Appendix Table T-15
Macroinvertebrates Collected by D-Frame Net
in the City Ditch, August 2005

	Macro 9	Macro 10	Macro 11	Total
Annelida				
Oligochaeta		3	3	6
Crustacea				
Amphipoda				
Gammaridae				
Gammarus	1			1
Insecta				
Collembola	2		3	5
Odonata				
Zygoptera				
Coenagrionidae				
Enallagma	2			2
Hemiptera				
Gerridae				
Aquarius		1		1
Mesoveliidae				
Mesovelia	1	2		3
Diptera				
Ceratopogonidae		3		3
Chironomidae	3	10		13
Simuliidae				
Simulium			2	2
Dolichopodidae				
Rhaphium		2		2
Sciomyzidae	1			1
Mollusca				
Gastropoda				
Physidae				
Physella		2	4	6
Hydrobiidae	3			3
Bivalvia	1			1
Total specimens	14	23	12	49
Total taxa	8	7	4	14

D-Net August 2005.xls\City Ditch

Source: ERC, Inc.

Appendix Table T-16
Macroinvertebrates Collected by D-Frame Net
in Shellpot Creek, August 2005

	Macro 12	Macro 13	Macro 14	Macro 15	Total
Annelida					
Oligochaeta	198	48	951	334	1531
Acari					
Hydrachnidia	7	5		6	18
Hirudinae		2	13	12	27
Crustacea					
Amphipoda					
Gammaridae					
Gammarus	22	3		7	32
Isopoda					
Asellidae					
Lirceus	1				1
Insecta					
Collembola	1	5			6
Odonata					
Anisoptera					
Libellulidae					
Libelulla				1	1
Zygoptera					
Coenagrionidae					
Enallagma	4	18	5	11	38
Hemiptera					
Hydrometridae					
Hydrometra		1			1
Veliidae					
Microvelia		3			3
Gerridae					
Aquarius				2	2
Rheumatobates		4		12	16
Belastomatidae					
Belastoma		1		1	2
Nepidae					
Ranatra		1			1
Corixidae					
Hesperocorixa	515	70	107	32	724
Trichocorixa	412	50	155	52	669
Notonectidae					
Notonecta	1	1		2	4
Mesoveliidae					
Mesovelia				2	2
Coleoptera					
Haliplidae					
Peltodytes	1	2			3
Dytiscidae					
Hydroporus	1	1	2		4
Psephenidae					
Psphenus		2	1	2	5
Elmidae					
Stenelmis	1	1			2
Diptera					
Ceratopogonidae			4	2	6
Chironomidae	30	10	19	84	143
Mollusca					
Gastropoda					
Physidae					
Physella	30	158	80	68	336
Planorbidae	12	20	4	1	37
Hydrobiidae	998	1475	1159	733	4365
Bivalvia	27	36	13	12	88
Total specimens	2261	1917	2513	1376	8067
Total taxa	17	23	13	20	28

Source: ERC, Inc.

Appendix Table 17
Macroinvertebrates Collected by D-Frame Net in the Ditches Adjacent to the AMTRAK Former Fueling Facility, October 2005

	Macro 1	Macro 2	Macro 3	Macro 4	Macro 5	Total
Platyhelminthes						
Turbellaria						
Planariidae	1				1	2
Annelida						
Oligochaeta	4	100	19	149	21	293
Hirudinae					1	1
Crustacea						
Amphipoda						
Gammaridae						
Gammarus	9					9
Decapoda						
Palaemonidae						
Palaemonetes	49	85	23	48	32	237
Proboyrus		2			1	3
Insecta						
Collembola					2	2
Ephemeroptera						
Baetidae						
Callibaetis	3					3
Odonata						
Anisoptera						
Aeshnidae						
Anax	1	1				2
Libellulidae						
Erythemis	32	1	1		2	36
Libelulla	3	1	5	10	10	29
Perithemis		8		6	6	20
Zygoptera						
Coenagronididae						
Enallagma	599	42	11	81	139	872
Hemiptera						
Veliidae						
Microvelia	1					1
Nepidae						
Ranatra					2	2
Notonectidae						
Notonecta		1			1	2
Mesoveliidae						
Mesovelia	40	1	15		8	64
Trichoptera	1					1
Coleoptera						
Haliplidae						
Peltodytes	1	7	3	7	3	21
Dytiscidae						
Laccophilus					1	1
Hydrochidae						
Hydrochus			1			1
Hydrophilidae						
Hydrochara	5					5
Tropisternus	4					4
Elmidae						
Stenelmis	1		1			2
Diptera						
Ceratopogonidae		1				1
Chaoboridae	2					2
Chironomidae	98	42	96	108	64	408
Culicidae	12	1			6	19
Tipulidae						
Antocha			4	2		6
Stratiomyidae						
Odontomyia	4		1			5
Mollusca						
Gastropoda						
Physidae						
Physella	55	2	1	31	21	110
Planorbidae	1	5	1	7	1	15
Hydrobiidae	24	1				25
Ancylidae			1	2		3
Bivalvia		4		26	3	33
Total specimens	950	305	183	477	325	2240
Total taxa	23	18	15	12	20	35

Source: ERC, Inc.

Appendix Table T-18
Macroinvertebrates Collected by D-Frame Net
in the Conectiv Impoundment, October 2005

	Macro 6	Macro 7	Macro 8	Total
Annelida				
Oligochaeta	44	13	7	64
Acari				
Hydrachnidia			1	1
Hirudinae	1		1	2
Insecta				
Ephemeroptera				
Baetidae				
Callibaetis			2	2
Odonata				
Anisoptera				
Aeshnidae				
Anax	1		1	2
Libellulidae				
Erythemis	12	28	29	69
Libelulla	3	2	1	6
Zygoptera				
Coenagrionidae				
Enallagma	95	123	189	407
Hemiptera				
Veliidae				
Microvelia		6		6
Pleidae				
Neoplea	355	695	153	1203
Corixidae	1			
Hesperocorixa			9	9
Notonectidae				
Notonecta	1	3	1	5
Mesoveliidae				
Mesovelia	4	12	2	18
Megaloptera				
Corydalidae				
Chauliodes		1		1
Coleoptera				
Haliplidae				
Haliplus	4	1		5
Peltodytes	1	1		2
Dytiscidae				
Agabus	1	1	8	10
Hydrochidae				
Hydrochus			6	6
Hydrophilidae				
Hydrobius		2		2
Hydrochara	4	86	12	102
Curculionidae		1		1
Diptera				
Ceratopogonidae	2	2		4
Chironomidae	65	288	144	497
Tipulidae	2			
Antocha		1		1
Ormosia	2	22	1	25
Pseudolimnophila	1			1
Tipula	14	12		26
Dolichopodidae				
Rhaphium			1	1
Stratiomyidae				
Odontomyia	2	7	1	10
Tabanidae				
Tabanus		1		1
Muscidae		1		1
Mollusca				
Gastropoda				
Physidae				
Physella	224	302	233	759
Planorbidae	11	11	40	62
Hydrobiidae	1	11	2	14
Total specimens	851	1633	844	3325
Total taxa	24	26	22	34

Source: ERC, inc.

Appendix Table T-19
Macroinvertebrates Collected by D-Frame Net
in the City Ditch, October 2005

	Macro 9	Macro 10	Macro 11	Total
Annelida				
Oligochaeta	5	69	307	381
Crustacea				
Amphipoda				
Gammaridae				
Gammarus	1	18		19
Decopoda				
Palaemonidae				
Palaemonetes	1	1		2
Insecta				
Odonata				
Anisoptera				
Libellulidae				
Perithemis	8	5	1	14
Zygoptera				
Coenagrionidae				
Enallagma	2	6		8
Diptera				
Chironomidae	72	205	45	322
Culicidae		1		1
Mollusca				
Gastropoda				
Physidae				
Physella			1	1
Hydrobiidae		2		2
Bivalvia	6	1		7
Total specimens	95	308	354	757
Total taxa	7	9	4	10

Source: ERC, Inc.

Appendix Table T-20
Macroinvertebrates Collected by D-Frame Net
in Shellpot Creek, October 2005

	Macro 12	Macro 13	Macro 14	Macro 15	Total
Platyhelminthes					
Turbellaria					
Planariidae	1				1
Annelida					
Oligochaeta	8	299	130	160	597
Acari					
Hydrachnidia	3				3
Hirudinae	1	1	2		4
Crustacea					
Amphipoda					
Gammaridae					
Gammarus	4	5	3	7	19
Decopoda					
Palaemonidae					
Palaemonetes				1	1
Insecta					
Collembola	1		1	18	20
Odonata					
Anisoptera					
Libellulidae					
Libellula			2		2
Zygoptera					
Coenagrionidae					
Enallagma	30	71	32	19	152
Hemiptera					
Gerridae					
Aquarius				2	2
Rheumatobates				2	2
Corixidae					
Hesperocorixa	29	41	304	118	492
Trichocorixa	49	50	313	51	463
Mesoveliidae					
Mesovelia	2	1	7	3	13
Coleoptera					
Dytiscidae	3				3
Hydrophilidae					
Hydrochara	2			1	3
Psephenidae					
Psephenus		3	8	2	13
Diptera					
Chaoboridae					
Chaoborus	2	2	3		7
Chironomidae	13	66	57	41	177
Culicidae	4		1		5
Stratiomyidae					
Odontomyia		1			1
Mollusca					
Gastropoda					
Physidae					
Physella	20	26	33	3	82
Planorbidae	3	1	1	3	8
Hydrobiidae	506	329	445	9	1289
Bivalvia	1	20	7	1	29
Total specimens	682	916	1349	441	3388
Total taxa	19	15	17	17	25

Source: ERC, Inc.

Appendix Table T-21
Macroinvertebrates Collected by D-Frame Net in the
Ditches Adjacent to the AMTRAK Former Fueling Facility, June 2006

	Macro 1	Macro 2	Macro 3	Macro 4	Macro 5	Total
Annelida						
Oligochaeta	5			20		25
Crustacea						
Amphipoda						
Gammaridae						
Gammarus	4					4
Copepoda	1		4		4	9
Decapoda						
Palaemonidae						
Palaemonetes	18	18	2	1	5	44
Insecta						
Collembola				1		1
Odonata						
Anisoptera						
Aeshnidae						
Anax		3				3
Libellulidae		2				
Erythemis	2					2
Zygoptera						
Coenagrionidae						
Enallagma	26	4	7	7	1	45
Hemiptera						
Hydrometridae						
Hydrometra		1				1
Corixidae						
Trichocorixa	1					1
Notonectidae						
Notonecta				1		1
Mesoveliidae						
Mesovelia		1				
Coleoptera						
Haliplidae						
Peltodytes	2	1	1	3		7
Dytiscidae						
Agabus		1				1
Hydrophilidae			1			
Hydrobius					1	1
Hydrochara	1				1	2
Tropisternus		2		1	1	4
Elmidae						
Macronychus	1					1
Curculionidae	3	1				4
Diptera						
Ceratopogonidae				2		2
Chironomidae		9	23	60		92
Culicidae		1				1
Stratiomyidae						
Odontomyia		2			1	3
Muscidae		1				1
Syrphidae					2	2
Mollusca						
Gastropoda						
Physidae						
Physella	1	2		3		6
Planorbidae	1	1	1	1	1	5
Hydrobiidae	26	4				30
Ancylidae			2	1		3
Total specimens	92	54	41	101	17	301
Total taxa	14	17	8	12	9	28

Source: ERC, Inc.

Appendix Table T-22
Macroinvertebrates Collected by D-Frame Net
in the Conectiv Impoundment, June 2006

	Macro 6	Macro 7	Macro 8	Total
Annelida				
Oligochaeta	129	97	4	230
Acari				
Hydrachnidia	6	8	4	18
Crustacea				
Decapoda				
Palaemonidae				
Palaemonetes	1			1
Insecta				
Collembola	3			3
Ephemeroptera				
Baetidae				
Callibaetis	11	6	9	26
Odonata				
Anisoptera				
Aeshnidae				
Anax			1	1
Zygoptera				
Coenagrionidae				
Enallagma	1			1
Hemiptera				
Hydrometridae				
Hydrometra	1			1
Veliidae				
Microvelida		2		2
Belostomatidae				
Belostoma			1	1
Pleidae				
Neoplea	328	630	266	1224
Corixidae				
Hesperocorixa	5	6	24	35
Trichocorixa	70	96	114	280
Notonectidae				
Notonecta	2	6	16	24
Mesoveliidae				
Mesovelia		1	2	3
Coleoptera				
Haliplidae				
Haliplus		1		1
Peltodytes			3	3
Dytiscidae				
Laccophilus	1	1		2
Hydrochidae				
Hydrochus	1			1
Hydrophilidae				
Hydrobius		2		2
Psephenidae				
Psephenus			1	1
Elmidae				
Macronychus		1		1
Stenelmis		1		1
Diptera				
Ceratopogonidae	27	9		36
Chironomidae	1			1
Dolichopodidae				
Rhaphium			1	1
Tipulidae	1			1
Stratiomyidae				
Odontomyia	3	2		5
Mollusca				
Gastropoda				
Physidae				
Physella	342	598	627	1567
Planorbidae		8	6	14
Total specimens	933	1475	1079	3487
Total taxa	18	18	15	30

Source: ERC, inc.

Appendix Table T-23
Macroinvertebrates Collected by D-Frame Net
in the City Ditch, June 2006

	Macro 9	Macro 10	Macro 11	Total
Platyhelminthes				
Turbellaria				
Planariidae	1	2		3
Annelida				
Oligochaeta	163	50	475	688
Acari				
Hydrachnidia			1	1
Nematoda			1	1
Crustacea				
Amphipoda				
Gammaridae				
Gammarus		1		1
Decapoda				
Cambaridae			1	1
Insecta				
Collembola			2	2
Odonata				
Anisoptera				
Gomphidae				
Arigomphus	1			1
Coleoptera				
Haliplidae				
Peltodytes	1	2		3
Dytiscidae				
Agabus	1			1
Hydrochidae				
Hydrochus		1		1
Diptera				
Ceratopogonidae				
Chironomidae	50	13	3	66
Psychodidae				
Pericoma			1	1
Dolichopodidae				
Rhaphium	1			1
Mollusca				
Gastropoda				
Physidae				
Physella	10	2		12
Planorbidae				
Hydrobiidae	85	3	1	89
Bivalvia	37	4		41
Total specimens	350	78	485	913
Total taxa	10	9	8	17

Source: ERC, Inc.

Appendix Table T-24
Macroinvertebrates Collected by D-Frame Net
in Shellpot Creek, June 2006

	Macro 12	Macro 13	Macro 14	Macro 15	Total
Platyhelminthes					
Turbellaria					
Planariidae		1		2	3
Annelida					
Oligochaeta	31	33	85	106	255
Hirudinae		2		1	3
Crustacea					
Amphipoda					
Gammaridae					
Gammarus	23	7	20	15	65
Isopoda					
Asellidae					
Lirceus			2		2
Insecta					
Collembola	64		4	1	69
Odonata					
Anisoptera					
Libellulidae					
Perithemis				1	1
Zygoptera					
Coenagrionidae					
Argia	2				2
Hemiptera					
Pleidae					
Neoplea	23	5	2		30
Corixidae					
Trichocorixa	32	4	22	1	59
Notonectidae					
Notonecta			1		1
Coleoptera					
Haliplidae					
Peltodytes		1		1	2
Dytiscidae					
Agabus			1		1
Laccophilus			2		2
Elmidae					
Macronychus	1		11		12
Diptera					
Chironomidae	13	21	17	25	76
Culicidae	2				2
Tipulidae					
Tipula	1				1
Dolichopodidae					
Rhaphium	1		1		2
Stratiomyidae					
Odontomyia	1				1
Muscidae	2				2
Mollusca					
Gastropoda					
Physidae					
Physella	49	20	8	12	89
Planorbidae	4	3		1	8
Hydrobiidae	48	159	137	96	440
Bivalvia	1		5	1	7
Total specimens	298	256	318	263	1135
Total taxa	17	11	15	13	25

Source: ERC, Inc.

Appendix Table T-25
Macroinvertebrates Collected by D-Frame Net in the
Ditches Adjacent to the AMTRAK Former Fueling Facility, August 2006

	Macro 1	Macro 2	Macro 3	Macro 4	Macro 5	Total
Platyhelminthes						
Turbellaria						
Planariidae		2				2
Annelida						
Oligochaeta	4	83	19	175	2	283
Crustacea						
Decapoda						
Palaemonidae						
Palaemonetes	19	17	8	31	4	79
Proboyrus	2					2
Insecta						
Collembola	1				1	2
Ephemeroptera						
Baetidae						
Callibaetis	1	1	2	1		5
Odonata						
Anisoptera						
Aeshnidae						
Anax	1					1
Libellulidae						
Libelulla		3	9	9		21
Pachydiplax	1	3				4
Perithemis			14	30		44
Zygoptera						
Coenagrionidae						
Enallagma		109	33	20	19	181
Ischnura		79	19	8	15	121
Hemiptera						
Hydrometridae						
Hydrometra				1		1
Belostomatidae						
Belostoma		1				1
Nepidae						
Ranatra					2	2
Pleidae						
Neoplea	1					1
Corixidae						
Trichocorixa				1		1
Mesoveliidae						
Mesovelia	15	3	20		2	40
Coleoptera						
Haliplidae						
Haliplus						
Peltodytes	1	1		6	2	10
Dytiscidae						
Agabus						
Laccophilus				2	2	4
Noteridae						
Hydrocanthus			4			4
Hydrochidae						
Hydrochus		2				2
Hydrophilidae						
Tropisternus	1	8	4		3	16
Elmidae						
Stenelmis					1	1
Diptera						
Ceratopogonidae	1				2	3
Chaoboridae	1					1
Chironomidae	36	203	196	136	106	677
Stratiomyidae						
Odontomyia		7			3	10
Sciomyzidae		2		1		3
Mollusca						
Gastropoda						
Ancylidae	1	8	1	1		11
Physidae						
Physella	11	17	8	14	10	60
Planorbidae		3	5	2		10
Lymnaeidae	5		1	1	12	19
Total specimens	102	552	343	439	186	1622
Total taxa	17	19	15	17	16	33

Source: ERC, Inc.

Appendix Table T-26
Macroinvertebrates Collected by D-Frame Net
in the Conectiv Impoundment, August 2006

	Macro 6	Macro 7	Macro 8	Total
Annelida				
Oligochaeta	158	2		160
Hirudinae	3	1		4
Insecta				
Collembola	1			1
Ephemeroptera				
Baetidae				
Callibaetis	177	200	254	631
Odonata				
Anisoptera				
Aeshnidae				
Anax			11	11
Libellulidae				
Libelulla	158	72	19	249
Pachydiplax	15	39	50	104
Tramea		4		4
Zygoptera				
Coenagrionidae				
Enallagma	76	33		109
Ischnura	33	35	102	170
Hemiptera				
Veliidae				
Microvelia	3	2	4	9
Mesoveliidae				
Mesovelia	19	17	12	48
Gerridae				
Rheumatobates	1			1
Belostomatidae				
Belostoma	2	2	3	7
Pleidae				
Neoplea	32	101	123	256
Corixidae				
Hesperocorixa		1		1
Trichocorixa	2			2
Notonectidae				
Notonecta		4	14	18
Coleoptera				
Haliplidae				
Haliplus	30		4	34
Peltodytes		1		1
Dytiscidae				
Laccophilus		4	3	7
Noteridae				
Hydrocanthus		1		1
Hydrophilidae				
Tropisternus	9			9
Diptera				
Ceratopogonidae	92		2	94
Chaoboridae	1	4	1	6
Chironomidae	945	14	88	1047
Stratiomyidae				
Odontomyia	3	2	7	12
Sciomyzidae	2		1	3
Mollusca				
Gastropoda				
Physidae				
Physella	688	99	98	885
Planorbidae	39	15	3	57
Total specimens	2489	653	799	3941
Total taxa	23	22	18	30

Source: ERC, inc.

Appendix Table T-27
Macroinvertebrates Collected by D-Frame Net
in the City Ditch, August 2006

	Macro 9	Macro 10	Macro 11	Total
Annelida				
Oligochaeta		114	1388	1502
Nematoda		4	4	8
Hirudinea		6		6
Insecta				
Odonata				
Zygoptera				
Coenagrionidae				
Enallagma		1		1
Coleoptera				
Haliplidae				
Peltodytes			1	1
Diptera				
Ceratopogonidae	2	1	2	5
Chironomidae	11	46	41	98
Mollusca				
Gastropoda				
Hydrobiidae	2			2
Physidae				
Physella		1	5	6
Lymnaeidae		1	1	2
Bivalvia	1			1
Total specimens	16	174	1442	1632
Total taxa	4	8	7	11

D-Net August 2006.xls\City Ditch

Source: ERC, Inc.

Appendix Table T-28
Macroinvertebrates Collected by D-Frame Net
in Shellpot Creek, August 2006

	Macro 12	Macro 13	Macro 14	Macro 15	Total
Annelida					
Oligochaeta		699		181	880
Hirudinae		5			5
Crustacea					
Amphipoda					
Gammaridae					
Gammarus	10				10
Decopoda					
Palaemonidae					
Palaemonetes		1			1
Insecta					
Collembola	15	13	3		31
Odonata					
Anisoptera					
Aeshnidae					
Anax				1	1
Zygoptera					
Coenagrionidae					
Enallagma	2	11		4	17
Ischnura		2			2
Hemiptera					
Hydrometridae					
Hydrometra	2	1	2	1	6
Veliidae					
Microvelia		1			1
Gerridae					
Rheumatobates	3	4	9	14	30
Corixidae					
Trichocorixa	40	6	6	5	57
Mesoveliidae					
Mesovelia	1	1		1	3
Coleoptera					
Hydrochidae					
Hydrochus			1		1
Elmidae					
Dubiraphia	1				1
Stenelmis		1			1
Diptera					
Ceratopogonidae			1		1
Chironomidae	15	51	16	8	90
Muscidae				1	1
Mollusca					
Gastropoda					
Physidae					
Physella	2	6	5	2	15
Planorbidae	1				1
Hydrobiidae	6	21	98	6	131
Lymnaeidae	1		11		12
Total specimens	99	823	152	224	1298
Total taxa	13	15	10	11	23

Source: ERC, Inc.

Appendix Table T-29
Macroinvertebrates Collected by Hester-Dendy Sampler in the Ditches Adjacent to the AMTRAK Former Fueling Facility,October-November 2004

	Macro 1		Macro 2		Macro 3		Macro 4		Macro 5		Total
	A	B	A	B	A	B	A	B	A	B	
Platyhelminthes											
Turbellaria											
Planariidae	14	40				1					55
Annelida											
Oligochaeta	2	7	3	29		2	3		4	10	60
Crustacea											
Amphipoda											
Gammaridae											
Gammarus		1									1
Insecta											
Odonata											
Anisoptera											
Libellulidae											
Erythemis										2	2
Libelulla									1	2	3
Zygoptera											
Coenagrionidae											
Enallagma	2	1				3		1	1	5	13
Diptera											
Ceratopogonidae	1							1		2	4
Chironomidae	16	6		1	1	1	5	11	16	14	71
Mollusca											
Gastropoda											
Physidae											
Physella							1			10	11
Planorbidae		3								5	8
Total specimens	35	58	3	30	1	6	9	13	22	50	228
Total taxa	5	6	1	2	1	4	3	3	4	8	10

Source: ERC, Inc.

Appendix Table T-30
Macroinvertebrates Collected by Hester-Dendy Sampler in the Conectiv Impoundment, October-November 2004

	Macro 6		Macro 7		Macro 8		Total
	A	B	A	B	A	B	
Annelida							
Oligochaeta	36	22	159	196	12	1	426
Hirudinae	6	3	10		1	2	22
Acari							
Hydrachnidia				1			1
Nematoda	2						2
Crustacea							
Isopoda							
Asellidae							
Lirceus	5	5	1	1	2	1	15
Insecta							
Odonata							
Anisoptera							
Aeshnidae				1			1
Libellulidae							
Erythemis				1			1
Libelulla	25	4	1	3	16	1	50
Zygoptera							
Coenagrionidae							
Enallagma	13	40	37	75	1	25	191
Coleoptera							
Haliplidae							
Haliplus	13	20	30	19	3	9	94
Dytiscidae							
Agabus		17	19	25	3	11	75
Diptera							
Ceratopogonidae	2	5	15	24	2	5	53
Chironomidae	95	178	134	260	131	87	885
Mollusca							
Gastropoda							
Physidae							
Physella	18	23	13	111	28	40	233
Planorbidae	5	3	11	13	7	20	59
Ancylidae					1		1
Bivalvia						3	3
Total specimens	220	320	430	730	207	205	2112
Total taxa	11	11	11	13	12	12	17

Source: ERC, Inc.

Appendix Table T-31
Macroinvertebrates Collected by Hester-Dendy Sampler in the City Ditch,
October-November 2004

	Macro 9		Macro 10		Macro 11		Total
	A	B	A	B	A	B	
Platyhelminthes							
Turbellaria							
Planariidae				3			3
Annelida							
Oligochaeta	6	6	20	37	1	8	78
Acari							
Hydrachnidia			1				1
Nematoda	1			1			2
Crustacea							
Amphipoda							
Gammaridae							
Gammarus		3					3
Insecta							
Trichoptera							
Polycentropidae			1				1
Diptera							
Chironomidae	17	30	29	43		1	120
Mollusca							
Gastropoda							
Physidae							
Physella			1				1
Planorbidae			13	1			14
Ancylidae			1				1
Hydrobiidae	1			2			3
Total specimens	25	39	66	87	1	9	227
Total taxa	4	3	7	6	1	2	11

Source: ERC, Inc.

Appendix Table T-32
Macroinvertebrates Collected by Hester Dendy Sampler in Shellpot Creek,
October-November 2004

	Macro 12		Macro 13		Macro 14		Macro 15		Total
	A	B	A	B	A	B	A	B	
Platyhelminthes									
Turbellaria									
Planariidae			3		2	15	8		28
Annelida									
Oligochaeta	55	98	1	3	51	2	14	13	237
Nematoda	1								1
Hirudinae								1	1
Acari									
Hydrachnidia								1	1
Crustacea									
Amphipoda									
Gammaridae									
Gammarus	4		20	21	5	44	35		129
Insecta									
Odonata									
Zygoptera									
Coenagrionidae									
Enallagma		1	2			1			4
Diptera									
Chironomidae	180	54	18	14	22	5	46	2	341
Mollusca									
Gastropoda									
Physidae									
Physella			3	1			1		5
Planorbidae	1		35	33		1			70
Hydrobiidae	1		1	1	5	9			17
Ancylidae							1		1
Bivalvia								1	1
Total specimens	242	153	83	73	85	77	105	18	836
Total taxa	6	3	8	6	5	7	6	5	13

HD October 2004.xls\Shellpot Creek

Source: ERC, Inc.

Appendix Table T-33
Macroinvertebrates Collected by Hester-Dendy Sampler in the Ditches Adjacent to the AMTRAK Former Fueling Facility, May-June 2005

	Macro 1		Macro 2		Macro 3		Macro 4		Macro 5		Total
	A	B	A	B	A	B	A	B	A	B	
Platyhelminthes											
Turbellaria											
Planariidae	13	32	1	1		2			1		50
Annelida											
Oligochaeta	173	248	241	381	256	138	240	295	567	506	3045
Hirudinae	2	1									3
Nematoda	1	1		1			1		2	1	7
Insecta											
Collembola	5	5		1							11
Odonata											
Anisoptera											
Aeshnidae											
Anax									1		1
Zygoptera											
Coenagronididae											
Enallagma	1										1
Hemiptera											
Mesoveliidae											
Mesovelia	1										1
Diptera											
Chironomidae	54	38	23	52	21	7	17	14	31	24	281
Simulidae											
Simulium		1									1
Tabanidae							3				3
Mollusca											
Gastropoda											
Physidae											
Physella	18	61	8	5	1	7		2	122	5	229
Planorbidae	4	17	2	2				1	12	73	111
Hydrobiidae	204	324		4					2		534
Ancylidae		1									1
Bivalvia					1						1
Total specimens	476	729	275	447	279	154	261	312	738	609	4280
Total taxa	11	11	5	8	4	4	4	4	8	5	16

Source: ERC, Inc.

Appendix Table T-34
Macroinvertebrates Collected by Hester-Dendy Sampler in the Conectiv Impoundment, May-June 2005

	Macro 6		Macro 7		Macro 8		Total
	A	B	A	B	A	B	
Annelida							
Oligochaeta	278	76	166	241	126	271	1158
Hirudinae	10	1	3	27	21	22	84
Crustacea							
Copepoda			2	1		2	5
Isopoda							
Asellidae							
Lirceus	1		14	4	4	2	25
Insecta							
Coleoptera							
Haliplidae							
Haliplus				2			2
Peltodytes	1			1		2	4
Diptera							
Ceratopogonidae						1	1
Chironomidae	111	29	168	127	122	144	701
Mollusca							
Gastropoda							
Physidae							
Physella	54	4	138	20	10	23	249
Planorbidae	2		1				3
Ancylidae					2		2
Bivalvia				1		2	3
Total specimens	457	110	492	424	285	469	2237
Total taxa	7	4	7	9	6	9	12

Source: ERC, inc.

Appendix Table T-35
Macroinvertebrates Collected by Hester-Dendy Sampler
in the City Ditch, May-June 2005

	Macro 9		Macro 10		Macro 11		Total
	A	B	A	B	A	B	
Platyhelminthes							
Turbellaria							
Planariidae	34	40		1			75
Annelida							
Oligochaeta	30	119	1	39	510	281	980
Hirudinae		23					23
Nematoda					17	3	20
Crustacea							
Amphipoda							
Gammaridae							
Gammarus	24	6		3			33
Insecta							
Odonata							
Zygoptera							
Coenagronididae							
Enallagma	1						1
Diptera							
Chironomidae	3	12	2	51			68
Mollusca							
Gastropoda							
Physidae							
Physella	104	62	28	36			230
Planorbidae	2	1					3
Hydrobiidae	674	624	12	53			1363
Bivalvia				2			2
Total specimens	872	887	43	185	527	284	2798
Total taxa	8	8	4	7	2	2	11

Source: ERC, Inc.

Appendix Table T-36
Macroinvertebrates Collected by Hester-Dendy Sampler in Shellpot Creek, May-June 2005

	Macro 12		Macro 13[1]		Macro 14		Macro 15[1]		Total
	A	B	A	B	A	B	A	B	
Platyhelminthes			X	X			X	X	
Turbellaria			X	X			X	X	
Planariidae	2	7	X	X	6	4	X	X	19
			X	X			X	X	
Annelida			X	X			X	X	
Oligochaeta	1010	953	X	X	383	212	X	X	2558
			X	X			X	X	
Hirudinae	1		X	X			X	X	1
			X	X			X	X	
Nematoda	2		X	X		1	X	X	3
			X	X			X	X	
Crustacea			X	X			X	X	
Amphipoda			X	X			X	X	
Gammaridae			X	X			X	X	
Gammarus	27	86	X	X	131	163	X	X	407
Isopoda			X	X			X	X	
Asellidae			X	X			X	X	
Lirceus	5		X	X			X	X	5
			X	X			X	X	
Insecta			X	X			X	X	
Diptera			X	X			X	X	
Chironomidae	111	121	X	X	108	269	X	X	609
			X	X			X	X	
Mollusca			X	X			X	X	
Gastropoda			X	X			X	X	
Physidae			X	X			X	X	
Physella	11	19	X	X	45	13	X	X	88
Planorbidae		12	X	X	5	3	X	X	20
Hydrobiidae	19	34	X	X	19	12	X	X	84
Bivalvia		1	X	X	11		X	X	12
			X	X			X	X	
Total specimens	1188	1233	X	X	708	677	X	X	3806
Total taxa	9	8	X	X	8	8	X	X	11

[1]Samplers lost

Source: ERC, Inc.

Appendix Table T-37
Macroinvertebrates Collected by Hester-Dendy Sampler in the Ditches Adjacent to the AMTRAK Former Fueling Facility, August-September 2005

	Macro 1		Macro 2		Macro 3		Macro 4		Macro 5		Total
	A	B	A	B	A	B	A	B	A	B	
Platyhelminthes											
Turbellaria											
Planariidae	94	86	25	24					23	13	265
Annelida											
Oligochaeta	51	45	20	14	51	42	139	66	229	76	733
Crustacea											
Amphipoda											
Gammaridae											
Gammarus		4									4
Insecta											
Ephemeroptera											
Baetidae											
Callibaetis					2						2
Odonata											
Anisoptera											
Libellulidae											
Erythemis	1	4									5
Libellula			8	2	2	2	1	2	4	6	27
Zygoptera											
Coenagronididae											
Enallagma	16	17	2		8	2	1	3	8	17	74
Diptera											
Chironomidae	49	126	129	133	74	121	35	16	88	60	831
Mollusca											
Gastropoda											
Physidae											
Physella	2	2	19	10	7	4	43	100	10	97	294
Planorbidae	1		31						2	8	42
Hydrobiidae	4									1	5
Total specimens	218	284	234	183	144	171	219	187	364	278	2282
Total taxa	8	7	7	5	6	5	5	5	7	8	11

Source: ERC, Inc.

Appendix Table T-38
Macroinvertebrates Collected by Hester-Dendy Sampler in the Conectiv Impoundment, August-September 2005

	Macro 6		Macro 7		Macro 8		Total
	A	B	A	B	A	B	
Platyhelminthes							
Turbellaria							
Planariidae		1					1
Annelida							
Oligochaeta	28	50	9	9	7	15	118
Hirudinae	7	9	1				17
Crustacea							
Isopoda							
Asellidae							
Lirceus	1	1					2
Insecta							
Ephemeroptera							
Baetidae							
Callibaetis	14				3	5	22
Odonata							
Anisoptera							
Libellulidae							
Erythemis	11	2	1		2	4	20
Libellula	14	10	10	5	13	6	58
Zygoptera							
Coenagrionidae							
Enallagma	49	7		2	7	52	117
Hemiptera							
Gerridae							
Aquarius		1					1
Pleidae							
Neoplea			1				1
Coleoptera							
Haliplidae							
Haliplus		5		1	1	3	10
Diptera							
Ceratopogonidae					2	2	4
Chironomidae	166	64	37	23	126	373	789
Psychodidae							
Pericoma					1	10	11
Mollusca							
Gastropoda							
Physidae							
Physella	28	35	7	12	7	20	109
Planorbidae	7	4	2	3		2	18
Ancylidae			1			3	4
Total specimens	325	189	69	55	169	495	1302
Total taxa	10	12	9	7	10	12	17

Source: ERC, inc.

Appendix Table T-39
Macroinvertebrates Collected by Hester-Dendy Sampler
in the City Ditch, August-September

	Macro 9		Macro 10		Macro 11		Total
	A	B	A	B	A	B	
Platyhelminthes							
Turbellaria							
Planariidae	111	170	136	21			438
Annelida							
Oligochaeta	32	48	75	13	92	157	417
Nematoda			1				1
Crustacea							
Copepoda					11	9	20
Amphipoda							
Gammaridae							
Gammarus		5	2	2			9
Insecta							
Collembola						4	4
Ephemeroptera							
Caenidae							
Caenis	1						1
Odonata							
Anisoptera							
Libellulidae							
Libellula		1					1
Sympetrum		2	1				3
Zygoptera							
Coenagronididae							
Enallagma	1		2				3
Trichoptera							
Hydropsychidae			1				1
Diptera							
Ceratopogonidae					2		2
Chironomidae	36	64	217	125	8	5	455
Mollusca							
Gastropoda							
Physidae							
Physella	1		1	2	2	1	7
Planorbidae				15			15
Hydrobiidae			8	1			9
Total specimens	182	290	444	179	115	176	1386
Total taxa	6	6	10	7	5	5	16

Source: ERC, Inc.

Appendix Table T-40
Macroinvertebrates Collected by Hester-Dendy Sampler in Shellpot Creek,
August-September 2005

	Macro 12		Macro 13		Macro 14		Macro 15		Total
	A	B	A	B	A	B	A	B	
Platyhelminthes									
Turbellaria									
Planariidae	78	103	103	5	8	12	17	49	375
Annelida									
Oligochaeta	60	55	109	56	60	28	84	43	495
Acari									
Hydrachnidia	1	2			1	1			5
Hirudinae	7	8	9	6	4	8	5	15	62
Crustacea									
Decopoda									
Xanthidae							1	1	2
Amphipoda									
Gammaridae									
Gammarus							1	9	10
Insecta									
Hemiptera									
Corixidae		3	4						7
Diptera									
Ceratopogonidae					1				1
Chironomidae	24	28	71	13	38	30	18	48	270
Mollusca									
Gastropoda									
Physidae									
Physella	1	3	6		2	3	1		16
Planorbidae		1	4		4	3		1	13
Hydrobiidae	29	20	105	32	33	104	3	1	327
Ancylidae	1	1							2
Bivalvia					3				3
Total specimens	201	224	411	112	154	189	130	167	1588
Total taxa	8	10	8	5	10	8	8	8	14

Source: ERC, Inc.

Appendix Table T-41
Macroinvertebrates Collected by Hester-Dendy Sampler in the Ditches Adjacent to the AMTRAK Former Fueling Facility, October-November 2005

	Macro 1		Macro 2		Macro 3		Macro 4		Macro 5		Total
	A	B	A	B	A	B	A	B	A	B	
Platyhelminthes											
Turbellaria											
Planariidae	4	4	10	4	3				2	3	30
Annelida											
Oligochaeta	58	39	45	50	58	42	77	18	7	113	507
Crustacea											
Amphipoda											
Gammaridae											
Gammarus	1	1									2
Insecta											
Collembola	5								1		6
Odonata											
Anisoptera											
Libellulidae											
Libellula				1					1	2	4
Zygoptera											
Coenagrionidae											
Enallagma		1	1	6						1	9
Diptera											
Ceratopogonidae	3		1	2					1	8	15
Chironomidae	93	75	145	151	123	200	69	85	50	143	1134
Mollusca											
Gastropoda											
Physidae											
Physella		2	8	10					24	7	51
Planorbidae	1	1	2								4
Hydrobiidae		4	1	2							7
Total specimens	165	127	213	226	184	242	146	103	86	277	1769
Total taxa	7	8	8	8	3	2	2	2	7	7	11

Source: ERC, Inc.

Appendix Table T-42
Macroinvertebrates Collected by Hester-Dendy Sampler in the Conectiv Impoundment, October-November 2005

	Macro 6		Macro 7		Macro 8		Total
	A	B	A	B	A	B	
Annelida							
Oligochaeta	9	15	7	7	2	2	42
Acari							
Hydrachnidia			1				1
Hirudinae		1		2	1		4
Nematoda		2				1	3
Crustacea							
Amphipoda							
Gammaridae							
Gammarus				2			2
Insecta							
Odonata							
Anisoptera							
Libellulidae							
Libellula			13	2	3		18
Zygoptera							
Coenagrionidae							
Enallagma			1				1
Hemiptera							
Pleidae							
Neoplea						1	1
Coleoptera							
Dytiscidae							
Agabus				2			2
Hydrophilidae							
Berosus		1					1
Diptera							
Ceratopogonidae	4	3					7
Chironomidae	12	126	198	259	94	90	779
Mollusca							
Gastropoda							
Physidae							
Physella		1	139	15	22	8	185
Planorbidae		1	32	20	3		56
Hydrobiidae					1		1
Total specimens	25	150	391	309	126	102	1103
Total taxa	3	8	7	8	7	5	15

Source: ERC, inc.

Appendix Table T-43
Macroinvertebrates Collected by Hester-Dendy Sampler
in the City Ditch, October-November 2005

	Macro 9		Macro 10		Macro 11		Total
	A	B	A	B	A	B	
Platyhelminthes							
Turbellaria							
Planariidae	18	25	4	112			159
Annelida							
Oligochaeta	33	59	159	28	13	4	296
Crustacea							
Amphipoda							
Gammaridae							
Gammarus	2			9			11
Isopoda							
Asellidae							
Lirceus				1			1
Insecta							
Collembola	1	1					2
Odonata							
Anisoptera							
Libellulidae							
Libellula				1			1
Perithemis			1				1
Zygoptera							
Coenagrionidae							
Argia				1			1
Trichoptera							
Hydroptilidae							
Hydroptila	1						1
Diptera							
Ceratopogonidae		1			2		3
Chironomidae	29	56	20	81			186
Mollusca							
Gastropoda							
Planorbidae				10			10
Hydrobiidae	28	84		205			317
Ancyclidae			140				140
Total specimens	112	226	324	448	15	4	1129
Total taxa	7	8	5	9	2	1	14

Source: ERC, Inc.

Appendix Table T-44
Macroinvertebrates Collected by Hester-Dendy Sampler in Shellpot Creek, October-November 2005

	Macro 12		Macro 13		Macro 14		Macro 15		Total
	A	B	A	B	A	B	A	B	
Platyhelminthes									
Turbellaria									
Planariidae	64	21	50	10	21	14	5	25	210
Annelida									
Oligochaeta	90	53	132	184	92	159	38	44	792
Hirudinae	10		3		12	7			32
Crustacea									
Amphipoda									
Gammaridae									
Gammarus	1				1		1	3	6
Isopoda									
Asellidae									
Lirceus	1								1
Insecta									
Odonata									
Zygoptera									
Coenagrionidae									
Enallagma								1	1
Coleoptera									
Dytiscidae									
Agabus							1		1
Diptera									
Chironomidae	17	16	40	75	9	20	94	165	436
Mollusca									
Gastropoda									
Physidae									
Physella	3	1		3	2				9
Planorbidae	1	1			1		1		4
Hydrobiidae	18	13	52	6	50	25	62	68	294
Total specimens	205	105	277	278	188	225	202	306	1786
Total taxa	9	6	5	5	8	5	7	6	11

Source: ERC, Inc.

Appendix Table T-45
Macroinvertebrates Collected by Hester-Dendy Sampler in the Ditches Adjacent to the AMTRAK Former Fueling Facility, May June 2006

	Macro 1		Macro 2		Macro 3		Macro 4		Macro 5		Total
	A	B	A	B	A	B	A	B	A	B	
Platyhelminthes											
Turbellaria											
Planariidae	71	48	5						4		128
Annelida											
Oligochaeta	591	669	400	403	80	68	139	33	87	11	2481
Hirudinae	1										1
Acari											
Hydrachnidia				1							1
Crustacea											
Amphipoda											
Gammaridae											
Gammarus	2	10	2								14
Insecta											
Collembola	2		1								3
Coleoptera											
Dytiscidae											
Dystiscus			1								1
Diptera											
Chironomidae	472	451	359	405	408	291	14	3	495	16	2914
Stratiomyidae											
Odontomyia	1										1
Mollusca											
Gastropoda											
Physidae											
Physella	30	33	6			6			71	3	149
Planorbidae	9	20	34	2				1	8		74
Hydrobiidae	602	1000	3			1					1606
Ancylidae									2		2
Bivalvia		1									1
Total specimens	1781	2232	811	811	488	366	153	37	667	30	7376
Total taxa	10	8	9	4	2	4	2	3	6	3	14

Source: ERC, Inc.

Appendix Table T-46
Macroinvertebrates Collected by Hester-Dendy Sampler in the Conectiv Impoundment, May-June 2006

	Macro 6		Macro 7		Macro 8		Total
	A	B	A	B	A	B	
Annelida							
Oligochaeta	168	36	246	209	360	415	1434
Hirudinae				1			1
Insecta							
Diptera							
Ceratopogonidae					1	1	2
Chironomidae	20	3	7	9	44	12	95
Mollusca							
Gastropoda							
Physidae							
Physella				1	3	12	16
Total specimens	188	39	253	220	408	440	1548
Total taxa	2	2	2	4	4	4	5

HD June 2006.xls\Conectiv

Source: ERC, inc.

Appendix Table T-47
Macroinvertebrates Collected by Hester-Dendy Sampler
in the City Ditch, May-June 2006

	Macro 9		Macro 10[1]		Macro 11		Total
	A	B	A	B	A	B	
Platyhelminthes			X	X			
Turbellaria			X	X			
Planariidae		2	X	X			2
			X	X			
Annelida			X	X			
Oligochaeta	82	225	X	X	46	206	559
			X	X			
Insecta			X	X			
Diptera			X	X			
Chironomidae	4	25	X	X	3	3	35
			X	X			
Mollusca			X	X			
Gastropoda			X	X			
Physidae			X	X			
Physella	1	1	X	X			2
Planorbidae		2	X	X			2
Hydrobiidae	1	15	X	X			16
Ancylidae		4	X	X			4
Bivalvia		1	X	X			1
Total specimens	88	275	X	X	49	209	621
Total taxa	4	8	X	X	2	2	8

[1]*Samplers lost*

Source: ERC, Inc.

Appendix Table T-48
Macroinvertebrates Collected by Hester-Dendy Sampler in Shellpot Creek, May-June 2006

	Macro 12		Macro 13		Macro 14		Macro 15		Total
	A	B	A	B	A	B	A	B	
Platyhelminthes									
Turbellaria									
Planariidae	2						1		3
Annelida									
Oligochaeta	281	137	527	1110	173	450	708	385	3771
Hirudinae	1				1		4	1	7
Crustacea									
Amphipoda									
Gammaridae									
Gammarus	8			5			5		18
Insecta									
Diptera									
Chironomidae	272	64	11	208	14	108	150	87	914
Mollusca									
Gastropoda									
Physidae									
Physella	5	2		2				1	10
Planorbidae				1					1
Hydrobiidae	9	2		5				1	17
Bivalvia	13	2					4	2	21
Total specimens	591	207	538	1331	188	558	872	477	4762
Total taxa	8	5	2	6	3	2	6	6	9

Source: ERC, Inc.

Appendix Table T-49
Macroinvertebrates Collected by Hester-Dendy Sampler in the Ditches Adjacent to the AMTRAK Former Fueling Facility, August-September 2006

	Macro 1		Macro 2		Macro 3		Macro 4		Macro 5		Total
	A	B	A	B	A	B	A	B	A	B	
Platyhelminthes											
Turbellaria											
Planariidae	420	404	70	16			5	4	8	72	999
Annelida											
Oligochaeta	157	145	60	296	141	92	429	257	343	838	2758
Hirudinae							1		1		2
Crustacea											
Amphipoda											
Gammaridae											
Gammarus		3									3
Insecta											
Odonata											
Anisoptera											
Libellulidae											
Libellula				3		1	1	1			6
Pachydiplax						2		1			3
Zygoptera											
Coenagrionidae											
Argia	1										1
Ischnura	2	9	11			1	11	13		1	48
Coleoptera											
Elmidae											
Macronychus		1									1
Diptera											
Ceratopogonidae	1			1							2
Chironomidae	470	499	364	417	72	72	317	208	191	567	3177
Mollusca											
Gastropoda											
Physidae											
Physella		1	18	22	21	43	66	71	1	97	340
Planorbidae		17	17	5	56	20	4	2			121
Hydrobiidae	4	2									6
Ancylidae			8	7	17	44	55	4	1	69	205
Bivalvia		1									1
Total specimens	1055	1082	548	767	307	275	889	561	545	1644	7673
Total taxa	7	10	7	8	5	8	9	9	6	6	16

Source: ERC, Inc.

Appendix Table T-50
Macroinvertebrates Collected by Hester-Dendy Sampler in the Conectiv Impoundment, Augsut-September 2006

	Macro 6		Macro 7		Macro 8		Total
	A	B	A	B	A	B	
Annelida							
Oligochaeta	28	11	20	3	26	58	146
Hirudinae	1				1	1	3
Insecta							
Odonata							
Anisoptera							
Libellulidae							
Pachydiplax				2		1	3
Zygoptera							
Coenagrionidae							
Ischnura			2				2
Diptera							
Chironomidae	10	2			4	10	26
Mollusca							
Gastropoda							
Ancylidae				1			1
Physidae							
Physella			7	2		1	10
Planorbidae			1				1
Total specimens	39	13	30	8	31	71	192
Total taxa	3	2	4	4	3	5	8

Source: ERC, inc.

Appendix Table T-51
Macroinvertebrates Collected by Hester-Dendy Sampler
in the City Ditch, August-September 2006

	Macro 9		Macro 10[1]		Macro 11		Total
	A	B	A	B	A	B	
Platyhelminthes			X	X			
Turbellaria			X	X			
Planariidae	4	182	X	X			186
			X	X			
Annelida			X	X			
Oligochaeta	510	424	X	X	58	46	1038
			X	X			
Hirudinae		1	X	X			1
			X	X			
Nematoda		1	X	X			1
			X	X			
Crustacea			X	X			
Amphipoda			X	X			
Gammaridae			X	X			
Gammarus	2	8	X	X			10
			X	X			
Insecta			X	X			
Odonata			X	X			
Anisoptera							
Libellulidae			X	X			
Perithemis		1	X	X			1
Diptera			X	X			
Chironomidae	5	176	X	X			181
			X	X			
Mollusca			X	X			
Gastropoda			X	X			
Hydrobiidae	1	11	X	X			12
Total specimens	522	804	X	X	58	46	1430
Total taxa	5	8	X	X	1	1	8

[1]sampler lost

Source: ERC, Inc.

Appendix Table T-52
Macroinvertebrates Collected by Hester-Dendy Sampler in Shellpot Creek,
August-September, 2006

	Macro 12		Macro 13		Macro 14		Macro 15		Total
	A	B	A	B	A	B	A	B	
Platyhelminthes									
Turbellaria									
Planariidae			14	1		3	3	1	22
Annelida									
Oligochaeta	296	79	1165	886	266	227	3		2922
Hirudinae			2		2	1			5
Nematoda						1			1
Crustacea									
Amphipoda									
Gammaridae									
Gammarus			7			6	3		16
Isopoda									
Asellidae									
Lirceus				1					1
Insecta									
Diptera									
Chironomidae			15	45	3	41	12	5	121
Mollusca									
Gastropoda									
Physidae									
Physella							2		2
Planorbidae			2						2
Hydrobiidae		4	1			1			6
Ancylidae			2	9					11
Total specimens	296	83	1208	942	271	280	23	6	3109
Total taxa	1	2	8	5	3	7	5	2	11

Source: ERC, Inc.

Appendix Table T-53
Fish Collected by Electrofishing in the Ditches Adjacent to the AMTRAK Former Fueling Facility, October 2004

Station	ES-3			ES-4			ES-5			ES-6			ES-7			Total		
Date	10/25/2004			10/25/2004			10/25/2004			10/25/2004			10/25/2004					
Time	1100-1125			1215-1235			1440-1455			1315-1327			0920-0945					
Shocking duration (min)	10.6			11.8			6.8			7.0			12.7			48.9		
Water temp. (°C)	12.4			12.9			13.3			13.3			11.9					
Dissolved oxygen (mg/l)	-			14.3			10.1			10.1			16.3					
Specific conductance (umhos)	147			148			137			137			148					
pH	6.9			6.9			5.7			5.7			6.3					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
Goldfish	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.143	17.5	0	0.000	0.0	1	0.020	17.5
Common carp	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.079	27.2	1	0.020	27.2
Brown bullhead	0	0.000	0.0	1	0.085	6.9	3	0.441	17.5	0	0.000	0.0	3	0.236	19.9	7	0.143	44.3
Eastern mudminnow	2	0.189	8.4	1	0.085	1.9	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	3	0.061	10.3
Banded killifish	59	5.566	163.7	47	3.983	142.8	5	0.735	20.0	7	1.000	14.5	5	0.394	23.8	123	2.515	364.8
Mummichog	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	2	0.157	25.0	2	0.041	25.0
Pumpkinseed	20	1.887	352.1	19	1.610	381.6	18	2.647	229.6	18	2.571	187.6	13	1.024	186.9	88	1.800	1337.8
Bluegill	47	4.434	123.6	29	2.458	165.4	7	1.029	44.2	13	1.857	47.9	29	2.283	62.7	125	2.556	443.8
Smallmouth bass	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.143	27.2	0	0.000	0.0	1	0.020	27.2
Total specimens	128	12.075		97	8.220		33	4.853		40	5.714		53	4.173		351	7.178	
Total weight			647.8			698.6			311.3			294.7			345.5			2297.9
Total species	4			5			4			5			6			9		

Electrofishing Oct 2004.xls\amtrak ditches

Source: ERC, Inc.

Appendix Table T-54
Fish Collected by Electrofishing in the Conectiv Impoundment, October 2004

Station	ES-1			ES-2			Total		
Date	10/20/2004			10/20/2004					
Time	0942-1000			1035-1058					
Shocking duration (min.)	13.2			12.1			25.3		
Water temp. (°C)	11.5			11.4					
Dissolved oxygen (mg/l)	3.8			3.9					
Specific conductance (umhos)	137			139					
pH	6.9			7.2					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
Brown bullhead	1	0.08	23.2	2	0.17	122.6	3	0.12	145.8
Redfin pickerel	2	0.15	88.4	6	0.50	188.2	8	0.32	276.6
Eastern mudminnow	10	0.76	141.3	48	3.97	461.2	58	2.29	602.5
Eastern mosquito fish	0	0.00	0.0	3	0.25	0.6	3	0.12	0.6
Pumpkinseed	8	0.61	153.6	2	0.17	46.8	10	0.40	200.4
Bluegill	7	0.53	72.1	2	0.17	27.5	9	0.36	99.6
Smallmouth bass	0	0.00	0.0	1	0.08	5.4	1	0.04	5.4
Black crappie	2	0.15	29.1	0	0.00	0.0	2	0.08	29.1
Total specimens	30	2.27		64	5.29		94	3.72	
Total weight			507.7			852.3			1360.0
Total species	6			7			8		

Electrofishing Oct 2004.xls\Impoundment

Source: ERC, Inc.

Appendix Table T-55
Fish Collected by Electrofishing in the City Ditch, October 2004

Station	ES-8			ES-9			ES-10			Total		
Date	10/20/2004			10/20/2004			10/20/2004					
Time	1330-1355			1415-1435			1450-1515					
Shocking duration (min)	10.0			10.0			10.6			30.6		
Water temp. (°C)	12.6			12.6			12.4					
Dissolved oxygen (mg/l)	6.0			7.1			8.3					
Specific conductance (umhos)	143			145			138					
pH	7.1			7.0			7.1					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	0	0.000	0.0	0	0.000	0.0	1	0.094	48.5	1	0.033	48.5
Golden shiner	0	0.000	0.0	1	0.100	15.1	0	0.000	0.0	1	0.033	15.1
Spottail shiner	0	0.000	0.0	1	0.100	9.6	0	0.000	0.0	1	0.033	9.6
Banded killifish	26	2.600	82.2	3	0.300	9.5	34	3.208	72.6	63	2.059	164.3
Mummichog	2	0.200	12.9	0	0.000	0.0	1	0.094	8.2	3	0.098	21.1
Pumpkinseed	0	0.000	0.0	4	0.400	77.2	1	0.094	13.9	5	0.163	91.1
Smallmouth bass	0	0.000	0.0	1	0.100	7.3	0	0.000	0.0	1	0.033	7.3
Black crappie	1	0.100	4.3	0	0.000	0.0	0	0.000	0.0	1	0.033	4.3
Total specimens	29	2.900		10	1.000		37	3.491		76	2.484	
Total weight			99.4			118.7			143.2			361.3
Total species	3			5			4			8		

Electrofishing Oct 2004.xls\city ditch

Source: ERC, Inc.

Appendix Table T-56
Fish Collected by Electrofishing in Shellpot Creek, October 2004

Station	ES-11			ES-12			ES-13			ES-14			Total		
Date	10/21/2004			10/21/2004			10/21/2004			10/21/2004					
Time	1138-1200			1245-1310			1340-1410			1505-1525					
Shocking duration (min)	12.3			12.0			12.0			11.6			47.9		
Water temp. (°C)	12.5			12.7			12.9			13.3					
Dissolved oxygen (mg/l)	6.6			8.1			8.3			7.7					
Specific conductance (umhos)	132			129			129			129					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	1	0.081	5.9	7	0.583	180.3	14	1.167	212.5	23	1.983	341.0	45	0.939	739.7
Goldfish	3	0.244	917.2	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	3	0.063	917.2
Common carp	6	0.488	501.5	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	6	0.125	501.5
Golden shiner	2	0.163	30.6	1	0.083	24.3	8	0.667	114.1	0	0.000	0.0	11	0.230	169.0
Creek chub	0	0.000	0.0	0	0.000	0.0	1	0.083	43.4	0	0.000	0.0	1	0.021	43.4
Creek chubsucker	0	0.000	0.0	7	0.583	435.6	8	0.667	588.2	0	0.000	0.0	15	0.313	1023.8
White sucker	10	0.813	987.7	14	1.167	730.1	16	1.333	1488.9	6	0.517	668.0	46	0.960	3874.7
Brown bullhead	0	0.000	0.0	4	0.333	254.7	0	0.000	0.0	0	0.000	0.0	4	0.084	254.7
Redfin pickerel	0	0.000	0.0	1	0.083	92.7	4	0.333	135.1	0	0.000	0.0	5	0.104	227.8
Eastern mudminnow	0	0.000	0.0	7	0.583	79.9	14	1.167	124.7	2	0.172	5.1	23	0.480	209.7
Banded killifish	4	0.325	28.5	4	0.333	24.7	17	1.417	116.5	9	0.776	19.8	34	0.710	189.5
Mummichog	0	0.000	0.0	1	0.083	12.2	0	0.000	0.0	2	0.172	13.2	3	0.063	25.4
Green sunfish	0	0.000	0.0	2	0.167	21.1	0	0.000	0.0	0	0.000	0.0	2	0.042	21.1
Pumpkinseed	1	0.081	23.5	17	1.417	397.0	2	0.167	84.3	4	0.345	21.7	24	0.501	526.5
Bluegill	0	0.000	0.0	5	0.417	237.1	6	0.500	69.2	0	0.000	0.0	11	0.230	306.3
Smallmouth bass	1	0.081	47.1	1	0.083	81.4	2	0.167	47.2	3	0.259	441.9	7	0.146	617.6
Black crappie	0	0.000	0.0	5	0.417	54.9	0	0.000	0.0	0	0.000	0.0	5	0.104	54.9
Total specimens	28	2.276		76	6.333		92	7.667		49	4.224		245	5.115	
Total weight			2542.0			2626.0			3024.1			1510.7			9702.8
Total species	8			14			11			7			17		

Electrofishing Oct 2004.xls\shellpot creek

Source: ERC, Inc.

Appendix Table T-57
Fish Collected by Electrofishing in the Ditches Adjacent to the AMTRAK Former Fueling Facility, May 2005

Station	ES-3			ES-4			ES-5			ES-6			ES-7			Total		
Date	5/4/2005			5/4/2005			5/4/2005			5/4/2005			5/4/2005					
Time	0900-0920			1015-1035			1346-1359			1305-1320			1310-1330					
Shocking duration (min)	10.2			10.6			6.8			5.5			10.4			43.5		
Water temp. (°C)	14.3			13.8			15.9			15.9			16.2					
Dissolved oxygen (mg/l)	12.6			13.8			14.8			14.8			19.9					
Specific conductance (umhos)	154			153.4			147			145			145					
pH	7.9			8.2			7.8			7.8			8.4					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	1	0.098	32.7	2	0.189	85.5	1	0.147	59.9	1	0.182	41.8	1	0.096	45.1	6	0.138	265.0
Goldfish	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	9	1.636	1095.8	2	0.192	355.8	11	0.253	1451.6
Common carp	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.096	338.4	1	0.023	338.4
Golden shiner	1	0.098	4.3	1	0.094	4.9	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	2	0.046	9.2
Brown bullhead	0	0.000	0.0	0	0.000	0.0	6	0.882	33.0	0	0.000	0.0	1	0.096	6.1	7	0.161	39.1
Banded killifish	85	8.333	265.1	97	9.151	351.3	10	1.471	21.5	14	2.545	39.2	1	0.096	1.9	207	4.759	679.0
Mummichog	13	1.275	24.0	0	0.000	0.0	2	0.294	26.8	5	0.909	54.3	3	0.288	49.2	23	0.529	154.3
Pumpkinseed	93	9.118	633.6	49	4.623	337.5	32	4.706	294.1	55	10.000	821.4	42	4.038	640.9	271	6.230	2727.5
Bluegill	13	1.275	142.7	8	0.755	70.5	0	0.000	0.0	5	0.909	176.3	3	0.288	25.7	29	0.667	415.2
Largemouth bass	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.182	97.5	2	0.192	251.0	3	0.069	348.5
Total specimens	206	20.196		157	14.811		51	7.500		90	16.364		56	5.385		560	12.874	
Total weight			1102.4			849.7			435.3			2326.3			1714.1			6427.8
Total species	6			5			5			7			9			10		

Electrofishing May 2005.xls\amtrak ditches

Source: ERC, Inc.

Appendix Table T-58
Fish Collected by Electrofishing in the Conectiv Impoundment, May 2005

Station	ES-1			ES-2			Total		
Date	5/2/2005			5/2/2005					
Time	1250-1315			1130-1156					
Shocking duration (min.)	11.0			11.5			22.5		
Water temp. (°C)	15.4			16.3					
Dissolved oxygen (mg/l)	9.7			8.6					
Specific conductance (umhos)	141			139					
pH	7.3			7.3					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	1	0.09	37.7	2	0.17	65.3	3	0.13	103.0
Golden shiner	0	0.00	0.0	1	0.09	4.7	1	0.04	4.7
Brown bullhead	1	0.09	302.3	1	0.09	102.9	2	0.09	405.2
Eastern mudminnow	3	0.27	38.1	2	0.17	20.7	5	0.22	58.8
Pumpkinseed	1	0.09	80.3	6	0.52	179.6	7	0.31	259.9
Bluegill	0	0.00	0.0	3	0.26	27.1	3	0.13	27.1
Total specimens	6	0.55		15	1.30		21	0.93	
Total weight			458.4			400.3			858.7
Total species	4			6			6		

Electrofishing May 2005.xls\Impoundment

Source: ERC, Inc.

Appendix Table T-59
Fish Collected by Electrofishing in the City Ditch, May 2005

Station	ES-8			ES-9			ES-10			Total		
Date	5/3/2005			5/3/2005			5/3/2005					
Time	1145-1205			1226-1246			1325-1340					
Shocking duration (min)	10.1			10.3			9.6			30.0		
Water temp. (°C)	13.2			13.9			14.3					
Dissolved oxygen (mg/l)	10.9			10.8			11.8					
Specific conductance (umhos)	126			127			129					
pH	7.5			7.5			7.6					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	0	0.000	0.0	0	0.000	0.0	2	0.208	114.5	2	0.067	114.5
Gizzard shad	0	0.000	0.0	0	0.000	0.0	1	0.104	1500.0	1	0.033	1500.0
Golden shiner	0	0.000	0.0	0	0.000	0.0	1	0.104	5.0	1	0.033	5.0
Spottail shiner	1	0.099	4.6	0	0.000	0.0	0	0.000	0.0	1	0.033	4.6
Creek chub	0	0.000	0.0	0	0.000	0.0	1	0.104	22.1	1	0.033	22.1
Banded killifish	26	2.574	87.3	6	0.583	31.7	8	0.833	40.8	40	1.333	159.8
Mummichog	0	0.000	0.0	17	1.650	76.1	23	2.396	117.9	40	1.333	194.0
Pumpkinseed	3	0.297	126.3	1	0.097	8.6	15	1.563	151.3	19	0.633	286.2
Bluegill	2	0.198	11.2	0	0.000	0.0	5	0.521	30.7	7	0.233	41.9
Total specimens	32	3.168		24	2.330		56	5.833		112	3.733	
Total weight			229.4			116.4			1982.3			2328.1
Total species	4			3			8			9		

Electrofishing May 2005.xls\city ditch

Source: ERC, Inc.

Appendix Table T-60
Fish Collected by Electrofishing in Shellpot Creek, May 2005

Station	ES-11			ES-12			ES-13			ES-14			Total		
Date	5/5/2005			5/5/2005			5/5/2005			5/5/2005					
Time	1145-1205			1235-1255			1318-1340			1402-1420					
Shocking duration (min)	10.1			10.1			10.5			10.2			40.9		
Water temp. (°C)	12.7			14.0			15.8			19.9					
Dissolved oxygen (mg/l)	7.4			8.9			8.2			9.6					
Specific conductance (umhos)	149			144.0			148.0			137.0					
pH	7.2			7.3			7.2			7.3					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	2	0.198	52.9	11	1.089	202.0	15	1.429	318.1	16	1.569	359.2	44	1.076	932.2
Common carp	1	0.099	3600.0	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.024	3600.0
Golden shiner	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	5	0.490	120.6	5	0.122	120.6
Creek chub	0	0.000	0.0	2	0.198	8.0	0	0.000	0.0	0	0.000	0.0	2	0.049	8.0
Creek chubsucker	0	0.000	0.0	0	0.000	0.0	1	0.095	9.2	0	0.000	0.0	1	0.024	9.2
White sucker	2	0.198	15.1	3	0.297	147.6	2	0.190	70.2	3	0.294	80.0	10	0.244	312.9
Eastern mudminnow	0	0.000	0.0	0	0.000	0.0	2	0.190	5.8	0	0.000	0.0	2	0.049	5.8
Banded killifish	1	0.099	11.7	7	0.693	50.8	3	0.286	33.5	9	0.882	67.5	20	0.489	163.5
Mummichog	0	0.000	0.0	0	0.000	0.0	3	0.286	10.5	0	0.000	0.0	3	0.073	10.5
Green sunfish	0	0.000	0.0	2	0.198	71.7	0	0.000	0.0	0	0.000	0.0	2	0.049	71.7
Pumpkinseed	6	0.594	177.8	4	0.396	101.3	9	0.857	82.5	2	0.196	45.5	21	0.513	407.1
Bluegill	1	0.099	0.6	3	0.297	11.2	0	0.000	0.0	0	0.000	0.0	4	0.098	11.8
Tessellated darter	0	0.000	0.0	2	0.198	14.1	0	0.000	0.0	0	0.000	0.0	2	0.049	14.1
Total specimens	13	1.287		34	3.366		35	3.333		35	3.431		117	2.861	
Total weight			3858.1			606.7			529.8			672.8			5667.4
Total species	6			8			7			5			13		

Electrofishing May 2005.xls\shellpot creek

Source: ERC, Inc.

Appendix Table T-61
Fish Collected by Electrofishing in the Ditches Adjacent to the AMTRAK Former Fueling Facility, August 2005

Station	ES-3			ES-4			ES-5			ES-6			ES-7			Total		
Date	8/8/2005			8/8/2005			8/8/2005			8/8/2005			8/12/2005					
Time	1230-1245			1320-1337			1048-1100			1000-1016			1010-1028					
Shocking duration (min)	10.6			10.4			8.0			10.2			10.0			49.2		
Water temp. (°C)	29.3			29.3			27.9			27.9			28.2					
Dissolved oxygen (mg/l)	4.3			4.3			4.7			4.7			2.8					
Specific conductance (umhos)	149			149			2000			2000			143					
pH	7.8			7.8			7.3			7.3			7.5					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.100	73.1	1	0.020	73.1
Goldfish	0	0.000	0.0	0	0.000	0.0	5	0.625	1115.7	0	0.000	0.0	0	0.000	0.0	5	0.102	1115.7
Common shiner	0	0.000	0.0	2	0.192	1.2	0	0.000	0.0	0	0.000	0.0	1	0.100	4.2	3	0.061	5.4
Golden shiner	1	0.094	0.7	1	0.096	4.1	0	0.000	0.0	2	0.196	5.9	0	0.000	0.0	4	0.081	10.7
Brown bullhead	0	0.000	0.0	0	0.000	0.0	3	0.375	75.5	1	0.098	32.7	3	0.300	297.6	7	0.142	405.8
Banded killifish	52	4.906	149.9	176	16.923	315.1	5	0.625	7.7	18	1.765	72.1	51	5.100	160.4	302	6.138	705.2
Mummichog	1	0.094	3.6	1	0.096	3.9	10	1.250	42.4	9	0.882	78.4	12	1.200	60.1	33	0.671	188.4
Green sunfish	1	0.094	59.3	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.020	59.3
Pumpkinseed	36	3.396	418.2	26	2.500	207.9	10	1.250	268.2	64	6.275	741.8	59	5.900	865.1	195	3.963	2501.2
Bluegill	5	0.472	181.9	4	0.385	175.7	0	0.000	0.0	0	0.000	0.0	3	0.300	53.2	12	0.244	410.8
Smallmouth bass	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	2	0.196	203.9	0	0.000	0.0	2	0.041	203.9
Largemouth bass	1	0.094	528.5	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.020	528.5
Total specimens	97	9.151		210	20.192		33	4.125		96	9.412		130	13.000		566	11.504	
Total weight			1342.1			707.9			1509.5			1134.8			1513.7			6208.0
Total species	7			6			5			6			7			12		

Electrofishing August 2005.xls\amtrak ditches

Source: ERC, Inc.

Appendix Table T-62
Fish Collected by Electrofishing in the Conectiv Impoundment, August 2005

Station	ES-1			ES-2			Total		
Date	8/9/2005			8/9/2005					
Time	1247-1308			1320-1338					
Shocking duration (min.)	10.0			10.0			20.0		
Water temp. (°C)	26.4			26.4					
Dissolved oxygen (mg/l)	0.8			0.8					
Specific conductance (umhos)	148			148					
pH	7.3			7.3					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
Golden shiner	2	0.20	36.7	2	0.20	31.4	4	0.20	68.1
Eastern mudminnow	9	0.90	65.8	2	0.20	12.1	11	0.55	77.9
Eastern mosquitofish	1	0.10	0.4	0	0.00	0.0	1	0.05	0.4
Bluegill	2	0.20	43.8	1	0.10	0.8	3	0.15	44.6
Black crappie	1	0.10	22.5	0	0.00	0.0	1	0.05	22.5
Total specimens	15	1.50		3	0.30		20	1.00	
Total weight			169.2			44.3			213.5
Total species	5			3			5		

Electrofishing August 2005.xls\Impoundment

Source: ERC, Inc.

Appendix Table T-63
Fish Collected by Electrofishing in the City Ditch, August 2005

Station	ES-8			ES-9			ES-10			Total		
Date	8/10/2005			8/10/2005			8/10/2005					
Time	1422-1439			1500-1516			1330-1348					
Shocking duration (min)	10.0			10.0			10.2			30.2		
Water temp. (°C)	26.8			27.5			27.0					
Dissolved oxygen (mg/l)	7.3			7.3			6.3					
Specific conductance (umhos)	141			152			152					
pH	7.5			7.5			7.5					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	1	0.100	0.0	3	0.300	188.1	0	0.000	0.0	4	0.132	188.1
Common shiner	0	0.000	0.0	0	0.000	0.0	1	0.098	2.7	1	0.033	2.7
Spottail shiner	4	0.400	6.7	1	0.100	0.8	0	0.000	0.0	5	0.166	7.5
White sucker	0	0.000	0.0	1	0.100	9.8	0	0.000	0.0	1	0.033	9.8
Banded killifish	5	0.500	4.5	8	0.800	44.6	2	0.196	9.2	15	0.497	58.3
Mummichog	37	3.700	107.4	20	2.000	77.8	57	5.588	257.8	114	3.775	443.0
Green sunfish	0	0.000	0.0	0	0.000	0.0	1	0.098	133.8	1	0.033	133.8
Pumpkinseed	0	0.000	0.0	5	0.500	118.6	7	0.686	201.2	12	0.397	319.8
Bluegill	1	0.100	3.8	0	0.000	0.0	2	0.196	77.8	3	0.099	81.6
Smallmouth bass	0	0.000	0.0	0	0.000	0.0	1	0.098	2.6	1	0.033	2.6
Total specimens	48	4.800		38	3.800		71	6.961		157	5.199	
Total weight			122.4			439.7			685.1			1247.2
Total species	5			6			7			10		

Electrofishing August 2005.xls\city ditch

Source: ERC, Inc.

Appendix Table T-64
Fish Collected by Electrofishing in Shellpot Creek, August 2005

Station	ES-11			ES-12			ES-13			ES-14			Total		
Date	8/11/2005			8/11/2005			8/11/2005			8/11/2005					
Time	0955-1012			0822-0838			0910-0925			0720-0735					
Shocking duration (min)	10.4			10.0			10.0			10.2			40.6		
Water temp. (°C)	27.0			24.2			25.0			25.3					
Dissolved oxygen (mg/l)	2.1			0.8			0.8			1.0					
Specific conductance (umhos)	127			119			122			127					
pH	7.2			7.3			7.3			7.3					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	1	0.096	14.4	1	0.100	5.4	1	0.100	14.0	3	0.294	31.7	6	0.148	65.5
Goldfish	0	0.000	0.0	0	0.000	0.0	2	0.200	58.1	0	0.000	0.0	2	0.049	58.1
Common carp	0	0.000	0.0	3	0.300	12600.0	1	0.100	3500.0	0	0.000	0.0	4	0.099	16100.0
Common shiner	1	0.096	1.8	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.025	1.8
Golden shiner	1	0.096	10.9	0	0.000	0.0	1	0.100	1.2	0	0.000	0.0	2	0.049	12.1
White sucker	1	0.096	8.3	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.025	8.3
Brown bullhead	1	0.096	179.5	0	0.000	0.0	9	0.900	871.2	1	0.098	0.4	11	0.271	1051.1
Eastern mudminnow	0	0.000	0.0	2	0.200	4.8	2	0.200	5.6	0	0.000	0.0	4	0.099	10.4
Banded killifish	12	1.154	27.7	1	0.100	2.7	0	0.000	0.0	0	0.000	0.0	13	0.320	30.4
Mummichog	5	0.481	20.9	16	1.600	19.9	0	0.000	0.0	2	0.196	1.4	23	0.567	42.2
Eastern mosquitofish	2	0.192	0.3	2	0.200	0.3	5	0.500	1.4	6	0.588	2.7	15	0.369	4.7
Green sunfish	0	0.000	0.0	1	0.100	41.3	0	0.000	0.0	0	0.000	0.0	1	0.025	41.3
Bluegill	0	0.000	0.0	2	0.200	7.8	1	0.100	0.3	0	0.000	0.0	3	0.074	8.1
Total specimens	24	2.308		28	2.800		22	2.200		12	1.176		86	2.118	
Total weight			263.8			12682.2			4451.8			36.2			17434.0
Total species	8			8			8			4			13		

Electrofishing August 2005.xls\shellpot creek

Source: ERC, Inc.

Appendix Table T-65
Fish Collected by Electrofishing in the Ditches Adjacent to the AMTRAK Former Fueling Facility, October 2005

Station	ES-3			ES-4			ES-5			ES-6			ES-7			Total		
Date	10/20/2005			10/20/2005			10/18/2005			10/18/2005			10/20/2005					
Time	1110-1126			1235-1250			1251-1304			1335-1350			0935-0950					
Shocking duration (min)	10.4			10.5			8.4			9.4			10.4			49.1		
Water temp. (°C)	15.2			15.9			16.1			17.5			15					
Dissolved oxygen (mg/l)	7.8			8.8			6.2			7.0			8.8					
Specific conductance (umhos)	154			154.3			167			165			157					
pH	7.8			7.8			7.5			7.5			8.2					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	0	0.000	0.0	0	0.000	0.0	1	0.119	18.9	0	0.000	0.0	2	0.192	49.0	3	0.061	67.9
Goldfish	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.106	281.2	5	0.481	1025.6	6	0.122	1306.8
Common shiner	0	0.000	0.0	1	0.095	3.8	0	0.000	0.0	0	0.000	0.0	4	0.385	5.0	5	0.102	8.8
Golden shiner	0	0.000	0.0	2	0.190	84.1	0	0.000	0.0	2	0.213	6.2	0	0.000	0.0	4	0.081	90.3
Spotfin shiner	0	0.000	0.0	0	0.000	0.0	1	0.119	0.7	0	0.000	0.0	0	0.000	0.0	1	0.020	0.7
Brown bullhead	0	0.000	0.0	2	0.190	313.1	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	2	0.041	313.1
Banded killifish	201	19.327	300.1	295	28.095	604.3	32	3.810	52.4	78	8.298	126.2	14	1.346	27.2	620	12.627	1110.2
Mummichog	0	0.000	0.0	0	0.000	0.0	7	0.833	30.5	3	0.319	14.3	10	0.962	53.4	20	0.407	98.2
Green sunfish	0	0.000	0.0	0	0.000	0.0	1	0.119	2.8	0	0.000	0.0	0	0.000	0.0	1	0.020	2.8
Pumpkinseed	35	3.365	316.7	24	2.286	301.8	34	4.048	150.2	78	8.298	890.9	47	4.519	478.2	218	4.440	2137.8
Bluegill	8	0.769	202.7	14	1.333	553.8	4	0.476	106.6	13	1.383	178.4	7	0.673	7.5	46	0.937	1049.0
Smallmouth bass	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.096	9.9	1	0.020	9.9
Largemouth bass	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.096	332.7	1	0.020	332.7
Total specimens	244	23.462		338	32.190		80	9.524		175	18.617		91	8.750		928	18.900	
Total weight			819.5			1860.9			362.1			1497.2			1988.5			6528.2
Total species	3			6			7			6			9			13		

Electrofishing Oct 2005.xls\amtrak ditches

Source: ERC, Inc.

Appendix Table T-66
Fish Collected by Electrofishing in the Conectiv Impoundment, October 2005

Station	ES-1			ES-2			Total		
Date	10/17/2005			10/17/2005					
Time	0950-1006			0920-0935					
Shocking duration (min.)	10.0			10.0			20.0		
Water temp. (°C)	12.4			12.1					
Dissolved oxygen (mg/l)	3.9			3.7					
Specific conductance (umhos)	174			171					
pH	7.3			6.9					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
Goldfish	0	0.00	0.0	1	0.10	39.2	1	0.05	39.2
Brown bullhead	0	0.00	0.0	6	0.60	1270.4	6	0.30	1270.4
Eastern mosquitofish	0	0.00	0.0	2	0.20	1.7	2	0.10	1.7
Pumpkinseed	7	0.70	12.4	7	0.70	222.0	14	0.70	234.4
Bluegill	2	0.20	60.6	7	0.70	149.5	9	0.45	210.1
Total specimens	9	0.90		23	2.30		32	1.60	
Total weight			73.0			1682.8			1755.8
Total species	2			5			5		

Electrofishing Oct 2005.xls\Impoundment

Source: ERC, Inc.

Appendix Table T-67
Fish Collected by Electrofishing in the City Ditch, October 2005

Station	ES-8			ES-9			ES-10			Total		
Date	10/17/2005			10/17/2005			10/17/2005					
Time	1240-1255			1310-1325			1340-1355					
Shocking duration (min)	9.1			10.6			10.3			30.0		
Water temp. (°C)	16.3			16.5			16.3					
Dissolved oxygen (mg/l)	7.6			7.5			7.3					
Specific conductance (umhos)	131			127			126					
pH	7.6			7.6			7.6					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	1	0.110	35.4	0	0.000	0.0	0	0.000	0.0	1	0.033	35.4
Spottail shiner	1	0.110	1.2	2	0.189	9.1	4	0.388	19.1	7	0.233	29.4
Banded killifish	13	1.429	50.1	3	0.283	11.2	0	0.000	0.0	16	0.533	61.3
Mummichog	5	0.549	19.3	2	0.189	5.0	0	0.000	0.0	7	0.233	24.3
Green sunfish	0	0.000	0.0	0	0.000	0.0	4	0.388	12.2	4	0.133	12.2
Pumpkinseed	10	1.099	186.2	16	1.509	231.4	10	0.971	234.2	36	1.200	651.8
Bluegill	3	0.330	11.4	3	0.283	11.5	1	0.097	1.8	7	0.233	24.7
Smallmouth bass	0	0.000	0.0	0	0.000	0.0	4	0.388	208.6	4	0.133	208.6
Total specimens	33	3.626		26	2.453		23	2.233		82	2.733	
Total weight			303.6			268.2			475.9			1047.7
Total species	6			5			5			9		

Electrofishing Oct 2005.xls\city ditch

Source: ERC, Inc.

Appendix Table T-68
Fish Collected by Electrofishing in Shellpot Creek, October 2005

Station	ES-11			ES-12			ES-13			ES-14			Total		
Date	10/18/2005			10/18/2005			10/19/2005			10/18/2005					
Time	1520-1534			1640-1655			1403-1420			1720-1735					
Shocking duration (min)	10.3			10.0			10.1			10			40.4		
Water temp. (°C)	18.3			17.1			16.8			19.9					
Dissolved oxygen (mg/l)	4.36			5.6			5.2			9.6					
Specific conductance (umhos)	153			147.0			150.0			137.0					
pH	7.6			7.7			7.6			7.3					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	1	0.097	37.1	1	0.100	24.2	1	0.099	10.3	1	0.100	32.9	4	0.099	104.5
Goldfish	0	0.000	0.0	0	0.000	0.0	1	0.099	88.1	0	0.000	0.0	1	0.025	88.1
Golden shiner	3	0.291	53.7	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	3	0.074	53.7
Common shiner	5	0.485	42.9	0	0.000	0.0	3	0.297	22.2	0	0.000	0.0	8	0.198	65.1
Longnose dace	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.100	7.3	1	0.025	7.3
Creek chubsucker	0	0.000	0.0	0	0.000	0.0	6	0.594	142.1	1	0.100	127.2	7	0.173	269.3
White sucker	9	0.874	441.3	6	0.600	501.5	20	1.980	1153.8	1	0.100	164.5	36	0.891	2261.1
Brown bullhead	0	0.000	0.0	3	0.300	534.3	2	0.198	137.2	1	0.100	50.3	6	0.149	721.8
Eastern mudminnow	0	0.000	0.0	4	0.400	27.1	3	0.297	3.3	0	0.000	0.0	7	0.173	30.4
Banded killifish	6	0.583	13.6	34	3.400	140.6	3	0.297	2.1	57	5.700	117.4	100	2.475	273.7
Mummichog	2	0.194	14.4	1	0.100	6.0	0	0.000	0.0	12	1.200	47.6	15	0.371	68.0
Eastern mosquitofish	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.100	0.1	1	0.025	0.1
White perch	6	0.583	39.0	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	6	0.149	39.0
Pumpkinseed	4	0.388	168.1	4	0.400	138.7	24	2.376	687.4	1	0.100	3.5	33	0.817	997.7
Bluegill	0	0.000	0.0	1	0.100	1.7	6	0.594	73.3	0	0.000	0.0	7	0.173	75.0
Smallmouth bass	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	2	0.200	130.7	2	0.050	130.7
Black crappie	0	0.000	0.0	0	0.000	0.0	3	0.297	67.6	0	0.000	0.0	3	0.074	67.6
Total specimens	36	3.495		54	5.400		72	7.129		78	7.800		240	5.941	
Total weight			810.1			1374.1			2387.4			681.5			5253.1
Total species	8			8			10			10			17		

Electrofishing Oct 2005.xls\shellpot creek

Source: ERC, Inc.

Appendix Table T-69
Fish Collected by Electrofishing in the Ditches Adjacent to the AMTRAK Former Fueling Facility, May 2006

Station	ES-3			ES-4			ES-5			ES-6			ES-7			Total		
Date	5/1/2006			5/1/2006			5/3/2006			5/3/2006			5/3/2006					
Time	1050-1105			1200-1215			1041-11			1143-1200			1437-1455					
Shocking duration (min)	9.8			10.4			8.5			10.0			10.1			48.8		
Water temp. (°C)	17.3			17.3			17.1			17.1			22.3					
Dissolved oxygen (mg/l)	9.6			9.6			8.9			8.9			12.5					
Specific conductance (umhos)	155			155			132			132			138					
pH	7.4			7.4			7.8			7.8			8.2					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	0	0.000	0.0	0	0.000	0.0	1	0.118	36.1	2	0.200	56.0	0	0.000	0.0	3	0.061	92.1
Gizzard shad	0	0.000	0.0	0	0.000	0.0	1	0.118	362.5	0	0.000	0.0	0	0.000	0.0	1	0.020	362.5
Goldfish	0	0.000	0.0	0	0.000	0.0	7	0.824	1370.2	0	0.000	0.0	3	0.297	728.3	10	0.205	2098.5
Common carp	0	0.000	0.0	0	0.000	0.0	5	0.588	6602.3	2	0.200	4403.7	0	0.000	0.0	7	0.143	11006.0
Golden shiner	0	0.000	0.0	0	0.000	0.0	3	0.353	159.6	5	0.500	37.4	5	0.495	64.1	13	0.266	261.1
Spottail shiner	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.100	6.6	3	0.297	18.1	4	0.082	24.7
Swallowtail shiner	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.100	2.1	0	0.000	0.0	1	0.020	2.1
Brown bullhead	0	0.000	0.0	0	0.000	0.0	1	0.118	144.1	2	0.200	53.8	6	0.594	1134.2	9	0.184	1332.1
Banded killifish	253	25.816	787.5	322	30.962	1256.6	48	5.647	134.1	132	13.200	346.2	41	4.059	139.2	796	16.311	2663.6
Mummichog	5	0.510	20.1	1	0.096	2.3	0	0.000	0.0	4	0.400	60.8	0	0.000	0.0	10	0.205	83.2
Pumpkinseed	29	2.959	326.8	57	5.481	869.2	51	6.000	319.4	58	5.800	563.4	81	8.020	626.1	276	5.656	2704.9
Bluegill	3	0.306	96.4	10	0.962	316.8	1	0.118	80.2	3	0.300	86.4	6	0.594	59.1	23	0.471	638.9
Largemouth bass	0	0.000	0.0	1	0.096	301.3	1	0.118	630.5	1	0.100	96.3	2	0.198	728.3	5	0.102	1756.4
Total specimens	290	29.592		391	37.596		119	14.000		211	21.100		147	14.554		1158	23.730	
Total weight			1230.8			2746.2			9839.0			5712.7			3497.4			23026.1
Total species	4			5			10			11			8			13		

Electrofishing May 2006.xls\amtrak ditches

Source: ERC, Inc.

Appendix Table T-70
Fish Collected by Electrofishing in the Conectiv Impoundment, May 2006

Station	ES-1			ES-2			Total		
Date	5/2/2006			5/2/2006					
Time	1320-1335			1245-1305					
Shocking duration (min.)	10.2			10.2			20.4		
Water temp. (°C)	18.2			18.7					
Dissolved oxygen (mg/l)	>20.0			19.9					
Specific conductance (umhos)	157			155					
pH	9.2			8.9					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	1	0.10	7.5	0	0.00	0.0	1	0.05	7.5
Goldfish	0	0.00	0.0	1	0.10	117.9	1	0.05	117.9
Golden shiner	2	0.20	70.9	0	0.00	0.0	2	0.10	70.9
Brown bullhead	1	0.10	167.4	1	0.10	454.8	2	0.10	622.2
Eastern mudminnow	1	0.10	3.9	0	0.00	0.0	1	0.05	3.9
Pumpkinseed	1	0.10	52.9	10	0.98	334.1	11	0.54	387.0
Bluegill	1	0.10	6.2	0	0.00	0.0	1	0.05	6.2
Black crappie	0	0.00	0.0	1	0.10	30.8	1	0.05	30.8
Total specimens	7	0.69		13	1.27		20	0.98	
Total weight			308.8			937.6			1246.4
Total species	6			4			8		

Source: ERC, Inc.

Appendix Table T-71
Fish Collected by Electrofishing in the City Ditch, May 2006

Station	ES-8			ES-9			ES-10			Total		
Date	5/1/2006			5/1/2006			5/1/2006					
Time	1450-1507			1512-1535			1413-1430					
Shocking duration (min)	10.1			10.1			10.0			30.2		
Water temp. (°C)	18.6			17.7			17.7					
Dissolved oxygen (mg/l)	7.9			7.7			8.0					
Specific conductance (umhos)	137			137			138					
pH	7.6			7.6			7.7					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
Golden shiner	0	0.000	0.0	0	0.000	0.0	2	0.200	19.1	2	0.066	19.1
Spottail shiner	0	0.000	0.0	0	0.000	0.0	1	0.100	0.8	1	0.033	0.8
Creek chub	0	0.000	0.0	0	0.000	0.0	1	0.100	4.2	1	0.033	4.2
Banded killifish	0	0.000	0.0	6	0.594	36.2	9	0.900	69.1	15	0.497	105.3
Mummichog	8	0.792	72.3	14	1.386	106.3	5	0.500	42.6	27	0.894	221.2
Pumpkinseed	8	0.792	100.6	15	1.485	343.3	28	2.800	355.3	51	1.689	799.2
Bluegill	0	0.000	0.0	1	0.099	58.4	0	0.000	0.0	1	0.033	58.4
Largemouth bass	1	0.099	93.4	0	0.000	0.0	0	0.000	0.0	1	0.033	93.4
Total specimens	17	1.683		36	3.564		46	4.600		99	3.278	
Total weight			266.3			544.2			491.1			1301.6
Total species	3			4			6			8		

Electrofishing May 2006.xls\city ditch

Source: ERC, Inc.

Appendix Table T-72
Fish Collected by Electrofishing in Shellpot Creek, May 2006

Station	ES-11			ES-12			ES-13			ES-14			Total		
Date	5/4/2006			5/4/2006			5/4/2006			5/4/2006					
Time	0745-0805			0825-0845			1008-1030			0925-0945					
Shocking duration (min)	10.1			10.0			10.0			10.2			40.3		
Water temp. (°C)	16.6			15.4			16.4			15.0					
Dissolved oxygen (mg/l)	3.0			3.1			3.7			4.1					
Specific conductance (umhos)	152			152			152			154					
pH	7.4			7.4			7.3			7.4					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	0	0.000	0.0	4	0.400	148.1	2	0.200	21.0	4	0.392	159.2	10	0.248	328.3
Common carp	2	0.198	11800.0	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	2	0.050	11800.0
Common shiner	0	0.000	0.0	0	0.000	0.0	3	0.300	45.1	0	0.000	0.0	3	0.074	45.1
Golden shiner	0	0.000	0.0	1	0.100	21.0	1	0.100	15.2	0	0.000	0.0	2	0.050	36.2
Creek chubsucker	0	0.000	0.0	0	0.000	0.0	1	0.100	15.4	0	0.000	0.0	1	0.025	15.4
White sucker	3	0.297	597.7	1	0.100	22.9	10	1.000	583.9	6	0.588	1254.6	20	0.496	2459.1
Brown bullhead	1	0.099	157.1	0	0.000	0.0	1	0.100	119.2	0	0.000	0.0	2	0.050	276.3
Banded killifish	22	2.178	83.6	27	2.700	101.9	3	0.300	19.3	3	0.294	15.4	55	1.365	220.2
Mummichog	20	1.980	97.9	35	3.500	198.5	4	0.400	22.7	4	0.392	11.3	63	1.563	330.4
Green sunfish	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	3	0.294	159.6	3	0.074	159.6
Pumpkinseed	6	0.594	190.4	8	0.800	342.3	25	2.500	509.1	22	2.157	471.0	61	1.514	1512.8
Bluegill	0	0.000	0.0	0	0.000	0.0	3	0.300	57.2	2	0.196	38.4	5	0.124	95.6
Largemouth bass	0	0.000	0.0	0	0.000	0.0	1	0.100	373.4	2	0.196	507.2	3	0.074	880.6
Black crappie	0	0.000	0.0	0	0.000	0.0	1	0.100	55.8	1	0.098	41.4	2	0.050	97.2
Total specimens	54	5.347		76	7.600		55	5.500		47	4.608		232	5.757	
Total weight			12926.7			834.7			1837.3			2658.1			18256.8
Total species	6			6			12			9			14		

Electrofishing May 2006.xls\shellpot creek

Source: ERC, Inc.

Appendix Table T-73
Fish Collected by Electrofishing in the Ditches Adjacent to the AMTRAK Former Fueling Facility, August 2006

Station	ES-3			ES-4			ES-5			ES-6			ES-7			Total		
Date	8/10/2006			8/10/2006			8/11/2006			8/11/2006			8/9/2006					
Time	1540-1605			1355-1420			1200-1216			1143-1200			0930-0950					
Shocking duration (min)	10.1			10.1			8.4			8.4			10.1			47.1		
Water temp. (°C)	28.9			28.4			25.4			25.4			24.4					
Dissolved oxygen (mg/l)	10.0			8.6			5.7			5.7			5.3					
Specific conductance (umhos)	143			143			145.9			145.9			146					
pH	8.3			8.1			7.8			7.8			7.2					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	0	0.000	0.0	0	0.000	0.0	1	0.119	22.3	0	0.000	0.0	1	0.099	24.7	2	0.042	47.0
Gizzard shad	0	0.000	0.0	0	0.000	0.0	1	0.119	327.8	0	0.000	0.0	0	0.000	0.0	1	0.021	327.8
Goldfish	0	0.000	0.0	0	0.000	0.0	6	0.714	1557.4	2	0.238	324.9	8	0.792	1735.7	16	0.340	3618.0
Common carp	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.119	900.0	0	0.000	0.0	1	0.021	900.0
Common shiner	12	1.188	21.2	8	0.792	14.7	0	0.000	0.0	3	0.357	12.2	0	0.000	0.0	23	0.488	48.1
Golden shiner	9	0.891	168.2	4	0.396	82.5	0	0.000	0.0	1	0.119	15.2	5	0.495	88.6	19	0.403	354.5
Brown bullhead	1	0.099	290.3	0	0.000	0.0	2	0.238	360.2	0	0.000	0.0	7	0.693	799.5	10	0.212	1450.0
Banded killifish	70	6.931	306.1	90	8.911	550.5	12	1.429	75.4	23	2.738	72.4	45	4.455	163.5	240	5.096	1167.9
Mummichog	1	0.099	3.4	0	0.000	0.0	1	0.119	5.6	0	0.000	0.0	14	1.386	98.6	16	0.340	107.6
Rockbass	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.119	3.5	0	0.000	0.0	1	0.021	3.5
Green sunfish	0	0.000	0.0	0	0.000	0.0	1	0.119	15.6	0	0.000	0.0	0	0.000	0.0	1	0.021	15.6
Pumpkinseed	49	4.851	997.6	27	2.673	544.8	73	8.690	869.2	77	9.167	997.6	147	14.554	1697.3	373	7.919	5106.5
Bluegill	4	0.396	158.4	7	0.693	206.8	1	0.119	93.2	7	0.833	232.9	1	0.099	6.3	20	0.425	697.6
Largemouth bass	1	0.099	294.3	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.021	294.3
Total specimens	147	14.554		136	13.465		98	11.667		115	13.690		228	22.574		724	15.372	
Total weight			2239.5			1399.3			3326.7			2558.7			4614.2			14138.4
Total species	8			5			9			8			8			14		

Electrofishing August 2006.xls\amtrak ditches

Source: ERC, Inc.

Appendix Table T-74
Fish Collected by Electrofishing in the Conectiv Impoundment, August 2006

Station	ES-1			ES-2			Total		
Date	8/10/2006			8/10/2006					
Time	1010-1035			1045-1112					
Shocking duration (min.)	10.2			10.0			20.2		
Water temp. (°C)	23.4			23.7					
Dissolved oxygen (mg/l)	2.4			3.8					
Specific conductance (umhos)	154			155					
pH	7.5			7.6					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
Goldfish	1	0.10	3.8	5	0.50	11.7	6	0.30	15.5
Redfin pickerel	0	0.00	0.0	1	0.10	17.0	1	0.05	17.0
Eastern mudminnow	14	1.37	37.6	15	1.50	45.6	29	1.44	83.2
Eastern mosquitofish	7	0.69	2.1	14	1.40	7.0	21	1.04	9.1
Bluegill	1	0.10	1.1	1	0.10	0.5	2	0.10	1.6
Total specimens	23	2.25		36	3.60		59	2.92	
Total weight			44.6			81.8			126.4
Total species	4			5			5		

Electrofishing August 2006.xls\Impoundment

Source: ERC, Inc.

Appendix Table T-75
Fish Collected by Electrofishing in the City Ditch, August 2006

Station	ES-8			ES-9			ES-10			Total		
Date	8/11/2006			8/11/2006			8/11/2006					
Time	1430-1450			1510-1530			1408-1420					
Shocking duration (min)	8.4			7.0			7.0			22.4		
Water temp. (°C)	27.5			27.1			27.0					
Dissolved oxygen (mg/l)	6.4			5.2			5.3					
Specific conductance (umhos)	144			155			149					
pH	7.6			7.5			7.5					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	0	0.000	0.0	2	0.286	18.9	3	0.429	94.7	5	0.223	113.6
Common shiner	2	0.238	4.8	59	8.429	143.8	0	0.000	0.0	61	2.723	148.6
Spottail shiner	1	0.119	1.7	5	0.714	8.2	0	0.000	0.0	6	0.268	9.9
Banded killifish	13	1.548	59.4	23	3.286	88.2	6	0.857	32.8	42	1.875	180.4
Mummichog	2	0.238	18.6	0	0.000	0.0	3	0.429	33.5	5	0.223	52.1
Eastern mosquitofish	0	0.000	0.0	1	0.143	0.6	0	0.000	0.0	1	0.045	0.6
Pumpkinseed	12	1.429	183.5	11	1.571	132.9	12	1.714	271.4	35	1.563	587.8
Bluegill	2	0.238	94.5	2	0.286	1.8	0	0.000	0.0	4	0.179	96.3
Smallmouth bass	0	0.000	0.0	1	0.143	26.5	1	0.143	10.5	2	0.089	37.0
Black crappie	0	0.000	0.0	1	0.143	10.1	0	0.000	0.0	1	0.045	10.1
Total specimens	32	3.810		105	15.000		25	3.571		162	7.232	
Total weight			362.5			431.0			442.9			1236.4
Total species	6			9			5			10		

Electrofishing August 2006.xls\city ditch

Source: ERC, Inc.

Appendix Table T-76
Fish Collected by Electrofishing in Shellpot Creek, August 2006

Station	ES-11			ES-12			ES-13			ES-14			Total		
Date	8/9/2006			8/9/2006			8/9/2006			8/9/2006					
Time	1512-1535			1340-1402			1255-1315			1200-1225					
Shocking duration (min)	10.2			10.2			10.0			10.3			40.7		
Water temp. (°C)	31.3			30.7			30.5			25.5					
Dissolved oxygen (mg/l)	6.3			6.33			5.8			3.3					
Specific conductance (umhos)	132			132			132			136					
pH	7.6			7.4			7.3			7.1					
Species	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)	No.	No./min.	Wt. (g)
American eel	0	0.000	0.0	2	0.196	36.3	1	0.100	42.3	2	0.194	82.0	5	0.123	160.6
Common shiner	3	0.294	6.3	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	3	0.074	6.3
Golden shiner	16	1.569	341.6	0	0.000	0.0	7	0.700	142.2	0	0.000	0.0	23	0.565	483.8
White sucker	1	0.098	42.6	0	0.000	0.0	2	0.200	88.1	1	0.097	160.3	4	0.098	291.0
Yellow bullhead	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.097	74.5	1	0.025	74.5
Redfin pickerel	0	0.000	0.0	0	0.000	0.0	0	0.000	0.0	1	0.097	27.6	1	0.025	27.6
Banded killifish	0	0.000	0.0	19	1.863	111.5	6	0.600	124.4	36	3.495	189.6	61	1.499	425.5
Mummichog	0	0.000	0.0	2	0.196	22.3	2	0.200	18.2	12	1.165	100.1	16	0.393	140.6
Eastern mosquitofish	0	0.000	0.0	0	0.000	0.0	1	0.100	0.6	0	0.000	0.0	1	0.025	0.6
Pumpkinseed	8	0.784	124.1	4	0.392	161.2	9	0.900	266.3	7	0.680	204.1	28	0.688	755.7
Bluegill	1	0.098	5.6	2	0.196	25.1	0	0.000	0.0	1	0.097	10.6	4	0.098	41.3
Smallmouth bass	2	0.196	70.1	1	0.098	9.8	0	0.000	0.0	0	0.000	0.0	3	0.074	79.9
Black crappie	0	0.000	0.0	2	0.196	113.4	0	0.000	0.0	0	0.000	0.0	2	0.049	113.4
Total specimens	31	3.039		32	3.137		28	2.800		61	5.922		152	3.735	
Total weight			590.3			479.6			682.1			848.8			2600.8
Total species	6			7			7			8			13		

Electrofishing August 2006.xls\shellpot creek

Source: ERC, Inc.

Appendix Table T-77
Fishes Collected by Trap Net in the Ditches Adjacent to the AMTRAK Former Fueling Facility, October 2004

Station	TN-3			TN-4			Total		
	Set		Retrieve	Set		Retrieve			
Date	10/25/2004		10/26/2004	10/25/2004		10/26/2004			
Time	1400		0900	1405		0920			
Sampling duration (hrs)		19.0			19.25		38.3		
Water temp. (°C)	12.9		12.8	12.9		12.4			
Dissolved oxygen (mg/l)	14.7		16.2	14.7		-			
Specific conductance (umhos)	148		152	148		148			
pH	6.9		7.4	6.9		7.8			
Species	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)
Banded killifish	2	0.11	12.0	16	0.83	122.3	18	0.47	134.3
Green sunfish	0	0.00	0.0	3	0.16	147.1	3	0.08	147.1
Pumpkinseed	13	0.68	240.6	29	1.51	598.6	42	1.10	839.2
Bluegill	12	0.63	507.7	10	0.52	298.4	22	0.58	806.1
Total specimens	27	1.42		58	3.01		85	2.22	
Total weight			760.3			1166.4			1926.7
Total species	3			4			4		
Red-bellied turtle	2	0.11	-	0	0.00	-	2	0.05	-
Eastern painted turtle	0	0.00	-	2	0.10	-	2	0.05	-

Trapnet Oct. 2004.xls\amtrak ditches

Source: ERC, Inc.

Appendix Table T-78
Fishes Collected by Trap Net in the Conectiv Impoundment, October 2004

Station	TN-1			TN-2			Total		
	Set		Retrieve	Set		Retrieve			
Date	10/20/2004		10/21/2004	10/20/2004		10/21/2004			
Time	1215		0935	1200		0900			
Sampling duration (hrs)		21.3			21.0		42.3		
Water temp. (°C)	11.5		11.3	11.4		11.2			
Dissolved oxygen (mg/l)	3.8		4.2	3.9		3.4			
Specific conductance (umhos)	137		142	139		144			
pH	6.9		7.0	7.2		7.0			
Species	No.	No./hr	Wt. (g)	No.	No./hr	Wt. (g)	No.	No./hr	Wt. (g)
Quillback	0	0.00	0.0	1	0.05	198.0	1	0.02	198.0
Redfin pickerel	0	0.00	0.0	1	0.05	47.0	1	0.02	47.0
Pumpkinseed	10	0.47	288.1	9	0.43	285.1	19	0.45	573.2
Bluegill	4	0.19	190.8	2	0.10	117.8	6	0.14	308.6
Black crappie	4	0.19	96.8	0	0.00	0.0	4	0.09	96.8
Total specimens	18	0.85		13	0.62		31	0.73	
Total weight			575.7			647.9			1223.6
Total species	3			4			5		
Eastern painted turtle	4	0.19	-	3	0.14	-	7	0.17	-

Trapnet Oct. 2004.xls\impoundment

Source: ERC, Inc.

Appendix Table T-79
Fishes Collected by Trap Net in Shellpot Creek, October 2004

Station	TN-5			TN-6			Total		
	Set		Retrieve	Set		Retrieve			
Date	10/21/2004		10/22/2004	10/21/2004		10/22/2004			
Time	1600		0920	1615		0935			
Sampling duration (hrs)		17.3			17.3		34.6		
Water temp. (°C)	13.1		11.8	12.9		11.9			
Dissolved oxygen (mg/l)	8.3		7.0	8.7		6.8			
Specific conductance (umhos)	132		138	128		138			
Species	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)
Creek chubsucker	0	0.00	0.0	2	0.12	356.1	2	0.06	356.1
Pumpkinseed	0	0.00	0.0	2	0.12	51.8	2	0.06	51.8
Total specimens	0	0.00		4	0.23		4	0.12	
Total weight			0.0			407.9			407.9
Total species	0			4			4		
Red-bellied turtle	0	0.00	-	2	0.12	-	2	0.06	-
Eastern painted turtle	1	0.06	-	0	0.00	-	1	0.03	-

Trapnet Oct. 2004.xls\Shellpot

Source: ERC, Inc.

Appendix Table T-80
Fishes Collected by Trap Net in the Ditches Adjacent to the AMTRAK Former Fueling Facility, May 2005

Station	TN-3			TN-4			TN-4		
	Set		Retrieve	Set		Retrieve			
Date	5/4/2005		5/5/2005	5/4/2005		5/5/2005			
Time	1145		0850	1155		0925			
Sampling duration (hrs)		20.9			21.6			42.5	
Water temp. (°C)	14.3		12.9	13.8		12.9			
Dissolved oxygen (mg/l)	12.6		17.3	8.2		17.3			
Specific conductance (umhos)	154		156	153		156			
pH	7.9		8.2	8.2		8.2			
Species	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)
Golden shiner	0	0.00	0.0	3	0.14	137.9	3	0.07	137.9
Creek chubsucker	1	0.05	124.4	1	0.05	197.8	2	0.05	322.2
Banded killifish	0	0.00	0.0	17	0.79	148.2	17	0.40	148.2
Pumpkinseed	14	0.67	395.7	18	0.83	285.9	32	0.75	681.6
Bluegill	18	0.86	737.3	6	0.28	340.1	24	0.56	1077.4
Total specimens	33	1.58		45	2.08		78	1.84	
Total weight			1257.4			1109.9			2367.3
Total species	3			5			5		
Red-bellied turtle	1	0.05	-	0	0.00	-	1	0.02	-
Eastern painted turtle	0	0.00	-	4	0.19	-	4	0.09	-
Snapping turtle	1	0.05	-	0	0.00	-	1	0.02	-

Trapnet May 2005.xls\amtrak ditches

Source: ERC, Inc.

Appendix Table T-81
Fishes Collected by Trap Net in the Conectiv Impoundment, May 2005

Station	TN-1			TN-2			Total		
	Set		Retrieve	Set		Retrieve			
Date	5/2/2005		5/3/2005	5/2/2005		5/3/2005			
Time	1340		0945	1405		1010			
Sampling duration (hrs)		20.1			20.1			40.2	
Water temp. (°C)	15.4		9.9	15.4		12.3			
Dissolved oxygen (mg/l)	9.7		6.3	9.7		8.6			
Specific conductance (umhos)	141		148	141		146			
pH	7.3		7.2	7.3		7.2			
Species	No.	No./hr	Wt. (g)	No.	No./hr	Wt. (g)	No.	No./hr	Wt. (g)
Yellow bullhead	1	0.05	38.2	0	0.00	0.0	1	0.02	38.2
Pumpkinseed	2	0.10	107.4	2	0.10	96.5	4	0.10	203.9
Total specimens	3	0.15		2	0.10		5	0.12	
Total weight			145.6			96.5			242.1
Total species	2			1			2		
Eastern painted turtle	15	0.75	-	2	0.10	-	17	0.42	-

Trapnet May 2005.xls\impoundment

Source: ERC, Inc.

Appendix Table T-82
Fishes Collected by Trap Net in Shellpot Creek, May 2005

Station	TN-5			TN-6			TN-4		
	Set		Retrieve	Set		Retrieve			
Date	5/5/2005		5/6/2005	5/5/2005		5/6/2005			
Time	1530		1140	1510		1215			
Sampling duration (hrs)		20.2			21.1			41.3	
Water temp. (°C)	19.3		12.0	15.7		12.1			
Dissolved oxygen (mg/l)	8.1		6.9	9.6		7.3			
Specific conductance (umhos)	140		152.0	143		149			
pH	7.3		7.1	7.3		7.3			
Species	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)
Brown bullhead	1	0.05	229.9	0	0.00	0.0	1	0.02	229.9
Banded killifish	5	0.25	47.6	2	0.09	14.7	7	0.17	62.3
Mummichog	0	0.00	0.0	10	0.47	66.8	10	0.24	66.8
Bluegill	0	0.00	0.0	1	0.05	5.4	1	0.02	5.4
Total specimens	6	0.30		13	0.62		19	0.46	
Total weight			277.5			86.9			364.4
Total species	2			3			4		
Red-bellied turtle	3	0.15	-	0	0.00	-	3	0.07	-
Eastern painted turtle	1	0.05	-	0	0.00	-	1	0.02	-

Trapnet May 2005.xls\Shellpot

Source: ERC, Inc.

Appendix Table T-83
Fishes Collected by Trap Net in the Ditches Adjacent to the AMTRAK Former Fueling Facility, August 2005

Station	TN-3			TN-4			TN-4		
	Set		Retrieve	Set		Retrieve			
Date	8/8/2005		8/9/2005	8/8/2005		8/9/2005			
Time	1445		0945	1450		1010			
Sampling duration (hrs)		19.0			19.3		38.3		
Water temp. (°C)	30.8		26.6	30.8		26.6			
Dissolved oxygen (mg/l)	8.1		2.5	8.1		2.5			
Specific conductance (umhos)	138		142	138		142			
pH	7.8		7.2	7.8		7.2			
Species	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)
Golden shiner	1	0.05	48.7	1	0.05	10.6	2	0.05	59.3
Banded killifish	0	0.00	0.0	23	1.19	134.9	23	0.60	134.9
Mummichog	1	0.05	7.5	1	0.05	15.0	2	0.05	22.5
Green sunfish	1	0.05	48.8	1	0.05	84.6	2	0.05	133.4
Pumpkinseed	3	0.16	65.9	42	2.18	584.7	45	1.17	650.6
Bluegill	5	0.26	82.6	9	0.47	91.7	14	0.37	174.3
Total specimens	11	0.58		77	3.99		88	2.30	
Total weight			253.5			921.5			1175.0
Total species	5			6			6		
Red-bellied turtle	4	0.21	-	1	0.05	-	5	0.13	-
Eastern painted turtle	2	0.11	-	6	0.31	-	8	0.21	-

Trapnet August 2005.xls\amtrak ditches

Source: ERC, Inc.

Appendix Table T-84
Fishes Collected by Trap Net in the Conectiv Impoundment, August 2005

Station	TN-1			TN-2			Total		
	Set		Retrieve	Set		Retrieve			
Date	8/9/2005		8/10/2005	8/9/2005		8/10/2005			
Time	1417		1215	1402		1155			
Sampling duration (hrs)		21.0			21.9		42.9		
Water temp. (°C)	26.4		-	26.4		-			
Dissolved oxygen (mg/l)	0.8		-	0.8		-			
Specific conductance (umhos)	149		-	149		-			
pH	7.3		-	7.3		-			
Species	No.	No./hr	Wt. (g)	No.	No./hr	Wt. (g)	No.	No./hr	Wt. (g)
Golden shiner	4	0.19	47.8	0	0.00	0.0	4	0.09	47.8
Redfin pickerel	1	0.05	44.3	0	0.00	0.0	1	0.02	44.3
Pumpkinseed	2	0.10	27.1	0	0.00	0.0	2	0.05	27.1
Bluegill	1	0.05	30.2	2	0.09	1.6	3	0.07	31.8
Total specimens	8	0.38		2	0.09		10	0.23	
Total weight			149.4			1.6			151.0
Total species	4			1			4		
Midland painted turtle	0	0.00	-	1	0.05	-	1	0.02	-
Eastern painted turtle	2	0.10	-	35	1.60	-	37	0.86	-

Trapnet August 2005.xls\impoundment

Source: ERC, Inc.

Appendix Table T-85
Fishes Collected by Trap Net in Shellpot Creek, August 2005

Station	TN-5			TN-6			TN-4		
	Set		Retrieve	Set		Retrieve			
Date	8/11/2005		8/12/2005	8/11/2005		8/12/2005			
Time	1030		0855	0815		0830			
Sampling duration (hrs)		22.5			23.75			46.3	
Water temp. (°C)	27.0		29.7	25.3		27.9			
Dissolved oxygen (mg/l)	2.1		4.8	1.0		1.3			
Specific conductance (umhos)	127		154.0	127		158			
pH	7.2		7.4	7.3		7.4			
Species	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)
Brown bullhead	20	0.89	3546.0	1	0.04	43.4	21	0.45	3589.4
Banded killifish	1	0.04	3.3	5	0.21	18.2	6	0.13	21.5
Mummichog	1	0.04	3.2	1	0.04	4.1	2	0.04	7.3
White perch	2	0.09	113.2	0	0.00	0.0	2	0.04	113.2
Total specimens	24	1.07		7	0.29		31	0.67	
Total weight			3665.7			65.7			3731.4
Total species	4			3			4		
Red-bellied turtle	2	0.09	-	0	0.00	-	2	0.04	-
Eastern painted turtle	2	0.09	-	1	0.04	-	3	0.06	-
Snapping turtle	1	0.04	-	0	0.00	-	1	0.02	-

Trapnet August 2005.xls\Shellpot

Source: ERC, Inc.

Appendix Table T-86
Fishes Collected by Trap Net in the Ditches Adjacent to the AMTRAK Former Fueling Facility, October 2005

Station	TN-3			TN-4			Total		
	Set		Retrieve	Set		Retrieve			
Date	10/19/2005		10/20/2005	10/19/2005		10/20/2005			
Time	1650		1340	1700		1355			
Sampling duration (hrs)		20.8			20.9		41.7		
Water temp. (°C)	18.7		16.5	18.7		16.5			
Dissolved oxygen (mg/l)	10.4		9.1	10.4		9.1			
Specific conductance (umhos)	150		153	150		153			
pH	7.9		7.9	7.9		7.9			
Species	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)
Golden shiner	0	0.00	0.0	16	0.77	735.4	16	0.38	735.4
Banded killifish	1	0.05	3.5	3	0.14	20.3	4	0.10	23.8
Green sunfish	0	0.00	0.0	1	0.05	60.7	1	0.02	60.7
Pumpkinseed	8	0.38	95.2	18	0.86	328.5	26	0.62	423.7
Bluegill	6	0.29	318.6	3	0.14	174.5	9	0.22	493.1
Total specimens	15	0.72		41	1.96		56	1.34	
Total weight			417.3			1319.4			1736.7
Total species	3			5			5		
Eastern painted turtle	1	0.05	-	6	0.29		7	0.17	-

Trapnet Oct. 2005.xls\amtrak ditches

Source: ERC, Inc.

Appendix Table T-87
Fishes Collected by Trap Net in the Conectiv Impoundment, October 2005

Station	TN-1			TN-2			Total		
	Set		Retrieve	Set		Retrieve			
Date	10/17/2005		10/18/2005	10/17/2005		10/18/2005			
Time	1103		1120	1106		1140			
Sampling duration (hrs)		24.3			24.6		48.9		
Water temp. (°C)	12.4		14.2	12.4		15.9			
Dissolved oxygen (mg/l)	3.9		3.6	3.9		4.4			
Specific conductance (umhos)	174		173	174		167			
pH	7.3		7.4	7.3		7.4			
Species	No.	No./hr	Wt. (g)	No.	No./hr	Wt. (g)	No.	No./hr	Wt. (g)
Golden shiner	0	0.00	0.0	3	0.12	47.5	3	0.06	47.5
Brown bullhead	0	0.00	0.0	2	0.08	555.4	2	0.04	555.4
Pumpkinseed	3	0.12	70.1	1	0.04	50.1	4	0.08	120.2
Bluegill	0	0.00	0.0	2	0.08	77.1	2	0.04	77.1
Total specimens	3	0.12		8	0.33		11	0.22	
Total weight			70.1			730.1			800.2
Total species	1			4			4		
Red-bellied turtle	0	0.00	-	1	0.04	-	1	0.02	-
Stinkpot	1	0.04	-	2	0.08	-	3	0.06	-
Midland painted turtle	0	0.00	-	2	0.08	-	2	0.04	-
Eastern painted turtle	6	0.25	-	100	4.07	-	106	2.17	-

Trapnet Oct. 2005.xls\impoundment

Source: ERC, Inc.

Appendix Table T-88
Fishes Collected by Trap Net in Shellpot Creek, October 2005

Station	TN-5			TN-6			Total		
	Set		Retrieve	Set		Retrieve			
Date	10/18/2005		10/19/2005	10/18/2005		10/19/2005			
Time	1800		1535	1630		1500			
Sampling duration (hrs)		21.6			22.5		44.1		
Water temp. (°C)	18.3		20.0	18.2		16.8			
Dissolved oxygen (mg/l)	4.5		6.5	5.0		5.2			
Specific conductance (umhos)	153		133	146		150			
pH	7.6		7.5	7.6		7.6			
Species	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)
Common shiner	20	0.93	167.3	0	0.00	0.0	20	0.45	167.3
Brown bullhead	2	0.09	459.7	0	0.00	0.0	2	0.05	459.7
White perch	7	0.32	96.3	0	0.00	0.0	7	0.16	96.3
Pumpkinseed	1	0.05	57.2	2	0.09	80.2	3	0.07	137.4
Black crappie	2	0.09	96.3	0	0.00	0.0	2	0.05	96.3
Total specimens	32	1.48		2	0.09		34	0.77	
Total weight			876.8			80.2			957.0
Total species	5			1			5		
Red-bellied turtle	2	0.09	-	0	0.00		2	0.05	-
Eastern painted turtle	4	0.19	-	2	0.09		6	0.14	-

Trapnet Oct. 2005.xls\Shellpot

Source: ERC, Inc.

Appendix Table T-89
Fishes Collected by Trap Net in the Ditches Adjacent to the AMTRAK Former Fueling Facility, May 2006

Station	TN-3			TN-4			Total		
	Set		Retrieve	Set		Retrieve			
Date	5/1/2006		5/2/2006	5/1/2006		5/2/2006			
Time	1320		1045	1330		1115			
Sampling duration (hrs)		21.4			21.7		43.1		
Water temp. (°C)	17.3		18.5	17.3		18.5			
Dissolved oxygen (mg/l)	9.6		8.9	9.6		8.9			
Specific conductance (umhos)	153		155	153		155			
pH	7.4		7.9	7.4		7.9			
Species	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)
Brown bullhead	1	0.05	61.4	13	0.60	2518.9	14	0.32	2580.3
Banded killifish	3	0.14	14.4	1	0.05	7.2	4	0.09	21.6
Mummichog	0	0.00	0.0	1	0.05	8.2	1	0.02	8.2
Pumpkinseed	12	0.56	297.3	9	0.41	175.1	21	0.49	472.4
Bluegill	8	0.37	498.1	4	0.18	192.4	12	0.28	690.5
Total specimens	24	1.12		28	1.29		52	1.21	
Total weight			871.2			2901.8			3773.0
Total species	4			0			5		
Red-bellied turtle	3	0.14	-	0	0.00	-	3	0.07	-
Eastern painted turtle	3	0.14	-	1	0.05	-	4	0.09	-
Midland painted turtle	1	0.05	-	0	0.00	-	1	0.02	-
Snapping turtle	2	0.09	-	0	0.00	-	2	0.05	-

Trapnet May 2006.xls\amtrak ditches

Source: ERC, Inc.

Appendix Table T-90
Fishes Collected by Trap Net in the Conectiv Impoundment, May 2006

Station	TN-1			TN-2			Total		
	Set		Retrieve	Set		Retrieve			
Date	5/2/2006		5/3/2006	5/2/2006		5/3/2006			
Time	1405		1330	1410		1350			
Sampling duration (hrs)		23.6			23.7		47.3		
Water temp. (°C)	18.7		20.3	18.2		20.3			
Dissolved oxygen (mg/l)	19.9		15.7	<20		15.7			
Specific conductance (umhos)	155		153	157		153			
pH	8.9		8.7	9.2		8.7			
Species	No.	No./hr	Wt. (g)	No.	No./hr	Wt. (g)	No.	No./hr	Wt. (g)
Golden shiner	2	0.08	72.4	0	0.00	0.0	2	0.04	72.4
Pumpkinseed	1	0.04	67.1	6	0.25	158.2	7	0.15	225.3
Total specimens	3	0.13		6	0.25		9	0.19	
Total weight			139.5			158.2			297.7
Total species	2			1			2		
Stinkpot	2	0.08	-	1	0.04	-	3	0.06	-
Eastern painted turtle	5	0.21	-	2	0.08	-	7	0.15	-

Trapnet May 2006.xls\impoundment

Source: ERC, Inc.

Appendix Table T-91
Fishes Collected by Trap Net in Shellpot Creek, May 2006

Station	TN-5			TN-6			Total		
Date	Set 5/4/2006		Retrieve 5/5/2006	Set 5/4/2006		Retrieve 5/5/2006			
Time	1135		1015	1120		0950			
Sampling duration (hrs)		22.7			22.5			45.2	
Water temp. (°C)	18.3		18.7	16.4		18.0			
Dissolved oxygen (mg/l)	4.1		3.8	3.7		3.2			
Specific conductance (umhos)	150		145	152		148			
pH	7.3		6.7	7.3		6.9			
Species	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)
Brown bullhead	1	0.04	450.0	0	0.00	0.0	1	0.02	450.0
Pumpkinseed	3	0.13	105.8	0	0.00	0.0	3	0.07	105.8
Total specimens	4	0.18		0	0.00		4	0.09	
Total weight			555.8			0.0			555.8
Total species	2			0			2		
Red-bellied turtle	0	0.00	-	2	0.09	-	2	0.04	-
Eastern painted turtle	0	0.00	-	1	0.04	-	1	0.02	-
Snapping turtle	0	0.00	-	1	0.04	-	1	0.02	-
Stinkpot	0	0.00	-	1	0.04	-	1	0.02	-

Trapnet May 2006.xls\Shellpot

Source: ERC, Inc.

Appendix Table T-92
Fishes Collected by Trap Net in the Ditches Adjacent to the AMTRAK Former Fueling Facility, August 2006

Station	TN-3			TN-4			Total		
	Set		Retrieve	Set		Retrieve			
Date	8/10/2006		8/11/2006	8/10/2006		8/11/2006			
Time	1350		1020	1355		1035			
Sampling duration (hrs)		20.5			20.7		41.2		
Water temp. (°C)	28.2		24.9	28.2		24.9			
Dissolved oxygen (mg/l)	8.6		6.3	8.6		6.3			
Specific conductance (umhos)	143		146	143		146			
pH	8.1		7.9	8.1		7.9			
Species	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)
Golden shiner	0	0.00	0.0	9	0.43	367.1	9	0.22	367.1
Brown bullhead	0	0.00	0.0	4	0.19	153.9	4	0.10	153.9
Pumpkinseed	1	0.05	1.7	9	0.43	224.2	10	0.24	225.9
Bluegill	3	0.15	45.9	3	0.14	140.2	6	0.15	186.1
Total specimens	4	0.20		25	1.21		29	0.70	
Total weight			47.6			885.4			933.0
Total species	2			4			4		
Red-bellied turtle	1	0.05	-	0	0.00	-	1	0.02	-
Eastern painted turtle	2	0.10	-	2	0.10	-	4	0.10	-
Snapping turtle	1	0.05	-	0	0.00	-	1	0.02	-

Trapnet August 2006.xls\amtrak ditches

Source: ERC, Inc.

Appendix Table T-93
Fishes Collected by Trap Net in the Conectiv Impoundment, August 2006

Station	TN-1			TN-2			Total		
	Set		Retrieve	Set		Retrieve			
Date	8/5/2006		8/6/2006	8/5/2006		8/6/2006			
Time	1105		1020	1045		1005			
Sampling duration (hrs)		23.3			23.3		46.6		
Water temp. (°C)	24.7		23.6	25.5		23.6			
Dissolved oxygen (mg/l)	0.3		0.8	4.2		0.8			
Specific conductance (umhos)	174		159	162		159			
pH	7.4		7.0	7.6		7.0			
Species	No.	No./hr	Wt. (g)	No.	No./hr	Wt. (g)	No.	No./hr	Wt. (g)
No Fish	0	0.00	0.0	0	0.00	0.0	0	0.00	0.0
Total specimens	0	0.00		0	0.00		0	0.00	
Total weight			0.0			0.0			0.0
Total species	0			0			0		
Midland painted turtle	0	0.00	-	2	0.09	-	2	0.04	-
Eastern painted turtle	1	0.04	-	2	0.09	-	2	0.04	-

Trapnet August 2006.xls\impoundment

Source: ERC, Inc.

Appendix Table T-94
Fishes Collected by Trap Net in Shellpot Creek, August 2006

Station	TN-5			TN-6			Total		
	Set		Retrieve	Set		Retrieve			
Date	8/9/2006		8/10/2006	8/9/2006		8/10/2006			
Time	1605		1300	1445		1235			
Sampling duration (hrs)		20.9			21.8			42.7	
Water temp. (°C)	31.3		30.0	30.7		27.6			
Dissolved oxygen (mg/l)	6.3		5.8	6.3		4.4			
Specific conductance (umhos)	132		142	132		145			
pH	7.6		7.4	7.4		7.2			
Species	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)	No.	No./hr.	Wt. (g)
Golden shiner	6	0.29	148.2	0	0.00	0.0	6	0.14	148.2
Banded killifish	1	0.05	3.2	6	0.28	29.3	7	0.16	32.5
Striped bass	1	0.05	93.0	0	0.00	0.0	1	0.02	93.0
Pumpkinseed	8	0.38	242.7	1	0.05	45.8	9	0.21	288.5
Bluegill	3	0.14	93.4	1	0.05	7.4	4	0.09	100.8
Smallmouth bass	2	0.10	107.4	0	0.00	0.0	2	0.05	107.4
Total specimens	21	1.00		8	0.37		29	0.68	
Total weight			687.9			82.5			770.4
Total species	6			3			6		
Blue crab	1	0.05	-	0	0.00	-	1	0.02	-
Red-bellied turtle	1	0.05	-	1	0.05	-	2	0.05	-
Midland painted turtle	0	0.00	-	1	0.05	-	1	0.02	-
Eastern painted turtle	2	0.10	-	0	0.00	-	2	0.05	-

Trapnet August 2006.xls\Shellpot

Source: ERC, Inc.

Appendix U

Ecological Assessment Data Graphs

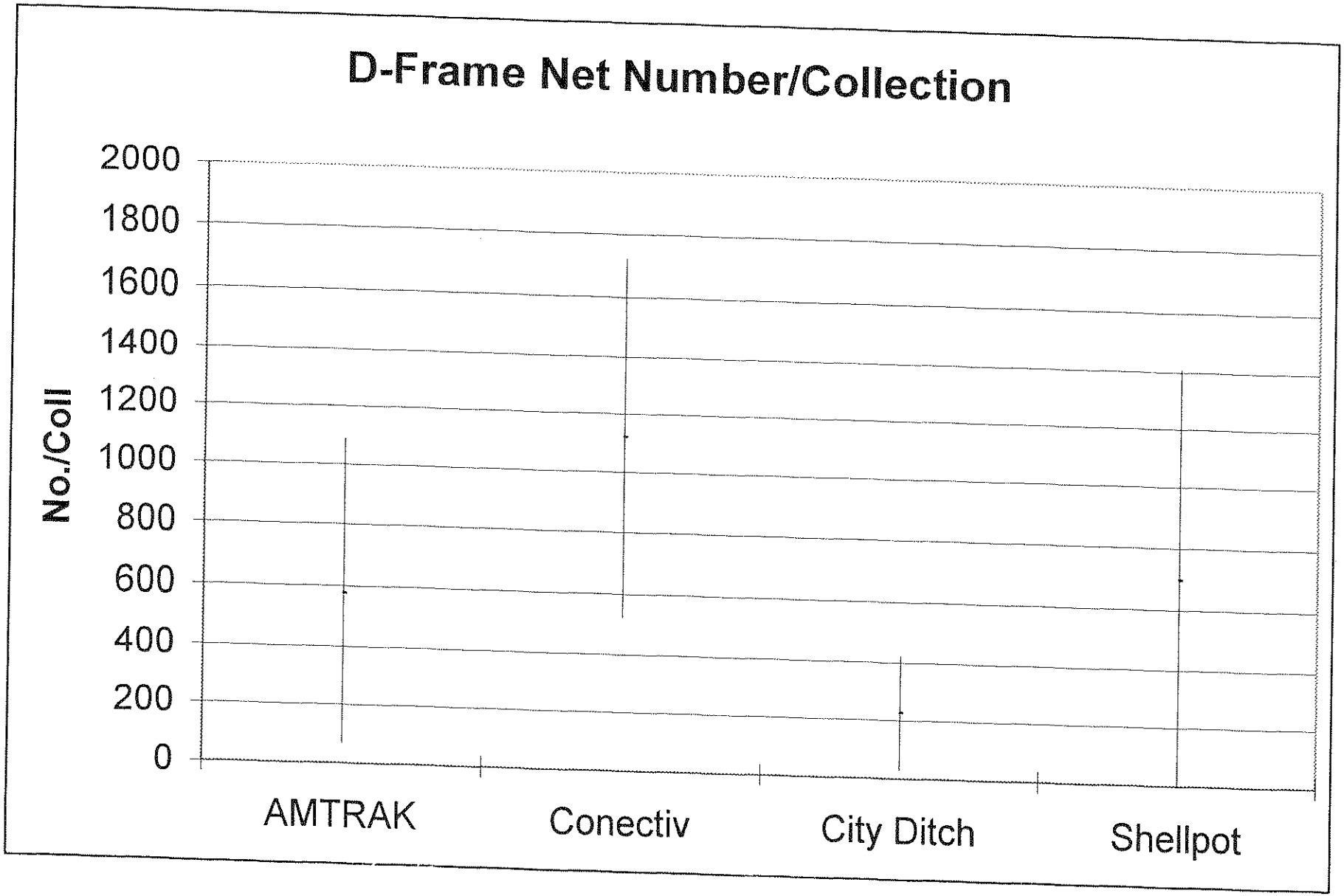


Figure A
Mean D-Frame Net Number Per Collection at the Phase II RI Locations, October 2004 through August 2006
(vertical bars indicate upper and lower 95% confidence limits of the mean)

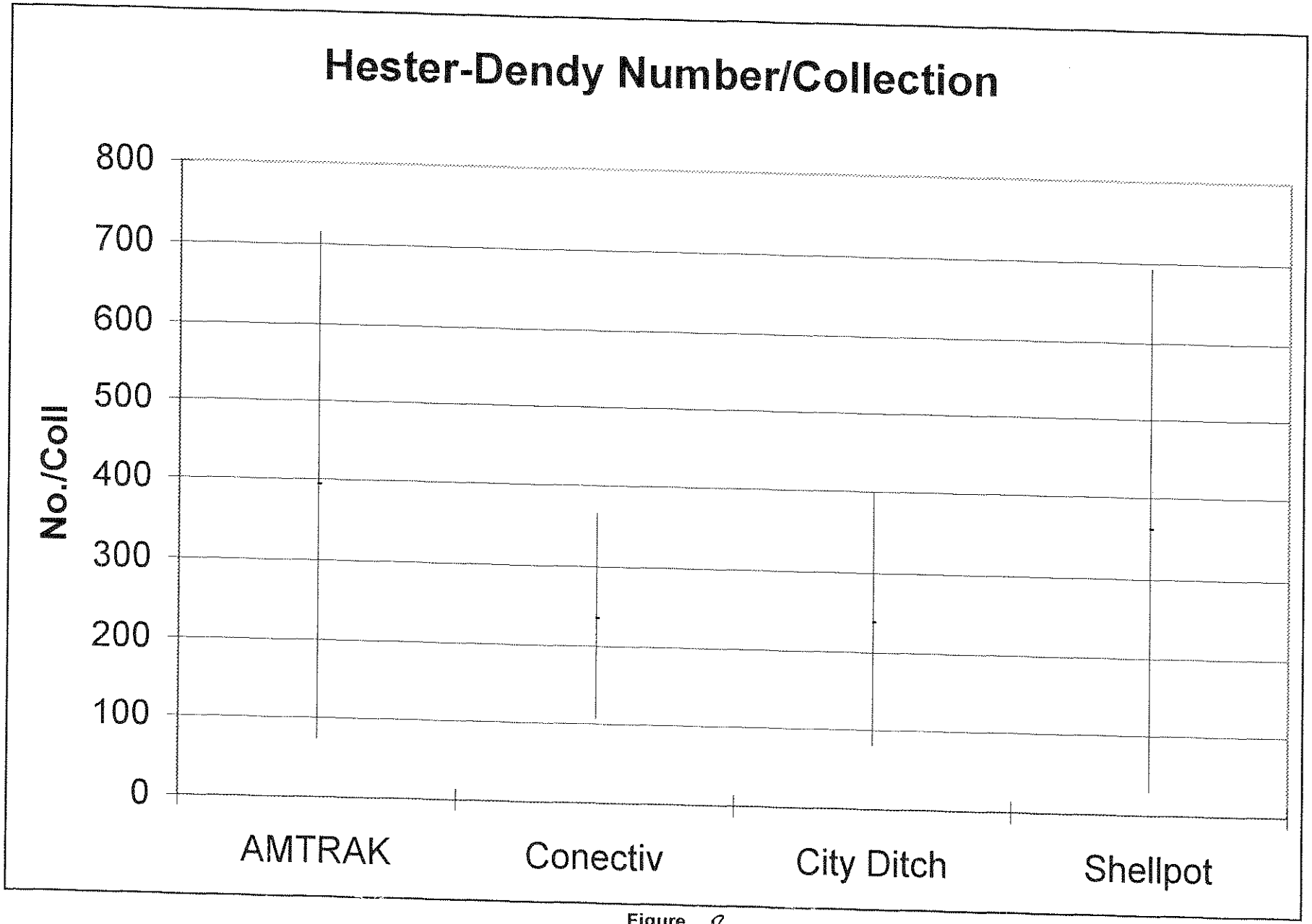


Figure 13
Mean Hester-Dendy Number Per Collection at the Phase II RI Locations, October 2004 through August 2006
(vertical bars indicate upper and lower 95% confidence limits of the mean)

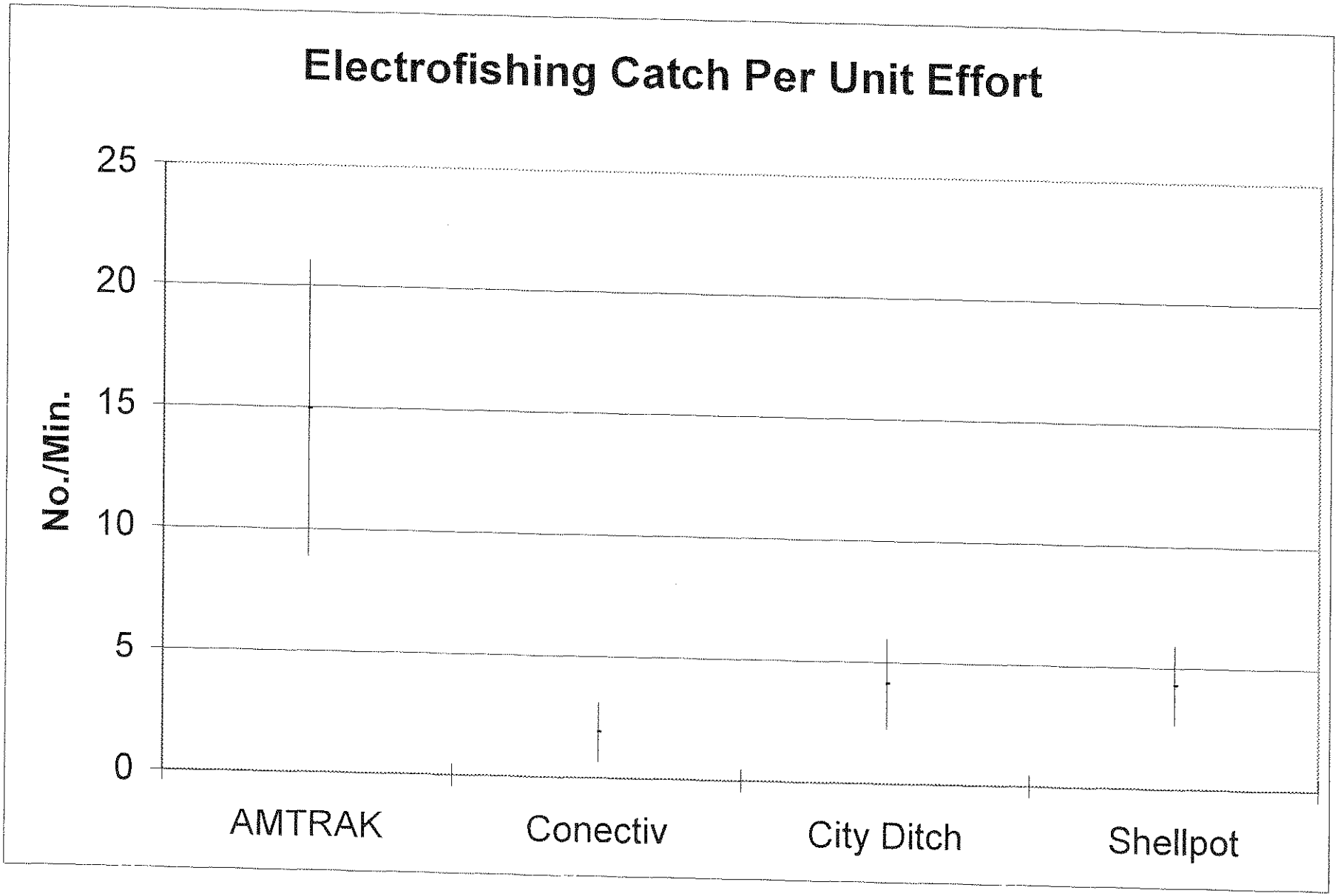


Figure C

Mean Electrofishing Catch Per Unit Effort at the Phase II RI Locations, October 2004 through August 2006
(vertical bars indicates upper and lower 95% confidence limits of the mean)

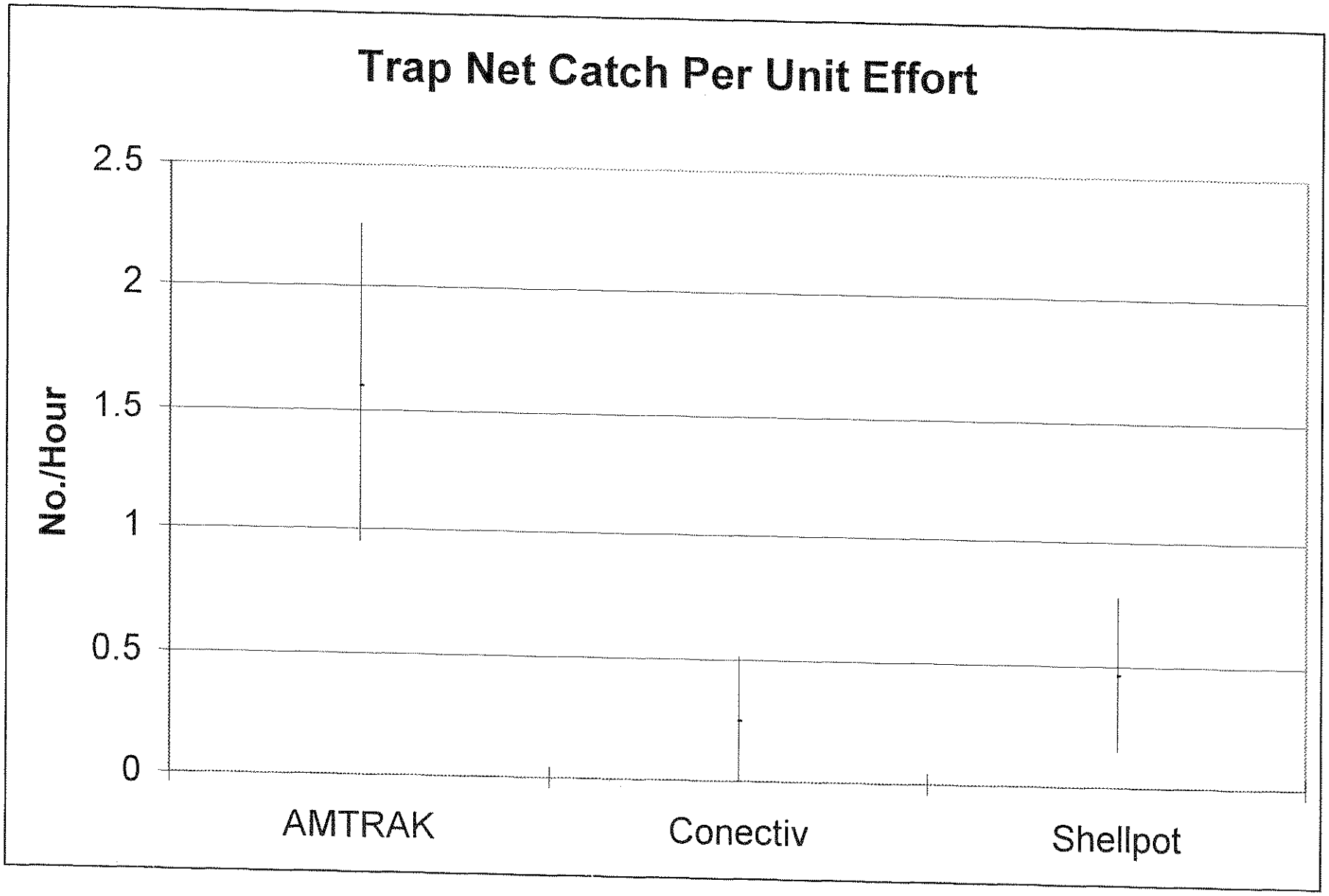


Figure D
Mean Trap Netting Catch Per Unit Effort at the Phase II RI Locations, October 2004 through August 2006
(vertical bars indicate upper and lower 95% confidence limits of the mean)

Appendix V

Western Drainage Ditch Sediment Treatability Testing Status Report

the IT group

IT Corporation
A Member of The IT Group

DRAFT
5-30-01

M E M O R A N D U M

TO: Frank Aceto Date: 5/30/2001

FROM: Ernie Stine, Greg Bennett

SUBJECT: **AMTRAK TREATABILITY STUDY UPDATE, Project No.: 13030177**

On Tuesday May 8, two 5-gallon buckets of AMTRAK materials were received at IT Technology Development Laboratory in Knoxville TN and assigned unique sample numbers, TDL 2967 and TDL 2968. The samples were sent by Sergio Morescalchi from the IT Corporation West Chester, PA office. The buckets contained black organic smelling liquid on top of sediment, leaves, rocks, and twigs. The material in the bucket was homogenized with a four-inch twin turbine blade paint mixer attached to a drill. The physical properties measured for these samples are listed in Table 1. Analysis of the results in Table 1 indicates that the two received samples are similar. Since the materials in the buckets appear to be same, they were not homogenized. Only sample TDL 2967 was used in all solidification experiments.

TABLE 1: PHYSICAL CHARACTERIZATION

Sample	Percent Solid [1]	Density (pcf)	pH
TDL 2967	20.3	67.72	6.2
TDL 2968	19.6	68.22	6.2

[1]Percent Solids measured by drying approximately 150 grams in an oven at 105 °C.

Objectives and Reagents Selection

There are three objectives for this study.

- Objective 1.: Determine the dosage of drying agents for the material to meet the paint filter test so that it can be shipped to a disposal site. A material was considered successful if
    - It passed the paint filter (P-F) test within 16 hours of mixing with the reagent,

- was not sticky to the extent that it would significantly adhere to excavation equipment or provide difficulty in field handling,
- would not release liquid when mildly shaken or
- express liquid when pressure was applied with the Soiltest® pocket penetrometer.

- Objective 2.: Determine the dosage of reagent to achieve 10 to 20 psi unconfined compressive strength such that future geotextile materials capping can be accomplished. The strength may be derived from compaction effort, pozzolonic/cementitious reactions, or a combination of both. The strength was measured with a Soiltest Pocket Penetrometer.

- Objective 3.: What formulation will produce a material that will minimize organic compound leaching, e.g. pg/l of organic compounds in the TCLP. Due to the schedule, leaching studies can not be performed. Formulations were considered promising if
  - the treated material set up between 4 and 24 hours,
  - developed greater than 300 psi unconfined compressive strength (UCS by ASTM D-2166), and
  - did not visibly leach oil from a 7-day cured monolithic material soak in water.

  Four formulations were made. UCS and water immersion were measured at seven days. Additional molds for each formulation were made to test the TCLP leachability and permeability at later date, if so desired.

Various reagents were added to TDL 2967 to test their ability to increase the sediment solid content and to create a mixture that meets the performance objectives outlined above. In Tables 2 through 6 the following abbreviation are used to for reagent designations. After the reagent name, the manufacture of the reagent tested and a ballpark price range for each reagent delivered is listed.

- QL: Powder Quicklime (Centre Lime and Stone, Pleasant Gap, PA, $70 - $100/ton)
- LKD: Lime Kiln Dust (Bellefonte Lime Co, Belefonte, PA, $25 - $50/ton)
- PC: Portland Cement Type 1 (South Down, Knoxville, TN, $70 - $100/ton)
- CKD: Cement Kiln Dust (Loizeaux, Milford, CT, $ 25 - $50/ton)
- FAC: Fly Ash Class C (Bayshore, $25 - $50/ton)
- FAF: Fly Ash Class F (Trans Ash Cincinnati, OH, $15 - $35/ton)
- Carbon (Norit Americas Inc., Pryor OK, $0.90 to $1.00/lb)
- Bentonite (Baroid, Houston Texas, The price is highly dependent on the shipping costs.)

Addition of all solid reagents will increase the solids content of the mixture. For example if the sediment had an initial solids content of 20 percent and 100 lbs of a non-reactive sand was added to 100 grams of sediment, the final product would have a solids content of 60 percent. Reagents with free lime (i.e., PC, CKD, FAC, and LKD) will also increase the solids content by the reaction of the free lime with the water in the sediment. QL is calcium oxide and releases significant amounts of heat when mixed with water. LKD is a by-product dust from the manufacture of QL. It contains up to about 50 percent free calcium oxide. LKD is typically a fine powder and it also releases a significant amount of heat when added to water. In this project, the temperature rise was delayed for 30 to 45 minutes after mixing with QL or LKD. PC was investigated to increase the strength by its cementitious reactions. CKD is a by-product from the manufacture of PC. CKD contains variable amounts of free lime and some of the strength formation reagents of PC. FAC is a flyash that contains greater than 10 percent free lime and when mixed with water, in the correct proportions, it hardens to moderate strengths. The final strength of the cured hydrated PC is greater than those from similarly cured FAC or CKD products. FAF is a flyash that contains less than 10 percent free lime and it does not setup when mixed with water. Addition of lime containing materials (e.g., QL or LKD) to FAF increases the free lime content of the reagent mixture. This mixture is self-setting when mixed with water and develops strength, as does FAC. In Table 4, LKD and FAF were mixed at 1:1 weight ratios to test the usefulness of the mixture.

Objective 1: Paint Filter Formulations

Various drying reagents were added to TDL 2967 to increase the solids content such that the treated material would pass the Paint Filter Tests within 16 hours of mixing with the reagents, be workable with typical earth working equipment or pugmills, and be transportable in common trucks used for transporting treated sediments. Table 2 lists the formulations, percent solids and physical descriptions for each formulation.

For all reagents investigated except quicklime, the percent solid content of the treated material had to exceed approximately 60 percent in order for the material not to be sticky, pass the Paint Filter Test, and not express water when light pressure was applied within 16 hours cure time. Formulations which are sticky are difficult to mix and maneuver in the field. If the formulations express water when light pressure is applied, they have a reasonable probability of releasing water during transport in the truck to the landfill.

Table 2: Formulations to Meet Pass Paint Filter Test at 16 hours							
Additive	Mix Ratio	% Solids	Density (pcf)	Does the Formulation Pass the Performance Criteria			Description
				P-F	Sticky	Release Liquid	
QL	0.20	39.9	78.0	No	N/A	N/A	Moist-Pasty at 6 days.
QL	0.25	43.5	73.0	Yes	No	N/A	Pass P-F at 1 day, moist and sticky at 6 days
QL	0.30	49.6	79.9	Yes	Yes @ 6 day-	Yes	Pass P-F at 1 day. Moderately sticky playdough-like at 6 days
PC	0.50	49.7	84.3	No	N/A	No	Very wet at 1 day, Damp with low strength at 6 days
PC	0.60	55.1	69.3	No @ 1 Day, Yes @ 3 Days	Yes	Yes	Pass P-F @ 3 days. Crust on top express liquid w/ pressure at 1 day. Develops strength at 6 days
PC	0.70	54.6	77.4	No @ 1 Day, Yes @ 2 Days	Yes	Yes	Pass P-F @ 2 days. Soft, Glistens w/ light pressure @ 1 day, Develops strength at 6 days
CKD	0.60	54.5	90.5	No	No	No	Mushy, barely pass P-F @ 6 days, sticky, damp
CKD	0.70	57.2	92.4	Yes	No	N/A	Mushy, pass P-F. less sticky than 60% CKD @ 6 days
CKD	0.80	59.9	94.3	Yes	Yes	Yes @ 6 days	Mushy, pass P-F. Slightly sticky playdough-like at 6 days.
FAC	0.70	56.7	87.4	No	N/A	N/A	Bleed overnight
FAC	0.80	57.9	89.3	No	N/A	N/A	Bleed overnight and at 6 days.
FAC	0.90	59.6	91.8	No	N/A	N/A	Bleed overnight and at 6 days.
FAF	0.80	58.5	89.3	No	N/A	N/A	Bleed overnight and at 6 days.
FAF	0.80	57.5	88.7	No	N/A	N/A	Bleed overnight and at 6 days.
FAF	1.00	62.8	92.4	No	N/A	N/A	Bleed overnight and at 6 days.
LKD	0.50	53.6	80.5	No	N/A	N/A	Mushy at 1 day. Pass paint filter at 6 days, thick non-sticky paste
LKD	0.60	56.8	87.4	No	N/A	N/A	Mushy, express liquid w/pressure at 1 day, Pass P-F at 6 days, damp soil –like
LKD	0.70	60.9	86.8	Yes	Yes	Yes	Pass P-F, near soil like, @ 6 days recompactable
The mix ratio is the reagent to sediment (w/w) ratio N/A: Not analyzed							

The approximate reagent cost for the formulations listed in Table 2 are shown in Table 3. The price is based on one cubic yard of sediment and the midpoint reagent price. The reagent price/cy that is closest to the recommended formulation is highlighted in Table 3. The actual cost to implement is also affected by the total reagent dosage. As a general rule, the higher the reagent dosage, the higher the labor costs to mix, the schedule is lengthened, and the product volume increase is larger.

Table 3. Formulations to Pass Paint Filter		
Additive	Mix Ratio	Price/cy
QL	0.20	15.60
QL	0.30	23.40
QL	0.25	19.50
PC	0.50	39.00
PC	0.60	46.80
PC	0.70	54.60
CKD	0.60	20.65
CKD	0.70	24.09
CKD	0.80	27.53
FAC	0.70	24.09
FAC	0.80	27.53
FAC	0.90	30.97
FAF	0.80	18.35
FAF	0.80	18.35
FAF	1.00	22.94
LKD	0.50	17.20
LKD	0.60	20.65
LKD	0.70	24.09

Recommendations

The recommended formulations are the minimum reagent dosages to meet the performance criteria. The material from the Amtrak site can be solidified to pass the Paint Filter Test after an overnight cure by adding:

0.3 mix ratio quicklime,
0.6 mix ratio Portland cement,
0.75 cement kiln dust, or
0.65 lime kiln dust.

A 0.3 mix ratio for QL was selected since it passes the P-F within a few hours after mixing. There was a significant amount of heat released approximately 30 to 45 minutes after mixing. This will have to be taken into account during field operations. Based on previous experience, treatment during full-scale operations with QL and LKD will produce a slightly higher solid content product than was achieved in the small laboratory-scale experiment. A formulation that was slightly sticky in the laboratory was therefore selected as the recommended QL formulation.

The 0.6 mix ratio for PC does not meet the P-F at 16 hours; however, it does after three days cure. At six days, the material has set up to approximately 20 psi.

CKD recommendation is an interpolation between the 0.7 and 0.8 mix ratios in Table 2. A mix ratio of 0.70 was a little too sticky. The 0.8 mix ratio was slightly sticky but still workable. The mix ratio was selected as a compromise between the performance criteria and the cost of the formulation.

The 0.60 LKD mix ratio failed the performance criteria; however, the 0.70 mix ratio well exceeded it. A balanced formulation of 0.65 mix ratio was selected for the recommended formulation.

Additional formulations beyond those in Table 2 were not made with FAF or FAC since the mix ratio was already $\geq$ 0.90. If there was more free lime content in the flyash, then formulations could be made to meet the performance criteria with lower mix ratios than those required by the currently tested flyash materials. In addition, if there is a source of higher calcium oxide content flyashes near the site, then additional experiments can be conducted to determine if three flyashes are acceptable. A few formulations in Table 4 used a 1:1 (w/w) LKD/FA reagent dry blend to solidify the site sediment. In these formulations, the free lime content was increased by mixing a high lime material with the flyash. The mix ratio of 1.33 for a 1:1 LKD/FAF (see Table 4) definitely does meet all of the Objective 1 (paint filter) performance criteria. This mixture had a LKD dosage of 66.5 percent which is close to the minimum recommended LKD dosage to meet the paint filter criteria. Based on these results, a lower dose of this 1:1 LKD/FAF blend could be used to treat the site sediment. If desired additional experiments could be performed to determine this dosage. By interpolation, the expected dosage of the 1:1 LKD/FAF blend will be between 1.0 to 1.33 mix ratio.

Objective 2. Compactable or Low Strength Formulations

Various drying reagents were added to TDL 2967 to increase the solids content such that treated material would have the physical appearance similar to soil and be compactable or enough reagent is added for the pozzolonic/cementitious reactions to set up the material and achieve and UCS of at least 20 psi. All UCS results are estimated from values determined with a Soiltest Pocket Penetrometer. The Pocket Penetrometer measures the penetration resistance in tons per square foot (tsf). For screening experiments, IT usually divides the pocket penetrometer results by 1.5 to 2.0 to estimate the actual ASTM D-2166 UCS value. For this project, this equates to a UCS, as measured with a pocket penetrometer, passing values of 2.25 tsf. Many of the non-cement based formulations were crumbled after 5 to 6 days cure and recompacted to determine if the percent solids content was sufficient to be capable of being compacted to meet the desired UCS criterion. The cement formulation was not recompacted since its strength at five (5) days well exceeded the 2.25 tsf criterion and since PC

provides much of its own strength to the formulation. Table 4 lists the formulations, percent solids and physical descriptions for each formulation.

Table 4: Soil Like Formulations to Gain Strength or be Compacted

Additive	Mix Ratio	% Solids	Density (pcf)	Pocket Penetrometer (tons/ft2)			Description
				Day 1	Day 5	Recom-pacted	
QL	0.40	55.0	83.0	<0.25	0.6	<0.25	Wet and pasty @ 6 day
QL	0.50	62.2	61.8	3.75	3.25	2.5	Damp soil like
QL	0.55	65.5	64.3	3.75	>4.5	3.25	Too dry for good compaction
QL	0.70	73.1	63.1	3.4	3.75	Dusty	Dried to powder
PC	1.00	65.1	98.0	3.75	>4.5	-	Not soil like when mixed, thick paste
CKD	1.00	65.1	103.8	<0.25	-	<0.25	Pasty @ mixing, immediate slight bleed, too wet to get recompaction strength
CKD	1.10	67.3	96.0	<0.25	-	<0.25	Pasty @ mixing, immediate slight bleed (less than 100% CKD), too wet to get recompaction strength
CKD	1.35	70.4	101.5	1.5	-	0.25-0.5	Pasty @ mixing,
CKD	1.50	72.5	111.1	2.25	>4.5	2	Damp soil like compactable, slightly damp @ 6 days, recompactable, sticks to ram
FA/CKD (1:1)	1.33	70.2	107.4	0.75	2.8	-	Damp soil like compactable
FA/CKD (1:1)	1.50	70.7	101.1	0.25	2.75	-	Damp soil like compactable, slightly mushy as gets compacted
LKD	0.90	67.0	98.1	2.0	-	<0.25	Like play dough @ mixing slight bleed @ mixing, too wet to get recompaction strength
LKD	1.00	69.1	96.8	2.25	-	1.0	Like play dough @ mixing
LKD	1.20	71.7	97.3	>4.5	-	3.25	Damp soil @ mixing
LKD	1.50	77.6	87.4	>4.5	>4.5	>4.5	After 90 minutes very soil like a little on the dry side, recompactable
LKD	1.84	81.9	108.0	>4.5	>4.5	3-4	Wet side of soil like at mixing got almost too dry to compact after heated up, recompactable
LKD	2.00	83.9	88.7	2.25	2.25	-	Soil like at mixing gets too dry with heat evolution
LKD/FAF (1:1)	1.33	71.1	90.5	3.0	>4.5	-	Damp soil like compactable, mushy as gets compacted
LKD/FAF (1:1)	1.45	72.8	94.9	>4.5	>4.5	-	Damp soil like compactable
PC/FAF (1:1)	1.67	74.3	108.0	>4.5	>4.5	-	Like PC mix

Bolded values denote Pocket Penetrometer values greater than 2.0 tsf
The mix ratio is the reagent to sediment (w/w) ratio.

The approximate reagent cost for the formulations listed in Table 4 are shown in Table 5. The price is based on one cubic yard of sediment and the midpoint reagent price. The reagent price/cy that is closest to the recommended formulation is highlighted in Table 5. The price for PC is found in Table 3.

Table 5. Soil Like Formulations to Gain Strength or be Compacted

Additive	Mix Ratio	Price/cy
QL	0.40	31.20
QL	0.50	39.00
QL	0.55	42.90
QL	0.70	54.60
PC	1.00	78.00
CKD	1.00	34.41
CKD	1.10	37.85
CKD	1.35	46.45
CKD	1.50	51.61
FA/CKD (1:1)	1.33	38.14
FA/CKD (1:1)	1.50	43.01
LKD	0.90	30.97
LKD	1.00	34.41
LKD	1.20	41.29
LKD	1.50	51.61
LKD	1.84	63.31
LKD	2.00	68.82
LKD/FA (1:1)	1.33	38.14
LKD/FA (1:1)	1.45	41.58
PC/FA (1:1)	1.67	84.28

Recommendations

The following formulations can be compacted or will have pozzolonic/cementious reactions to produce solidified material that will have a UCS of at least 20 psi:

0.5 mix ratio quicklime,
0.65 mix ratio Portland cement (see Table 2 and 4),
1.42 mix ratio cement kiln dust.
1.1 mix ratio lime kiln dust

The recommended QL formulation of 0.5 mix ratio met the UCS criterion before and after re-compaction. This formulation was thus selected as the recommended QL formulation.

The recommended PC formulation is derived from comparing the results from Tables 2 and 4. In Table 4, the 1.0 mix ratio at 5 days cure had strengths well in excess of 20 psi. Results in Table 2 state that the 0.6 and 0.7 PC mix ratio gained strength by days 5 and 6. These latter two materials were reasonably hard to break up by hand. The recommended formulation is therefore between 0.6 and 0.7 mix ratio. It is likely that a 0.6 PC mix ratio would achieve the 20 psi before 28 days cure time. Additional experiments will need to be conducted to optimize the PC reagent dosage, if desired.

CKD recommended mix ratio is an interpolated value between two values in Table 4. The 1.5 mix ratio met the UCS criterion at one day and far exceeded it at five days. The 1.35 mix ratio material was pasty material which gained strength of 1.5 tsf at 5 days, but did not meet the desired 2.25 tsf. The formulations may continue to gain strength with time though. Since the 1.5 mix ratio exceeded the goals and the 1.35 mix ratio was pasty, a recommended formulation was selected with a value half way in between the two values.

Like CKD, the recommended formulations for LKD is between two investigated formulations in Table 4. Both the 1.0 and 1.2 mix ratios met the UCS goal at one day; however, the 1.0 mix ratio formulation did not achieve the UCS goal during recompaction. A recommended formulations was therefore selected half way in between the two tested formulations.

Due to the ineffective performance of FAC and FAF meeting the Objective 1 goals, they were not investigated by themselves in this set of experiments. Several of the FAF formulations that were blended with CKD or LKD could meet the UCS goal; however, the extra reagent cost of blended reagents or the extra labor and schedule impacts blending the two reagents in the field outweighed any benefit these formulations may have.

Objective 3: Low Leachability Formulations

Formulations were made by varying the Portland Type 1 cement (PC) content. PC was added to form a strong dense material with reasonably low permeability. Other reagents were added to lower the organic compound leachability and make the cured material even less permeable, i.e., carbon and bentonite, respectively. Four molds were made for each formulation. The UCS was determined by ASTM D-2166 on May 17, 2001 on the lowest PC dosage formulation. The UCS was > 327 psi. Since this formulation met and exceeded the UCS criterion, the UCS was not determined on the other formulations with high PC loadings. Another sample of the same formulation was de-molded and submerged into water on the same day to observe for sample degradation and for significant amounts of an organic film forming on top of water. There was no organic film or sample degradation observed after two weeks of immersion in water. There are sealed molded samples for all formulations being

stored in the laboratory for permeability and TCLP analyses after several months of curing, if so desired. These low leachability, low permeability formations are listed in Table 6. From comparisons to physical properties of these formulations with the other two sets of formulations it is apparent that addition of carbon and bentonite assist PC in setting up at lower PC dosages.

TABLE 6. LOW LEACHABILITY, LOW PERMEABILITY FORMULATIONS

Reagent	Mix Ratio	Reagent	Mix Ratio	Reagent	Mix Ratio	UCS @ 7 Days (psi)
PC	0.70	Bentonite	0.02	Carbon	0.02	>327
PC	0.80	Bentonite	0.02	Carbon	0.02	-
PC	0.90	Bentonite	0.02	Carbon	0.02	-
PC	1.00	Bentonite	0.02	Carbon	0.02	-

Recommendations

The material from the Amtrak site can be solidified into a very hard solid that should have low permeability and low leaching after 28 days of cure using the following formulation:

0.6 mix ratio of Portland cement with 0.02 mix ratio of Bentonite clay,
and 0.02 mix ratio activated carbon

This formulation had an unconfined compressive strength greater than 327 psi at 7 days of cure. Molds were prepared for TCLP and permeability testing at 28 days of cure, and can be tested at the client's request.

Appendix W

Treatability Testing Report for Sediment Capping

TREATABILITY TESTING REPORT FOR SEDIMENT CAPPING

AMTRAK

June 9, 2006

Prepared by:

SECOR International, Inc.

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1-1
1.1 Site Description 1-1
1.2 Waste Stream Description 1-1
1.3 Treatment Technology Description 1-2
1.3.1 Stabilization/Alkaline Dehalogenation 1-2
1.3.2 In-Situ Capping 1-3
1.4 Previous Site Treatability Studies 1-4
2.0 TREATABILITY STUDY APPROACH 2-1
2.1 Test Objectives and Rationale 2-1
2.2 Experimental Design and Procedures 2-2
2.2.1 Percent Solids 2-2
2.2.2 Density 2-2
2.2.3 pH/ORP 2-3
2.2.4 Heat Capacity 2-3
2.2.5 PCB and TOC Concentration 2-4
2.2.6 Stabilization Testing 2-4
2.2.7 Evaluation of Moisture/Density Relationship for Treated Sediment 2-5
2.2.8 Evaluation of Alkaline Dehalogenation 2-5
2.2.9 Column Leach Tests 2-6
2.2.10 Simulated Stream Flow Testing 2-7
2.3 Equipment and Materials 2-8
3.0 RESULTS AND DISCUSSION 3-1
3.1 Waste Stream Characteristics 3-1
3.2 Analysis of Treatability Study Data 3-1
3.2.1 Percent Solids 3-1
3.2.2 Density 3-1
3.2.3 pH/ORP 3-1
3.2.4 Heat Capacity 3-1
3.2.5 PCB and TOC Concentration 3-2
3.2.6 Stabilization Testing 3-2
3.2.7 Evaluation of Moisture/Density Relationship for Treated Sediment 3-3
3.2.8 Evaluation of Alkaline Dehalogenation 3-3
3.2.9 Column Leach Tests 3-4
3.2.10 Calculation of the Organic Carbon Partitioning Coefficient 3-5
3.2.11 Simulated Stream Flow Testing 3-5
3.3 Comparison to Test Objectives 3-7
4.0 CONCLUSIONS AND RECOMMENDATIONS 4-1

EXECUTIVE SUMMARY

Treatability testing was performed on sediment samples collected from Eastern Drainage Ditch and confluence area in the Amtrak Former Fueling Facility located in Wilmington, Delaware for evaluation of stabilization and capping remedial options. The treatability testing showed that stabilization with lime provided no actual destructive treatment of PCBs, but that stabilization was able to reduce PCB leachability. However, the testing also showed that remedial capping would provide similar benefits to stabilization at potentially much lower costs.

There are three primary goals for a sediment capping program. One goal is to reduce the flux of dissolved contaminants into the water column from the sediment. A second goal is to physically isolate the contaminated sediments from the benthic environment. A third goal is to prevent resuspension and transport of impacted sediments by erosion. The results of the treatability testing indicated that all three of these goals can be achieved by installation of a remedial cap consisting of bentonite-coated gravel and sand.

Flume tests and column tests show that PCBs at the Amtrak facility are highly insoluble and that the majority of PCBs enter the water body by the erosive forces of water. Testing shows that the PCBs have a high organic carbon partitioning coefficient, and that the high organic content of the sediment (TOC = 16%) tends to keep the PCBs in the adsorbed state. The maximum solubility for PCBs in non-turbid water observed during testing was 0.1 ug/l. However, when water was transferred across sediment in a flume at a velocity of 2 ft/min, the concentration of PCBs in the water increased to 8 ug/l in the turbid water. Higher concentrations of suspended solids were observed in the water at flume velocities greater than 2 ft/min, thus confirming that fine, organic-rich particles were the primary transporter of PCBs into the water body.

Regular bentonite materials were tested as a capping material but were found to swell too much to be useful since they were easily scoured due to their gelatinous nature. However, when bentonite was mixed with other materials, it produced a low-permeability capping material that was resistant to erosion and was capable of supporting a protective sand covering. In particular, bentonite-coated gravel sold under the tradename of AquaBlok® performed very well at resisting erosion while also supporting an overlying sand layer. Testing of the bentonite/sand cap showed that it could resist erosion and reduce PCB transport in both dissolved and adsorbed states. With the cap in place, the moving water in the flume appeared clear at water velocities up to 10 ft/min. Tests showed that the suspended solids in water were reduced significantly by capping, and that the PCB concentrations were reduced 80-fold. Based on the results of the treatability study, a pilot capping program is recommended to evaluate the potential for implementing full-scale capping at the site.

1.0 INTRODUCTION

1.1 Site Description

The AMTRAK Wilmington Shops consist of the Maintenance Facility and Former Fueling Facility. The Former Fueling Facility encompasses approximately 20 acres. The Former Fueling Facility is located south of the former round house, bounded to the east by an unnamed surface water drainage feature (to be referred to as the Eastern Drainage Ditch), and to the west by a drainage ditch (to be referred to as the Western Drainage Ditch), which separates the AMTRAK Wilmington Shops from the former Atlas Sanitation property. Both of the drainage ditches flow to the south and empty into a confluence area. The Former Fueling Facility is bounded to the south by the confluence of the two surface water features and the 12th Street Dam. The Former Fueling Facility is situated in an industrial area of southeast Wilmington. The site is zoned General Industrial (M-2) by the City of Wilmington. Located immediately east of the Eastern Drainage Ditch is an open area and then an access road. On the east side of the access road is the former CONRAIL Edgemoor Yards, now owned and operated by Norfolk Southern (NS), a tank car cleaning company, an asphalt plant, and a cement plant. The Western Drainage Ditch separates the Former Fueling Facility from a tract of land formerly operated by Atlas Sanitation. The area across 12th Street to the south of the study area is also industrialized and is referred to as the Brandywine Industrial Complex.

The Former Fueling Facility was used primarily to service locomotives with coal and later diesel fuel and lubricating oil. Fueling operations ceased in this area in November 1995 and were transferred to a newly constructed facility north of the former roundhouse. Other operations historically performed in the Former Fueling Facility included the refilling of caboose cabin heaters with kerosene and supplying steam engines with water, sand and coal. The area is currently used to store passenger railcars, locomotives, maintenance of way equipment, and other equipment, and will continue to be used for that purpose in the future. Additional information pertaining to the site setting and site history is provided in the Draft Remedial Investigation Report.

1.2 Waste Stream Description

Sediments in site ditches contain PCBs. Over 90 percent of the PCBs are reported to be Aroclor 1260 congeners. Aroclor 1260 congeners are slightly soluble (up to 2 to 3 ug/l solubility in water) and have high sorption capacity, (octanol/water coefficient Kow > 20,000) and low volatility (boiling points in the range of 700 to 800 ° F). The 1260 congeners are the least likely of the PCBs to dissolve into water and the most difficult to remove from particulate matter. However, the Focused Feasibility Study will consider remedial alternatives including options to e stabilize or cap the sediments in order to reduce the loading of PCBs in storm water.

1.3 Treatment Technology Description

The USEPA document "Remediation of Contaminated Sediments (EPA 625/6-91/028)" released in 1990 stated that the remedial technologies available to address contaminated sediments were limited, and that dredging was the only proven remedial technology. Due to a lack of technologies to address contaminated sediments, the USEPA created a Sediments Steering Committee tasked to develop a Contaminated Sediments Management Strategy (CSMS). When the committee issued the CSMS, it stated that the preferred method for controlling contaminated sediments was through natural recovery when possible. Natural recovery refers to the natural capping of impacted sediments by unimpacted solids.

In 1999, the National Sediments Coalition (NSC) was assembled in Washington D.C. to review scientifically-sound, realistic, risk-based approaches to contaminated sediment management. The NSC reported that dredging activities at the Manistique River project in Michigan, the Fox River project in Wisconsin and the Shiawassee River project in Michigan may have actually increased exposure risk to PCBs by increasing the concentration of PCBs in down-stream sediments as a result of sediment disruption. One of the conclusions of the study was a recommendation for in-situ capping of sediments at sites where natural recovery was occurring too slowly.

This treatability study evaluated two technologies for treatment of PCB-impacted sediments at the Amtrak site; (1) stabilization with possible benefits by alkaline dehalogenation and (2) in-situ capping. Each of these technologies is summarized in detail below.

1.3.1 Stabilization/Alkaline Dehalogenation

Strong bases can react with halogenated aromatic compounds in a reaction that replaces chlorines on the compound with hydroxides. The reaction may take place by nucleophilic aromatic substitution or by an elimination-addition reaction mechanism. This reaction can occur even with stable compounds with minimal electron-withdrawing ability if the reaction occurs at elevated temperatures or pressures.

Brunelle and Singleton reported in 1983 that a strong base with polyethylene glycol could degrade PCBs. In 1987, Maurer et al. demonstrated that lime could be used by itself to treat PCBs when used at elevated temperatures. In 1991, the United States Environmental Protection Agency (USEPA) issued a preliminary report stating that that quicklime appeared to have the ability to degrade PCBs by alkaline dehalogenation based on in-house testing and studies by a contracted laboratory (RMC Environmental). However, the USEPA later concluded that the PCBs were primarily being removed by volatilization rather than alkaline destruction.

This conclusion appears to have been based on one bench scale test. No details were provided in the report to explain which of the 209 PCB congeners were evaluated. Additional testing in the 1990s supported that lime treatment had the ability to destroy at least some PCB congeners (Bölsing), but the treatment was highly dependant upon temperature, pressure and the type of PCB congener exposed to the alkaline process.

Although there is evidence that some PCBs can be treated with quicklime, there is currently no information available to determine if such treatment is effective on some of the most recalcitrant PCB congeners found in Aroclor 1260 such as the heptachlorobiphenyls and octachlorobiphenyls. If the treatment were successful, it could be quite useful if it had the ability to reduce the concentration of PCBs in the sediment. This would allow for in-situ treatment of the sediments (after dewatering the stream with a coffer dam) combined with placement of a clean soil cap above the treated sediment. To evaluate this remedial alternative, two reagent mixtures were used for stabilization in the treatability study. One reagent consisted of a 50/50 mixture of quicklime (calcium oxide) and Portland cement and the other reagent consisted of only quicklime.

1.3.2 In-Situ Capping

In-situ capping is defined as the placement of an isolating material over an in-situ deposit of contaminated sediment. In-situ capping is considered an economic and effective approach for remediation of contaminated sediment and the technology has been used at project sites worldwide. Caps for in-situ sediment remediation are generally constructed of clean sediments, sand, gravel, and/or bentonite mixes. The purpose of a cap is to achieve the following objectives:

- Reduce the flux of dissolved contaminants into the water column;
- Physically isolate contaminated sediments from the benthic environment; and
- Prevent resuspension and transport of impacted solids.

In-situ capping for the Amtrak site was evaluated using column studies to evaluate reducing the flux of dissolved PCBs, density and strength testing to evaluate the ability of capping materials to isolate the sediment from the benthic environment, and simulated stream flow testing to evaluate the potential for resuspension and transport of impacted solids.

1.4 Previous Site Treatability Studies

IT Corporation performed a treatability study on sediment from the Amtrak site in 2001 to evaluate reagent dosage requirements for sediment solidification using various drying reagents including flyash, lime, lime kiln dust, Portland cement, cement kiln dust and bentonite. The testing showed that the sediment could be dried to pass the paint filter test using one of the following four reagent addition rates:

- 30% quicklime;
- 60% Portland cement;
- 75% cement kiln dust; or
- 65% lime kiln dust.

The dosage rates required for the reagents to achieve 20 psi strength in the sediment were as follows:

- 50% quicklime;
- 65% Portland cement;
- 142% cement kiln dust; or
- 110% lime kiln dust.

Additional testing was performed to evaluate low leachability formulations. The leachability was evaluated by ASTM D-2166, a test method that evaluates compressive strength. Leach testing was not performed on the samples. Based on the results of this testing, the following formulation was recommended for solidification treatment of the sediment:

- 60% Portland cement, 2% bentonite and 2% activated carbon.

2.0 TREATABILITY STUDY APPROACH

Three 5-gallon buckets of sediment collected from Eastern Drainage Ditch and the confluence area were shipped from the Amtrak site to SECOR's Treatability Testing Laboratory in Sylvania, Ohio for testing in April 2005. The sediment samples were sealed and stored in the laboratory pending approval for treatability testing. After receiving approval to proceed, the samples were homogenized with a mechanical mixer. Testing of the homogenized samples began in April 2006. A summary of the tests performed and the testing protocol are provided in the sections below.

2.1 Test Objectives and Rationale

Testing on sediment from the Amtrak site was performed to provide the necessary data for determining the most appropriate and economical sediment capping option. The specific objectives of the test are to:

- Characterize the chemical and physical properties of the sediment including percent solids, density, pH, oxidation-reduction potential (ORP), PCB concentration, heat capacity and total organic carbon;
- Perform lime stabilization testing to confirm dosage requirements, stabilized density values, volume expansion, and empirical heat capacity values for use in calculating appropriate lime dosage rates;
- Perform synthetic precipitation leaching procedure (SPLP) analyses on untreated and treated sediment samples to determine how the treatment affects the ability of PCBs to leach from the sediments;
- Evaluate how bentonite affects the cohesive strength of the sediment when broadcast across the top of the sediment using different particle sizes to reflect differing point-source density loads;
- Perform load tests to determine if different size gravel may be placed over the sediment with sufficient support by the underlying media;
- Perform column tests with treated and untreated sediment to determine PCB leaching rates and concentrations; and
- Constructing and operating and artificial recirculating stream to test different capping materials at water velocities ranging from 0.1 feet per minute to 10 feet per minute where the recirculated water is tested for total suspended solids (TSS) and PCB concentration.

2.2 *Experimental Design and Procedures*

The procedures used for testing the sediment collected for the Site are summarized below:

2.2.1 Percent Solids

The percent solids of the samples were tested using a modified ASTM D 2216 procedure. A summary for this procedure is described below.

- The tare weights of 70-millimeter aluminum weigh boats were recorded;
- A representative sample (average 45-grams) of the sediment was placed into the aluminum weight boat and the initial weight was recorded;
- The samples were heated in a convection oven at 230 °F for 24 hours;
- After 24 hours, the samples were removed and allowed to cool;
- The cooled samples were weighed and the final weights recorded;
- The wet and dry weights of the samples were calculated by subtracting the tare weight of the 70-millimeter aluminum weigh boat from both the initial and final sample weights;
- The percent solids were calculated by subtracting the final weight from the initial weight, and dividing that value by the initial weight.

2.2.2 Density

Densities of the samples were measured using a Fann Model 140 mud balance. This instrument is a self-contained measuring device used to determine the density of a material in the range of 52.5 to 180 pounds per cubic foot. The procedure for measuring density of the samples with the balance is summarized below.

- The balance cup was cleaned and dried before each test;
- The base of the balance was placed onto a level surface to perform the testing;
- The balance cup was filled with the sediment to a mark 1.4 millimeters below the top of the balance cup;
- The lid of the cup was placed onto the cup and pushed into place;

- If the lid did not fit firmly onto the cup, small amounts of sample material were removed until the lid could be pushed onto the cup to create a flat sample surface in contact with the lid;

- The knife edge of the balance arm was placed onto the fulcrum and the rider was moved along the balance arm until the assembly was balanced on the fulcrum;

- A reading was taken from the side of the rider closest to the balance cup;

The sample cup was emptied and cleaned for the next sample analysis.

2.2.3 pH/ORP

The following procedures were used to determine the pH and ORP of the sample.

- A twenty gram soil and/or sediment sample was placed into a 250-milliliter glass beaker;
- Twenty milliliters of deionized water were added to the beaker;
- A magnetic stir bar was added to the beaker and the sample was mixed for 10 minutes using a magnetic stirrer;
- After the 10 minute mixing period, the pH and ORP were measured using a calibrated laboratory pH meter and a laboratory ORP meter. The pH meter was calibrated against 4.01, 7.00, and 10.00 pH buffer solutions. The ORP meter was tested against a 237.5 mV ORP Standard at 25-degrees C.

2.2.4 Heat Capacity

The following procedure was used to determine the heat capacity of the sediment:

- A 100-gram sample was placed in a calorimeter and the initial temperature was measured;
- 100-grams of water was heated to a specific temperature;
- The water was added to the calorimeter and the calorimeter contents were mixed and sealed;
- The temperature inside the calorimeter was monitored using a digital laboratory thermometer until the temperature stabilized, and the final temperature was recorded;
- The temperature difference between the initial water temperature and the final temperature (ΔTemp) in the calorimeter was used to determine the energy transfer from

the water (q) by the water using 1 BTU/lb °F as the heat capacity (Cp) for water with the following equation;

$$q = mass \times Cp \times \Delta Temp$$

- The heat capacity for the sediment was calculated by dividing the energy lost from the water (q) by the change in temperature of the sediment and mass of the sediment.

2.2.5 PCB and TOC Concentration

Two representative samples of the mixed sediment were collected in 4-ounce glass sample containers and sent to Merit Laboratories in a cooler on ice for analyses of PCBs and TOC.

2.2.6 Stabilization Testing

After initial sediment characterization testing, testing was performed to determine potential mix recipes for stabilization of the sediment. The chemical reagents evaluated for treatment were Portland cement and lime. Testing for stabilization was conducted as follows:

- Representative samples of sediment were placed into one-gallon zip-lock bags each containing 200 grams of sediment;
- Pre-calculated masses of Portland cement and lime were added to the zip-lock bags for stabilizing testing;
- The materials inside each zip-lock bag were mixed inside the bag for no more than 30 seconds to minimize the loss of heat and moisture from reaction;
- The mixtures were each placed into 250-milliliter insulated containers and sealed with insulated lids;
- A digital laboratory thermometer was pushed through an opening in the top of the lid so the sensing portion of the thermometer rested firmly in the treated sediment;
- The temperature of the treated sediment was recorded as a function of time to monitor reaction kinetics and heat generation;
- Recording of temperature data was discontinued once the temperature of the material began to decrease inside the insulated container;

- The samples were allowed to cure inside the insulated container for 24-hours;
- The samples were tested for unconfined compressive strength by penetrometer;
- Samples of stabilized material were subjected to SPLP to evaluate PCB fixation; and
- Samples of stabilized material were subjected to durability testing which exposed the samples to 11 successive wetting and drying cycles.

2.2.7 Evaluation of Moisture/Density Relationship for Treated Sediment

Testing was performed to determine the optimal moisture content and dry density for the stabilized/neutralized sediment. The testing involved the following procedures:

- Prepare three to five samples of treated sediment;
- Each sample was compacted inside a standard mold by the drop of a standard weight;
- After compaction, the samples were weighed and the moisture was determined by oven drying;
- Moisture-density relationships were determined in accordance with ASTM D 698;
- Data from testing were plotted to generate optimal moisture content plots for each sample; and
- The amount of water addition required during treatment was calculated based on the average optimal moisture content of the three samples.

2.2.8 Evaluation of Alkaline Dehalogenation

The following testing procedures were performed to evaluate the potential for alkaline dehalogenation to reduce PCB concentrations in the sediment;

- Eight hundred grams of sediment were mixed well to create a composite sediment sample;
- The sediment was divided into two 200-gram samples and one 400-gram for testing;

- The 400-gram sample of sediment was placed into a convection oven at 210 °F ± 5 °F for 48 hours to simulate the heating that would occur during lime treatment to evaluate potential volatilization losses;

- The 200-gram sample of sediment was treated with 20 percent quicklime and placed inside a sealed, insulated container at a temperature of 212 °F for reaction;

- The final 200-gram sample of sediment was treated with 40 percent quicklime; and

- All three samples were submitted to Merit Laboratories for testing of solids content and PCBS for analyses to provide the data necessary to perform an evaluation of treatment efficiency by means of a mass balance.

2.2.9 Column Leach Tests

A column leach test was conducted to determine permeability and leaching potential for treated sediments and capping materials. The procedures for the test were as follows:

- Four columns were constructed using one-inch PVC cylinders. The bottom of each cylinder was covered with a screen mesh and capped with a bushing equipped with a burette to collect infiltration water;

- The first column was packed with six inches of sediment using a ½-inch diameter tamper rod to remove air pockets from the sediment during filling of the cylinder. This column was used as a control to determine the permeability and PCB leaching for untreated sediment;

- The second column was packed with six inches of top soil, followed by with six inches of sediment;

- The third column was packed with six inches of bentonite, followed by six inches of sediment;

- The fourth column was packed with six inches of bentonite-amended top soil with the bentonite concentration at 7.5 percent by weight followed by six inches of sediment;

- A five foot column of water was added to each cylinder on top of the sediment.

- The burettes were monitored daily for water collection;

- Permeability was calculated using Darcy's law as shown below.

$$Q = kA(\Delta h/L)$$

Where:

Q = Flow of liquid (cm^3/sec)
k = Hydraulic conductivity (cm/sec)
Δh = Gradient (cm) = 5 ft or 152.4 cm
L = Length of column (cm) = 1 ft or 30.5 cm
A = Cross-sectional area of flow (cm^2) = 5.57 cm^2

- The infiltration water collected was sent to an offsite laboratory for PCB analysis.

2.2.10 Simulated Stream Flow Testing

A simulated stream was constructed to determine the ability of specific capping materials to resist erosion. An open-top flume containing one foot of water flowing over three inches of capping material on top of three inches of sediment was used for the testing.

The wooden, crate-like frame of the flume was constructed with inner dimensions of four feet in length, two feet in height, and one foot in width. The frame was lined with a medium-density polyethylene liner to form the flume. An outlet drain was placed at a height of eighteen inches on the flume to ensure a constant water level. Water exiting the outlet drain was transferred by gravity feed into a 20-gallon reserve tank. The bottom of the flume was filled with three inches of sediment and 15 inches of water was added to the elevation of the outlet drain.

A 1/3-HP Teel 4RH69 pump was connected to the 20-gallon reserve tank using ¾-inch braided PVC hose. The pump included a flow control valve and flowmeter. The discharge of the pump was connected to a one-inch section of pipe with multiple drilled holes along the length of the pile to direct water into the flume toward the back-side of the flume without disrupting the sediments.

Water was cycled through the system at velocities ranging from 0.1 feet per minute to 10 feet to evaluate erosive effects of flow with different capping materials. The testing included the following test materials:

- Sediment with no amendment or capping materials;
- Three grades of CETCO bentonite pellets;
- A mixture of 30 percent bentonite in top soil with and without a sand cover; and
- AquaBlok® bentonite-coated gravel with and without a sand cover.

2.3 Equipment and Materials

The following lists are a summary of the equipment, materials and reagents used to conduct the characterization testing:

Equipment and Materials

Digital laboratory thermometer
Laboratory balance
Laboratory fume hood
70-mm aluminum weigh boats
Stainless steel spatula
Convection oven
Magnetic stirrer
Magnetic stir bars
Hot Plate
Refrigerator
Fann Model 140 mud balance
Penetrometer
250-ml Pyrex beaker
Oakton pH meter
Oakton ORP meter
Oakton InfraPro 1 Model 35629-00 infrared thermometer
Harvard mini-compaction device
One-liter glass jars
Calorimeter
1-inch diameter PVC permeability cells
1/3-HP Teel Model 4RH69 centrifugal pump
Lumber frame for flume construction
20-mil polyethylene liner– Model X40240AA

Reagents

Top Soil
Distilled water
Calcium Oxide (Lime)
Portland cement
CETOC Volclay® tablets
CETCO CP-200 bentonite
AquaBlok 2000 FW #10
AquaBlok 3070 FW #8

3.0 RESULTS AND DISCUSSION

3.1 Characterization Testing

The results of the laboratory testing for characterization and stabilization testing are summarized in the sections below.

3.2 Analysis of Treatability Study Data

The results of the laboratory testing for characterization and stabilization testing are summarized in the sections below.

3.2.1 Percent Solids

A composite sediment sample of sediment was tested for percent solids by modified ASTM D 2216 procedure. The testing was conducted on three different representative samples. The results of the three samples varied by less than 1 percent, with an average percent solids composition of 46 percent.

3.2.2 Density

A composite sediment sample was tested for density using a Fann mud balance. The density testing was conducted on three different representative samples. The results were each within 2 lb/ft^3 of each other and were averaged to calculate a final sediment density of 82 lb/ft^3.

3.2.3 pH/ORP

The pH and ORP of the sediment as measured using the procedures described is section 2.2.3. The pH of the sediment was measured at 6.9 and the ORP was highly negative with a value less than -100 mV.

3.2.4 Heat Capacity

The heat capacity of the sediment was calculated using 6 calorimeter tests at different temperatures. The temperature of the water samples used in the testing ranged from 88 to 180 °F. The average heat capacity for the sediment based on the testing was 0.76 BTU/lb °F. For the alkaline destruction testing, part of the goal was to raise the temperature of the sediment to at least the boiling point of water. Since each pound of quicklime will produce 500 BTUs of heat energy when it reacts with water and the sediment generally has to be heated from 75 to 212 ° F (approximately 137 ° F), the minimum amount of lime needed to raise 100 pounds of sediment to the boiling point of water can be calculated as follows:

$$\text{Energy Needed} = q_{sediment} = (m \times Cp \times \Delta T) = (100 \times 0.76 \times 137) = 10{,}412 \text{ BTUs}$$

Lime Needed: m = 10,412 BTUs/(500 BTU/lb) = 20.8 lbs lime/100 lbs sediment

Using this information, it was determined that a 20 percent dosage of lime was the minimum amount needed to raise the temperature of the sediment to its boiling point. This information was used to determine minimum dosage requirements for the alkaline dechlorination testing.

3.2.5 PCB and TOC Concentration

Two representative samples were collected in 4-ounce glass sample containers and sent offsite for PCB and TOC analysis. PCB-1260 was detected at a concentration of 59,000 ug/kg. The TOC concentration was 16 percent.

3.2.6 Stabilization Testing

Stabilization testing was performed on sediment using two different mix recipes. One mix recipe used only quicklime to heat and dry the sediment while the second mix recipe included Portland cement and lime for pozzolanic fixation. The testing showed that the sediment had no measurable compressive strength when dosed with less than 20 percent quicklime. However, at 20 percent dosage, a compressive strength of 3.5 psi was observed. The strength increased to greater than 50 psi when the quicklime dosage was increased to 25 percent. Based on this testing, it was determined that the optimum quicklime dosage rate was in the range of 20 to 25 percent. Samples dosed with the mixture of quicklime and Portland cement had no measurable strength at dosages up to 30 percent. At 35 percent dosage, the sediment had a 24-hour compressive strength of 7 psi. The 24-hour strength increased to greater than 50 psi at a dosage of 40 percent.

Samples of the treated sediment were subjected to SPLP testing to determine if the treatment reduced the leachability of PCBs from the sediment. A control sample of dried sediment was also submitted for SPLP analyses. The results of the SPLP analyses showed that the control sample leached 0.1 ug/l PCB in the SPLP extract but that the treated samples contained less than 0.1 ug/l PCBs in both extracts. The detection limit J-value for the procedure was 0.05 ug/l.

Samples of untreated and stabilized sediments were compacted with the Harvard mini-compaction device to create cores for durability testing in wetting and drying cycle tests. The samples were subjected to 11 wetting and drying cycles and the sample mass was recorded after each wetting and drying cycle. The untreated samples and the samples treated with a 50/50 mixture of lime and Portland cement all maintained their integrity during the durability testing. The samples did not break apart and no swelling of the samples was observed. These

data showed that treatment of the sediment could provide a stable material that did not expand or erode when re-exposed to water over time under unconfined conditions.

3.2.7 Evaluation of Moisture/Density Relationship for Treated Sediment

Samples of untreated and treated sediment were tested for moisture/density relationship to determine optimal dry density and moisture content for compaction after treatment. Testing was performed on an untreated sediment sample, a sediment sample treated with lime, and a sediment sample treated with lime and Portland cement. The samples were amended with differing amounts of water and were then compacted with the Harvard mini-compaction apparatus to develop a moisture/density relationship for each sample. The test results showed that the sediment had a low maximum dry density in the range of 60 to 64 lb/ft^3 for both untreated and treated samples. The optimum moisture content for compaction was in the range of 30 to 32 percent for both the untreated and treated samples. The wet densities for the untreated and treated sediments were in the range of 79 to 84 lb/ft^3. These values show that very little density change occurred in the sediment as it was treated. Therefore, the volume expansion in the sediment will be proportional to the volume of additive used for treatment.

3.2.8 Evaluation of Alkaline Dehalogenation

Approximately one gallon of sediment was mixed to create a composite sediment sample for evaluation of alkaline dehalogenation. The decant water above the sediment was removed prior to mixing so the initial solids content of the sediment was elevated at 50 percent on a wet basis. Eight hundred grams of the sample were divided into two 200-gram samples and one 400-gram for testing for testing. The 400-gram sample of sediment was placed into a convection oven at 210 ° F ± 5 ° F for 48 hours to simulate stabilization heating to evaluate potential volatilization losses without lime treatment. The dried sample was removed from the oven after 48 hours and was then allowed to cool. The mass of the sample after heating was 202 grams. This showed that 198 grams of water had evaporated from the sample in the convention oven. The final solids content of the sample was 100 percent. Since the original sediment contained approximately 59 mg/kg PCB, it was anticipated that the final PCB concentration of the dried sediment should be 118 mg/kg (59 mg/l divided by 50% solids) assuming that no volatilization had occurred. The sample of dried sediment was tested at Merit Laboratories and was found to contain 113 mg/kg PCBs. This value is within 5 percent of the anticipated theoretically concentration of 118 and suggests that no significant volatilization of PCBs occurred at 210 ° F ± 5 °F.

The 200-gram sample of sediment treated with 40 grams of quicklime was air-dried to a final percent solids concentration of 92 percent before sending the sample into the laboratory. The mass of the sample after air drying was 171 grams, thus showing that 69 grams of water had

evaporated from the sample or reacted with the lime. The final theoretical concentration of PCB in the sample was therefore anticipated to be 69 mg/kg (59 mg/kg x 200 grams initial /171 grams final). The actual sample contained 70 mg/kg. These data showed that the lime did not provide any treatment for the Aroclor 1260 by alkaline destruction.

The 200-gram sample of sediment treated with 80 grams of quicklime was also air dried to a final solids concentration of 92 percent before sending the sample into the laboratory for PCB analyses. The mass of the sample after air drying was 214 grams, thus showing that 66 grams of water evaporated from the sample or reacted with the lime prior to testing. The final theoretical concentration of PCB in the sample was anticipated to be 55 mg/kg (59 mg/kg x 200 grams initial /214 grams final). The actual sample contained 58 mg/kg. This value is approximately 5 percent higher than the anticipated theoretically concentration and therefore shows that no treatment for Aroclor 1260 occurred by alkaline destruction.

3.2.9 Column Leach Tests

Twelve 1-inch columns (4 sets of 3 test groups) were constructed to test different capping remedies for permeability and PCB leaching. The first set of three columns was a control group that contained only sediment with 5 feet of distilled water placed above the sediment. As the water infiltrated through the sediment, the column was continuously replaced with make-up water to maintain a constant head over the sediment. The rate of water infiltration through the sediment was monitored over time, and samples of the leachate were collected and stored in a refrigerator over time so the leachate could be analyzed for PCBs. Similar tests were performed on the other three extra sets of columns. One of the sets contained six inches of sediment and six inches of top soil packed into the column so the water would pass through the sediment first and then through the top soil. Another set of columns was first packed with three inches of CETCO CP-200 bentonite which was allowed to swell with water to approximately six inches in thickness prior to adding six inches of sediment over the bentonite. The final set of columns contained six inches of sediment and six inches of topsoil mixed with 7.5 percent CETCO CP-200 bentonite placed into the column so the water would pass through the sediment first and then through the bentonite.

The volumetric flow of leachate through the columns was recorded over time and the data were used to calculate the hydraulic conductivity of the sediment using Darcy's Law. The control columns containing only sediment had an average of 42.3 milliliters of leachate pass through the columns per day (0.00049 cc^3/sec). The permeability of the sediment was therefore calculated to be 1.7×10^{-5} cm/sec which corresponds to a typical permeability that might be anticipated for sediment. The leachate collected from the column was analyzed for PCBs and

was found to contain 0.1 ug/l Aroclor 1260. This supports that the majority of congeners found in Aroclor 1260 are highly insoluble.

The three columns containing sediment over topsoil had an average of 41.7 milliliters of leachate pass through the columns per day (0.00048 cc^3/sec). The permeability of the system was therefore also calculated to be 1.7×10^{-5} cm/sec. The topsoil is more permeable than the sediments which explain the similarities in permeability. The leachate collected from the columns was analyzed for PCBs, but the PCB concentration was less than the detection limits of 0.1 ug/l.

The three columns containing sediment over bentonite-amended topsoil had an average of 9.6 milliliters of leachate pass through the columns per day (0.0001 cc^3/sec). The permeability of the system was therefore calculated to be 3.5×10^{-6} cm/sec. The leachate collected from the columns was analyzed for PCBs, but the PCB concentration was less than the detection limits of 0.1 ug/l.

No leachate passed through the three columns containing sediment over bentonite during the 30-day test, thus indicating that the permeability of the system was less than 1×10^{-8} cm/sec.

3.2.10 Calculation of the Organic Carbon Partitioning Coefficient

Using the value of 0.1 ug/l from the sediment column, the theoretical organic carbon partitioning coefficient (K_{oc}) for PCBs at the Amtrak site was calculated with the following sediment/water partitioning equation:

$$K_{oc} = C_{sediment} / (f_{oc} \times C_{dissolved})$$

Where f_{oc} is 0.16 based on the TOC analyses, $C_{sediment}$ is 118 mg/kg based on the oven-dried sediment sample, and $C_{dissolved}$ is 0.0001 mg/l based on the sediment column test. Based on this equation, the K_{oc} was calculated to be 7.3×10^6. This value is very high and suggests that the primary transport route for PCBs into the water table is likely from erosive forces rather than dissolution.

3.2.11 Simulated Stream Flow Testing

Water was cycled through the laboratory flume to simulate different stream velocities across potential capping materials to determine if the materials would erode at velocities ranging from 0.1 to 10 ft/min. The first test was conducted with the water passing across the uncapped sediment. As the water velocity approached 2 ft/min, the turbidity of the water system increased and scouring of the sediments was observed from the water velocity. The system was allowed

to operate for 24 hours at this velocity and a sample of the water was collected for analyses of total suspended solids (TSS) and PCBs. The results showed an elevated TSS concentration of 168 mg/l and the PCB concentration of 8 ug/l. Since this concentration exceeds the anticipated solubility for the heavy congeners in Aroclor 1260, it is likely that almost all of the PCBs in the water sample were adsorbed to fine organic-rich particulates.

The water was removed from the flume and replaced with new water for testing with three different sizes of pure bentonite chips. The bentonite chips consisted of CETCO Volclay® tablets in sizes of 1/4", 3/8" and 1/2" tablets. In each of the tests, the bentonite pellets swelled to a soft gelatinous mass that was easily scoured from the surface of the sediment at water velocities as low as 2 ft/min. An attempt was made to place sand over the bentonite, but the sand sunk into the soft gelatinous bentonite. Based on these observations, no further testing was conducted with the CETCO bentonite pellets.

A mixture of 30 percent bentonite and 70 percent topsoil was prepared as an alternate capping material. CETCO CP-200 bentonite chips were mixed with topsoil and water to create a soft paste-like slurry. The mixture was placed over the sediment and the flume was placed into operation. As observed in the previous testing, the water became turbid as the water velocity approached 2 ft/min from scouring of fine bentonite particulates. The flume was therefore shut down and a 3-inch layer of sand was placed over the bentonite/topsoil mixture. This mixture supported the sand since it was comprised of a mixture of solids and bentonite rather than pure bentonite. The flume was placed back into operation and the velocity was increased to a maximum velocity of 10 ft/min. At this velocity, no scouring was observed on the sand-covered mixture of bentonite and topsoil. A sample of water was collected from the flume after operating at a velocity of 10 ft/min for 24 hours. The water sample contained only 25 mg/l TSS and the PCB concentration in the water contained only 0.1 ug/l PCBs. This test shows that a cap consisting of sand over bentonite will effectively reduce the flux of both dissolved and adsorbed PCBs into the overlying water table. However, the bentonite must not be a high-swelling bentonite and it must contain a secondary material for strength. In this particular test, the PCB concentration in the water over the sediment was reduced by 80-fold with the use of a bentonite/topsoil mixture with a sand cap.

A load test was performed on the cap described above to determine if it could support gravel as an armoring material for resistance to benthic disturbance. A 3-inch diameter (7 in^2) plate was placed onto the sediment with a graduated cylinder placed onto the plate. The plate was then gradually loaded by filling the graduated cylinder with sand until it began to sink into the cap. For heavier loading, weighs were placed on top of the graduated cylinder. This testing showed

that the plate began to sink into the sediment when loaded with only 600 grams (1.32 pounds) of sand, thus indicating the cap could only support approximately 0.19 psi.

One final test was conducted using a commercial capping material (AquaBlok®) that is comprised of bentonite-coated gravel particles. This material was already tested in a pilot program for PCBs on the Ottawa River in Toledo, Ohio in 2000 and was recently tested as part of the SITES program for a capping project in Washington D.C. The material has a lower swell ratio than the CETCO bentonite and is therefore less susceptible to scouring. The gravel in the material also has the potential to provide greater strength to support a sand cap. A mixture containing two grades of AquaBlok® were used for this testing. One grade contained #8 gravel in the bentonite core and the other contained #10 gravel in the core. Testing showed that the AquaBlok® material did not scour at water velocities as high as 10 ft/min. Furthermore, the load-plate testing showed that the lower swell ratio and gravel interior gave the material more than 5 times the strength of the topsoil/bentonite mixture.

3.3 Comparison to Test Objectives

The treatability testing met the specific test objectives described in the proposed work scope. A summary of the objectives achieved are described below.

- The chemical and physical properties of the sediment received for testing were characterized as follows:
  - percent solids = 46%
  - density = 82 lb/ft^3
  - pH = 6.9
  - ORP < -100 mV
  - PCBs = 59 mg/l
  - heat capacity = 0.76 BTU/lb °F
  - TOC = 16%

- Lime stabilization showed that 25 percent quicklime was required to solidify the sediment for optimum compaction. The stabilized density of the sediment was approximately 84 lb/ft^3 and the volume expansion was proportional to the mass of reagent added for treatment. The calculated heat capacity of 0.76 BTU/lb °F showed that 20 percent quicklime dosage was required to bring the temperature of the sediments up to 212 °F.

- SPLP testing was performed on untreated and treated sediment samples. The untreated sample leached 0.1 ug/l of PCBs while the leachate from sediment treated

with lime or a mixture of lime and Portland cement contained no detectable PCBs at detection limits of 0.1 ug/l.

- The addition of bentonite with another reagent (soil or fine gravel) over the sediment increased its ability to bear weight and support a protective sand layer. Although pure CETCO bentonite pellets performed poorly, bentonite mixed with soil supported 0.2 psi. AquaBlok® pellets supported greater than 1 psi.

- Load tests showed that the cap would not support armoring constructed of gravel or stone, but bentonite amendments were able to support a layer of sand to provide a barrier to bioturbation.

- Column tests showed that bentonite amendment could reduce permeability by one to two orders of magnitude while also reducing PCB concentrations if the bentonite was amended with topsoil.

- Flume testing used to evaluate different capping materials showed that the existing sediments are easily disrupted by flowing water and that the disruption contributes a significant mass of adsorbed PCBs into the water. Bentonite capping significantly reduced erosion effects, but the bentonite was also sheared at higher velocities (except for the AquaBlok® pellets). Placing a sand layer of the bentonite cap was highly effective in reducing erosion and resulted in an 80-fold decrease in PCB concentrations.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Conclusions

- Lime treatment did not provide alkaline dechlorination of Aroclor 1260 at ambient pressures at a temperature of 212 °F;

- Stabilization with 25 percent quicklime or 40 percent addition of a mixture of lime and Portland cement reduced the leachable PCB concentration to less than 0.1 ug/l in the sediment where the J-value for detection of PCBs in solution was 0.05 ug/l;

- Stabilized samples of sediment contained greater than 50 mg/kg PCBs, thus indicating that in-situ treatment would be no more effective than a capping remedy;

- Testing showed that the use of bentonite as a capping material could reduce the permeability of the upper sediment layer by one to two orders of magnitude and significantly reduce the transport rate of dissolved-phase PCBs into the overlying water body;

- Bentonite capping materials were able to reduce the concentration of suspended solids in water by almost 7-fold, even when subjected to higher flow velocities;

- Bentonite and sand capping materials were able to reduce the PCB concentration in water above the sediment by 80-fold when placed under dynamic flow conditions with water velocities in the range of 2 to 10 ft/min;

- The sediment did not have the ability to support large gravel or other dense armoring materials due to the low density and solids content. However, since the majority of biological activity typically occurs in the first six inches of sediment, bioturbation effects may be minimized by placing a six-inch sand cap over the bentonite cap;

- Testing with AquaBlok® showed that AquaBlok® has greater supportive strength than other bentonite materials and thus will provide greater support for a sand cap;

- The cost of AquaBlok® delivered to the Site is estimated to be $300 per ton, and each ton of AquaBlok® will cap an estimated 100 square feet of sediment.

Recommendations

- Perform a pilot capping program at an upgradient location of the stream to evaluate the effectiveness of the full-scale capping program that performed well at the bench-scale level;

- Perform preliminary testing in the pilot study area to evaluate the diversity and population of the benthic community prior to placement of the capping material;

- Place 3 inches of AquaBlok® having a #8 to #10 gravel core over the sediment using a Tele Belt Conveyor Truck or other application technique and allow one day of hydration time so the material can expand to provide a 6-inch bentonite barrier cap that can support sand;

- Place 6 inches of sand over the AquaBlok® to provide resistance to erosion and to provide a bioturbation layer;

- Collect core samples from the pilot study area one year after installation for visual and laboratory performance evaluation;

- Perform testing one year after installation to evaluate the diversity and population of the benthic community in the pilot study area after placement of the capping material; and

- Use the results of the pilot study to determine how to scale up or improve the system design for full-scale application.

REFERENCES

Amend LJ and PB Lederman, *Critical evaluation of PCB remediation technologies.* ENVIRONMENTAL PROGRESS, Vol. 11, No. 3, 1992, pp 173-177.

Bölsing, F., *Method of Dehalogenating Halogenated Hydrocarbons*, U.S. Pat. 5,108,647, April 28, 1992.

Brunelle, D.J., and D.A. Singleton, *Destruction/removal of polychlorinated biphenyls from non-polar media, Reaction of PCB with polyethylene glycol/KOH*, CHEMOSPHERE, 12, 1983, pp 183-96.

IT Corporation, *Amtrak Treatability Study Update*, May 30, 2001.

Maurer, P. et al., *Process for the Chemical Thermodecomposition of Higher Halogenated Hydrocarbons*, U.S. Pat. 4,654,203, March 31, 1987.

Oberle, D.W., *Contaminated Sediment Prevention and Remediation, A Need for Consistent Policy and Sound Science*, THE TOLEDO JOURNAL OF GREAT LAKES' LAW, SCIENCE & POLICY, Vol. 3, No. 1, Fall 2000.

Palermo, M., et al., Guidance *for In-Situ Subaqueous Capping of Contaminated Sediments*, EPA 905-B96-004,1998.

Reible, D. D., et al., *Chemodynamic Models for Transport of Contaminants from Sediment Beds*, THE HANDBOOK OF ENVIRONMENTAL CHEMISTRY, Vol. 2., 1991.

USEPA, *Contaminated Sediment Management Strategy*, 63 Fed. Reg. 25,037, 1998.

USEPA, *Remediation of Contaminated Sediments*, EPA 625/6-91/028, 1990.

USEPA SITE Program, Final Report Site Demonstration of the AquaBlok™ Sediment Capping Technology – Six Month Post-Cap Installation Geophysical Survey, Anacostia River, Washington, DC, November 8, 2004.

Appendix X

Diesel Fuel Remedy Five Year Review

SECOR

SECOR
INTERNATIONAL
INCORPORATED

www.secor.com

FIVE-YEAR REMEDY EVALUATION REPORT

AMTRAK FORMER FUELING FACILITY
VANDEVER AVENUE
WILMINGTON, DELAWARE

DE-266

JULY 2007

Prepared for:

National Railroad Passenger Corporation (AMTRAK)
and
American Premier Underwriters, Inc.

Prepared by:

SECOR International Incorporated
102 Pickering Way, Suite 200
Exton, PA 19341

Reviewed By:

Frank Aceto, PG (DE S40000892)
Principal Hydrogeologist

Steve Baggett, PG (DE S40000770)
Principal Hydrogeologist

7/31/07

TABLE OF CONTENTS

1.0 INTRODUCTION **1**
1.1 General 1
2.0 PROJECT OVERVIEW **4**
2.1 Project Background 4
2.2 Remedial Objectives 5
2.3 Organization and Responsibilities 6
2.4 Applicable Local, State and Federal Requirements 7
3.0 REMEDIAL DESIGN AND ACTION OVERVIEW **10**
3.1 Interim Remedial Measures Plan (September 9, 1998) 10
3.2 Diesel Fuel Oil Remedial Program 11
3.2.1 Oil Recovery Trench Systems 11
3.2.2 Compressed Gas Powered Product Recovery Systems 15
4.0 OPERATION AND MAINTENANCE OVERVIEW **16**
4.1 Oil Recovery Operations 16
4.2 Liquid Level Gauging Results 17
4.3 Groundwater Monitoring 19
4.4 NPDES Monitoring Program 20
4.5 Stained Surface Soil Remediation 21
4.6 Evaluation of Operating Systems 22
4.6.1 Trench Recovery Systems 22
4.6.2 Compressed Gas Recovery Systems 23
5.0 REMEDY EVALUATION **24**
6.0 CONCLUSIONS AND RECOMMENDATIONS **26**
6.1 Conclusions 26
6.2 Recommendations 27

LIST OF FIGURES

Figure 1: Site Location
Figure 2: Area of Investigation
Figure 3: Layout of Remedial System
Figure 4: Cumulative Product Recovery – Manual Product Recovery, Sump #1 (IRM), Trench Product Recovery Wells, Construction Dewatering and Compressed Gas System through December 2006
Figure 5: Cumulative Product Recovery –, Sump #1 (IRM), Trench Product Recovery Wells and Construction Dewatering – through December 2006

Figure 6: Manual Product Recovery by Event and Cumulative Product Recovery Summary through December 2006
Figure 7: Product Recovery Summary – Compressed Gas System through December 2006
Figure 8: Apparent Product Thickness Measurements – March 21, 2007

LIST OF TABLES

Table 1: Monitoring Well Construction Specifications
Table 2: Stained Soil Areas Soil Sample Petroleum Hydrocarbon Results – 2001 and 2005

LIST OF APPENDICES

APPENDIX A LIQUID LEVEL GAUGING DATA AND SELECT HHYDROGRAPHS
APPENDIX B HISTORIC GROUNDWATER MONITOIRNG ANALYTICAL DATA
APPENDIX C NPDES PERMIT REQUIREMENTS

1.0 INTRODUCTION

This Five-year Remedy Evaluation Report (RER) has been prepared on behalf of National Railroad Passenger Corporation (AMTRAK) and American Premier Underwriters, Inc. (APU) to document and evaluate the operation and monitoring of the diesel fuel remedy at the Former Fueling Facility portion of the AMTRAK Wilmington Shops. The AMTRAK Wilmington Shops are located along Vandever Avenue in Wilmington, Delaware (**Figure 1**). This report has been prepared in response to DNREC's August 10, 2006 letter to AMTRAK which included a request that a five-year remedy evaluation be performed for the diesel fuel remedy. This RER has been prepared and organized consistent with Delaware Department of Natural Resource's (DNREC's) *Operation and Maintenance Guidance Document for HSCA and VCP Sites* dated February 2002.

1.1 General

A remedial investigation (RI) has previously been conducted under the Delaware Voluntary Cleanup Program (VCP) enacted under 7 Del. C. Chapter 91: Delaware Hazardous Substance Cleanup Act (HSCA). The RI was documented in *Draft Remedial Investigation Report – AMTRAK Former Fueling Facility, Vandever Avenue, Wilmington, Delaware* (Draft RI Report) prepared by the IT Corporation and dated May 28, 1999. Data collected during the RI, other previous site investigations, and interim remedial measures (the scope was provided to DNREC in September 9, 1998 correspondence) were used to develop an appropriate remedial program for the removal of liquid-phase diesel fuel from beneath the Former Fueling Facility.

The diesel fuel remedy was described in *Diesel Fuel Remedial Work Plan – AMTRAK Former Fueling Facility, Vandever Avenue, Wilmington, Delaware* (Diesel Fuel Remedial Work Plan) prepared by the IT Corporation and dated March 2000. DNREC approved the Diesel Fuel Remedial Work Plan as a component of the overall site remedy in a letter to IT Corporation dated June 22, 2000. Construction of the diesel fuel remedy was initiated in September 2000 and the recovery system was operational in December 2000. The installation of the diesel fuel remedy and the operation and monitoring program, from system installation through October 2001, were documented in *Diesel Fuel Oil Remedy System Installation and Progress Report* prepared by IT Corporation and dated November 2001. Operation and monitoring activities for the period November 2001 to December 2002, including a plan for management of the soil pile generated during the remedial system installation and the plan for drainage improvement and sediment reduction in the vicinity of Outfall 004 were presented in the *Diesel Fuel Oil Remedy*

Progress Report, prepared by SECOR, dated May 6, 2003. A status summary of the diesel fuel remedy for the period January through June 2006 was prepared by SECOR, dated November 2006.

As mentioned previously, the Draft (Phase I) RI Report prepared by IT Corporation was submitted to DNREC on May 28, 1999. DNREC provided comments to the Draft (Phase I) RI Report in a letter to AMTRAK dated July 27, 2001. In their letter to AMTRAK, DNREC requested additional remedial investigations and a Focused Feasibility Study (FFS) report be performed. A Phase II Remedial Investigation and Focused Feasibility Study Work Plan (Phase II RI/FFS Work Plan) was submitted to DNREC during December 2001. DNREC provided comments to the Phase II RI/FFS Work Plan in a letter to AMTRAK dated August 12, 2002. SECOR met with DNREC during December 2002 to discuss DNREC's comments. In follow-up to the December 2002 meeting, SECOR submitted a letter to DNREC responding to DNREC's comments. In an April 22, 2003 letter, DNREC concurred with the strategy outlined in SECOR's letter. A Revised Phase II RI/FFS Work Plan was submitted to DNREC by SECOR on August 28, 2003. A data package including the summarized analytical results and sample location drawings for Phase II remedial investigations was submitted to DNREC on March 6, 2006.

On behalf of AMTRAK and APU, SECOR proposed supplemental Phase II remedial investigation activities in a letter to DNREC dated May 30, 2006, based on the results of the data collected during Phase II remedial investigations. The proposed supplemental Phase II remedial investigation activities included the investigation of a former/abandoned (reportedly closed) sewer, in addition to other investigative activities such as the further characterization of site soils.

Although DNREC had already provided verbal authorization to implement the activities outlined in the Supplemental Phase II RI Work Plan; they compiled a comment letter dated August 10, 2006. The letter included a request that a five-year evaluation of the diesel remedy be prepared. In follow-up to DNREC's letter, a letter responding to DNREC's comments was submitted to DNREC on October 31, 2006. As requested by DNREC in their letter, a Phase II RI/FFS Progress Report was submitted to DNREC on January 26, 2007.

This report provides an evaluation of the diesel fuel remedial system operation and monitoring program (described in the Diesel Fuel Remedial Work Plan). Components of the diesel fuel remedial program include:

- Operation of five active product skimming pumps installed in recovery trenches,
- Manual product recovery from site monitoring wells, sumps, and standpipes,

- Periodic liquid level gauging of site monitoring wells, sumps, and standpipes,
- Periodic water pumping from the recovery trenches in order to enhance product recovery (extracted water is routed through granular activated carbon (GAC)),
- Periodic operation of compressed gas (nitrogen) product recovery pumps which can be moved from location to location,
- Groundwater sampling and analyses from monitoring wells,
- Bioremediation of stained soils in three areas in the vicinity of the Eastern Drainage Ditch,
- Periodic inspection of oil containment booms maintained in site drainage ditches (recommendations to replace the booms are provided to facility personnel as needed), and
- Review of NPDES sampling data for permitted outfalls in the Former Fueling Facility area.

This RER focuses on the product recovery operations. A total of approximately 15,200 gallons of product have been recovered since initiation of product recovery activities through December 2006.

2.0 PROJECT OVERVIEW

A discussion of the project background, remedial objectives, project organization and responsibilities, and applicable local, state and federal environmental requirements is provided below.

2.1 Project Background

The AMTRAK Wilmington Shops consist of the Maintenance Facility and Former Fueling Facility. The Former Fueling Facility encompasses approximately 20 acres (refer to **Figure 2**). The Former Fueling Facility is located south of the former round house location, bounded to the east by the unnamed drainage feature (to be referred to as the Eastern Drainage Ditch), and to the west by a drainage ditch (to be referred to as the Western Drainage Ditch), which separates the AMTRAK Wilmington Shops from the former Atlas Sanitation property. Both of the drainage ditches flow to the south and empty into a confluence area. The Former Fueling Facility is bounded to the south by the confluence of the two surface water features and 12th Street. The Former Fueling Facility is situated in an industrial area of southeast Wilmington. The site is zoned General Industrial (M-2) by the City of Wilmington. Located immediately east of the Eastern Drainage Ditch is an open area and then an access road. On the east side of the access road is the former CONRAIL Edgemoore Yards, now operated by Norfolk Southern (NS), a tank car cleaning company, an asphalt plant, and a cement plant. The Western Drainage Ditch separates the Former Fueling Facility from a tract of land formerly operated by Atlas Sanitation (DE-280). This property was observed to be currently used for the processing of recycled materials including metal goods and concrete. DNREC performed a preliminary assessment of this property during 1994 and recommended that a Site Investigation be performed. No Site Investigation has been conducted. The area across 12th Street to the south of the study area is also industrialized and is referred to as the Brandywine Industrial Complex. Included in the Brandywine Complex are the Electric Hose and Rubber Site (DE-174). As mentioned in the November 2003 Progress Report, PCB concentrations up to 1,970 mg/kg have been reported in soils where transformers and other equipment were located. The site is currently being investigated under the direction of DNREC.

The Former Fueling Facility was used primarily to service locomotives with coal and later diesel fuel, lubricating oil and sand. Fueling operations ceased in this area in November 1995 and were transferred to a newly constructed facility (with secondary containment) north of the former roundhouse. Other operations historically performed in the Former Fueling Facility included the refilling of caboose cabin heaters with kerosene and supplying steam engines with water, sand

and coal. The area is currently used to stage maintenance of way equipment as well as other equipment and will continue to be used for that purpose in the future.

2.2 Remedial Objectives

The remedial approach described in the Diesel Fuel Remedial Work Plan, included light non-aqueous phase liquids (LNAPL) recovery in the vicinity of the general source area (former fueling area); reducing visible oil stains in surface soils adjacent to the Eastern Drainage Ditch through bioremediation; product containment/recovery along the Western Drainage Ditch; and identification and removal of preferential oil migration pathways to the drainage features. Sorbent booms in the drainage features are also maintained as appropriate. The remedial strategy also provides for the ongoing evaluation of the effectiveness of the remedial action through liquid level measurements, groundwater sampling, and surface water (NPDES) sampling as well as the visual inspection of soils and sorbent booms.

LNAPL has been detected in monitoring wells, standpipes, and sumps within the Former Fueling Facility and in the Western Drainage Ditch. Oil sheens have also been observed in the Eastern Drainage Ditch. As described in the Diesel Fuel Remedial Work Plan, the primary goals of the proposed remedial system is to recover light nonaqueous phase liquids (LNAPL)/product from the subsurface to the extent practical and to prevent the off-site movement of LNAPL.

As described in Section 13.0 of the Draft Phase II RI/FFS Report, remedial action objectives for LNAPL on the water table surface include reducing the quantity and mobility of LNAPL in the subsurface in order to prevent PCBs in the LNAPL from impacting site surface water and sediments. Recovery of LNAPL will be performed to the extent practical (as discussed in EPA Guide for State Regulators EPA 510-R-96-001). Practical objectives for the recovery of LNAPL provided in the EPA Guide include 0.10 feet of apparent product thickness on the water table over 2 years of monitoring; product recovery of less than 2 gallons/month; and less than 0.02 ratio of product recovery to water pumped.

Conventional remedial technologies can be effective in removing LNAPL down to a minimal apparent product thickness (for example less than 0.10 feet) on the water table surface. However, as a result of processes such absorption/desorption to/from the aquifer matrix under fluctuating water table conditions and heterogeneities of the aquifer, some minor thickness of product may remain following active remediation. Since diesel fuel-related compounds biologically degrade under aerobic and anaerobic conditions, the residual product will be further diminished by natural processes.

The strategy for addressing groundwater within the Former Fueling Facility considers the risk to human health and the natural biodegradability of the constituents of diesel fuel. Exposure to groundwater was not considered in the human health risk assessment because potable water in the vicinity of the site supplied by the City of Wilmington and there are no occupied buildings (for inhalation exposure scenarios) in the Former Fueling Facility. Data collected at the site indicates that groundwater beneath the vicinity of the former fueling area discharges to the site drainage features. As a result, the only receptors of concern are the discharge of groundwater to the Eastern and Western Drainage Ditches.

Surface water quality within the drainage ditches has been and will continue to be monitored at several locations. NPDES surface water outfall locations 001, 005, and 006 receive drainage from both the Former Fueling Facility as well as adjacent properties. Surface water monitoring will continue under the new NPDES permit. Data collected as part of the NPDES monitoring program is evaluated as part of the remedial action in order to monitor surface water leaving the site. As has been discussed in the Draft Phase II RI/FFS Report, the ecological communities in the AMTRAK ditches are similar to, or higher quality than those in the comparative ecological sampling locations, and are typical of the communities found in ponds and small impoundments is the area.

The rate of natural biodegradation of dissolved diesel fuel components will be enhanced as product is removed from the subsurface. As a result of the reduction of the mass of hydrocarbons in the subsurface through product recovery, the relative flux of oxygen to the subsurface from precipitation will increase.

As discussed in the Draft Phase II RI/FFS Report, once LNAPL remedial objectives have been attained, the groundwater sampling of perimeter monitoring wells for laboratory analyses will be performed to monitor/verify natural attenuation processes. Monitoring will continue until HSCA Standards for petroleum hydrocarbons (using EPH/VPH analyses of groundwater samples) can be attained and maintained in order to be protective of surface water quality leaving the site.

2.3 Organization and Responsibilities

The project organization is summarized below.

AMTRAK and APU Representative

The Project Coordinator is:

- Mr. Charles Lin of AMTRAK
  - telephone number: (202) 906-3273
  - facsimile number: (202) 906-3439
  - e-mail address: clin@amtrak.com

SECOR Personnel

The project is managed out of SECOR's Exton, Pennsylvania office. SECOR is a DNREC approved HSCA contractor. The personnel who actively manage and perform the work are licensed professionals in the State of Delaware.

Key project staff for SECOR will include the individuals identified below.

Title:	Project Director
Person:	Frank Aceto, PG (Delaware Registration S40000892)
Telephone:	(484) 875-3075
Facsimile:	(484) 875-9286
E-mail:	faceto@secor.com
Responsibilities:	Is responsible for coordinating all personnel involved with the field and reporting activities while considering the project schedule and budget constraints. Additionally, the Project Director is the primary contact between AMTRAK and APU, and DNREC.

Title:	Project Manager and Principal Hydrogeologist
Person:	Stephen M. Baggett, PG (Delaware Registration S40000770)
Telephone:	(484) 875-3075
Facsimile:	(484) 875-9286
E-mail:	sbaggett@secor.com
Responsibilities:	Is responsible for overseeing the field operation, maintenance and monitoring activities and will furnish his findings and recommendations to the Project Director. As project manager will manage field and staff level personnel to be utilized to perform various field and remedial design activities.

2.4 Applicable Local, State and Federal Requirements

Applicable local, state and federal environmental requirements that will be considered for the diesel fuel remedial program are summarized below.

The Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act (as further amended, herein referred to as RCRA) established the federal program regulating solid and hazardous waste management. RCRA allows EPA authority to control hazardous waste, including the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous wastes.

Regulations developed as a result of RCRA include 40 CFR 261, Identification and Listing of Hazardous Waste; require the proper identification, manifesting, transportation and disposal of wastes. Any soils removed from the site for disposal must be properly characterized and disposed according to these regulations.

Excavated soils from the site must be properly characterized and disposed. Should any soil be determined to be a characteristic hazardous waste, land ban regulations (40 CFR 268) may prohibit their disposal by landfill. Soils which are identified as hazardous wastes should be treated onsite prior to being disposed in a landfill, or disposed in a permitted incinerator. All soils designated for off-site disposal will be properly characterized. At this time, no soils are anticipated to be classified as hazardous wastes under RCRA regulations.

Delaware Regulations Governing Hazardous Waste would also be applicable to the characterization and disposal of site wastes. These regulations would require similar identification, tracking and disposal requirements as RCRA regulations.

The Toxic Substances Control Act (TSCA) is an extensive statute allowing EPA the ability to track the numerous chemicals currently produced or imported into the United States. TSCA allows EPA to track chemicals, require testing of certain chemicals, develop specific regulations related to the use and/or disposal of certain chemicals, and in some cases, ban or limit the production and/or use of chemicals.

Management of PCBs, including the remediation of PCB contaminated sites and the disposal of PCB-contaminated materials, is controlled by regulations developed under the authority of TSCA. 40 CFR 761 sets specific requirements for materials, including site soils, contaminated by PCBs. These regulations set specific requirements for the characterization, remediation and disposal of PCB soils.

The Delaware Hazardous Substance Cleanup Act (7 Del. C., Chapter 91) provides the regulatory basis for cleanup. The Delaware Regulations Governing Hazardous Substances Cleanup provides the basis for the Voluntary Cleanup Program which this site is currently being remediated.

Remediation Standards Guidance under the Delaware Hazardous Substance Cleanup Act (DNREC, December 1999) provides media-specific numeric Uniform-Risk-Based Standards (URS) for the protection of human health and the environment. The guidance also allows for the development of site-specific standards established using a traditional EPA risk assessment approach that characterizes the risk posed by a site and allows pathway elimination remedial options that can eliminate complete exposure pathways.

The Delaware River Basin Commission (DRBC) implemented the Pollutant Minimization Plan for PCBs (PMP) process in accordance with the Delaware River Basin Commission (DRBC) PMP Rule 4.30.9. The PMP process was implemented to reduce PCB loadings to the Delaware River Estuary. A PMP for the site dated September 28, 2005 was submitted to DRBC. The most recent NPDES permit for the site (Permit Number DE0050962; Effective Date May 1, 2006) is consistent with the DRBC PMP approach.

3.0 REMEDIAL DESIGN AND ACTION OVERVIEW

In response to the quantification of PCBs in product at the Former Fueling Facility, interim remedial measures (IRM) were implemented during 1998 to further characterize PCBs in product, initiate product recovery, and further control/contain the surface occurrence of product in the Eastern and Western Drainage Ditches. Other activities were previously performed in order to prevent the release and control the movement of product in the vicinity of the Former Fueling Facility including: the installation of the dams and sorbent booms in the Eastern and Western Drainage Ditches; the upgrade of the dams; the transfer of fueling operations to a newly constructed facility north of the former roundhouse, and removal of ASTs. During 2000, the product recovery system described in the Diesel Fuel Remedial Work Plan was installed. During 2007, and additional recovery trench was installed. The following is an overview of the implementation of the diesel fuel remedy.

3.1 Interim Remedial Measures Plan (September 9, 1998)

Based on field observations and data collected during the Phase I remedial investigation, interim remedial measures (IRM) were implemented in September 1998. The scope of the interim remedial measures was provided to DNREC in Interim Remedial Measures Plan (IRM Plan) prepared by IT Corporation dated September 9, 1998. Interim remedial measures performed included:

- Gauging and manual recovery of product from site monitoring wells and standpipes.
- Installation of two 30-inch diameter product recovery sumps; automated product skimming equipment was installed in the sump determined to yield the most product (Sump #1).
- Installation of in-well collection devices in three select monitoring wells.
- Removal of oil and surface debris (oil-soaked leaves, etc.) from the Western Drainage Ditch.
- Replacement of existing sorbent booms and placement and maintenance of additional booms in the site drainage features.

- Field reconnaissance and exploratory excavations for preferred pathways of product seepage to either Eastern or Western Drainage Ditches, such as piping runs.

These IRM activities were documented in the Draft Phase I RI Report and in the Diesel Fuel Remedial Work Plan.

3.2 Diesel Fuel Oil Remedial Program

AMTRAK and APU proactively developed the Diesel Fuel Remedial Work Plan to increase diesel fuel recovery and reduce the mobility of the diesel fuel in the subsurface. The oil recovery system described in the Diesel Fuel Remedial Work Plan was installed during the period September to December 2000. The system was installed to address liquid phase diesel-fuel occurrence in the Former Fueling Facility. Slight modifications were made to the proposed system presented in the Diesel Fuel Remedial Work Plan, as a result of conditions encountered during installation.

Components of the on-going diesel fuel remedial program include:

- Operation of oil recovery systems,
- Bioremediation of surface soils in the vicinity of the Eastern Drainage Ditch,
- Depth to liquids measurements in site monitoring locations,
- Groundwater monitoring and review of NPDES surface water results, and
- Continuation of the sorbent boom maintenance program.

The following is a discussion of the implementation of the current oil recovery systems.

3.2.1 Oil Recovery Trench Systems

Construction of the oil recovery system began on September 5, 2000. The system was installed and equipment shakedown completed by December 1, 2000. The operation and maintenance of the system began in December 2000. The layout of the oil recovery system is presented on

Figure 3. The system installation, including test trenching and preferential pathway removal and operation of the system from December 2000 through October 2001 were detailed in Diesel Fuel Oil Remedy System Installation and Semi-Annual Progress Report dated November 2001. The system installation and operation are summarized below.

The installation of the oil recovery system included the following:

- Installation of approximately 1200 feet of recovery trenches approximately 9 feet deep. Four trenches were installed for active product skimming.

- A total of five 30-inch diameter recovery wells (RW-1, 2, 3, 4 and 5) and nine 8-inch diameter standpipes (SP-1 through 9) were installed within the active product skimming trenches. Oil recovery pumps are currently placed at five new recovery well locations. Oil is routed from these to the 1,000 gallon above-ground storage tank.

- All subsurface piping encountered during recovery trench construction were capped and/or sealed on both sides of the trench.

- All recovery wells, standpipe and trench locations were surveyed and a new base map prepared.

- A total of 11 oil collection and monitoring sumps were installed in the vicinity of the Eastern and Western Drainage Ditches. The sumps consist of 12-inch diameter PVC well screen placed to depths from 5 to 7 feet, backfilled with pea gravel and covered with site fill material. As indicated on **Figure 3**, the lateral extent of the pea gravel at each location varies and is dependent on the extent of oil observed in the subsurface during excavation.

- Six sumps were installed in the vicinity of the Eastern Drainage Ditch (ED-1 through ED-6). As indicated on **Figure 3**, ED-3 and ED-4 were installed in a "passive" recovery trench approximately 100 feet in length.

- Five sumps were installed in the vicinity of the Western Drainage Ditch (WD-A, WD-B, WD-D, WD-E and WD-F).

- The former inspection pit was filled with pea gravel and backfilled. Holes were drilled into the concrete of the pit before backfilling to allow oil collection. Two 8-inch diameter recovery sumps were installed to a depth of approximately 2 feet below the bottom of

the inspection pit. The pea gravel was covered with geofabric and crush-and-run was placed above the geofabric.

In order to increase oil recovery from the active oil-skimming recovery trenches, a temporary system was installed to remove water accumulated in the trenches, route the water through granular activated carbon and drain the treated water to the ground surface in the immediate track area. This removal of the water accumulated in the trenches is being performed in similar fashion to what was implemented in the fall of 2000 during trench construction. This procedure was reviewed with DNREC via telephone conversation on June 19, 2000 and relayed via correspondence to DNREC on June 14, 2001 (request for authorization to remove water) and June 19, 2001 (confirmation of authorization to remove water). Although the water is treated with GAC, some iron staining has been observed in the track area due to naturally occurring iron and the anaerobic conditions occurring in the subsurface. Water pumps installed in RW-1 and RW-3 on July 25, 2001 were operated manually until the water level floats, storage tank and controls were in place. Water pumps were subsequently placed in all recovery wells.

Since the evacuated water is routed through granular activated carbon and discharged to ground surface in the track area, operation of the dewatering system is assessed on a regular basis. Water pumping is adjusted so that the evacuated water drains in the track area. The water pumping system is deactivated when periodic water pumping does not provide for efficient oil recovery, when standing water from precipitation is observed in the track area, or if the ground is frozen limiting infiltration into the ground surface.

As a result of the detection of product in test pit standpipes installed during 2005 (refer to Section 3.2.2 of the Draft Phase II RI/FFS Report), an additional recovery trench was installed during April 2007. This trench was placed between test pit standpipes TP-101 and TP-106 (the southernmost standpipes in the trench area in which product was detected and TP-102 (in which product has not been detected) in order to prevent the southerly movement of product. This recovery trench is approximately 70 feet long and extends in a general east-west direction to the south of the previously existing recovery trench system (refer to **Figure 3**). The trench construction was similar to that of the existing trenches (approximately nine feet deep, and three feet wide, filled with pea gravel), although the trench was excavated to a depth of 12 feet in the vicinity of the recovery well (RW-6). RW-6 is a 30-inch diameter PVC recovery well with 10 feet of 40 slot well screen and two feet of PVC (0.627 inch thickness) riser (solid) pipe. Two standpipes (SP-10 and SP-11) were installed in order to monitor the depth to liquids in the western portion of the trench. A 16-inch diameter steel pipe was excavated at a depth of approximately 4 feet bgs, trending in a north-south direction (perpendicular to this trench) between SP-10 and SP-11 (refer to **Figure 3**). Excavation was performed below this pipe to a

depth of nine feet bgs and the excavation was backfilled with pea gravel so the trench was continuous. SP-10 and SP-11 will be used to monitor depth to liquid in the western portion of the trench. Product recovery and water pumps were placed in RW-6. Water and product conveyance conduits were connected to existing liquids management systems.

The major trench product recovery system components consist of the following:

- Five Filter Scavenger® product recovery pumps (currently installed in RW-1, RW-2, RW-3, RW-4, and RW-6),
- One 1,000 gallon double-walled recovered oil storage aboveground tank equipped with interstitial monitoring and overfill protection (a product level probe will deactivate the product pumps when this tank is nearly full). The recovered oil is pumped directly to this tank.
- Five Grundfos ½ Hp submersible water pumps. When activated, these pumps operate on float controls that maintain a predetermined water level range in the recovery well,
- A control panel which interconnects tank probes and water level probes in the recovery wells with the product and water recovery pumps,
- A 10,000 gallon aboveground water storage tank. Water is pumped directly from the water pumps to this storage tank. Generally, water is allowed to gravity drain from this tank although water level probes in this tank activate a water transfer pump when the water level reaches a select level. Another set of water level probes will deactivate all water pumps in the recovery wells when the tank is nearly full to prevent overfilling.
- A water transfer pump. This pump routes water from the water storage tank as activated by the water level probes in the water storage tank.
- Bag filter assembly. All water from the water storage tank is routed through this bag filter to remove suspended solids.
- After the bag filter, water is routed though an 1,100 pound granular activated carbon (GAC) unit for the removal of dissolved hydrocarbons. The treated water is then routed to the ground surface in the track area as described previously.

3.2.2 Compressed Gas Powered Product Recovery Systems

In response to the measurement of approximately 0.3 to 0.35 feet of oil on the water surface at sump WD-B, a product skimming system was installed during April 2001. Since electrical service was not available in the vicinity of sump WD-B, a compressed gas powered product skimming system was installed. A second pump was later installed in WD-E which is connected to the same control unit and oil recovery tank. This product skimming system utilizes a pump intake that floats on the water surface. The system is operated by a battery-powered timer which activates the pump. The timer is set to activate the pump at a selected number of intervals and duration of each interval (determined based on the oil recovery rate). When the pump is activated, compressed nitrogen gas is used to evacuate oil collecting in the pump intake. The recovered oil is routed to a 100 gallon double-walled recovery tank adjacent to the recovery locations. The recovery tank is equipped with an overfill shutoff probe that will deactivate the system when the tank is full. This system can be relocated to other wells/sumps based on observed apparent product thicknesses.

The major compressed gas product recovery system components consist of the following:

- Two Xitech Instruments, Inc. oil skimming product recovery pumps (currently installed in WD-B and WD-E),

- A control unit which controls the flow of compressed gas to each recovery pump using a timer and will deactivate both pumps when product in the recovery tank reaches a set level. The timer is set to activate the pumps on set intervals for a set pumping period. The timer is set based on operational of knowledge of the rate of product recovery into the recovery sumps.

- One 100 gallon double-walled recovered oil storage aboveground tank equipped with overfill protection (a product level probe will deactivate the product pumps when this tank is nearly full). The recovered oil is pumped directly to this tank.

- Compressed nitrogen canisters. Normally, there a rack of 12 canisters inside a fenced area used to power the recovery pumps.

4.0 OPERATION AND MAINTENANCE OVERVIEW

Routine operation and maintenance of the oil recovery system is performed to service the recovery equipment as well as to perform other tasks including manually recovering oil, collecting depth to liquids measurements, and inspecting the sorbent booms in the drainage features. The effectiveness of the system is monitored through recording oil recovery volumes, depth to liquids measurements, groundwater sampling and analysis, and tracking the results of surface water sampling associated with the NPDES permit for the site. The operation and maintenance work scope has been described in semi-annual Progress Reports previously submitted to DNREC.

4.1 Oil Recovery Operations

As described, Filter Scavenger® oil recovery pumps are deployed in RW-1, RW-2, RW-3, RW-4 and RW-6. Water pumps are also deployed to remove water accumulating in the recovery trenches and maintain a low water level in order to enhance oil recovery. Since the evacuated water is routed through granular activated carbon and discharged to ground surface in the track area, operation of the dewatering system is assessed on a regular basis. Water pumping is adjusted so that the evacuated water drains in the track area. The water pumping system is deactivated when periodic water pumping does not provide for efficient oil recovery, when standing water from precipitation is observed in the track area, or if the ground is frozen limiting infiltration into the ground surface.

Routine system checks are performed to: measure the product thickness in the recovery tanks, record totalizer readings from the water management system, replace the filter in the bag filter housing, visually inspect components of the system, and maintain and clean product and water pumps, as necessary. Product is also recovered manually based on the results of liquid level gauging.

Product has been recovered through operation of the oil recovery pumps in the recovery trenches, manual product bailing, and the compressed gas (nitrogen) powered oil recovery pumps. Oil recovery volumes for these methods through December 2006 are summarized below.

Figure 4 depicts the total liquid product recovery from the initiation of the IRM through December 2006. As indicated, the total oil recovery volume is approximately 15,209 gallons. The total recovered volume includes the following:

- Approximately 574 gallons of oil recovered during oil recovery trench construction and approximately 12,207 gallons of oil recovery for the Filter Scavenger product recovery pumps installed in Sump #1, RW-1, RW-2, RW-3, RW-4 and RW-5 (refer to **Figure 5**),
- Approximately 1,263 gallons from the manual recovery program (refer to **Figure 6**), and
- Approximately 718 gallons from the compressed nitrogen gas system (refer to **Figure 7**).

Oil samples are collected from the 1,000 gallon oil recovery AST prior disposal of the product. Recovered oil is removed from the recovery ASTs and transported to a TSCA authorized facility for thermal destruction.

4.2 Liquid Level Gauging Results

Liquid level measurements are recorded from wells, standpipes and sumps on at least a quarterly basis. Monitoring well construction specifications are summarized on **Table 1**.

As first described in the Progress Report dated October 2005, 15 test pits (designated TP-101 through TP-115) were installed in the Former Fueling Facility to a depth of approximately eight feet below ground surface (bgs) during July 2005. The test pits were installed primarily in the southern portion of the recovery trench area in order to evaluate oil occurrence on the water table. During January 2007, an additional 20 test (designated TP-116 through TP-135) pits were installed along the eastern portion of the Fueling Facility (refer to Section 3.2.2 of the Draft Phase II RI/FFS Report).

Quarterly liquid level data collected from site-wide gauging events performed through March 21, 2007 is presented in **Appendix A.** Liquid level data from the site-wide and other gauging events were used to develop hydrographs for select wells in order to evaluate seasonal water table elevation and oil thickness. Hydrographs for recovery wells RW-1 and RW-3 and monitoring wells MW-7 and MW-16 are included in **Appendix A**.

Hydrographs for MW-7 and MW-16 display the seasonal fluctuations of the water table at the site for the period 1998 through March 21, 2007. The water table elevation is typically lowest during the late summer through fall.

The hydrograph from RW-1 is effected by the extraction of water from the trenches during the reporting period (water was not pumped from RW-3 since approximately 2003). Comparison of

the hydrographs for RW-1 and RW-3 to **Figure 5** (cumulative oil recovery for the trench system) confirms that increased oil recovery occurs when the water levels in the trenches are low.

Product has not been detected in monitoring wells MW-1 (and MW-1A), MW-2, MW-3 (and MW-3A), MW-4, MW-8A, MW-11, MW-12, and MW-13 since liquid level gauging began. Since oil was detected in MW-14 for the first time on June 25, 2003, more frequent (weekly) liquid level measurements were collected. A hydrograph for MW-14 is also included in **Appendix A**. Product has not been detected in MW-14 since October 16, 2004 (when an apparent product thickness of 0.01 feet was reported).

As described previously, 15 test pit standpipes (designated TP-101 through TP-115) were installed during July 2005 in order to evaluate product occurrence in the vicinity of the recovery trenches. These test pit standpipe locations are depicted on **Figure 3**. Hydrographs were prepared for TP-105, TP-106 and TP-114 in order to depict the change in apparent product thickness with changing water elevation (refer to **Appendix A**). As indicated on these hydrographs, the greatest apparent product thicknesses in these standpipes were reported during September 2005 when the water table elevation was the lowest since the new standpipes were installed. Product has not been detected in TP-102.

Figure 8 presents the apparent product thickness measurements recorded on March 21, 2007, including all monitoring wells and test pit standpipes. The detection of product in newly installed standpipes is considered in the Draft Phase II RI/FFS Report for the development of remedial alternatives.

In order to evaluate the change in apparent product thickness in site wells and standpipes, apparent product thickness maps were prepared for the July 1, 1998, October 15, 1999, February 2, 2001, and June 24, 2004 gauging events were presented in a previous Progress Report (dated September 2004). Since the apparent product thickness in the wells is affected by the elevation of the water table, the selection of these events allows for the comparison of apparent product thickness over time when the water table was at a similar elevation.

As described in a previous Progress Report (dated April 2005), comparison of data for these gauging events indicated a significant reduction in the apparent thickness is depicted in all wells/standpipes in which greater than 1.0 feet of apparent product thickness was measured on June 1, 1998. As mentioned, product has not been detected in monitoring wells MW-1 (and MW-1A), MW-2, MW-3 (and MW-3A), MW-4. MW-8A, MW-11, MW-12 and MW-13 since liquid level gauging began. However, as described previously, product was detected in new test pit standpipes installed during 2005 and 2007. As described in the Draft (Phase I) RI Report, product bail-down tests were performed during 1998. These tests indicated that the "apparent"

product thickness was 3 to 15 times greater than the "true" product thickness estimated for the wells tested.

4.3 Groundwater Monitoring

The diesel fuel remedial program includes the monitoring of groundwater in order to verify that the natural attenuation of dissolved constituents is occurring. During each sampling event groundwater samples were collected from all wells in which product was not detected.

Groundwater samples have been analyzed for total petroleum hydrocarbons/diesel range organics (TPH-DRO) by modified EPA Method 8015B by Lancaster Laboratories of Lancaster, Pennsylvania. Laboratory analyses have also been performed for iron and manganese (dissolved and total), nitrate, nitrite, sulfate, alkalinity, free carbon dioxide, and methane. During well purging, field measurements of temperature, pH, specific conductance, Eh, and dissolved oxygen were recorded.

Appendix B presents historic groundwater chemistry data for wells sampled since the initiation of the groundwater monitoring program (April 2001). The data indicates that MW-8 and MW-8A (both located west of the former fueling area and near the Western Drainage Ditch where product has been detected in sumps along the ditch) consistently reported the highest TPH-DRO concentrations. In general, the wells located at a greater distance from the former fueling area reported lower TPH-DRO concentrations than the wells closer to the former fueling area. Because of the heterogeneous nature of the subsurface materials at the site, the water chemistry at each well location will reflect local subsurface conditions. The groundwater generally has a low redox potential (less than 0 mV) and low dissolved oxygen content (less than 1.0 mg/l) in the majority of the wells sampled (discussion of anaerobic biodegradation is provided below).

As first discussed in the Progress Report dated April 2004, review of the historic groundwater monitoring data indicates that natural attenuation of dissolved hydrocarbons is occurring in most of the site wells that do not contain free product. The data suggests that the groundwater system is limited by the availability of electron acceptors for aerobic biodegradation (primarily oxygen and nitrates) as evidenced by the elevated concentrations of dissolved iron and manganese (characteristic of anaerobic biodegradation). Naturally occurring diesel fuel-utilizing bacteria are more efficient under aerobic conditions. The elevated concentrations of these dissolved metals indicate that nitrates and dissolved oxygen are generally not available in the groundwater. The data suggests that subsurface conditions alternate from anaerobic to aerobic degradation between rainfall events that release dissolved oxygen to the groundwater when

considering dissolved oxygen, nitrates and oxidation-reduction potential (ORP) as primary indicators of natural attenuation processes (the depth to groundwater is shallow at the site). This is characteristic of a groundwater system where natural attenuation of hydrocarbons is occurring with mixed kinetics. Percolating rainfall provides dissolved oxygen and nitrates into the groundwater to enhance aerobic reduction naturally due to the shallow water table. When oxygen and nitrates are consumed, the system converts to using iron and manganese in the soil as electron acceptors. Considering the presence of hydrocarbons in the subsurface at the site, this process is likely to continue for some time during operation of the remedial system as product is removed.

Because of the mass of hydrocarbons in the subsurface, a significant decrease in TPH-DRO concentrations in groundwater has not been detected in the vicinity of the former fueling area. Although natural attenuation is occurring, the availability of oxygen in the subsurface is limited because it is consumed at a rate faster than it is recharged to the system through percolating rainfall. As separate-phase product is recovered and dissolved petroleum hydrocarbons are degraded, dissolved TPH-DRO concentrations will decrease. Based on the rate of natural attenuation observed, annual groundwater monitoring is proposed (rather than quarterly monitoring). The monitoring performed during 2001 through June 2006 can be used to assess seasonal changes in groundwater chemistry. However, as noted, groundwater chemistry appears to change in response to precipitation events to (providing oxygen to the system) to a greater extent than seasonal fluctuations.

4.4 NPDES Monitoring Program

As described in Section 2.0, surface water data collected by AMTRAK as part of the NPDES monitoring program at the facility is evaluated on an ongoing basis to verify that groundwater discharge does not have an adverse effect on surface water quality in the ditches. A new NPDES permit (DE0050962) became effective May 1, 2006. As previously mentioned, three sampling locations adjacent to or downgradient of the former fueling area (Outfall 001, 005 and 006) are identified in the current NPDES permit are monitored in accordance with the permit.

Prior to the implementation of the new NPDES permit, the only detection of PCBs (detection limit of 0.5 ug/l) in locations receiving run-off from the former fueling area (Outfalls 001, 005, and 006) occurred during January 2006. During January 2006, total PCB aroclors were reported at a concentration of 0.710 ug/l at Outfall 006. AMTRAK contacted DNREC and provided written notification regarding the exceedence on February 28, 2006 (the same day that AMTRAK received the analytical results). As a result of the detection of PCBs, the outfall was also

sampled during February, March and April 2006. PCBs were not detected in any of these subsequent sampling events. Oil and grease was reported at a concentration of 17 mg/l in Outfall 005 (above the permit standard of 15 mg/l) during January 2006, but was below the permit standard in February 2006 and subsequent sampling events.

The monitoring requirements of the new NPDES permit vary by outfall locations and are included in **Appendix C**. Parameters for analysis under the permit include oil and grease, pH, TCE, surfactants, PCB congeners, total nitrogen, total phosphorus, and enterococci. The new permit also requires annual PCB congener analyses from Outfall 006 and Outfall 002, and biannual analyses at Outfall 007.

Outfall 006 receives flow from the Eastern and Western Drainage Ditches. The Eastern Drainage Ditch receives storm water from properties east of the AMTRAK facility including the NS Yard, the cement and asphalt facilities, and a tank car cleaning operation. The Western Drainage Ditch receives direct surface water runoff from the adjacent Atlas Sanitation property which is on the western side of the Western Drainage Ditch. The location of Outfall 006 is tidal and periodically water flows from the Brandywine Creek and City of Wilmington drainage ditch upgradient through Outfall 006 during high tide conditions.

4.5 Stained Surface Soil Remediation

The diesel fuel remedial program includes addressing hydrocarbon-stained surface soils adjacent to the Eastern Drainage Ditch through bioremediation. These soils occur in three general areas adjacent to the Eastern Drainage Ditch; immediately north of the former 250,000 gallon AST location (northern area), immediately south of the former 250,000 gallon AST location (middle area), and to the southwest of Sump ED-1 (southern area) (refer to **Figure 3**).

As described in the Diesel Fuel Remedial Work Plan, diesel fuel components biodegrade most efficiently under aerobic (oxygen-rich) conditions. Under aerobic conditions, indigenous microorganisms utilize inorganic nutrients and oxygen to convert hydrocarbons into cell mass, carbon dioxide, and water. In the areas of the stained surface soils, inorganic nutrients such as nitrogen, phosphorous and potassium have been previously added by tilling a fertilizer into the soils, weather permitting.

All three areas were periodically visibly inspected to determine if the soils were dry enough to allow tilling. Based on visual observations, a greater proportion of each area is covered by vegetation than in the past.

A comparison of petroleum hydrocarbon sample results between samples collected in each of the three areas during June 2005 and November 2001 was provided in the May 2006 progress report and Section 7.1 of the Draft Phase II RI/FFS Report. The results are summarized on **Table 2**. All samples collected in June 2005 reported C5-C8 aliphatic hydrocarbons, C9-C12 aliphatic hydrocarbons, and C9-C-10 aromatic hydrocarbon concentrations below detection levels. In general, C9-C-18 aliphatic hydrocarbons, C19-C-36 aliphatic hydrocarbons, and C11 and C22 aromatic hydrocarbons, reported lower concentrations in 2005 than in 2001 (these are heavier molecular weight hydrocarbons and generally take longer to biodegrade than lighter molecular weight hydrocarbons).

4.6 Evaluation of Operating Systems

The operating system components of the diesel fuel remedy consist of the trench product recovery systems and the compressed gas product recovery systems. These systems are serviced on a routine basis.

4.6.1 Trench Recovery Systems

Product and water recovery pumps associated with the trench recovery system are cleaned and maintained as needed. Components of the product recovery pumps are replaced with new components from the manufacturer based on observations of pump operations. Hoses and tubing are replaced based on visual observations. Overall, the product pumps have been reliable and have effectively removed product accumulating in the recovery wells.

The water pumping systems are deactivated during the winter months so that the water pipes and hoses do not freeze and because the track area may become covered with ice. However, normally product pumps continue to skim product. During the first winter of operations, heat tracing was placed on the product discharge lines from the product pumps. Water in the product discharge line (from clearing the water collected in the pump during normal operations) periodically froze causing the pump to "dead-head". The heat tracing was also placed on the 1,000 gallon recovery tank.

As has been discussed, the operation of the trench dewatering systems significantly increases the volume of product recovered. However, following during rain events the dewatering system is periodically deactivated because the track area where the water is discharged is limited with

respect to the volume of water that can be discharged. In addition, the operation of the water pumps must be sequenced so that all water pumps are not operating at once because of the limited capacity of the discharge area to accept water. AMTRAK and APU are considering routing a portion of the treated water to the property to the east of the Eastern Drainage Ditch where there is significantly more area available to accept the water. This option will be further discussed with DNREC. The increased capacity to manage water will increase the volume of product recovered.

4.6.2 Compressed Gas Recovery Systems

The compressed gas systems require minimal maintenance to continue to effectively skim product collecting in the recovery sumps. The operation and maintenance activities for these systems include cleaning the pump intakes, keeping the battery to the control unit charged and changing out the compressed nitrogen cylinders. The compressed gas and product recovery tubing is inspected regularly and replaced as needed. At this time, there are no plans to move the systems to other recovery locations or to make modifications to the systems.

5.0 REMEDY EVALUATION

Overall, the diesel fuel remedy has been effective in recovering product from the subsurface as indicated by the recovery of 15,200 gallons of product through December 2006. The occurrence and extent of product seeps to the Western Drainage Ditch and sheens on the Eastern Drainage Ditch have significantly reduced since implementation of the diesel fuel remedy based on visual observations. Seeps and sheen that occur are managed by the on-going sorbent boom maintenance program and function of the dams. Surface water quality is monitored in accordance with the NPDES permit for the facility.

The rate of product recovery is affected by the ability to effectively dewater the recovery trenches. Increased product recovery is observed when a low water level can be maintained in the trenches. If the capacity to manage water is increased, the rate of oil recovery is anticipated to increase.

The apparent product thickness in the monitoring locations is also affected by the water table elevation. Review of hydrographs indicates the greatest apparent product thicknesses occur under lower water table conditions and the apparent product thicknesses diminish as the water table rises. As described by USEPA (1996) ("How to Effectively Recovery Free Product at Leaking Underground Storage Tank Sites: A Guide for State Regulators", EPA-510-R-96-001), fluctuations in the water table can result in large differences in the apparent LNAPL thickness. The referenced literature also notes that increasing product thickness is commonly observed with declining water tables, which is supported by site observations. The increase was attributed to drainage from the unsaturated zone or as the water table falls, product previously trapped in the residual phase (in the zone of water saturation) is mobilized and detected in monitoring wells. Conversely, as the water table elevation rises, residual product may be trapped below the water table. Therefore, long-term trends in apparent product thicknesses (refer to Section 4.2) and the rate of product recovery can be used to evaluate system performance.

Based on the results of site investigations and systems operations, the use of dual pump systems (product skimming pumps in conjunction with dewatering pumps) installed in the recovery wells, remains the recommended technology for product recovery. The trenches allow product recovery over a large cross-sectional area of the subsurface when compared to well point systems. Also, the subsurface materials are heterogeneous and product has been encountered within the void space of fill materials. Trenches are also more effective in containing and intercepting product movement under these conditions. The use of dual pumps (compared to total fluids extraction with above-ground oil/water separation) is also more efficient because less water is pumped. Product pumps can continue to operate under freezing

conditions when water cannot be treated above-ground due to freezing conditions. Also, the effects product emulsification through an oil/water separator is minimized by dual pump recovery systems. An evaluation of other product recovery techniques was provided in the Diesel Fuel Remedial Work Plan.

Because of the mass of hydrocarbons in the subsurface, a significant decrease in TPH-DRO concentrations in groundwater has not been detected in the vicinity of the former fueling area. Although groundwater monitoring indicates that natural attenuation is occurring, the availability of oxygen in the subsurface is limited because it is consumed at a rate faster than it is recharged to the system through percolating rainfall. As product is recovered and dissolved petroleum hydrocarbons are degraded, dissolved TPH-DRO concentrations will decrease. The monitoring performed during 2001 through June 2006 can be used to assess seasonal changes in groundwater chemistry. However, as previously noted groundwater chemistry appears to change in response to precipitation events (providing oxygen to the system) to a greater extent than seasonal fluctuations.

Since groundwater is not used at the site and there are no occupied buildings in the Former Fueling Facility, discharge to surface water is the most significant groundwater receptor. Surface water data collected during NPDES monitoring at locations adjacent to the Former Fueling Facility is reviewed in order to monitor surface water chemistry.

Soil samples were collected during 2001 and 2006 in order to assess the effectiveness of the surface soil bioremediation program in three areas in the vicinity of the Eastern Drainage Ditch. All samples collected in June 2005 reported C5-C8 aliphatic hydrocarbons, C9-C12 aliphatic hydrocarbons, and C9-C-10 aromatic hydrocarbon concentrations below detection levels. These are the lower molecular weight and more mobile components of diesel fuel. In general, C9-C-18 aliphatic hydrocarbons, C19-C-36 aliphatic hydrocarbons, and C11 and C22 aromatic hydrocarbons, reported lower concentrations in 2005 than in 2001 (these are heavier molecular weight hydrocarbons and generally take longer to biodegrade than lighter molecular weight hydrocarbons).

6.0 CONCLUSIONS AND RECOMMENDATIONS

This Five-year Remedy Evaluation Report (RER) has been prepared to document and evaluate the operation and monitoring of the diesel fuel remedy at the Former Fueling Facility portion of the AMTRAK Wilmington Shops. This RER is being submitted as a component of the Draft Phase II RI/FFS Report as previously proposed to DNREC.

In response to the quantification of PCBs in product at the Former Fueling Facility, interim remedial measures (IRM) were implemented during 1998 to further characterize PCBs in product, initiate product recovery, and further control/contain the surface occurrence of product in the Eastern and Western Drainage Ditches. Other activities were performed in order to prevent the release and control the movement of product in the vicinity of the Former Fueling Facility including: the installation of the dams and sorbent booms in the Eastern and Western Drainage Ditches; the upgrade of the dams; the transfer of fueling operations to a newly constructed facility north of the former roundhouse, and removal of ASTs.

AMTRAK and APU proactively developed the Diesel Fuel Remedial Work Plan to increase diesel fuel recovery and reduce the mobility of the diesel fuel. The oil recovery system described in the Diesel Fuel Remedial Work Plan was installed during the period September to December 2000. The system was installed to address liquid phase diesel-fuel occurrence in the Former Fueling Facility.

The remedial approach described in the Diesel Fuel Remedial Work Plan included: product recovery in the vicinity of the general source area (former fueling area); reducing visible oil stains in surface soils adjacent to the Eastern Drainage Ditch through bioremediation; product containment/recovery along the Western Drainage Ditch; and identification and removal of preferential oil migration pathways to the drainage features. Sorbent booms in the drainage features are also maintained as appropriate. The remedial strategy also provides for the ongoing evaluation of the effectiveness of the remedial action through liquid level measurements, groundwater sampling, and surface water (NPDES) sampling as well as the visual inspection of soils and sorbent booms.

6.1 Conclusions

Conclusions from the evaluation of the operation of the diesel fuel remedy are summarized below:

- Overall, the diesel fuel remedy has been effective in recovering product from the subsurface as indicated by the recovery of more than 15,200 gallons of product through December 2006.

- The rate of product recovery is affected by the ability to effectively dewater the recovery trenches. Increased product recovery is observed when a low water level can be maintained in the trenches.

- Based on the results of site investigations and systems operations, the use of dual pump systems (product skimming pumps in conjunction with dewatering pumps) installed in the recovery wells, remains the recommended technology for product recovery.

- Review of hydrographs indicates the greatest apparent product thicknesses occur under lower water table conditions and the apparent product thicknesses diminish as the water table rises.

- Because of the mass of hydrocarbons in the subsurface, a significant decrease in TPH-DRO concentrations in groundwater has not been detected in the vicinity of the former fueling area, although natural attenuation processes are occurring.

- Groundwater is not used at the site and there are no occupied buildings in the Former Fueling Facility. As a result, the discharge to surface water is the most significant groundwater receptor and surface water data collected during NPDES monitoring at locations adjacent to the Former Fueling Facility is reviewed in order to monitor surface water chemistry.

6.2 Recommendations

Considering the evaluation of the operation and monitoring of the diesel fuel remedy and the results of site investigations documented in the Draft Phase II RI/FFS Report, the following recommendations have been developed.

- Continue the operation of the current diesel fuel recovery systems as a component of the overall remedy for the site.

- Modify the current diesel fuel remedy consistent with the VCP, Draft Phase II RI/FFS Report, and Plan of Remedial Action process. The recommended alternative for product in the subsurface identified in the Draft Phase II RI/FFS Report is to augment the current recovery systems with perimeter interceptor/recovery trenches in order to further protect the site drainage features from potential migration of product in the subsurface.

- Pursue options to increase the capacity to manage water pumped from the recovery trenches in order to enhance the rate of product recovery. An option to be further discussed with DNREC is to route the treated water to the AMTRAK property to the east of the Eastern Drainage Ditch.

- Based on the rate of natural attenuation observed, perform groundwater monitoring an annual basis proposed (rather than quarterly monitoring). The groundwater monitoring frequency could be increased in perimeter monitoring wells once the remedial action objectives for product on the water table (refer to Section 2.2) are met.

- Discontinue the surface soil bioremediation program in the three areas adjacent to the Eastern Drainage Ditch. The lower molecular weight and more mobile hydrocarbons have been reduced to nondetectable concentrations. The residual higher molecular weight and less mobile hydrocarbons would be addressed by the implementation of the remedy for the site-wide soils (refer to Section 13.0 of the Draft Phase II RI/FFS Report).

- Continue to review the results of sampling performed in accordance with NPDES permit in order to monitor surface water quality.

TABLES

Table 1
Monitoring Well Construction Details
Amtrak Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

Well ID	Well Depth (feet)	Installation Date	Ground Elevation (feet)[1]	Top of Casing Elevation (feet)[1]	Well Diameter (inches)	Riser Interval (feet bgs)	Screen Interval (feet bgs)
MW-1	13.0	11/30/94	5.70	5.32	2.0	0.0 - 3.0	3.0 - 13.0
MW-1A	13.0	01/13/04	5.42	7.83	2.0	0.0-2.0	2.0 - 13.0
MW-2	13.0	11/29/94	9.50	9.26	2.0	0.0 - 4.0	4.0 - 13.0
MW-3	17.0	11/28/94	15.00	14.59	2.0	0.0 - 7.0	7.0 - 17.0
MW-3A	17.0	01/13/04	14.33	16.55	2.0	0.0-5.0	5.0 - 17.0
MW-4	14.0	11/30/94	9.09	8.98	2.0	0.0 - 4.0	4.0 - 14.0
MW-5	13.0	11/30/94	9.80	9.48	2.0	0.0 - 3.0	3.0 - 13.0
MW-6*	13.0	11/30/94	---	---	---	---	---
MW-6A	15.0	06/01/98	8.60	12.39	4.0	0.0 - 2.5	2.5 - 15.0
MW-7	13.0	11/29/94	---	8.99	2.0	0.0 - 3.0	3.0 - 13.0
MW-8	14.0	11/30/94	8.30	7.92	---	---	---
MW-8A	14.0	06/02/98	8.27	8.01	4.0	0.0 - 2.0	2.0 - 14.0
MW-9	13.0	11/29/94	9.40	9.25	2.0	0.0 - 3.0	3.0 - 13.0
MW-10*	13.0	11/29/94	---	---	---	---	---
MW-10A	16.0	06/01/98	---	7.27	4.0	0.0 - 3.0	3.0 - 16.0
MW-11	14.0	12/01/94	7.00	7.97	2.0	0.0 - 4.0	4.0 - 14.0
MW-12	14.0	12/01/94	7.30	7.04	2.0	0.0 - 4.0	4.0 - 14.0
MW-13	12.0	06/02/98	6.90	6.66	4.0	0.0 - 1.0	1.0 - 12.0
MW-14	14.0	06/02/98	8.70	8.41	4.0	0.0 - 2.0	2.0 - 14.0
MW-15	14.0	06/02/98	8.80	8.54	4.0	0.0 - 2.0	2.0 - 14.0
MW-16	14.0	06/02/98	10.10	9.67	4.0	0.0 - 2.0	2.0 - 14.0
MW-17	14.0	06/01/98	---	4.88	4.0	0.0 - 2.0	2.0 - 14.0

Notes:

[1] All elevations measured by professional surveyor relative to bench mark located at the top of existing National Geodetic Survey Disk stamped R-21 1929 in the top east corner of the concrete base of the east leg of high tension line tower No. 8 CR 6822. Elevation 11.99 feet. Elevations were then converted to NAVD, 1988.

* Monitoring wells MW-6, MW-8, and MW-10 were destroyed and replaced with wells MW-6A, MW-8A, and MW-10A.

P:\Clients\Amtrak-APU\Phase 2 RI REPORT\Tables\[WELLINFO.XLS]Table 1

TABLE 2

Stained Soil Areas Surface Soil Sample
Petroleum Hydrocarbon Results - 2001 and 2005

Amtrak Former Fueling Facility
4001 Vandever Avenue
Wilmington, DE

Northern Stained Soil Area

Sample ID		SSA-1A		SSA-1B		SSA-1D		SSA-1C		Average for Northern		URS for Protection Of Human-Health
Sample Date		06/08/05		06/08/05		06/08/05		06/08/05		06/08/05	11/29/2001	
						Duplicate of SSA-1B						
Parameter	Units	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Result	Result	
C9 to C18 Aliphatics	mg/kg	4900 J	380	13000 J	830	18000 J	1700	5400 J	300	10,325	23,000	2500
C19 to C36 Aliphatics	mg/kg	13000 J	750	31000 J	1700	42000 J	3400	9300 J	610	23,825	25,000	5000
C11 to C22 Aromatics	mg/kg	6800 J	380	27000 J	1700	29000 J	1700	7500 J	610	17,575	23,000	2000
C5-C8 Aliphatic Hydrocarbons	mg/kg	ND	735	ND	866	ND	1420	ND	744	ND	ND	500
C9-C12 Aliphatic Hydrocarbons	mg/kg	ND	735	ND	866	ND	1420	ND	744	ND	487	2500
C9-C10 Aromatic Hydrocarbons	mg/kg	ND	735	ND	866	ND	1420	ND	744	ND	105	500

Middle Stained Soil Area

Sample ID		SSA-2A		SSA-2B		SSA-2C		Average for Middle		URS for Protection Of Human-Health
Sample Date		06/08/05		06/08/05		06/08/05		06/08/05	11/29/2001	
Parameter	Units	Result	MDL	Result	MDL	Result	MDL	Result	Result	
C9 to C18 Aliphatics	mg/kg	40000 J	1000	5000 J	360	6800 J	400	17,267	32,000	2500
C19 to C36 Aliphatics	mg/kg	10000 J	2000	1500 J	720	2400 J	790	4,633	11,000	5000
C11 to C22 Aromatics	mg/kg	23000 J	2000	1300 J	140	6600 J	400	10,300	41,000	2000
C5-C8 Aliphatic Hydrocarbons	mg/kg	ND	860	ND	598	ND	808	ND	39 J	500
C9-C12 Aliphatic Hydrocarbons	mg/kg	ND	860	ND	598	ND	808	ND	750	2500
C9-C10 Aromatic Hydrocarbons	mg/kg	ND	860	ND	598	ND	808	ND	230	500

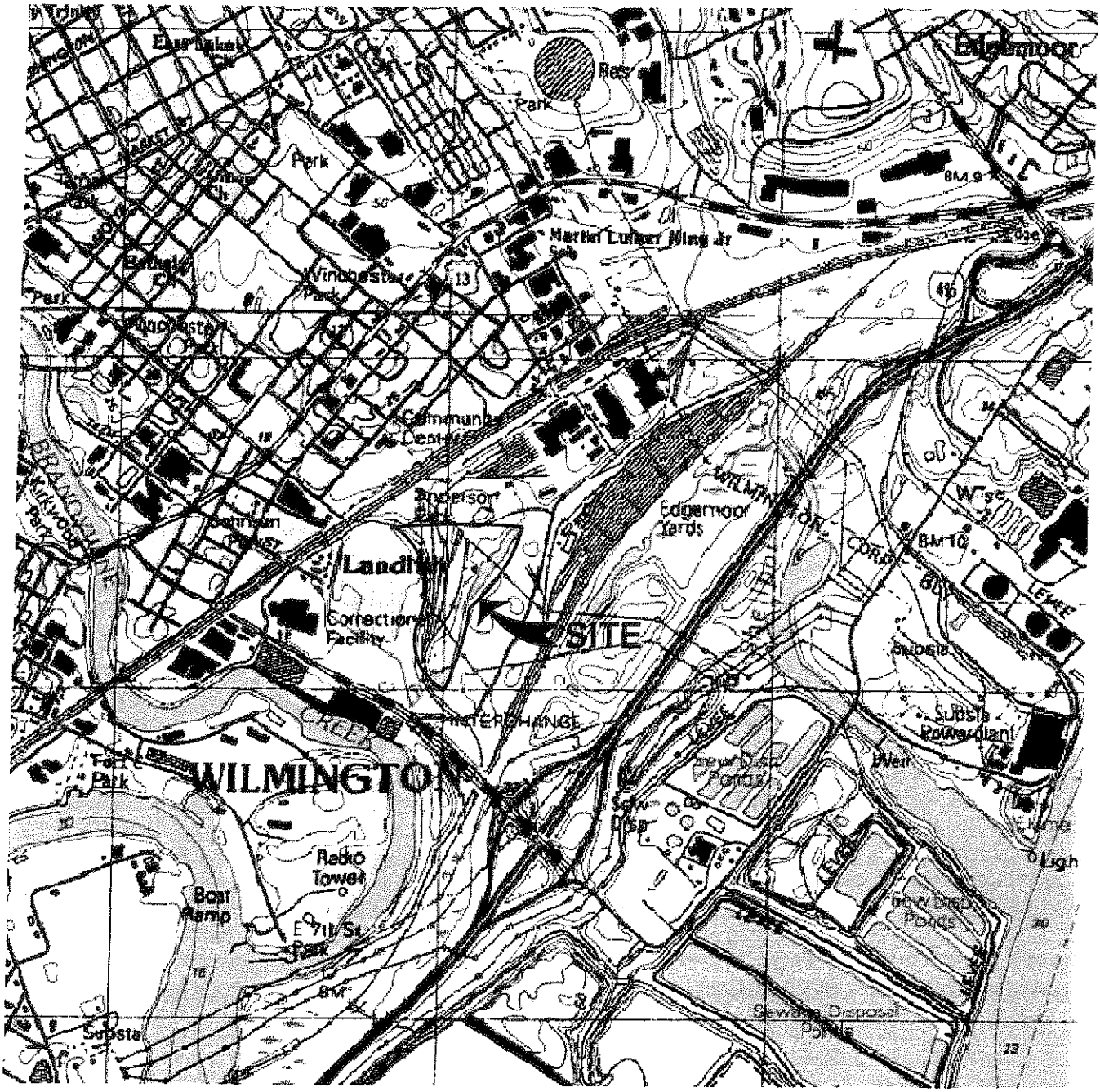
Southern Stained Soil Area

Sample ID		SSA-3A		SSA-3B		SSA-3C		Average for Southern		URS for Protection Of Human-Health
Sample Date		06/08/05		06/08/05		06/08/05		06/08/05	11/29/2001	
Sample Depth										
Parameter	Units	Result	MDL	Result	MDL	Result	MDL	Result	Result	
C9 to C18 Aliphatics	mg/kg	3700 J	410	1200 J	79	3800 J	340	2,900	20,000	2500
C19 to C36 Aliphatics	mg/kg	2200 J	810	880 J	160	1200 J	680	1,427	22,000	5000
C11 to C22 Aromatics	mg/kg	4200 J	410	1100 J	160	2000 J	340	2,433	30,000	2000
C5-C8 Aliphatic Hydrocarbons	mg/kg	ND	844	ND	642	ND	706	ND	58	500
C9-C12 Aliphatic Hydrocarbons	mg/kg	ND	844	ND	642	ND	706	ND	1,530	2500
C9-C10 Aromatic Hydrocarbons	mg/kg	ND	844	ND	642	ND	706	ND	221	500

NOTES:
MDL = Method detection limit
mg/kg = milligrams per kilogram
ND = Not detected at or above the method detection limit
J = Estimated value
Standards based on Delaware Uniform Risk-Based Remediation Standards for non-critical water resource area.
Petroleum Hydrocarbons - Mass.-EPH analyzed by MA EPH method 1/98 and Mass.-VPH analyzed by MADEP-VPH method modified 8021B
PCB Aroclors analyzed by Method 8082

P:\Clients\Amtrak-AP\05 Year Review\[Table 2.xls]Stained area validated

FIGURES



QUADRANGLE LOCATION

N

0 1/4 1/2

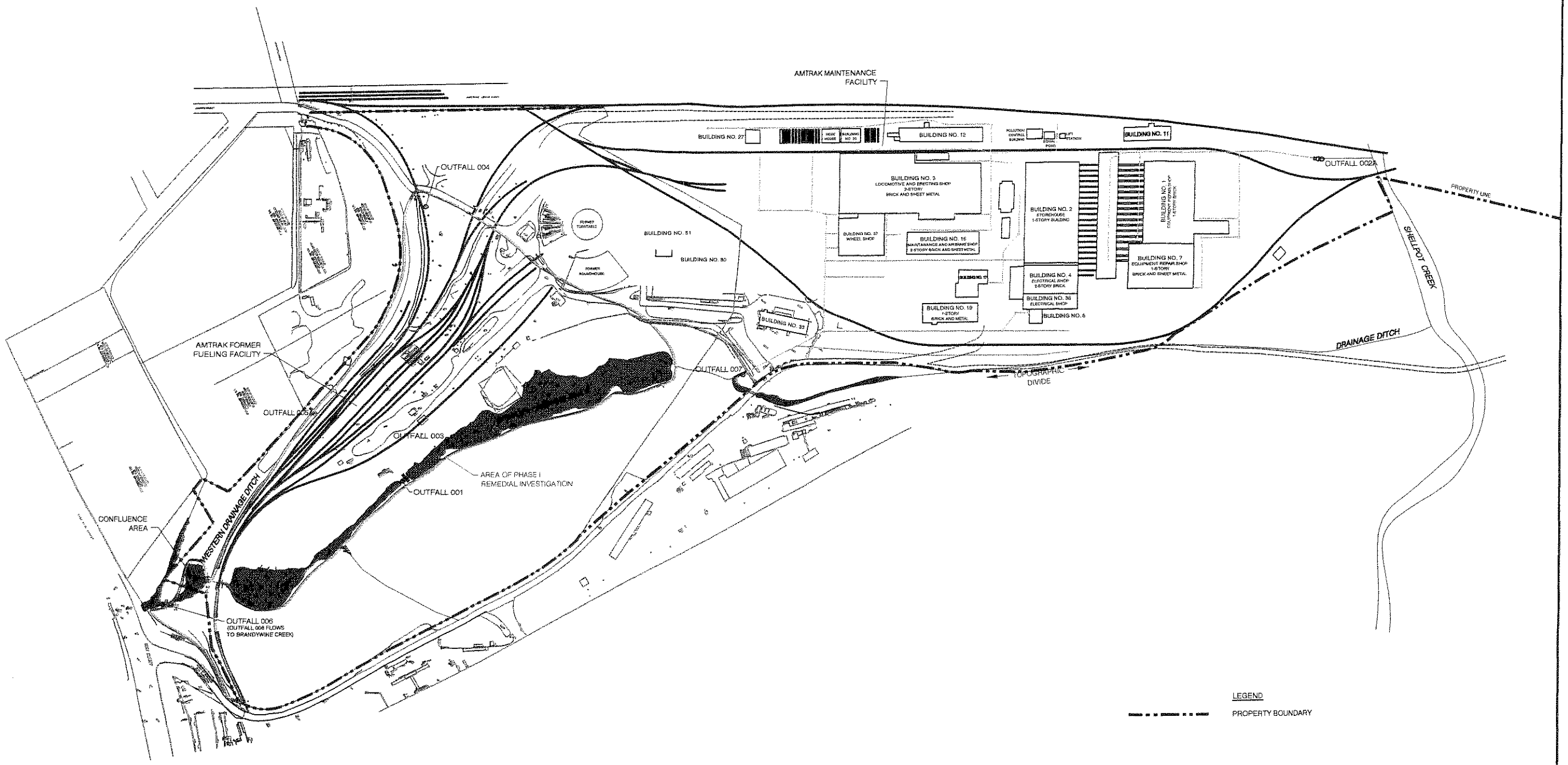
MILES

REFERENCE: USGS 7.5 MINUTE QUADRANGLE; WILMINGTON SOUTH, DELAWARE/PENNSYLVANIA , 1997

SECOR
102 PICKERING WAY, SUITE 200
EXTON, PENNSYLVANIA
PHONE: (484) 875-3075/875-9286 (FAX)

FOR:				FIGURE:
AMTRAK FORMER FUELING FACILITY 4001 VANDEVER AVENUE WILMINGTON, DELAWARE		SITE LOCATION MAP		1
JOB NUMBER:	DRAWN BY: KEF	CHECKED BY: SB	APPROVED BY:	DATE: 04/25/2007

62OT-1057-1-1.DWG



SECOR
102 PICKERING WAY, SUITE 300
EXTON, PENNSYLVANIA
PHONE: (484) 873-5076/875-6266 (FAX)

FOR:
AMTRAK FORMER FUELING FACILITY
VANDEVER AVENUE
WILMINGTON, DELAWARE

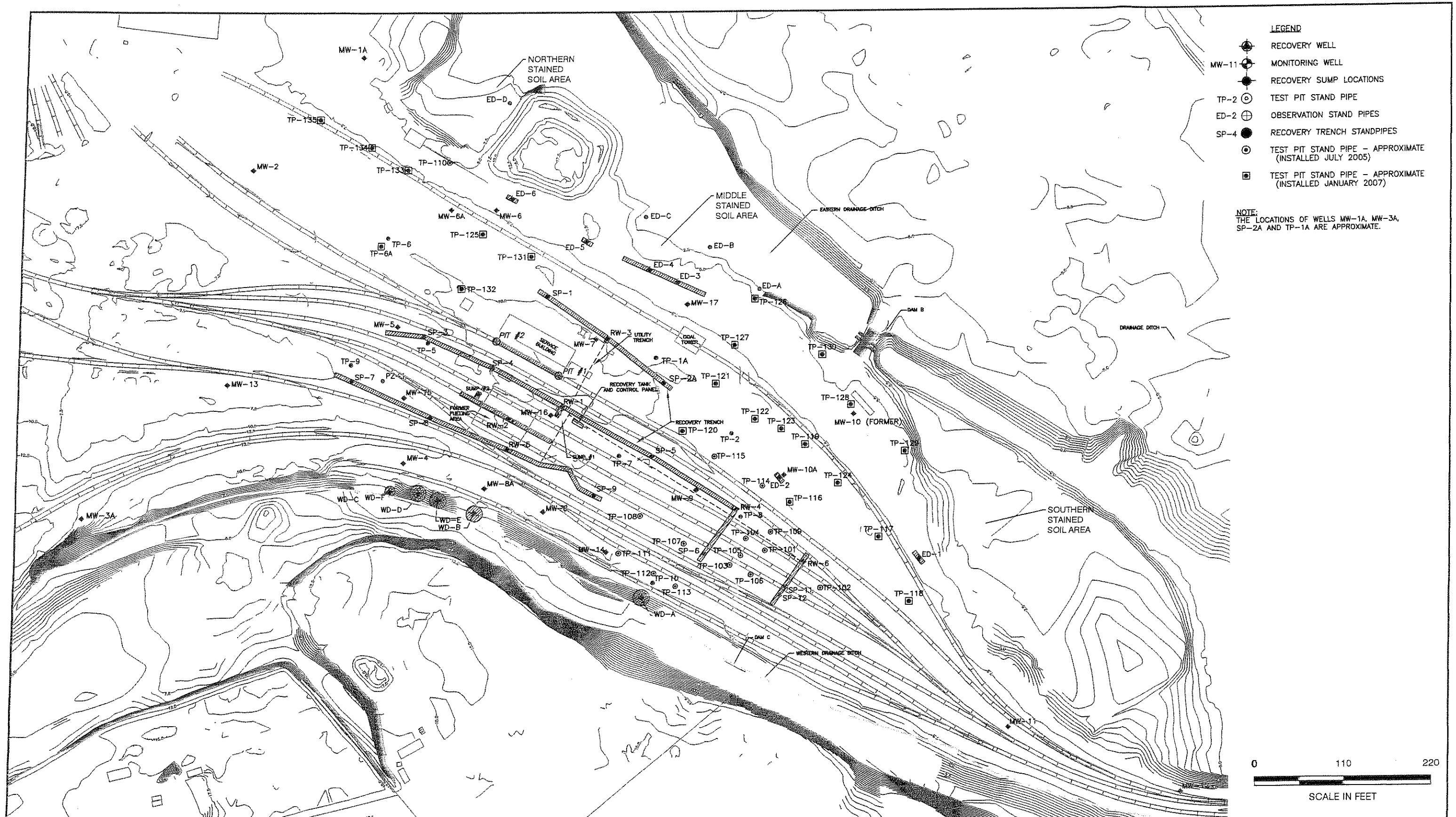
SITE PLAN

PLATE: 2

JOB NUMBER: 6207-01057
DRAWN BY: KEF
CHECKED BY: SB
APPROVED BY:
DATE: 04/27/2001

FILEPATH: PHASE II RI REPORT - 2007

6207-1057-1-2.DWG



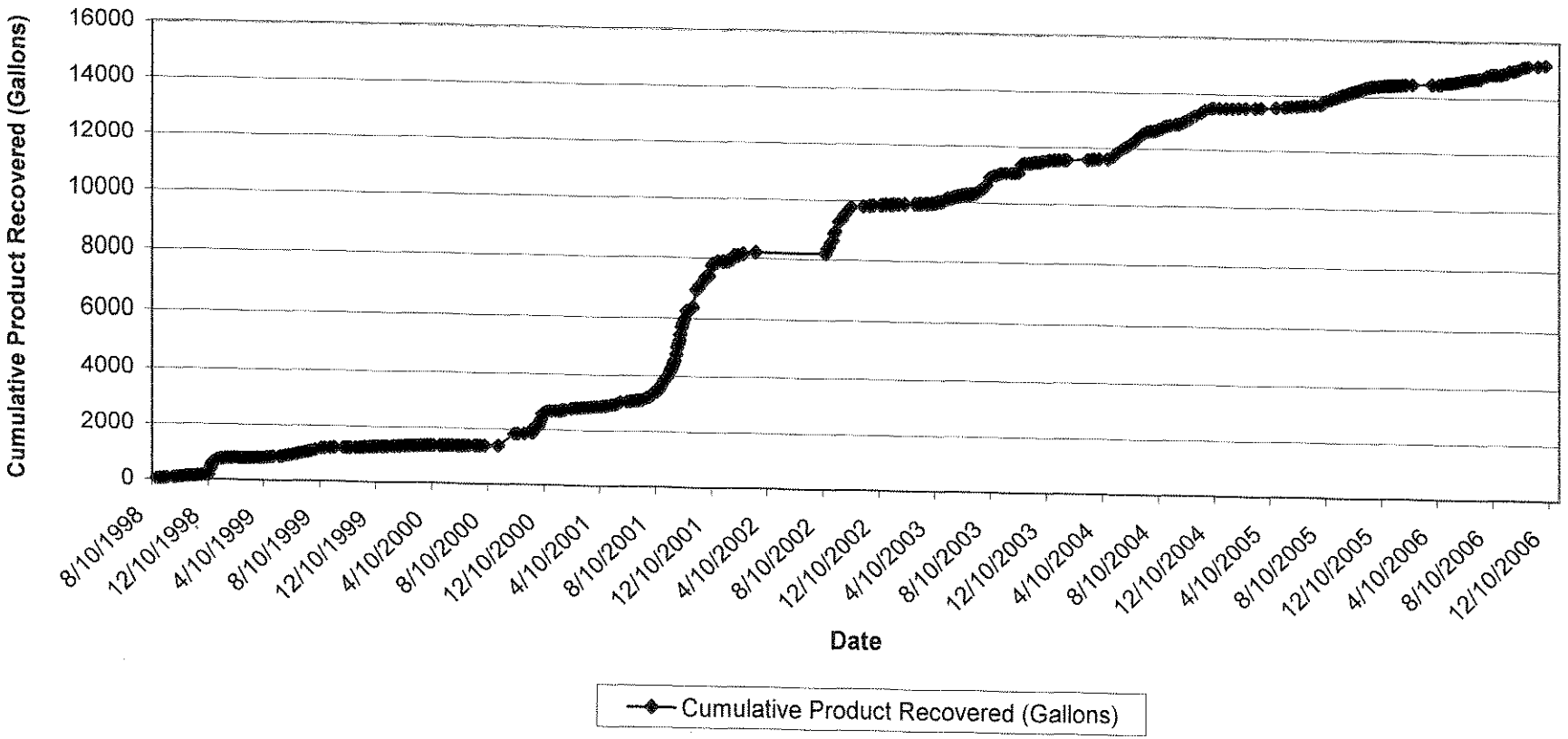
SECOR
102 PICKERING WAY, SUITE 200
EXTON, PENNSYLVANIA
PHONE: (484) 875-3075/875-9286 (FAX)

FOR:				FIGURE:
AMTRAK FORMER FUELING FACILITY 4001 VANDEVER AVENUE WILMINGTON, DELAWARE		LAYOUT OF REMEDIAL SYSTEM		3
JOB NUMBER: 62OT.01057	DRAWN BY: KEF	CHECKED BY: SB	APPROVED BY:	DATE: 04/27/2007

FILEPATH: PHASE II RI REPORT - 2007

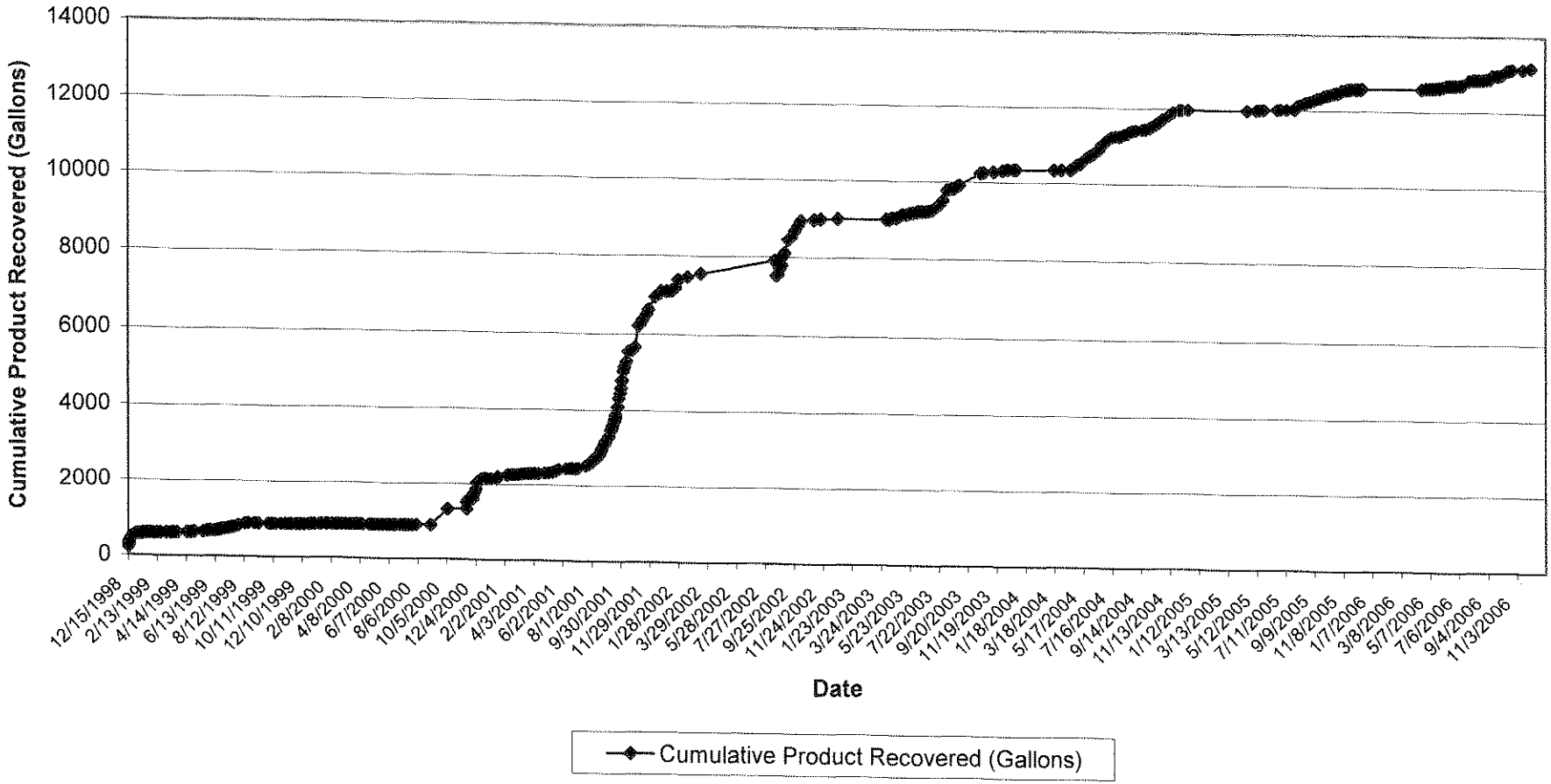
62OT-1057-3-1.DWG

FIGURE 4
Cumulative Product Recovered
Manual Recovery, Sump #1 (IRM), Trench Recovery Wells,
Construction Dewatering and Compressed Gas System
Through December 2006
Amtrak Former Fueling Facility
4001 Vandever Avenue, Wilmington, Delaware



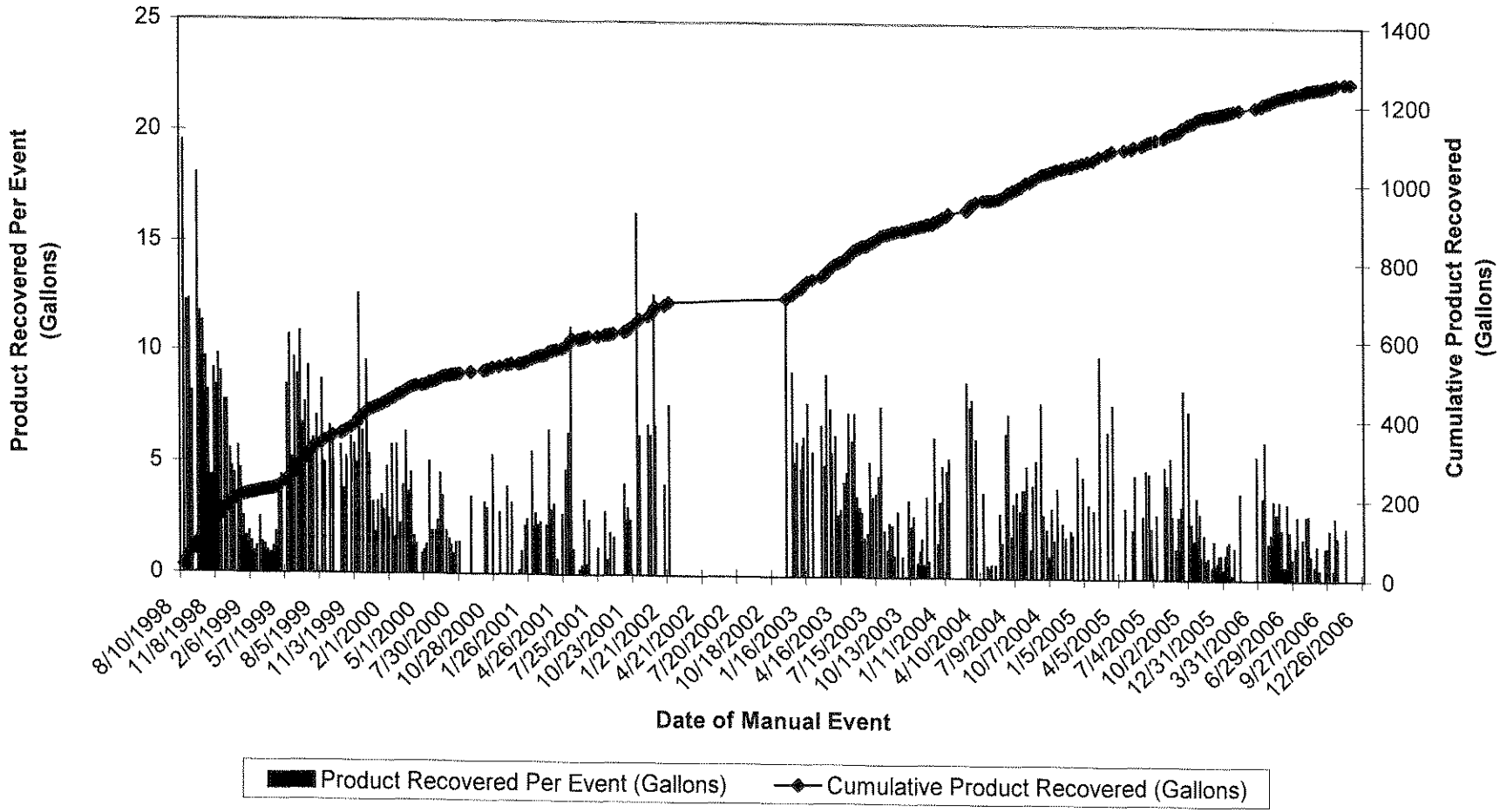
S:/Clients/Amtrak-APU/LPH/Product Recovery tables through december 2006 r.xls/total rec chart

FIGURE 5
Cumulative Product Recovered
Sump #1 (IRM), Trench Recovery Wells and Construction Dewatering
Through December 2006
Amtrak Former Fueling Facility
4001 Vandever Avenue, Wilmington, Delaware



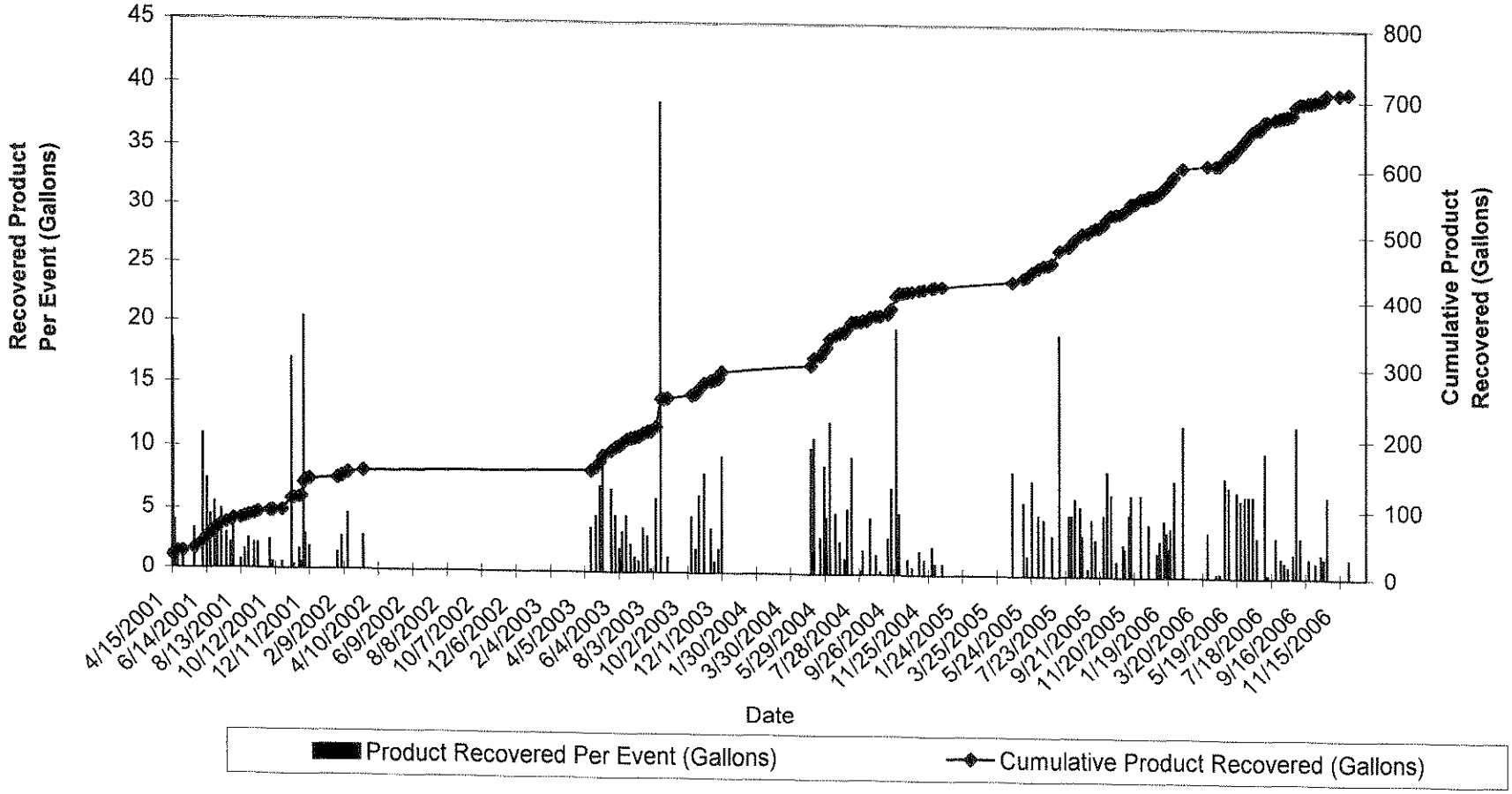
S:/Clients/Amtrak-APU/LPH/Product Recovery tables through december 2006 r.xls/Sys Cht

FIGURE 6
Product Recovered Per Event and Cumulative Product Recovered
Manual Recovery
Through December 2006
Amtrak Former Fueling Facility
4001 Vandever Avenue, Wilmington, Delaware

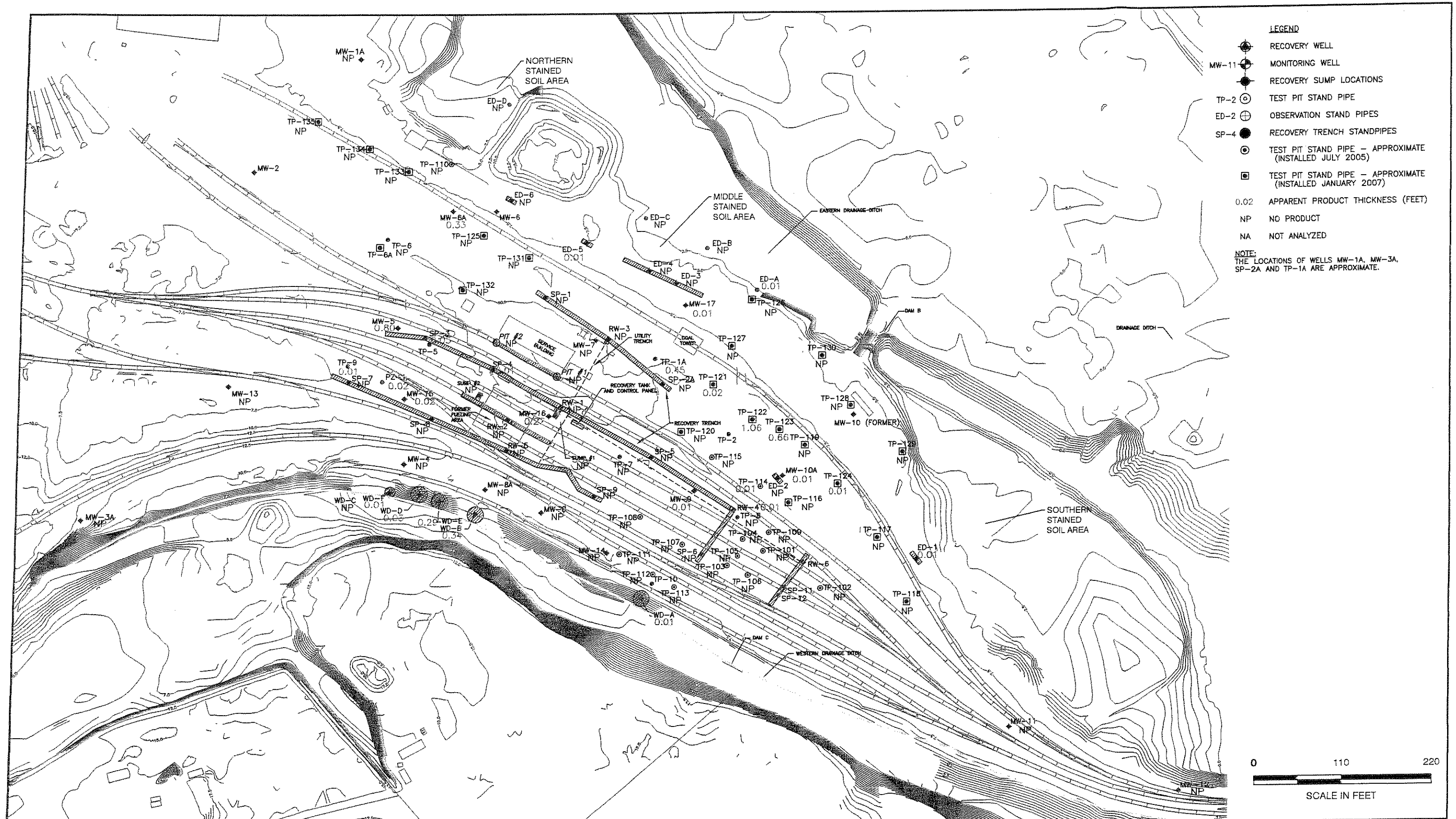


S:/Clients/Amtrak-APU/LPH/Product Recovery tables through december 2006 r.xls/man rec chart

FIGURE 7
Product Recovered Per Event and Cumulative Product Recovered
Compressed Gas System
Through Decmber 2007
Amtrak Former Fueling Facility
4001 Vandever Avenue, Wilmington, Delaware



S:/Clients/Amtrak-APU/LPH/Product Recovery tables through december 2006 r.xls/Xitech Cht



SECOR
102 PICKERING WAY, SUITE 200
EXTON, PENNSYLVANIA
PHONE: (484) 875-3075/875-9286 (FAX)

FOR:
AMTRAK FORMER FUELING FACILITY
4001 VANDEVER AVENUE
WILMINGTON, DELAWARE

TEST PIT STANDPIPE APPARENT PRODUCT THICKNESS MARCH 21, 2007

FIGURE: **8**

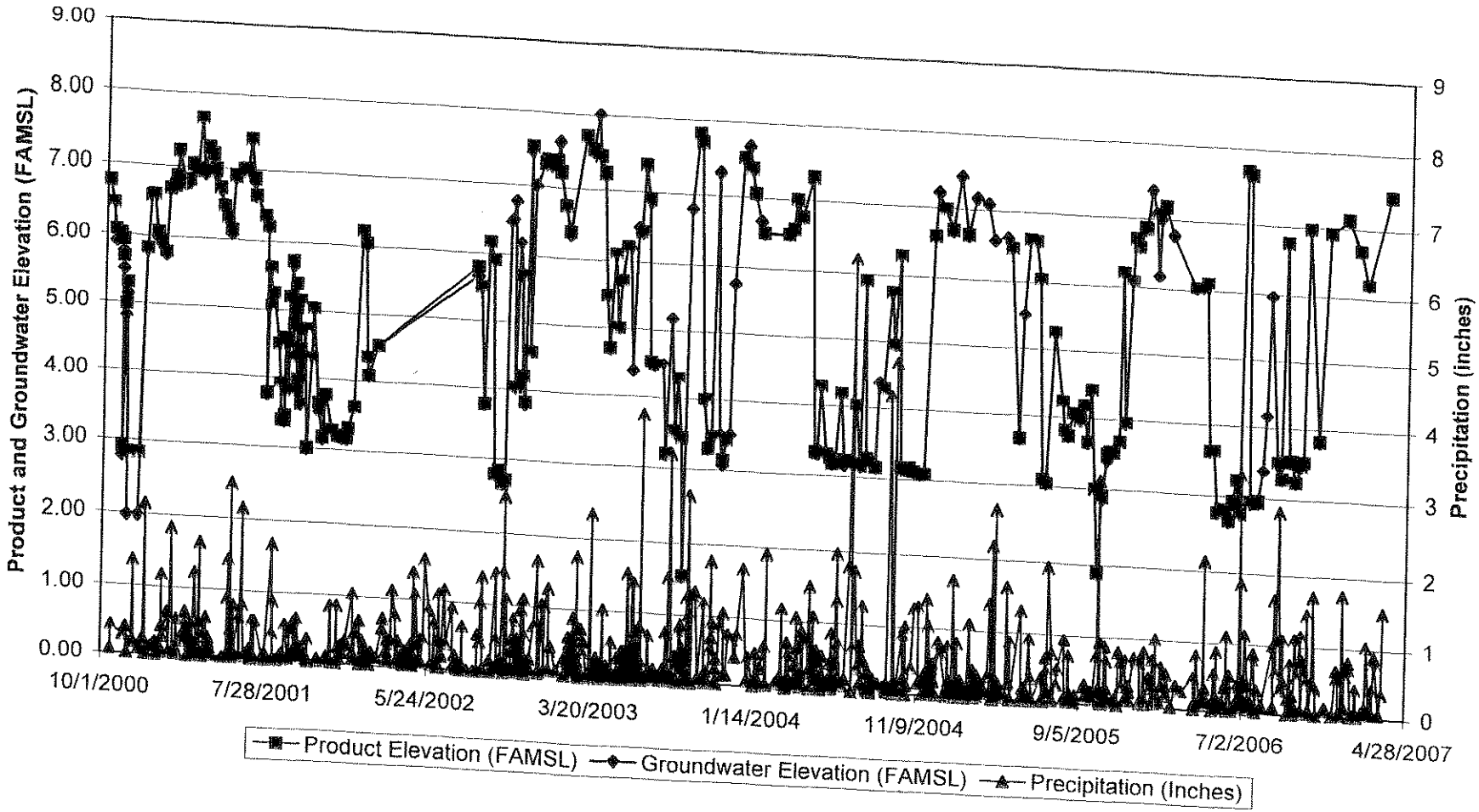
JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
62OT.01057	KEF	SB		04/27/2007

FILEPATH: PHASE II RI REPORT - 2007

62OT-1057-3-6.DWG

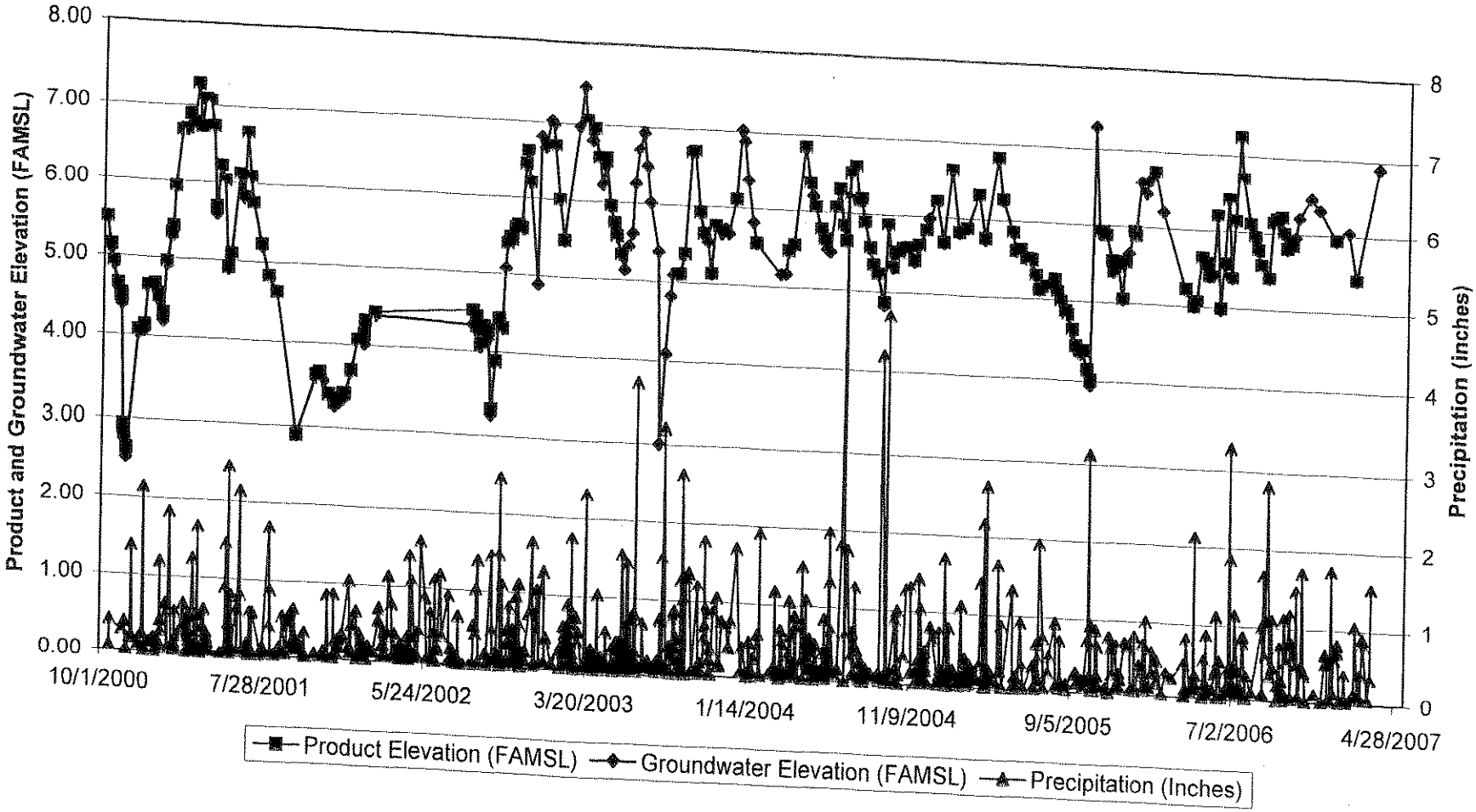
APPENDIX A
LIQUID LEVEL GAUGING DATA AND SELECT HYDROGRAPHS

AMTRAK Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware
RW-1
Through March 21, 2007 Hydrograph



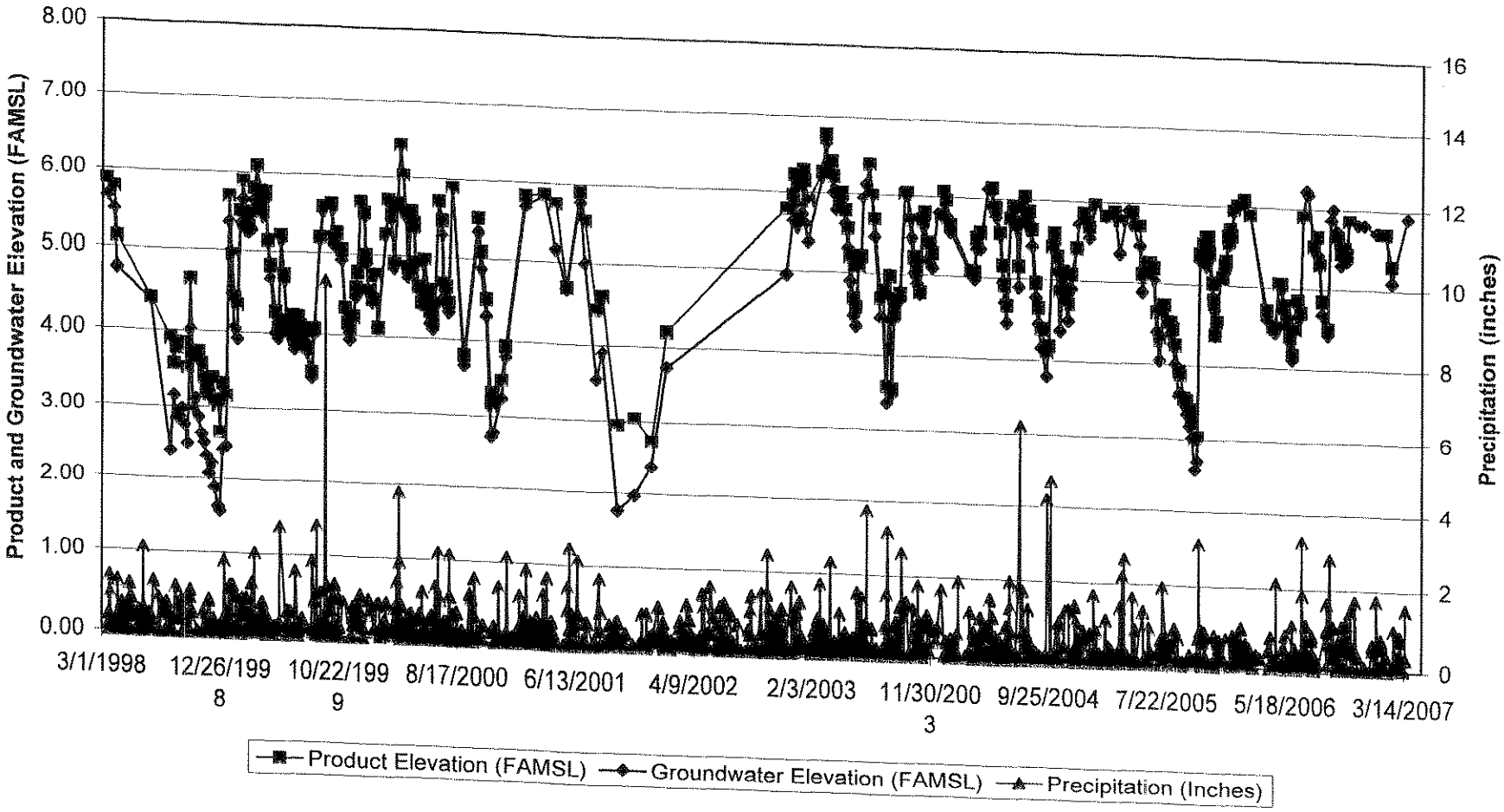
S:/Clients/Amtrak-APU/Hydrographs/2005 (through jan 07) Hydrographs (RW-1,-3, MW-7,16,14)/RW-1 chart

AMTRAK Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware
RW-3
Through March 21, 2007 Hydrograph



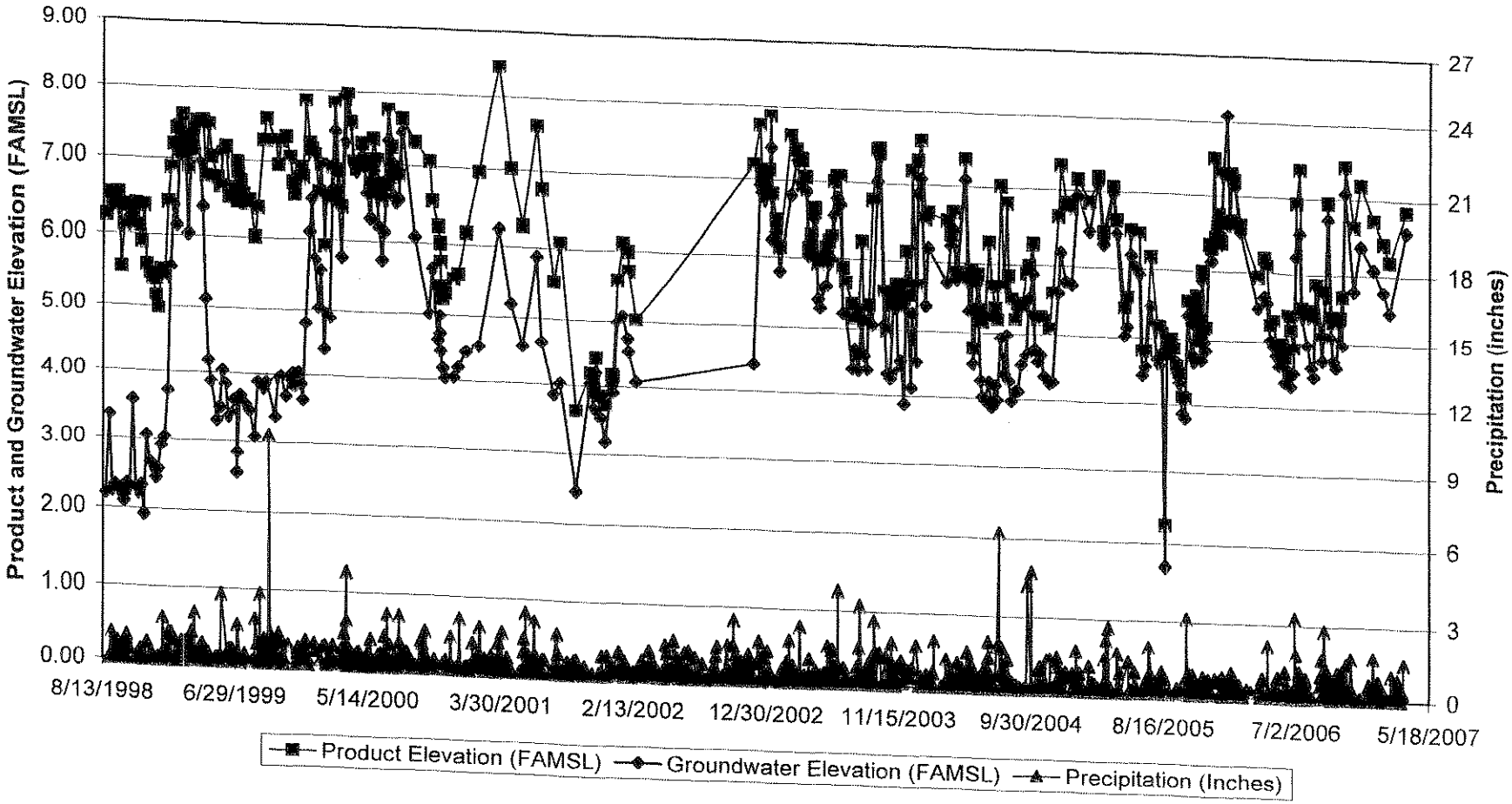
S:/Clients/Amtrak-APU/Hydrographs/2005 (through jan 07) Hydrographs (RW-1,-3, MW-7,16,14)/RW-3 chart

AMTRAK Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware
MW-7
Through March 21, 2007 Hydrograph

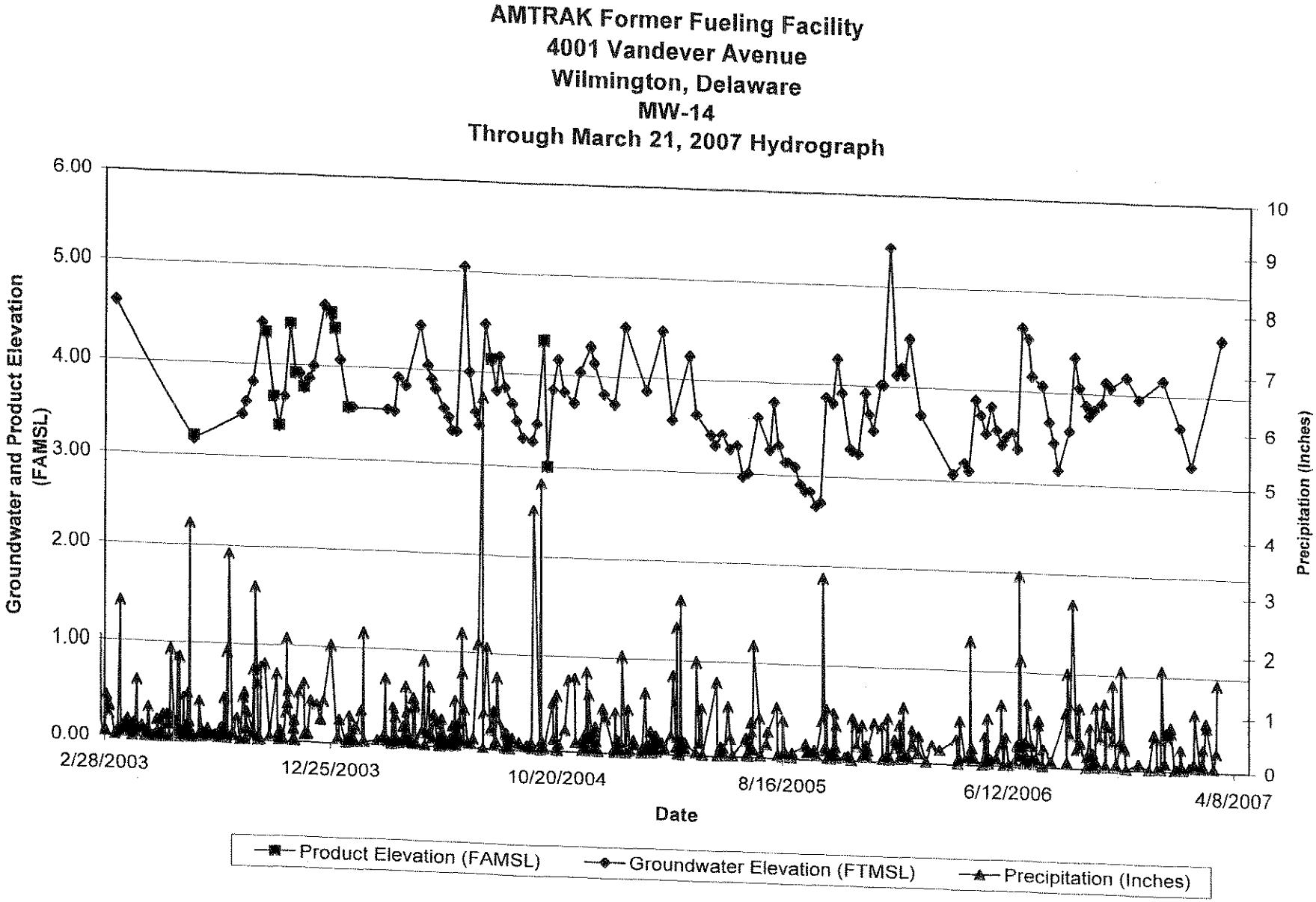


S:/Clients/Amtrak-APU/Hydrographs/2005 (through jan 07) Hydrographs (RW-1,-3, MW-7,16,14)/MW-7 chart

AMTRAK Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware
MW-16
Through March 21, 2007 Hydrograph

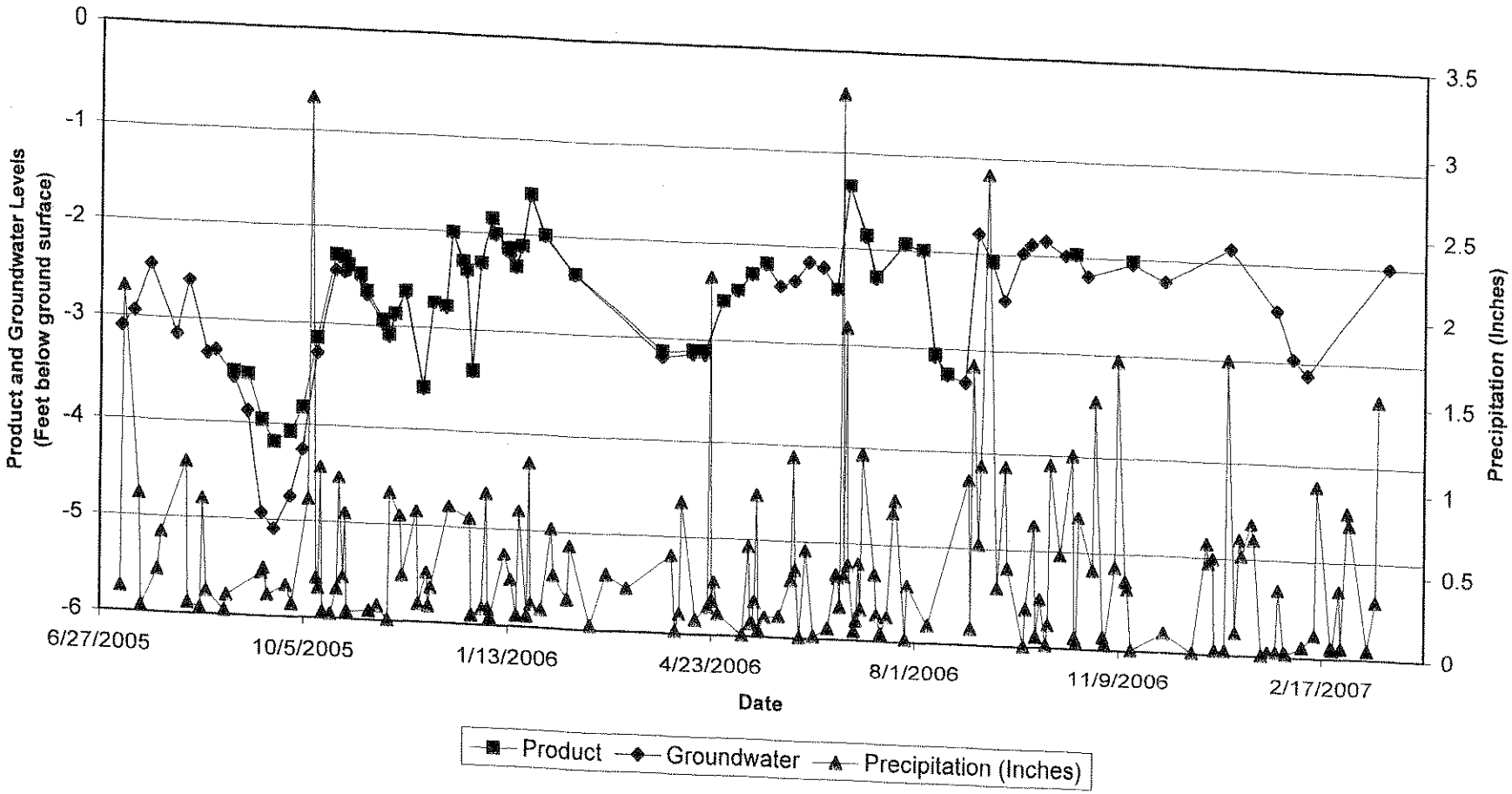


S:/Clients/Amtrak-APU/Hydrographs/2005 (through jan 07) Hydrographs (RW-1,-3, MW-7,16,14)/MW-16 chart


AMTRAK Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware
MW-14
Through March 21, 2007 Hydrograph
Groundwater and Product Elevation (FAMSL)
Precipitation (Inches)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
10
9
8
7
6
5
4
3
2
1
0
2/28/2003
12/25/2003
10/20/2004
8/16/2005
6/12/2006
4/8/2007
Date
Product Elevation (FAMSL)
Groundwater Elevation (FTMSL)
Precipitation (Inches)

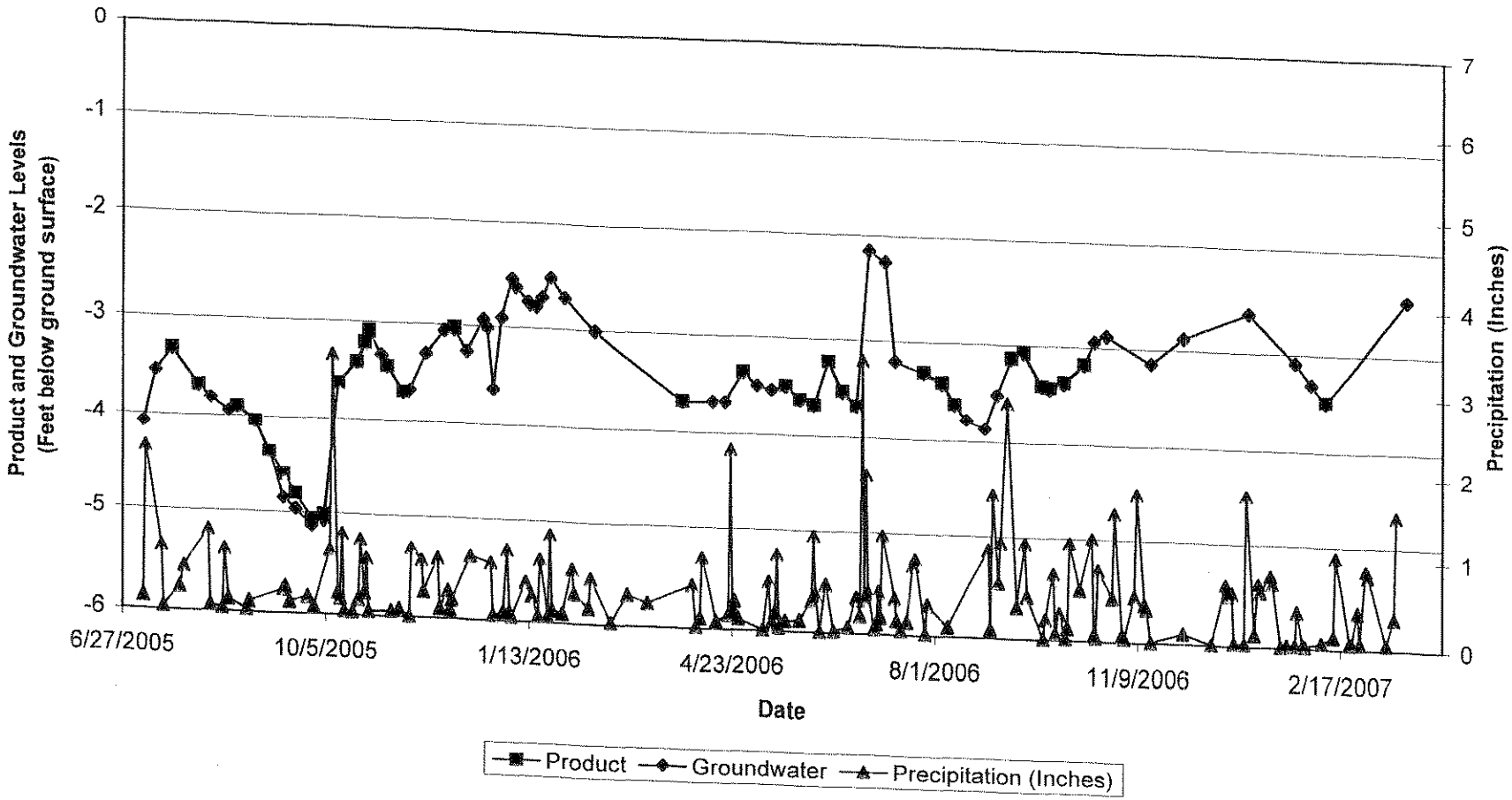
TP-105 Hydrograph
through March 21, 2007

AMTRAK Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware



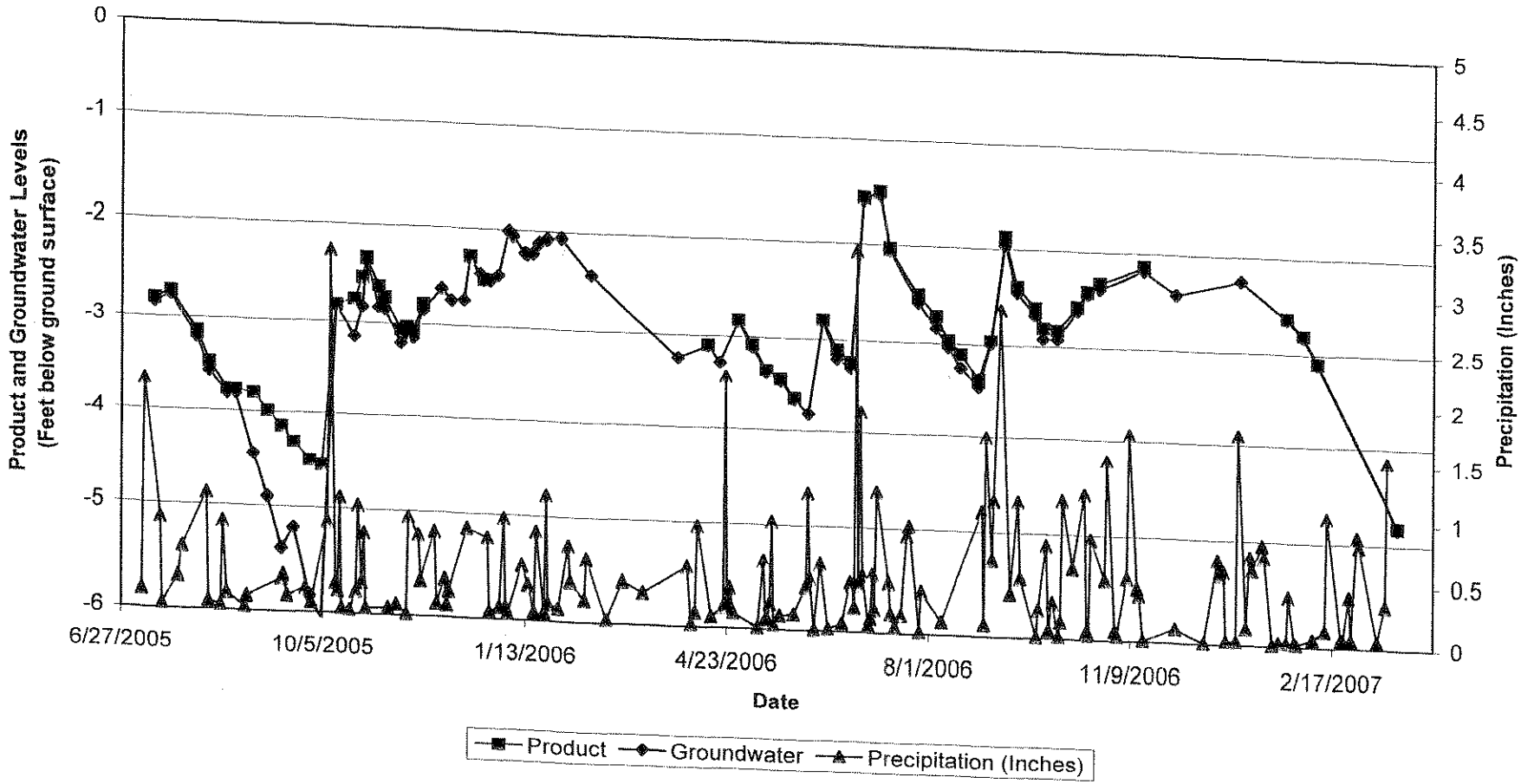
TP-106 Hydrograph
through March 21, 2007

AMTRAK Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware



TP-114 Hydrograph
through March 21, 2007

AMTRAK Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware



AMTRAK Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

Liquid Level Data Sheet
September 13, 2006

Well ID	Measuring Point Elevation (ft rmsl)	Depth to Product (feet)	Depth to Water (feet)	Apparent Product Thickness (feet)	Estimated Product Specific Gravity [1]	Water Level Elevation (ft rmsl)	Product Level Elevation (ft rmsl)	Corrected Water Level Elevation (ft rmsl)
MW-1A	7.83	---	6.11	---	NA	1.72	---	---
MW-2	9.26	---	3.51	---	NA	5.75	---	---
MW-3A	16.55	---	12.68	---	NA	3.87	---	---
MW-4	8.98	---	3.96	---	NA	5.02	---	---
MW-5	9.48	---	2.61	---	NA	6.87	---	---
MW-6A	12.39	9.00	9.22	0.22	0.87	3.17	3.39	3.36
MW-7	8.99	---	3.00	---	NA	5.99	---	---
MW-8	7.92	---	4.25	---	NA	---	---	---
MW-8A	8.01	---	3.92	---	NA	4.09	---	---
MW-9	9.25	---	2.31	---	NA	6.94	---	---
MW-10A	7.27	2.56	2.57	0.01	0.87	4.70	4.71	4.71
MW-11	7.97	---	4.65	---	NA	3.32	---	---
MW-12	7.04	---	5.58	---	NA	NA	---	---
MW-13	6.66	---	2.27	---	NA	4.39	---	---
MW-14	8.41	---	4.36	---	NA	4.05	---	---
MW-15	8.54	1.70	1.71	0.01	0.87	6.83	6.84	6.84
MW-16	9.67	2.73	2.95	0.22	0.87	6.72	6.94	6.91
MW-17	4.88	---	1.64	---	NA	3.24	---	---
ED-A	6.26	---	4.50	---	NA	1.76	---	---
ED-B	5.31	---	4.49	---	NA	0.82	---	---
ED-C	5.14	---	3.07	---	NA	2.07	---	---
ED-D	5.86	---	2.92	---	NA	2.94	---	---
WD-A	8.01	7.23	7.24	0.01	0.87	0.77	0.78	0.78
WD-B	6.40	5.19	5.40	0.21	0.87	1.00	1.21	1.18
WD-C	6.43	---	2.65	---	NA	3.78	---	---
WD-D	NS	5.41	5.43	0.02	0.87	---	---	---
WD-E	NS	5.08	5.16	0.08	0.87	---	---	---
WD-F	NS	3.11	3.12	0.01	0.87	---	---	---
PZ-1	9.80	5.51	5.53	0.02	0.87	4.27	4.29	4.29
Sump #1	10.94	---	4.06	---	NA	6.88	---	---
Sump#2	10.37	3.00	3.01	0.01	0.87	7.36	7.37	7.37
SP#1	9.66	---	3.52	---	NA	6.14	---	---
SP#2A	NS	3.25	3.26	0.01	0.87	---	---	---
SP#3	9.85	---	2.98	---	NA	6.87	---	---
SP#4	10.72	---	3.85	---	NA	6.87	---	---
SP#5	9.67	---	2.80	---	NA	6.87	---	---
SP#6	9.74	2.80	2.81	0.01	0.87	6.93	6.94	6.94
SP#7	8.75	1.79	1.80	0.01	0.87	6.95	6.96	6.96
SP#8	9.51	---	2.53	---	NA	6.98	---	---
SP#9	9.82	---	2.89	---	NA	6.93	---	---

Well ID	Measuring Point Elevation (ft rmsl)	Depth to Product (feet)	Depth to Water (feet)	Apparent Product Thickness (feet)	Estimated Product Specific Gravity [1]	Water Level Elevation (ft rmsl)	Product Level Elevation (ft rmsl)	Corrected Water Level Elevation (ft rmsl)
RW#1	9.70	2.85	2.86	0.01	0.87	6.84	6.85	6.85
RW#2	8.37	2.64	2.65	0.01	0.87	5.72	5.73	5.73
RW#3	9.62	3.43	3.44	0.01	0.87	6.18	6.19	6.19
RW#4	8.45	1.40	1.41	0.01	0.87	7.04	7.05	7.05
RW#5	8.63	---	2.75	---	NA	5.88	---	---
Pit#1	10.05	---	2.79	---	NA	7.26	---	---
Pit#2	8.16	2.66	2.68	0.02	0.87	5.48	5.50	5.50
ED#1	10.28	6.06	6.07	0.01	0.87	4.21	4.22	4.22
ED#2	11.77	---	5.28	---	NA	6.49	---	---
ED#3	8.58	---	4.59	---	NA	3.99	---	---
ED#4	8.55	---	4.57	---	NA	3.98	---	---
ED#5	9.96	5.69	5.70	0.01	0.87	4.26	4.27	4.27
ED#6	10.73	6.45	6.46	0.01	0.87	4.27	4.28	4.28
TP-1A	NS	7.30	7.45	0.15	0.87	---	---	---
TP-6	13.21	---	6.90	---	NA	6.31	---	---
TP-7	14.48	NA	NA	---	NA	---	---	---
TP-8	13.58	---	6.86	---	NA	6.72	---	---
TP-9	11.88	---	5.16	---	NA	6.72	---	---
TP-101	NS	6.45	6.46	0.01	0.87	---	---	---
TP-102	NS	---	4.22	---	NA	---	---	---
TP-103	NS	---	6.27	---	NA	---	---	---
TP-104	NS	---	5.08	---	NA	---	---	---
TP-105	NS	---	5.48		NA	---	---	---
TP-106	NS	5.65	5.66	0.01	0.87	---	---	---
TP-107	NS	---	5.31	---	NA	---	---	---
TP-108	NS	---	6.41	---	NA	---	---	---
TP-109	NS	---	5.68	---	NA	---	---	---
TP-110	NS	---	6.35	---	NA	---	---	---
TP-111	NS	---	6.49	---	NA	---	---	---
TP-112	NS	---	5.80	---	NA	---	---	---
TP-113	NS	---	6.35	---	NA	---	---	---
TP-114	NS	5.25	5.31	0.06	0.87	---	---	---
TP-115	NS	6.22	6.23	0.01	0.87	---	---	---

NS = Not Surveyed

NA =Not Applicable

[1] = Specific gravity estimated on product type anaylsis

ft rmsl = feet relative to mean sea level

NM[1] = Not Measured, covered with dirt

P:\Clients\Amtrak-APU\Monthly Liquid Levels\[Quarterly Levels March 2007.xls]9-13-06

AMTRAK Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

Liquid Level Data Sheet
December 1, 2006

Well ID	Measuring Point Elevation (ft rmsl)	Depth to Product (feet)	Depth to Water (feet)	Apparent Product Thickness (feet)	Estimated Product Specific Gravity [1]	Water Level Elevation (ft rmsl)	Product Level Elevation (ft rmsl)	Corrected Water Level Elevation (ft rmsl)
MW-1A	7.83	---	6.17	---	NA	---	---	---
MW-2	9.26	---	NA	---	NA	---	---	---
MW-3A	16.55	---	12.57	---	NA	---	---	---
MW-4	8.98	---	4.60	---	NA	4.38	---	---
MW-5	9.48	---	2.50	---	NA	6.98	---	---
MW-6A	12.39	6.23	6.46	0.23	0.87	5.93	6.16	6.13
MW-7	8.99	---	3.20	---	NA	5.79	---	---
MW-8	7.92	---	4.27	---	NA	---	---	---
MW-8A	8.01	---	3.91	---	NA	4.10	---	---
MW-9	9.25	2.35	2.36	0.01	0.87	6.89	6.90	6.90
MW-10A	7.27	2.61	2.62	0.01	0.87	4.65	4.66	4.66
MW-11	7.97	---	5.02	---	NA	2.95	---	---
MW-12	7.04	---	5.91	---	NA	1.13	---	---
MW-13	6.66	---	2.31	---	NA	4.35	---	---
MW-14	8.41	---	4.46	---	NA	3.95	---	---
MW-15	8.54	---	1.26	---	NA	7.28	---	---
MW-16	9.67	2.49	3.30	0.81	0.87	6.37	7.18	7.07
MW-17	4.88	---	1.95	---	NA	2.93	---	---
ED-A	6.26	4.58	4.59	0.01	0.87	1.67	1.68	1.68
ED-B	5.31	---	4.49	---	NA	---	---	---
ED-C	5.14	---	NA	---	NA	---	---	---
ED-D	5.86	---	NA	---	NA	---	---	---
WD-A	8.01	7.48	7.49	0.01	0.87	0.52	0.53	0.53
WD-B	6.40	5.21	5.55	0.34	0.87	0.85	1.19	1.15
WD-C	6.43	---	2.43	---	NA	4.00	---	---
WD-D	NS	5.41	5.46	0.05	0.87	---	---	---
WD-E	NS	5.11	5.35	0.24	0.87	---	---	---
WD-F	NS	---	3.14	---	NA	---	---	---
PZ-1	9.80	5.50	5.52	0.02	0.87	4.28	4.30	4.30
Sump #1	10.94	---	3.95	---	NA	6.99	---	---
Sump#2	10.37	---	3.02	---	NA	7.35	---	---
SP#1	9.66	---	3.42	---	NA	6.24	---	---
SP#2A	NS	---	3.15	---	NA	---	---	---
SP#3	9.85	---	2.85	---	NA	7.00	---	---
SP#4	10.72	3.67	3.70	0.03	0.87	7.02	7.05	7.05
SP#5	9.67	---	2.62	---	NA	7.05	---	---
SP#6	9.74	---	2.68	---	NA	7.06	---	---
SP#7	8.75	---	1.61	---	NA	7.14	---	---
SP#8	9.51	---	2.55	---	NA	6.96	---	---
SP#9	9.82	---	2.88	---	NA	6.94	---	---

Well ID	Measuring Point Elevation (ft rmsl)	Depth to Product (feet)	Depth to Water (feet)	Apparent Product Thickness (feet)	Estimated Product Specific Gravity [1]	Water Level Elevation (ft rmsl)	Product Level Elevation (ft rmsl)	Corrected Water Level Elevation (ft rmsl)
RW#1	9.70	2.70	2.71	0.01	0.87	6.99	7.00	7.00
RW#2	8.37	2.63	2.64	0.01	0.87	5.73	5.74	5.74
RW#3	9.62	---	3.30	---	NA	6.32	---	---
RW#4	8.45	1.30	1.32	0.02	0.87	7.13	7.15	7.15
RW#5	8.63	---	2.78	---	NA	5.85	---	---
Pit#1	10.05	---	2.75	---	NA	7.30	---	---
Pit#2	8.16	---	2.64	---	NA	5.52	---	---
ED#1	10.28	6.25	6.26	0.01	0.87	4.02	4.03	4.03
ED#2	11.77	---	5.35	---	NA	6.42	---	---
ED#3	8.58	---	4.75	---	NA	3.83	---	---
ED#4	8.55	---	4.75	---	NA	3.80	---	---
ED#5	9.96	5.94	5.95	0.01	0.87	4.01	4.02	4.02
ED#6	10.73	6.70	6.71	0.01	0.87	4.02	4.03	4.03
TP-1A	NS	7.15	7.60	0.45	0.87	---	---	---
TP-6	13.21	---	6.98	---	NA	6.23	---	---
TP-7	14.48	---	5.13	---	NA	9.35	---	---
TP-8	13.58	---	6.98	---	NA	6.60	---	---
TP-9	11.88	---	5.59	---	NA	6.29	---	---
TP-101	NS	---	6.29	---	NA	---	---	---
TP-102	NS	---	4.17	---	NA	---	---	---
TP-103	NS	---	6.04	---	NA	---	---	---
TP-104	NS	---	5.08	---	NA	---	---	---
TP-105	NS	---	5.22	---	NA	---	---	---
TP-106	NS	---	5.47	---	NA	---	---	---
TP-107	NS	---	5.08	---	NA	---	---	---
TP-108	NS	---	6.32	---	NA	---	---	---
TP-109	NS	---	5.59	---	NA	---	---	---
TP-110	NS	---	6.62	---	NA	---	---	---
TP-111	NS	---	6.60	---	NA	---	---	---
TP-112	NS	---	5.88	---	NA	---	---	---
TP-113	NS	---	6.32	---	NA	---	---	---
TP-114	NS	---	5.28		NA	---	---	---
TP-115	NS	---	6.24	---	NA	---	---	---

NS = Not Surveyed

NA =Not Applicable

[1] = Specific gravity estimated on product type anaylsis

ft rmsl = feet relative to mean sea level

NM[1] = Not Measured, covered with dirt

P:\Clients\Amtrak-APU\Monthly Liquid Levels\[Quarterly Levels March 2007.xls]12-1-06

AMTRAK Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

Liquid Level Data Sheet
March 21, 2007

Well ID	Measuring Point Elevation (ft rmsl)	Depth to Product (feet)	Depth to Water (feet)	Apparent Product Thickness (feet)	Estimated Product Specific Gravity [1]	Water Level Elevation (ft rmsl)	Product Level Elevation (ft rmsl)	Corrected Water Level Elevation (ft rmsl)
MW-1A	7.83		5.63		NA	---	---	---
MW-2	9.26		NG		NA	---	---	---
MW-3A	16.55		12.58		NA	---	---	---
MW-4	8.98		3.66		NA	5.32	---	---
MW-5	9.48	2.10	2.90	0.80	0.87	6.58	7.38	7.28
MW-6A	12.39	8.87	9.20	0.33	0.87	---	---	---
MW-7	8.99		3.10		NA	5.89	---	---
MW-8	7.92		4.06		NA	---	---	---
MW-8A	8.01		3.69		NA	4.32	---	---
MW-9	9.25	2.20	2.21	0.01	0.87	7.04	7.05	7.05
MW-10A	7.27	2.58	2.59	0.01	0.87	4.68	4.69	4.69
MW-11	7.97		4.19		NA	3.78	---	---
MW-12	7.04		6.20		NA	0.84	---	---
MW-13	6.66		2.05		NA	4.61	---	---
MW-14	8.41		3.85		NA	4.56	---	---
MW-15	8.54	1.32	1.34	0.02	0.87	7.20	7.22	7.22
MW-16	9.67	2.83	3.10	0.27	0.87	6.57	6.84	6.80
MW-17	4.88	1.60	1.61	0.01	0.87	3.27	3.28	3.28
ED-A	6.26	4.38	4.39	0.01	0.87	1.87	1.88	1.88
ED-B	5.31		4.40		NA	0.91	---	---
ED-C	5.14		3.50		NA	1.64	---	---
ED-D	5.86		3.53		NA	2.33	---	---
WD-A	8.01	7.13	7.14	0.01	0.87	0.87	0.88	0.88
WD-B	6.40	5.16	5.50	0.34	0.87	0.90	1.24	1.20
WD-C	6.43		2.58		NA	3.85	---	---
WD-D	NS	5.40	5.43	0.03	0.87	---	---	---
WD-E	NS	5.11	5.40	0.29	0.87	---	---	---
WD-F	NS	3.11	3.12	0.01	0.87	---	---	---
PZ-1	9.80	5.10	5.12	0.02	0.87	4.68	4.70	4.70
Sump #1	10.94		4.44		NA	6.50	---	---
Sump#2	10.37		2.56		NA	7.81	---	---
SP#1	9.66		2.82		NA	6.84	---	---
SP#2A	NS		2.50		NA	---	---	---
SP#3	9.85	2.34	2.37	0.03	0.87	7.48	7.51	7.51
SP#4	10.72	3.18	3.19	0.01	0.87	7.53	7.54	7.54
SP#5	9.67		2.15		NA	7.52	---	---
SP#6	9.74		2.20		NA	7.54	---	---
SP#7	8.75		1.40		NA	7.35	---	---
SP#8	9.51		2.13		NA	7.38	---	---
SP#9	9.82		2.45		NA	7.37	---	---
RW#1	9.70		2.18		NA	7.52	---	---
RW#2	8.37		2.20		NA	6.17	---	---
RW#3	9.62		2.72		NA	6.90	---	---
RW#4	8.45	1.35	1.36	0.01	0.87	7.09	7.10	7.10
RW#5	8.63		2.34		NA	6.29	---	---
Pit#1	10.05		2.31		NA	7.74	---	---
Pit#2	8.16		2.24		NA	5.92	---	---
ED#1	10.28	5.84	5.85	0.01	0.87	4.43	4.44	4.44
ED#2	11.77		4.71		NA	7.06	---	---

Well ID	Measuring Point Elevation (ft rmsl)	Depth to Product (feet)	Depth to Water (feet)	Apparent Product Thickness (feet)	Estimated Product Specific Gravity [1]	Water Level Elevation (ft rmsl)	Product Level Elevation (ft rmsl)	Corrected Water Level Elevation (ft rmsl)
ED#3	8.58		4.51		NA	4.07	---	---
ED#4	8.55		4.40		NA	4.15	---	---
ED#5	9.96	5.55	5.56	0.01	0.87	4.40	4.41	4.41
ED#6	10.73		6.30		NA	4.43	---	---
TP-1A	NS	7.10	7.55	0.45	0.87	---	---	---
TP-6	13.21		5.52		NA	7.69	---	---
TP-7	14.48		6.86		NA	7.62	---	---
TP-8	13.58		6.48		NA	7.10	---	---
TP-9	11.88	4.68	4.69	0.01	0.87	7.19	7.20	7.20
TP-101	NS		6.32		NA	---	---	---
TP-102	NS		3.72		NA	---	---	---
TP-103	NS		5.61		NA	---	---	---
TP-104	NS		4.58		NA	---	---	---
TP-105	NS		5.00		NA	---	---	---
TP-106	NS		5.05		NA	---	---	---
TP-107	NS		4.62		NA	---	---	---
TP-108	NS		5.83		NA	---	---	---
TP-109	NS		5.20		NA	---	---	---
TP-110	NS		6.21		NA	---	---	---
TP-111	NS		6.11		NA	---	---	---
TP-112	NS		5.68		NA	---	---	---
TP-113	NS		6.12		NA	---	---	---
TP-114	NS	7.71	7.72	0.01	0.87	---	---	---
TP-115	NS		5.71		NA	---	---	---
TP-116			5.74			---	---	---
TP-117			5.20			---	---	---
TP-118			5.53			---	---	---
TP-119			7.88			---	---	---
TP-120			5.15			---	---	---
TP-121		6.07	6.09	0.02	0.87	---	---	---
TP-122		6.44	7.50	1.06	0.87	---	---	---
TP-123		5.72	6.38	0.66	0.87	---	---	---
TP-124		7.15	7.16	0.01	0.87	---	---	---
TP-125			8.00			---	---	---
TP-126			5.96			---	---	---
TP-127			6.83			---	---	---
TP-128			5.08			---	---	---
TP-129			6.32			---	---	---
TP-130			6.03			---	---	---
TP-131			8.00			---	---	---
TP-132			5.75			---	---	---
TP-133			7.58			---	---	---
TP-134			6.14			---	---	---
TP-135			9.00			---	---	---

NS = Not Surveyed

NA =Not Applicable

[1] = Specific gravity estimated on product type anaylsis

ft rmsl = feet relative to mean sea level

NM[1] = Not Measured, covered with dirt

P:\Clients\Amtrak-APU\Monthly Liquid Levels\[Quarterly Levels March 2007.xls]3-21-07

APPENDIX B
HISTORIC GROUNDWATER MONITOIRNG ANALYTICAL DATA

MW-1A
Groundwater Analytical Results

Amtrak Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

Date	3/22/2004	6/24/2004	9/16/2004	12/22/2004	3/21/2005	6/23/2005	9/20/2005	12/13/2005	3/29/2006	6/29/2006
Laboratory Analyses										
TPH-DRO	9	<1.0	6.3	8.4	9.9	5.9	3.6	3	3	3.1
Total Iron	66.4	77.8	63.7	68.2	63.9	67.8	64.2	61.4	56.9	54.8
Dissolved Iron	55.3	55.1	64.0	52.1	58.4	62.8	60.9	62.9	66.7	53.6
Total Manganese	0.905	0.99	0.976	1.01	0.888	1.03	0.913	0.874	0.813	0.693
Dissolved Manganese	0.997	1.04	1.17	0.841	0.896	0.968	0.981	0.901	0.943	0.684
Nitrite Nitrogen	<0.050	<0.050	<0.05*	0.067	0.063	0.069	0.075	0.11	0.086	0.1
Nitrate Nitrogen	<0.10	<0.50	<0.1	<0.5	<0.10	<0.10	<0.1	<0.10	< 0.10	<0.1
pH	6.3	6.4	6.5	6.4	6.4	6.2	6.4	6.5	6.5	6.4
Alkalinity to pH 8.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	< 2.0	<2.0
Alkalinity to pH 4.5	165	176	205	166	187	175	180	221	181	179
Free Carbon Dioxide	165	140	130	132	149	221	143	140	114	143
Sulfate (turbidimetric)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5	< 5.0	<5.0
Methane	6.3	4.5	7.6	5.7	4.8	3.2	5.5	5.3	5.3	4.9
Field Measurements										
pH (s.u.)	6.51	6.97	6.44	6.70	6.42	6.21	6.16	6.68	6.04	6.32
Temperature (°C)	10.03	18.36	21.6	16.9	9.97	17.20	22.64	15.45	11.70	18.23
Specific Conductance (S/cm)	1.26	0.491	0.621	0.484	0.595	0.94	0.632	0.900	0.567	0.550
Dissolved Oxygen (mg/l)	11.24	0.37	0.11	0.50	0.00	1.82	1.45	9.69	2.31	0.71
Redox (mv)	-88.00	-135	-117	-100	-101	-114.00	-125	-71	-95	-98

Notes:

All results are reported in milligrams per liter (mg/L) unless otherwise noted

TPH-DRO = Total Petroleum Hydrocarbons - Diesel Range Organics

J = estimated value

<2.0 = result not detected above quantitation limit

TPH-DRO analyzed by US EPA Method 8015B, iron analyzed by US EPA Method 7380, manganese analyzed by US EPA Method 7640, nitrite nitrogen and nitrate nitrogen analyzed by US EPA Method 353.2, alkalinity to pH 8.3 and 4.5 analyzed by US EPA Method 310.1, pH analyzed by US EPA Method 150.1, sulfate analyzed by US EPA Method 300.0, free carbon dioxide analyzed by Method SM-18 4500CO2

NA = Not analyzed due to equipment problems.

* = Analyzed past the 48 hour hold time for nitrite

P:\Clients\Amtrak-APU\GW Analytical Data\[GW data per well through June 2006 (complete).xls]MW-1A

MW-2
Groundwater Analytical Results

Amtrak Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

Date	4/19/2001	8/2/2001	11/28/2001	3/13/2003	6/25/2003	9/28/2003	12/15/2003	3/22/2004	6/24/2004	6/23/2005	9/20/2005	12/13/2005	3/29/2006
Laboratory Analyses													
TPH-DRO	1.7	1.6	2.1	1.5	14	1.3	1.4	1.9	2.7	2	3.8	0.32	2.1
Total Iron	101	62.1	70.1	90.5	90.4	71.4	84.8	93.3	104	142	106	31.4	33.6
Dissolved Iron	0.471	18.2	6.82	17.7	67.2	56.4	57.8	77.1	69.3	84.6	55.9	0.846	29.5
Total Manganese	1.05	0.941	0.998	1.3	0.859	0.978	1.14	1.05	1.03	1.12	1.36	0.436	0.959
Dissolved Manganese	0.838	0.811	0.94	1.3	1.04	0.875	1.06	1.35	1.15	1.1	1.12	0.105	1.09
Nitrite Nitrogen	0.125	0.099	0.123	0.1	<0.05	0.12	0.063	<0.050	<0.050	0.068	<0.05	<0.05	< 0.050
Nitrate Nitrogen	<0.04	<0.04	<0.04	<0.10	1.5	0.48	0.6	<0.10	1.6	<0.10	<0.1	<0.1	< 0.10
pH	6.49	6.16	6.37	6.7	6.5	6.4	6.4	6.2	6.4	6.3	6.3	6.4	6.5
Alkalinity to pH 8.3	<0.41	<0.41	<0.41	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	< 2.0
Alkalinity to pH 4.5	114	79.5	79	77.4	87	103	73.3	76.4	93.6	110	106	42.7	117
Free Carbon Dioxide	73.8	110	67.4	30.9	55	82	58.4	96.4	74.5	110	106	340	74
Sulfate (turbidimetric)	24.1	2.5J	2.1J	7.4	16.9	15.2	18.1	7.5	18.5	13.7	10.5	20.5	15.9
Methane	6.4	5.4	7.7	8.5	0.73	6.5	1.9	6.6	0.54	1.5	5.0	4.2	4.8
Field Measurements													
pH (s.u.)	6.47	6.03	6.05	6.62	6.37	5.82	7.19	6.56	7.19	6.53	6.16	6.81	5.84
Temperature (°C)	11.47	18.3	17.71	11.7	12.84	18.21	16.38	11.17	15.55	14.75	19.69	14.59	12.40
Specific Conductance (S/cm)	0.244	NA	0.429	0.272	0.367	0.271	0.327	0.484	0.349	0.662	0.457	0.900	0.499
Dissolved Oxygen (mg/l)	10.04	0.57	0 (1)	3.86	1.23	19.99	3.98	0.36	0.42	1.18	0.93	10.32	3.45
Redox (mv)	-1.60	-61.8	-74	-49	-123	-18	-82	-123	-145	-187	-103	-82	-14

Notes:

All results are reported in milligrams per liter (mg/L) unless otherwise noted

TPH-DRO = Total Petroleum Hydrocarbons - Diesel Range Organics

J = estimated value

<2.0 = result not detected above quantitation limit

TPH-DRO analyzed by US EPA Method 8015B, iron analyzed by US EPA Method 7380, manganese analyzed by US EPA Method 7640, nitrite nitrogen and nitrate nitrogen analyzed by US EPA Method 353.2, alkalinity to pH 8.3 and 4.5 analyzed by US EPA Method 310.1, pH analyzed by US EPA Method 150.1, sulfate analyzed by US EPA Method 300.0, free carbon dioxide analyzed by Method SM-18 4500CO2

MW-2 was resampled on April 10, 2003 for total and dissolved iron and managenese only. This data is reported under the March 13, 2003 sampling event.

NA = Not analyzed due to equipment problems.

(1) = All dissolved oxygen results were reported as 0 mg/l - field meter may not have been functioning properly.

MW-2 was buried under a gravel pile and was not sampled after the 06/24/04 event until the 06/23/05 event

MW-3A (MW-3)
Groundwater Analytical Results

Amtrak Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

	MW-3			MW-3A										
Date	4/19/2001	8/2/2001	11/28/2001	3/22/2004	6/24/2004	9/16/2004	12/22/2004	3/21/2005	6/23/2005	9/20/2005	12/13/2005	3/29/2006	6/29/2006
Laboratory Analyses													
TPH-DRO	8.5	0.5	0.6	<1.0	<1.0	0.83	1.7	1.4	1.3	0.74	0.56	0.91	0.73
Total Iron	80.8	34.9	59	65	203	71.2	68.3	51	64.3	54.5	88.9	48.7	58.9
Dissolved Iron	0.753	0.051J	<0.05	38.7	42.9	47.3	38.7	43	47.9	49.8	45.9	45.9	43.3
Total Manganese	1.04	1.19	1.29	2.06	8.77	2.78	2.06	1.54	1.95	1.75	3.89	1.4	1.36
Dissolved Manganese	0.438	1.02	1.08	1.44	1.47	1.53	1.29	1.43	1.63	1.68	1.52	1.41	1.23
Nitrite Nitrogen	0.079	0.079	0.075	<0.050	<0.050	0.067	0.065	<0.050	0.076	<0.05	<0.05	< 0.050	<0.05
Nitrate Nitrogen	0.51	<0.04	<0.04	<0.10	<0.50	<0.5	<0.5	<0.10	<0.10	<0.1	<0.1	< 0.10	<0.1
pH	6.36	6.52	6.68	6.9	6.8	6.7	6.9	6.8	6.9	6.9	6.9	6.8	6.8
Alkalinity to pH 8.3	<0.41	<0.41	<0.41	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	< 2.0	<2.0
Alkalinity to pH 4.5	140	338	375	427	441	475	469	475	483	514	516	405	475
Free Carbon Dioxide	122	204	157	108	140	190	118	151	122	129	130	128	151
Sulfate (turbidimetric)	53.6	9.7	1.7J	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5	< 5.0	<5.0
Methane	7.8	8.6	10	10.0	11.0	15.0	13.0	10.0	5.6	11.0	12.0	7.5	9.4
Field Measurements													
pH (s.u.)	6.51	6.84	6.49	7.71	7.35	6.89	6.99	7.00	6.91	6.87	6.66	6.74	6.82
Temperature (°C)	12.35	18.0	19.19	13.39	15.32	19.8	17.73	13.98	15.3	19.30	11.06	16.44	18.00
Specific Conductance (S/cm)	0.696	NA	1.38	1.08	0.904	1.33	0.898	1.35	1.39	1.48	0.703	0.875	0.926
Dissolved Oxygen (mg/l)	1.96	0.58	0 (1)	0	0.71	1.18	4.99	5.13	0.41	0.00	3.86	2.39	0.62
Redox (mv)	23.40	-101.0	-115	-146	-190	-162	-144	-160	-186	-417	-42	-139	-132.4

Notes:

All results are reported in milligrams per liter (mg/L) unless otherwise noted

TPH-DRO = Total Petroleum Hydrocarbons - Diesel Range Organics

J = estimated value

<2.0 = result not detected above quantitation limit

TPH-DRO analyzed by US EPA Method 8015B, iron analyzed by US EPA Method 7380, manganese analyzed by US EPA Method 7640, nitrite nitrogen and nitrate nitrogen analyzed by US EPA Method 353.2, alkalinity to pH 8.3 and 4.5 analyzed by US EPA Method 310.1, pH analyzed by US EPA Method 150.1, sulfate analyzed by US EPA Method 300.0, free carbon dioxide analyzed by Method SM-18 4500CO2

NA = Not analyzed due to equipment problems.

(1) = All dissolved oxygen results were reported as 0 mg/l - field meter may not have been functioning properly.

MW-3 was destroyed by site activities and was replace in January 2004 by MW-3A.

MW-4
Groundwater Analytical Results

Amtrak Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

Date	4/19/2001	8/2/2001	12/5/2001	3/13/2003	6/25/2003	9/28/2003	12/15/2003	3/22/2004	6/24/2004	9/16/2004	12/21/2004	3/21/2005	6/23/2005	9/20/2005	12/13/2005	3/29/2006	6/29/2006
Laboratory Analyses																	
TPH-DRO	15	18	15	11	0.99	12	18	20	19	17	18	20	14	17	13	17	15
Total Iron	100	70	76.9	97.6	97.4	115	103	118	120	79.4	78.3	87.8	111	64.9	79.3	94.7	95.9
Dissolved Iron	3.69	27.6	19.7	42.8	98.7	70.9	93.6	103	105	87.2	83.7	94.3	97.9	77.5	79.5	102	90.9
Total Manganese	0.507	0.263	0.289	0.33	0.354	0.415	0.335	0.401	0.589	0.288	0.28	0.329	0.386	0.234	0.274	0.282	0.25
Dissolved Manganese	0.375	0.281	0.24	0.3	0.316	0.261	0.286	0.33	0.328	0.265	0.252	0.306	0.293	0.241	0.251	0.301	0.253
Nitrite Nitrogen	0.147	0.043J	0.14	0.12	0.14	0.15	0.16	0.1	0.074	0.095	0.1*	0.09	0.094	0.067	0.12	0.13	0.16
Nitrate Nitrogen	0.13	<0.04	<0.04	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.1	<0.1	<0.10	<0.10	<0.1	<0.1	< 0.10	<0.1
pH	6.32	6.17	6.29	6.5	6.3	6.1	6.4	6.3	6.3	6.3	6.2	6.2	6.2	6.4	6.3	6.4	6.3
Alkalinity to pH 8.3	<0.41	<0.41	<0.41	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	< 2.0	<2.0
Alkalinity to pH 4.5	149	155	143	170	199	223	160	154	163	163	125	181	167	127	208	192	160
Free Carbon Dioxide	143	210	147	108	199	354	127	154	163	163	158	228	211	101	208	153	160
Sulfate (turbidimetric)	41.9	<1.5	4.2J	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5	< 5.0	<5.0
Methane	15	14	9.1	23	24	16	18	20.0	15.0	12.0	11.0	12.0	6.7	8.7	12.0	17	14
Field Measurements																	
pH (s.u.)	6.28	6.89	6.48	6.51	6.45	5.99	7.24	6.97	6.73	6.35	6.37	6.22	6.3	6.42	6.49	6.28	6.42
Temperature (°C)	11.48	19.9	18.02	10.9	14.27	20.75	17.41	11.03	16.28	20.9	16.72	11.27	16.2	20.90	15.09	13.93	16.88
Specific Conductance (S/cm)	0.580	56.7	0.516	0.413	0.517	0.45	0.428	0.524	0.445	0.457	0.347	0.508	0.543	0.634	0.449	0.382	0.371
Dissolved Oxygen (mg/l)	8.65	0.66	0 (1)	3.87	0.81	6.87	1.52	0	0.6	0.77	0.89	0.71	0.45	0.00	0.8	2.69	0.34
Redox (mv)	-31.70	-98.6	-76	-87	-119	-70	-98	-74	-110	-99	-73	-80	-114	-454	-101	-93	-89.6

Notes:

All results are reported in milligrams per liter (mg/L) unless otherwise noted

TPH-DRO = Total Petroleum Hydrocarbons - Diesel Range Organics

J = estimated value

<2.0 = result not detected above quantitation limit

TPH-DRO analyzed by US EPA Method 8015B, iron analyzed by US EPA Method 7380, manganese analyzed by US EPA Method 7640, nitrite nitrogen and nitrate nitrogen analyzed by US EPA Method 353.2, alkalinity to pH 8.3 and 4.5 analyzed by US EPA Method 310.1, pH analyzed by US EPA Method 150.1, sulfate analyzed by US EPA Method 300.0, free carbon dioxide analyzed by Method SM-18 4500CO2

MW-4 was resampled on April 10, 2003 for total and dissolved iron and manganese only. This data is reported under the March 13, 2003 sampling event.

(1) = All dissolved oxygen results were reported as 0 mg/l - field meter may not have been functioning properly.

* = Sample was submitted past the 48 hour hold time for nitrite nitrogen

P:\Clients\Amtrak-APU\GW Analytical Data\[GW data per well through June 2006 (complete).xls]MW-4

MW-5
Groundwater Analytical Results

Amtrak Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

Date	9/16/2004	12/22/2004
Laboratory Analyses		
TPH-DRO	54	92
Total Iron	118	90.5
Dissolved Iron	117	75.8
Total Manganese	0.702	0.413
Dissolved Manganese	0.684	0.341
Nitrite Nitrogen	0.051*	0.062
Nitrate Nitrogen	<0.1	<0.1
pH	6.3	6.4
Alkalinity to pH 8.3	<2.0	<2.0
Alkalinity to pH 4.5	238	104
Free Carbon Dioxide	239	82.8
Sulfate (turbidimetric)	<5.0	<5.0
Methane	22.0	14.0
Field Measurements		
pH (s.u.)	6.35	6.48
Temperature (°C)	19.6	14.93
Specific Conductance (S/cm)	0.512	0.28
Dissolved Oxygen (mg/l)	0.25	0.58
Redox (mv)	-97	-86

Notes:
All results are reported in milligrams per liter (mg/L) unless otherwise noted
TPH-DRO = Total Petroleum Hydrocarbons - Diesel Range Organics
J = estimated value
<2.0 = result not detected above quantitation limit
TPH-DRO analyzed by US EPA Method 8015B, iron analyzed by US EPA Method 7380, manganese analyzed by US EPA Method 7640, nitrite nitrogen and nitrate nitrogen analyzed by US EPA Method 353.2, alkalinity to pH 8.3 and 4.5 analyzed by US EPA Method 310.1, pH analyzed by US EPA Method 150.1, sulfate analyzed by US EPA Method 300.0, free carbon dioxide analyzed by Method SM-18 4500CO2
NA = Not analyzed due to equipment problems.
* = Analyzed past the 48 hour hold time for nitrite

MW-8
Groundwater Analytical Results

Amtrak Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

Date	4/19/2001	8/2/2001	12/5/2001	3/13/2003	6/25/2003	9/28/2003	12/15/2003	3/22/2004	6/24/2004	9/16/2004	12/21/2004	3/21/2005	6/23/2005	9/20/2005	12/13/2005	3/29/2006	6/29/2006
Laboratory Analyses																	
TPH-DRO	39	40	25	20	45	17	82	55	120	40	42	39	18	64	18	46	21
Total Iron	101	95.3	88.7	102	102	100	94.3	109	113	97.1	91.1	99.7	87.6	102	100	86.2	84.2
Dissolved Iron	2.72	45.1	36.6	64.4	96.9	86.8	84.2	98.8	97.2	87.5	90.5	94.6	92.9	96.5	83.2	90.9	84.9
Total Manganese	0.387	0.362	0.33	0.38	0.427	0.422	0.374	0.406	0.476	0.436	0.346	0.38	0.342	0.411	0.359	0.315	0.314
Dissolved Manganese	0.253	0.348	0.318	0.38	0.386	0.359	0.333	0.379	0.387	0.345	0.401	0.354	0.379	0.374	0.351	0.332	0.313
Nitrite Nitrogen	0.047J*	0.064	0.172	0.13	0.12	0.16	0.14	0.073	0.11	0.11	0.11**	0.096	0.1	0.094	0.14	0.098	0.17
Nitrate Nitrogen	0.095J	<0.04	<0.04	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.1	<0.1	<0.10	<0.10	<0.1	<0.1	< 0.10	<0.1
pH	6.33	6.18	6.29	6.5	6.5	6.3	6.4	6.4	6.2	6.3	6.2	6.3	6.3	6.2	6.4	6.2	6.3
Alkalinity to pH 8.3	<0.41	<0.41	<0.41	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	< 2.0	<2.0
Alkalinity to pH 4.5	149	171	171	178	212	214	163	152	195	197	179	235	195	161	255	205	178
Free Carbon Dioxide	139	226	175	113	134	215	130	121	195	197	226	236	246	203	203	259	178
Sulfate (turbidimetric)	46.6	22.8	2.4J	11.5	6.2	<5.0	6.4	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5	< 5.0	<5.0
Methane	21	21	14	24	21	19	15	20.0	22.0	21.0	20.0	17.0	8.5	11.0	16.0	17	14
Field Measurements																	
pH (s.u.)	6.43	6.42	6.46	6.53	6.46	6.11	7.43	7.14	6.73	6.38	6.38	6.45	6.37	6.52	6.45	6.49	6.38
Temperature (°C)	16.97	18.7	17.96	12.2	13.7	19.93	17.33	12.45	16.25	20.0	17.0	12.31	16.4	20.30	9.64	14.84	15.88
Specific Conductance (S/cm)	0.582	92.0	0.528	0.415	0.501	0.436	0.402	0.474	0.397	0.448	0.348	0.488	0.516	0.608	0.536	0.361	0.365
Dissolved Oxygen (mg/l)	7.82	0.77	0 (1)	5.59	0.73	11.56	1.33	0	0.35	0.38	0.51	0.00	0.27	0.00	2.65	2.02	0.27
Redox (mv)	-22.70	-71.1	-121	-67	-116	-78	-107	-88	-109	-92	-73	-115	-110	-473	-59	-118	-80.6

Notes:

All results are reported in milligrams per liter (mg/L) unless otherwise noted

TPH-DRO = Total Petroleum Hydrocarbons - Diesel Range Organics

J = estimated value

<2.0 = result not detected above quantitation limit

TPH-DRO analyzed by US EPA Method 8015B, iron analyzed by US EPA Method 7380, manganese analyzed by US EPA Method 7640, nitrite nitrogen and nitrate nitrogen analyzed by US EPA Method 353.2, alkalinity to pH 8.3 and 4.5 analyzed by US EPA Method 310.1, pH analyzed by US EPA Method 150.1, sulfate analyzed by US EPA Method 300.0, free carbon dioxide analyzed by Method SM-18 4500CO2

MW-8 was resampled on April 10, 2003 for total and dissolved iron and manganese only. This data is reported under the March 13, 2003 sampling event.

MW-8 was analyzed past the 48 hour hold time for nitrite nitrogen for the September 28, 2003 sampling event.

* = The nitrite nitrogen analysis was originally performed within the 48 hour holding time, however the result obtained was greater than the subsequent result obtained for nitrate. The nitrite analysis was repeated past the holding time to yield the reported result.

(1) = All dissolved oxygen results were reported as 0 mg/l - field meter may not have been functioning properly.

** = Sample was submitted past the 48 hour hold time for nitrite nitrogen

P:\Clients\Amtrak-AP\MW Analytical Data\[GW data per well through June 2006 (complete).xls]MW-8

MW-8A
Groundwater Analytical Results

Amtrak Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

Date	4/19/2001	8/2/2001	12/5/2001	3/13/2003	6/25/2003	9/28/2003	12/15/2003	3/22/2004	6/24/2004	9/16/2004	12/21/2004	3/21/2005	6/23/2005	9/20/2005	12/13/2005	3/29/2006	6/29/2006
Laboratory Analyses																	
TPH-DRO	40	19	24	15	19	12	77	28	82	20	32	51	19	28	23	21	22
Total Iron	148	60.7	71.3	104	83.5	83.2	202	96.6	92.1	65.2	68.4	68.3	79.3	86.1	72.7	79.5	77.3
Dissolved Iron	17	25.7	25.7	24.7	83.2	80.3	92.4	79.5	112	104	80.8	82.8	76	116	75.8	89	131
Total Manganese	0.789	0.358	0.357	0.58	0.444	0.429	1.03	0.527	0.595	0.392	0.404	0.428	0.367	0.452	0.321	0.417	0.3
Dissolved Manganese	0.481	0.367	0.336	0.43	0.398	0.389	0.705	0.373	0.813	0.812	0.499	0.583	0.395	0.618	0.304	0.456	0.648
Nitrite Nitrogen	0.051*	0.042J	0.123	0.1	0.12	0.12	0.14	<0.050	0.067	0.086	0.087**	0.061	0.085	0.082	0.13	0.11	<0.05
Nitrate Nitrogen	<0.04	<0.04	<0.04	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.1	<0.1	<0.10	<0.10	<0.1	<0.1	< 0.10	<0.1
pH	6.34	6.12	6.25	6.5	6.4	6.2	6.3	6.3	6.3	6.2	6.3	6.3	6.3	6.3	6.4	6.4	6.3
Alkalinity to pH 8.3	<0.41	<0.41	<0.41	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	< 2.0	<2.0
Alkalinity to pH 4.5	137	127	124	160	185	205	128	129	163	135	125	170	163	143	232	191	144
Free Carbon Dioxide	125	193	139	101	147	259	128	129	163	170	125	170	163	143	185	152	144
Sulfate (turbidimetric)	53.3	6.9	5.7	15.1	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5	< 5.0	<5.0
Methane	22	11	6.5	20	21	15	9.2	18.0	12.0	8.2	9.4	4.7	8.3	7.6	14.0	14	14
Field Measurements																	
pH (s.u.)	6.14	6.37	6.47	6.54	6.51	6.02	7.36	7.10	6.83	6.44	6.43	6.22	6.25	6.39	6.44	6.31	6.35
Temperature (°C)	11.63	18.4	18.07	11.2	14.1	20.68	18.07	11.78	15.78	19.8	16.6	12.17	16.7	19.80	11.35	14.30	16.05
Specific Conductance (S/cm)	0.622	89.0	0.461	0.372	0.441	0.399	0.491	0.415	0.48	0.405	0.331	0.508	0.473	0.660	0.421	0.37	0.306
Dissolved Oxygen (mg/l)	1.84	0.38	0 (1)	7.6	0.78	14.43	0	0	0.44	0.18	0	0.00	0.79	0.00	2.83	0	2.74
Redox (mv)	-25.60	-74.4	-92	-16	-118	-84	-120	-94	-130	-106	-77	-84	-111	-473	-64	-89	-41.1

Notes:

All results are reported in milligrams per liter (mg/L) unless otherwise noted

TPH-DRO = Total Petroleum Hydrocarbons - Diesel Range Organics

J = estimated value

<2.0 = result not detected above quantitation limit

TPH-DRO analyzed by US EPA Method 8015B, iron analyzed by US EPA Method 7380, manganese analyzed by US EPA Method 7640, nitrite nitrogen and nitrate nitrogen analyzed by US EPA Method 353.2, alkalinity to pH 8.3 and 4.5 analyzed by US EPA Method 310.1, pH analyzed by US EPA Method 150.1, sulfate analyzed by US EPA Method 300.0, free carbon dioxide analyzed by Method SM-18 4500CO2

MW-8A was resampled on April 10, 2003 for total and dissolved iron and managenese only. This data is reported under the March 13, 2003 sampling event.

* = The nitrite nitrogen analysis was originally performed within the 48 hour holding time, however the result obtained was greater than the subsequent result obtained for nitrate. The nitrite analysis was repeated past the holding time to yield the reported result.

(1) = All dissolved oxygen results were reported as 0 mg/l - field meter may not have been functioning properly.

** = Sample was submitted past the 48 hour hold time for nitrite nitrogen

P:\Clients\Amtrak-APU\GW Analytical Data\[GW data per well through June 2006 (complete).xls]MW-8A

MW-11
Groundwater Analytical Results

Amtrak Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

Date	4/19/2001	8/2/2001	11/28/2001	3/13/2003	6/25/2003	9/28/2003	12/15/2003	3/22/2004	6/24/2004	9/16/2004	12/22/2004	3/21/2005	6/23/2005	9/20/2005	12/13/2005	3/29/2006	6/29/2006
Laboratory Analyses																	
TPH-DRO	7.6	2.0	2.0	6.9	13.0	8.2	5.9	24.0	13.0	2.1	4.5	3.3	4	3.0	2.7	2.7	5.9
Total Iron	122	63.2	92.5	54.1	48.6	31.3	11.9	61.2	39.9	73.8	60.3	58.2	72.7	71.5	59.5	61.5	12.4
Dissolved Iron	17.1	24.4	23	29.9	38.8	26.4	12.5	57.4	17.2	58.8	9.14	53.6	67.6	60.4	57.7	68.8	10.1
Total Manganese	2.03	2.26	2.14	1.8	1.65	1.52	1.17	1.86	0.928	1.56	1.31	1.86	1.48	1.55	1.91	1.62	0.826
Dissolved Manganese	1.86	2.24	2.07	2.0	1.6	1.19	1.16	1.56	0.706	1.27	0.610	1.48	1.35	1.42	1.400	1.76	0.823
Nitrite Nitrogen	0.152	0.042J	0.135	0.085	0.073	0.076	0.063	<0.050	<0.050	0.096	<0.05	0.055	0.067	0.08	0.091	0.07	<0.05
Nitrate Nitrogen	0.095J	<0.04	<0.04	0.42	<0.1	0.33	3.6	<0.10	0.94	<0.1	<0.5	<0.10	<0.10	<0.1	<0.1	< 0.10	1.6
pH	6.31	6.19	6.44	6.2	5.8	5.9	5.6	6.2	5.9	6.4	6.3	6.4	6.3	6.1	6.5	6.3	5.2
Alkalinity to pH 8.3	<0.41	<0.41	<0.41	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	< 2.0	<2.0
Alkalinity to pH 4.5	119	115	139	52.8	41.7	66.7	8.3	55.5	21.5	116	62.5	84.7	107	113	141	135	7.4
Free Carbon Dioxide	117	149	101	66.6	132	168	41.7	70	54.1	92.4	62.6	67.4	107	180	89.2	135	93.4
Sulfate (turbidimetric)	19.3	2.6J	<1.5	32.9	40.4	33.2	23.9	19.9	29	<5.0	8.6	6.0	<5.0	<5.0	<5	5.2	37.5
Methane	6.7	6.1	12	2.1	0.1	0.44	0.23	4.4	0.24	11.0	6.9	5.0	3.2	2.4	4.9	3.6	0.32
Field Measurements																	
pH (s.u.)	6.32	6.58	6.27	6.05	5.21	5.94	6.16	6.11	5.25	6.2	5.75	6.30	6.22	6.08	6.72	6.2	4.7
Temperature (°C)	12.11	19.1	18.73	9.8	17.7	20.32	15.42	11.31	20.73	22.5	15.32	11.86	21.6	23.44	13.98	13.30	20.61
Specific Conductance (S/cm)	0.375	NA	0.505	0.177	0.205	0.317	0.109	0.304	0.098	0.331	0.124	0.283	0.406	0.305	0.9	61.5	0.122
Dissolved Oxygen (mg/l)	3.64	1.77	0 (1)	8.43	1.05	5.91	4.85	1.28	0.44	0.98	6.39	4.23	1.32	1.83	10.37	2.73	0.32
Redox (mv)	-23.50	-65.7	-62	-4	25	-33	-14	-42	70	-68	77	-44	-90	-96	-85	-35	233

Notes:

All results are reported in milligrams per liter (mg/L) unless otherwise noted

TPH-DRO = Total Petroleum Hydrocarbons - Diesel Range Organics

J = estimated value

<2.0 = result not detected above quantitation limit

TPH-DRO analyzed by US EPA Method 8015B, Iron analyzed by US EPA Method 7380, manganese analyzed by US EPA Method 7640, nitrite nitrogen and nitrate nitrogen analyzed by US EPA Method 353.2, alkalinity to pH 8.3 and 4.5 analyzed by US EPA Method 310.1, pH analyzed by US EPA Method 150.1, sulfate analyzed by US EPA Method 300.0, free carbon dioxide analyzed by Method SM-18 4500CO2

MW-11 was resampled on April 10, 2003 for total and dissolved iron and managenese only. This data is reported under the March 13, 2003 sampling event.

Nitrite nitrogen was analyzed past the 48 hour hold time for the June 25, 2003 sampling event.

NA = Not analyzed due to equipment problems.

(1) = All dissolved oxygen results were reported as 0 mg/l - field meter may not have been functioning properly.

P:\Clients\Amtrak-APL\GW Analytical Data\[GW data per well through June 2005 (complete).xls]MW-11

MW-12
Groundwater Analytical Results

Amtrak Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

Date	4/19/2001	8/2/2001	11/28/2001	3/13/2003	6/25/2003	9/28/2003	12/15/2003	3/22/2004	6/24/2004	9/16/2004	12/22/2004	3/21/2005	6/23/2005	9/20/2005	12/13/2005	3/29/2006	6/29/2006
Laboratory Analyses																	
TPH-DRO	0.37	0.20	0.18	0.41	0.18	0.33	0.33	0.25	15	0.25	0.42	0.14	<0.099	0.31	0.13	0.21	0.38
Total Iron	83.9	57.7	77.8	24.3	45.7	35.9	22.9	64.5	57.3	46.4	39.7	51.2	78.6	55.8	91.2	64.9	9.43
Dissolved Iron	0.174	8.44	9.57	3.3	23	26.4	20.5	59.2	39.8	41.3	46.1	48.5	48.1	86.2	45.5	70.2	11.5
Total Manganese	3.62	4.94	4.88	2.1	2.21	2.02	1.91	3.06	2.81	2.82	2.48	3.55	3.43	3.22	4.11	4.5	0.867
Dissolved Manganese	3.19	4.44	4.65	2.1	1.8	1.79	1.49	2.95	2.61	2.88	2.62	3.51	3.17	3.49	4.04	4.99	1.18
Nitrite Nitrogen	<0.015*	0.054	0.098	0.06	0.1	0.13	<0.050	<0.050	<0.050	0.07	0.052	<0.050	0.074	<0.05	0.091	0.075	<0.05
Nitrate Nitrogen	0.087J	0.04	<0.04	<0.10	<0.10	<1.0	<0.10	<0.10	<0.10	<0.1	<0.5	<0.10	<0.10	<0.1	<0.1	< 0.10	0.5
pH	6.43	6.28	6.47	6.4	6.7	6.3	6.4	6.4	6.4	6.4	6.4	6.5	6.2	6.4	6.5	6.5	6.2
Alkalinity to pH 8.3	<0.41	<0.41	<0.41	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	< 2.0	<2.0
Alkalinity to pH 4.5	272	250	293	143	116	427	102	231	167	200	183	248	255	301	337	313	78
Free Carbon Dioxide	202	262	199	114	46.3	428	81.2	184	133	159	146	157	322	240	213	198	98.4
Sulfate (turbidimetric)	5.5	1.5	1.8J	56.4	48.5	15	49.5	<5.0	44.2	<5.0	<5.0	<5.0	<5.0	<5.0	<5	< 5.0	63.6
Methane	7.7	7.3	11	19	8.1	12	4.3	9.3	6.8	12.0	7.6	7.1	6.1	7.8	7.1	8.6	0.92
Field Measurements																	
pH (s.u.)	6.16	6.82	6.3	6.39	6.06	5.91	6.63	6.45	6.55	6.45	6.45	6.32	6.27	6.2	6.39		6.18
Temperature (°C)	10.41	17.8	16.45	9.6	13.27	18.1	15.28	10.08	15.71	19.2	14.52	10.63	15.3	17.98	14.59		15.08
Specific Conductance (S/cm)	0.548	NA	0.843	0.36	0.344	0.381	0.285	0.552	0.348	0.433	0.327	0.495	0.567	0.821	0.001		0.238
Dissolved Oxygen (mg/l)	3.08	1.09	0 (1)	6.57	1.73	2.51	5.32	17.14	0.59	0.64	2.14	0.00	0.36	1.84	10.58		0.34
Redox (mv)	-40.70	-60.4	-103	3	-42	-63	-53	-102	-95	-103	-59	-113	-126	-123	-85		25.7

Notes:

All results are reported in milligrams per liter (mg/L) unless otherwise noted
TPH-DRO = Total Petroleum Hydrocarbons - Diesel Range Organics
J = estimated value
<2.0 = result not detected above quantitation limit
TPH-DRO analyzed by US EPA Method 8015B, iron analyzed by US EPA Method 7380, manganese analyzed by US EPA Method 7640, nitrite nitrogen and nitrate nitrogen analyzed by US EPA Method 353.2, alkalinity to pH 8.3 and 4.5 analyzed by US EPA Method 310.1, pH analyzed by US EPA Method 150.1, sulfate analyzed by US EPA Method 300.0, free carbon dioxide analyzed by Method SM-18 4500CO2
MW-12 was resampled on April 10, 2003 for total and dissolved iron and managenese only. This data is reported under the March 13, 2003 sampling event.
* = The nitrite nitrogen analysis was originally performed within the 48 hour holding time, however the result obtained was greater than the subsequent result obtained for nitrate. The nitrite analysis was repeated past the holding time to yield the reported result.
NA = Not analyzed due to equipment problems.
(1) = All dissolved oxygen results were reported as 0 mg/l - field meter may not have been functioning properly.

P:\Clients\Amtrak-APU\GW Analytical Data\[GW data per well through june 2006 (complete).xls]MW-12

MW-13
Groundwater Analytical Results

Amtrak Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

Date	4/19/2001	8/2/2001	12/5/2001	9/16/2004	12/21/2004	3/21/2005	6/23/2005	9/20/2005	12/13/2005	3/29/2006	6/29/2006
Laboratory Analyses											
TPH-DRO	6.6	3.8	0.9	2.0	7.4	6.0	5.6	1.9	3.0	3.4	0.99
Total Iron	99.8	54.9	63.5	47.8	69.7	86.7	61.7	45	46.7	58.2	47.2
Dissolved Iron	6.15	7.61	17.8	41.0	59.6	66.2	68.8	53.6	47.0	69.9	44.5
Total Manganese	0.639	0.48	0.432	0.301	0.407	0.398	0.282	0.289	0.279	0.305	0.237
Dissolved Manganese	0.606	0.49	0.412	0.226	0.34	0.328	0.323	0.319	0.305	0.381	0.227
Nitrite Nitrogen	<0.015*	0.35J	0.114	0.062	0.079**	0.065	0.055	<0.05	0.059	0.079	<0.05
Nitrate Nitrogen	0.089J	<0.04	<0.04	<0.5	<0.5	<0.10	<0.10	<0.1	<0.1	< 0.10	<0.1
pH	6.5	6.15	6.44	6.9	6.7	6.4	6.4	6.4	6.6	6.5	6.4
Alkalinity to pH 8.3	<0.41	<0.41	<0.41	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	< 2.0	<2.0
Alkalinity to pH 4.5	169	123	107	176	141	172	113	97.2	143	113	110
Free Carbon Dioxide	107	174	77.7	44.3	56.3	137	90	77.4	71.8	71.5	87.6
Sulfate (turbidimetric)	84	<1.5	<1.5	5.2	<5.0	<5.0	<5.0	<5.0	<5	< 5.0	<5.0
Methane	11	11	4.5	11.0	12.0	10.0	4.7	5.4	7.4	8.9	3.9
Field Measurements											
pH (s.u.)	6.31	7.19	6.73	6.77	6.66	6.58	6.68	6.48	6.64	6.45	6.83
Temperature (°C)	10.64	18.1	15.55	19	13.73	9.57	15.32	19.80	13.92	11.10	16.81
Specific Conductance (S/cm)	0.732	NA	0.878	0.447	0.324	0.445	0.582	0.986	0.9	0.94	0.439
Dissolved Oxygen (mg/l)	3.63	1.50	0 (1)	0.12	0	0.00	0.00	0.00	16.11	1.81	0.42
Redox (mv)	-82.30	-75.2	-158	-143	-117	-122	-199	-481	-62	-12.5	-143.9

Notes:

All results are reported in milligrams per liter (mg/L) unless otherwise noted

TPH-DRO = Total Petroleum Hydrocarbons - Diesel Range Organics

J = estimated value

<2.0 = result not detected above quantitation limit

TPH-DRO analyzed by US EPA Method 8015B, iron analyzed by US EPA Method 7380, manganese analyzed by US EPA Method 7640, nitrite nitrogen and nitrate nitrogen analyzed by US EPA Method 353.2, alkalinity to pH 8.3 and 4.5 analyzed by US EPA Method 310.1, pH analyzed by US EPA Method 150.1, sulfate analyzed by US EPA Method 300.0, free carbon dioxide analyzed by Method SM-18 4500CO2

MW-13 was resampled on April 10, 2003 for total and dissolved iron and manganese only. This data is reported under the March 13, 2003 sampling event.

* = The nitrite nitrogen analysis was originally performed within the 48 hour holding time, however the result obtained was greater than the subsequent result obtained for nitrate. The nitrite analysis was repeated past the holding time to yield the reported result.

NA = Not analyzed due to equipment problems.

(1) = All dissolved oxygen results were reported as 0 mg/l - field meter may not have been functioning properly.

** = Sample was submitted past the 48 hour hold time for nitrite nitrogen

P:\Clients\Amtrak-APU\GW Analytical Data\[GW data per well through June 2006 (complete).xls]MW-13

MW-14
Groundwater Analytical Results

Amtrak Former Fueling Facility
4001 Vandever Avenue
Wilmington, Delaware

Date	4/19/2001	8/2/2001	12/5/2001	3/13/2003	12/15/2003	3/22/2004	6/24/2004	9/16/2004	12/21/2004	3/21/2005	6/23/2005	9/20/2005	12/13/2005	3/29/2006	6/29/2006
Laboratory Analyses															
TPH-DRO	7.7	8.1	10	2.8	84	12	2.1	11	35	17	23	21	90	8.9	7
Total Iron	344	27.1	59.7	28.1	173	71.1	28.5	62.9	69.8	39.4	36	51.7	97.1	13.4	124
Dissolved Iron	7.62	13.7	17.5	3.3	118	65.6	13.8	151	144	70.4	65.1	170	149	19.4	33.5
Total Manganese	2.12	0.448	0.812	0.53	1.13	0.677	0.269	0.856	0.694	0.433	0.459	0.691	1.04	0.416	1.41
Dissolved Manganese	0.946	0.464	0.83	0.45	1.7	0.679	0.186	1.89	1.71	0.491	1.09	1.91	1.7	0.452	0.505
Nitrite Nitrogen	0.078	0.063	0.106	<0.050	0.088	0.059	<0.25	0.06	0.11**	<0.050	<0.25	<0.05	<0.25	< 0.050	0.15
Nitrate Nitrogen	0.86	<0.04	<0.04	0.22	<0.10	<0.10	<0.50	<0.2	<0.1	0.21	<0.50	<0.1	<0.1	< 0.10	<0.1
pH	6.25	6.25	6.26	6.4	6.3	6.3	6.4	6.2	6.3	6.2	5.1	6.2	6.3	6.2	6.3
Alkalinity to pH 8.3	<0.41	<0.41	<0.41	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	< 2.0	<2.0
Alkalinity to pH 4.5	135	154	166	106	133	163	95.8	140	112	108	129	143	148	98.5	298
Free Carbon Dioxide	152	173	182	84.4	133	163	76.3	177	112	136	2050	180	148	124	299
Sulfate (turbidimetric)	95	5.7	7.6	39.7	9.9	14.3	31	<5.0	10.9	36	<5.0	<5.0	6.8	63.2	7.6
Methane	2.7	6.5	5.7	3.4	6.4	11.0	6.7	12.0	6.1	1.9	2.8	3.6	4.8	0.89	6.6
Field Measurements															
pH (s.u.)	6.05	6.41	6.57	6.23	7.89	7.08	6.33	6.25	6.11	5.58	6.2	6.37	6.46	6.02	6.32
Temperature (°C)	12.14	18.2	17.85	12.2	16.89	11.36	16.91	20.5	17.03	12.51	17.1	20.80	13.16	14.81	16.15
Specific Conductance (S/cm)	0.379	91.0	0.795	0.223	0.801	0.505	0.214	0.327	0.351	0.339	0.394	0.689	0.554	0.294	0.279
Dissolved Oxygen (mg/l)	6.70	0.90	0 (1)	5.84	0	0	1.51	3.53	0	0.00	0.88	0.00	3.44	0	4.04
Redox (mv)	87.30	-62.7	-132	28	-151	-104	-39	-133	-82	64	-87	-488	-60	-26	-3.5

Notes:

All results are reported in milligrams per liter (mg/L) unless otherwise noted

TPH-DRO = Total Petroleum Hydrocarbons - Diesel Range Organics

J = estimated value

<2.0 = result not detected above quantitation limit

TPH-DRO analyzed by US EPA Method 8015B, iron analyzed by US EPA Method 7380, manganese analyzed by US EPA Method 7640, nitrite nitrogen and nitrate nitrogen analyzed by US EPA Method 353.2, alkalinity to pH 8.3 and 4.5 analyzed by US EPA Method 310.1, pH analyzed by US EPA Method 150.1, sulfate analyzed by US EPA Method 300.0, free carbon dioxide analyzed by Method SM-18 4500CO2

MW-14 was resampled on April 10, 2003 for total and dissolved iron and managenese only. This data is reported under the March 13, 2003 sampling event.

* = The nitrite nitrogen analysis was originally performed within the 48 hour holding time, however the result obtained was greater than the subsequent result obtained for nitrate. The nitrite analysis was repeated past the holding time to yield the reported result.

(1) = All dissolved oxygen results were reported as 0 mg/l - field meter may not have been functioning properly.

** = Sample was submitted past the 48 hour hold time for nitrite nitrogen

P:\Clients\Amtrak-APU\GW Analytical Data\[GW data per well through June 2006 (complete).xls]MW-14

APPENDIX C
NEW NPDES PERMIT REQUIREMENTS

State Permit Number WPCC 3089D/85
NPDES Permit Number DE 0050962
Effective Date: May 1, 2006
Expiration Date: April 30, 2011

AUTHORIZATION TO DISCHARGE UNDER THE

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

AND THE LAWS OF THE

STATE OF DELAWARE

In compliance with the provisions of the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 (33 U.S.C. 1251 et seq.) (hereinafter referred to as "the Act"), and pursuant to the provisions of 7 Del. C., 6003

The National Railroad Passenger Corporation (AMTRAK)
Wilmington Maintenance Facility
4001 Vandever Avenue
Wilmington, Delaware 19801

is authorized to discharge from the facility (Point Sources 001, 002, 003, 004, 005, 006, and 007) located at

4002 Vandever Avenue
Wilmington, Delaware 19801

to receiving waters named

Brandywine Tributary (Outfalls 001, 003, 004, 005, 006, and 007)
Shellpot Creek (Outfall 002)

The effluent limitations, monitoring requirements and other permit conditions are set forth in Part I, II and III hereof.

R. Peder Hansen, P.E., Manager
Surface Water Discharges Section
Division of Water Resources
Department of Natural Resources
and Environmental Control

Date Signed

Part I

A. Description Facilities and Permitted Discharges

1. Permitted Discharges

Outfall 001 discharges storm water run-off via inverted pipes through a dam (Dam B) in the Eastern Drainage Ditch, a tributary of Brandywine Creek. The pipes discharge to rip-rap and then into the Eastern Drainage Ditch. The Outfall 001 drainage area is located at the southern portion of the site and is undeveloped except for a series of railroad tracks associated with the rail yard. Significant materials[1] generally are not stored in this area other than the interim storage of oil recovered from the diesel fuel remedial program.

Outfall 002 discharges storm water run-off through a 42-inch storm conduit that discharges to a drainage swale, a tributary to Shellpot Creek. The Outfall 002 drainage area is the northern portion of the Maintenance Facility and generally includes maintenance shop areas, catch basins, parking lots, and paved roadways. Significant materials are stored in this area.

Outfall 003 discharges storm water run-off to the Eastern Drainage Ditch through a collection point located on the east side of that Ditch, a tributary of the Brandywine Creek. The Outfall 003 drainage area is located at the southern portion of the site and includes an area where a 0.25 million gallon oil tank was previously located. Significant materials generally are not stored in this area other than the interim storage of oil recovered from the diesel fuel remedial program.

Outfall 004 discharges storm water run-off through a catchment box to the Western Drainage Ditch, a tributary to Brandywine Creek. The Outfall 004 drainage area is located along the western section of the maintenance yard. Significant materials generally are not stored in this area.

Outfall 005 discharges storm water run-off via inverted pipes through a dam (Dam C), in the Western Drainage Ditch, a tributary to Brandywine Creek. The Outfall 005 drainage area is located at the southern portion of the site. Storm water runoff from the west side, southern section of the maintenance yard discharges through this outfall. Significant materials generally are not stored in this area other than the interim storage of oil recovered from the diesel fuel remedial program.

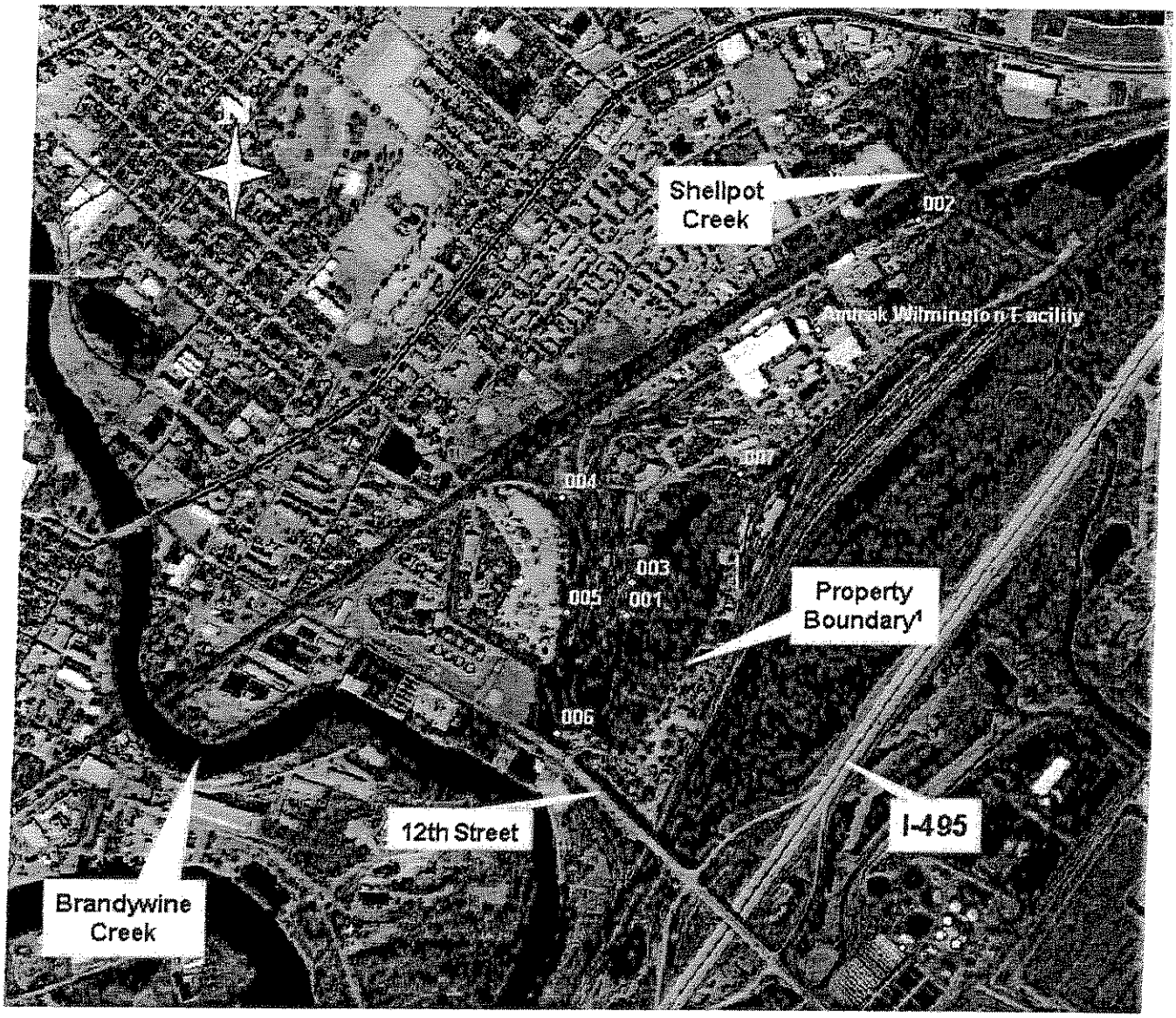
Outfall 006 discharges storm water run-off from inverted pipes through a dam (12th Street Dam) to a tributary to Brandywine Creek. Outfall 006 located at the convergence of the Eastern Drainage Ditch and the Western Drainage Ditch. The Outfall 006 drainage area is located at the southern portion of the site and is undeveloped except for a series of railroad tracks associated with the rail yard. Significant materials generally are not stored in this area other than the interim storage of oil recovered from the diesel fuel remedial program.

Outfall 007 discharges storm water run-off through a 42-inch storm conduit to a drainage swale that drains to the Eastern Drainage Ditch, a tributary of Brandywine Creek. The Outfall 007 drainage area is located in the central section of the facility and includes maintenance shop areas, the rail engine refueling area, multiple catch basins throughout the yard, parking lots, and paved roadways.

[1] Materials which could significantly impact storm water quality.

A. General Description of Discharges and Facilities (continued)

2. Site Location and Outfalls Locations Map[1]



1 The "Property Boundary" line in the "Outlines Locations Map" delineates the nominal area of responsibility of the permittee, and is not an exact property boundary line.

B. Effluent Limitations and Monitoring Requirements

1. Outfall 001 – EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning effective date and lasting through expiration date, the permittee is authorized to discharge from point source 001[1] the quantity and quality of effluent specified below:

Parameter	Effluent Limitations							Monitoring Requirements[2]	
	Load			Concentration				Measurement Frequency	Sample Type
	Daily Average	Daily Maximum	Units	Daily Average	Daily Maximum	Maximum Instantaneous	Units		
Flow			GPM	--	--	--	--	Instantaneous[3]	Estimated[4]
Oil and Grease	--	--	--	10.0	15.0	--	mg/L	Quarterly	Grab
pH	The pH shall be between 6.0 S.U. and 9.0 S.U. at all times						S.U.	Semi-annually	Grab
Surfactants	--	--	--	--		--	mg/L	Semi-annually	Grab
PCBs	See Special Conditions Nos.4 and 5 beginning on page 42 of this permit.						pg/L		
Discharges of stormwater associated with industrial activity shall be free of floating solids, sludge deposits, debris, oil, and scum to the MEP.[5] Non-stormwater discharges are prohibited. The discharges shall not cause scouring or erosion.									

The timing of sampling shall allow for two full days of standard operating activities to occur at the facility since the last rainfall event that resulted in run-off from the facility. A representative[6] stormwater sample shall be taken at the discharge of Outfall 001, in accordance with the monitoring requirements specified above. No samples shall be taken under circumstances having the potential to endanger the person taking the sample.

1 See discharge description on page 2 of this permit.
2 Report "nondetected" testing results on the discharge monitoring report (DMR) as "<" and the applicable test MDL. For example, if Surfactants are "nondetected" using a test method with an MDL of 10 µg/L, report "< 10 µg/L" on the DMR.
3 The instantaneous flow rate shall be recorded at each time a sample is taken for each specific parameter.
4 Determine the flow of stormwater at the time the sample is taken. A reading from a rain gauge can be substituted for an estimate of flow.
5 Maximum Extent Practicable (MEP) – means to complete an objective or requirement of the permit to a level which bears the most benefit from and environmental standpoint but not to a level that is physically or economically unattainable, or that would jeopardize human health or safety, or that would prohibit the conductance of work at the facility.
6 Storm water must discharge for at least 15 minutes and the sample must be taken within the first hour of discharge in order to be representative.

B. Effluent Limitations and Monitoring Requirements (continued)

2. Outfalls 002, 006, and 007 – FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning three years after the effective date and lasting through expiration date, the permittee is authorized to discharge from point sources 002, 006, and 007[1] the quantity and quality of effluent specified below:

Parameter	Effluent Limitations							Monitoring Requirements[2]	
	Load			Concentration				Measurement Frequency	Sample Type
	Daily Average	Daily Maximum	Units	Daily Average	Daily Maximum	Maximum Instantaneous	Units		
Flow			GPM	--	--	--		Instantaneous[3]	Estimated[4]
pH	The pH shall be between 6.0 S.U. and 9.0 S.U. at all times						S.U.	Semi-annually	Grab
Oil and Grease	--	--	--	10.0	15.0	--	mg/L	Semi-annually	Grab
Surfactants	--	--	--	--		--	mg/L	Semi-annually	Grab
Trichloroethylene	--	--	--	--		--	mg/L	002 Only - Annually	Grab
Total Nitrogen (as N)	--	--	--	--		--	mg/L	007 Only - Annually	Grab
Total Phosphorus (as P)	--	--	--	--		--	mg/L	007 Only - Annually	Grab
Enterococci	--	--	--	--		--	mg/L	007 Only - Annually	Grab
PCBs	See Special Conditions Nos.4 and 5 beginning on page 42 of this permit.						pg/L	002 & 006 - Annually, 007 - Biennially	Composite[5]
Discharges of stormwater associated with industrial activity shall be free of floating solids, sludge deposits, debris, oil, and scum to the MEP.[6] Non-stormwater discharges are prohibited. The discharges shall not cause scouring or erosion.									

The timing of sampling shall allow for two full days of standard operating activities to occur at the facility since the last rainfall event that resulted in run-off from the facility. A sample from a representative[7] stormwater discharge shall be taken at the location of the Outfalls in accordance with the monitoring requirements specified above. No samples shall be taken under circumstances having the potential to endanger the person taking the sample.

1 See discharge descriptions on page 2 of this permit.
2 Report "nondetected" testing results on the discharge monitoring report (DMR) as "<" and the applicable test MDL. For example, if Surfactants are "nondetected" using a test method with an MDL of 10 µg/L, report "< 10 µg/L" on the DMR.
3 The instantaneous flow rate shall be recorded at each time a sample is taken for each specific parameter.
4 Determine the flow of stormwater at the time the sample is taken. A reading from a rain gauge can be substituted for an estimate of flow.
5 For purposes of PCB congener monitoring at Outfall 006, a "composite" sample will be as defined in the approved Pollutant Minimization Plan. See Special Conditions Nos.4 and 5 beginning on page 20 of this permit.
6 Maximum Extent Practicable (MEP) – means to complete an objective or requirement of the permit to a level which bears the most benefit from and environmental standpoint but not to a level that is physically or economically unattainable, or that would jeopardize human health or safety, or that would prohibit the conductance of work at the facility.
7 Storm water must discharge for at least 15 minutes and the sample must be taken within the first hour of discharge in order to be representative.

B. Effluent Limitations and Monitoring Requirements (continued)

3. Outfalls 003 and 004 – EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning effective date and lasting through expiration date, the permittee is authorized to discharge from point sources 003 and 004[1] the quantity and quality of effluent specified below:

Parameter	Effluent Limitations							Monitoring Requirements[2]	
	Load			Concentration				Measurement Frequency	Sample Type
	Daily Average	Daily Maximum	Units	Daily Average	Daily Maximum	Maximum Instantaneous	Units		
PCBs	See Special Conditions Nos.4 and 5 beginning on page 42 of this permit.						pg/L		
Discharges of stormwater associated with industrial activity shall be free of floating solids, sludge deposits, debris, oil, and scum to the MEP.[3] Non-stormwater discharges are prohibited. The discharges shall not cause scouring or erosion.									

1 *See discharge descriptions on page 2 of this permit..*

2 Report "nondetected" testing results on the discharge monitoring report (DMR) as "<" and the applicable test MDL. For example, if Surfactants are "nondetected" using a test method with an MDL of 10 µg/L, report "< 10 µg/L" on the DMR.

3 Maximum Extent Practicable (MEP) – means to complete an objective or requirement of the permit to a level which bears the most benefit from and environmental standpoint but not to a level that is physically or economically unattainable, or that would jeopardize human health or safety, or that would prohibit the conductance of work at the facility.

B. Effluent Limitations and Monitoring Requirements (continued)

4. Outfall 005 – EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning effective date and lasting through expiration date, the permittee is authorized to discharge from point source 005[1] the quantity and quality of effluent specified below:

Parameter	Effluent Limitations							Monitoring Requirements[2]	
	Load			Concentration				Measurement Frequency	Sample Type
	Daily Average	Daily Maximum	Units	Daily Average	Daily Maximum	Maximum Instantaneous	Units		
Flow			gpm	--	--	--	--	Instantaneous[3]	Estimated[4]
pH	The pH shall be between 6.0 S.U. and 9.0 S.U. at all times						S.U.	Semi-annually	Grab
Oil and Grease	--	--	--	10.0	15.0	--	mg/L	Semi-annually	Grab
Surfactants	--	--	--			--	mg/L	Semi-annually	Grab
PCBs	See Special Conditions Nos.4 and 5 beginning on page 42 of this permit.						pg/L		
Discharges of stormwater associated with industrial activity shall be free of floating solids, sludge deposits, debris, oil, and scum to the MEP.[5] Non-stormwater discharges are prohibited. The discharges shall not cause scouring or erosion.									

The timing of sampling shall allow for two full days of standard operating activities to occur at the facility since the last rainfall event that resulted in run-off from the facility. A representative[6] stormwater sample shall be taken at the discharge of Outfall 001, in accordance with the monitoring requirements specified above. No samples shall be taken under circumstances having the potential *to endanger the person taking the sample.*

1 See discharge descriptions on page 2 of this permit.
2 Report "nondetected" testing results on the discharge monitoring report (DMR) as "<" and the applicable test MDL. For example, if Surfactants are "nondetected" using a test method with an MDL of 10 µg/L, report "< 10 µg/L" on the DMR.
3 The instantaneous flow rate shall be recorded at each time a sample is taken for each specific parameter.
4 Determine the flow of stormwater at the time the sample is taken. A reading from a rain gauge can be substituted for an estimate of flow.
5 Maximum Extent Practicable (MEP) – means to complete an objective or requirement of the permit to a level which bears the most benefit from and environmental standpoint but not to a level that is physically or economically unattainable, or that would jeopardize human health or safety, or that would prohibit the conductance of work at the facility.
6 Storm water must discharge for at least 15 minutes and the sample must be taken within the first hour of discharge in order to be representative.

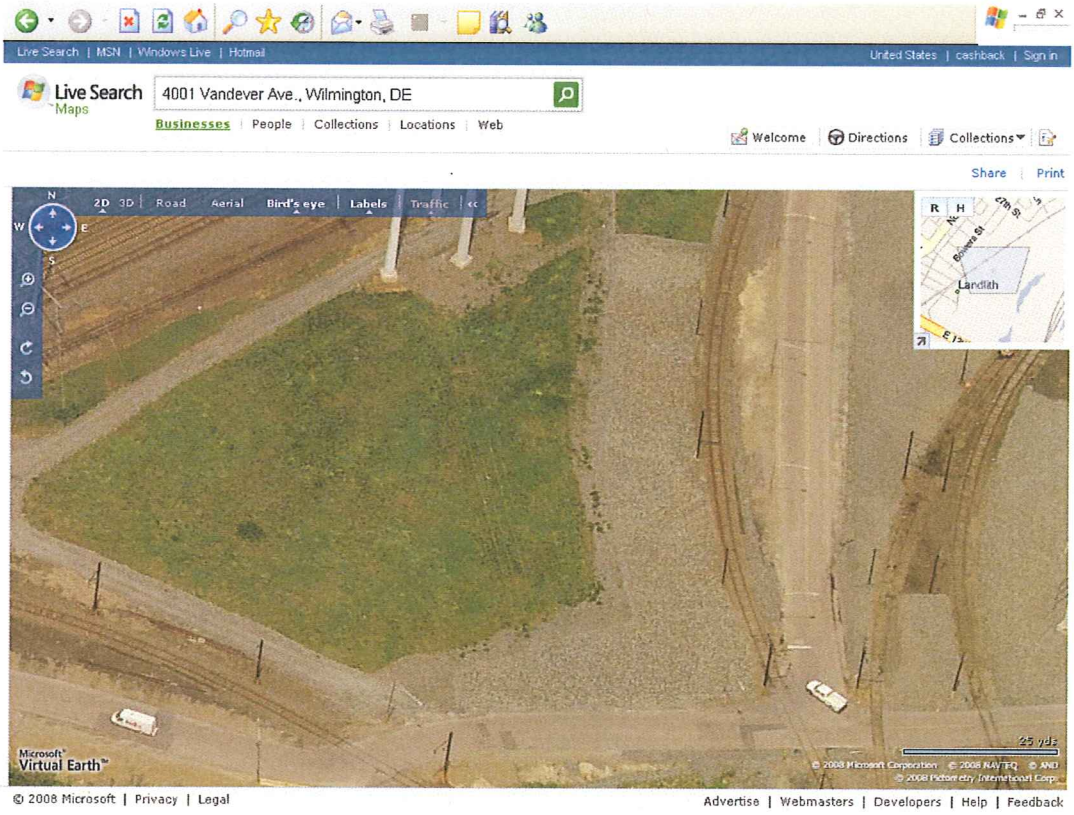
PCB Mass Loading
Amtrak Refueling Yard
SIRB ID: DE-0266
Wilmington, Delaware

BrightFields, Inc.

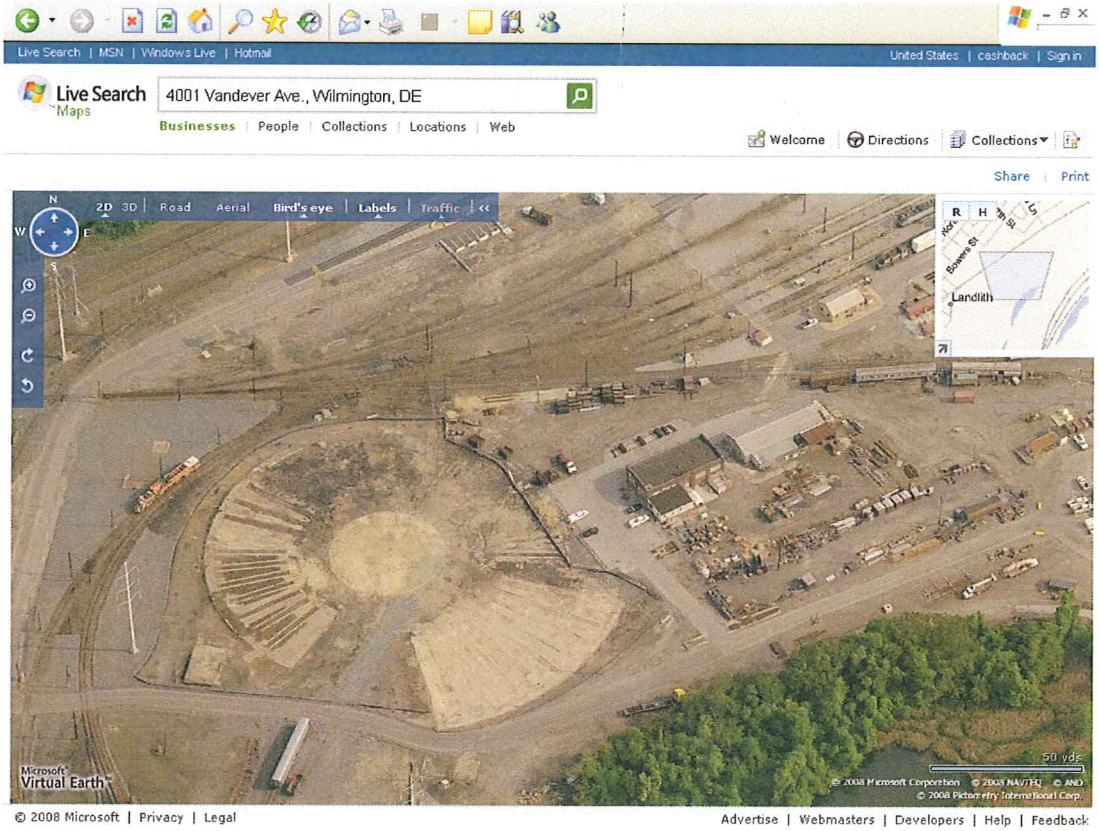
Site Photographs

(Aerial Photography)

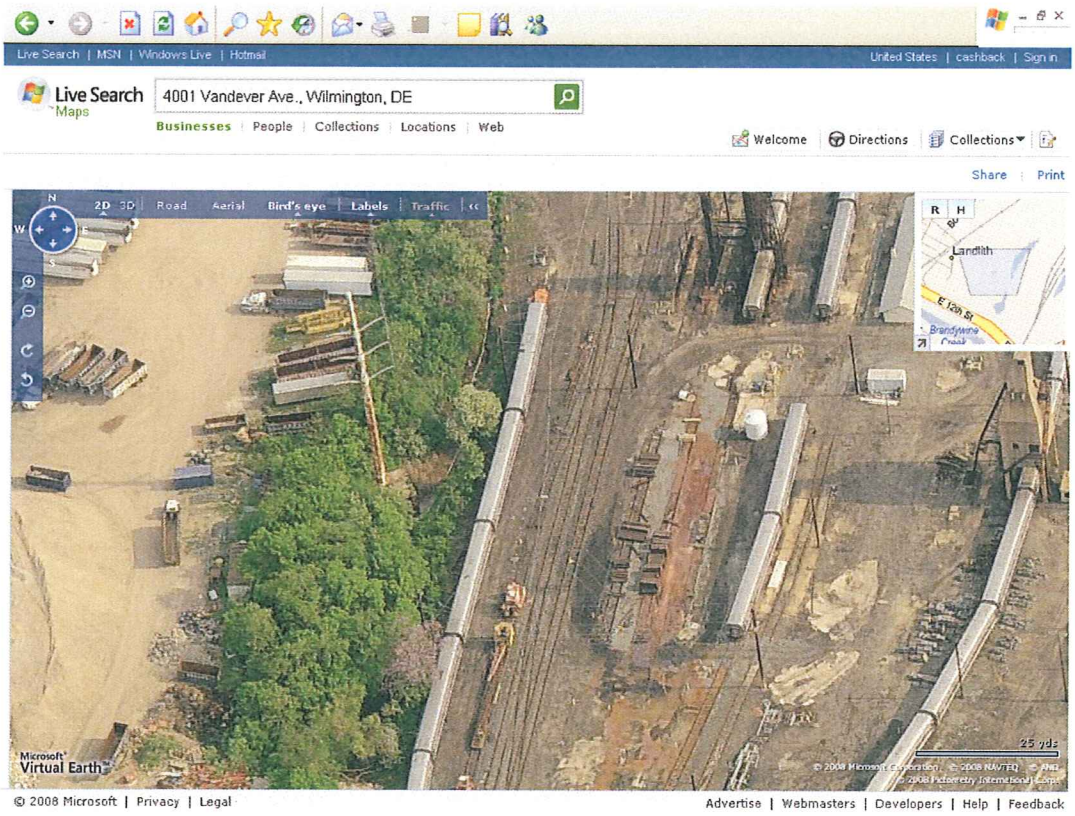
AREA 5


Live Search | MSN | Windows Live | Hotmail
United States | cashback | Sign in
Live Search Maps
4001 Vandever Ave., Wilmington, DE
Businesses | People | Collections | Locations | Web
Welcome | Directions | Collections
Share | Print
2D 3D | Road | Aerial | Bird's eye | Labels | Traffic
Landlith
25 yds
Microsoft Virtual Earth
© 2008 Microsoft | Privacy | Legal
Advertise | Webmasters | Developers | Help | Feedback

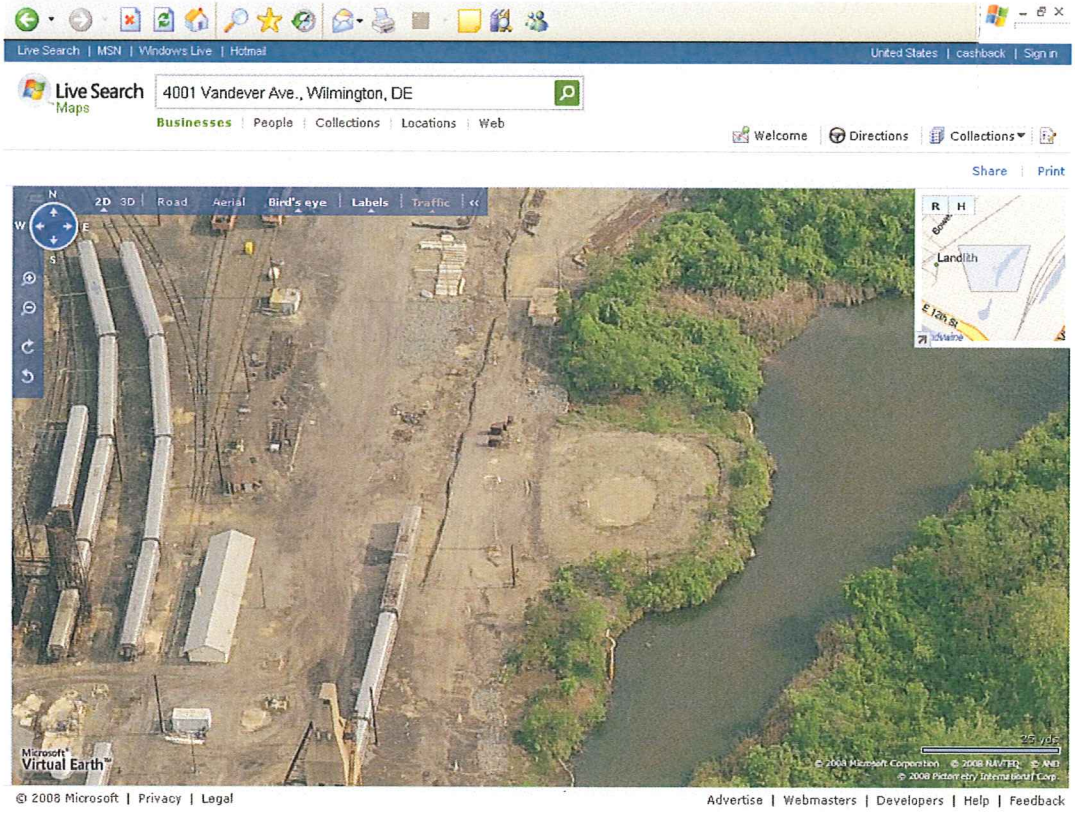
AREA 4


Live Search | MSN | Windows Live | Hotmail
United States | cashback | Sign in
Live Search Maps
4001 Vandever Ave., Wilmington, DE
Businesses | People | Collections | Locations | Web
Welcome | Directions | Collections
Share | Print
2D 3D | Road | Aerial | Bird's eye | Labels | Traffic
Landlith
50 yds
Microsoft Virtual Earth
© 2008 Microsoft | Privacy | Legal
Advertise | Webmasters | Developers | Help | Feedback

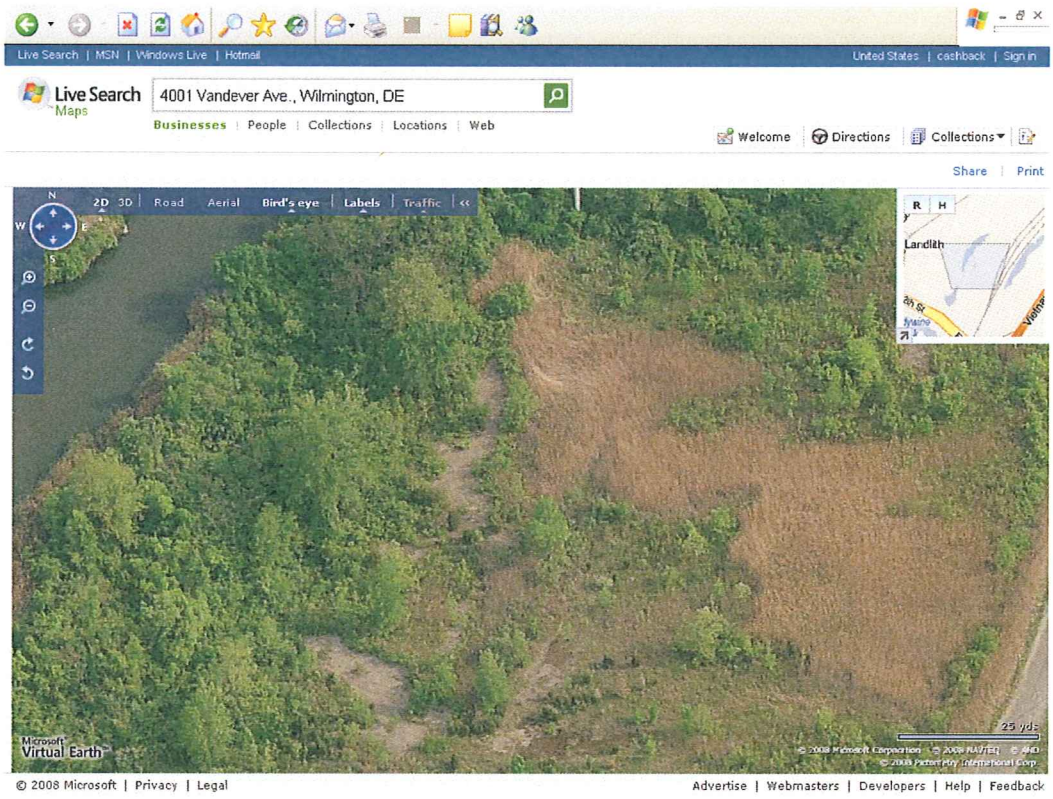
AREA 3


Live Search | MSN | Windows Live | Hotmail
United States | cashback | Sign in
Live Search Maps
4001 Vandever Ave., Wilmington, DE
Businesses | People | Collections | Locations | Web
Welcome | Directions | Collections
Share | Print
2D 3D | Road | Aerial | Bird's eye | Labels | Traffic
Landlith
E 12th St
25 yds
Microsoft Virtual Earth
© 2008 Microsoft | Privacy | Legal
Advertise | Webmasters | Developers | Help | Feedback

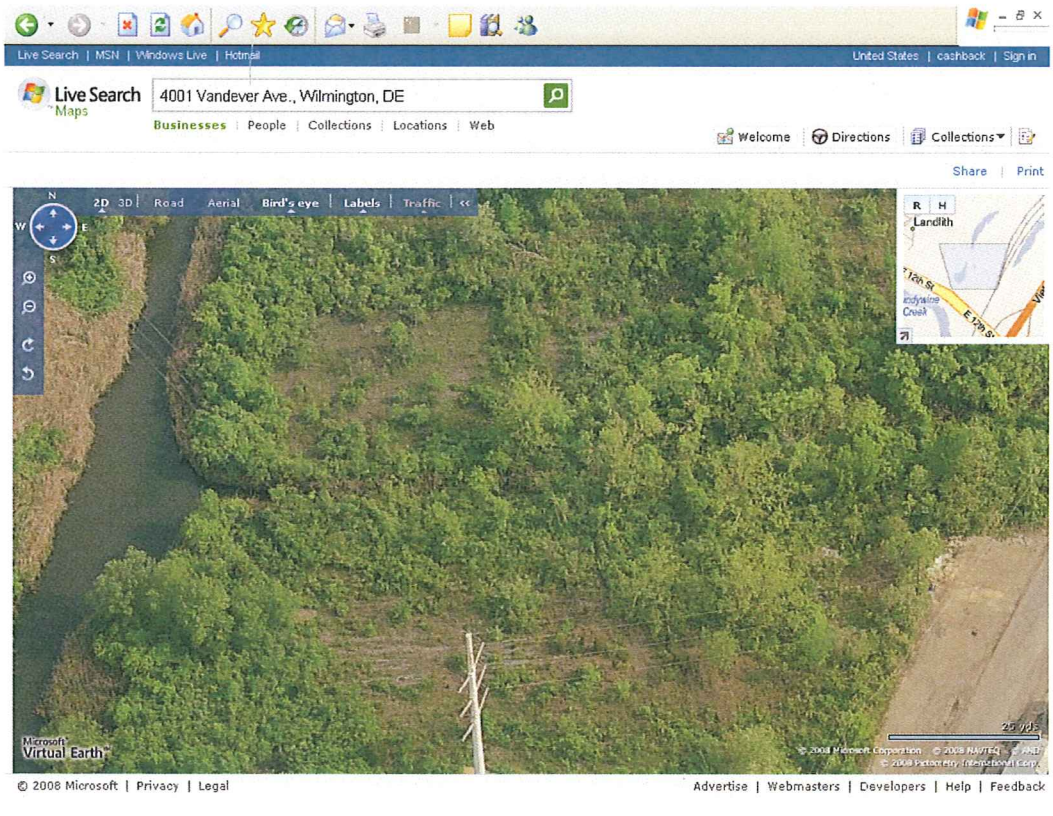
AREA 2


Live Search | MSN | Windows Live | Hotmail
United States | cashback | Sign in
Live Search Maps
4001 Vandever Ave., Wilmington, DE
Businesses | People | Collections | Locations | Web
Welcome | Directions | Collections
Share | Print
2D 3D | Road | Aerial | Bird's eye | Labels | Traffic
Landlith
E 12th St
25 yds
Microsoft Virtual Earth
© 2008 Microsoft | Privacy | Legal
Advertise | Webmasters | Developers | Help | Feedback

AREA 1



AREA 1 Small Creek Feature



PCB Mass Loading
Amtrak Refueling Yard
SIRB ID: DE-0266
Wilmington, Delaware

BrightFields, Inc.

Overland Flow Calculations

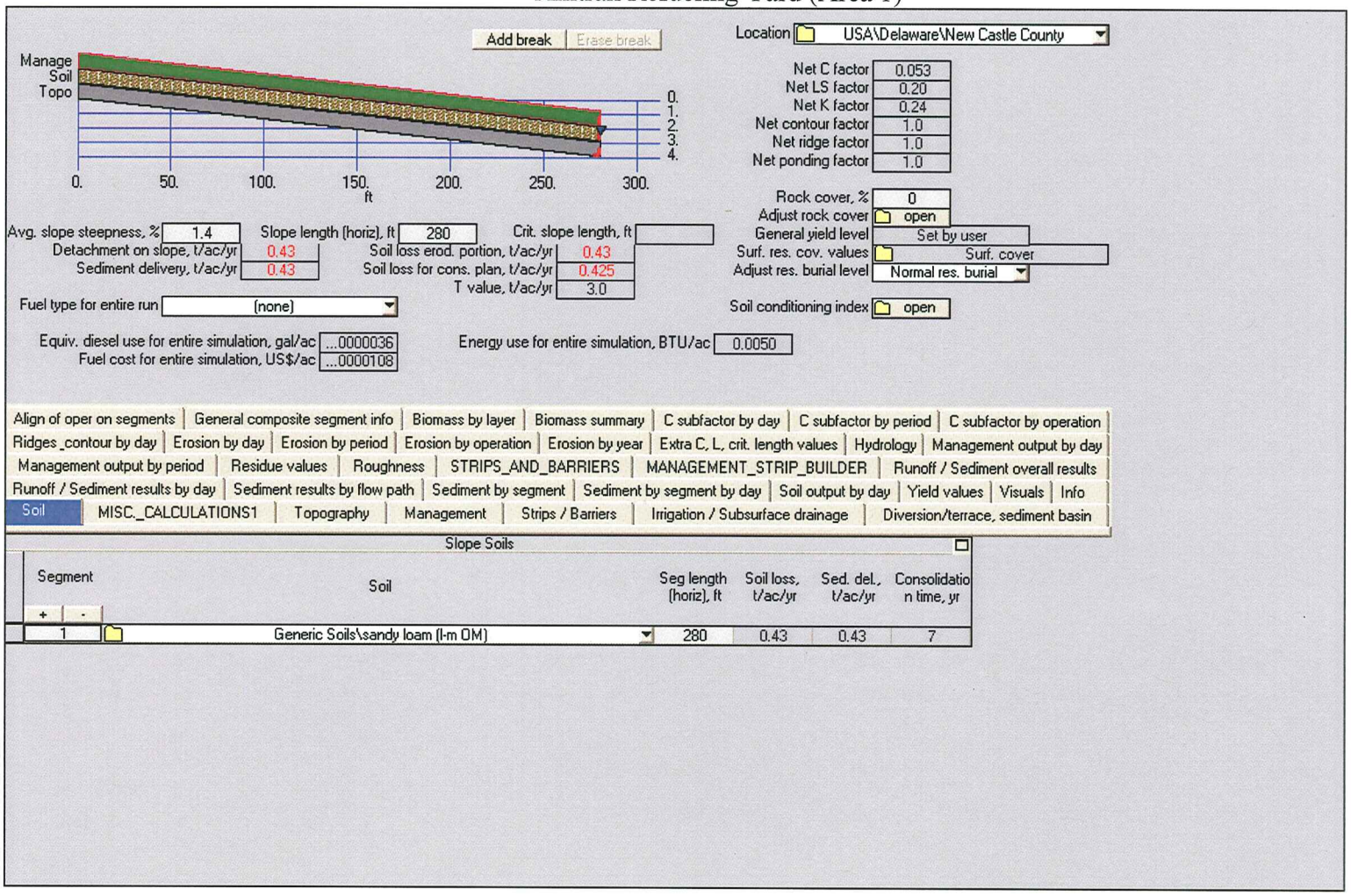
PCB Loading Calculations from the Universal Soil Loss Equation
Amtrak Refueling Yard (Area 1)
Wilmington, DE
DE-0266

Surface PCB Concentration | 27.6 | mg/kg

Symbol	Factor	Value	Units
R	Rainfall/Runoff Erosivity Index	170	10^2 ft-tonf in/acre hr
K	Soil Erodibility	0.24	0.01 tonf acre hr/ac ft-ton in
	Estimated Slope Length	281	Feet
	Estimated Elevation Difference	4	Feet
	Slope	1.4	Percent
	Erodeable Area	21.9	Acres
LS	Topographic Factor	0.200	Dimensionless
C	Cover and Management Factor	0.053	Dimensionless
P	Support Practice Factor	1	Dimensionless
	Average Annual Soil Loss	0.43	ton/ac/yr

PCB Loading via Overland Flow | 236 | **grams/year - PCBs**

Amtrak Refueling Yard (Area 1)



PCB Loading Calculations from the Universal Soil Loss Equation
Amtrak Refueling Yard (Area 2)
Wilmington, DE
DE-0266

Surface PCB Concentration | 171 | mg/kg

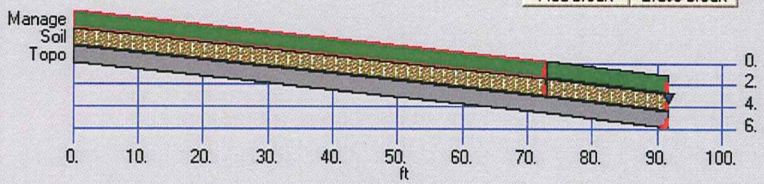
Symbol	Factor	Value	Units
R	Rainfall/Runoff Erosivity Index	170	10^2 ft-tonf in/acre hr
K	Soil Erodibility	0.24	0.01 tonf acre hr/ac ft-ton in
	Estimated Slope Length	92.5	Feet
	Estimated Elevation Difference	6	Feet
	Slope	6.5	Percent
	Erodeable Area	15.7	Acres
LS	Topographic Factor	0.780	Dimensionless
C	Cover and Management Factor	0.22 - 0.45	Dimensionless
P	Support Practice Factor	0.57	Dimensionless
	Average Annual Soil Loss	8.6	ton/ac/yr

PCB Loading via Overland Flow | 20,945 | **grams/year - PCBs**

Amtrak Refueling Yard (Area 2)

Add break | Erase break

Location: USA\Delaware\New Castle County



Net C factor
Net LS factor
Net K factor
Net contour factor
Net ridge factor
Net ponding factor

Rock cover, %: 0
Adjust rock cover: open
General yield level: Set by user
Surf. res. cov. values: Surf. cover
Adjust res. burial level: Normal res. burial

Avg. slope steepness, %: 6.5
Slope length (horiz), ft: 92
Crit. slope length, ft:
Detachment on slope, t/ac/yr: 11
Sediment delivery, t/ac/yr: 8.6
Soil loss erod. portion, t/ac/yr: 11
Soil loss for cons. plan, t/ac/yr: 10.4
I value, t/ac/yr:

Fuel type for entire run: (none)

Soil conditioning index: open

Equiv. diesel use for entire simulation, gal/ac: 0.28
Fuel cost for entire simulation, US$/ac: 1.41

Energy use for entire simulation, BTU/ac: 39000

Align of oper on segments | General composite segment info | Biomass by layer | Biomass summary | C subfactor by day | C subfactor by period | C subfactor by operation | Ridges _contour by day | Erosion by day | Erosion by period | Erosion by operation | Erosion by year | Extra C, L, crit. length values | Hydrology | Management output by day | Management output by period | Residue values | Roughness | STRIPS_AND_BARRIERS | MANAGEMENT_STRIP_BUILDER | Runoff / Sediment overall results | Runoff / Sediment results by day | Sediment results by flow path | Sediment by segment | Sediment by segment by day | Soil output by day | Yield values | Visuals | Info | Soil | MISC._CALCULATIONS1 | Topography | Management | Strips / Barriers | Irrigation / Subsurface drainage | Diversion/terrace, sediment basin

Slope Soils

Segment	Soil	Seg length (horiz), ft	Soil loss, t/ac/yr	Sed. del., t/ac/yr	Consolidation time, yr
1	Generic Soils\sandy loam (l-m OM)	73	13	13	7
2	Generic Soils\sandy loam (l-m OM)	19	-10	8.6	7

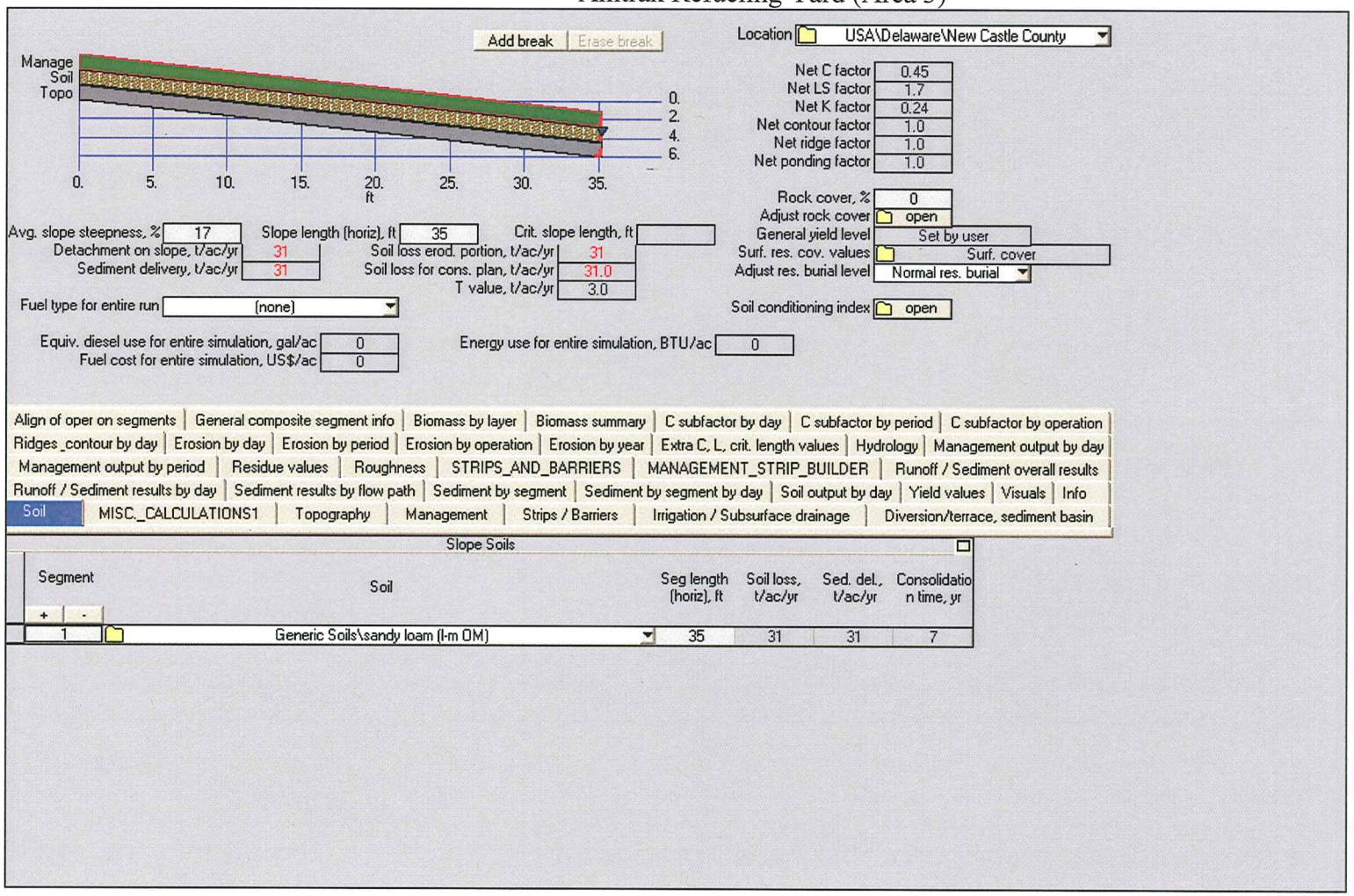
PCB Loading Calculations from the Universal Soil Loss Equation
Amtrak Refueling Yard (Area 3)
Wilmington, DE
DE-0266

Surface PCB Concentration | 20.2 | mg/kg

Symbol	Factor	Value	Units
R	Rainfall/Runoff Erosivity Index	170	10^2 ft-tonf in/acre hr
K	Soil Erodibility	0.24	0.01 tonf acre hr/ac ft-ton in
	Estimated Slope Length	35.3	Feet
	Estimated Elevation Difference	6	Feet
	Slope	17.0	Percent
	Erodeable Area	4.68	Acres
LS	Topographic Factor	1.70	Dimensionless
C	Cover and Management Factor	0.45	Dimensionless
P	Support Practice Factor	1	Dimensionless
	Average Annual Soil Loss	31.0	ton/ac/yr

PCB Loading via Overland Flow | 2,660 | **grams/year - PCBs**

Amtrak Refueling Yard (Area 3)



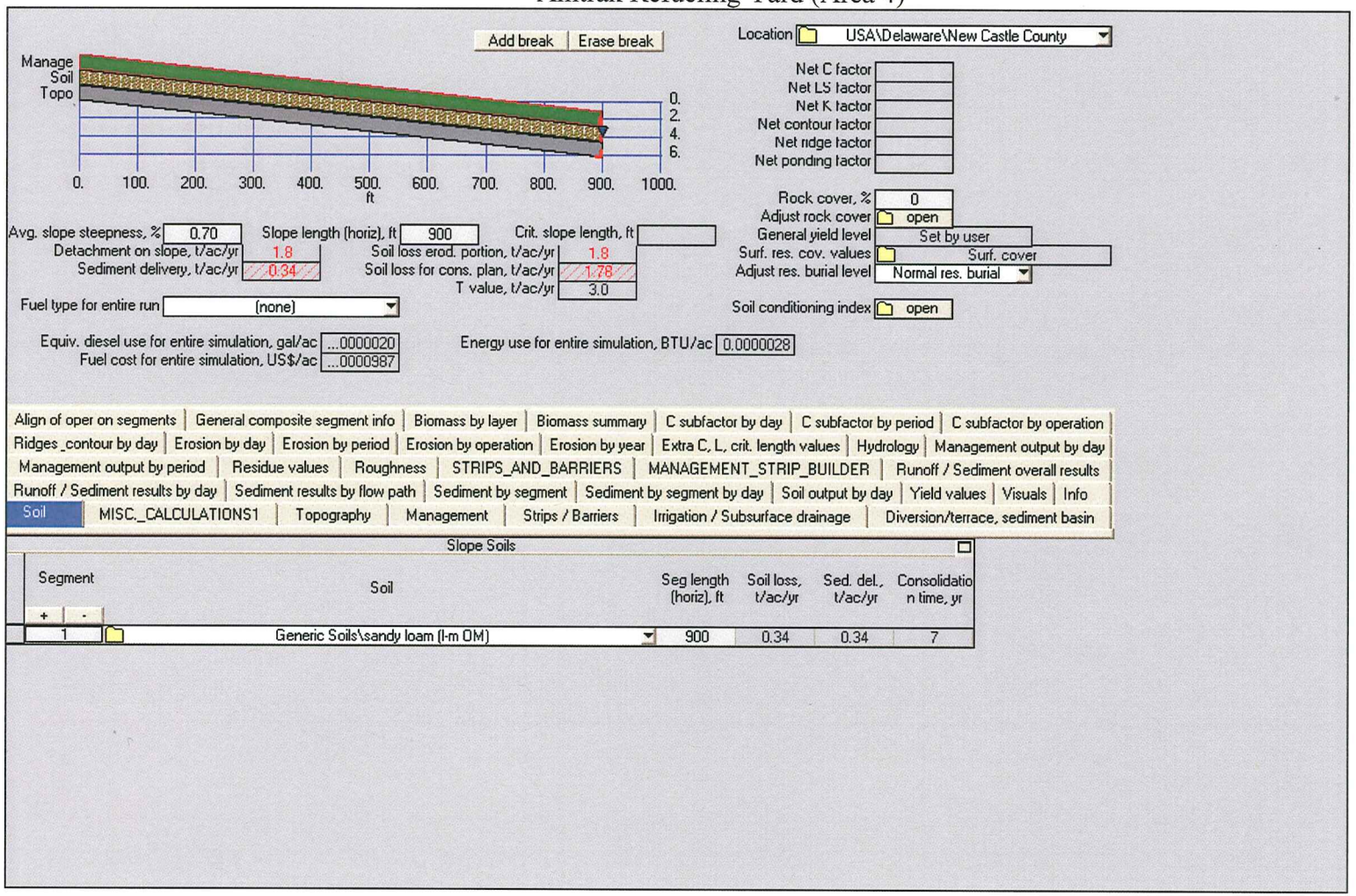
PCB Loading Calculations from the Universal Soil Loss Equation
Amtrak Refueling Yard (Area 4)
Wilmington, DE
DE-0266

Surface PCB Concentration | 171 | mg/kg

Symbol	Factor	Value	Units
R	Rainfall/Runoff Erosivity Index	170	10^2 ft-tonf in/acre hr
K	Soil Erodibility	0.24	0.01 tonf acre hr/ac ft-ton in
	Estimated Slope Length	903	Feet
	Estimated Elevation Difference	6	Feet
	Slope	0.7	Percent
	Erodeable Area	7.17	Acres
LS	Topographic Factor	0.120	Dimensionless
C	Cover and Management Factor	0.45	Dimensionless
P	Support Practice Factor	0.190	Dimensionless
	Average Annual Soil Loss	0.340	ton/ac/yr

378 **grams/year - PCBs**

Amtrak Refueling Yard (Area 4)



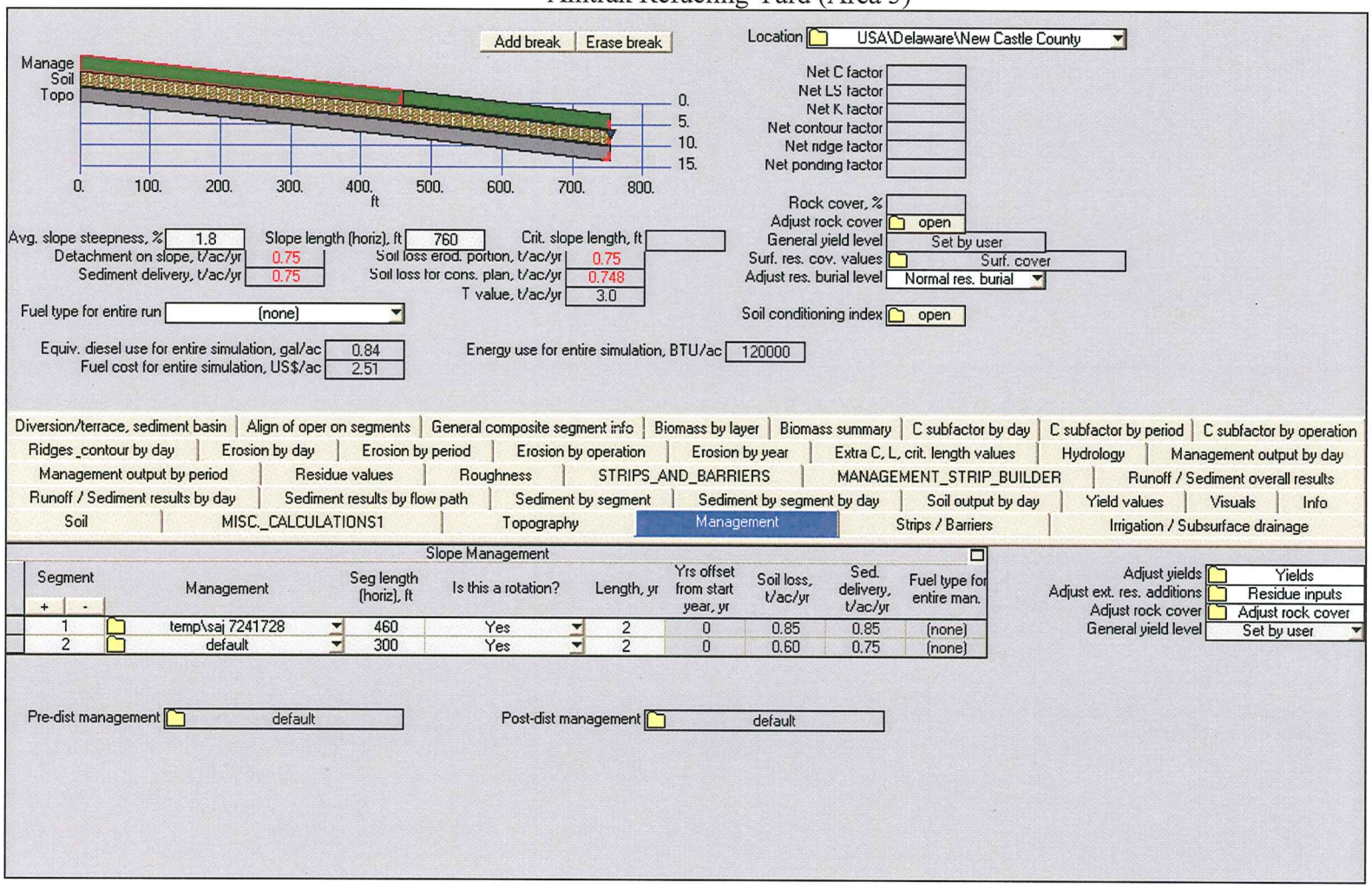
PCB Loading Calculations from the Universal Soil Loss Equation
Amtrak Refueling Yard (Area 5)
Wilmington, DE
DE-0266

Surface PCB Concentration | 9.53 | mg/kg

Symbol	Factor	Value	Units
R	Rainfall/Runoff Erosivity Index	170	10^2 ft-tonf in/acre hr
K	Soil Erodibility	0.24	0.01 tonf acre hr/ac ft-ton in
	Estimated Slope Length	759	Feet
	Estimated Elevation Difference	14	Feet
	Slope	1.8	Percent
	Erodeable Area	4.44	Acres
LS	Topographic Factor	0.310	Dimensionless
C	Cover and Management Factor	0.012 - 0.05	Dimensionless
P	Support Practice Factor	1	Dimensionless
	Average Annual Soil Loss	0.750	ton/ac/yr

PCB Loading via Overland Flow | 28.8 | **grams/year - PCBs**

Amtrak Refueling Yard (Area 5)



PCB Mass Loading
Amtrak Refueling Yard
SIRB ID: DE-0266
Wilmington, Delaware

BrightFields, Inc.

Groundwater Transport Calculations

PCB Loading Calculations - Groundwater Discharge to Surface Water
Amtrak Refueling Yard
Wilmington, DE
DE-0266

TABLE A
Groundwater Discharge Calculations

Location	Hydraulic Conductivity (K) (ft/day)	Horizontal Gradient (i) (ft/ft)	Cross-sectional Area (A) (ft2)	Groundwater Discharge*	
				Liters/day	Gallons/ day
Zone A (Wells 7,8)					
Minimum	0.066	0.003	6,500	36	10
Maximum	1.83	0.0034	26,000	4,600	1,200
Zone B (Wells 15, 16, 18)					
Minimum	0.066	0.003	6,500	36	10
Maximum	1.83	0.0037	26,000	5,000	1,300
TOTAL					
Minimum	0.066	0.003	13,000	73	19
Maximum	1.83	0.0037	52,000	9,600	2,500

* - Groundwater Discharge (Q) = KiA

TABLE B
Potential Groundwater PCB Concentration Calculation

Location	Maximum Soil PCB (µg/kg)	f_{OC} (fraction of organic carbon)		Average Detected Groundwater PCB (µg/L)	
				Maximum	Minimum
Zone A				2.5	2.5
Zone B				0.83	0.83

TABLE C
Estimated Mass Loadings of PCBs in Groundwater to Surface Water

Location	Maximum Detected Groundwater Concentration (µg/L)	Estimated PCB Mass Loading (g/yr)	
		Minimum	Maximum
Zone A	2.5	0.03	4.2
Zone B	0.83	0.011	1.5
TOTAL		0.04	5.7