-01	1.15E-05
4-Amino-2-nitrotoluene	2.41E+02	8.00E+00	3.01E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.20E-05	3.05E-06	3.05E-06	1.05E-09
2,4-DNT	9.41E+00	8.00E+00	1.18E+00	1.00E+00	1.00E+00	6.92E-03	5.88E-03	1.00E+00	8.52E-01	8.58E-01	0.00E+00	0.00E+00	8.58E-01	1.09E-05
2,6-DNT	6.22E+00	8.00E+00	7.77E-01	1.00E+00	1.00E+00	7.19E-03	9.26E-03	0.00E+00	0.00E+00	9.26E-03	1.23E-04	1.58E-04	9.41E-03	1.62E-07
3,4-DNT	2.83E+01	8.00E+00	3.54E+00	1.00E+00	1.00E+00	6.92E-03	1.95E-03	0.00E+00	0.00E+00	1.95E-03	9.20E-05	2.60E-05	1.98E-03	1.55E-07
Nitrobenzene	4.37E-01	8.00E+00	5.46E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Nitrotoluene	3.77E+01	8.00E+00	4.71E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.28E-03	1.76E-03	1.76E-03	2.62E-07
1,3,5-TNB	9.66E+00	8.00E+00	1.21E+00	1.00E+00	1.00E+00	6.92E-03	5.73E-03	9.14E-01	7.57E-01	7.63E-01	0.00E+00	0.00E+00	7.63E-01	1.49E-06
2,4,6-TNT	2.79E+01	8.00E+00	3.49E+00	1.00E+00	1.00E+00	6.92E-03	1.98E-03	1.00E+00	2.88E-01	2.90E-01	0.00E+00	0.00E+00	2.90E-01	1.15E-05
Inorganics														
Aluminum	3.67E+00	8.00E+00	4.58E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.12E+00	4.62E+00	4.62E+00	0.00E+00
Antimony	2.38E-01	8.00E+00	2.97E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	2.32E+00	8.00E+00	2.90E-01	1.00E+00	1.00E+00	3.32E-02	1.15E-01	3.20E-01	1.10E+00	1.22E+00	0.00E+00	0.00E+00	1.22E+00	1.88E-03
Calcium	6.71E+03	8.00E+00	8.39E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	1.66E+02	8.00E+00	2.07E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.24E+00	1.56E-01	1.56E-01	0.00E+00
Lead	2.81E+01	8.00E+00	3.51E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-02	3.36E-03	3.36E-03	0.00E+00
Magnesium	1.01E+03	8.00E+00	1.26E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.77E+00	6.17E-02	6.17E-02	8.25E-01
Manganese	3.09E+02	8.00E+00	3.86E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.45E-01	6.35E-03	6.35E-03	0.00E+00
Potassium	1.01E+04	8.00E+00	1.26E+03	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	1.01E+04	8.00E+00	1.26E+03	1.00E+00	1.00E+00	1.65E+01	1.31E-02	1.59E+02	1.27E-01	1.40E-01	1.64E+01	1.30E-02	1.53E-01	8.16E+01
Vanadium	6.85E-01	8.00E+00	8.56E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.00E-03	9.35E-02	9.35E-02	0.00E+00
TOTAL							**5.54E-01**		**9.00E+01**			**4.95E+00**	**9.55E+01**	

Body Weight (kg)	0.015
Water intake (L/d)	0.0023
Food intake (kg(dw)/d)	0.008
Soil intake (kg/d)	0.00083
Invertebrate intake (kg(dw)/d)--100% of diet	0.008

Plum Brook Ordnance Works
West Area Red Water Ponds

Herbivorous Mammal: **White-tailed deer *(Odocoileus virginianus)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (soil)	Foraging Factor (sw)	Soil Intake (mg/kg-d)	Soil Intake Hazard Quotient	Plant Intake (mg/kg-d)	Plant Intake Hazard Quotient	Soil/Plant Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index
Organics													
Acetone	5.44E+00	8.00E+00	6.80E-01	1.00E-02	1.00E-02	7.87E-08	1.16E-07	2.10E-04	3.08E-04	3.09E-04	0.00E+00	0.00E+00	3.09E-04
Anthracene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	1.31E-06	3.57E-05	6.80E-06	1.85E-04	2.21E-04	0.00E+00	0.00E+00	2.21E-04
Benzo(a)anthracene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	1.31E-06	3.57E-05	1.45E-06	3.95E-05	7.51E-05	0.00E+00	0.00E+00	7.51E-05
Benzo(b)fluoranthene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	1.31E-06	3.57E-05	7.98E-07	2.17E-05	5.73E-05	0.00E+00	0.00E+00	5.73E-05
Benzo(g,h,i)perylene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	1.31E-06	3.57E-05	4.38E-07	1.19E-05	4.76E-05	0.00E+00	0.00E+00	4.76E-05
Benzo(k)fluoranthene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	1.31E-06	3.57E-05	7.98E-07	2.17E-05	5.73E-05	0.00E+00	0.00E+00	5.73E-05
Bromomethane	1.16E+00	8.00E+00	1.45E-01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-06	5.77E-05	5.77E-05
Chrysene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	1.31E-06	3.57E-05	1.45E-06	3.95E-05	7.51E-05	0.00E+00	0.00E+00	7.51E-05
Di-n-octyl phthalate	2.56E+02	8.00E+00	3.20E+01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.12E-04	9.76E-06	9.76E-06
Fluoranthene	3.68E+01	8.00E+00	4.60E+00	1.00E-02	1.00E-02	1.31E-06	2.85E-07	3.74E-06	8.13E-07	1.10E-06	0.00E+00	0.00E+00	1.10E-06
Indeno(1,2,3-cd)pyrene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	1.31E-06	3.57E-05	4.38E-07	1.19E-05	4.76E-05	0.00E+00	0.00E+00	4.76E-05
Phenanthrene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	1.31E-06	3.57E-05	6.80E-06	1.85E-04	2.21E-04	0.00E+00	0.00E+00	2.21E-04
Pyrene	2.21E+01	8.00E+00	2.76E+00	1.00E-02	1.00E-02	1.31E-06	4.75E-07	3.74E-06	1.35E-06	1.83E-06	0.00E+00	0.00E+00	1.83E-06
1,3-DNB	3.24E-01	8.00E+00	4.05E-02	1.00E-02	1.00E-02	8.20E-07	2.03E-05	2.18E-04	5.40E-03	5.42E-03	1.20E-05	2.97E-04	5.72E-03
4-Amino-2,6-DNT	5.22E+00	8.00E+00	6.52E-01	1.00E-02	1.00E-02	8.20E-07	1.26E-06	1.11E-04	1.70E-04	1.71E-04	0.00E+00	0.00E+00	1.71E-04
4-Amino-2-nitrotoluene	3.73E+01	8.00E+00	4.66E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.40E-05	5.15E-06	5.15E-06
2,4-DNT	1.46E+00	8.00E+00	1.82E-01	1.00E-02	1.00E-02	8.20E-07	4.50E-06	1.14E-04	6.25E-04	6.29E-04	0.00E+00	0.00E+00	6.29E-04
2,6-DNT	9.63E-01	8.00E+00	1.20E-01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	7.94E-05	6.60E-04	6.60E-04	3.20E-05	2.66E-04	9.26E-04
3,4-DNT	4.39E+00	8.00E+00	5.49E-01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	7.63E-05	1.39E-04	1.39E-04	2.40E-05	4.37E-05	1.83E-04
Nitrobenzene	6.77E-02	8.00E+00	8.46E-03	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Nitrotoluene	5.83E+00	8.00E+00	7.29E-01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.16E-03	2.96E-03	2.96E-03
1,3,5-TNB	1.50E+00	8.00E+00	1.87E-01	1.00E-02	1.00E-02	8.20E-07	4.38E-06	3.30E-04	1.77E-03	1.77E-03	0.00E+00	0.00E+00	1.77E-03
2,4,6-TNT	4.32E+00	8.00E+00	5.40E-01	1.00E-02	1.00E-02	8.20E-07	1.52E-06	1.11E-04	2.05E-04	2.07E-04	0.00E+00	0.00E+00	2.07E-04
Inorganics													
Aluminum	5.68E-01	8.00E+00	7.10E-02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.52E-01	7.78E+00	7.78E+00
Antimony	3.68E-02	8.00E+00	4.60E-03	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	3.59E-01	8.00E+00	4.49E-02	1.00E-02	1.00E-02	3.93E-06	8.77E-05	1.14E-06	2.54E-05	1.13E-04	0.00E+00	0.00E+00	1.13E-04
Calcium	1.04E+03	8.00E+00	1.30E+02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	2.57E+01	8.00E+00	3.21E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.44E-01	2.63E-01	2.63E-01
Lead	4.35E+00	8.00E+00	5.44E-01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E-03	5.66E-03	5.66E-03
Magnesium	1.56E+02	8.00E+00	1.95E+01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E+00	1.04E-01	1.04E-01
Manganese	4.79E+01	8.00E+00	5.98E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.40E-02	1.07E-02	1.07E-02
Potassium	1.56E+03	8.00E+00	1.95E+02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	1.56E+03	8.00E+00	1.95E+02	1.00E-02	1.00E-02	1.96E-03	1.00E-05	6.37E-03	3.27E-05	4.27E-05	4.28E+00	2.20E-02	2.20E-02
Vanadium	1.06E-01	8.00E+00	1.33E-02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.09E-03	1.58E-01	1.58E-01
TOTAL							**4.16E-04**		**9.85E-03**	**1.03E-02**		**8.34E+00**	**8.35E+00**

Body Weight (kg)	61
Water Intake (L/d)	4
Food Intake (kg(dw)/d)	2
Soil Intake (kg/d)	0.04
Plant Intake (kg(dw)/d) -- 100% of diet	2

Plum Brook Ordnance Works
West Area Red Water Ponds

Insectivorous Bird: **Marsh wren *(Cistothorus palustris)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (soil)	Foraging Factor (sw)	Soil Intake (mg/kg-d)	Soil Intake Hazard Quotient	Invert. Intake (mg/kg-d)	Invert. Intake Hazard Quotient	Soil/Invert. Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index	Tissue Conc. mg/kg(dw)
Organics														
Acetone	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	2.28E-04	0.00E+00	1.33E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.46E-09
Anthracene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	3.80E-03	0.00E+00	3.80E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.92E-03
Benzo(a)anthracene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	3.80E-03	0.00E+00	4.34E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E-01
Benzo(b)fluoranthene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	3.80E-03	0.00E+00	4.57E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.94E-01
Benzo(g,h,i)perylene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	3.80E-03	0.00E+00	4.81E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.52E+00
Benzo(k)fluoranthene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	3.80E-03	0.00E+00	4.57E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.94E-01
Bromomethane	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.67E-05	0.00E+00	0.00E+00	4.50E-11
Chrysene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	3.80E-03	0.00E+00	4.34E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.61E-01
Di-n-octyl phthalate	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.11E-03	0.00E+00	0.00E+00	3.08E-05
Fluoranthene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	3.80E-03	0.00E+00	4.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E-02
Indeno(1,2,3-cd)pyrene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	3.80E-03	0.00E+00	4.81E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.52E+00
Phenanthrene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	3.80E-03	0.00E+00	3.80E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.92E-03
Pyrene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	3.80E-03	0.00E+00	4.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E-02
1,3-DNB	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	2.38E-03	0.00E+00	1.69E+00	0.00E+00	0.00E+00	8.10E-05	0.00E+00	0.00E+00	3.47E-06
4-Amino-2,6-DNT	3.20E-02	8.00E+00	4.00E-03	1.00E+00	1.00E+00	2.38E-03	5.94E-01	1.79E+00	4.47E+02	4.48E+02	0.00E+00	0.00E+00	4.48E+02	1.24E-05
4-Amino-2-nitrotoluene	3.20E-02	8.00E+00	4.00E-03	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E-04	4.05E-02	4.05E-02	1.12E-09
2,4-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	2.38E-03	0.00E+00	1.79E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-05
2,6-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.16E-04	0.00E+00	0.00E+00	2.91E-09
3,4-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E-04	0.00E+00	0.00E+00	2.18E-09
Nitrobenzene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Nitrotoluene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-02	0.00E+00	0.00E+00	2.80E-07
1,3,5-TNB	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	2.38E-03	0.00E+00	1.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-06
2,4,6-TNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	2.38E-03	0.00E+00	1.79E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-05
Inorganics														
Aluminum	1.10E+02	8.00E+00	1.38E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.73E+00	2.71E-01	2.71E-01	0.00E+00
Antimony	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	1.14E-02	0.00E+00	5.70E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E-03
Calcium	2.83E+03	8.00E+00	3.54E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	5.00E+01	8.00E+00	6.25E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.70E+00	9.12E-01	9.12E-01	0.00E+00
Lead	3.85E+00	8.00E+00	4.81E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.08E-02	4.32E-02	4.32E-02	0.00E+00
Magnesium	1.50E+02	8.00E+00	1.88E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E+01	7.30E-01	7.30E-01	8.83E-01
Manganese	9.77E+02	8.00E+00	1.22E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.32E-01	3.54E-03	3.54E-03	0.00E+00
Potassium	1.00E+03	8.00E+00	1.25E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	1.00E+03	8.00E+00	1.25E+02	1.00E+00	1.00E+00	5.67E+00	4.54E-02	2.84E+02	2.27E+00	2.31E+00	2.89E+01	2.31E-01	2.55E+00	8.21E+01
Vanadium	1.14E+01	8.00E+00	1.43E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E-02	9.89E-03	9.89E-03	0.00E+00
TOTAL							**6.39E-01**		**4.50E+02**	**4.50E+02**		**2.23E+00**	**4.52E+02**	

Body Weight (kg)	0.01
Water Intake (L/d)	0.0027
Food Intake (kg(dw)/d)	0.0095
Soil Intake (kg/d)	0.00019
Plant Intake (kg(dw)/d) -- 0% of diet	0
Invertebrate Intake (kg(dw)/d) – 100% of die	0.0095

Avian predator: **Red-tailed hawk (*Buteo jamaicensis*)**

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (soil)	Foraging Factor (sw)	Soil Intake (mg/kg-d)	Soil Intak Hazard Quotient	Bird Intake (mg/kg-d)	Bird Intak Hazard Quotient	Mouse Intake (mg/kg-d)	Mouse Intake Hazard Quotient	Rabbit Intake (mg/kg-d)	Rabbit Intake Hazard Quotient	Shrew Intake (mg/kg-d)	Shrew Intake Hazard Quotient	Total Intake Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index
Organics																			
Acetone	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	2.51E-07	0.00E+00	1.12E-12	0.00E+00	2.71E-12	0.00E+00	5.19E-12	0.00E+00	1.10E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Anthracene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	4.18E-06	0.00E+00	2.24E-06	0.00E+00	6.72E-07	0.00E+00	1.88E-08	0.00E+00	2.19E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(a)anthracene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	4.18E-06	0.00E+00	4.03E-05	0.00E+00	1.20E-05	0.00E+00	1.51E-07	0.00E+00	3.95E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(b)fluoranthene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	4.18E-06	0.00E+00	1.24E-04	0.00E+00	3.70E-05	0.00E+00	3.89E-07	0.00E+00	1.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(g,h,i)perylene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	4.18E-06	0.00E+00	3.80E-04	0.00E+00	1.13E-04	0.00E+00	1.05E-06	0.00E+00	3.72E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(k)fluoranthene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	4.18E-06	0.00E+00	1.24E-04	0.00E+00	3.70E-05	0.00E+00	3.89E-07	0.00E+00	1.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bromomethane	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	1.13E-14	0.00E+00	2.38E-14	0.00E+00	4.61E-14	0.00E+00	1.11E-14	0.00E+00	0.00E+00	1.25E-07	0.00E+00	0.00E+00
Chrysene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	4.18E-06	0.00E+00	4.03E-05	0.00E+00	1.20E-05	0.00E+00	1.51E-07	0.00E+00	3.95E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Di-n-octyl phthalate	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	7.74E-09	0.00E+00	1.63E-08	0.00E+00	3.16E-08	0.00E+00	7.63E-09	0.00E+00	0.00E+00	4.65E-06	0.00E+00	0.00E+00
Fluoranthene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	4.18E-06	0.00E+00	6.87E-06	0.00E+00	2.06E-06	0.00E+00	3.95E-08	0.00E+00	6.73E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Indeno(1,2,3-cd)pyrene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	4.18E-06	0.00E+00	3.80E-04	0.00E+00	1.13E-04	0.00E+00	1.05E-06	0.00E+00	3.72E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	4.18E-06	0.00E+00	2.24E-06	0.00E+00	6.72E-07	0.00E+00	1.88E-08	0.00E+00	2.19E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pyrene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	4.18E-06	0.00E+00	6.87E-06	0.00E+00	2.06E-06	0.00E+00	3.95E-08	0.00E+00	6.73E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-DNB	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	2.61E-06	0.00E+00	8.71E-10	0.00E+00	4.12E-10	0.00E+00	3.35E-10	0.00E+00	8.54E-10	0.00E+00	0.00E+00	1.79E-07	0.00E+00	0.00E+00
4-Amino-2,6-DNT	3.20E-02	8.00E+00	4.00E-03	1.00E-02	1.00E-02	2.61E-06	6.53E-04	3.11E-09	7.76E-07	1.19E-09	2.96E-07	5.77E-10	1.44E-07	3.05E-09	7.62E-07	6.55E-04	0.00E+00	0.00E+00	6.55E-04
4-Amino-2-nitrotoluene	3.20E-02	8.00E+00	4.00E-03	1.00E-02	1.00E-02	0.00E+00	0.00E+00	2.81E-13	7.02E-11	5.93E-13	1.48E-10	1.15E-12	2.87E-10	2.77E-13	6.93E-11	5.74E-10	3.57E-07	8.93E-05	8.93E-05
2,4-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	2.61E-06	0.00E+00	2.95E-09	0.00E+00	1.14E-09	0.00E+00	5.65E-10	0.00E+00	2.90E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,6-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	7.29E-13	0.00E+00	1.54E-12	0.00E+00	2.98E-12	0.00E+00	4.29E-11	0.00E+00	0.00E+00	4.76E-07	0.00E+00	0.00E+00
3,4-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	5.46E-13	0.00E+00	1.15E-12	0.00E+00	2.23E-12	0.00E+00	4.11E-11	0.00E+00	0.00E+00	3.57E-07	0.00E+00	0.00E+00
Nitrobenzene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Nitrotoluene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	7.03E-11	0.00E+00	1.48E-10	0.00E+00	2.87E-10	0.00E+00	6.93E-11	0.00E+00	0.00E+00	3.22E-05	0.00E+00	0.00E+00
1,3,5-TNB	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	2.61E-06	0.00E+00	4.02E-10	0.00E+00	2.30E-10	0.00E+00	2.41E-10	0.00E+00	3.94E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4,6-TNT	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	2.61E-06	0.00E+00	3.11E-09	0.00E+00	1.19E-09	0.00E+00	5.77E-10	0.00E+00	3.05E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Inorganics																			
Aluminum	1.10E+02	8.00E+00	1.38E+01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.22E-03	5.98E-04	5.98E-04
Antimony	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	1.25E-05	0.00E+00	4.70E-07	0.00E+00	1.46E-07	0.00E+00	3.19E-08	0.00E+00	4.96E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium	2.83E+03	8.00E+00	3.54E+02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	5.00E+01	8.00E+00	6.25E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E-02	2.01E-03	2.01E-03
Lead	3.85E+00	8.00E+00	4.81E-01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.59E-05	9.53E-05	9.53E-05
Magnesium	1.50E+02	8.00E+00	1.88E+01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	2.21E-04	1.18E-05	4.67E-04	2.49E-05	9.05E-04	4.82E-05	2.18E-04	1.17E-05	9.66E-05	3.02E-02	1.61E-03	1.71E-03
Manganese	9.77E+02	8.00E+00	1.22E+02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.53E-04	7.80E-06	7.80E-06
Potassium	1.00E+03	8.00E+00	1.25E+02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	1.00E+03	8.00E+00	1.25E+02	1.00E-02	1.00E-02	6.24E-03	4.99E-05	2.06E-02	1.65E-04	1.02E-02	8.20E-05	1.00E-02	8.01E-05	2.16E-02	1.73E-04	5.49E-04	6.37E-02	5.10E-04	1.06E-03
Vanadium	1.14E+01	8.00E+00	1.43E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.11E-05	2.18E-05	2.18E-05
TOTAL							**7.03E-04**		**1.77E-04**		**1.07E-04**		**1.28E-04**		**1.85E-04**	**1.30E-03**		**4.94E-03**	**6.24E-03**

Body Weight (kg)	0.957
Water Intake (L/d)	0.057
Food Intake (kg(dw)/d)	0.1
Soil Intake (kg/d)	0.002
Bird Intake (kg(dw)/d) -- 24% of diet	0.024
Mouse Intake (kg(dw)/d) -- 25.3% of diet	0.025333
Shrew Intake (kg(dw)/d) -- 25.3% of diet	0.025333
Rabbit Intake (kg(dw)/d) -- 25.3% of diet	0.025333

Chemical Data

Chemical Name	Sediment Conc. (mg/kg)	Water Conc. (mg/L)	log Kow (organics)	Kow (organics)	log Koc (organics) (mL/g)	Koc (organics) (mL/g)	Kd (inorganics) (mL/g)	Foc	Water-to-Fish/Invert BCF	Food Chain Multiplier	Water-to-Fish BAF	Fish Conc. (mg/kgww)	Fish Conc. (mg/kgdw)	Pore water Conc. (mg/L)	Solubility (mg/L)	< of the PoreH2O or Solubility	Invert. Conc. (mg/kgww)	Invert Conc. (mg/kgdw)	Food-to-Muscle TF
Organics																			
Acetone	1.10E-01		-2.40E-01	5.75E-01	-2.36E-01	5.81E-01	---	6.70E-02	5.75E-01	1.00E+00	5.75E-01	0.00E+00	0.00E+00	2.82E+00		2.82E+00	1.63E+00	6.50E+00	1.04E-08
Bromomethane		2.10E-04	1.09E+00	1.23E+01	1.07E+00	1.18E+01	---	6.70E-02	1.23E+01	1.00E+00	1.23E+01	2.58E-03	8.07E-03	0.00E+00		0.00E+00	0.00E+00	0.00E+00	2.46E-07
Carbazole			3.29E+00	1.95E+03	3.23E+00	1.72E+03	---	6.70E-02	1.95E+03	1.01E+00	1.97E+03	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	4.61E-05
Dibenzofuran			4.12E+00	1.32E+04	4.05E+00	1.12E+04	---	6.70E-02	1.32E+04	1.10E+00	1.44E+04	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	3.32E-04
Di-n-octyl phthalate		7.80E-03	5.22E+00	1.66E+05	5.13E+00	1.35E+05	---	6.70E-02	1.66E+05	4.05E+00	6.72E+05	5.24E+03	1.64E+04	0.00E+00		0.00E+00	0.00E+00	0.00E+00	4.54E-03
Methylene chloride	2.00E-02		1.26E+00	1.82E+01	1.24E+00	1.73E+01	---	6.70E-02	1.82E+01	1.00E+00	1.82E+01	0.00E+00	0.00E+00	1.72E-02		1.72E-02	3.13E-01	1.25E+00	3.69E-07
Methyl ethyl ketone	2.90E-02		2.80E-01	1.91E+00	2.76E-01	1.89E+00	---	6.70E-02	1.91E+00	1.01E+00	1.92E+00	0.00E+00	0.00E+00	2.30E-01		2.30E-01	4.37E-01	1.75E+00	3.58E-08
1,3-DNB	7.00E-01	3.00E-04	1.49E+00	3.09E+01	1.46E+00	2.92E+01	---	6.70E-02	3.09E+01	1.00E+00	3.09E+01	9.27E-03	2.90E-02	3.58E-01		3.58E-01	1.11E+01	4.43E+01	6.37E-07
2-Amino-4,6-DNT	3.00E-01		2.00E+00	1.00E+02	1.97E+00	9.25E+01	---	6.70E-02	1.00E+02	1.00E+00	1.00E+02	0.00E+00	0.00E+00	4.84E-02		4.84E-02	4.84E+00	1.94E+01	2.14E-06
4-Amino-2-NT		6.00E-04	2.00E+00	1.00E+02	1.97E+00	9.25E+01	---	6.70E-02	1.00E+02	1.00E+00	1.00E+02	6.00E-02	1.88E-01	0.00E+00		0.00E+00	0.00E+00	0.00E+00	2.14E-06
2,6-DNB			1.49E+00	3.09E+01	1.46E+00	2.92E+01	---	6.70E-02	3.09E+01	1.00E+00	3.09E+01	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	6.37E-07
2,4-DNT	7.00E-01		1.98E+00	9.55E+01	1.95E+00	8.84E+01	---	6.70E-02	9.55E+01	1.00E+00	9.55E+01	0.00E+00	0.00E+00	1.18E-01		1.18E-01	1.13E+01	4.51E+01	2.04E-06
2,6-DNT	4.00E-01	8.00E-04	2.28E+00	1.91E+02	2.24E+00	1.74E+02	---	6.70E-02	1.91E+02	1.00E+00	1.91E+02	1.52E-01	4.76E-01	3.42E-02		3.42E-02	6.52E+00	2.61E+01	4.17E-06
3,4-DNT		6.00E-04	2.28E+00	1.91E+02	2.24E+00	1.74E+02	---	6.70E-02	1.91E+02	1.00E+00	1.91E+02	1.14E-01	3.57E-01	0.00E+00		0.00E+00	0.00E+00	0.00E+00	4.17E-06
3-NT		5.40E-02	2.43E+00	2.69E+02	2.39E+00	2.45E+02	---	6.70E-02	2.69E+02	1.00E+00	2.70E+02	1.46E+01	4.55E+01	0.00E+00		0.00E+00	0.00E+00	0.00E+00	5.96E-06
1,3,5-TNB	8.00E-01		1.18E+00	1.51E+01	1.16E+00	1.45E+01	---	6.70E-02	1.51E+01	1.00E+00	1.51E+01	0.00E+00	0.00E+00	8.26E-01		8.26E-01	1.25E+01	5.00E+01	3.05E-07
2,4,6-TNT			2.00E+00	1.00E+02	1.97E+00	9.25E+01	---	6.70E-02	1.00E+02	1.00E+00	1.00E+02	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	2.14E-06
Inorganics																			
Aluminum	9.60E+03	1.38E+01	---	---	---	---	1.50E+03	6.70E-02	1.00E+02	1.00E+00	1.00E+02	1.38E+03	4.31E+03	6.40E+00	9.80E-01	9.80E-01	9.80E+01	3.92E+02	NA
Arsenic	6.50E+00		---	---	---	---	2.00E+02	6.70E-02	4.40E+01	1.00E+00	4.40E+01	0.00E+00	0.00E+00	3.25E-02		3.25E-02	1.43E+00	5.72E+00	4.00E-03
Barium	6.50E+01		---	---	---	---	6.00E+01	6.70E-02	4.00E+00	1.00E+00	4.00E+00	0.00E+00	0.00E+00	1.08E+00		1.08E+00	4.33E+00	1.73E+01	2.00E-04
Calcium	7.47E+04		---	---	---	---	4.10E+00	6.70E-02	1.00E+02	1.00E+00	1.00E+02	0.00E+00	0.00E+00	1.82E+04	1.31E+03	1.31E+03	1.31E+05	5.24E+05	2.00E-03
Chromium	1.81E+01		---	---	---	---	8.50E+02	6.70E-02	2.00E+02	1.00E+00	2.00E+02	0.00E+00	0.00E+00	2.13E-02		2.13E-02	4.26E+00	1.70E+01	NA
Copper	2.45E+01		---	---	---	---	3.50E+01	6.70E-02	2.00E+02	1.00E+00	2.00E+02	0.00E+00	0.00E+00	7.00E-01		7.00E-01	1.40E+02	5.60E+02	NA
Iron	2.43E+04	2.11E+01	---	---	---	---	5.00E+03	6.70E-02	2.00E+02	1.00E+00	2.00E+02	4.22E+03	1.32E+04	4.86E+00	6.70E+01	4.86E+00	9.72E+02	3.89E+03	NA
Lead	1.88E+01	7.70E-02	---	---	---	---	4.00E+02	6.70E-02	3.00E+02	1.00E+00	3.00E+02	2.31E+01	7.22E+01	4.70E-02		4.70E-02	1.41E+01	5.64E+01	NA
Magnesium	6.77E+03	5.07E+01	---	---	---	---	4.60E+00	6.70E-02	1.00E+02	1.00E+00	1.00E+02	5.07E+03	1.58E+04	1.47E+03	6.20E+00	6.20E+00	6.20E+02	2.48E+03	2.00E-02
Manganese	2.99E+02	1.60E+00	---	---	---	---	1.00E+03	6.70E-02	4.00E+02	1.00E+00	4.00E+02	6.40E+02	2.00E+03	2.99E-01		2.99E-01	1.20E+02	4.78E+02	NA
Phosphorus	3.10E+00		---	---	---	---	3.50E+00	6.70E-02	5.00E+04	1.00E+00	5.00E+04	0.00E+00	0.00E+00	8.86E-01		8.86E-01	4.43E+04	1.77E+05	NA
Potassium	1.35E+03		---	---	---	---	5.60E+00	6.70E-02	1.00E+02	1.00E+00	1.00E+02	0.00E+00	0.00E+00	2.42E+02		2.42E+02	2.42E+04	9.66E+04	1.00E+00
Sodium		1.07E+02	---	---	---	---	NA	6.70E-02	2.00E+01	1.00E+00	2.00E+01	2.14E+03	6.69E+03	0.00E+00		0.00E+00	0.00E+00	0.00E+00	6.50E-02
Vanadium	2.50E+01	5.22E-02	---	---	---	---	1.00E+03	6.70E-02	1.00E+02	1.00E+00	1.00E+02	5.22E+00	1.63E+01	2.50E-02		2.50E-02	2.50E+00	1.00E+01	NA

Toxicity Data

Chemical Name	Mammals NOAEL (mg/kg/d)	Mammals Test Species	Mammals Body Wt. (kg)	Birds NOAEL (mg/kg/d)	Birds Test Species	Birds Body Wt. (kg)
Organics						
Acetone	1.00E+01	rat	0.35	--	--	--
Bromomethane	2.14E+00	rat	0.35	--	--	--
Carbazole	2.00E+00	mouse	0.03	--	--	--
Dibenzofuran	--	--	--	--	--	--
Di-n-octyl phthalate	4.70E+02	rat	0.35	--	--	--
Methylene chloride	5.85E+00	rat	0.35	--	--	--
Methyl ethyl ketone	1.77E+03	rat	0.35	--	--	--
1,3-DNB	5.95E-01	rat	0.35	--	--	--
2-Amino-4,6-DNT	1.39E+01	rat	0.35	3.20E-02	unknown	1
4-Amino-2-NT	6.86E+01	rat	0.35	3.20E-02	unknown	1
2,6-DNB	4.00E-01	rat	0.35	--	--	--
2,4-DNT	2.68E+00	rat	0.35	--	--	--
2,6-DNT	1.77E+00	rat	0.35	--	--	--
3,4-DNT	8.07E+00	rat	0.35	--	--	--
3-NT	1.07E+01	rat	0.35	--	--	--
1,3,5-TNB	2.75E+00	rat	0.35	--	--	--
2,4,6-TNT	7.95E+00	rat	0.35	--	--	--
Inorganics						
Aluminum	1.93E+00	mouse	0.03	1.10E+02	ringed dove	0.155
Arsenic	1.26E-01	mouse	0.03	2.46E+00	cowbird	0.049
Barium	5.10E+00	rat	0.435	2.08E+01	chicks	0.121
Calcium	1.05E+03	rabbit	3.8	2.83E+03	Jap. Quail	0.072
Chromium	2.74E+03	rat	0.35	1.00E+00	black duck	1.25
Copper	1.17E+01	mink	1	4.70E+01	chicks	0.534
Iron	2.60E+01	rabbit	3.8	5.00E+01	poultry	1.6
Lead	8.00E+00	rat	0.35	3.85E+00	Am. Kestrel	0.13
Magnesium	1.58E+02	rabbit	3.8	1.50E+02	poultry	1.6
Manganese	8.80E+01	rat	0.35	9.77E+02	Jap. Quail	0.072
Phosphorus	5.26E+02	rabbit	3.8	4.00E+02	poultry	1.6
Potassium	1.58E+03	rabbit	3.8	1.00E+03	poultry	1.6
Sodium	1.58E+03	rabbit	3.8	1.00E+03	poultry	1.6
Vanadium	2.10E-01	rat	0.26	1.14E+01	mallard duck	1.17

Plum Brook Ordnance Works
West Area Red Water Ponds

Piscivorous Bird: **Great Blue Heron *(Ardea herodias)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (sed./sw.)	Sediment Intake (mg/kg-d)	Sediment Hazard Quotient	Fish Intake (mg/kg-d)	Fish Hazard Quotient	Macroinvert Intake (mg/kg-d)	Macroinvert Hazard Quotient	Total Intake Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index
Organics														
Acetone	0.00E+00	8.00E+00	0.00E+00	1.00E+00	3.94E-04	NA	0.00E+00	NA	4.72E-02	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bromomethane	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	1.41E-03	NA	0.00E+00	NA	0.00E+00	9.53E-06	0.00E+00	0.00E+00
Carbazole	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibenzofuran	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Di-n-octyl phthalate	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	2.85E+03	NA	0.00E+00	NA	0.00E+00	3.54E-04	0.00E+00	0.00E+00
Methylene chloride	0.00E+00	8.00E+00	0.00E+00	1.00E+00	7.17E-05	NA	0.00E+00	NA	9.10E-03	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl ethyl ketone	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.04E-04	NA	0.00E+00	NA	1.27E-02	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-DNB	0.00E+00	8.00E+00	0.00E+00	1.00E+00	2.51E-03	NA	5.05E-03	NA	3.21E-01	NA	0.00E+00	1.36E-05	0.00E+00	0.00E+00
2-Amino-4,6-DNT	3.20E-02	8.00E+00	4.00E-03	1.00E+00	1.08E-03	2.69E-01	0.00E+00	0.00E+00	1.41E-01	3.51E+01	3.54E+01	0.00E+00	0.00E+00	3.54E+01
4-Amino-2-NT	3.20E-02	8.00E+00	4.00E-03	1.00E+00	0.00E+00	0.00E+00	3.27E-02	8.17E+00	0.00E+00	0.00E+00	8.17E+00	2.72E-05	6.81E-03	8.17E+00
2,6-DNB	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	2.51E-03	NA	0.00E+00	NA	3.28E-01	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,6-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.43E-03	NA	8.30E-02	NA	1.89E-01	NA	0.00E+00	3.63E-05	0.00E+00	0.00E+00
3,4-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	6.22E-02	NA	0.00E+00	NA	0.00E+00	2.72E-05	0.00E+00	0.00E+00
3-NT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	7.93E+00	NA	0.00E+00	NA	0.00E+00	2.45E-03	0.00E+00	0.00E+00
1,3,5-TNB	0.00E+00	8.00E+00	0.00E+00	1.00E+00	2.87E-03	NA	0.00E+00	NA	3.63E-01	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4,6-TNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Inorganics														
Aluminum	1.10E+02	8.00E+00	1.38E+01	1.00E+00	3.44E+01	2.50E+00	7.51E+02	5.46E+01	2.85E+00	2.07E-01	5.74E+01	6.26E-01	4.55E-02	5.74E+01
Arsenic	2.46E+00	8.00E+00	3.08E-01	1.00E+00	2.33E-02	7.58E-02	0.00E+00	0.00E+00	4.15E-02	1.35E-01	2.11E-01	0.00E+00	0.00E+00	2.11E-01
Barium	2.08E+01	8.00E+00	2.60E+00	1.00E+00	2.33E-01	8.96E-02	0.00E+00	0.00E+00	1.26E-01	4.84E-02	1.38E-01	0.00E+00	0.00E+00	1.38E-01
Calcium	2.83E+03	8.00E+00	3.54E+02	1.00E+00	2.68E+02	7.56E-01	0.00E+00	0.00E+00	3.80E+03	1.07E+01	1.15E+01	0.00E+00	0.00E+00	1.15E+01
Chromium	1.00E+00	8.00E+00	1.25E-01	1.00E+00	6.49E-02	5.19E-01	0.00E+00	0.00E+00	1.24E-01	9.89E-01	1.51E+00	0.00E+00	0.00E+00	1.51E+00
Copper	4.70E+01	8.00E+00	5.88E+00	1.00E+00	8.78E-02	1.49E-02	0.00E+00	0.00E+00	4.07E+00	6.92E-01	7.07E-01	0.00E+00	0.00E+00	7.07E-01
Iron	5.00E+01	8.00E+00	6.25E+00	1.00E+00	8.71E+01	1.39E+01	2.30E+03	3.68E+02	2.82E+01	4.52E+00	3.86E+02	9.57E-01	1.53E-01	3.86E+02
Lead	3.85E+00	8.00E+00	4.81E-01	1.00E+00	6.74E-02	1.40E-01	1.26E+01	2.61E+01	4.09E-01	8.51E-01	2.71E+01	3.49E-03	7.26E-03	2.71E+01
Magnesium	1.50E+02	8.00E+00	1.88E+01	1.00E+00	2.43E+01	1.29E+00	2.76E+03	1.47E+02	1.80E+01	9.60E-01	1.49E+02	2.30E+00	1.23E-01	1.50E+02
Manganese	9.77E+02	8.00E+00	1.22E+02	1.00E+00	1.07E+00	8.78E-03	3.48E+02	2.85E+00	3.47E+00	2.84E-02	2.89E+00	7.26E-02	5.94E-04	2.89E+00
Phosphorus	4.00E+02	8.00E+00	5.00E+01	1.00E+00	1.11E-02	2.22E-04	0.00E+00	0.00E+00	1.29E+03	2.57E+01	2.57E+01	0.00E+00	0.00E+00	2.57E+01
Potassium	1.00E+03	8.00E+00	1.25E+02	1.00E+00	4.85E+00	3.88E-02	0.00E+00	0.00E+00	7.02E+02	5.61E+00	5.65E+00	0.00E+00	0.00E+00	5.65E+00
Sodium	1.00E+03	8.00E+00	1.25E+02	1.00E+00	0.00E+00	0.00E+00	1.17E+03	9.32E+00	0.00E+00	0.00E+00	9.32E+00	4.85E+00	3.88E-02	9.36E+00
Vanadium	1.14E+01	8.00E+00	1.43E+00	1.00E+00	8.96E-02	6.29E-02	2.84E+00	1.99E+00	7.26E-02	5.09E-02	2.11E+00	2.37E-03	1.66E-03	2.11E+00
TOTAL						**1.97E+01**		**6.18E+02**		**8.57E+01**	**7.23E+02**		**3.77E-01**	**7.24E+02**

Body Weight (kg)	2.204
Water intake (L/d)	0.1
Food intake (kg(dw)/d)	0.4
Sediment intake (kg/d)	0.0079
Fish intake (kg(dw)/d) -- 96% of diet	0.384
Macroinvert intake (kg(dw)/d) -- 4% of diet	0.016

Omnivorous mammal: **Raccoon *(Procyon lotor)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (sed./sw.)	Sediment Intake (mg/kg-d)	Sediment Hazard Quotient	Aq. Invert. Intake (mg/kg-d)	Aq. Invert. Hazard Quotient	Fish Intake (mg/kg-d)	Fish Hazard Quotient	Total Intake Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index
Organics														
Acetone	5.12E+00	8.00E+00	6.40E-01	1.00E+00	2.59E-04	4.05E-04	6.96E-02	1.09E-01	0.00E+00	0.00E+00	1.09E-01	0.00E+00	0.00E+00	1.09E-01
Bromomethane	1.10E+00	8.00E+00	1.37E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.23E-06	6.01E-05	6.01E-05	8.85E-06	6.47E-05	1.25E-04
Carbazole	5.54E-01	8.00E+00	6.92E-02	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibenzofuran	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	NA	0.00E+00	0.00E+00	0.00E+00
Di-n-octyl phthalate	2.41E+02	8.00E+00	3.01E+01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.67E+01	5.56E-01	5.56E-01	3.29E-04	1.09E-05	5.56E-01
Methylene chloride	2.99E+00	8.00E+00	3.74E-01	1.00E+00	4.71E-05	1.26E-04	1.34E-02	3.59E-02	0.00E+00	0.00E+00	3.60E-02	0.00E+00	0.00E+00	3.60E-02
Methyl ethyl ketone	9.06E+02	8.00E+00	1.13E+02	1.00E+00	6.82E-05	6.02E-07	1.87E-02	1.65E-04	0.00E+00	0.00E+00	1.66E-04	0.00E+00	0.00E+00	1.66E-04
1,3-DNB	3.05E-01	8.00E+00	3.81E-02	1.00E+00	1.65E-03	4.33E-02	4.74E-01	1.25E+01	2.95E-05	7.76E-04	1.25E+01	1.26E-05	3.32E-04	1.25E+01
2-Amino-4,6-DNT	7.13E+00	8.00E+00	8.92E-01	1.00E+00	7.06E-04	7.91E-04	2.07E-01	2.32E-01	0.00E+00	0.00E+00	2.33E-01	0.00E+00	0.00E+00	2.33E-01
4-Amino-2-NT	3.51E+01	8.00E+00	4.39E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-04	4.36E-05	4.36E-05	2.53E-05	5.76E-06	4.93E-05
2,6-DNB	2.05E-01	8.00E+00	2.56E-02	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-DNT	1.37E+00	8.00E+00	1.71E-01	1.00E+00	1.65E-03	9.61E-03	4.83E-01	2.82E+00	0.00E+00	0.00E+00	2.83E+00	0.00E+00	0.00E+00	2.83E+00
2,6-DNT	9.06E-01	8.00E+00	1.13E-01	1.00E+00	9.41E-04	8.31E-03	2.79E-01	2.47E+00	4.86E-04	4.29E-03	2.48E+00	3.37E-05	2.98E-04	2.48E+00
3,4-DNT	4.13E+00	8.00E+00	5.16E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.64E-04	7.06E-04	7.06E-04	2.53E-05	4.90E-05	7.55E-04
3-NT	5.49E+00	8.00E+00	6.86E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.64E-02	6.77E-02	6.77E-02	2.28E-03	3.32E-03	7.10E-02
1,3,5-TNB	1.41E+00	8.00E+00	1.76E-01	1.00E+00	1.88E-03	1.07E-02	5.35E-01	3.04E+00	0.00E+00	0.00E+00	3.05E+00	0.00E+00	0.00E+00	3.05E+00
2,4,6-TNT	4.07E+00	8.00E+00	5.09E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Inorganics														
Aluminum	5.34E-01	8.00E+00	6.68E-02	1.00E+00	2.26E+01	3.38E+02	4.20E+00	6.28E+01	4.40E+00	6.58E+01	4.67E+02	5.82E-01	8.71E+00	4.75E+02
Arsenic	3.49E-02	8.00E+00	4.36E-03	1.00E+00	1.53E-02	3.51E+00	6.12E-02	1.40E+01	0.00E+00	0.00E+00	1.75E+01	0.00E+00	0.00E+00	1.75E+01
Barium	2.76E+00	8.00E+00	3.45E-01	1.00E+00	1.53E-01	4.44E-01	1.86E-01	5.39E-01	0.00E+00	0.00E+00	9.83E-01	0.00E+00	0.00E+00	9.83E-01
Calcium	9.78E+02	8.00E+00	1.22E+02	1.00E+00	1.76E+02	1.44E+00	5.61E+03	4.59E+01	0.00E+00	0.00E+00	4.73E+01	0.00E+00	0.00E+00	4.73E+01
Chromium	1.40E+03	8.00E+00	1.75E+02	1.00E+00	4.26E-02	2.43E-04	1.82E-01	1.04E-03	0.00E+00	0.00E+00	1.28E-03	0.00E+00	0.00E+00	1.28E-03
Copper	7.79E+00	8.00E+00	9.73E-01	1.00E+00	5.76E-02	5.92E-02	6.00E+00	6.16E+00	0.00E+00	0.00E+00	6.22E+00	0.00E+00	0.00E+00	6.22E+00
Iron	2.42E+01	8.00E+00	3.02E+00	1.00E+00	5.72E+01	1.89E+01	4.16E+01	1.38E+01	1.34E+01	4.45E+00	3.72E+01	8.90E-01	2.95E-01	3.75E+01
Lead	4.09E+00	8.00E+00	5.12E-01	1.00E+00	4.42E-02	8.64E-02	6.04E-01	1.18E+00	7.36E-02	1.44E-01	1.41E+00	3.25E-03	6.34E-03	1.42E+00
Magnesium	1.47E+02	8.00E+00	1.83E+01	1.00E+00	1.59E+01	8.68E-01	2.66E+01	1.45E+00	1.62E+01	8.80E-01	3.20E+00	2.14E+00	1.16E-01	3.31E+00
Manganese	4.50E+01	8.00E+00	5.63E+00	1.00E+00	7.04E-01	1.25E-01	5.12E+00	9.10E-01	2.04E+00	3.62E-01	1.40E+00	6.75E-02	1.20E-02	1.41E+00
Phosphorus	4.89E+02	8.00E+00	6.11E+01	1.00E+00	7.29E-03	1.19E-04	1.90E+03	3.10E+01	0.00E+00	0.00E+00	3.10E+01	0.00E+00	0.00E+00	3.10E+01
Potassium	1.47E+03	8.00E+00	1.83E+02	1.00E+00	3.18E+00	1.74E-02	1.03E+03	5.64E+00	0.00E+00	0.00E+00	5.66E+00	0.00E+00	0.00E+00	5.66E+00
Sodium	1.47E+03	8.00E+00	1.83E+02	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.82E+00	3.72E-02	3.72E-02	4.51E+00	2.46E-02	6.18E-02
Vanadium	9.98E-02	8.00E+00	1.25E-02	1.00E+00	5.88E-02	4.72E+00	1.07E-01	8.58E+00	1.66E-02	1.33E+00	1.46E+01	2.20E-03	1.76E-01	1.48E+01
TOTAL						**3.68E+02**		**2.13E+02**		**7.37E+01**	**6.55E+02**		**9.34E+00**	**6.65E+02**

Body Weight (kg)	5.1
Water intake (L/d)	0.215
Food intake (kg(dw)/d)	0.26
Sediment intake (kg/d)	0.012
Aquatic Invert. Intake (kg(dw)/d -- 21% of diet	0.0546
Fish intake (kg(dw)/d) -- 2% of diet	0.0052

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds

Chemical Data

Chemical Name	Surface Soil Conc. (mg/kg)	Total Soil Conc. (mg/kg)	Water Conc. (mg/L)	log Kow (organics)	Soil-to-Plant TF	Shallow-rooted Plant Conc. (mg/kgdw)	Deep-rooted Plant Conc. (mg/kgdw)	Soil-to-Invert. BAF	Invert. Conc. (mg/kgdw)	Food-to-Muscle TF
Organics										
Acetone		1.25E-02		-2.40E-01	5.33E+01	0.00E+00	6.66E-01	1.16E+01	0.00E+00	1.04E-08
Anthracene				4.45E+00	1.04E-01	0.00E+00	0.00E+00	2.00E+01	0.00E+00	7.28E-04
Benzo(a)anthracene				5.61E+00	2.22E-02	0.00E+00	0.00E+00	2.28E+01	0.00E+00	1.15E-02
Benzo(b)fluoranthene				6.06E+00	1.22E-02	0.00E+00	0.00E+00	2.40E+01	0.00E+00	3.35E-02
Benzo(g,h,i)perylene				6.51E+00	6.69E-03	0.00E+00	0.00E+00	2.53E+01	0.00E+00	9.77E-02
Benzo(k)fluoranthene				6.06E+00	1.22E-02	0.00E+00	0.00E+00	2.40E+01	0.00E+00	3.35E-02
Bromomethane			1.10E-04	1.09E+00	9.08E+00	0.00E+00	0.00E+00	1.36E+01	0.00E+00	2.46E-07
Chrysene				5.61E+00	2.22E-02	0.00E+00	0.00E+00	2.28E+01	0.00E+00	1.15E-02
Di-n-octyl phthalate				5.22E+00	3.72E-02	0.00E+00	0.00E+00	2.18E+01	0.00E+00	4.54E-03
Fluoranthene				4.90E+00	5.70E-02	0.00E+00	0.00E+00	2.10E+01	0.00E+00	2.12E-03
Indeno(1,2,3-cd)pyrene				6.51E+00	6.69E-03	0.00E+00	0.00E+00	2.53E+01	0.00E+00	9.77E-02
Phenanthrene				4.45E+00	1.04E-01	0.00E+00	0.00E+00	2.00E+01	0.00E+00	7.28E-04
Pyrene				4.90E+00	5.70E-02	0.00E+00	0.00E+00	2.10E+01	0.00E+00	2.12E-03
1,3-DNB	1.25E-01	1.25E-01		1.49E+00	5.33E+00	6.66E-01	6.66E-01	1.42E+01	1.78E+00	6.37E-07
4-Amino-2,6-DNT	1.25E-01	1.25E-01		2.00E+00	2.70E+00	3.38E-01	3.38E-01	1.51E+01	1.88E+00	2.14E-06
4-Amino-2-nitrotoluene				2.00E+00	2.70E+00	0.00E+00	0.00E+00	1.51E+01	0.00E+00	2.14E-06
2,4-DNT	1.25E-01	1.25E-01		1.98E+00	2.78E+00	3.47E-01	3.47E-01	1.50E+01	1.88E+00	2.04E-06
2,6-DNT	1.30E-01	1.30E-01		2.28E+00	1.86E+00	2.42E-01	2.42E-01	1.56E+01	2.02E+00	4.17E-06
3,4-DNT	1.25E-01	1.25E-01		2.28E+00	1.86E+00	2.33E-01	2.33E-01	1.56E+01	1.95E+00	4.17E-06
Nitrobenzene		1.30E-01		1.87E+00	3.21E+00	0.00E+00	4.18E-01	1.48E+01	0.00E+00	1.57E-06
3-Nitrotoluene				2.43E+00	1.53E+00	0.00E+00	0.00E+00	1.58E+01	0.00E+00	5.96E-06
1,3,5-TNB	1.25E-01	1.25E-01		1.18E+00	8.05E+00	1.01E+00	1.01E+00	1.37E+01	1.71E+00	3.05E-07
2,4,6-TNT	1.25E-01	1.25E-01		2.00E+00	2.70E+00	3.38E-01	3.38E-01	1.51E+01	1.88E+00	2.14E-06
Inorganics										
Aluminum			3.04E+00	---	NA	0.00E+00	0.00E+00	NA	0.00E+00	NA
Antimony		3.40E+00		---	5.60E-04	0.00E+00	1.90E-03	1.00E+00	0.00E+00	4.00E-05
Beryllium				---	5.80E-03	0.00E+00	0.00E+00	1.00E+00	0.00E+00	1.00E-03
Calcium				---	1.90E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00	2.00E-03
Iron			5.79E+00	---	NA	0.00E+00	0.00E+00	NA	0.00E+00	NA
Lead			8.70E-03	---	NA	0.00E+00	0.00E+00	NA	0.00E+00	NA
Magnesium				---	7.80E-01	0.00E+00	0.00E+00	1.00E+00	0.00E+00	2.00E-02
Manganese			4.04E-01	---	NA	0.00E+00	0.00E+00	NA	0.00E+00	NA
Potassium				---	7.80E-01	0.00E+00	0.00E+00	1.00E+00	0.00E+00	2.00E-02
Sodium	2.97E+02	3.10E+02		---	6.50E-02	1.93E+01	2.02E+01	1.00E+00	2.97E+02	8.00E-02
Vanadium				---	NA	0.00E+00	0.00E+00	NA	0.00E+00	NA

Toxicity Data

Chemical Name	Mammals NOAEL (mg/kg/d)	Mammals Test Species	Mammals Body Wt. (kg)	Birds NOAEL (mg/kg/d)	Birds Test Species	Birds Body Wt. (kg)
Organics						
Acetone	1.00E+01	rat	0.35	--	--	--
Anthracene	1.00E+00	mouse	0.03	--	--	--
Benzo(a)anthracene	1.00E+00	mouse	0.03	--	--	--
Benzo(b)fluoranthene	1.00E+00	mouse	0.03	--	--	--
Benzo(g,h,i)perylene	1.00E+00	mouse	0.03	--	--	--
Benzo(k)fluoranthene	1.00E+00	mouse	0.03	--	--	--
Bromomethane	2.14E+00	rat	0.35	--	--	--
Chrysene	1.00E+00	mouse	0.03	--	--	--
Di-n-octyl phthalate	4.70E+02	rat	0.35	--	--	--
Fluoranthene	1.25E+02	mouse	0.03	--	--	--
Indeno(1,2,3-cd)pyrene	1.00E+00	mouse	0.03	--	--	--
Phenanthrene	1.00E+00	mouse	0.03	--	--	--
Pyrene	7.50E+01	mouse	0.03	--	--	--
1,3-DNB	5.95E-01	rat	0.35	--	--	--
4-Amino-2,6-DNT	9.59E+00	rat	0.35	3.20E-02	unknown	1
4-Amino-2-nitrotoluene	6.86E+01	rat	0.35	3.20E-02	unknown	1
2,4-DNT	2.68E+00	rat	0.35	--	--	--
2,6-DNT	1.77E+00	rat	0.35	--	--	--
3,4-DNT	8.07E+00	rat	0.35	--	--	--
Nitrobenzene	2.30E-01	mouse	0.03	--	--	--
3-Nitrotoluene	1.07E+01	rat	0.35	--	--	--
1,3,5-TNB	2.75E+00	rat	0.35	--	--	--
2,4,6-TNT	7.95E+00	rat	0.35	--	--	--
Inorganics						
Aluminum	1.93E+00	mouse	0.03	1.10E+02	ringed dove	0.155
Antimony	1.25E-01	mouse	0.03	--	--	--
Beryllium	6.60E-01	rat	0.35	--	--	--
Calcium	1.05E+03	rabbit	3.8	2.83E+03	Jap. quail	0.072
Iron	2.60E+01	rabbit	3.8	5.00E+01	poultry	1.6
Lead	8.00E+00	rat	0.35	3.85E+00	Am. Kestrel	0.13
Magnesium	1.58E+02	rabbit	3.8	1.50E+02	poultry	1.6
Manganese	8.80E+01	rat	0.35	9.77E+02	Jap. Quail	0.072
Potassium	1.58E+03	rabbit	3.8	1.00E+03	poultry	1.6
Sodium	1.58E+03	rabbit	3.8	1.00E+03	poultry	1.6
Vanadium	2.10E-01	rat	0.26	1.14E+01	mallard duck	1.17

Plum Brook Ordnance Site
Pentolite Road Red Water Ponds

Omnivorous Rodent: **Deer mouse *(Peromyscus manicalatus)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (soil)	Foraging Factor (sw)	Soil Intake (mg/kg-d)	Soil Intake Hazard Quotient	Plant Intake (mg/kg-d)	Plant Intake Hazard Quotient	Invert. Intake (mg/kg-d)	Invert. Intake Hazard Quotient	Soil/Plant/Invert. Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index	Tissue Conc. mg/kg(dw)
Organics																
Acetone	2.21E+01	8.00E+00	2.76E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Anthracene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(a)anthracene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(b)fluoranthene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(g,h,i)perylene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(k)fluoranthene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bromomethane	4.72E+00	8.00E+00	5.90E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E-05	2.77E-05	2.77E-05	4.71E-11
Chrysene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Di-n-octyl phthalate	1.04E+03	8.00E+00	1.30E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoranthene	1.49E+02	8.00E+00	1.86E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Indeno(1,2,3-cd)pyrene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenanthrene	1.19E+00	8.00E+00	1.49E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pyrene	8.95E+01	8.00E+00	1.12E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-DNB	1.31E+00	8.00E+00	1.64E-01	1.00E+00	1.00E+00	4.81E-04	2.94E-03	7.69E-02	4.69E-01	1.31E-01	7.99E-01	1.27E+00	0.00E+00	0.00E+00	1.27E+00	1.56E-06
4-Amino-2,6-DNT	2.11E+01	8.00E+00	2.64E+00	1.00E+00	1.00E+00	4.81E-04	1.82E-04	3.90E-02	1.48E-02	1.39E-01	5.26E-02	6.75E-02	0.00E+00	0.00E+00	6.75E-02	4.48E-06
4-Amino-2-nitrotoluene	1.51E+02	8.00E+00	1.89E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-DNT	5.91E+00	8.00E+00	7.39E-01	1.00E+00	1.00E+00	4.81E-04	6.52E-04	4.01E-02	5.42E-02	1.39E-01	1.88E-01	2.43E-01	0.00E+00	0.00E+00	2.43E-01	4.29E-06
2,6-DNT	3.90E+00	8.00E+00	4.88E-01	1.00E+00	1.00E+00	5.01E-04	1.03E-03	2.79E-02	5.73E-02	1.49E-01	3.06E-01	3.64E-01	0.00E+00	0.00E+00	3.64E-01	8.68E-06
3,4-DNT	1.78E+01	8.00E+00	2.22E+00	1.00E+00	1.00E+00	4.81E-04	2.16E-04	2.69E-02	1.21E-02	1.44E-01	6.45E-02	7.68E-02	0.00E+00	0.00E+00	7.68E-02	8.35E-06
Nitrobenzene	2.74E-01	8.00E+00	3.43E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Nitrotoluene	2.36E+01	8.00E+00	2.95E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3,5-TNB	6.06E+00	8.00E+00	7.58E-01	1.00E+00	1.00E+00	4.81E-04	6.35E-04	1.16E-01	1.53E-01	1.26E-01	1.67E-01	3.21E-01	0.00E+00	0.00E+00	3.21E-01	8.68E-07
2,4,6-TNT	1.75E+01	8.00E+00	2.19E+00	1.00E+00	1.00E+00	4.81E-04	2.20E-04	3.90E-02	1.78E-02	1.39E-01	6.34E-02	8.14E-02	0.00E+00	0.00E+00	8.14E-02	4.48E-06
Inorganics																
Aluminum	2.30E+00	8.00E+00	2.88E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.52E-01	1.57E+00	1.57E+00	0.00E+00
Antimony	1.49E-01	8.00E+00	1.86E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	1.46E+00	8.00E+00	1.82E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium	4.22E+03	8.00E+00	5.27E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	1.04E+02	8.00E+00	1.30E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.61E-01	6.62E-02	6.62E-02	0.00E+00
Lead	1.76E+01	8.00E+00	2.21E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-03	5.86E-04	5.86E-04	0.00E+00
Magnesium	6.32E+02	8.00E+00	7.91E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	1.94E+02	8.00E+00	2.43E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.01E-02	2.48E-03	2.48E-03	0.00E+00
Potassium	6.32E+03	8.00E+00	7.90E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	6.32E+03	8.00E+00	7.90E+02	1.00E+00	1.00E+00	1.14E+00	1.45E-03	2.23E+00	2.82E-03	2.19E+01	2.77E-02	3.20E-02	0.00E+00	0.00E+00	3.20E-02	2.37E+01
Vanadium	4.30E-01	8.00E+00	5.37E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL							**7.31E-03**		**7.81E-01**		**1.67E+00**	**2.46E+00**		**1.64E+00**	**4.10E+00**	

Body Weight (kg)	0.0148
Water intake (L/d)	0.0022
Food Intake (kg(dw)/d)	0.0028
Soil Intake (kg/d)	0.000057
Plant Intake (kg(dw)/d) -- 61% of diet	0.001708
Invertebrate Intake (kg(dw)/d) -- 39% of diet	0.001092

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds

Opportunistic Omnivore: **Raccoon *(Procyon lotor)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (soil)	Foraging Factor (sw)	Soil Intake (mg/kg-d)	Soil Intake Hazard Quotient	Plant Intake (mg/kg-d)	Plant Intake Hazard Quotient	Invert. Intake (mg/kg-d)	Invert. Intake Hazard Quotient	Mouse Intake (mg/kg-d)	Mouse Intake Hazard Quotient	Total Intake Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index
Organics																	
Acetone	5.12E+00	8.00E+00	6.40E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Anthracene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(a)anthracene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(b)fluoranthene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(g,h,i)perylene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(k)fluoranthene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bromomethane	1.10E+00	8.00E+00	1.37E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-13	8.77E-13	8.77E-13	9.27E-06	6.77E-05	6.77E-05
Chrysene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Di-n-octyl phthalate	2.41E+02	8.00E+00	3.01E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoranthene	3.46E+01	8.00E+00	4.33E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Indeno(1,2,3-cd)pyrene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenanthrene	2.77E-01	8.00E+00	3.46E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pyrene	2.08E+01	8.00E+00	2.60E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-DNB	3.05E-01	8.00E+00	3.81E-02	1.00E+00	1.00E+00	2.94E-04	7.73E-03	1.43E-02	3.75E-01	2.72E-02	7.14E-01	3.96E-09	1.04E-07	1.10E+00	0.00E+00	0.00E+00	1.10E+00
4-Amino-2,6-DNT	4.91E+00	8.00E+00	6.14E-01	1.00E+00	1.00E+00	2.94E-04	4.79E-04	7.24E-03	1.18E-02	2.88E-02	4.70E-02	1.14E-08	1.86E-08	5.92E-02	0.00E+00	0.00E+00	5.92E-02
4-Amino-2-nitrotoluene	3.51E+01	8.00E+00	4.39E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-DNT	1.37E+00	8.00E+00	1.71E-01	1.00E+00	1.00E+00	2.94E-04	1.72E-03	7.43E-03	4.33E-02	2.87E-02	1.68E-01	1.09E-08	6.38E-08	2.13E-01	0.00E+00	0.00E+00	2.13E-01
2,6-DNT	9.06E-01	8.00E+00	1.13E-01	1.00E+00	1.00E+00	3.06E-04	2.70E-03	5.19E-03	4.58E-02	3.09E-02	2.73E-01	2.21E-08	1.95E-07	3.22E-01	0.00E+00	0.00E+00	3.22E-01
3,4-DNT	4.13E+00	8.00E+00	5.16E-01	1.00E+00	1.00E+00	2.94E-04	5.70E-04	4.99E-03	9.66E-03	2.98E-02	5.76E-02	2.13E-08	4.12E-08	6.79E-02	0.00E+00	0.00E+00	6.79E-02
Nitrobenzene	6.37E-02	8.00E+00	7.96E-03	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Nitrotoluene	5.49E+00	8.00E+00	6.86E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3,5-TNB	1.41E+00	8.00E+00	1.76E-01	1.00E+00	1.00E+00	2.94E-04	1.67E-03	2.16E-02	1.23E-01	2.62E-02	1.49E-01	2.21E-09	1.26E-08	2.73E-01	0.00E+00	0.00E+00	2.73E-01
2,4,6-TNT	4.07E+00	8.00E+00	5.09E-01	1.00E+00	1.00E+00	2.94E-04	5.78E-04	7.24E-03	1.42E-02	2.88E-02	5.66E-02	1.14E-08	2.24E-08	7.14E-02	0.00E+00	0.00E+00	7.14E-02
Inorganics																	
Aluminum	5.34E-01	8.00E+00	6.68E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.56E-01	3.84E+00	3.84E+00
Antimony	3.46E-02	8.00E+00	4.33E-03	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	3.38E-01	8.00E+00	4.22E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium	9.78E+02	8.00E+00	1.22E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	2.42E+01	8.00E+00	3.02E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.88E-01	1.62E-01	1.62E-01
Lead	4.09E+00	8.00E+00	5.12E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.34E-04	1.43E-03	1.43E-03
Magnesium	1.47E+02	8.00E+00	1.83E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	4.50E+01	8.00E+00	5.63E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.41E-02	6.05E-03	6.05E-03
Potassium	1.47E+03	8.00E+00	1.83E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	1.47E+03	8.00E+00	1.83E+02	1.00E+00	1.00E+00	6.99E-01	3.81E-03	4.13E-01	2.25E-03	4.54E+00	2.48E-02	6.04E-02	3.29E-04	3.12E-02	0.00E+00	0.00E+00	3.12E-02
Vanadium	9.98E-02	8.00E+00	1.25E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL							**1.93E-02**		**6.24E-01**		**1.49E+00**		**3.30E-04**	**2.13E+00**		**4.01E+00**	**6.14E+00**

Body Weight (kg)	5.1
Water intake (L/d)	0.43
Food intake (kg(dw)/d)	0.26
Soil intake (kg/d)	0.012
Mouse Intake (kg(dw)/d) – 5 % of diet	0.013
Plant intake (kg(dw)/d) -- 42% of diet	0.1092
Invertebrate intake (kg(dw)/d) -- 30% of diet	0.078

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds

Herbivorous Rodent: **Eastern Cottontail *(Sylvilagus floridanus)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (soil)	Foraging Factor (sw)	Soil Intake (mg/kg-d)	Soil Intake Hazard Quotient	Plant Intake (mg/kg-d)	Plant Hazard Quotient	Soil/Plant Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index	Tissue Conc. mg/kg(dw)
Organics														
Acetone	1.34E+01	8.00E+00	1.67E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Anthracene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(a)anthracene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(b)fluoranthene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(g,h,i)perylene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(k)fluoranthene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bromomethane	2.86E+00	8.00E+00	3.57E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-05	2.99E-05	2.99E-05	9.12E-11
Chrysene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Di-n-octyl phthalate	6.28E+02	8.00E+00	7.85E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoranthene	9.03E+01	8.00E+00	1.13E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Indeno(1,2,3-cd)pyrene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenanthrene	7.23E-01	8.00E+00	9.03E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pyrene	5.42E+01	8.00E+00	6.77E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-DNB	7.95E-01	8.00E+00	9.93E-02	1.00E+00	1.00E+00	6.63E-04	6.67E-03	5.65E-02	5.69E-01	5.76E-01	0.00E+00	0.00E+00	5.76E-01	1.26E-06
4-Amino-2,6-DNT	1.28E+01	8.00E+00	1.60E+00	1.00E+00	1.00E+00	6.63E-04	4.14E-04	2.87E-02	1.79E-02	1.83E-02	0.00E+00	0.00E+00	1.83E-02	2.18E-06
4-Amino-2-nitrotoluene	9.16E+01	8.00E+00	1.15E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-DNT	3.58E+00	8.00E+00	4.47E-01	1.00E+00	1.00E+00	6.63E-04	1.48E-03	2.94E-02	6.58E-02	6.73E-02	0.00E+00	0.00E+00	6.73E-02	2.13E-06
2,6-DNT	2.36E+00	8.00E+00	2.95E-01	1.00E+00	1.00E+00	6.89E-04	2.33E-03	2.05E-02	6.95E-02	7.18E-02	0.00E+00	0.00E+00	7.18E-02	3.07E-06
3,4-DNT	1.08E+01	8.00E+00	1.35E+00	1.00E+00	1.00E+00	6.63E-04	4.92E-04	1.97E-02	1.47E-02	1.51E-02	0.00E+00	0.00E+00	1.51E-02	2.95E-06
Nitrobenzene	1.66E-01	8.00E+00	2.08E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Nitrotoluene	1.43E+01	8.00E+00	1.79E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3,5-TNB	3.67E+00	8.00E+00	4.59E-01	1.00E+00	1.00E+00	6.63E-04	1.44E-03	8.54E-02	1.86E-01	1.87E-01	0.00E+00	0.00E+00	1.87E-01	9.09E-07
2,4,6-TNT	1.06E+01	8.00E+00	1.33E+00	1.00E+00	1.00E+00	6.63E-04	4.99E-04	2.87E-02	2.16E-02	2.21E-02	0.00E+00	0.00E+00	2.21E-02	2.18E-06
Inorganics														
Aluminum	1.39E+00	8.00E+00	1.74E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.95E-01	1.69E+00	1.69E+00	0.00E+00
Antimony	9.03E-02	8.00E+00	1.13E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	8.81E-01	8.00E+00	1.10E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium	2.55E+03	4.00E+00	6.38E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	6.30E+01	4.00E+00	1.58E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.63E-01	3.57E-02	3.57E-02	0.00E+00
Lead	1.07E+01	8.00E+00	1.34E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.45E-04	6.33E-04	6.33E-04	0.00E+00
Magnesium	3.83E+02	4.00E+00	9.58E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	1.18E+02	8.00E+00	1.47E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.93E-02	2.67E-03	2.67E-03	0.00E+00
Potassium	3.83E+03	4.00E+00	9.57E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	3.83E+03	4.00E+00	9.57E+02	1.00E+00	1.00E+00	1.57E+00	1.64E-03	1.64E+00	1.71E-03	3.36E-03	0.00E+00	0.00E+00	3.36E-03	8.91E+00
Vanadium	2.60E-01	8.00E+00	3.25E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL							**1.50E-02**		**9.46E-01**	**9.61E-01**		**1.73E+00**	**2.69E+00**	

Body Weight (kg)	1.132
Water Intake (L/d)	0.11
Food Intake (kg(dw)/d)	0.096
Soil Intake (kg/d)	0.006
Plant Intake (kg(dw)/d) -- 100% of diet	0.096

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds

Insectivorous mammal: **Short-tailed shrew *(Blarina brevicauda)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (soil)	Foraging Factor (sw)	Soil Intake (mg/kg-d)	Soil Intake Hazard Quotient	Invert. Intake (mg/kg-d)	Invert. Intake Hazard Quotient	Soil/Invert. Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index	Tissue Conc. mg/kg(dw)
Organics														
Acetone	3.51E+01	8.00E+00	4.39E+00	1.00E+00	1.00E+00	6.92E-04	1.58E-04	0.00E+00	0.00E+00	1.58E-04	0.00E+00	0.00E+00	1.58E-04	3.82E-11
Anthracene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(a)anthracene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(b)fluoranthene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(g,h,i)perylene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(k)fluoranthene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bromomethane	7.52E+00	8.00E+00	9.40E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-05	1.80E-05	1.80E-05	2.20E-11
Chrysene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Di-n-octyl phthalate	1.65E+03	8.00E+00	2.06E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoranthene	2.38E+02	8.00E+00	2.97E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Indeno(1,2,3-cd)pyrene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenanthrene	1.90E+00	8.00E+00	2.38E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pyrene	1.43E+02	8.00E+00	1.78E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-DNB	2.09E+00	8.00E+00	2.61E-01	1.00E+00	1.00E+00	6.92E-03	2.65E-02	9.47E-01	3.63E+00	3.65E+00	0.00E+00	0.00E+00	3.65E+00	3.23E-06
4-Amino-2,6-DNT	3.37E+01	8.00E+00	4.21E+00	1.00E+00	1.00E+00	6.92E-03	1.64E-03	1.00E+00	2.39E-01	2.40E-01	0.00E+00	0.00E+00	2.40E-01	1.15E-05
4-Amino-2-nitrotoluene	2.41E+02	8.00E+00	3.01E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-DNT	9.41E+00	8.00E+00	1.18E+00	1.00E+00	1.00E+00	6.92E-03	5.88E-03	1.00E+00	8.52E-01	8.58E-01	0.00E+00	0.00E+00	8.58E-01	1.09E-05
2,6-DNT	6.22E+00	8.00E+00	7.77E-01	1.00E+00	1.00E+00	7.19E-03	9.26E-03	1.08E+00	1.39E+00	1.40E+00	0.00E+00	0.00E+00	1.40E+00	2.41E-05
3,4-DNT	2.83E+01	8.00E+00	3.54E+00	1.00E+00	1.00E+00	6.92E-03	1.95E-03	1.04E+00	2.93E-01	2.95E-01	0.00E+00	0.00E+00	2.95E-01	2.31E-05
Nitrobenzene	4.37E-01	8.00E+00	5.46E-02	1.00E+00	1.00E+00	7.19E-03	1.32E-01	0.00E+00	0.00E+00	1.32E-01	0.00E+00	0.00E+00	1.32E-01	6.01E-08
3-Nitrotoluene	3.77E+01	8.00E+00	4.71E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3,5-TNB	9.66E+00	8.00E+00	1.21E+00	1.00E+00	1.00E+00	6.92E-03	5.73E-03	9.14E-01	7.57E-01	7.63E-01	0.00E+00	0.00E+00	7.63E-01	1.49E-06
2,4,6-TNT	2.79E+01	8.00E+00	3.49E+00	1.00E+00	1.00E+00	6.92E-03	1.98E-03	1.00E+00	2.88E-01	2.90E-01	0.00E+00	0.00E+00	2.90E-01	1.15E-05
Inorganics														
Aluminum	3.67E+00	8.00E+00	4.58E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E-01	1.02E+00	1.02E+00	0.00E+00
Antimony	2.38E-01	8.00E+00	2.97E-02	1.00E+00	1.00E+00	1.88E-01	6.34E+00	0.00E+00	0.00E+00	6.34E+00	0.00E+00	0.00E+00	6.34E+00	3.99E-05
Beryllium	2.32E+00	8.00E+00	2.90E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium	6.71E+03	8.00E+00	8.39E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	1.66E+02	8.00E+00	2.07E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.88E-01	4.28E-02	4.28E-02	0.00E+00
Lead	2.81E+01	8.00E+00	3.51E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E-03	3.80E-04	3.80E-04	0.00E+00
Magnesium	1.01E+03	8.00E+00	1.26E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	3.09E+02	8.00E+00	3.86E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.19E-02	1.60E-03	1.60E-03	0.00E+00
Potassium	1.01E+04	8.00E+00	1.26E+03	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	1.01E+04	8.00E+00	1.26E+03	1.00E+00	1.00E+00	1.72E+01	1.36E-02	1.58E+02	1.26E-01	1.40E-01	0.00E+00	0.00E+00	1.40E-01	7.46E+01
Vanadium	6.85E-01	8.00E+00	8.56E-02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL							**6.53E+00**		**7.57E+00**			**1.06E+00**	**1.52E+01**	

Body Weight (kg)	0.015
Water intake (L/d)	0.0023
Food intake (kg(dw)/d)	0.008
Soil intake (kg/d)	0.00083
Invertebrate intake (kg(dw)/d)--100% of diet	0.008

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds

Herbivorous Mammal: **White-tailed deer *(Odocoileus virginianus)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (soil)	Foraging Factor (sw)	Soil Intake (mg/kg-d)	Soil Intake Hazard Quotient	Plant Intake (mg/kg-d)	Plant Intake Hazard Quotient	Soil/Plant Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index
Organics													
Acetone	5.44E+00	8.00E+00	6.80E-01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	2.18E-04	3.21E-04	3.21E-04	0.00E+00	0.00E+00	3.21E-04
Anthracene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(a)anthracene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(b)fluoranthene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(g,h,i)perylene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(k)fluoranthene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bromomethane	1.16E+00	8.00E+00	1.45E-01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.40E-06	3.02E-05	3.02E-05
Chrysene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Di-n-octyl phthalate	2.56E+02	8.00E+00	3.20E+01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoranthene	3.68E+01	8.00E+00	4.60E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Indeno(1,2,3-cd)pyrene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenanthrene	2.94E-01	8.00E+00	3.68E-02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pyrene	2.21E+01	8.00E+00	2.76E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-DNB	3.24E-01	8.00E+00	4.05E-02	1.00E-02	1.00E-02	8.20E-07	2.03E-05	2.18E-04	5.40E-03	5.42E-03	0.00E+00	0.00E+00	5.42E-03
4-Amino-2,6-DNT	5.22E+00	8.00E+00	6.52E-01	1.00E-02	1.00E-02	8.20E-07	1.26E-06	1.11E-04	1.70E-04	1.71E-04	0.00E+00	0.00E+00	1.71E-04
4-Amino-2-nitrotoluene	3.73E+01	8.00E+00	4.66E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-DNT	1.46E+00	8.00E+00	1.82E-01	1.00E-02	1.00E-02	8.20E-07	4.50E-06	1.14E-04	6.25E-04	6.29E-04	0.00E+00	0.00E+00	6.29E-04
2,6-DNT	9.63E-01	8.00E+00	1.20E-01	1.00E-02	1.00E-02	8.52E-07	7.08E-06	7.94E-05	6.60E-04	6.67E-04	0.00E+00	0.00E+00	6.67E-04
3,4-DNT	4.39E+00	8.00E+00	5.49E-01	1.00E-02	1.00E-02	8.20E-07	1.49E-06	7.63E-05	1.39E-04	1.41E-04	0.00E+00	0.00E+00	1.41E-04
Nitrobenzene	6.77E-02	8.00E+00	8.46E-03	1.00E-02	1.00E-02	0.00E+00	0.00E+00	1.37E-04	1.62E-02	1.62E-02	0.00E+00	0.00E+00	1.62E-02
3-Nitrotoluene	5.83E+00	8.00E+00	7.29E-01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3,5-TNB	1.50E+00	8.00E+00	1.87E-01	1.00E-02	1.00E-02	8.20E-07	4.38E-06	3.30E-04	1.77E-03	1.77E-03	0.00E+00	0.00E+00	1.77E-03
2,4,6-TNT	4.32E+00	8.00E+00	5.40E-01	1.00E-02	1.00E-02	8.20E-07	1.52E-06	1.11E-04	2.05E-04	2.07E-04	0.00E+00	0.00E+00	2.07E-04
Inorganics													
Aluminum	5.68E-01	8.00E+00	7.10E-02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.22E-01	1.71E+00	1.71E+00
Antimony	3.68E-02	8.00E+00	4.60E-03	1.00E-02	1.00E-02	0.00E+00	0.00E+00	6.24E-07	1.36E-04	1.36E-04	0.00E+00	0.00E+00	1.36E-04
Beryllium	3.59E-01	8.00E+00	4.49E-02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium	1.04E+03	8.00E+00	1.30E+02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	2.57E+01	8.00E+00	3.21E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.32E-01	7.22E-02	7.22E-02
Lead	4.35E+00	8.00E+00	5.44E-01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.48E-04	6.40E-04	6.40E-04
Magnesium	1.56E+02	8.00E+00	1.95E+01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	4.79E+01	8.00E+00	5.98E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E-02	2.70E-03	2.70E-03
Potassium	1.56E+03	8.00E+00	1.95E+02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	1.56E+03	8.00E+00	1.95E+02	1.00E-02	1.00E-02	1.95E-03	9.99E-06	6.61E-03	3.39E-05	4.39E-05	0.00E+00	0.00E+00	4.39E-05
Vanadium	1.06E-01	8.00E+00	1.33E-02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL							**5.05E-05**		**2.57E-02**	**2.57E-02**		**1.79E+00**	**1.81E+00**

Body Weight (kg)	61
Water Intake (L/d)	4
Food Intake (kg(dw)/d)	2
Soil Intake (kg/d)	0.04
Plant Intake (kg(dw)/d) -- 100% of diet	2

Insectivorous Bird: **Marsh wren *(Cistothorus palustris)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (soil)	Foraging Factor (sw)	Soil Intake (mg/kg-d)	Soil Intake Hazard Quotient	Invert. Intake (mg/kg-d)	Invert. Intake Hazard Quotient	Soil/Invert. Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index	Tissue Conc. mg/kg(dw)
Organics														
Acetone	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Anthracene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(a)anthracene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(b)fluoranthene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(g,h,i)perylene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(k)fluoranthene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bromomethane	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.97E-05	0.00E+00	0.00E+00	2.36E-11
Chrysene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Di-n-octyl phthalate	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoranthene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Indeno(1,2,3-cd)pyrene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pyrene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-DNB	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	2.38E-03	0.00E+00	1.69E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.47E-06
4-Amino-2,6-DNT	3.20E-02	8.00E+00	4.00E-03	1.00E+00	1.00E+00	2.38E-03	5.94E-01	1.79E+00	4.47E+02	4.48E+02	0.00E+00	0.00E+00	4.48E+02	1.24E-05
4-Amino-2-nitrotoluene	3.20E-02	8.00E+00	4.00E-03	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	2.38E-03	0.00E+00	1.79E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-05
2,6-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	2.47E-03	0.00E+00	1.92E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.59E-05
3,4-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	2.38E-03	0.00E+00	1.85E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.49E-05
Nitrobenzene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Nitrotoluene	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3,5-TNB	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	2.38E-03	0.00E+00	1.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-06
2,4,6-TNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	2.38E-03	0.00E+00	1.79E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E-05
Inorganics														
Aluminum	1.10E+02	8.00E+00	1.38E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.21E-01	5.97E-02	5.97E-02	0.00E+00
Antimony	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium	2.83E+03	8.00E+00	3.54E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	5.00E+01	8.00E+00	6.25E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E+00	2.50E-01	2.50E-01	0.00E+00
Lead	3.85E+00	8.00E+00	4.81E-01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.35E-03	4.88E-03	4.88E-03	0.00E+00
Magnesium	1.50E+02	8.00E+00	1.88E+01	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	9.77E+02	8.00E+00	1.22E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E-01	8.93E-04	8.93E-04	0.00E+00
Potassium	1.00E+03	8.00E+00	1.25E+02	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	1.00E+03	8.00E+00	1.25E+02	1.00E+00	1.00E+00	5.64E+00	4.51E-02	2.82E+02	2.26E+00	2.30E+00	0.00E+00	0.00E+00	2.30E+00	7.43E+01
Vanadium	1.14E+01	8.00E+00	1.43E+00	1.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL							**6.39E-01**		**4.50E+02**	**4.50E+02**		**3.16E-01**	**4.51E+02**	

Body Weight (kg)	0.01
Water Intake (L/d)	0.0027
Food Intake (kg(dw)/d)	0.0095
Soil Intake (kg/d)	0.00019
Plant Intake (kg(dw)/d) -- 0% of diet	0
Invertebrate Intake (kg(dw)/d) -- 100% of die	0.0095

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds

Avian predator: **Red-tailed hawk (*Buteo jamaicensis*)**

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (soil)	Foraging Factor (sw)	Soil Intake (mg/kg-d)	Soil Intak Hazard Quotient	Bird Intake (mg/kg-d)	Bird Intak Hazard Quotient	Mouse Intake (mg/kg-d)	Mouse Intake Hazard Quotient	Rabbit Intake (mg/kg-d)	Rabbit Intake Hazard Quotient	Shrew Intake (mg/kg-d)	Shrew Intake Hazard Quotient	Total Intake Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index
Organics																			
Acetone	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Anthracene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(a)anthracene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(b)fluoranthene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(g,h,i)perylene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(k)fluoranthene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bromomethane	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	5.91E-15	0.00E+00	1.25E-14	0.00E+00	2.41E-14	0.00E+00	5.83E-15	0.00E+00	0.00E+00	6.55E-08	0.00E+00	0.00E+00
Chrysene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Di-n-octyl phthalate	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluoranthene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Indeno(1,2,3-cd)pyrene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenanthrene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pyrene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-DNB	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	2.61E-06	0.00E+00	8.71E-10	0.00E+00	4.12E-10	0.00E+00	3.34E-10	0.00E+00	8.54E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4-Amino-2,6-DNT	3.20E-02	8.00E+00	4.00E-03	1.00E-02	1.00E-02	2.61E-06	6.53E-04	3.11E-09	7.76E-07	1.19E-09	2.96E-07	5.77E-10	1.44E-07	3.05E-09	7.62E-07	6.55E-04	0.00E+00	0.00E+00	6.55E-04
4-Amino-2-nitrotoluene	3.20E-02	8.00E+00	4.00E-03	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	2.61E-06	0.00E+00	2.95E-09	0.00E+00	1.14E-09	0.00E+00	5.65E-10	0.00E+00	2.90E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,6-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	2.72E-06	0.00E+00	6.49E-09	0.00E+00	2.30E-09	0.00E+00	8.13E-10	0.00E+00	6.37E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3,4-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	2.61E-06	0.00E+00	6.24E-09	0.00E+00	2.21E-09	0.00E+00	7.82E-10	0.00E+00	6.12E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrobenzene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Nitrotoluene	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3,5-TNB	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	2.61E-06	0.00E+00	4.02E-10	0.00E+00	2.30E-10	0.00E+00	2.41E-10	0.00E+00	3.94E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4,6-TNT	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	2.61E-06	0.00E+00	3.11E-09	0.00E+00	1.19E-09	0.00E+00	5.77E-10	0.00E+00	3.05E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Inorganics																			
Aluminum	1.10E+02	8.00E+00	1.38E+01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.81E-03	1.32E-04	1.32E-04
Antimony	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	0.00E+00	8.00E+00	0.00E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium	2.83E+03	8.00E+00	3.54E+02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	5.00E+01	8.00E+00	6.25E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.45E-03	5.52E-04	5.52E-04
Lead	3.85E+00	8.00E+00	4.81E-01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.18E-06	1.08E-05	1.08E-05
Magnesium	1.50E+02	8.00E+00	1.88E+01	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese	9.77E+02	8.00E+00	1.22E+02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.41E-04	1.97E-06	1.97E-06
Potassium	1.00E+03	8.00E+00	1.25E+02	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	1.00E+03	8.00E+00	1.25E+02	1.00E-02	1.00E-02	6.21E-03	4.97E-05	1.86E-02	1.49E-04	6.27E-03	5.02E-05	2.36E-03	1.89E-05	1.97E-02	1.58E-04	4.26E-04	0.00E+00	0.00E+00	4.26E-04
Vanadium	1.14E+01	8.00E+00	1.43E+00	1.00E-02	1.00E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL							**7.03E-04**		**1.50E-04**		**5.05E-05**		**1.90E-05**		**1.59E-04**	**1.08E-03**		**6.96E-04**	**1.78E-03**

Body Weight (kg)	0.957
Water Intake (L/d)	0.057
Food Intake (kg(dw)/d)	0.1
Soil Intake (kg/d)	0.002
Bird Intake (kg(dw)/d) -- 24% of diet	0.024
Mouse Intake (kg(dw)/d) -- 25.3% of diet	0.025333
Shrew Intake (kg(dw)/d) -- 25.3% of diet	0.025333
Rabbit Intake (kg(dw)/d) -- 25.3% of diet	0.025333

Chemical Data

Chemical Name	Sediment Conc. (mg/kg)	Water Conc. (mg/L)	log Kow (organics)	Kow (organics)	log Koc (organics) (mL/g)	Koc (organics) (mL/g)	Kd (inorganics) (mL/g)	Foc	Water-to-Fish/Invert BCF	Food Chain Multiplier	Water-to-Fish BAF	Fish Conc. (mg/kgww)	Fish Conc. (mg/kgdw)	Pore water Conc. (mg/L)	Solubility (mg/L)	< of the PoreH2O or Solubility	Invert. Conc. (mg/kgww)	Invert Conc. (mg/kgdw)	Food-to-Muscle TF
Organics																			
Acetone	6.90E-02		-2.40E-01	5.75E-01	-2.36E-01	5.81E-01	---	1.10E-02	5.75E-01	1.00E+00	5.75E-01	0.00E+00	0.00E+00	1.08E+01		1.08E+01	6.21E+00	2.48E+01	1.04E-08
Bromomethane		1.10E-04	1.09E+00	1.23E+01	1.07E+00	1.18E+01	---	1.10E-02	1.23E+01	1.00E+00	1.23E+01	1.35E-03	4.23E-03	0.00E+00		0.00E+00	0.00E+00	0.00E+00	2.46E-07
Carbazole	1.80E-01		3.29E+00	1.95E+03	3.23E+00	1.72E+03	---	1.10E-02	1.95E+03	1.01E+00	1.97E+03	0.00E+00	0.00E+00	9.54E-03		9.54E-03	1.86E+01	7.44E+01	4.61E-05
Dibenzofuran	6.00E-02		4.12E+00	1.32E+04	4.05E+00	1.12E+04	---	1.10E-02	1.32E+04	1.10E+00	1.44E+04	0.00E+00	0.00E+00	4.86E-04		4.86E-04	6.40E+00	2.56E+01	3.32E-04
Di-n-octyl phthalate			5.22E+00	1.66E+05	5.13E+00	1.35E+05	---	1.10E-02	1.66E+05	4.05E+00	6.72E+05	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	4.54E-03
Methylene chloride			1.26E+00	1.82E+01	1.24E+00	1.73E+01	---	1.10E-02	1.82E+01	1.00E+00	1.82E+01	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	3.69E-07
Methyl ethyl ketone	1.50E-02		2.80E-01	1.91E+00	2.76E-01	1.89E+00	---	1.10E-02	1.91E+00	1.01E+00	1.92E+00	0.00E+00	0.00E+00	7.23E-01		7.23E-01	1.38E+00	5.51E+00	3.58E-08
1,3-DNB			1.49E+00	3.09E+01	1.46E+00	2.92E+01	---	1.10E-02	3.09E+01	1.00E+00	3.09E+01	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	6.37E-07
2-Amino-4,6-DNT			2.00E+00	1.00E+02	1.97E+00	9.25E+01	---	1.10E-02	1.00E+02	1.00E+00	1.00E+02	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	2.14E-06
4-Amino-2-NT			2.00E+00	1.00E+02	1.97E+00	9.25E+01	---	1.10E-02	1.00E+02	1.00E+00	1.00E+02	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	2.14E-06
2,6-DNB			1.49E+00	3.09E+01	1.46E+00	2.92E+01	---	1.10E-02	3.09E+01	1.00E+00	3.09E+01	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	6.37E-07
2,4-DNT			1.98E+00	9.55E+01	1.95E+00	8.84E+01	---	1.10E-02	9.55E+01	1.00E+00	9.55E+01	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	2.04E-06
2,6-DNT			2.28E+00	1.91E+02	2.24E+00	1.74E+02	---	1.10E-02	1.91E+02	1.00E+00	1.91E+02	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	4.17E-06
3,4-DNT			2.28E+00	1.91E+02	2.24E+00	1.74E+02	---	1.10E-02	1.91E+02	1.00E+00	1.91E+02	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	4.17E-06
3-NT			2.43E+00	2.69E+02	2.39E+00	2.45E+02	---	1.10E-02	2.69E+02	1.00E+00	2.70E+02	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	5.96E-06
1,3,5-TNB			1.18E+00	1.51E+01	1.16E+00	1.45E+01	---	1.10E-02	1.51E+01	1.00E+00	1.51E+01	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	3.05E-07
2,4,6-TNT			2.00E+00	1.00E+02	1.97E+00	9.25E+01	---	1.10E-02	1.00E+02	1.00E+00	1.00E+02	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	2.14E-06
Inorganics																			
Aluminum		3.04E+00	---	---	---	---	1.50E+03	1.10E-02	1.00E+02	1.00E+00	1.00E+02	3.04E+02	9.50E+02	0.00E+00	9.80E-01	0.00E+00	0.00E+00	0.00E+00	NA
Arsenic			---	---	---	---	2.00E+02	1.10E-02	4.40E+01	1.00E+00	4.40E+01	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	4.00E-03
Barium			---	---	---	---	6.00E+01	1.10E-02	4.00E+00	1.00E+00	4.00E+00	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	2.00E-04
Calcium			---	---	---	---	4.10E+00	1.10E-02	1.00E+02	1.00E+00	1.00E+02	0.00E+00	0.00E+00	0.00E+00	1.31E+03	0.00E+00	0.00E+00	0.00E+00	2.00E-03
Chromium			---	---	---	---	8.50E+02	1.10E-02	2.00E+02	1.00E+00	2.00E+02	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	NA
Copper			---	---	---	---	3.50E+01	1.10E-02	2.00E+02	1.00E+00	2.00E+02	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	NA
Iron		5.79E+00	---	---	---	---	5.00E+03	1.10E-02	2.00E+02	1.00E+00	2.00E+02	1.16E+03	3.62E+03	0.00E+00	6.70E+01	0.00E+00	0.00E+00	0.00E+00	NA
Lead		8.70E-03	---	---	---	---	4.00E+02	1.10E-02	3.00E+02	1.00E+00	3.00E+02	2.61E+00	8.16E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	NA
Magnesium	1.93E+04		---	---	---	---	4.60E+00	1.10E-02	1.00E+02	1.00E+00	1.00E+02	0.00E+00	0.00E+00	4.20E+03	6.20E+00	6.20E+00	6.20E+02	2.48E+03	2.00E-02
Manganese		4.04E-01	---	---	---	---	1.00E+03	1.10E-02	4.00E+02	1.00E+00	4.00E+02	1.62E+02	5.05E+02	0.00E+00		0.00E+00	0.00E+00	0.00E+00	NA
Phosphorus			---	---	---	---	3.50E+00	1.10E-02	5.00E+04	1.00E+00	5.00E+04	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	NA
Potassium	1.04E+03		---	---	---	---	5.60E+00	1.10E-02	1.00E+02	1.00E+00	1.00E+02	0.00E+00	0.00E+00	1.86E+02		1.86E+02	1.86E+04	7.43E+04	1.00E+00
Sodium			---	---	---	---	NA	1.10E-02	2.00E+01	1.00E+00	2.00E+01	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	6.50E-02
Vanadium			---	---	---	---	1.00E+03	1.10E-02	1.00E+02	1.00E+00	1.00E+02	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	NA

Toxicity Data

Chemical Name	Mammals NOAEL (mg/kg/d)	Mammals Test Species	Mammals Body Wt. (kg)	Birds NOAEL (mg/kg/d)	Birds Test Species	Birds Body Wt. (kg)
Organics						
Acetone	1.00E+01	rat	0.35	--	--	--
Bromomethane	2.14E+00	rat	0.35	--	--	--
Carbazole	2.00E+00	mouse	0.03	--	--	--
Dibenzofuran	--	--	--	--	--	--
Di-n-octyl phthalate	4.70E+02	rat	0.35	--	--	--
Methylene chloride	5.85E+00	rat	0.35	--	--	--
Methyl ethyl ketone	1.77E+03	rat	0.35	--	--	--
1,3-DNB	5.95E-01	rat	0.35	--	--	--
2-Amino-4,6-DNT	1.39E+01	rat	0.35	3.20E-02	unknown	1
4-Amino-2-NT	6.86E+01	rat	0.35	3.20E-02	unknown	1
2,6-DNB	4.00E-01	rat	0.35	--	--	--
2,4-DNT	2.68E+00	rat	0.35	--	--	--
2,6-DNT	1.77E+00	rat	0.35	--	--	--
3,4-DNT	8.07E+00	rat	0.35	--	--	--
3-NT	1.07E+01	rat	0.35	--	--	--
1,3,5-TNB	2.75E+00	rat	0.35	--	--	--
2,4,6-TNT	7.95E+00	rat	0.35	--	--	--
Inorganics						
Aluminum	1.93E+00	mouse	0.03	1.10E+02	ringed dove	0.155
Arsenic	1.26E-01	mouse	0.03	2.46E+00	cowbird	0.049
Barium	5.10E+00	rat	0.435	2.08E+01	chicks	0.121
Calcium	1.05E+03	rabbit	3.8	2.83E+03	Jap. Quail	0.072
Chromium	2.74E+03	rat	0.35	1.00E+00	black duck	1.25
Copper	1.17E+01	mink	1	4.70E+01	chicks	0.534
Iron	2.60E+01	rabbit	3.8	5.00E+01	poultry	1.6
Lead	8.00E+00	rat	0.35	3.85E+00	Am. Kestrel	0.13
Magnesium	1.58E+02	rabbit	3.8	1.50E+02	poultry	1.6
Manganese	8.80E+01	rat	0.35	9.77E+02	Jap. Quail	0.072
Phosphorus	5.26E+02	rabbit	3.8	4.00E+02	poultry	1.6
Potassium	1.58E+03	rabbit	3.8	1.00E+03	poultry	1.6
Sodium	1.58E+03	rabbit	3.8	1.00E+03	poultry	1.6
Vanadium	2.10E-01	rat	0.26	1.14E+01	mallard duck	1.17

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds

Piscivorous Bird: **Great Blue Heron *(Ardea herodias)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (sed./sw.)	Sediment Intake (mg/kg-d)	Sediment Hazard Quotient	Fish Intake (mg/kg-d)	Fish Hazard Quotient	Macroinvert Intake (mg/kg-d)	Macroinvert Hazard Quotient	Total Intake Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index
Organics														
Acetone	0.00E+00	8.00E+00	0.00E+00	1.00E+00	2.47E-04	NA	0.00E+00	NA	1.80E-01	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bromomethane	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	7.37E-04	NA	0.00E+00	NA	0.00E+00	4.99E-06	0.00E+00	0.00E+00
Carbazole	0.00E+00	8.00E+00	0.00E+00	1.00E+00	6.45E-04	NA	0.00E+00	NA	5.40E-01	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibenzofuran	0.00E+00	8.00E+00	0.00E+00	1.00E+00	2.15E-04	NA	0.00E+00	NA	1.86E-01	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Di-n-octyl phthalate	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methylene chloride	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl ethyl ketone	0.00E+00	8.00E+00	0.00E+00	1.00E+00	5.38E-05	NA	0.00E+00	NA	4.00E-02	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-DNB	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2-Amino-4,6-DNT	3.20E-02	8.00E+00	4.00E-03	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4-Amino-2-NT	3.20E-02	8.00E+00	4.00E-03	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,6-DNB	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,6-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3,4-DNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-NT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3,5-TNB	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4,6-TNT	0.00E+00	8.00E+00	0.00E+00	1.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Inorganics														
Aluminum	1.10E+02	8.00E+00	1.38E+01	1.00E+00	0.00E+00	0.00E+00	1.66E+02	1.20E+01	0.00E+00	0.00E+00	1.20E+01	1.38E-01	1.00E-02	1.20E+01
Arsenic	2.46E+00	8.00E+00	3.08E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	2.08E+01	8.00E+00	2.60E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium	2.83E+03	8.00E+00	3.54E+02	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium	1.00E+00	8.00E+00	1.25E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	4.70E+01	8.00E+00	5.88E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	5.00E+01	8.00E+00	6.25E+00	1.00E+00	0.00E+00	0.00E+00	6.30E+02	1.01E+02	0.00E+00	0.00E+00	1.01E+02	2.63E-01	4.20E-02	1.01E+02
Lead	3.85E+00	8.00E+00	4.81E-01	1.00E+00	0.00E+00	0.00E+00	1.42E+00	2.95E+00	0.00E+00	0.00E+00	2.95E+00	3.95E-04	8.20E-04	2.95E+00
Magnesium	1.50E+02	8.00E+00	1.88E+01	1.00E+00	6.92E+01	3.69E+00	0.00E+00	0.00E+00	1.80E+01	9.60E-01	4.65E+00	0.00E+00	0.00E+00	4.65E+00
Manganese	9.77E+02	8.00E+00	1.22E+02	1.00E+00	0.00E+00	0.00E+00	8.80E+01	7.20E-01	0.00E+00	0.00E+00	7.20E-01	1.83E-02	1.50E-04	7.21E-01
Phosphorus	4.00E+02	8.00E+00	5.00E+01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium	1.00E+03	8.00E+00	1.25E+02	1.00E+00	3.73E+00	2.98E-02	0.00E+00	0.00E+00	5.39E+02	4.31E+00	4.34E+00	0.00E+00	0.00E+00	4.34E+00
Sodium	1.00E+03	8.00E+00	1.25E+02	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vanadium	1.14E+01	8.00E+00	1.43E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL						**3.72E+00**		**1.17E+02**		**5.27E+00**	**1.26E+02**		**5.30E-02**	**1.26E+02**

Body Weight (kg)	2.204
Water intake (L/d)	0.1
Food intake (kg(dw)/d)	0.4
Sediment intake (kg/d)	0.0079
Fish intake (kg(dw)/d) -- 96% of diet	0.384
Macroinvert intake (kg(dw)/d) -- 4% of diet	0.016

Plum Brook Ordnance Works
Pentolite Road Red Water Ponds

Omnivorous mammal: **Raccoon *(Procyon lotor)***

Chemical Name	NOAEL	Uncertainty Factor	Adjusted NOAEL	Foraging Factor (sed./sw.)	Sediment Intake (mg/kg-d)	Sediment Hazard Quotient	Aq. Invert. Intake (mg/kg-d)	Aq. Invert. Hazard Quotient	Fish Intake (mg/kg-d)	Fish Hazard Quotient	Total Intake Hazard Quotient	Water Intake (mg/kg-d)	Water Hazard Quotient	Overall Hazard Index
Organics														
Acetone	5.12E+00	8.00E+00	6.40E-01	1.00E+00	1.62E-04	2.54E-04	2.66E-01	4.16E-01	0.00E+00	0.00E+00	4.16E-01	0.00E+00	0.00E+00	4.16E-01
Bromomethane	1.10E+00	8.00E+00	1.37E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.31E-06	3.15E-05	3.15E-05	4.64E-06	3.39E-05	6.54E-05
Carbazole	5.54E-01	8.00E+00	6.92E-02	1.00E+00	4.24E-04	6.12E-03	7.97E-01	1.15E+01	0.00E+00	0.00E+00	1.15E+01	0.00E+00	0.00E+00	1.15E+01
Dibenzofuran	0.00E+00	8.00E+00	0.00E+00	1.00E+00	1.41E-04	NA	2.74E-01	NA	0.00E+00	NA	NA	0.00E+00	0.00E+00	0.00E+00
Di-n-octyl phthalate	2.41E+02	8.00E+00	3.01E+01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methylene chloride	2.99E+00	8.00E+00	3.74E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methyl ethyl ketone	9.06E+02	8.00E+00	1.13E+02	1.00E+00	3.53E-05	3.11E-07	5.90E-02	5.21E-04	0.00E+00	0.00E+00	5.21E-04	0.00E+00	0.00E+00	5.21E-04
1,3-DNB	3.05E-01	8.00E+00	3.81E-02	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2-Amino-4,6-DNT	7.13E+00	8.00E+00	8.92E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4-Amino-2-NT	3.51E+01	8.00E+00	4.39E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,6-DNB	2.05E-01	8.00E+00	2.56E-02	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-DNT	1.37E+00	8.00E+00	1.71E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,6-DNT	9.06E-01	8.00E+00	1.13E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3,4-DNT	4.13E+00	8.00E+00	5.16E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-NT	5.49E+00	8.00E+00	6.86E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3,5-TNB	1.41E+00	8.00E+00	1.76E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4,6-TNT	4.07E+00	8.00E+00	5.09E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Inorganics														
Aluminum	5.34E-01	8.00E+00	6.68E-02	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.69E-01	1.45E+01	1.45E+01	1.28E-01	1.92E+00	1.64E+01
Arsenic	3.49E-02	8.00E+00	4.36E-03	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	2.76E+00	8.00E+00	3.45E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium	9.78E+02	8.00E+00	1.22E+02	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium	1.40E+03	8.00E+00	1.75E+02	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	7.79E+00	8.00E+00	9.73E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iron	2.42E+01	8.00E+00	3.02E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.69E+00	1.22E+00	1.22E+00	2.44E-01	8.08E-02	1.30E+00
Lead	4.09E+00	8.00E+00	5.12E-01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.32E-03	1.62E-02	1.62E-02	3.67E-04	7.17E-04	1.70E-02
Magnesium	1.47E+02	8.00E+00	1.83E+01	1.00E+00	4.54E+01	2.47E+00	2.66E+01	1.45E+00	0.00E+00	0.00E+00	3.92E+00	0.00E+00	0.00E+00	3.92E+00
Manganese	4.50E+01	8.00E+00	5.63E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E-01	9.15E-02	9.15E-02	1.70E-02	3.03E-03	9.45E-02
Phosphorus	4.89E+02	8.00E+00	6.11E+01	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potassium	1.47E+03	8.00E+00	1.83E+02	1.00E+00	2.45E+00	1.33E-02	7.95E+02	4.34E+00	0.00E+00	0.00E+00	4.35E+00	0.00E+00	0.00E+00	4.35E+00
Sodium	1.47E+03	8.00E+00	1.83E+02	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vanadium	9.98E-02	8.00E+00	1.25E-02	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL						**2.49E+00**		**1.77E+01**		**1.58E+01**	**3.60E+01**		**2.00E+00**	**3.80E+01**

Body Weight (kg)	5.1
Water intake (L/d)	0.215
Food intake (kg(dw)/d)	0.26
Sediment intake (kg/d)	0.012
Aquatic Invert. Intake (kg(dw)/d -- 21% of diet	0.0546
Fish intake (kg(dw)/d) -- 2% of diet	0.0052

APPENDIX N

APPLICATION OF ESSENTIAL NUTRIENTS IN ECOLOGICAL RISK ASSESSMENT

APPENDIX N

APPLICATION OF ESSENTIAL NUTRIENTS IN ECOLOGICAL RISK ASSESSMENT

N.1.0 Introduction

All forms of living matter require inorganic elements, or minerals, for their normal life processes. All animal tissues and feeds contain inorganic or mineral elements in widely varying amounts and proportions. Minerals that are needed in relatively large amounts are referred to as major or macrominerals; those that are needed in very small amounts are referred to as trace minerals or microminerals. These terms represent quantity designations of the amounts required in an animal's diet and their generally low or trace concentrations in tissues. The major minerals are required in concentrations of greater than 100 parts per million (ppm) and are often reported as a percentage of diet, while trace elements are required at less than 100 ppm and are sometimes reported at the ppb level. Table 1 presents twenty-four elements known to be required by at least some animal species (McDowell, 1992).

The listing of some of the trace elements as essential is difficult and sometimes tentative, and rests on experiments with one or more species. In these experiments, diets adequate in all nutrients except the mineral in question produced clinical signs that were prevented or overcome by adding that mineral to the diets (McDowell, 1992).

Unlike other nutrients mineral elements cannot be synthesized by living organisms. Minerals act as (1) structural components of body organs and tissues, (2) constituents of body fluids and tissues as electrolytes, and (3) catalysts in enzyme and hormone systems. The most obvious function of mineral elements in the body is to provide structural support (skeleton) for the body. Ca, P, Mg, F, and Si in bones and teeth all contribute to mechanical stability. Birds use Ca to produce egg shells, and P and S are found in muscle proteins. Minerals are interrelated and balanced against each other, and most often cannot be considered as single elements with independent and self-sufficient roles in the organized bodily processes. The definite relationship of Ca and P in the formation of bones and teeth and the interrelationships of Fe, Cu, and Co (in vitamin B_{12}) in hemoglobin synthesis and red blood cell formation are examples. Sodium, K, Ca, P, and Cl serve individually and collectively in the body fluids. A number of trace elements (i.e.,

Cu, Zn, Fe, and Se) in addition to certain vitamins (i.e., A, D, E, B_6, and folacin) and other nutrients, are strongly related to adequate immune response (McDowell, 1992).

N.2.0 Mineral Requirements

A series of "safe" dietary levels of potentially toxic elements has been established on the extent to which other elements that affect their absorption and retention are present (McDowell, 1992). Table 2 presents some of these "safe" dietary levels or mineral requirements for selected species.

To determine whether concentrations of these minerals in the environment exceed safe dietary levels, the mineral requirements were converted to dietary doses using the following equation:

$$\text{Dose (mg/kg-day)} = \text{Diet (mg/kg)} \times \text{FI (kg/day)} \times 1/\text{BW (kg)}$$

where:

Diet (mg/kg) = Mineral requirement for each nutrient;
FI (kg/day) = Food ingestion rate; and
BW (kg/day) = Body weight.

Variables for the species are shown in Table 3.

Table 4 presents the mineral requirements calculated as dietary doses for selected species presented in Table 3.

N.3.0 Maximum Tolerance Levels

Information concerning the toxicity or tolerance of minerals is incomplete. According to available information, the toxic level of most major minerals is about 10 times the recommended level for young, growing livestock. The toxic levels of trace minerals appear to be highly variable, ranging between 10 and 1,500 times the recommended level. The National Research Council (NRC) publishes maximum tolerance levels for domestic animals. The maximum tolerance level is defined as that dietary level that, when fed for a limited period, will not impair animal performance and should not produce unsafe residues in human food derived from animals. The levels listed in Table 5 were derived from toxicity data on the designated species. Tolerance levels vary with the species, adaptation, duration of receiving the toxicants, age, physical condition of the animal, and many other factors (McDowell, 1992).

Using the same procedure described in Section 2.0, the maximum tolerance levels are converted into dietary doses to determine whether concentrations of these minerals in the environment exceed safe dietary levels. Variables for the domestic animals are shown in Table 6.

Table 7 presents the calculated dietary doses for selected species presented in Table 6.

N.4.0 Data Use

Mineral requirements or maximum tolerance levels will be used in ecological risk assessments, as appropriate.

N.5.0 References

IT, 1999. Best professional judgment for cat's (*Felis domesticus*) body weight being 10 lbs.

Oak Ridge National Laboratory (ORNL) 1996. *Toxicological Benchmarks for Wildlife: 1996 Revision*. B.E. Sample, D.M. Opresko, G.W. Suter II. ES/ER/TM-86/R3. June 1996.

U.S. Environmental Protection Agency (USEPA). 1993. *Wildlife Exposure Factors Handbook.* EPA/600/R-93/187a, December.

McDowell, L.R. 1992. *Minerals in Animal and Human Nutrition.* Academic Press, Inc. San Diego.

Note: This appendix is based on work initially completed by Ms. Margareg Roy of Radian Corporation (1988).

Table N-1

General Macro and Microminerals
Plum Brook Ordnance Works, Sandusky, Ohio

Major or Macrominerals	Trace or Microminerals		
Calcium (Ca)	Arsenic (As)*	Iodine (I)	Nickel (Ni)*
Chlorine (Cl)	Boron (B)*	Iron (Fe)	Selenium (Se)
Magnesium (Mg)	Chromium (Cr)	Lead (Pb)*	Silicon (Si)*
Phosphorus (P)	Cobalt (Co)	Lithium (Li)*	Tin (Sn)*
Potassium (K)	Copper (Cu)	Manganese (Mn)	Vanadium (V)*
Sodium (Na)	Fluorine (F)	Molybdenum (Mo)	Zinc (Zn)
Sulfur (S)			

* These elements have not been shown to be essential for livestock or humans consuming typical diets.

Table N-2

Mineral Requirements for Selected Species
Plum Brook Ordnance Works, Sandusky, Ohio

Species	Mineral (mg/kg of feed)									
	Ca	Mg	K	Na	Cu	Fe	Mn	P	Se	Zn
Japanese Quail	25,000	500	4,000	1,500	6	100	70	5,000	0.2	50
Rat	5,000	400	3,600	500	5	35	50	4,000	0.10	0.25
Mouse	4,000	500	2000	---	4.5	25	44	4,000	---	30
Cat	8,000	400	4,000	500	5	80	5	6,000	0.1	50
Mink	6,000	440	3,000	---	6	80	44	5,500	0.1	66

Table N-3

Food Ingestion and Body Weights
Plum Brook Ordnance Works, Sandusky, Ohio

Species	Food Ingestion (FI) (kg/day)	Body Weight (Kg)
Japanese Quail	0.017 derived from FI(kg/day) = 0.0582*BW(kg)$^{0.651}$ [b]	0.15[a]
Rat	0.08[a]	0.35[a]
Mouse	0.0055[a]	0.03[a]
Cat	0.24 derived from FI(kg/day)=0.0687*BW(kg)$^{0.822}$ [b]	4.5 derived from 10lbs*0.4535923 conversion factor.[c]
Mink	0.137[a]	1.0[a]

[a]ORNL, 1996.
[b]USEPA, 1993.
[c]IT, 1999.

Table N-4

Mineral Requirements as a Dietary Dose for Selected Species
Plum Brook Ordnance Works, Sandusky, Ohio

Species	Mineral Dose (mg/kg-day)									
	Ca	Mg	K	Na	Cu	Fe	Mn	P	Se	Zn
Japanese Quail	2,833	56.7	453	170	0.7	11.3	7.9	567	0.02	5.7
Rat	1,143	91.4	823	114	1.1	8	11.4	914	0.02	0.06
Mouse	733	92	367	---	0.8	4.6	8.1	733	---	5.5
Cat	427	21	213	26.7	0.3	4.3	0.3	320	0.01	2.7
Mink	822	60	411	---	0.8	11	6	753	0.01	9

Table N-5

Maximum Tolerance Levels for Domestic Animals
Plum Brook Ordnance Works, Sandusky, Ohio

Species	Maximum Tolerance Levels of Dietary Minerals (ppm)									
	Ca[a]	Mg	K	Na (as NaCl)	Cu	Fe	Mn	P	Se	Zn
Poultry	40,000[b] 12,000[c]	(3,000)	(20,000)	20,000	300	1,000	2,000	8,000	20,000	1,000
Rabbits	20,000	(3,000)	(30,000)	(30,000)	200	(500)	(400)	10,000	(20,000)	(500)

Source: McDowell, 1992.
The levels in parentheses were derived by interspecific species extrapolation.

[a]Ratio of calcium to phosphorus is important.
[b]Laying hen.
[c]Other poultry.

Table N-6

Food Ingestion and Body Weights for Domestic Animals
Plum Brook Ordnance Works, Sandusky, Ohio

Species	Food Ingestion (FI) (kg/day)	Body Weight (Kg)
Poultry	0.08 derived from $FI(kg/day) = 0.0582*BW(kg)^{0.651}$ [a]	1.6 (mean weight of male and female chicken) [b]
Rabbits	0.2 derived from $FI(kg/day)=0.0687*BW(kg)^{0.822}$ [a]	3.8 [b]

[a]USEPA, 1993.
[b]ORNL, 1996.

Table N-7

Maximum Tolerance Level as a Dietary Dose for Domestic Animals
Plum Brook Ordnance Works, Sandusky, Ohio

Species	Dietary Doses (mg/kg-day)									
	Ca	Mg	K	Na (as NaCl)	Cu	Fe	Mn	P	Se	Zn
Poultry	600	150	1,000	1,000	15	50	100	400	1,000	50
Rabbits	1,053	158	1,579	1,579	11	26	21	526	1,053	26

APPENDIX O

RESPONSES TO TECHNICAL COMMENTS

Note Concerning the Responses To Technical Comments
Section 6.0 Ecological Risk Assessment
TNT Area B
Plum Brook Ordnance Works
Sandusky, Ohio

Responses to comments received concerning the ecological risk assessment presented in Section 6.0 are included. Revisions to the text have not been completed pending collection of additional data as proposed in *the Phase 2 Ecological Risk Assessment of the Red Water Ponds Areas* (IT, 2000) under Contract Number DACA62-00-D-002. The comments received will be incorporated into future reports, as appropriate.

Response to Ohio EPA Technical Review Comments
Risk Assessment and Direct Push Investigation of the Red Water Ponds Areas, Former Plum Brook Ordnance Works, Sandusky, Ohio

Reference: *Ohio EPA letter from Ron Nabors (DERR) dated February 22, 2000, to U.S. Army Corps of Engineers, Nashville District (CELRN-ED-R-M, Ms. Linda Ingram), RE: U.S. NASA Plum Brook, Erie County, Ohio I.D#: 322-0552, Red Water Ponds Investigation, Risk Assessment Comments.*

General. The following comments are for the human health and ecological risk assessment sections found in the Draft Risk Assessment and Direct Push Investigation, Red Water Ponds Areas, Former Plum Brook Ordnance Works, Sandusky, OH dated March 1999. Each comment identifies the section of the report and page number in **bold** and the text from the report in *italics*.

Response: *USACE is grateful for the careful review performed by OEPA and for the suggestions that will help improve the overall quality of the human health risk assessment (HHRA) and ecological risk assessment (ERA). The review reflects a high level of understanding of risk assessment (RA).*

Several of the comments, however, suggest that the reviewer was not familiar with the Baseline Human Health Risk Assessment and Ecological Risk Assessment Work Plans, Red Water Ponds Areas (RAWP) on which the risk assessments are based. USACE invested considerable resources, in cooperation with its contractor, IT Corporation, and with OEPA, to develop the RAWP for the express purpose of minimizing the revisions of the RAs. The final (September 1998) version of the RAWP incorporates OEPA comments and is considered to be approved by OEPA. Therefore, the USACE believes that the RAWP probably should be followed in most cases where it clearly identifies how a given issue should be handled. Particularly significant in this regard is comparison with background, and the determination of which exposure pathways to quantify.

Please notice the caveat in the previous statement. The USACE is committed to producing a reasonable, well defended and high quality RA that provides a complete and transparent evaluation of an adequate data set in order to give maximum support to sound risk management decisions. The USACE prefers to minimize changes to the RAs, but no comment is dismissed or treated lightly because it differs from the RAWP. The merits of all comments are evaluated to determine whether they suggest a more defensible approach to RA. The USACE will provide adequate justification for all changes it declines to make.

Comment 1. [Section 5.1, Introduction, page 5-1] "Both current and future land use is classified as industrial for the purpose of identifying plausible human receptors and exposure pathways..."

There are no restrictions on this property to prevent future residential land use. Revise this statement to say "Current land use is classified as industrial and future land use is classified as residential for the purpose of identifying plausible receptors."

Response: *Agreed; the sentence in question will be revised as requested.*

Comment 2. [Section 5.1, Introduction, page 5-3] "Currently, there is no pathway through which a receptor at the site could be exposed to potentially contaminated shallow groundwater."

The construction worker is a receptor for both the current and future land use scenarios. It is possible for the construction worker to come in contact with shallow groundwater during excavation activities, utility repairs, construction of homes with basements. Re-evaluate this pathway.

Response: *Evaluation of hydrogeologic conditions at the RWP areas indicates that shallow groundwater is present near the surface during much of the year, and that construction worker exposure is plausible. However, as a programmatic matter, note that site-wide groundwater (shallow and deep) will be evaluated at a later date. The pathway for construction worker exposure to shallow groundwater will be developed at that time. The first full paragraph on page 5-3 will be revised as follows: "Earlier investigations summarized by USACE indicate that subsurface soil, surface water, the shallow or overburden groundwater and the bedrock groundwater aquifer are contaminated with organic compounds including explosives (predominantly TNT degradation products), VOCs and SVOCs, and possibly with metals. Contaminated media evaluated in this RA are limited to surface water, sediment and soil. Both shallow and deep groundwater associated with the Red Water Ponds Areas will be evaluated under a future site-wide HHRA, following additional groundwater characterization at PBOW. It is assumed that the deep groundwater aquifer could be developed as a source of potable water in the future. The shallow groundwater is not considered a plausible source of potable water under either current or future receptor scenarios. Incidental contact with shallow groundwater (dermal contact and inhalation of VOC emissions), however, is plausible during construction projects. Therefore, incidental contact with shallow groundwater, and the potential development of the deep groundwater as a source of potable water, will be developed and evaluated as plausible exposure scenarios in the future site-wide HHRA."*

The first complete paragraph on page 5-14 will be revised as follows: "Tables 5-9 and 5-10 present data summaries for shallow groundwater for the two sites, for information only. Screening criteria are not presented and COPC are not selected. This is because both shallow and deep groundwater will be evaluated under a forthcoming site-wide HHRA following additional groundwater characterization."

The description of construction worker exposure in Tables 5-11 and 5-12, and Figure 5-1 will be revised to include dermal contact and inhalation of VOCs from shallow groundwater.

The first paragraph of the construction worker description on page 5-17 will be revised as follows: "The construction worker scenario is created to evaluate short-term exposure to shallow groundwater, surface soil and subsurface soil in both the current and future land-use scenarios. Shallow groundwater exposure pathways include inhalation of VOCs and dermal contact. Relevant pathways for exposure to soil include incidental ingestion, dermal contact, and inhalation of dust and VOCs. Volatilization from subsurface soil is quantified because construction activity may uncover significant subsurface soil concentrations of VOCs, facilitating emission of VOCs directly into the construction worker's breathing zone."

A new penultimate paragraph will be added to the description of the construction worker on page 5-19 as follows: "The construction worker may be exposed to shallow groundwater during the 3-month part of the construction period involving excavation and grading, and inhalation of VOCs and dermal contact are evaluated for this period. It is assumed that construction activities involve work in a utilities trench that is 2 ft (51 cm) wide, 2.5 ft (76 cm) deep, and of undetermined length. Dermal exposure will be quantified only if water is expected to pool in the bottom of the trench. It is assumed that the construction worker wears protective footwear, and that only the hands and arms are exposed to shallow groundwater. These regions comprise a body surface area of approximately 3100 cm2 (EPA, 1992b) as described above. Inhalation exposure to airborne VOCs will be quantified only during the 3-month excavation and grading period. Although VOCs may be present in air during the remaining 3 months of the construction period, the worker is not confined to the trench where airborne concentrations are highest. It is assumed that airborne concentrations to which the construction worker would be exposed during the remainder of the construction period are toxicologically insignificant compared with concentrations in the trench because of natural air currents and the large dilution factor of ambient air above the trench."

Comment 3. [Section 5.2.1.1 Sorting Analytical Data, page 5-4] "Surface soil (generally 0 to 1 feet bgs) and subsurface soil (1 to 10 feet bgs for direct exposure pathways) are considered separate media." ... "Therefore, surface soils included samples from 0 to 3 feet, while subsurface soils included data from 2 to 10 feet."
It is unclear what depth separates surface soils from subsurface soils. Are surface soils classified as 0 to 1 feet bgs or are they classified as 0 to 3 feet bgs? Also, samples from the 2 to 3 feet bgs interval appear to be included in both the surface soil and subsurface soil data sets. Revise text to clarify the separation between surface soil and subsurface soil.

Response: *Surface soils are generally classified as from 0 to 1 feet bgs; however, a few soil samples were collected from 0 to 2 feet and 0 to 3 feet. These were also compiled*

in the surface soil data set. Individual soil sample results were included in either surface or subsurface soil data sets, not both. The following sentence will be added to the paragraph in question: "No sample results were included in both the surface soil and subsurface soil data sets."

Comment 4. [Section 5.2.1.3 Identifying Site-Related Chemicals, page 5-5] Revise this section. In general, comparison with naturally occurring levels is applicable only to inorganic chemicals because the majority of organic chemicals are not naturally occurring, even though they may be ubiquitous. Do not eliminate anthropogenic chemicals because it is extremely difficult to conclusively show that such chemicals are present at a site due to operations not related to the site or surrounding area. The presence of anthropogenic background chemicals can be discussed in the uncertainties section, however, these constituents should be retained and evaluated in the site-related risk.

Response: *The USACE respectfully disagrees with the statement that it is necessary to "...conclusively show that...chemicals are present at a site due to operations not related to the site..." in order to designate them as anthropogenic background. It is only necessary to show that their concentrations do not exceed anthropogenic background levels. Granted, the ATSDR Toxicity Profile on the PAHs is not the most relevant data set for background for PBOW. Furthermore, site-specific background data are not available and there are no plans to generate such data for the future. Therefore, the document will be revised so that PAHs are not screened against background. PAHs selected as COPC will be carried through the "site-related" part of the risk assessment. Should PAHs be identified as risk drivers, arguments will be developed in the uncertainty section for their presence, including vehicular traffic, annual burning of grasslands, etc. associated with post-DOD activities.*

Comment 5. [Section 5.2.1.3 Identifying Site-Related Chemicals, page 5-7} "Data sets for background surface water and sediment consist of only one to two samples, precluding developing UTLs or performing statistical comparison with site data. For these media, metals are selected as site -related only if their MDCs exceed 120 percent of background MDCs."

What is the basis for 120 percent? This methodology is not acceptable to Ohio EPA. I recommend collecting more samples to allow for UTL development or use the maximum detected concentration as the background value.

Response: *Agreed; there is no basis for 120 percent and this method is not consistent with the RAWP. Additional surface water and sediment background samples are to be collected during the summer/fall of 2000 to supplement the existing background data set.*

Comment 6. [Section 5.2.1.5 Evaluating Essential Nutrients, page 5-9] "Essential nutrients such as calcium, chloride, iodine, iron, magnesium, phosphorus, potassium and sodium are not selected as COPC..."

Using the essential nutrient status as the basis for the COPC screen should be limited to calcium, iron, magnesium, potassium, and sodium. Without consideration of the levels that may be associated with toxicity for these other inorganics, it is not appropriate to screen them out.

Response: *The text in question will be revised as follows: "Essential nutrients such as calcium, iron, magnesium, potassium, and sodium are usually eliminated as COPC because they are generally considered innocuous in environmental media. Other essential nutrients including chloride, iodine and phosphorus may be eliminated as COPC, provided that their presence in a particular medium is judged to be unlikely to cause adverse effects on human health." Please note that only calcium, magnesium, potassium, and sodium were eliminated as COPC based on their status as essential nutrients. Iron was inadvertently selected as a COPC in soil, surface water and sediment because its concentration exceeded its RBSC. However, the provisional oral RfD for iron, on which the RBSC is based, is based on dietary intake and does not accurately reflect the threshold for toxicity in humans. Iron will be de-selected as a COPC in the revised RA.*

Comment 7. [Section 5.2.2.1 Soil, Surface Water and Sediment, page 5-10] "Nondetects are assumed to be present at one-half the SQL (EPA, 1989a), although judgement may be used in those cases where matrix interference or other phenomena drive the SQL unusually high."

Define the judgement criteria that is used when evaluating data with unusually high SQL and how the data is handled in the risk assessment.

Response: *The most common cause of elevated SQL is sample dilution, usually necessitated because one or more chemicals are present at concentrations exceeding the range of the method calibration curve. SQLs are typically designated as unusually high when they are considerably above the highest positive detection. Their use in the data set may result in the 95% UCL exceeding the maximum detected concentration (MDC), which would impart a bias to the RA. Unusually high SQL results such as these are typically deleted from the data set.*

Comment 8. [Section 5.2.3, The Data Summary Tables, page 5-14] "This is because there is no plausible pathway for repeated, predictable human exposure to perched groundwater."

See comment # 2.

Response: *Please see response to Comment #2.*

Comment 9. [Section 5.3.1.3 Receptors and Exposure Pathways, page 5-16] "It is plausible that groundwater could be developed as a source of potable water under the future land-use scenario; therefore, contact with groundwater may also be evaluated when the groundwater data base is complete."

What is the anticipated completion date for the groundwater data base?

Response: *As mentioned in the response to Comment #2, evaluation of the risk associated with overburden and/or bedrock groundwater will be conducted on an installation-wide basis at a later date. Because groundwater is not confined to the geographic areas defined for the various areas of concern (AOC) identified for study at PBOW, possible contaminant migration between the AOCs would result in an incomplete evaluation of groundwater if conducted on an AOC-specific basis. Thus, the specific approach is to first complete the SIs/RIs for the site-specific media (soil, sediment, and surface water) at the various AOCs to identify site-specific contaminants in these media. Once these investigations are completed, the USACE will be able to conduct a more comprehensive evaluation of site-wide groundwater with a more complete understanding of site-specific contaminants and their potential impact on groundwater.*

The timing of the additional groundwater data collection and risk assessment is dependent upon completion of additional SIs/RIs of remaining AOCs as well as funding availability. However, additional groundwater investigations are currently identified in the work plan for FY 2001.

Comment 10. [Section 5.3.1.3 Receptors and Exposure Pathways, page 5-16] "Inhalation of VOC emissions from groundwater is also possible, but the large volume of ambient air is assumed to dilute airborne concentrations to toxicologically insignificant levels."

Is data available on the quality of ambient air at Plum Brook Ordnance Works site to justify this statement? Inhalation of VOC emissions from groundwater should be evaluated in the site risk assessment, unless justification for excluding this pathway from a quantitative assessment is provided.

Response: *This issue was discussed at length with OEPA during development of the approved RAWP. The justification for choosing to not quantify this inhalation pathway is intuitive, because validated models for airborne concentrations of VOCs from groundwater used as potable water are not available. The intuitive justification mentioned in the document includes dilution in the large volume of ambient air and the short exposure time. Further intuitive justification that could be cited includes natural air currents, which hasten dispersion in ambient air, and the assumption that inhalation exposure is expected to be far less significant than ingestion of 1 L/day, which is quantified. The justification on pages 5-16 to 5-17 will be revised as follows: "Inhalation of VOC emissions from deep groundwater*

used as a potable source is also possible, but natural air currents and the large volume of ambient air are assumed to dilute airborne concentrations to toxicologically insignificant levels. Also, potable water usage time is relatively short. Furthermore, exposure from inhalation of VOCs is expected to be far less significant than exposure from ingestion of 1 L/day, which will be quantified."

The uncertainty analysis (Section 5.6) will be significantly expanded to include the major sources of uncertainty in the HHRA for the Red Water Ponds Areas. Potentially complete exposure pathways that are not quantified, including this one, will be discussed as a source of non-conservative bias to the risk and hazard estimates.

No onsite ambient air quality data are known to exist at this time. The relevance of such data, however, is unclear, because the pathway in question involves exposure to VOCs that volatilize from deep groundwater during its use as potable water.

It should be understood that all groundwater evaluation will be postponed until groundwater has been more adequately characterized (please see response to Comments # 2 and 9).

Comment 11. [Section 5.3.1.3 Receptors and Exposure Pathways, page 5-18] "Inhalation of VOC emissions from surface water and sediment is possible, but the large volume of outdoor air is expected to dilute airborne concentrations to toxicologically insignificant levels, and this pathway is not evaluated."

See comment #10.

Response: *Please see response to Comment # 10. The sentence in question will be revised as follows: "Inhalation of VOC emissions from surface water and sediment is also possible, but natural air currents and the large volume of outdoor air are assumed to dilute airborne concentrations to toxicologically insignificant levels. Furthermore, exposure from inhalation of VOCs is expected to be far less significant than exposure from dermal contact with surface water, and from dermal contact and incidental ingestion of sediment, which are quantified."*

Comment 12. [Section 5.3.1.3 Receptors and Exposure Pathways, page 5-19] "For evaluating inhalation exposure to dust, it is assumed that 80 percent of the surface is covered with pavement or vegetation."

What is the basis for using the assumption that 80% of the surface is covered? What controls are in place to ensure that this assumption will not be violated under the future residential scenario? The default assumption of 0.5 (50%) is recommended by USEPA in the Soil Screening Guidance (1994).

Response: *The assumption of 80 percent of the surface covered reflects the observation that it is unusual to find residential plots with as much as 20 percent or more of the surface soil uncovered. This assumption was reviewed by OEPA and is presented in the approved RAWP. No controls are in place to ensure compliance with the 80 percent assumption.*

Comment 13. [Section 5.3.1.3 Receptors and Exposure Pathways, page 5-19] "It is assumed, however, that the large volume of outdoor air would effectively dilute airborne concentrations to toxicologically significant levels, and the inhalation pathway is not quantified."

See comment #10.

Response: *Please see response to Comment # 10. The sentence in question will be revised as follows: "It is assumed, however, that natural air currents and the large volume of outdoor air dilute airborne concentrations to toxicologically insignificant levels. Furthermore, the inhalation of VOCs is expected to be far less significant than exposure from incidental ingestion and dermal contact with surface water and sediment, which are quantified."*

Comment 14. [Section 5.5.1.1 West Area Red Water Ponds, page 5-40 and Section 5.5.1.2 Pentolite Road Red Water Ponds, page 5-41] "The ILCR of 1E-5 is the OEPA acceptable limit."

Ohio EPA currently operates within the risk range of 10-6 to 10-4, with the point of departure at 10-6. Risks in the range of 10-6 to 10-4must be acknowledged and discussed in the report. Risk less than 10-6 is considered to be protective and risk greater than 10-4 are considered not protective; however, risk falling within the range will need to be evaluated. The point at which to take remedial action and the final clean-up level will be a risk management decision. The use of the 10-6 point of departure, does not reflect a presumption that the final remedial action should attain such goals.

Response: *ILCRs less than 1E-6 will be described as sufficiently protective; an ILCR of 1E-6 will be described as the point of departure, ILCRs within the 1E-6 to 1E-4 range will be described as falling within the risk management range, and ILCRs greater than 1E-4 will be described as clearly unacceptable.*

Comment 15. [Section 5.5.1.1 West Area Red Ponds, page 5-40 and Section 5.5.1.2 Pentolite Road Red Water Ponds, page 5-41] Report the total pathway risk under the residential exposure scenario separately for the adult and child receptor.

Response: *Tables 5-16 through 5-18 present the ILCR calculations separately for the period of time that the resident is a child and the period of time the resident is an adult. The sentences in the text that present total risk for the resident will be revised to*

include the adult and child risk estimates separately in parentheses; e.g., "ILCRs summed across media for the residential exposure scenario are 3E-5 (1E-5 for the adult + 2E-5 for the child)..."

Comment 16. [Section 5.5.4 Conclusions, page 5-45] See comment #14.

Response: *Please see response to Comment # 14.*

Comment 17. [Section 6.2.1.1 General Site Background, page 6-3] "PBS, approximately 6,453 acres in size...."

To avoid confusion for the reader, use consistency when referring to the site name. Previously in this report, the site has been referred to as Plum Brook Ordnance Works (PBOW) and in this section is called the Plum Brook Station (PBS). Revise text for consistency.

Response: *Text will be revised to refer to the site as PBOW.*

Comment 18. [Section 6.2.2.2 Descriptive Statistical Calculations, page 6-14] "Nondetects are assumed to be present at one-half the SQL, although judgement may be used in those cases where matrix interference or other phenomena drive the SQL unusually high."

Define the judgement criteria that is used when evaluating data with unusually high SQL and how the data is handled in the risk assessment. Provide a list of the samples where judgement criteria was applied.

Response: *Please see response to Comment # 7. For the current risk assessment, no samples were excluded from the data set due to unusually high SQLs.*

Comment 19. [Section 6.2.2.4 Natural Site Constituents (Background and Essential Nutrients), page 6-14] "This comparison is generally valid for inorganic chemicals, but not for organic chemicals, because inorganic chemicals are naturally occurring and most organic chemicals, besides PAHs, are not."

This statement gives the impression that PAHs are only from natural sources. As defined in RAGS, part a (EPA, 1989), naturally occurring levels are ambient concentrations of chemicals present in the environment that have not been influenced by humans, and anthropogenic levels are concentrations of chemicals that are present in the environment due to human-made, non-site sources. PAHs are anthropogenic and ubiquitous, although these chemicals may be present in the environment from natural sources (e.g. forest fires).

In general, comparison with naturally occurring levels is applicable only to inorganic chemicals because the majority of organic chemicals are not naturally occurring, even though they may be ubiquitous. Do not eliminate anthropogenic chemicals because it is extremely difficult to conclusively show that such chemicals are present at a site due to operations not related to the site or surrounding area. The presence of anthropogenic background chemicals can be discussed in the uncertainties section, however, these constituents should be retained and evaluated in the site-related risk.

Response: *Please see response to Comment No. 4.*

Comment 20. [Section 6.2.2.4 Natural Site Constituents (Background and Essential Nutrients), page 6-16] "Essential nutrients such as calcium, chloride, iodine, magnesium, phosphorus, potassium and sodium may be eliminated as COPEC…"

See comment #6. In addition, it is not appropriate to apply the essential nutrient methodology, which is used in the human health risk assessment, to ecological risk assessments considering that recommended daily allowances have not been established for ecological organisms, whether they be wildlife, plant life, or microorganisms.

Response: *Essential nutrients were not eliminated from the ERA, unless they were below background. As shown in summary tables 6-27 through 6-30, some essential nutrients were found to be hazard drivers for ecological receptors (e.g., calcium, phosphorus, potassium, magnesium). The sentence in question will be revised to avoid the impression that nutritional essentiality for humans is somehow involved in COPEC selection for ecological receptors.*

Comment 21. [Section 6.2.4.2 Aquatic, page 6-20] "Exposure to aquatic organisms within the water bodies is assumed to occur via direct exposure to contaminants in the water column and via ingestion of…"

Direct contact of aquatic organisms to sediments is feasible, especially if bottom feeders such as catfish are found in these ponds.

Response: *Agreed. Because a Phase II ERA will be completed during the fall of 2000, this revision will be made following the collection and evaluation of additional data. The BERA will then be revised to incorporate the current and supplemental data.*

Comment 22. [Section 6.2.5.1 Assessment Endpoints, page 6-23] "The assessment endpoints of the Red Water Ponds are stated as "the protection of long-term survival and reproductive capabilities for terrestrial invertebrates..."

Terrestrial vegetation should be protected since it is a food source for many of the terrestrial organisms.

Response: *Table 6-24 evaluates the potential terrestrial plant impacts from COPECs in soil. Thus, existing information in the ERA addresses this issue. It should be noted that no threatened or endangered plant species were found at the sites (Section 6.2.1.8), thus potential adverse effects on individual plant specimens is not a concern. Ample alternative vegetation food sources exist in the area to provide forage for area wildlife. Protection of herbivorous mammals is listed as an assessment endpoint, and this endpoint protects terrestrial vegetation in an indirect manner as the null hypotheses is that the presence of site contaminants in "vegetation" will have no adverse impact on survival and reproductive capabilities of herbivorous mammals.*

Comment 23. [Section 6.5.1 Terrestrial Plant Impact Assessment, page 6-36] "Although bare soils were noted during site reconnaissance (Section 6.2.1.6), these finding could not be definitively attributed to chemical stressors in surface soils..."

Were discrete soil samples taken from these bare areas?

Response: *Yes, and results did not indicate elevated COC concentrations that would be expected to be related to plant toxicity. The Phase II BERA will include a discussion of chemical analytical results collected from the bare soil areas.*

Comment 24. [Section 6.5.5 Risk Description, page 6-42] "Based on the uncertainties of toxicity and sample size, and on the fact that no RTE species have been confirmed at this Red Water Pond, with the possible exception of the black-crowned night heron, remedial actions are not warranted."

With limited data, can you make this conclusion? More sampling is needed before a conclusion can be made.

Response: *Additional media sampling and ecological bioassay studies are scheduled to be conducted during the summer/fall of 2000.*

Comment 25. [Section 7.0 Conclusions and Recommendations, page 7-1] "Additional investigatory and risk assessment work may be warranted to characterize and assess potential risk from groundwater at these sites."

Additional work will need to be completed in order to assess the risk to the future resident and to the construction worker from exposure to groundwater.

Response: *Agreed; please see response to Comments # 2 and 9, and note the several places in Section 5 that refer to evaluation of groundwater when data are available.*

Comment 26. [Section 7.0 Conclusions and Recommendations, page 7-1] Remove all references to Ohio EPA acceptable limit of 10E-5 in this report. Revise this section to clarify that Ohio EPA is currently operating between the risk range of 10E-4 to 10E-6, with the point of departure at 10E-6. All risks falling within this range need to be reported and discussed.

Response: *Agreed; please see response to Comment # 14.*

Comment 27. [Table 5-1 to Table 5-8 & Table 6-9 to Table 6-16]

a. Add a footnote to indicate that one-half of the SQL was used for non-detects when calculating the arithmetic mean.

b. Clarify what the "<" symbol means in the 95% UCL column.

c. Values used for background should only be calculated for naturally occurring inorganic compounds. The calculated UTL for background constituents should not exceed the maximum detected concentration of that constituent. If this occurs, default to the maximum detected value for that constituent, as your background value.

d. Remove background values for PAHs that were used from ATSDR (1993). The background screen is only applicable to naturally occurring constituents.

e. Background for surface water and sediment should be a single value and not a range of values.

f. The concentration used in the risk assessment should be the 95% UCL. However, if the 95% UCL exceeds the maximum detect of a constituent, then default to the maximum detected value of that constituent as the source term concentration for the risk assessment.

g. Why was the mean value instead of the 95 % UCL used as the source term for antimony in Table 5-1?

h. Why aren't the 95% UCL values used as the source-term concentration for SVOCs in the tables?

i. Why was benzo(a)pyrene excluded as a COPEC in table 6-9?

Response: ***a.*** *Agreed.*

b. *The tables will be revised to present the 95 percent UCL as an absolute value; the "<" will be removed. The "<" symbol was used to show the selected nonparametric rank 95% UCL was a nondetect result; in the revised report one-half of the detection limit will be presented.*

c. The USACE respectfully disagrees with the position that screening against background should be limited to naturally occurring inorganic chemicals if adequate data are available for anthropogenic background. Please see response to Comment # 4. The USACE respectfully disagrees with the statement that the UTL should not exceed the MDC. The numerical value of the UTL is directly related to statistical variability contained within the data set. Defaulting to the MDC essentially ignores the variability that should be taken into account in the calculation of a background statistic. Development of the UTL methodology was one of the issues resolved by collaboration and presented in the RAWP.

d. Agreed that PAHs will not be screened against background in this evaluation. Please see response to Comment # 4.

e. Agreed; additional sampling of surface water and sediment is scheduled (please see response to Comment #5).

f. It appears that the protocol for estimating source-term concentrations is correctly stated in the text in Section 5.2.2.1, but that deviations from this protocol occasionally occurred during execution. The data summary tables and risk/hazard estimations will be revised accordingly.

g. The 95% UCL used as the source-term concentration for antimony was one-half of the detection limit of the selected nonparametric rank equivalent to the 95% UCL (6.8 divided by 2). Coincidentally, this value was also the arithmetic mean.

h. Please see response to Comment 27f.

i. The maximum detection was below the upper background concentration. See also response to Comments # 4 and 19.

Comment 28. [Table 5-9 to Table 5-10] Do not use the ">" and "<" symbols in the 95% UCL column. The value listed in this column should be the value that was calculated. If this value exceeds the maximum detect of the constituent, then make a separate footnote to denote that this has occurred.

Response: *Please see response to Comment # 27f. The UCL value in the revised data summary tables will be the calculated value; the concentration selected as the source-term concentration will be the smaller of the UCL or the MDC. Note: the "<" value in the draft report indicates the selected nonparametric concentration is from ranked data and is a nondetect value, and is subsequently divided by 2 for the source-term concentration.*

Comment 29. [Table 5-11]

a. Under the current land use scenario, there is potential for the construction worker to contact groundwater during excavation activities.

b. Footnote e - see comment #10.

Response: ***a.*** *Agreed; please see response to Comment # 2.*

b. *Please see response to Comment # 10.*

Comment 30. [Table 5-16 to 5-21]

a. Remove percentages associated with the major contributor column. It is difficult to calculate a meaningful number.

b. Revise footnote b to clarify that the maximum risk from either surface soil or subsurface soil was used to represent a single risk from the soil pathway. This max risk value was used to calculate the total pathway risk.

Response: ***a.*** *The USACE respectfully disagrees. Identification of the risk drivers and the amount they contribute to risk and hazard estimates provides information and perspective that may be useful to risk managers.*

b. *The USACE agrees with the need for clarification; the footnote in question will be revised as follows: "The larger of the total media risk (or hazard) estimates from surface soil or subsurface soil was used to estimate total pathway risk (or hazard) across all media for the receptor."*

Comment 31. [Table 6-8] The calculated UTL for background constituents should not exceed the maximum detected concentration of that constituent. If this occurs, default to the maximum detected value for that constituent, as your background value.

Response: *Please see response to Comment 27c.*

Comment 32. The ecological screening criteria used for soil at this site follows the methods outlined in the workplan. However, for future projects the following hierarchy is recommended as sources for ecological screening levels for soil:

1) Preliminary Remediation Goals for Ecological Endpoints, Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. August 1997. ES/ER/TM-162, Oak Ridge National Laboratory, Oak Ridge, TN 37831.

2) Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Efroymson, R.A., G.W. Suter II, and M.E. Will. ES/ER/TM-126/R2, Oak Ridge National Laboratory, Oak Ridge, TN 37831.

3) Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Efroymson, R.A., G.W. Suter II, A.C. Wooten and M.E. Will. ES/ER/TM-85/R3, Oak Ridge National Laboratory, Oak Ridge, TN 37831.

4) Ecological Data Quality Levels (EDQL), USEPA Region 5 Final Technical Approach for Developing EDQLs for RCRA Appendix IX Constituents and Other Significant Contaminants of Ecological Concern, April 1998.

Response: *Agreed.*

June 23, 2000

Commander
U.S. Army Engineer District, Nashville
ATTN: CELRN-ED-R-M (Ms. Linda Ingram)
Estes Kefauver Federal Building
801 Broadway
Nashville, Tennessee 37202-1070

Synopsis of the Plum Brook Ordnance Works Team Meeting
May 10, 2000 – NASA Plum Brook Station, Sandusky, Ohio
Contract Number DACA62-94-D-0030; IT P/N 773701 and 775616

Dear Mrs. Ingram:

In accordance with the requirements of delivery orders 0031 and 0034 of contract number DACA62-94-D-0030, IT Corporation is pleased to submit three copies of the synopsis of the Plum Brook Ordnance Works Team Meeting held at the NASA Plum Brook Station on May 10, 2000. Should you have any questions or require additional information regarding these minutes, please do not hesitate to call.

Sincerely,

Mikael L. Spangberg
Project Manager

cc: R. Meadows, CELRH – 6 Copies
R. Kunath, NASA Plum Brook Station – 1 Copy
R. Nabors, Ohio EPA, NW District – 3 Copies

Synopsis of Plum Brook Ordnance Works Team Meeting
May 10, 2000 – NASA Plum Brook Station, Sandusky, Ohio

Attendees:	Linda Ingram	USACE Nashville District
	Jim Beaujon	USACE Nashville District
	Lannae Long	USACE Nashville District
	Rick Meadows	USACE Huntington District
	Lisa Humphreys	USACE Huntington District
	Frank Albert	USACE Huntington District
	Kathryn Lucas Berezo	USACE Huntington District
	Ken Woodard	USACE Huntington District
	CPT John Osborn	USACE Huntington District
	Rich Kunath	NASA Plum Brook Station
	Ron Nabors	Ohio EPA
	John Weaver	Ohio EPA
	Laurie Moore	Ohio EPA
	Mikael Spangberg	IT Corporation, Windsor, CT
	Michael Gunderson	IT Corporation, Knoxville, TN

General Project Discussions. The meeting was called to order by Mr. Rick Meadows at 1300 hours at the NASA Plum Brook Station engineering building. Following introductions, Captain John Osborn provided a summary presentation of the Project Management Plan for the former Plum Brook Ordnance Works and requested that NASA and OEPA review and sign the plan on the signature page.

Mr. Meadows indicated that the USACE was considering the implementation of an 800 number that former employees of the PBOW or others with information regarding the operation of the facility could call to provide this information to the USACE. Ms. Moore stated that she had experienced difficulties with such requests for information at other sites due to confidentiality agreements signed by employees. The USACE indicated that they would confer with the members of the RAB to see if anyone had knowledge of such agreements having been signed at PBOW. The team agreed that barring difficulties with confidentiality agreements, the 800 number was a good option for gathering additional information regarding the site. However, it was agreed that the advertisements or requests for information should clearly limit the timeframe and type of information sought.

Red Water Ponds Areas Direct Push Investigation and Risk Assessments. In response to one of the OEPA comments regarding the evaluation of groundwater in the HHRA, the USACE clarified that the intent was for groundwater to be addressed on a site-wide basis. Mr. Nabors stated that he recalled discussing this in the past and that the OEPA was in agreement. However, the site-wide evaluation will be required to include evaluation of both the construction worker exposure scenario and drinking water exposure.

The USACE next inquired as to the status of OEPA's decision regarding the classification of the overburden groundwater as a non-potable water source. Mr. Nabors stated that the OEPA had determined that the overburden groundwater would not be classified as a drinking water source; however, the USACE will be required to evaluate and demonstrate results of possible migration between the overburden and bedrock groundwater zones before being permitted to eliminate potential exposure scenarios. It was agreed that such an evaluation would likely be conducted during the feasibility study (FS). Additionally, the parties agreed that the site-wide groundwater evaluation would include evaluation/comparison to site-wide groundwater background levels.

Regarding consideration of "background" PAH levels, OEPA stated that they would require site-specific background levels for any constituent that is of non-site related origin. The use of ATSDR levels without accompanying site data is not acceptable to OEPA. It was agreed that the six samples planned for collection at the upcoming ecological field investigation at the Red Water Ponds Areas could be used to establish site-specific background levels for PAHs at the RWP only. Evaluation of PAHs outside of the RWP would require the establishment of site-wide background levels.

Ms. Moore stated that many of her comments were the result of her attempt to apply consistent approaches for all risk assessment work at federal facilities within Ohio. The team agreed that this was a good approach. The first such approach related to the calculation of background risk, site risk, and total risk within the risk assessment. Ms. Moore stated that this approach was contrary to OEPA policy and that only total risk should be used in the risk assessment. Background levels and associated risk could then be applied following identification of COPCs through the risk assessment. IT agreed to evaluate the level of effort associated with this revision and determine whether this change would be made. Subsequent to the meeting, IT determined that the needed effort was minor and the requested change would be made.

OEPA inquired whether supporting documentation was available for the argument that VOC dilution was occurring in ambient air. Ms. Long stated that she had the supporting documentation and would provide this for information. Ms. Moore also inquired whether VOC s were detected or detected above screening levels in site soils. The USACE and IT stated that the data was not immediately available, but felt that any VOC detections had been below screening levels. Ms. Moore then asked that the dilution argument be removed – state simply that the screening levels were not exceeded since the pathway could potentially be complete.

The OEPA requested that while differentiating between the adult and child risks would not be necessary in the calculations the corresponding exposures be presented in the text parenthetically; i.e., "...risk is 5E-6 (adult 3E-6, child 2E-6)...". IT and the USACE agreed that this change would be made either in the text or tables of the risk assessment.

Regarding the comment on how samples exceeding the SQL were treated, OEPA asked that since none of the samples were so evaluated the statement be removed from the document. The USACE agreed that this would be done.

Ms. Moore added that in future risk assessments she would require that the minimum of the 95% UTL or maximum detected concentration be used (Comment 27). Although the use of 95% UTL in the current risk assessment sometimes exceeded the MDC, the use of the MDC in those cases would not alter the conclusions and changes to the assessment would not be required.

Upcoming Events. IT stated that field work would be conducted at the RWP, TNT Area A, and TNT Area C during the summer and fall of 2000. The kickoff meeting for this work was tentatively scheduled for June 13, 2000, at the NASA Plum Brook Station. Mr. Meadows stated that the next RAB meeting was scheduled for May 24, 2000.

The meeting was adjourned at 1600 hours.

Response to Technical Review Comments from CELRN-EP-R-D, Draft Risk Assessment and Direct Push Investigation of the Red Water Ponds Areas, Plum Brook Ordnance Works, Sandusky, Ohio, dated March 1999

1. Pg 2-2, last sentence of Section 2.2: Section 2.2 concerns DP groundwater sampling while the last sentence of Section 2.2 concerns the surface water and sediments samples. The subject sentence belongs at the end of Section 2.3. If anything the last sentence of Section 2.2 would reference Table 2-1 which includes the DP groundwater samples.

   Response: Agreed. The last sentence of this paragraph discussing surface water and sediment will be moved to the end of Section 2.3.

2. Pg 2-3, Section 2.5, second paragraph: The IDW from this investigation has either been disposed, or has been moved to the magazine area. Please rewrite paragraph to reflect actual current status.

   Response: Agreed. The text will be revised to indicate that all IDW generated during the red water ponds investigation was disposed of in accordance with IDW management recommendations approved by OEPA.

3. Page 3-1, Section 3.0, last sentence: Suggest changing blank-corrected data to blank-evaluated data.

   Response: Agreed. "Blank corrected " will be changed to "blank evaluated" throughout the text.

4. Page 3-2, Section 3.2, Title. See comment above.

   Response: Agreed. "Blank corrected " will be changed to "blank evaluated" throughout the text.

5. Page 4-1, Section 4.0, last sentence. See comment #3.

   Response: Agreed. "Blank corrected " will be changed to "blank evaluated" throughout the text.

6. Page 4-2, Section 4.1.1.5, last sentence. If beryllium was detected in twenty-two samples of the fifty-six samples, should that be included in the list of frequently detected metals?

   Response: Agreed. The last sentence in this paragraph will be rewritten as follows: "In addition, beryllium was detected in twenty-two of the fifty-six samples collected. Less frequently detected metals included antimony (two samples), cadmium (two samples), mercury (four samples), selenium (one sample), and sodium (seven samples)."

7. Section 5.2.2.2, Section 5.3.1.3, and Section 6.3.1: Each bold subsection heading should be preceded by the appropriate subsection number, such as 5.2.2.2.1, 5.2.2.2.2, 5.3.1.3.1, 5.3.1.3.2.

Response: Agreed.

8. Figures 6-1 through 6-8 (photos): Please include in each caption the date when the photo was taken.

   Response: The photos were taken the week of June 16, 1998. This information will be included in the Phase II BERA.

9. Appendix A: Now that the survey data is available please enter the Y, X, and elevation information into blocks 8 and 9 on the HTRW Drilling Logs.

   Response: Agreed. The X, Y and elevation data will be entered on all the HTRW Drilling Logs in Appendix A.

   Comment Continued. The location sketches would have been more informative had a compass direction been noted for the distance vectors indicated. It may seem unnecessary to field personnel to provide much detail on the sketch when they know the boring will be surveyed. However, additional activities at the site may be directed towards previous sampling locations and if a surveyor has to be used to get back to the sample location it represents an increase in project cost and a potential delay in the activity. Sample location marker stakes are helpful but they are not permanent, especially in areas trampled by deer and their hunters. For these reasons the USACE prefers the sketches provide enough information that the sample location can be revisited based on the log sketch alone. We recognize that at some sites there are no reliable landmarks to reference. In those situations the field personnel should do as best they can with what is at hand.

   Response: Agreed. Future fieldwork will incorporate methods for reliably locating sampling locations within the budgeted scope of work should additional work be required at the site. This may include either the suggested use of a compass bearing with measured distances from permanent site features (e.g., monitoring wells, building foundations, etc) if they exist at the site or measured distances from two or more permanent site features. As noted however, some sites do not contain any prominent permanent features and therefore historical sample locations can only be relocated through land surveying prior to further investigation.

10. Data Tables in Section 4, Appendix F and Section 5 COPC tables and Section 6 CPEC Tables: A full risk assessment data set is not apparent. Please add all data points used in the risk assessment to Appendix F, or advise where other results may be found. I was not able to verify numbers of sample results, nor certain concentrations used as input for exposure point development. For example, I identified four surface soil sample results with three detections and one non-detection for Toluene in the West Area Data Set. Table 5-1 indicates 10 sample results for VOCs and SVOCs. Certain inorganic chemicals indicate 40 surface soil sample results. I have identified 19 surface soil samples from the current study, and 23 surface soil samples from the Limited RI for a total of 42 sample results. I identified all West Area Zinc sample results as detections, while Table 5-1 indicates one non-detection.

Response: Appendix F presents blank evaluated data only, not all of the data. Thus, findings of our review indicate data from Appendix E (validated analytical data) were used in the risk assessment. For example, for surface soil toluene results for the West Area, Appendix E presents ten results for samples DP-02, DP-03, DP-06, DP-08, DP-10, DP-11, DP-13, DP-16, DP-18, and DP-19, with 3 detections and 7 nondetect results, matching the toluene data in Table 5-1.

11. Table 5-1 through –6: Explain what the less-than symbol means when it occurs in the 95% UCL column.

Response: The tables will be revised to present the 95 percent UCL as an absolute value; the "<" will be removed. Note: the "<" symbol indicated that the nonparametric ranked 95% UCL value was nondetect, and it was divided by 2 to estimate the source-term concentration.

12. Table 5-1 through –8, and Section 5.2.1.3 through .5: Clarify that chemicals were not screened against background concentrations such that non-facility related inorganics were carried through a risk assessment.

Response. All data were screen against available background data. Three types of risk calculations were performed: (1) a Total Risk evaluation, using both background and site-related COCs; (2) a Background Only evaluation, using only background COCs; and (3) a Site-Related evaluation, using only site-related. No inorganic COPC in soil, surface water or sediment was inadvertently placed in the site-related group that should have been in the background group.

It should be noted that additional background surface water, soil, and sediment samples will be collected to supplement the background data set.

Comment Continued. Section 5.5.1 Summary of Risk and Hazards: Were background risk and hazard calculated by using a UCL, UTL, MAX or AVE background value? Which background chemicals were run through a background risk assessment? What are the major background contributors, and are they the same as site COPCs?

Response: Background risk and hazard estimates were based on the source-term concentration of the COPC. As noted in the last paragraph in Section 5.2.2.1, the UCL or MDC, whichever is smaller, is selected as the source-term concentration. The chemicals identified as present at concentrations equivalent to background and evaluated as background COPC are presented in Tables 5-17 (for cancer risk) and 5-20 (for noncancer hazard). Sections 5.5.1.1, 5.5.1.2, 5.5.2.1 and 5.5.2.2 will be expanded to identify the risk drivers for background, and discuss the implications of whether or not they are the same as the risk drivers for site-related risks.

13. Tables 5-9 and –10, and Section 5.3 Exposure Evaluation: As per a conversation with OEPA, investigate using ASTM RBCA screening methods of shallow groundwater VOCs in both a residential inhalation scenario vapor intrusion through a basement floor, and a commercial/industrial worker inhalation scenario vapor intrusion into a work building. Shallow groundwater may not be a viable source of VOCs 100% of the year, as it may run dry. Can the screening method be adjusted for a fraction of a year rather than all year

long? For the portion of a year which groundwater is dry, inhalation of VOCs from the subsurface is already accounted for by the inhalation assessment of VOCs from soil.

Response: The OEPA comments on this RA indicate the need to evaluate construction worker inhalation exposure to VOCs in shallow groundwater during excavation. Per conversation with Laurie Moore (OEPA risk assessor on PBOW) 27 March '00 at 10:45 am, we will evaluate the construction worker scenario. Ms. Moore stated that she did not require quantification of the residential or commercial/industrial indoor air exposure scenarios described in the comment and knows of no other risk assessor that could have done so. Ms. Moore and Paul Goetchius (IT Corp) cooperatively decided on the following: The EPA Region IX PRGs for chemicals in ambient air will be used to develop RBSC for the VOCs identified in shallow groundwater. Airborne concentrations of VOCs from the construction worker exercise will be compared to the RBSCs. If airborne concentrations do not exceed RBSCs, the residential indoor air exposure scenarios described in the comment will not be quantified. If airborne concentrations from the construction worker scenario exceed the RBSCs, the residential indoor air exposure scenarios described in the comment will be developed and quantified. An indoor commercial/industrial worker scenario will also be developed and evaluated. Figure 5-1 and the descriptions of receptors in Section 5.3.1.3 will be revised to reflect this agreement.

14. Table 5-37 and Table 5-14 and -15: Where are each AF from? Please cite.

Response: Gastrointestinal absorption factors (GAF) are taken from the Chemical Hazard Evaluation Group, Toxicology and Risk Analysis Section, Life Sciences Division, Oak Ridge National Laboratory or the Agency for Toxic Substances and Disease Registry. These references for the GAF are listed in Tables 5-14 and 5-15 in the "Notes" section.

15. Table 5-14 and 5-15: Confirm Antimony GAF value.

Response: The GAF for antimony was taken from the Agency for Toxic Substances and Disease Registry (ATSDR, 1992) as presented in the "Notes" section at the end of the tables.

16. Table 5-14 and 5-15: Arsenic dermal SF is based on GAF of 0.95 while dermal RfD is based on GAF of 0.41. Recommendation, use 0.95. Be consistent with GAF, and change the RfD or the SF accordingly. Carry through the change trough the risk characterization.

Response: The purpose of the GAF is to adjust an oral dose to an equivalent absorbed dose. If the oral RfD and the oral SF are derived from different studies (e.g., a dietary study in one case and a corn oil gavage study in the other) it may be appropriate for the GAF for the noncancer evaluation to differ from that for the cancer evaluation. However, the GAF of 0.95 is appropriate for both cancer and noncancer evaluation of arsenic and will be used consistently in the revised report.

17. Table 5-14 and 5-15: Is it appropriate to use the RfD-i of 5.7x10-4 mg/kg-d as a surrogate for 3-nitroaniline?

Response: The origin of the RfDi of 5.7E-4 mg/kg-day, cited by the reviewer, as a surrogate for 3-nitroaniline, is unclear and cannot be evaluated. Table 5-15 presents "ND" for 3-nitroaniline's RfD-i. Table 5-14 does not present RfDs.

18. Section 6.2: To what soil depth were burrowing receptors evaluated?

Response: Burrowing animal receptors were evaluated for soil exposure based on 0 to 6 foot depth zone.

19. Tables 6-11 and –12: If burrowing receptors do not burrow beyond five feet in depth, then the ecological subsurface soil data set should be a sub-set of a 10 foot soil column data set. Explain why these tables exhibit more samples than the human health subsurface soil tables.

Response: For the Human Health RA, soil samples were segregated based on surface (0-3 ft.) and subsurface (2-10 ft.) depths. For the Ecological RA, the subsurface soil (total) zone included samples from 0 to 6 feet in depth. The reason for the difference in the number of samples is that the Ecological RA subsurface (total) soil zone included the surface soil samples that were not included in the HH RA subsurface soil zone. The titles for Tables 6-11 and 6-12 will be edited to present "Total Soils" not "Subsurface Soils," to indicate that surface and subsurface soil were evaluated for burrowing animals.

20. Table 6-13: Correct the 95% UCL for Aluminum.

Response: The distribution type for aluminum in Table 6-13 was determined to be lognormal. It is not uncommon for lognormal distributions to exhibit a 95% UCL concentration that is several orders of magnitude higher than the maximum concentration. This is the case for this sample set and the value given for the UCL for aluminum is correct as reported.

21. Section 6.5, Appendix M and Tables 6-27 through –30: Risk characterization was completed for worst-case scenarios. What would a central tendency analysis for the Great Blue Heron and Raccoon indicate? Ecological management decisions should be based upon a central tendency analysis.

Response: Ecological risks were not calculated for a worst-case scenario, as 95% UCL concentrations (not MDCs), average body weights (not minimum body weights), and average home ranges (not minimum home ranges) were used in the risk characterization. A central tendency analysis for the heron and raccoon would estimate lower hazards, primarily due to the use of arithmetic mean EPCs rather than 95% UCL EPCs, provided mean concentrations for hazard drivers are lower than the 95% UCL concentrations used in the Draft ERA. It is unclear what reference supports the statement that "ecological management decisions should be based upon a central tendency analysis." A central tendency analysis was not included in the draft RA as it was not specified in the work plan. Additionally, further field work has been proposed to refine the estimated ecological hazards presented in the draft RA. Thus ecological management decisions are not yet being proposed for site remediation. A central tendency analysis may be included

in the revised ERA that incorporates the results of the proposed field sampling program, if agreed to by the Agency.

Typing Errors and Other Minor Changes

These comments need not be reiterated in the responses and can be responded to with one general statement. If for some reason the suggested/implied change is not made, then a specific response/explanation should be supplied for that particular item. Some of the following comments merely quote a portion of the text. The intent is to draw attention to where an obvious change needs to be made.

Response: To document the receipt of the comments and to ensure that all comments are adequately addressed and incorporated into the revised document, the original comment will be included along with the response.

Figure 1-2: There is an unlabeled shaded area along Short Cut Road.

Response: The unlabeled shaded area along Short Cut Road will be deleted from the figure.

Table 2-1: Define "NS" and "NA".

Response: Agreed.

Pg 2-3: Section 2.5, Last Line: double-bagged

Response: Agreed.

Page 2-3, Section 2.6: "referenced to both the Ohio State Plane Coordinate System" and what?

Response: Agreed. The word "both" will be deleted.

Page 2-4, Section 2.6: Second to last line on page- here and elsewhere in text depth intervals are given with imbedded hyphens ("0-to 2-and 6-to 8-foot"). To this reviewer it seems unnecessary to have the hyphens.

Response: Disagree. The hypens are necessary but spaces will be inserted between the hyphen and "to" and "and".

Table 3-1: The methods reference footnote lists "update II" twice, each with a different publication date.

Response: Agreed. The last reference in the table will be changed to "Test Method for Evaluating Solid Waste, Physical/Chemical Methods, 3rd Edition, Revision I, December 1990".

List of Acronyms: The entry for FUDS should have the first letter of each word capitalized. Also, the entry for "micrograms per kilogram" reads "micrograms per liter".

Response: Agreed.

Pg 1-1, first paragraph, forth line: Change "formerly used defense sites" to "Formerly Used Defense Sites".

Response: Agreed.

Pg 1-1, Section 1-1, fifth line: Change "supplemental data soil" to "supplemental data concerning soil".

Response: Agreed.

Pg 1-2, Section 1.2, fourth paragraph, first line: Change "in the groundwater" to "in the soils and groundwater".

Response: Agreed.

Pg 1-5, Section 1.3.2, third paragraph, first line: I don't think "GWI" has been defined in the text prior to its usage here.

Response: Agreed. "GWI" will be defined on first use.

Pg 1-6, Section 1.4, first line: Change "by the NASA and" to "by NASA and".

Response: Agreed.

Pg 2-4, first line: The line implies that "consultation with the USACE" resulted in "equipment failure". Please rewrite for clarity.

Response: Agreed. The sentence will be rewritten as follows: "In addition, 2 direct-push locations in WARWP area were not completed due to equipment failure. Approval was obtained from the USACE prior to abandoning these two locations."

Pg 4-1, Section 4.1.1.1, fourth line: Change "levels of methylene chloride was" to "levels of methylene chloride were"

Response: Agreed.

Pg 5-2, paragraph beginning with "This basis": Change "This basis" to "The basis".

Response: Agreed.

Pg 5-3, paragraph beginning with "There are": Change "There are a number potential" to "There are a number of potential".

Response: Agreed.

Pg 5-19, On-Site Resident Section, end of first paragraph: Change "competed (Section 5.1)" to "completed (Section 5.1)".

Response: Agreed.