

APPENDIX E

Supporting Documentation for CM Analysis – SWMU8

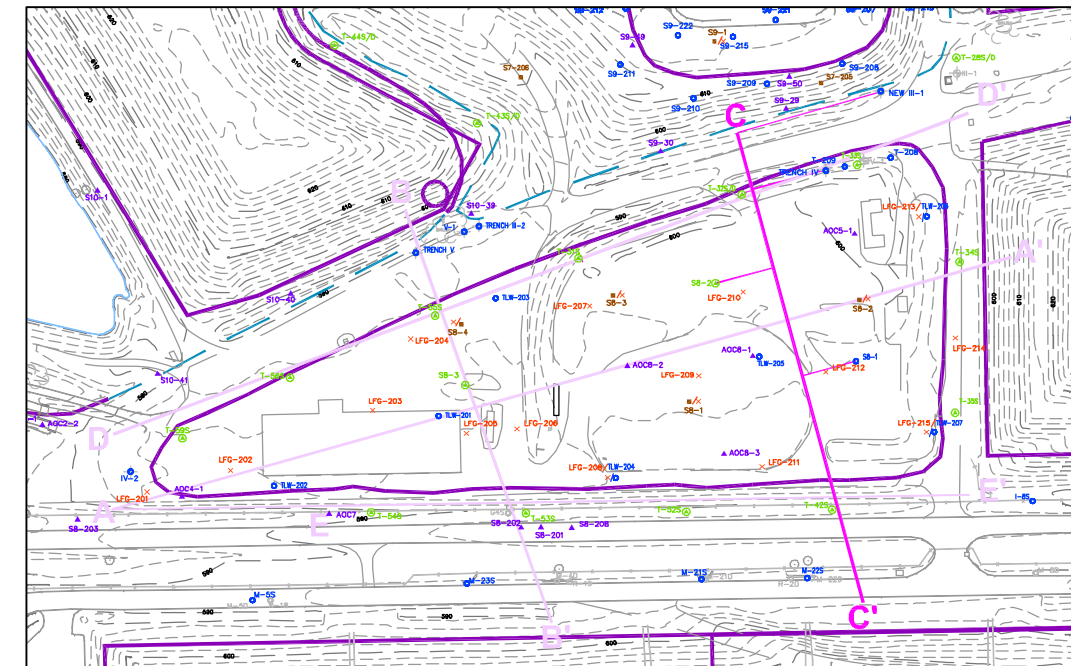
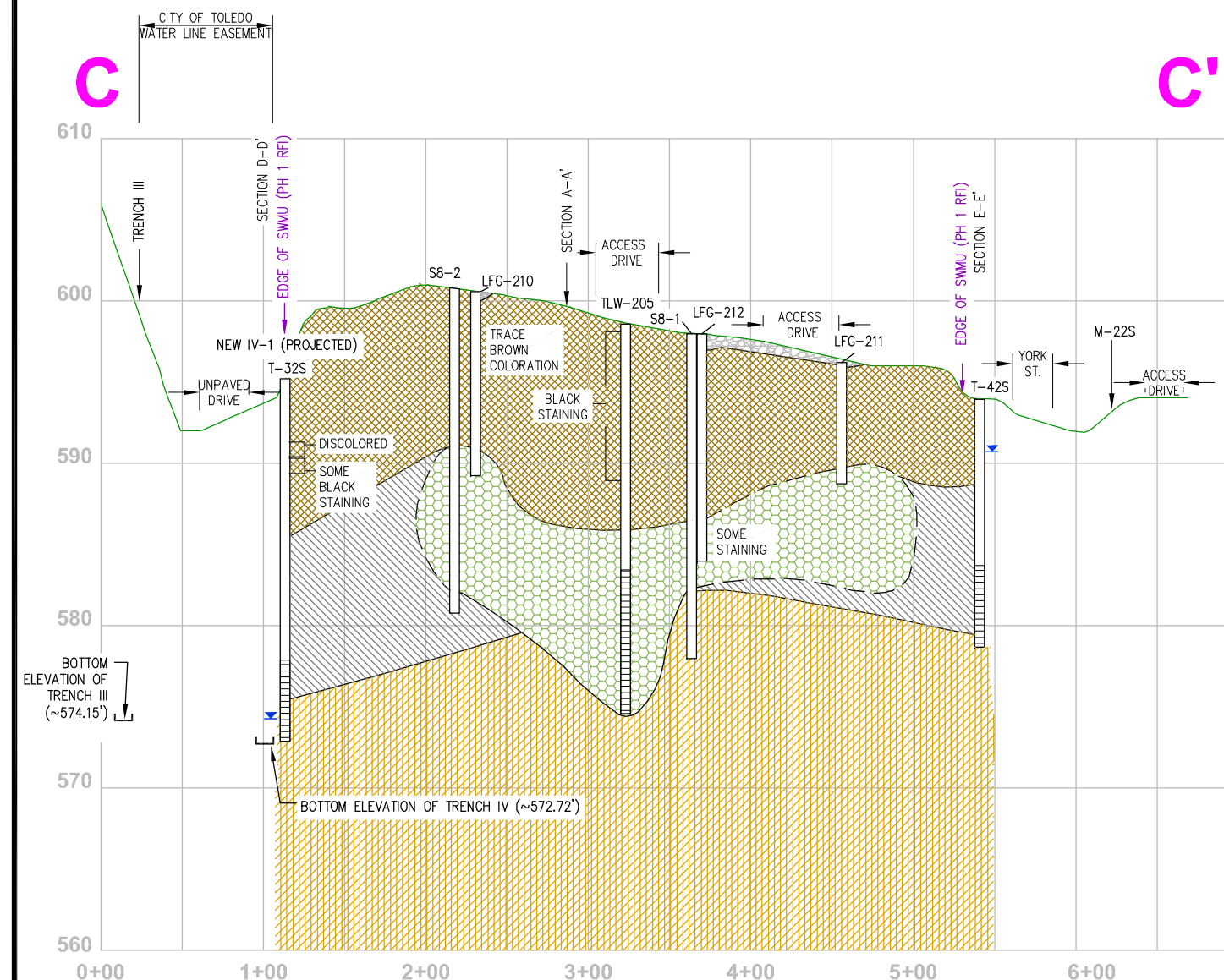
C O N T E N T S

Typical Cross-Sections

Comparison of Waste Characterization Data with TCLP Criteria

Cost Estimates – SWMU 8 Alternatives

Typical Cross-Sections



KEY MAP
1 INCH = 250 FEET

0 100
Scale In Feet

VERTICAL
EXAGGERATION IS
10X HORIZONTAL

LEGEND

- GRAVEL
- RECOMPACTED SILTY CLAY
- LACUSTRINE
- WASTE
- UPPER TILL
- STAINED LACUSTRINE
- SAND AND GRAVEL
- GROUND WATER/LEACHATE ELEVATION
- NAPL
- BOTTOM OF TRENCH¹

NOTES:

1. ALL SAMPLES SHOWN ON C-C' ARE PROJECTED AS SHOWN ON KEY MAP.
2. GROUNDWATER/LEACHATE LEVEL ELEVATIONS WERE MEASURED AUGUST 2007.

¹ WATERLINE MONITORING TRENCH INFORMATION IS PROJECTED INTO THE CROSS-SECTION FOR REFERENCE. BOTTOM ELEVATIONS OF TRENCHES WERE FOUND USING SLOPE AND DISTANCES DERIVED FROM KNOWN SUMP ELEVATIONS. ELEVATIONS ARE APPROXIMATE.

ENVIRON

SWMU 8 – CROSS-SECTION C-C'
ENVIROSAFE SERVICES OF OHIO, INC.
OTTER CREEK ROAD FACILITY
OREGON, OHIO

DRAFTED BY: KPM/KPM

DATE: 2/8/08

Figure
4.2

6174M8X05

Comparison of Waste Characterization Data with TCLP Criteria

Phase II RFI Data Summaries
Analytical Results for Waste Classification

	AOI		SWMU 08	SWMU 08	SWMU 08	Waste Classification		
	LOCATION		TLW-204	TLW-206	TLW-207	WC		
	ENVIRON Sample ID		TLW-204	TLW-206	TLW-207	COMPOSITE TLW203,205&S8- 204,20		
	SAMPLEMETHOD		GRAB	GRAB	GRAB	GRAB		
	Sample Date		4/20/2007	4/20/2007	4/20/2007	4/20/2007		
	Comments							
WCHAR								
	Cyanide (Reactive)	UG/KG	U (0.071)	U (0.071)	U (0.071)	U (0.071)		
	Sulfide (Reactive)	UG/KG	U (0.061)	140000 (0.061)	930000 (0.061)	U (0.061)		
VOC								
	Benzene	MG/L	0.0058 (0.00023)	0.019 (0.00023)	U (0.00023)	U (0.00023)	0.5	0.038
	2-Butanone	MG/L	U (0.001)	U (0.001)	U (0.001)	U (0.001)	200	0
	Carbon Tetrachloride	MG/L	U (0.00045)	U (0.00045)	U (0.00045)	U (0.00045)	0.5	0
	Chlorobenzene	MG/L	U (0.00028)	U (0.00028)	U (0.00028)	U (0.00028)	100	0
	Chloroform	MG/L	U (0.0004)	U (0.0004)	U (0.0004)	U (0.0004)	6	0
	1,4-Dichlorobenzene	MG/L	U (0.0052)	U (0.00052)	U (0.00052)	U (0.00052)	7.5	0
	1,2-Dichloroethane	MG/L	U (0.00048)	U (0.00048)	U (0.00048)	U (0.00048)	0.5	0
	1,1-Dichloroethene	MG/L	U (0.0006)	U (0.0006)	U (0.0006)	U (0.0006)	0.7	0
	Tetrachloroethene	MG/L	U (0.00083)	U (0.00083)	U (0.00083)	U (0.00083)	0.7	0
	Trichloroethene	MG/L	0.063 (0.00041)	U (0.00041)	U (0.00041)	U (0.00041)	0.5	0.126
	Vinyl Chloride	MG/L	U (0.00044)	U (0.00044)	U (0.00044)	U (0.00044)	0.2	0
SVOC								
	2,4-Dinitrotoluene	MG/L	U (0.004)	U (0.0004)	U (0.0004)	U (0.0004)	0.13	0
	Hexachlorobenzene	MG/L	U (0.00065)	U (0.000065)	U (0.000065)	U (0.000065)	0.13	0
	Hexachlorobutadiene	MG/L	U (0.0051)	U (0.00051)	U (0.00051)	U (0.00051)	0.5	0
	Hexachloroethane	MG/L	U (0.0058)	U (0.00058)	U (0.00058)	U (0.00058)	3	0
	2-Methylphenol	MG/L	U (0.0056)	U (0.00056)	U (0.00056)	U (0.00056)	200	0
	3&4-Methylphenol	MG/L	0.03 (0.00075)	U (0.00075)	U (0.00075)	U (0.00075)		
	Nitrobenzene	MG/L	U (0.00053)	U (0.000053)	U (0.000053)	U (0.000053)	2	0
	Pentachlorophenol	MG/L	U (0.0048)	U (0.00048)	U (0.00048)	U (0.00048)	100	0
	Pyridine	MG/L	U (0.0078)	U (0.00078)	U (0.00078)	0.0019 (0.00078)	5	0.00038
	2,4,5-Trichlorophenol	MG/L	U (0.0096)	U (0.00096)	U (0.00096)	U (0.00096)	400	0
	2,4,6-Trichlorophenol	MG/L	U (0.014)	U (0.0014)	U (0.0014)	U (0.0014)	2	0
PHYS								
	Solids (total)	PERCENT	83.2 (10)	84.2 (10)	81.6 (10)	84.1 (10)		
PEST								
	gamma-BHC	MG/L	U (0.0000062)	U (0.0000062)	0.00043 (0.0000062)	0.000091 (0.0000062)	0.4	0.001075
	Chlordane (total)	MG/L	U (0.000075)	U (0.000075)	0.0014 (0.000075)	0.0013 (0.000075)		
	Endrin	MG/L	U (0.0000074)	U (0.0000074)	U (0.0000074)	U (0.0000074)	0.02	0
	Heptachlor	MG/L	0.000091 (0.0000062)	U (0.0000062)	U (0.0000062)	U (0.0000062)	0.008	0.011375
	Heptachlor epoxide	MG/L	U (0.0000065)	U (0.0000065)	U (0.0000065)	U (0.0000065)	0.008	0
	Methoxychlor	MG/L	U (0.00001)	0.000017 (0.00001)	0.000015 (0.00001)	0.000032 (0.00001)	10	0.0000032
	Toxaphene	MG/L	U (0.00033)	0.00041 (0.00033)	U (0.00033)	U (0.00033)	0.5	0.00082
PCB								
	PCBs (total)	UG/KG	U (180)	1200 (89)	2400 (180)	8700 (360)		
	Aroclor-1016	UG/KG	U (130)	U (65)	U (130)	U (260)		0
	Aroclor-1221	UG/KG	U (160)	U (77)	U (160)	U (310)		0
	Aroclor-1232	UG/KG	U (140)	U (71)	U (150)	U (290)		0
	Aroclor-1242	UG/KG	U (170)	1000 (83)	970 (170)	U (330)		
	Aroclor-1248	UG/KG	U (180)	U (89)	U (180)	8700 (360)		
	Aroclor-1254	UG/KG	U (110)	140 (52)	1500 (110)	U (210)		
	Aroclor-1260	UG/KG	U (120)	U (58)	U (120)	U (230)		0
HERB								
	2,4-D	MG/L	U (0.0015)	U (0.0015)	U (0.0015)	U (0.0015)	10	0
	2,4,5-TP	MG/L	U (0.00016)	U (0.00016)	U (0.00016)	U (0.00016)	1	0

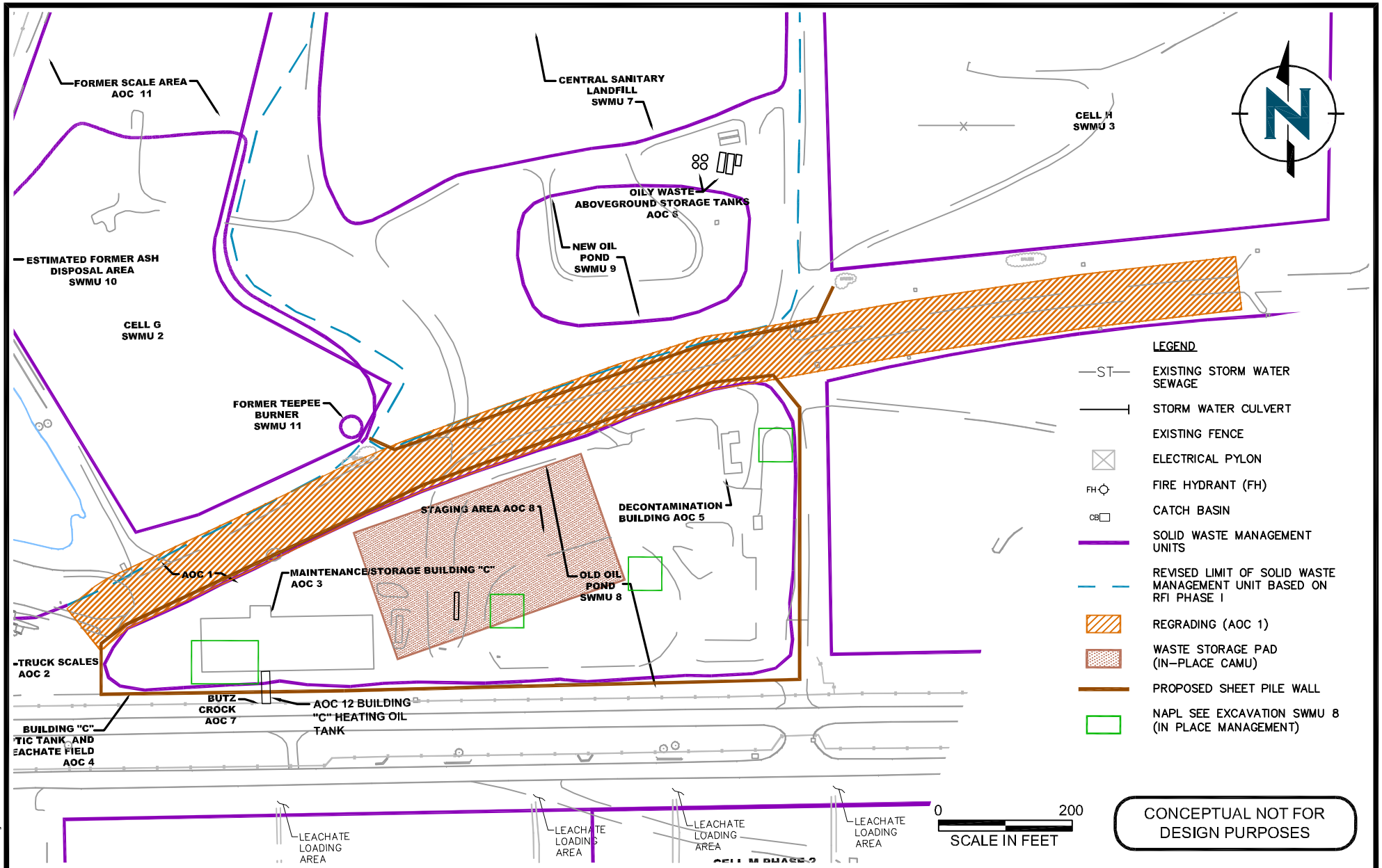
Notes:

- All concentrations are presented in ug/L (ppb).
- Only compounds with at least one detection are shown.

Abbreviations:

U -- Not Detected.
J -- Estimated
Concentration.
() -- Detection Limit.

Cost Estimates – SWMU 8 Alternatives



ENVIRON

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CORRECTIVE MEASURES EVALUATION SWMU 8 & AOC 1

ENVIROSAFE SERVICES OF OHIO, INC.
OTTER CREEK ROAD FACILITY
OREGON, OHIO

FIGURE

1

026174M14B

DRAFTED BY: BJK

DATE: 1/7/2011

Alternative 1: SWMU 8 - In Place Management

Cumulative Cost Deflator, 2005 to 2010 ->

1.11617

Scope and Assumptions

-Demolition of Building C - foot print of building estimated to be 260' x 80' and 12' high
-Excavation of AOC 7 - drain pipe and sump - an estimated 500 cubic yards (10' x 10' x 5') plus excavation of associated piping along south side of SWMU 8 (estimated 1200 cubic yards (10' x 3' x 1,080'))
-Excavation of two additional crocks near York St. gate (assumed to be similar dimensions to Butz Crock (AOC 7))
-Removal of AOC 5 - 2 USTs assumed to be 2,000-gal each
-Repair cap in observed area of NAPL seepage - an estimated 26,500 square feet (almost 9,000 cubic yards) of cap, cap can be reused.
-Leachate collection wells - leachate is estimated to be an average of 5 feet thick at the base of the unit (estimated 6 acres) and 20% drainable porosity, yielding an estimated volume of 3.4 million gallons of leachate
-Installation of passive landfill gas vents
-Installation of a sheet pile barrier wall on the north and south perimeter - an estimated 2,700 linear feet

Building C

Item	Description	Quantity	Unit	Unit Cost	Total
1	Demolition of Structure	249,600	ft ³	\$0.28	\$69,649
2	Demolition of Slab	20,800	ft ²	\$6.03	\$125,369
3	Excavation of AOC 7 and associated piping and vaults	1,256	1 yd ³	\$5.02	\$6,303
4	Backfill of AOC 7 and associated piping and vaults	1,256	1 yd ³	\$5.00	\$6,278
5	Disposal of Structure (recycle)	0	1 yd ³	-	-
6	Removal and Disposal of USTs of AOC 5	2	Tanks	\$3,350.00	\$6,700
7	Disposal of Slab	385	1 yd ³	\$12.33	\$4,751
8	Building Construction w/slab on grade	8,000	ft ²	\$122.00	\$976,000
Subtotal					\$1,195,000

Cap Repair

Item	Description	Quantity	Unit	Unit Cost	Total
1	Excavation of Cap in NAPL Seepage	8,833	1 yd ³	\$5.00	\$44,167
2	Backfilling and Repair Seep Areas	8,833	1 yd ³	\$5.00	\$44,167
3	Vegetative Layer Establishment	6.7	acre	\$1,339	\$8,974
Subtotal					\$97,000

Installation of Leachate Recovery Wells

Item	Description	Quantity	Unit	Unit Cost	Total
1	Mobilization and Demobilization	1	LS	\$1,500.00	\$1,500
2	Subsistence	54	man/day	\$100.00	\$5,400
3	10" Sonic Drilling	400	feet	\$55.00	\$22,000
4	4" SS x HDPE Well Labor and Materials	400	ft	\$69.00	\$27,600
5	Restore site and waste management	10	hr	\$350.00	\$3,500
6	Decon Time (Rig and 3 man crew)	14	hr	\$300.00	\$4,200
7	Backhoe	4	week	\$1,200.00	\$4,800
8	Initial Leachate Recovery & Disposal (start-up)	1,955,360	gallons	\$0.20	\$391,072
Subtotal					\$460,000

Passive Landfill Gas Vent Installation Around Perimeter

Item	Description	Quantity	Unit	Unit Cost	Total
1	Mobilization (included above)	1	LS	-	-
2	Labor and Equipment	5	Day	\$1,350	\$6,750
3	Installation of twelve, 4", 15 foot deep gas vents	180	ft	\$193	\$34,740
Subtotal					\$41,000

Containment Wall - SWMU 8 North and South Boundaries

Item	Description	Quantity	Unit	Unit Cost	Total
1a	Sheet Pile Wall (35')	94,500	1 ft ²	\$29	\$2,742,437
Subtotal					\$2,742,000

SUBTOTAL - CONSTRUCTION & STARTUP \$4,535,000

Engineering, Oversight, and Contingency

Item	Description	Quantity	Unit	Unit Cost	Total
1	Engineering and Permitting (12%)	1	LS	\$544,200	\$544,200
2	Construction Quality Assurance (10%)	1	LS	\$453,500	\$453,500
3	Contingency (20%)	1	LS	\$907,000	\$907,000
Subtotal					\$1,905,000

TOTAL CAPITAL COSTS \$ 6,440,000

Long Term Monitoring

Item	Description	Quantity	Unit	Unit Cost	Total
1	Leachate Removal System Maintenance (30 years)	10	pump	\$246	\$2,456
2	Leachate Disposal (30 years)	232,000	gallons	\$0.10	\$22,690
3	Gas Probe Maintenance (30 years)	2	event	\$123	\$246
4	Weekly Monitoring of Gas Probes (5 years)	130	hour	\$59.00	\$7,670
5	Semi-Annual Monitoring of Gas Probes (25 years)	10	hour	\$59.00	\$590
Annual Maintenance for the first 5 years					\$33,100
Annual Maintenance for 25 years (after the first 5)					\$26,000
TOTAL OPERATION AND MAINTENANCE \$					\$815,500
NPV OPERATION AND MAINTENANCE					\$563,591

ALTERNATIVE 1, TOTAL COST \$ 7,256,000
ALTERNATIVE 1, NPV \$ 7,004,000

Notes: Gas Probe monitoring for newly installed points. The existing 4 points to the southwest of the unit are addressed in the landfill gas cost estimate sheet.
-ESOI estimated 1 hour a week for weekly monitoring of 5 points. 12 points need weekly monitoring (for 5 years) = 2.5 hours/week. ESOI estimated 16 hours for one semi annual monitoring of 41 points. 12 points need semi annual monitoring (for 10 years) = 5 hours/event = 10 hrs/yr
-Line items show the annual cost.
-Long term monitoring does not include vegetation maintenance (see facility wide cap cost estimates)

Alternative 2: SWMU 8 - In Place CAMU

Cumulative Cost Deflator, 2005 to 2010 ->

1.11617

Scope and Assumptions

-Demolition of Building C - foot print of building estimated to be 260' x 80' and 12' high
-Excavation of AOC 7 - drain pipe and sump - an estimated 500 cubic yards (10' x 10' x 5') plus excavation of associated piping along south side of SWMU 8 (estimated 1200 cubic yards (10' x 3' x 1,080'))
-Excavation of two additional crocks near York St. gate (assumed to be similar dimensions to Butz Crock (AOC 7))
-Removal of AOC 5 - 2 USTs assumed to be 2,000-gal each
-Installation of liner system below waste which includes a leachate collection system- a portion of the waste will be excavated and stored on the remaining unit while the liner is installed. The temporary storage pad is estimated to be 360' x 200'. Leachate will be collected from this stored waste and disposed. Leachate is estimated to be an average of 5' thick at the base of the unit (estimated 6 acres) and 20% porosity, yielding an estimated volume of 3.4 million gallons of leachate.
-Estimated waste volume of 100,000 cubic yards, cap volume of 65,000 cubic yards
-1 foot of impacted soil to be removed from the base of the unit during the waste excavation and 3 samples per acre as confirmation samples. Soil placed with waste in the CAMU.

Building C

Item	Description	Quantity	Unit	Unit Cost	Total
1	Demolition of Structure	249,600	ft ³	\$0.28	\$69,649
2	Demolition of Slab	20,800	ft ²	\$6.03	\$125,369
3	Excavation of AOC 7 and associated piping and vaults	1,256	1 yd ³	\$5.02	\$6,303
4	Backfill of AOC 7 and associated piping and vaults	1,256	1 yd ³	\$5.00	\$6,278
5	Disposal of Structure (recycle)	0	1 yd ³	-	-
6	Removal and Disposal of USTs of AOC 5	2	Tanks	\$3,350.00	\$6,700
7	Disposal of Slab	385	CY	\$12.33	\$4,751
8	Building Construction	8,000	ft ²	\$122.00	\$976,000
Subtotal					\$1,195,000

Liner System

Item	Description	Quantity	Unit	Unit Cost	Total
1	Excavation of Waste and Cap	165,000	1 yd ³	\$5.02	\$828,300
2	12" gravel base for temporary storage pad	8,000	1 yd ²	\$17.19	\$137,513
3	40 mil HDPE liner for temporary storage pad	72,000	1 ft ²	\$0.56	\$40,182
4	6" gravel layer for temporary storage pad	8,000	1 yd ²	\$8.99	\$71,882
5	Excavate 1' of impacted soil below unit	10,809	1 yd ³	\$5.00	\$54,047
6	Confirmational Sampling of soil	20	sample	\$234.40	\$4,688
7	Soil Sampling Labor	20	sample	\$59.16	\$1,183
8	60 mil HDPE liner	291,852	1 ft ²	\$0.53	\$154,682
9	Geonet	291,852	1 ft ²	\$0.23	\$67,126
10	16 oz Geotextile	145,926	1 ft ²	\$0.22	\$32,104
11	Stone Aggregate	1,883	1 yd ³	\$29.50	\$55,535
12	Primary Clay	5,648	1 yd ³	\$8.00	\$45,181
13	80 mil HDPE	291,852	1 ft ²	\$0.63	\$183,867
14	Geonet	291,852	1 ft ²	\$0.23	\$67,126
15	16 oz Geotextile	323,956	1 ft ²	\$0.22	\$71,270
16	Stone Aggregate	1,883	1 yd ³	\$29.50	\$55,535
17	6 oz Geotextile	145,926	1 ft ²	\$0.14	\$20,430
18	Protective Cover	1,036	1 yd ³	\$19.80	\$20,514
19	HDPE Testing	145,926	1 ft ²	\$0.04	\$5,837
20	Stabilize Waste for Backfilling	100,000	yd ³	\$10.00	\$1,000,000
21	Backfill Waste	110,809	1 yd ³	\$5.00	\$554,047
Subtotal					\$3,471,000

Construction of a Composite Cover

Item	Description	Quantity	Unit	Unit Cost	Total
1	40 mil HDPE Liner Installation	291,852	1 ft ²	\$0.56	\$162,879
2	Geonet Drainage Layer Installation	291,852	1 ft ²	\$0.33	\$97,727
3	Geotextile Type 2 Installation	291,852	1 ft ²	\$0.22	\$65,151
4	Cover Soil Installation (36")	22,547	1 yd ³	\$5.02	\$113,248
5	Vent pipe installation	4,800	feet	\$15.00	\$72,000
6	Geotextile Vent Layer Type 1 Installation	291,852	1 ft ²	\$0.33	\$97,727
7	Anchor Trench	2,700	lf	\$10.84	\$29,268
8	Vegetative Layer Establishment	6.7	acre	\$1,339	\$8,974
Subtotal					\$647,000

Leachate and LNAPL Recovery During Construction

Item	Description	Quantity	Unit	Unit Cost	Total
1	Initial Leachate Recovery & Disposal (start-up)	1,955,360	gallons	\$0.20	\$391,072
Subtotal					\$391,000

SUBTOTAL - CONSTRUCTION & STARTUP \$5,704,000

Engineering

Item	Description	Quantity	Unit	Unit Cost	Total
1	Engineering and Permitting (15%)	1	LS	\$855,600	\$855,600
2	Construction Quality Assurance (10%)	1	LS	\$570,400	\$570,400
3	Contingency (20%)	1	LS	\$1,140,800	\$1,140,800
Subtotal					\$2,567,000

TOTAL CAPITAL COSTS \$ 8,271,000

Long Term Monitoring

Item	Description	Quantity	Unit	Unit Cost	Total
1	Leachate Removal System Maintenance (30 years)	10	pump	\$246	\$2,456
2	Leachate Disposal (30 years)	232,000	gallons	\$0.10	\$22,690
3	Gas Probe Maintenance (30 years)	2	event	\$123	\$246
4	Weekly Monitoring of Gas Vents (5 years)	130	hour	\$59.00	\$7,670
5	Semi-Annual Monitoring of Gas Vents (25 years)	10	hour	\$59.00	\$590
Annual Maintenance for the first 5 years					\$33,000
Annual Maintenance for 25 years (after the first 5)					\$26,000
TOTAL OPERATION AND MAINTENANCE					\$815,000
NPV OPERATION AND MAINTENANCE					\$563,591

ALTERNATIVE 2, TOTAL COST \$ 9,086,000

ALTERNATIVE 2, NPV \$ 8,835,000

Notes: Gas vent monitoring for newly installed vents. The existing 4 points to the southwest of the unit are addressed in the landfill gas cost estimate sheet.
-ESOI estimated 1 hour a week for weekly monitoring of 5 points. 12 points need weekly monitoring (for 5 years) = 2.5 hours/week. ESOI estimated 16 hours for one semi annual monitoring of 41 points. 12 points need semi annual monitoring (for 10 years) = 5 hours/semi = 10 hrs/yr
-Line items show the annual cost.
1 item from maintenance shown and include operation and maintenance from landfill side and not collection

Alternative 3: SWMU 8 - Active Cell M CAMU

Cumulative Cost Deflator, 2005 to 2010 ->

1.11617

Scope and Assumptions

-Demolition of Building C - foot print of building estimated to be 260' x 80' and 12' high
 -Excavation of AOC 7 - drain pipe and sump - an estimated 500 cubic yards (10' x 10' x 5') plus excavation of associated piping along south side of SWMU 8 (estimated 1200 cubic yards (10' x 3' x 1,080")
 -Excavation of two additional crocks near York St. gate (assumed to be similar dimensions to Butz Crock (AOC 7)
 -Removal of AOC 5 - 2 USTs assumed to be 2,000-gal each
 -Excavation and disposal of waste into Cell M
 -Estimated waste volume of 100,000 cubic yards, cap volume of 65,000 cubic yards
 -Waste is assumed to weigh 1.5 tons/cubic yard. Disposal costs provided by ESOI. Stabilization cost provided by ESOI for stability only.
 -Cap is assumed to be reusable as backfill.
 -1 foot of impacted soil to be removed from the base of the unit during the waste excavation and 3 samples per acre as confirmation samples. Soil disposed with the waste in the CAMU.

Building C

Item	Description	Quantity	Unit	Unit Cost	Total
1	Demolition of Structure	249,600	ft ³	\$0.28	\$69,649
2	Demolition of Slab	20,800	ft ²	\$6.03	\$125,369
3	Excavation of AOC 7 and associated piping and vaults	1,256	1 yd ³	\$5.02	\$6,303
4	Backfill of AOC 7 and associated piping and vaults	1,256	1 yd ³	\$5.00	\$6,278
5	Disposal of Structure (recycle)	0	CY	-	-
6	Removal and Disposal of USTs of AOC 5	2	Tanks	\$3,350.00	\$6,700
7	Disposal of Slab	385	CY	\$12.33	\$4,751
8	Building Construction	8,000	ft ²	\$122.00	\$976,000
Subtotal					\$1,195,000

Leachate and LNAPL Recovery During Construction

Item	Description	Quantity	Unit	Unit Cost	Total
1	Initial Leachate Recovery & Disposal (start-up)	1,955,360	gallons	\$0.20	\$391,072
Subtotal					\$391,000

CAMU

Item	Description	Quantity	Unit	Unit Cost	Total
1	Excavation and Stockpiling of Cap	65,000	1 yd ³	\$5.02	\$326,300
2	Excavation and Hauling of Waste	100,000	1 yd ³	\$5.02	\$502,000
3	Excavate 1' of impacted soil below unit	10,809	1 yd ³	\$5.02	\$54,263
4	Confirmational Sampling of soil	20	sample	\$234.40	\$4,688
5	Soil Sampling Labor	20	sample	\$59.16	\$1,183
6	Disposal of Waste	157,206	ton	\$57	\$8,882,152
7	Stabilization of Waste for strength improvement	100,000	ton	\$10	\$1,000,000
8	Backfill of unit	175,809	1 yd ³	\$5.00	\$879,047
9	Vegetative Layer Establishment	6.7	acre	\$1,339	\$8,974
Subtotal					\$11,659,000

SUBTOTAL - CONSTRUCTION & STARTUP \$ 13,245,000

Engineering

Item	Description	Quantity	Unit	Unit Cost	Total
1	Engineering and Permitting (15%)	1	LS	\$1,986,750	\$1,986,750
2	Construction Quality Assurance (10%)	1	LS	\$1,324,500	\$1,324,500
3	Contingency (20%)	1	LS	\$2,649,000	\$2,649,000
Subtotal					\$5,960,000

TOTAL CAPITAL COSTS \$ 19,205,000

ALTERNATIVE 3, TOTAL COST \$ 19,205,000

-Long term monitoring for vegetation maintenance is not included (see facility wide cap cost estimates)

APPENDIX F

Supporting Documentation for CM Analysis – SWMU 9

C O N T E N T S

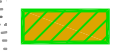
Conceptual Drawing for Stormwater Improvement

Conceptual Drawings and Cross-sections for Landfill Cover Alternatives

Cost Estimates – SWMU 9 Alternatives



LEGEND

-  CLEAR VEGETATION AND LINE EXISTING DRAINAGE SWALES
-  PROPOSED NEW LINED DRAINAGE SWALES
-  ROADWAYS

0 150
SCALE IN FEET

CONCEPTUAL NOT FOR
CONSTRUCTION

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DRAFTED BY: BJK

DATE: 07/27/2011

CONCEPTUAL STORMWATER IMPROVEMENTS - SWMU 7 AND 9 AND AOC 6

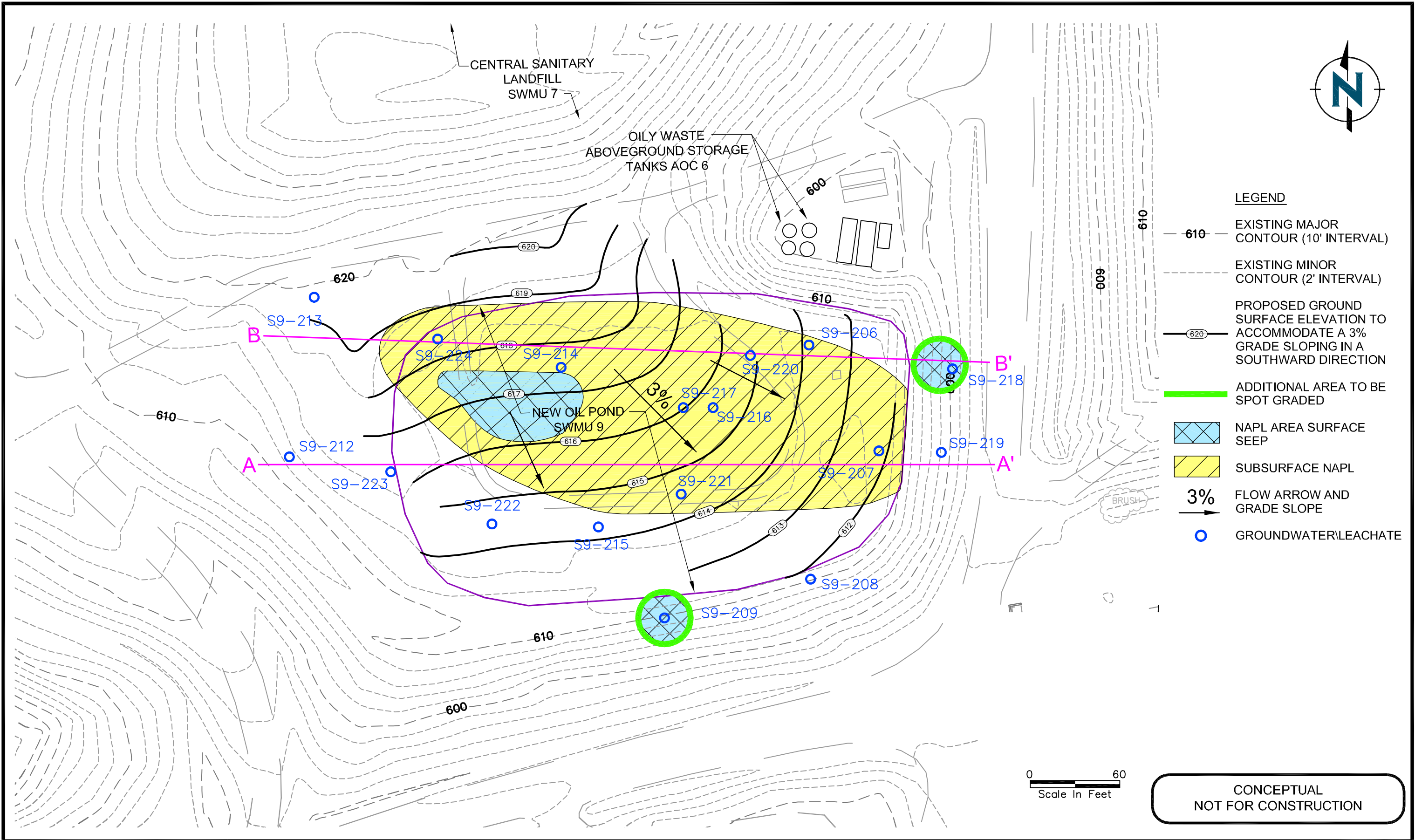
ENVIROSAFE SERVICES OF OHIO, INC.
OTTER CREEK ROAD FACILITY
OREGON, OHIO

FIGURE

1

026174M14B

Conceptual drawings and Cross-sections - Landfill Cover Alternatives



MBLEI 8/2/11 [026174M14B_X05]
F:\026174M14B

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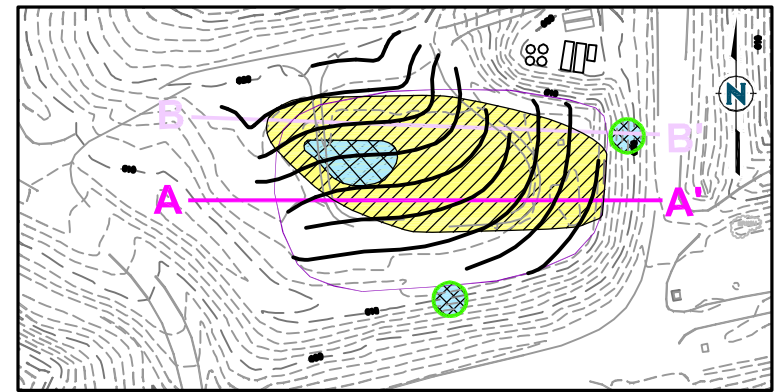
DATE: 07/27/2011

CONCEPTUAL CAP MODIFICATION PLAN - SWMU9
ENVIROSAFE SERVICES OF OHIO, INC.
OTTER CREEK ROAD FACILITY
OREGON, OHIO

**FIGURE
2**

026174M14B

Version 2.0, August 1, 2011



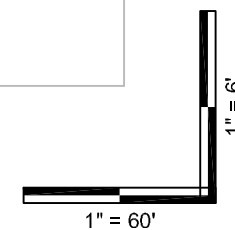
KEY MAP
1" = 200'

LEGEND

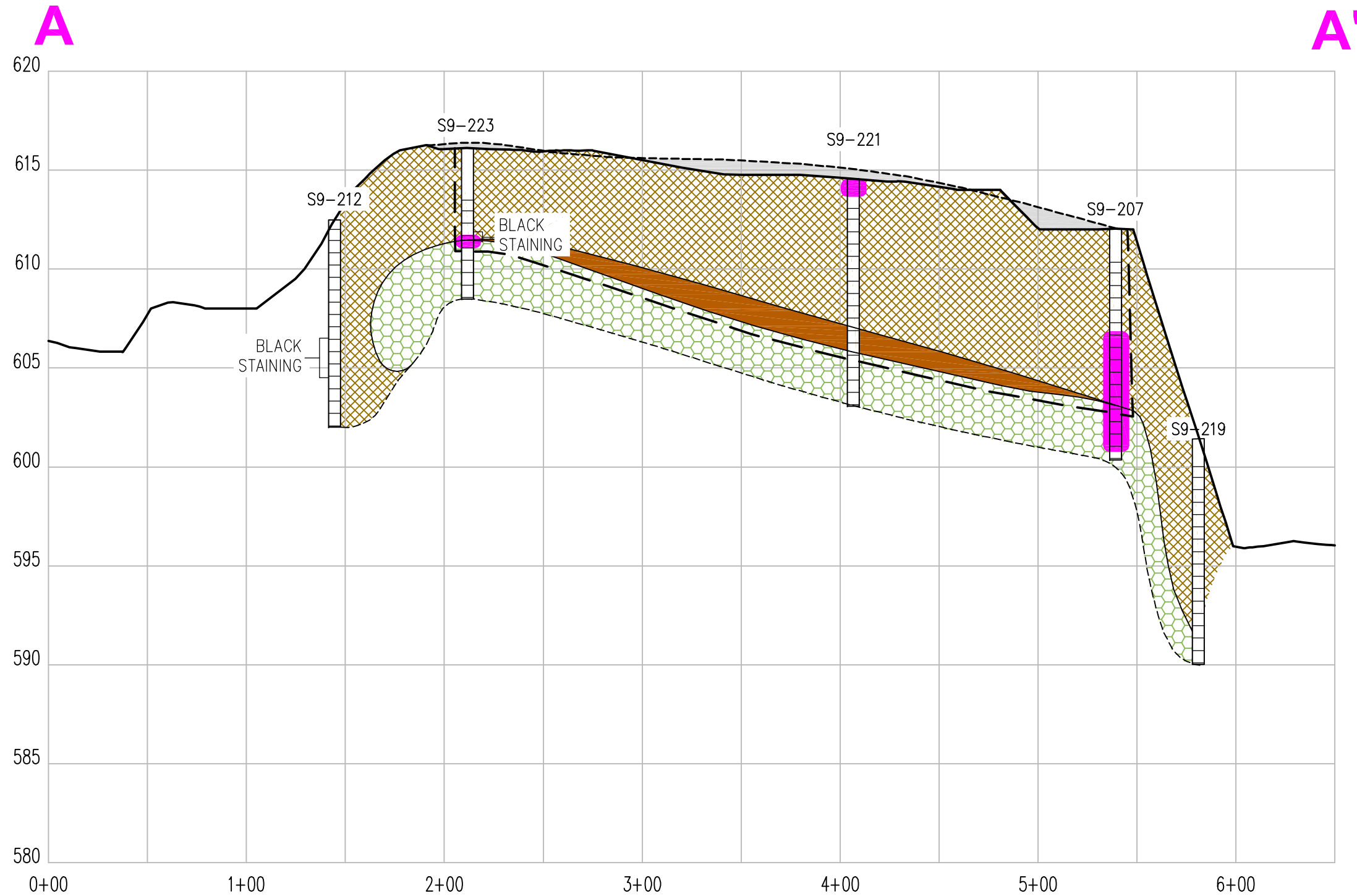
- GRAVEL
- RECOMPACTED SILTY CLAY EXISTING CAP
- LACUSTRINE
- WASTE
- UPPER TILL
- SILTY CLAY WITH OIL IN PORES
- NAPL
- EXISTING GRADE ELEVATION
- PROPOSED ELEVATION AFTER REGRADING
- ALTERNATIVE 2 CAP EXCAVATION DEPTH

NOTES:

1. CROSS-SECTION DOES NOT DEPICT FULL DEPTH OF UNIT.



CONCEPTUAL
NOT FOR CONSTRUCTION



MBLEI 8/2/11 [026174M14B_X05]
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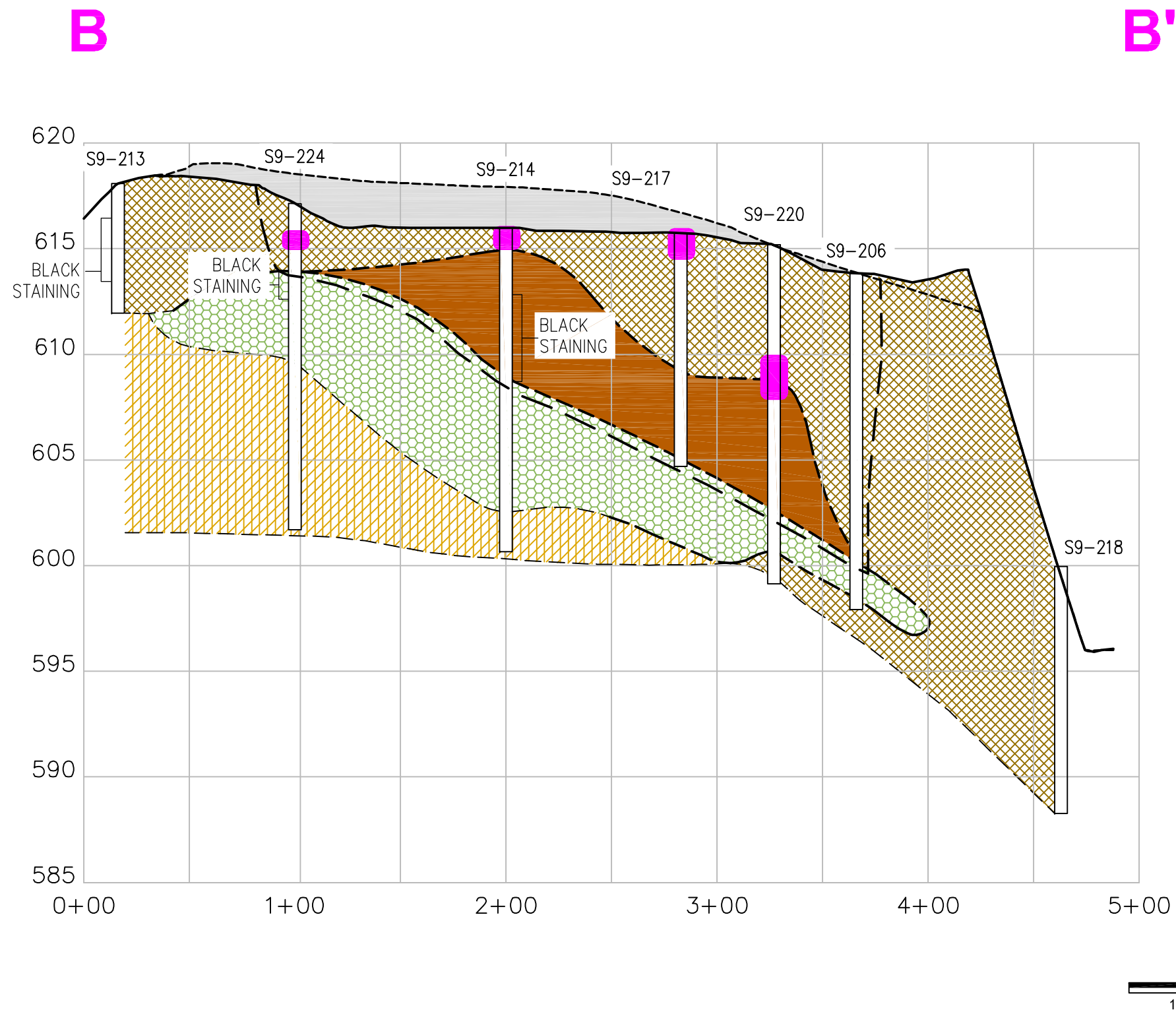
DATE: 07/27/2011

SWMU 9 - CROSS-SECTION A-A'
ENVIROSAFE SERVICES OF OHIO, INC.
OTTER CREEK ROAD FACILITY
OREGON, OHIO

**FIGURE
3**

026174M14B

Version 2.0, August 1, 2011



MBLEI 8/2/11 [026174M14B_X05]
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DATE: 07/27/2011

SWMU 9 - CROSS-SECTION B-B'
ENVIROSAFE SERVICES OF OHIO, INC.
OTTER CREEK ROAD FACILITY
OREGON, OHIO

FIGURE
4

026174M14B

Version 2.0, August 1, 2011

Cost Estimates – SWMU 9 Alternatives

Alternative 1: SWMU 9 - Repair Cap and Regrade Drainage Ditches

Cumulative Cost Deflator, 2005 to 2010 ->

1.11617

Scope and Assumptions

-Regrade areas in drainage ditches identified by Mannik & Smith Group where ponding occurs, an estimated 850 LF, and install a liner.
-Repair cap in area of NAPL seepage - an estimated area of 40,000 square feet (160' x 250')
-Install leachate recovery wells to dewater unit during construction. Leachate has been measured to be approximately 2' thick over the 1.6 acres of the unit, and 20% drainable porosity/drainable leachate is assumed.
-Labor costs to remove leachate are assumed to be 8 hours per day over a 3 month period (60 working days)
-Settlement tests will be performed prior to capping. After implementation, settlement survey will be done every 5 years.

Regrading Drainage Ditches and Installing Liner

Item	Description	Quantity	Unit	Unit Cost	Total
1	Remove accumulated material in ditches	315	1 yd ³	\$5.02	\$1,581
2	Regrading	315	1 yd ³	\$5.00	\$1,574
3	40 mil HDPE Liner Installation	12,750	1 ft ²	\$0.56	\$7,116
Subtotal					\$10,000

Repairing Cap in Areas of Seepage

Item	Description	Quantity	Unit	Unit Cost	Total
1	Protective Cover Removal for Repair	8,889	1 yd ³	\$5.02	\$44,647
2	Backfilling and Regrading	17,778	1 yd ³	\$5.00	\$88,889
3	Vegetative Layer Establishment	0.9	acre	\$1,339	\$1,230
4	Settlement Plate Installation and Survey	1.0	unit	\$40,000	\$40,000
Subtotal					\$175,000

Installation of Additional Dewatering Wells

Item	Description	Quantity	Unit	Unit Cost	Total
1	Mobilization and Demobilization	1	LS	\$1,500.00	\$1,500
2	Subsistence	14	man/day	\$100.00	\$1,350
3	10" Sonic Drilling	125	feet	\$55.00	\$6,875
4	4" SS x HDPE Well Labor and Materials	125	ft	\$69.00	\$8,625
5	Restore site and waste management	5	hr	\$350.00	\$1,750
6	Decon Time (Rig and 3 man crew)	7	hr	\$300.00	\$2,100
7	Backhoe	1	week	\$1,200.00	\$1,200
8	Leachate Disposal	208,530	gallons	\$0.10	\$20,394
9	Leachate Disposal Labor	480	hours	\$59.00	\$28,320
Subtotal					\$72,000

SUBTOTAL - CONSTRUCTION & STARTUP

\$257,000

Engineering

Item	Description	Quantity	Unit	Unit Cost	Total
1	Engineering and Permitting (12%)	1	LS	\$30,840	\$30,840
2	Construction Quality Assurance (10%)	1	LS	\$25,700	\$25,700
3	Contingency (20%)	1	LS	\$51,400	\$51,400
Subtotal					\$108,000

TOTAL CAPITAL COSTS \$

365,000

Long Term Monitoring

Item	Description	Quantity	Unit	Unit Cost	Total
1	Settlement Survey (every 5 years)	1	LS	\$10,000.00	\$10,000
2	Drainage Ditch Annual Maintenance	0.3	acre	\$188.89	\$55
Annual Operation and Maintenance Cost					\$2,055
TOTAL OPERATION AND MAINTENANCE					\$61,659
NPV OPERATION AND MAINTENANCE					\$42,000

ALTERNATIVE 1, TOTAL COST \$ 427,000

ALTERNATIVE 2, NPV \$ 407,000

Maintenance costs are facility wide and shown on the "Maintenance" tab

Alternative 2: SWMU 9 - Excavate Area of Seepage, Install Composite Cover, Regrade Ditches

Cumulative Cost Deflator, 2005 to 2010 ->

1.11617

Scope and Assumptions

oily seepage - cap is estimated to weigh 1.5 tons/cubic yard.
-Composite cover installed over the area plus additional area - an estimated 55,000 square feet
-The estimated 9,000 cubic yards of cap is assumed to be reusable for backfilling
-Regrade areas in drainage ditches identified by Mannik & Smith Group where ponding occurs, an estimated 600 LF, and install a liner
-Install leachate recovery wells to dewater unit. Leachate has been measured to be approximately 2' thick over the 1.6 acres of the unit, and 20% porosity/drainable leachate is assumed.
-Labor costs to remove leachate are assumed to be 8 hours per day over a 3 month period (60 working days)
-Settlement tests will be performed prior to capping. After implementation, settlement survey will be done every 5 years.

Excavation of Top of Unit and Installation of Composite Cover

Item	Description	Quantity	Unit	Unit Cost	Total
1	Protective Cover Removal	8,889	1 yd ³	\$5.02	\$44,647
2	Backfilling and regrading	17,778	1 yd ³	\$5.00	\$88,889
3	Disposal of 1-ft of cover soils in Cell M	2,222	ton	\$56.50	\$125,556
4	40 mil HDPE Liner Installation	55,000	1 ft ²	\$0.56	\$30,695
5	Geonet Drainage Layer Installation	55,000	1 ft ²	\$0.33	\$18,417
6	Geotextile Type 2 Installation	55,000	1 ft ²	\$0.22	\$12,278
7	Cover Soil Installation (36")	6,111	1 yd ³	\$5.02	\$30,695
8	Anchor Trench	960	lf	\$10.84	\$10,406
9	Vegetative Layer Establishment	1.3	acre	\$1,339	\$1,691
10	Settlement Plate Installation and Survey	1.0	unit	\$40,000	\$40,000
Subtotal					\$403,000

Regrading Drainage Ditches and Installing Liner

Item	Description	Quantity	Unit	Unit Cost	Total
1	Remove accumulated material from ditches	315	1 yd ³	\$5.02	\$1,581
2	Regrading ditches	315	1 yd ³	\$5.00	\$1,574
3	40 mil HDPE Liner Installation	12,750	1 ft ²	\$0.56	\$7,116
Subtotal					\$10,000

Installation of Piezometers

Item	Description	Quantity	Unit	Unit Cost	Total
1	Mobilization and Demobilization	1	LS	\$1,500.00	\$1,500
2	Subsistence	14	man/day	\$100.00	\$1,350
3	10" Sonic Drilling	125	feet	\$55.00	\$6,875
4	4" SS x HDPE Well Labor and Materials	125	ft	\$69.00	\$8,625
5	Restore site and waste management	5	hr	\$350.00	\$1,750
6	Decon Time (Rig and 3 man crew)	7	hr	\$300.00	\$2,100
7	Backhoe	1	week	\$1,200.00	\$1,200
8	Leachate Disposal	208,530	gallons	\$0.10	\$20,394
9	Leachate Disposal Labor	480	hours	\$59.00	\$28,320
Subtotal					\$72,000

SUBTOTAL - CONSTRUCTION & STARTUP \$485,000

Engineering

Item	Description	Quantity	Unit	Unit Cost	Total
1	Engineering and Permitting (15%)	1	LS	\$72,750	\$72,750
2	Construction Quality Assurance (10%)	1	LS	\$48,500	\$48,500
3	Contingency (20%)	1	LS	\$97,000	\$97,000
Subtotal					\$218,000

TOTAL CAPITAL COSTS \$ 703,000

Long Term Monitoring

Item	Description	Quantity	Unit	Unit Cost	Total
1	Settlement Survey (every 5 years)	1	LS	\$10,000.00	\$10,000
2	Drainage Ditch Annual Maintenance	0.3	acre	\$188.89	\$55
Annual Operation and Maintenance Cost					\$2,055
TOTAL OPERATION AND MAINTENANCE					\$61,659
NPV OPERATION AND MAINTENANCE					\$42,000

ALTERNATIVE 2, TOTAL COST \$ 765,000

ALTERNATIVE 2, NPV \$ 745,000

Maintenance costs are facility wide and shown on the "Maintenance" tab

APPENDIX G

Supporting Documentation for CM Analysis SWMU 5 - LNAPL

C O N T E N T S

Characterization Data Tables

Cross-Section

Cost Estimates - SWMU 5 LNAPL Alternatives

Characterization Data Tables

Table 3a
LNAPL Monitoring
ESOI Otter Creek Facility
Oregon, Ohio
Millard Road Landfill SWMU 5

Date	Well	Depth to NAPL (ft)	Depth to Water (ft)	LNAPL Thickness (ft)	Comments
7/20/2006	T-20S (1)	--	4.97	--	Wells were checked for DNAPL. No DNAPL was present
7/20/2006	T-20S (2)	13.97	14.00	0.03	Wells were checked for DNAPL. No DNAPL was present
7/20/2006	T-20S (3)	--	6.17	--	Wells were checked for DNAPL. No DNAPL was present
7/20/2006	T-20S (4)	--	10.19	--	Wells were checked for DNAPL. No DNAPL was present
7/20/2006	T-20S (5)	6.55	7.53	0.98	Wells were checked for DNAPL. No DNAPL was present
7/20/2006	T-20S (6)	--	13.99	--	Wells were checked for DNAPL. No DNAPL was present
7/20/2006	MR-6S	--	12.88	--	Wells were checked for DNAPL. No DNAPL was present
7/20/2006	T-21S	--	15.44	--	Wells were checked for DNAPL. No DNAPL was present
7/20/2006	TLW-1	--	11.83	--	Wells were checked for DNAPL. No DNAPL was present
7/25/2006	T-20S (2)	14.24	14.28	0.04	
7/25/2006	T-20S (5)	6.7	7.71	1.01	Sampled on July 25, 2006, effectively removing the NAPL layer
7/26/2006	T-20S (1)	--	5.3	--	
7/26/2006	T-20S (2)	14.22	14.25	0.03	
7/26/2006	T-20S (3)	--	6.42	--	
7/26/2006	T-20S (4)	--	10.4	--	
7/26/2006	T-20S (5)	6.83	7.12	0.29	
7/26/2006	T-20S (6)	--	14.12	--	
7/27/2006	T-20S (5)	6.74	7.00	0.26	
7/28/2006	T-20S (5)	5.59	5.79	0.20	Heavy rain fell the previous night
8/1/2006	T-20S (1)	--	5.16	--	
8/1/2006	T-20S (2)	14.1	14.13	0.03	
8/1/2006	T-20S (3)	--	6.22	--	
8/1/2006	T-20S (4)	--	10.3	--	
8/1/2006	T-20S (5)	6.34	6.63	0.29	
8/1/2006	T-20S (6)	--	13.98	--	
8/1/2006	MR-6S	--	13.06	--	
8/1/2006	T-20W	--	8.54	--	
8/1/2006	T-21S	--	15.46	--	
8/1/2006	T-46W	--	10.31	--	
8/1/2006	T-47W	--	14.19	--	
8/1/2006	T-45W	--	11.11	--	
8/1/2006	TLW-1	--	12.25	--	
8/3/2006	T-20S (1)	--	5.14	--	
8/3/2006	T-20S (2)	14.08	14.09	0.01	
8/3/2006	T-20S (3)	--	6.21	--	
8/3/2006	T-20S (4)	--	10.31	--	
8/3/2006	T-20S (5)	6.53	6.71	0.18	Checked for DNAPL , but it was not present.
8/3/2006	T-20S (6)	--	14.03	--	
8/3/2006	MR-6S	--	13.06	--	
8/3/2006	T-20W	--	8.51	--	
8/3/2006	T-21S	--	15.51	--	
8/3/2006	T-46W	--	10.34	--	
8/3/2006	T-47W	--	14.14	--	
8/3/2006	T-45W	--	11.36	--	
8/3/2006	TLW-1	--	12.39	--	Checked for DNAPL , but it was not present.

Table 3a
LNAPL Monitoring
ESOI Otter Creek Facility
Oregon, Ohio
Millard Road Landfill SWMU 5

8/8/2006	T-20S (1)	--	5.49	--	
8/8/2006	T-20S (2)	14.38	14.395	0.015	Checked for DNAPL , but it was not present.
8/8/2006	T-20S (3)	--	6.46	--	
8/8/2006	T-20S (4)	--	10.5	--	
8/8/2006	T-20S (5)	6.83	6.86	0.03	Checked for DNAPL , but it was not present.
8/8/2006	T-20S (6)	--	14.22	--	
8/8/2006	MR-6S	--	13.19	--	
8/8/2006	T-20W	--	8.83	--	
8/8/2006	T-21S	--	15.61	--	
8/8/2006	T-46W	--	10.53	--	
8/8/2006	T-47W	--	14.49	--	
8/8/2006	T-45W	--	11.97	--	
8/8/2006	TLW-1	--	12.91	--	
8/10/2006	T-20S (1)	--	5.38	--	
8/10/2006	T-20S (2)	14.31	14.32	0.01	Checked for DNAPL , but it was not present.
8/10/2006	T-20S (3)	--	6.44	--	
8/10/2006	T-20S (4)	--	10.43	--	
8/10/2006	T-20S (5)	6.87	6.89	0.02	Checked for DNAPL , but it was not present.
8/10/2006	T-20S (6)	--	14.19	--	
8/10/2006	MR-6S	--	13.24	--	
8/10/2006	T-20W	--	8.87	--	
8/10/2006	T-21S	--	15.6	--	
8/10/2006	T-46W	--	10.54	--	
8/10/2006	T-47W	--	14.41	--	
8/10/2006	T-45W	--	12.02	--	
8/10/2006	TLW-1	--	12.81	--	
10/24/2006	T-20S (1)	--	5.26	--	
10/24/2006	T-20S (2)	14.14	14.15	0.01	
10/24/2006	T-20S (3)	--	6.13	--	
10/24/2006	T-20S (4)	--	10.22	--	
10/24/2006	T-20S (5)	6.15	8.56	2.41	Bailed down NAPL
10/24/2006	T-20S (6)	--	14.02	--	
10/24/2006	MR-6S	--	13.17	--	
10/24/2006	T-20W	--	8.52	--	
10/24/2006	T-21S	--	15.08	--	
10/24/2006	T-46W	--	10.98	--	
10/24/2006	T-47W	--	14.1	--	
10/24/2006	T-45W	--	10.37	--	
10/24/2006	TLW-1	--	10.87	--	
10/26/2006	T-20S (1)	--	6.37	--	
10/26/2006	T-20S (2)	15.27	15.28	0.01	
10/26/2006	T-20S (3)	--	6.33	--	
10/26/2006	T-20S (4)	--	10.64	--	
10/26/2006	T-20S (5)	6.74	6.78	0.04	
10/26/2006	T-20S (6)	--	14.14	--	
10/26/2006	MR-6S	--	13.25	--	
10/26/2006	T-20W	--	8.51	--	
10/26/2006	T-21S	--	15.33	--	
10/26/2006	T-46W	--	10.76	--	

Table 3a LNAPL Monitoring ESOI Otter Creek Facility Oregon, Ohio Millard Road Landfill SWMU 5					
10/26/2006	T-47W	--	14.32	--	
10/26/2006	T-45W	--	10.37	--	
10/30/2006	T-20S (1)	--	5.54	--	
10/30/2006	T-20S (2)	14.4	14.41	0.01	
10/30/2006	T-20S (3)	--	6.05	--	
10/30/2006	T-20S (4)	--	10.15	--	
10/30/2006	T-20S (5)	6.27	6.28	0.01	
10/30/2006	T-20S (6)	--	13.78	--	
10/30/2006	T-20S (7)	--	7.4	--	DTB from TOC is 17.47'
10/30/2006	T-20S (8)	--	13.37	--	DTB from TOC is 20.33'
10/30/2006	MR-6S	--	13.19	--	
10/30/2006	T-20W	--	8.23	--	
10/30/2006	T-21S	--	14.8	--	
10/30/2006	T-46W	--	10.54	--	
10/30/2006	T-47W	--	13.19	--	
10/30/2006	T-45W	--	10.37	--	
10/30/2006	TLW-1	--	10.37	--	
11/1/2006	T-20S (1)	--	5.67	--	Time: 1301
11/1/2006	T-20S (2)	14.56	14.57	0.01	Time: 1312
11/1/2006	T-20S (3)	--	6.18	--	Time: 1259
11/1/2006	T-20S (4)	--	10.3	--	Time: 1255
11/1/2006	T-20S (5)	6.15	6.35	0.2	Time: 1308
11/1/2006	T-20S (6)	--	13.94	--	Time: 1253
11/1/2006	T-20S (7)	--	7.5	--	Time: 1306
11/1/2006	T-20S (8)	--	11.94	--	Time: 1303
8/27/2007	T-20S (1)	--	5.72	--	Wells were checked for DNAPL. No DNAPL was present
8/27/2007	T-20S (2)	15.39	15.45	0.06	Wells were checked for DNAPL. No DNAPL was present
8/27/2007	T-20S (3)	--	6.33	--	Wells were checked for DNAPL. No DNAPL was present
8/27/2007	T-20S (4)	--	10.41	--	Wells were checked for DNAPL. No DNAPL was present
8/27/2007	T-20S (5)	6.62	6.86	0.24	Wells were checked for DNAPL. No DNAPL was present
8/27/2007	T-20S (6)	14.94	14.95	0.01	Wells were checked for DNAPL. No DNAPL was present
8/27/2007	T-20S (7)	--	7.69	--	Wells were checked for DNAPL. No DNAPL was present
8/27/2007	T-20S (8)	--	10.26	--	Wells were checked for DNAPL. No DNAPL was present
8/27/2007	MR-6S	14.72	14.73	0.01	Wells were checked for DNAPL. No DNAPL was present
8/27/2007	T-21S	--	15.12	--	Wells were checked for DNAPL. No DNAPL was present
8/27/2007	TLW-1	--	--	--	Well is missing, presumed destroyed.
SWMU 5 LNAPL Bail-down Test					
8/27/2007	MR-6S	14.72	14.73	0.01	Time: 1720 No FP or sheen noted on purged water, will not include in bail-down test.
8/27/2007	T-20S (2)	15.42	15.45	0.03	Time: 1725
8/27/2007	T-20S (5)	6.62	6.86	0.24	Time: 1748
8/27/2007	T-20S (6)	14.96	14.97	0.01	Time: 1740
8/27/2007	T-20S (2)	15.98	15.99	0.01	Time: 1800
8/27/2007	T-20S (5)	6.8	6.84	0.04	Time: 1752
8/27/2007	T-20S (6)	15.3	15.31	0.01	Time: 1807
8/27/2007	T-20S (2)	15.96	15.97	0.01	Time: 1830
8/27/2007	T-20S (5)	6.68	6.72	0.04	Time: 1812
8/27/2007	T-20S (6)	15.32	15.33	0.01	Time: 1821

Table 3a
LNAPL Monitoring
ESOI Otter Creek Facility
Oregon, Ohio
Millard Road Landfill SWMU 5

11/28/2007	T-20S (1)	--	6.5	--	Wells were checked for DNAPL. No DNAPL was present
11/28/2007	T-20S (2)	14.92	15.30	0.38	Wells were checked for DNAPL. No DNAPL was present
11/28/2007	T-20S (3)	--	7.27	--	Wells were checked for DNAPL. No DNAPL was present
11/28/2007	T-20S (4)	--	11.10	--	Wells were checked for DNAPL. No DNAPL was present
11/28/2007	T-20S (5)	4.80	6.50	1.70	Wells were checked for DNAPL. No DNAPL was present
11/28/2007	T-20S (6)	15.80	16.20	0.40	Wells were checked for DNAPL. No DNAPL was present
11/28/2007	T-20S (7)	--	7.80	--	Wells were checked for DNAPL. No DNAPL was present
11/28/2007	T-20S (8)	--	11.90	--	Wells were checked for DNAPL. No DNAPL was present

**Table 3a LNAPL Monitoring
ESOI Otter Creek Facility
Oregon, Ohio
Millard Road Landfill - SWMU 5**

Date	Well	Depth to NAPL (ft)	Depth to Water (ft)	LNAPL Thickness (ft)	Comments
6/2/2010	T-20S (1)	--	5.53	--	Wells were checked for DNAPL. No DNAPL was present
	T-20S (2)	15.5	15.83	0.33	
	T-20S (3)	--	5.95	--	Wells were checked for DNAPL. No DNAPL was present
	T-20S (4)	--	10.11	--	Wells were checked for DNAPL. No DNAPL was present
	T-20S (5)	6.06	6.79	0.73	
	T-20S (6)	14.93	15.09	0.16	
	T-20S (7)	--	7.46	--	Wells were checked for DNAPL. No DNAPL was present
	T-20S (8)	--	11.95	--	Wells were checked for DNAPL. No DNAPL was present
	MR-6S	--	14.76	--	
	T21S	--	15.36	--	Wells were checked for DNAPL. No DNAPL was present
	T20W	--	8.18	--	Well is missing, presumed destroyed.
	T45W	--	12.15	--	
	T46W				Unable to locate, presumed abandoned.

Table 4a
Summary of Physical Properties
T20S(5) Non-Aqueous Phase Liquid
ESOI Otter Creek Facility
Oregon, Ohio

LOCATION		T-20S (5)
ENVIRON Sample ID		SWMU5-T20S5-NAPL
Matrix		NAPL
Sample Date		02-Jun-10
Comments		
Physical Properties		Units
Specific Gravity/Bulk Density		NONE 0.95
Viscosity @ 60F		CST 529.5
Viscosity @ 77F		CST 254.8
Viscosity @ 104F		CST 98.16
Viscosity @ 194F		CST 13.54
Viscosity @ 212F		CST 10.43

Abbreviations:

CST: Centistokes

Table 4b
Summary of Physical Properties
Non-Aqueous Phase Liquid
ESOI Otter Creek Facility
Oregon, Ohio

LOCATION	AOC 7	COMP_SWMU9	T-20S (5)	T-33S	TLW-202	
ENVIRON Sample ID	AOC7-NAPL-060726	SWMU9-NAPL-061101-C	T20S5-NAPL-060726	T33S-NAPL-060714	TLW202-NAPL-060726	
Matrix	NAPL	NAPL	NAPL	NAPL	NAPL	
Sample Date	26-Jul-06	01-Nov-06	26-Jul-06	14-Jul-06	26-Jul-06	
Comments						
Physical Properties	Units					
Specific Gravity/Bulk Density	NONE	0.99	0.93	0.97	0.98	
Viscosity (Initial)	CST	5549.82 @60F	25.43 @60F	518.46 @60F	53.04 @15.6C	107.44 @60F
Viscosity (Secondary)	CST	2086.92 @77F	17.19 @77F	244.72 @77F	33.2 @25C	62.74 @77F
Viscosity (Initial)	SUS	25646.3 @60F	121 @60F	507.8 @60F	245.9 @15.6C	496.7 @60F
Viscosity (Secondary)	SUS	9653.9 @77F	86.1 @77F	1132.1 @77F	155.7 @25C	290.8 @77F

Abbreviations:

CST: Centistokes

SUS: Saybolt Universal Seconds

Cross-Section

Cost Estimates – SWMU 5 LNAPL Alternatives

NAPL Recovery Estimates
ESOI Otter Creek Facility, Oregon, Ohio

Alternative 1: SWMU 5 - Passive Recovery

Cumulative Cost Deflator, 2005 to 2010 ->

1.11617

Scope and Assumptions

- Four 4" wells will be drilled and a passive skimmer will be installed in each.
- 875 gallons of recoverable NAPL.
- 55 gallon drums will be used to collect NAPL.
- Weekly maintenance will be performed, including emptying skimmers (1 hour per event).
- When recovery rate decreases, absorbent socks will be used for ~1 year, changing sock monthly.

NAPL Recovery

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total</u>
1	Passive Skimmer	4	EA	\$955.00	\$3,820
2	55 Gallon Drums	17	EA	\$110.41	\$1,877
3	Temporary Containment Area	1	EA	\$192.92	\$193
4	Installation	8	hour	\$59.16	\$473
5	Absorbent Socks	48	EA	\$2.33	\$112
Subtotal					\$6,000

Installation of Wells

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total</u>
1	Mobilization and Demobilization	1	LS	\$1,500.00	\$1,500
2	Subsistence	6	man/day	\$100.00	\$600
3	10" Sonic Drilling	80	feet	\$55.00	\$4,400
4	4" SS x HDPE Well Labor and Materials	80	ft	\$69.00	\$5,520
5	Restore Site and Waste Management	5	hr	\$350.00	\$1,750
6	Decon Time (Rig and 3 Man Crew)	5	hr	\$300.00	\$1,500
7	Backhoe	0.5	week	\$1,200.00	\$600
Subtotal					\$16,000

SUBTOTAL - CONSTRUCTION & STARTUP

\$22,000

Engineering

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total</u>
1	Engineering (12%)	1	LS	\$2,640	\$2,640
2	Construction Quality Assurance (10%)	1	LS	\$2,200	\$2,200
3	Contingency (20%)	1	LS	\$4,400	\$4,400
Subtotal					\$9,000

TOTAL CAPITAL COSTS

\$31,000

Long Term Monitoring

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total</u>
1	Remove Product, Skimmer Maintenance	208	hours	\$59.16	\$12,305
2	NAPL Disposal	0.5	drum	\$250.00	\$125
Annual Operation and Maintenance Cost					\$12,400
TOTAL OPERATION AND MAINTENANCE					\$186,000
NPV OPERATION AND MAINTENANCE					\$151,294

ALTERNATIVE 1, TOTAL COST \$217,000
ALTERNATIVE 1, NPV \$183,000

Note: NPV calculation using RoR of 2.7%

NAPL Recovery Estimates
ESOI Otter Creek Facility, Oregon, Ohio

Alternative 2: SWMU 5 - Active Recovery

Cumulative Cost Deflator, 2005 to 2010 ->

1.11617

Scope and Assumptions

- Two 4" wells will be drilled and a solar sipper (active skimmer) will be installed in each.
- 875 gallons of recoverable NAPL.
- 55 gallon drums will be used to collect NAPL and will be emptied 6 times per year (4 hours per event).
- Weekly maintenance will be performed (1 hour per event).
- When recovery rate decreases, absorbent socks will be used for ~1 year, changing sock monthly.

NAPL Recovery Equipment

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total</u>
1	Solar Sipper System	2	EA	\$6,355.00	\$12,710
2	55 Gallon Drums	17	EA	\$110.41	\$1,877
3	Temporary Containment Area	2	EA	\$192.92	\$386
4	Installation	8	hour	\$59.16	\$473
5	Absorbent Socks	24	EA	\$2.33	\$56
Subtotal					\$ 16,000

Well Installation

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total</u>
1	Mobilization and Demobilization	1	LS	\$1,500.00	\$1,500
2	Subsistence	3	man/day	\$100.00	\$300
3	10" Sonic Drilling	40	feet	\$55.00	\$2,200
4	4" SS x HDPE Well Labor and Materials	40	ft	\$69.00	\$2,760
5	Restore Site and Waste Management	3	hr	\$350.00	\$1,050
6	Decon Time (Rig and 3 Man Crew)	3	hr	\$300.00	\$900
7	Backhoe	0.5	week	\$1,200.00	\$600
Subtotal					\$9,000

SUBTOTAL - CONSTRUCTION & STARTUP

\$25,000

Engineering

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total</u>
1	Engineering (12%)	1	LS	\$3,000	\$3,000
2	Construction Quality Assurance (10%)	1	LS	\$2,500	\$2,500
3	Contingency (20%)	1	LS	\$5,000	\$5,000
Subtotal					\$11,000

TOTAL CAPITAL COSTS

\$36,000

Long Term Monitoring

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total</u>
1	Remove Product, Maintenance	76	hours	\$59.16	\$4,496
2	NAPL Disposal	6	drums	\$250.00	\$1,500
Annual Operation and Maintenance Cost					\$6,000
TOTAL OPERATION AND MAINTENANCE					\$18,000
NPV OPERATION AND MAINTENANCE					\$17,070

ALTERNATIVE 2, TOTAL COST \$54,000
ALTERNATIVE 2, NPV \$54,000

Note: NPV calculation using RoR of 2.7%

Geotech Solar Sipper

Hydrocarbon Recovery System



Geotech Solar Sipper

CONFIGURATION

Control Panel with:

- NEMA 4 Enclosure
- 64 watt solar panel with adjustable mounting plate
- Tankfull Shut-Off Switch (2 inch NPT bung-fitting)
- Microprocessor Controller with alpha-numeric vacuum fluorescent display
- On/Off Switch
- Pressure/Vacuum Pump
- Pressure/Vacuum Gauge

Skimmer Assembly with:

- 2" or 4" Intake
- Downwell Collection Canister
- 2" or 4" Slip Fit Well Cap
- Air and Discharge Tubing, 100' of each

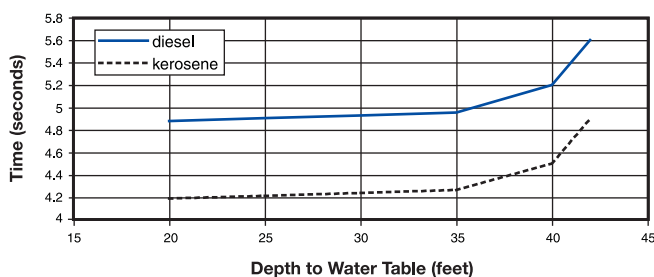
Options include:

- 55 Gallon Steel Product Drum
- Dual Containment Product Tank
- Additional Air and Discharge Tubing
- Power Cable Lead
- Screened Skimmer Assemblies
- Wall Mount Kit
- Pole Mount Kit
- AGM Solar Battery 104 AH, 12 Volt

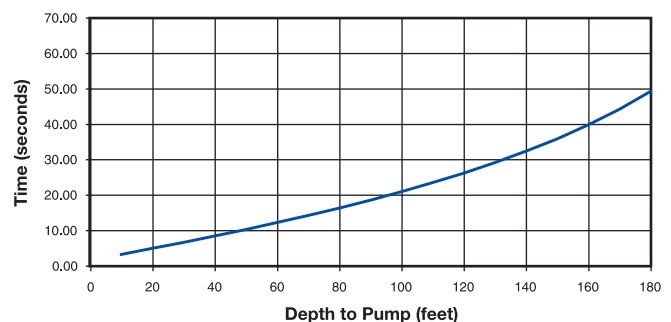
SPECIFICATIONS

Applications:	2" (5.8cm) or larger recovery wells	
Recovery Rate:	.2 gallons (.750 ml) per cycle	
Maximum Operating Depth:	180 feet (54.86m)	
Power Requirements:	12-15 Volts DC input @ 7.5 Amps 90-105 Watts usage	
Maximum Pressure:	100 psi	
Maximum Vacuum:	20" HgV @ MSL	
Oil/Water Separation:	Oleophilic/hydrophobic mesh screen	
Controller:		
Size	7" D x 17.4" L x 14" W (18cm D x 44.2cm L x 35.6cm W)	
Approximate Weight	18.4 lbs.	
Rating	NEMA 4	
Down Well Collection Canister:		
Size	23.5" L x 1.75" OD	
Weight	4.5 lbs.	
Materials	303 and 304 stainless steel, flexible tubing, PVC and brass	
Skimmer Assembly:	2" Model	4" Model
Effective Travel Range	12"	24"
Size	35.5" L x 1.75" OD	35.5" L x 3.75" OD
Weight	1.75 lbs.	2.25 lbs.
Operating Temperature	32° to 100°F	
Materials	304 Stainless Steel, Polyethylene, PVC, Polypropylene, Brass	
Tubing Sizes:		
Air	.17" ID x .25" OD (4.318mm ID x .35mm OD)	
Discharge	3/8" ID x 1/2" OD (9.525mm ID x 12.7mm OD)	
Solar Panel:		
Rated	Power 64 Watt	
Operating Voltage	16.5	
Operating Currant (Amps)	3.88	
Size	51.8" H x 59.0" W	
Approximate Weight	40.2 lbs.	

Solar Sipper Maximum Recommended Vacuum Times



Solar Sipper Time to Discharge (based on #2 Diesel)



CALL GEOTECH TODAY (800) 833-7958

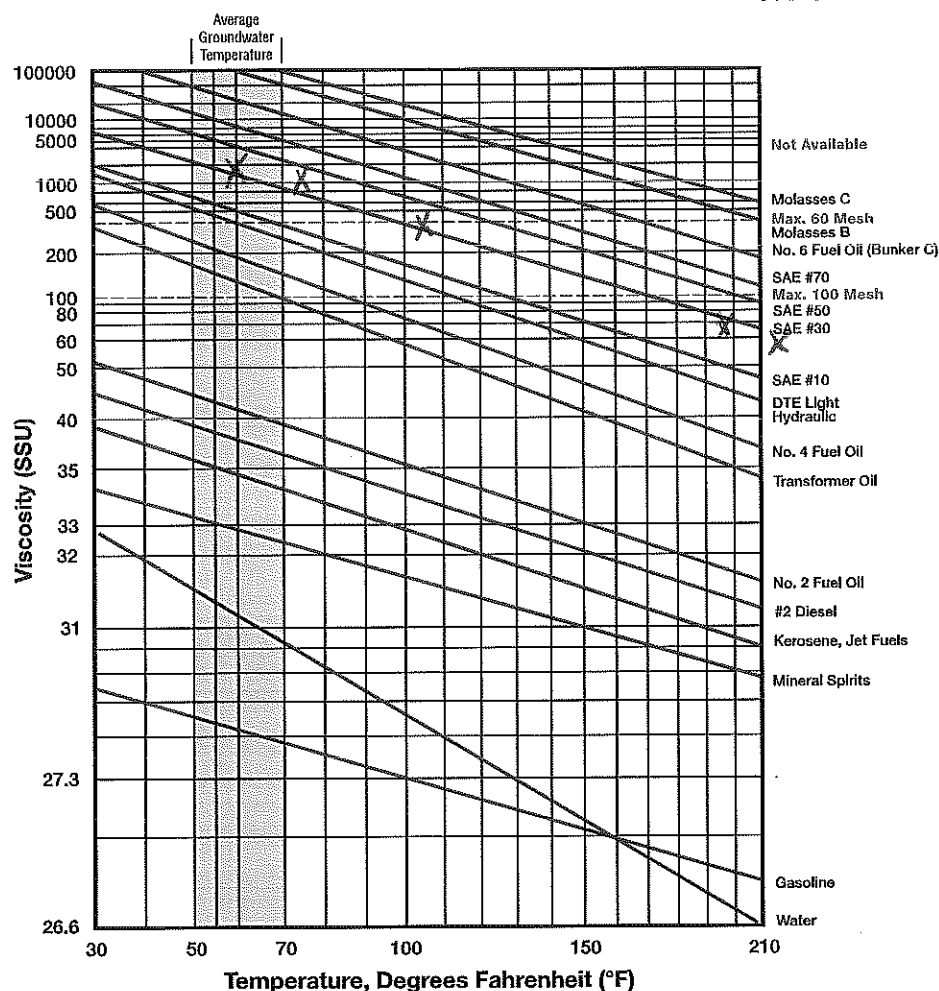
Geotech Environmental Equipment, Inc.

2650 East 40th Avenue • Denver, Colorado 80205

(303) 320-4764 • **(800) 833-7958** • FAX (303) 322-7242

email: sales@geotechenv.com website: www.geotechenv.com

Average Viscosities of Miscellaneous Liquids



Application Graph for Geotech Oleophilic/Hydrophilic Screens

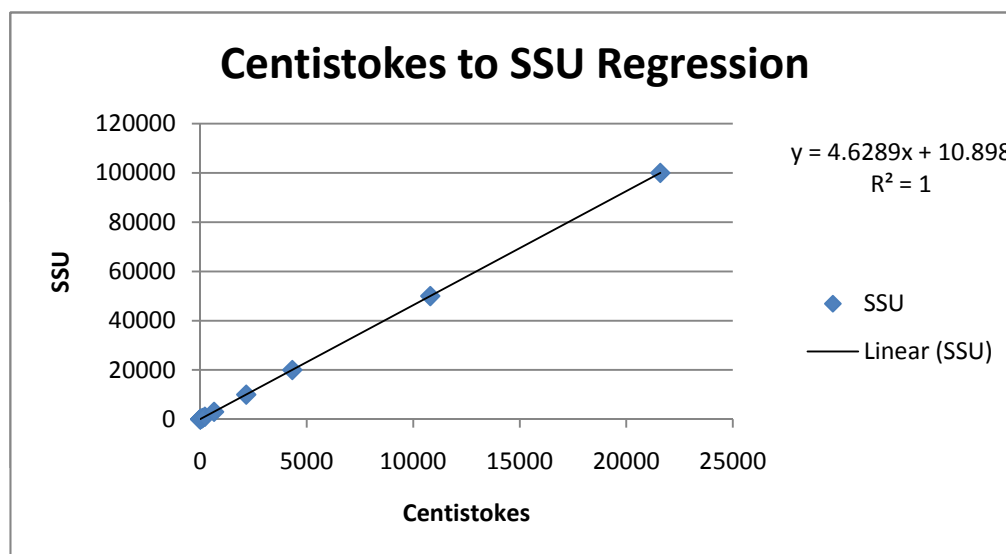
REFERENCE PAGES

Saybolt Universal SSU	Stokes	Centistokes	Poises*	Centipoises	Degrees Engler	Redwood No. 1 Seconds	Typical Liquids at 65°F
27.7	0.006	0.600	0.005	0.480	NA	27.99	Gasoline
31	0.010	1.00	0.008	0.800	1	29	Water
33	0.020	2.00	0.016	1.60	1.11	31	Mineral Spirits
35	0.025	2.50	0.020	2.00	1.17	32	Kerosene/Jet Fuel
37	0.030	3.00	0.024	2.40	1.23	33	No. 2 Diesel
39	0.040	4.00	0.032	3.20	1.3	36	No. 2 Fuel Oil
100	0.202	20.2	0.162	16.2	3.02	86	Transformer Oil
170	0.363	36.3	0.290	29.0	4.88	145	No. 4 Fuel Oil
200	0.432	43.2	0.346	34.6	5.92	170	Hydraulic Oil
500	1.10	110	0.880	88	14.6	423	SAE 10 Oil
1,000	2.16	216	1.73	173	29.2	847	SAE 30 Oil
3,000	6.5	647	5.2	518	87.6	2,541	SAE 50 Oil
10,000	21.6	2,160	17.3	1,728	292.0	8,471	STE 70 Oil
20,000	43.2	4,320	34.6	3,456	584.0	16,941	No. 6 Fuel Oil (Bunker C)
50,000	108	10,800	86	8,640	1460.0	42,353	Molasses B
100,000	216	21,600	173	17,280	2920.0	84,706	Molasses C

*Poises and centipoises are given for oil of .8 specific gravity.
Relationship: Centistokes x Specific Gravity = Centipoise

Viscosity Unit Conversion Chart

Saybolt Universal SSU	Stokes	Centistokes	Poises	Centipoises	Degrees Engler	Redwood No. 1 Seconds	Typical Liquids at 65°F
27.7	0.006	0.6	0.005	0.48	NA	27.99	Gasoline
31	0.01	1	0.008	0.8	1	29	Water
33	0.02	2	0.016	1.6	1.11	31	Mineral Spirits
35	0.025	2.5	0.02	2	1.17	32	Kerosene/Jet Fuel
37	0.03	3	0.024	2.4	1.23	33	No. 2 Diesel
39	0.04	4	0.032	3.2	1.3	36	No. 2 Fuel Oil
100	0.202	20.2	0.162	16.2	3.02	86	Transformer Oil
170	0.363	36.3	0.29	29	4.88	145	No. 4 Fuel Oil
200	0.432	43.2	0.346	34.6	5.92	170	Hydraulic Oil
500	1.1	110	0.88	88	14.6	423	SAE 10 Oil
1,000	2.16	216	1.73	173	29.2	847	SAE 30 Oil
3,000	6.5	647	5.2	518	87.6	2,541	SAE 50 Oil
10,000	21.6	2,160	17.3	1,728	292	8,471	STE 70 Oil
20,000	43.2	4,320	34.6	3,456	584	16,941	No. 6 Fuel Oil (Bunker C)
50,000	108	10,800	86	8,640	1460	42,353	Molasses B
100,000	216	21,600	173	17,280	2920	84,706	Molasses C



6/2/2010 Data

Temp (°F)	CST	SSU
60	529.5	2461.90055
77	254.8	1190.34172
104	98.16	465.270824
194	13.54	73.573306
212	10.43	59.177427

APPENDIX H

Supporting Documentation for CM Analysis – AOC 1

C O N T E N T S

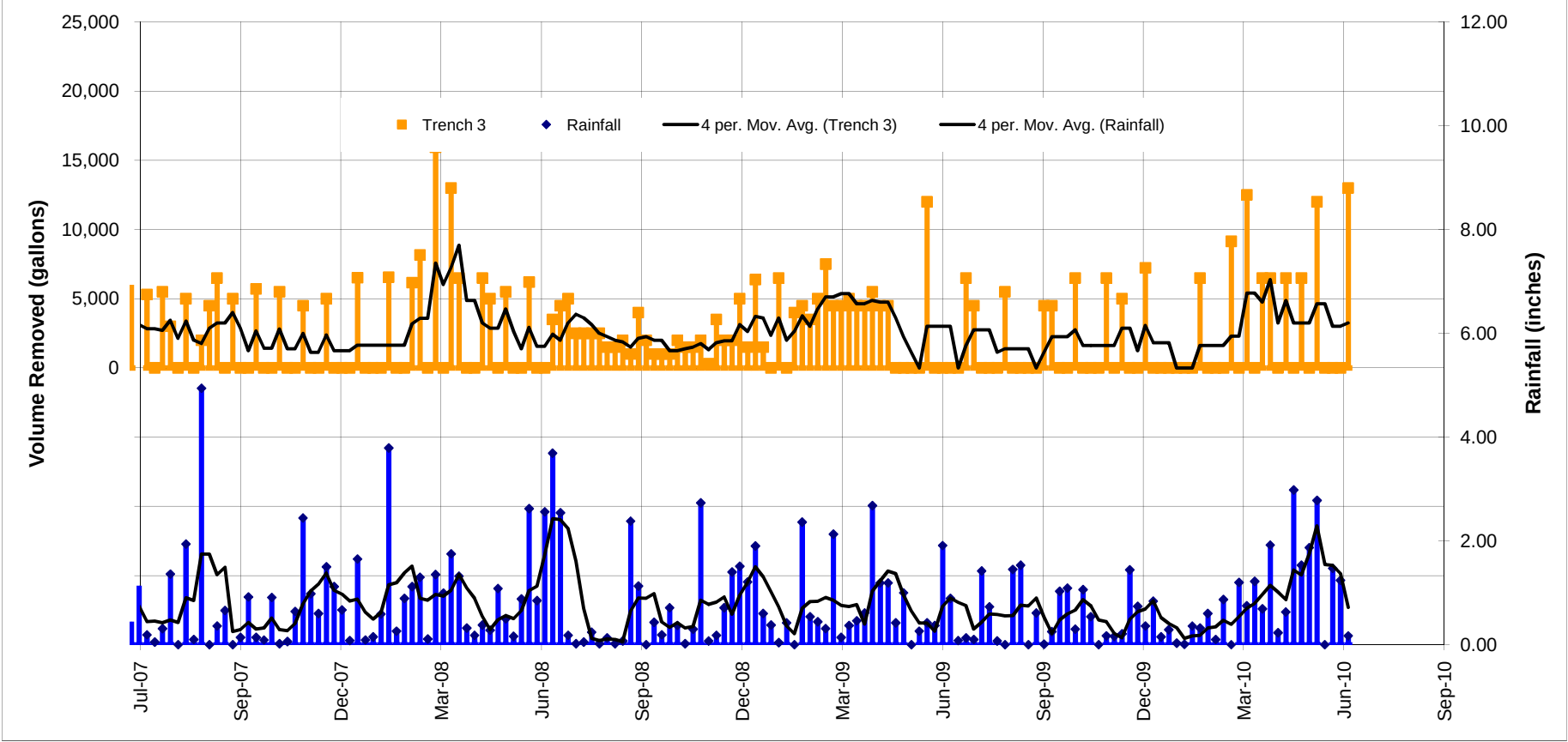
Water Recovery Graphs

Data Table

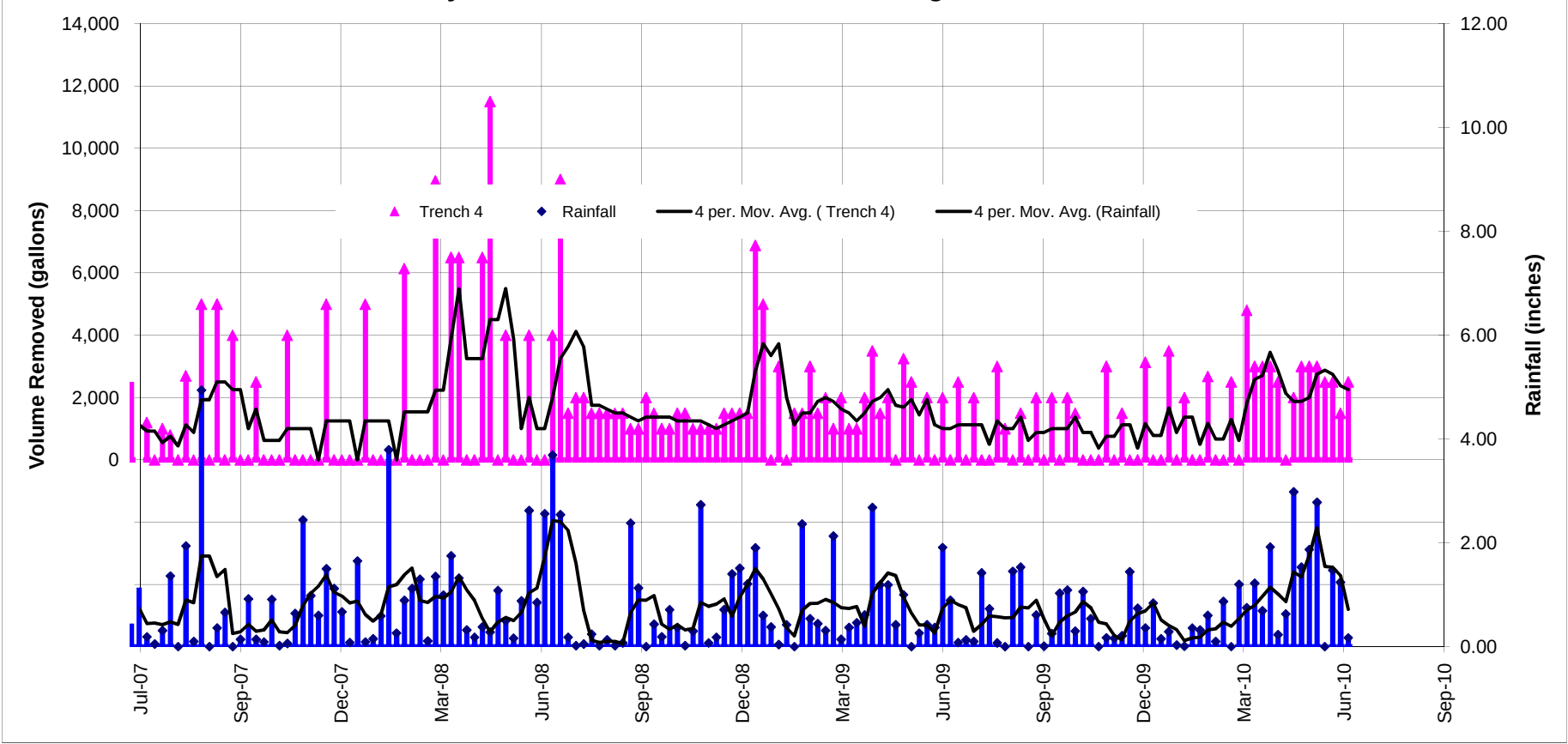
Cost Estimates – AOC 1 Alternatives

Water Recovery Graphs

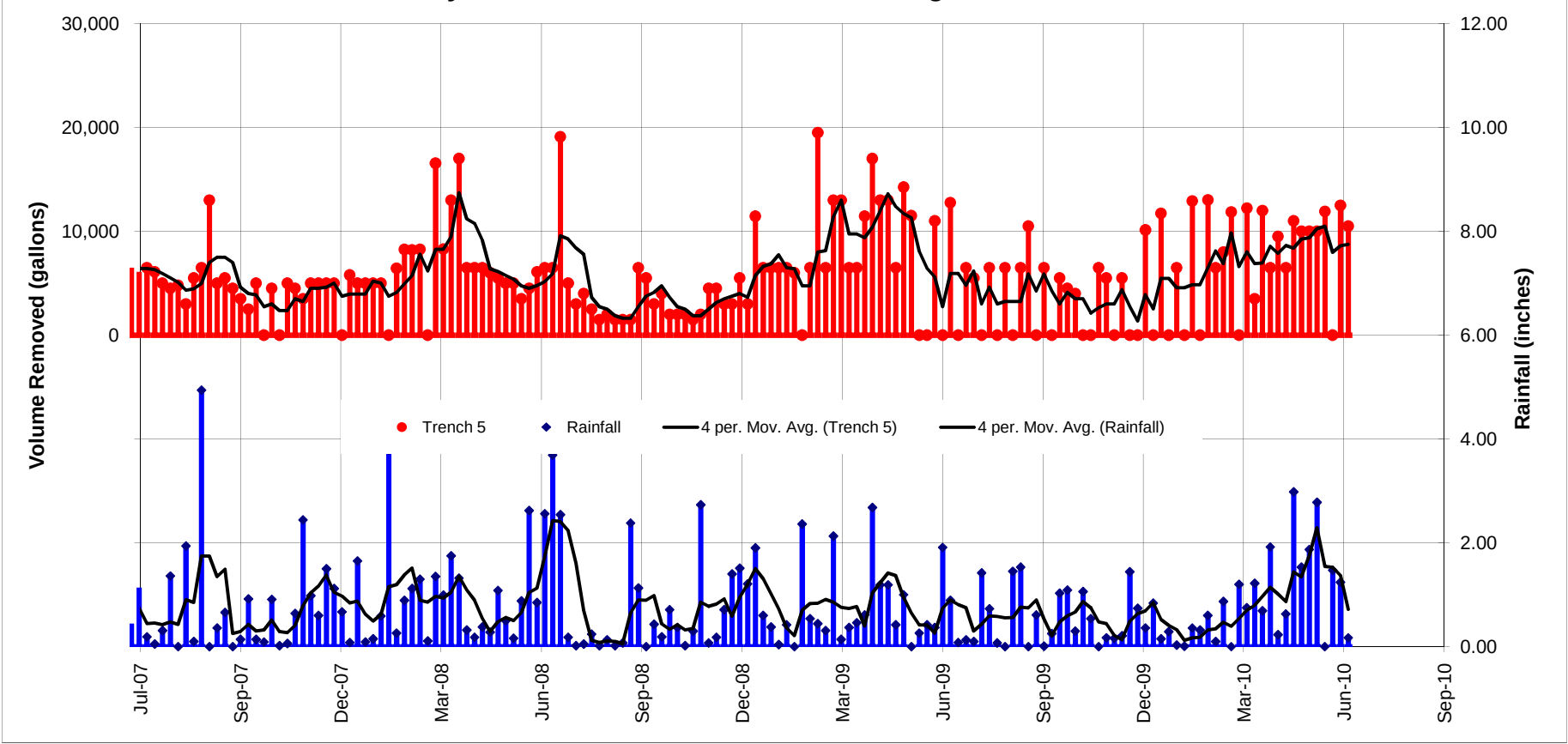
Summary of Water Removed from Dewatering Trench 3 and Rainfall



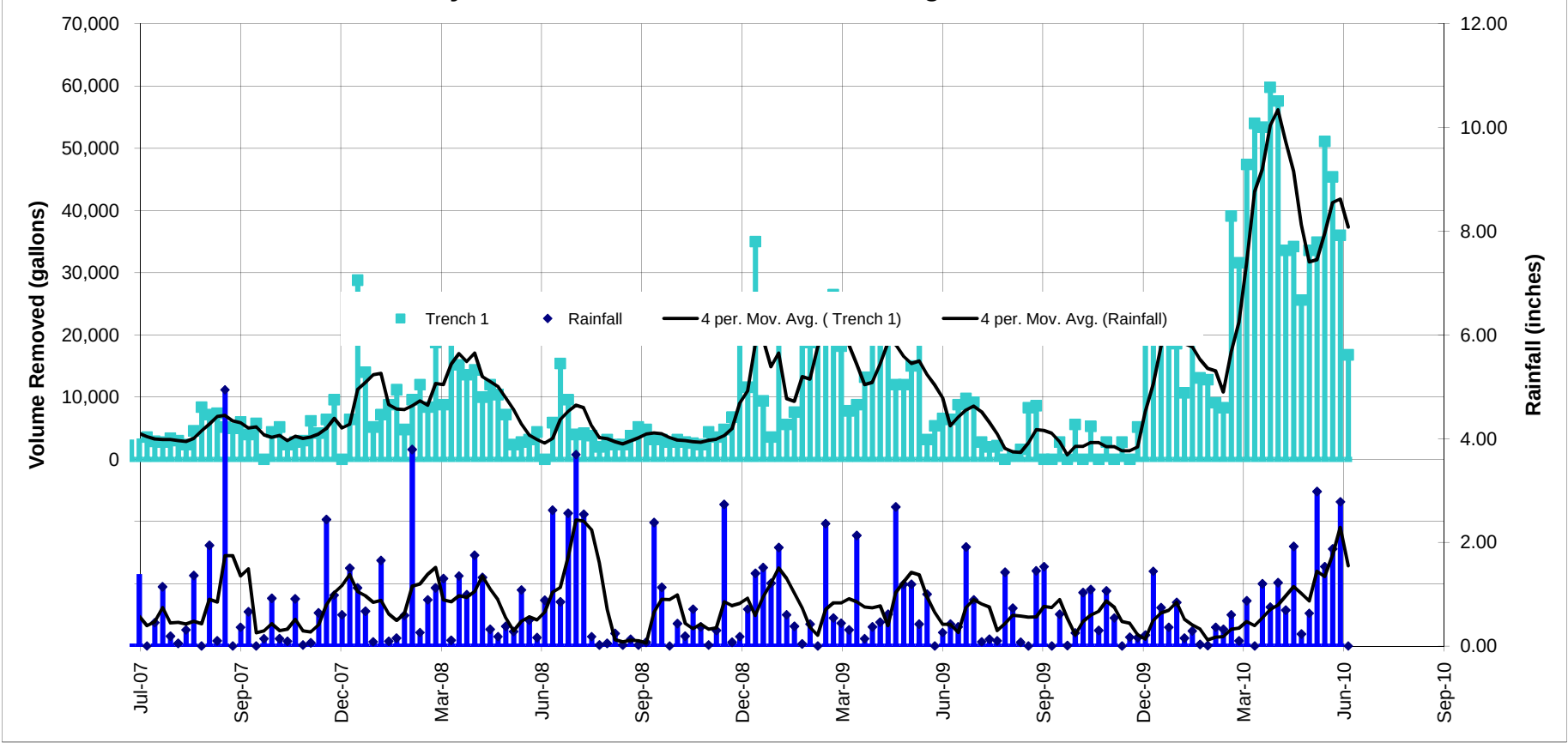
Summary of Water Removed from Dewatering Trench 4 and Rainfall



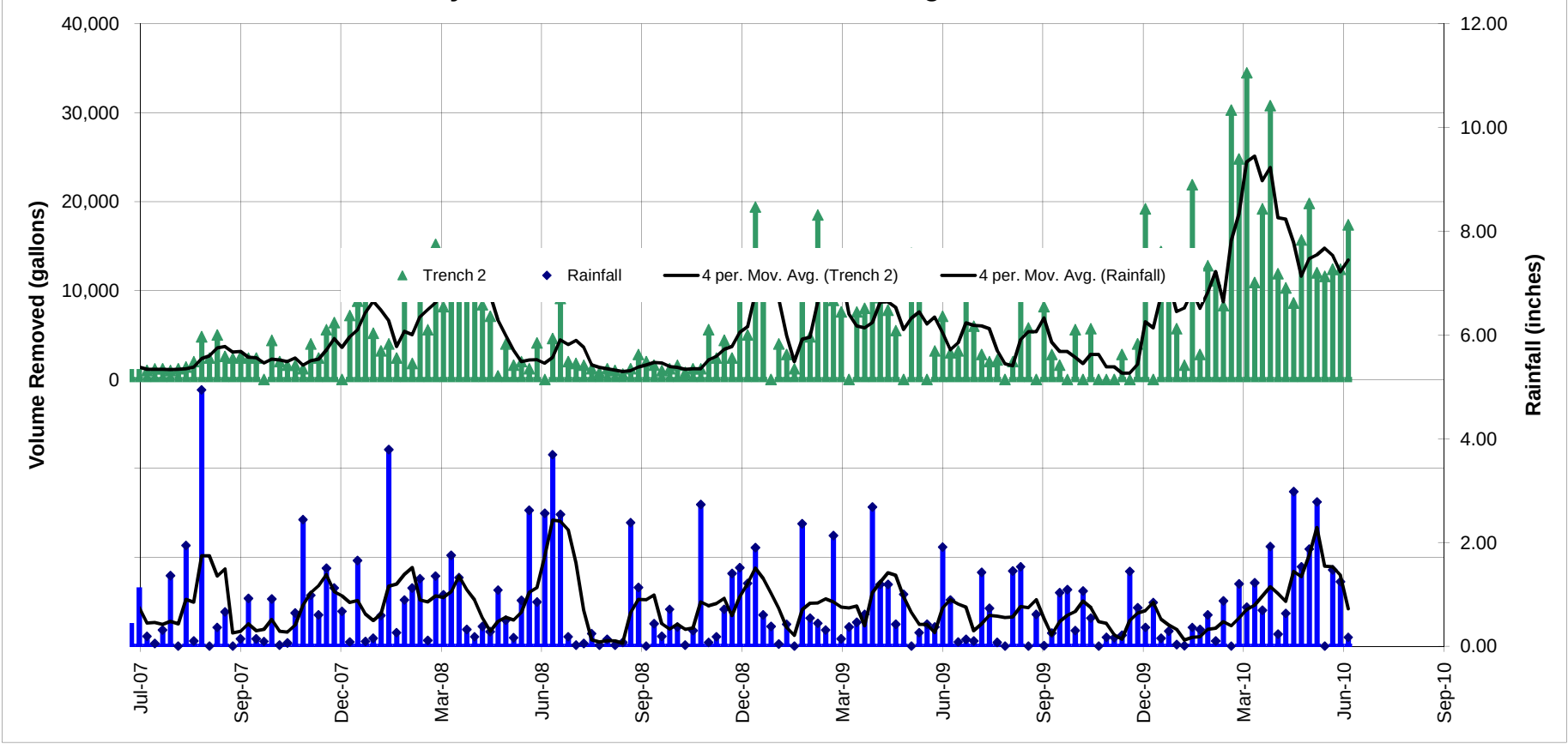
Summary of Water Removed from Dewatering Trench 5 and Rainfall



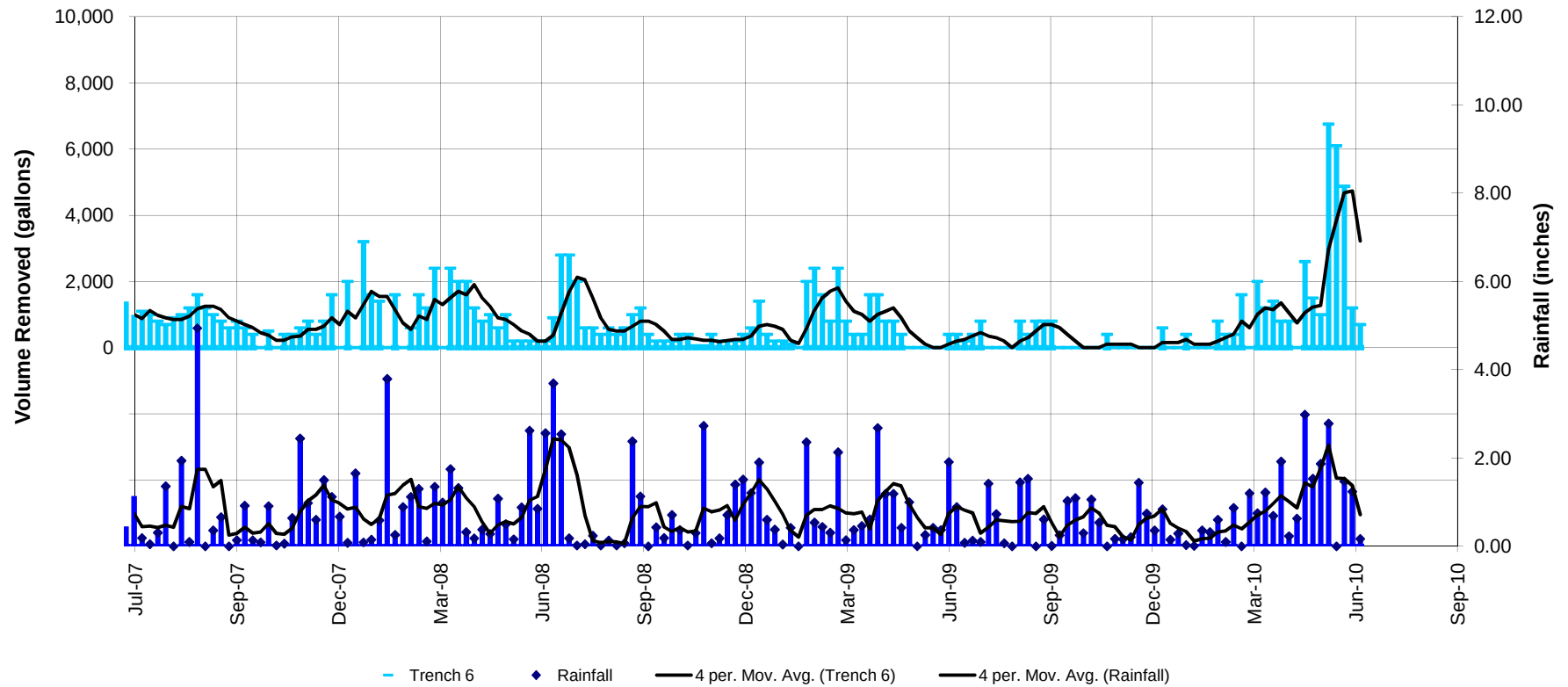
Summary of Water Removed from Monitoring Trench 1 and Rainfall



Summary of Water Removed from Monitoring Trench 2 and Rainfall



Summary of Water Removed from Monitoring Trench 6 and Rainfall



Data Table

Table 2
Analytical Results
May 2010 City of Toledo Water Line Trench
Envirosafe Services of Ohio, Inc.

Lab	Sump	Sample Date	Constituent	Result	Q	Unit	MDL	PQL	Dilution
DEWATERING TRENCHES									
General									
J & H	P-3W(5N)	5/5/2010	Conductivity	2980		umhos/cm		1	
J & H	P-3W(5N)	5/5/2010	pH	6.91		SU		1.00	
J & H	P-3W(5N)	5/5/2010	Chloride	341		mg/L		1	
J & H	P-3W(5N)	5/5/2010	Biological Oxygen Demand	32		mg/L		4	
J & H	P-3W(5N)	5/5/2010	Total Phenols	12		ug/L		5	
J & H	P-3W(5N)	5/5/2010	Sulfate	324		mg/L		5	
J & H	P-3W(5N)	5/5/2010	Total Suspended Solids	31		mg/L		5	
TA-NC	P-3W(5N)	5/5/2010	n-Hexane Extractable Material (O&G)	8.9		mg/L	0.77	5	1
TA-NC	P-3W(5N)	5/5/2010	Chemical Oxygen Demand (COD)	212		mg/L	20.4	40	4
Dissolved Metals									
TA-NC	P-3W(5N)	5/5/2010	Barium-DISS	676	B	ug/L	0.67	200	1
TA-NC	P-3W(5N)	5/5/2010	Chromium-DISS	3	J	ug/L	2.2	5	1
TA-NC	P-3W(5N)	5/5/2010	Iron-DISS	87.7	J	ug/L	81	100	1
TA-NC	P-3W(5N)	5/5/2010	Magnesium-DISS	95000	B	ug/L	34	5000	1
TA-NC	P-3W(5N)	5/5/2010	Sodium-DISS	235000		ug/L	590	5000	1
Polychlorinated Biphenyls (PCBs)									
TA-NC	P-3W(5N)	5/5/2010	PCB-1254	27		ug/L	0.8	5	5
Volatile Organic Compounds (VOC)									
TA-NC	P-3W(5N)	5/5/2010	Benzene	110		ug/L	2.2	17	16.67
TA-NC	P-3W(5N)	5/5/2010	Tetrahydrofuran	410		ug/L	7	83	16.67
Semi-Volatile Organic Compounds (SVOC)									
TA-NC	P-3W(5N)	5/5/2010	1,4-Dioxane	21	J	ug/L	2	40	4
TA-NC	P-3W(5N)	5/5/2010	Acenaphthene	2.5	J	ug/L	0.4	40	4
TA-NC	P-3W(5N)	5/5/2010	Anthracene	1.3	J	ug/L	0.4	40	4
TA-NC	P-3W(5N)	5/5/2010	Benzo(a)anthracene	1.5	J	ug/L	0.4	40	4
TA-NC	P-3W(5N)	5/5/2010	Benzo(a)pyrene	1.6	J	ug/L	0.4	40	4
TA-NC	P-3W(5N)	5/5/2010	Benzo(b)fluoranthene	1.4	J	ug/L	0.4	40	4
TA-NC	P-3W(5N)	5/5/2010	Benzo(ghi)perylene	1.6	J	ug/L	0.4	40	4
TA-NC	P-3W(5N)	5/5/2010	bis(2-Ethylhexyl) phthalate	6.1	J	ug/L	3.2	40	4
TA-NC	P-3W(5N)	5/5/2010	Chrysene	1.8	J	ug/L	0.4	40	4
TA-NC	P-3W(5N)	5/5/2010	Dibenz(a,h)anthracene	1.8	J	ug/L	0.4	40	4
TA-NC	P-3W(5N)	5/5/2010	Fluoranthene	1.5	J	ug/L	0.4	40	4
TA-NC	P-3W(5N)	5/5/2010	Fluorene	2.9	J	ug/L	0.4	40	4
TA-NC	P-3W(5N)	5/5/2010	Indeno(1,2,3-cd)pyrene	1.1	J	ug/L	0.4	40	4
TA-NC	P-3W(5N)	5/5/2010	Naphthalene	2.6	J	ug/L	0.4	40	4
TA-NC	P-3W(5N)	5/5/2010	Phenanthrene	2.2	J	ug/L	0.4	40	4
TA-NC	P-3W(5N)	5/5/2010	Pyrene	2.1	J	ug/L	0.4	40	4
Total Organic Halogens (TOX)									
TA-NC	P-3W(5N)	5/5/2010	Total Organic Halogens	280		ug/L	95	150	5
TA-NC	P-3W(5N)	5/5/2010	Total Organic Halogens	361		ug/L	95	150	5
TA-NC	P-3W(5N)	5/5/2010	Total Organic Halogens	429		ug/L	95	150	5
TA-NC	P-3W(5N)	5/5/2010	Total Organic Halogens	361		ug/L	95	150	5
			Average TOX	357.75					
Total Organic Carbon (TOC)									
TA-NC	P-3W(5N)	5/5/2010	Total Organic Carbon	16.5		mg/L	0.24	1	1
TA-NC	P-3W(5N)	5/5/2010	Total Organic Carbon	15.8		mg/L	0.24	1	1
TA-NC	P-3W(5N)	5/5/2010	Total Organic Carbon	16.5		mg/L	0.24	1	1
TA-NC	P-3W(5N)	5/5/2010	Total Organic Carbon	17.5		mg/L	0.24	1	1
			Average TOC	16.6					
General									
J & H	P-4E(4S)	5/5/2010	Conductivity	1780		umhos/cm		1	
J & H	P-4E(4S)	5/5/2010	pH	6.55		SU		1.00	
J & H	P-4E(4S)	5/5/2010	Chloride	199		mg/L		1	
J & H	P-4E(4S)	5/5/2010	Biological Oxygen Demand	16		mg/L		4	
J & H	P-4E(4S)	5/5/2010	Sulfate	308		mg/L		5	
J & H	P-4E(4S)	5/5/2010	Total Suspended Solids	51		mg/L		5	

Table 2
Analytical Results
May 2010 City of Toledo Water Line Trench
Envirosafe Services of Ohio, Inc.

Lab	Sump	Sample Date	Constituent	Result	Q	Unit	MDL	PQL	Dilution
TA-NC	P-4E(4S)	5/5/2010	n-Hexane Extractable Material (O&G)	10.3		mg/L	0.77	5	1
TA-NC	P-4E(4S)	5/5/2010	Chemical Oxygen Demand (COD)	86.7		mg/L	5.1	10	1
Dissolved Metals									
TA-NC	P-4E(4S)	5/5/2010	Barium-DISS	179	B J	ug/L	0.67	200	1
TA-NC	P-4E(4S)	5/5/2010	Iron-DISS	429		ug/L	81	100	1
TA-NC	P-4E(4S)	5/5/2010	Magnesium-DISS	55500	B	ug/L	34	5000	1
TA-NC	P-4E(4S)	5/5/2010	Sodium-DISS	117000		ug/L	590	5000	1
Polychlorinated Biphenyls (PCBs)									
Volatile Organic Compounds (VOC)									
TA-NC	P-4E(4S)	5/5/2010	1,1-Dichloroethane	150		ug/L	0.75	5	5
TA-NC	P-4E(4S)	5/5/2010	1,2-Dichloroethene (total)	23		ug/L	1.7	10	5
TA-NC	P-4E(4S)	5/5/2010	1,2-Dichloropropane	1.5	J	ug/L	0.9	5	5
TA-NC	P-4E(4S)	5/5/2010	Benzene	2.7	J	ug/L	0.65	5	5
TA-NC	P-4E(4S)	5/5/2010	Chloroethane	170		ug/L	1.4	5	5
TA-NC	P-4E(4S)	5/5/2010	Ethylbenzene	170		ug/L	0.85	5	5
TA-NC	P-4E(4S)	5/5/2010	Tetrahydrofuran	35		ug/L	2.1	25	5
TA-NC	P-4E(4S)	5/5/2010	Toluene	41		ug/L	0.65	5	5
TA-NC	P-4E(4S)	5/5/2010	Trichloroethene	1.9	J	ug/L	0.85	5	5
TA-NC	P-4E(4S)	5/5/2010	Vinyl chloride	36		ug/L	1.1	5	5
Semi-Volatile Organic Compounds (SVOC)									
TA-NC	P-4E(4S)	5/5/2010	1,4-Dioxane	30		ug/L	0.49	10	1
TA-NC	P-4E(4S)	5/5/2010	2,4-Dimethylphenol	0.86	J	ug/L	0.8	10	1
TA-NC	P-4E(4S)	5/5/2010	Acenaphthene	0.27	J	ug/L	0.1	10	1
TA-NC	P-4E(4S)	5/5/2010	Benzo(b)fluoranthene	0.23	J	ug/L	0.1	10	1
TA-NC	P-4E(4S)	5/5/2010	bis(2-Ethylhexyl) phthalate	3.3	J	ug/L	0.8	10	1
TA-NC	P-4E(4S)	5/5/2010	Butyl benzyl phthalate	0.86	J	ug/L	0.8	10	1
TA-NC	P-4E(4S)	5/5/2010	Fluorene	0.28	J	ug/L	0.1	10	1
TA-NC	P-4E(4S)	5/5/2010	Pyrene	0.37	J	ug/L	0.1	10	1
Total Organic Halogens (TOX)									
TA-NC	P-4E(4S)	5/5/2010	Total Organic Halogens	224		ug/L	38	60	2
TA-NC	P-4E(4S)	5/5/2010	Total Organic Halogens	189		ug/L	38	60	2
TA-NC	P-4E(4S)	5/5/2010	Total Organic Halogens	174		ug/L	38	60	2
TA-NC	P-4E(4S)	5/5/2010	Total Organic Halogens	215		ug/L	38	60	2
			Average TOX	200.5					
Total Organic Carbon (TOC)									
TA-NC	P-4E(4S)	5/5/2010	Total Organic Carbon	16.5		mg/L	0.96	4	4
TA-NC	P-4E(4S)	5/5/2010	Total Organic Carbon	15.9		mg/L	0.96	4	4
TA-NC	P-4E(4S)	5/5/2010	Total Organic Carbon	16.3		mg/L	0.96	4	4
TA-NC	P-4E(4S)	5/5/2010	Total Organic Carbon	16.5		mg/L	0.96	4	4
			Average TOC	16.3					
General									
J & H	P-4W(5S)	5/5/2010	Conductivity	2490		umhos/cm		1	
J & H	P-4W(5S)	5/5/2010	pH	6.97		SU		1.00	
J & H	P-4W(5S)	5/5/2010	Chloride	262		mg/L		1	
J & H	P-4W(5S)	5/5/2010	Biological Oxygen Demand	7		mg/L		4	
J & H	P-4W(5S)	5/5/2010	Sulfate	329		mg/L		5	
J & H	P-4W(5S)	5/5/2010	Total Suspended Solids	14		mg/L		5	
TA-NC	P-4W(5S)	5/5/2010	n-Hexane Extractable Material (O&G)	3.8	J	mg/L	0.77	5	1
TA-NC	P-4W(5S)	5/5/2010	Chemical Oxygen Demand (COD)	42.9		mg/L	5.1	10	1
Dissolved Metals									
TA-NC	P-4W(5S)	5/5/2010	Barium-DISS	241	B	ug/L	0.67	200	1
TA-NC	P-4W(5S)	5/5/2010	Iron-DISS	1400		ug/L	81	100	1
TA-NC	P-4W(5S)	5/5/2010	Magnesium-DISS	163000	B	ug/L	34	5000	1
TA-NC	P-4W(5S)	5/5/2010	Sodium-DISS	132000		ug/L	590	5000	1
Polychlorinated Biphenyls (PCBs)									
Volatile Organic Compounds (VOC)									
TA-NC	P-4W(5S)	5/5/2010	1,1-Dichloroethane	0.29	J	ug/L	0.15	1	1
TA-NC	P-4W(5S)	5/5/2010	Benzene	0.6	J	ug/L	0.13	1	1

Table 2
Analytical Results
May 2010 City of Toledo Water Line Trench
Envirosafe Services of Ohio, Inc.

Lab	Sump	Sample Date	Constituent	Result	Q	Unit	MDL	PQL	Dilution
TA-NC	P-4W(5S)	5/5/2010	Chloroethane	7.2		ug/L	0.29	1	1
TA-NC	P-4W(5S)	5/5/2010	Tetrahydrofuran	1.4	J	ug/L	0.42	5	1
Semi-Volatile Organic Compounds (SVOC)									
TA-NC	P-4W(5S)	5/5/2010	1,4-Dioxane	33		ug/L	0.49	10	1
TA-NC	P-4W(5S)	5/5/2010	bis(2-Ethylhexyl) phthalate	1.5	J	ug/L	0.8	10	1
Total Organic Halogens (TOX)									
TA-NC	P-4W(5S)	5/5/2010	Total Organic Halogens	58.6		ug/L	19	30	1
TA-NC	P-4W(5S)	5/5/2010	Total Organic Halogens	65.8		ug/L	19	30	1
TA-NC	P-4W(5S)	5/5/2010	Total Organic Halogens	74.9		ug/L	19	30	1
TA-NC	P-4W(5S)	5/5/2010	Total Organic Halogens	40.9		ug/L	19	30	1
			Average TOX	60.1					
Total Organic Carbon (TOC)									
TA-NC	P-4W(5S)	5/5/2010	Total Organic Carbon	17.5		mg/L	0.24	1	1
TA-NC	P-4W(5S)	5/5/2010	Total Organic Carbon	16.9		mg/L	0.24	1	1
TA-NC	P-4W(5S)	5/5/2010	Total Organic Carbon	17.6		mg/L	0.24	1	1
TA-NC	P-4W(5S)	5/5/2010	Total Organic Carbon	17.1		mg/L	0.24	1	1
			Average TOC	17.3					
General									
J & H	P-5E(6N)	5/5/2010	Conductivity	4030		umhos/cm		1	
J & H	P-5E(6N)	5/5/2010	pH	6.95		SU		1.00	
J & H	P-5E(6N)	5/5/2010	Chloride	999		mg/L		1	
J & H	P-5E(6N)	5/5/2010	Biological Oxygen Demand	13		mg/L		4	
J & H	P-5E(6N)	5/5/2010	Total Phenols	26		ug/L		5	
J & H	P-5E(6N)	5/5/2010	Sulfate	13		mg/L		5	
J & H	P-5E(6N)	5/5/2010	Total Suspended Solids	11		mg/L		5	
TA-NC	P-5E(6N)	5/5/2010	n-Hexane Extractable Material (O&G)	4.6	J	mg/L	0.77	5	1
TA-NC	P-5E(6N)	5/5/2010	Chemical Oxygen Demand (COD)	87		mg/L	5.1	10	1
Dissolved Metals									
TA-NC	P-5E(6N)	5/5/2010	Barium-DISS	2050	B	ug/L	0.67	200	1
TA-NC	P-5E(6N)	5/5/2010	Iron-DISS	2480		ug/L	81	100	1
TA-NC	P-5E(6N)	5/5/2010	Magnesium-DISS	93100	B	ug/L	34	5000	1
TA-NC	P-5E(6N)	5/5/2010	Sodium-DISS	535000		ug/L	590	5000	1
Polychlorinated Biphenyls (PCBs)									
Volatile Organic Compounds (VOC)									
TA-NC	P-5E(6N)	5/5/2010	Benzene	66		ug/L	0.26	2	2
TA-NC	P-5E(6N)	5/5/2010	Chlorobenzene	5.7		ug/L	0.3	2	2
TA-NC	P-5E(6N)	5/5/2010	Tetrahydrofuran	5.6	J	ug/L	0.84	10	2
TA-NC	P-5E(6N)	5/5/2010	Toluene	0.47	J	ug/L	0.26	2	2
Semi-Volatile Organic Compounds (SVOC)									
TA-NC	P-5E(6N)	5/5/2010	1,4-Dichlorobenzene	0.52	J	ug/L	0.34	10	1
TA-NC	P-5E(6N)	5/5/2010	1,4-Dioxane	5	J	ug/L	0.49	10	1
TA-NC	P-5E(6N)	5/5/2010	2,4-Dimethylphenol	27		ug/L	0.8	10	1
TA-NC	P-5E(6N)	5/5/2010	Benzo(a)anthracene	0.53	J	ug/L	0.1	10	1
TA-NC	P-5E(6N)	5/5/2010	Benzo(ghi)perylene	0.27	J	ug/L	0.1	10	1
TA-NC	P-5E(6N)	5/5/2010	bis(2-Ethylhexyl) phthalate	1.8	J	ug/L	0.8	10	1
TA-NC	P-5E(6N)	5/5/2010	Chrysene	0.58	J	ug/L	0.1	10	1
TA-NC	P-5E(6N)	5/5/2010	Diethyl phthalate	1.8	J	ug/L	0.6	10	1
TA-NC	P-5E(6N)	5/5/2010	Di-n-butyl phthalate	1.5	J	ug/L	0.67	10	1
TA-NC	P-5E(6N)	5/5/2010	Phenol	1.2	J	ug/L	0.6	10	1
Total Organic Halogens (TOX)									
TA-NC	P-5E(6N)	5/5/2010	Total Organic Halogens	1080		ug/L	19	30	1
TA-NC	P-5E(6N)	5/5/2010	Total Organic Halogens	1110		ug/L	95	150	5
TA-NC	P-5E(6N)	5/5/2010	Total Organic Halogens	1250		ug/L	95	150	5
TA-NC	P-5E(6N)	5/5/2010	Total Organic Halogens	1140		ug/L	95	150	5
			Average TOX	1145					
Total Organic Carbon (TOC)									
TA-NC	P-5E(6N)	5/5/2010	Total Organic Carbon	26.2		mg/L	0.24	1	1
TA-NC	P-5E(6N)	5/5/2010	Total Organic Carbon	24.3		mg/L	0.24	1	1

Table 2
Analytical Results
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Envirosafe Services of Ohio, Inc.

Lab	Sump	Sample Date	Constituent	Result	Q	Unit	MDL	PQL	Dilution
TA-NC	P-5E(6N)	5/5/2010	Total Organic Carbon	24.7		mg/L	0.24	1	1
TA-NC	P-5E(6N)	5/5/2010	Total Organic Carbon	24.2		mg/L	0.24	1	1
			Average TOC	24.9					
General									
J & H	P-5W(7N)	5/5/2010	Conductivity	2460		umhos/cm		1	
J & H	P-5W(7N)	5/5/2010	pH	6.91		SU		1.00	
J & H	P-5W(7N)	5/5/2010	Chloride	373		mg/L		1	
J & H	P-5W(7N)	5/5/2010	Biological Oxygen Demand	20		mg/L		4	
J & H	P-5W(7N)	5/5/2010	Sulfate	296		mg/L		5	
TA-NC	P-5W(7N)	5/5/2010	n-Hexane Extractable Material (O&G)	2.1	J	mg/L	0.77	5	1
TA-NC	P-5W(7N)	5/5/2010	Chemical Oxygen Demand (COD)	89.4		mg/L	5.1	10	1
Dissolved Metals									
TA-NC	P-5W(7N)	5/5/2010	Barium-DISS	356	B	ug/L	0.67	200	1
TA-NC	P-5W(7N)	5/5/2010	Iron-DISS	761		ug/L	81	100	1
TA-NC	P-5W(7N)	5/5/2010	Magnesium-DISS	86600	B	ug/L	34	5000	1
TA-NC	P-5W(7N)	5/5/2010	Sodium-DISS	186000		ug/L	590	5000	1
Polychlorinated Biphenyls (PCBs)									
Volatile Organic Compounds (VOC)									
TA-NC	P-5W(7N)	5/5/2010	1,2-Dichloroethene (total)	0.59	J	ug/L	0.34	2	1
TA-NC	P-5W(7N)	5/5/2010	1,4-Dioxane	22	J	ug/L	19	50	1
TA-NC	P-5W(7N)	5/5/2010	Benzene	8.4		ug/L	0.13	1	1
TA-NC	P-5W(7N)	5/5/2010	Chlorobenzene	1.4		ug/L	0.15	1	1
TA-NC	P-5W(7N)	5/5/2010	Ethylbenzene	0.69	J	ug/L	0.17	1	1
TA-NC	P-5W(7N)	5/5/2010	Tetrahydrofuran	1.2	J	ug/L	0.42	5	1
Semi-Volatile Organic Compounds (SVOC)									
TA-NC	P-5W(7N)	5/5/2010	1,4-Dioxane	19		ug/L	0.49	10	1
TA-NC	P-5W(7N)	5/5/2010	Acenaphthene	0.2	J	ug/L	0.1	10	1
TA-NC	P-5W(7N)	5/5/2010	bis(2-Ethylhexyl) phthalate	15		ug/L	0.8	10	1
TA-NC	P-5W(7N)	5/5/2010	Diethyl phthalate	1.4	J	ug/L	0.6	10	1
Total Organic Halogens (TOX)									
TA-NC	P-5W(7N)	5/5/2010	Total Organic Halogens	220		ug/L	38	60	2
TA-NC	P-5W(7N)	5/5/2010	Total Organic Halogens	214		ug/L	38	60	2
TA-NC	P-5W(7N)	5/5/2010	Total Organic Halogens	270		ug/L	38	60	2
TA-NC	P-5W(7N)	5/5/2010	Total Organic Halogens	275		ug/L	38	60	2
			Average TOX	245					
Total Organic Carbon (TOC)									
TA-NC	P-5W(7N)	5/5/2010	Total Organic Carbon	23.6		mg/L	0.96	4	4
TA-NC	P-5W(7N)	5/5/2010	Total Organic Carbon	23.8		mg/L	0.96	4	4
TA-NC	P-5W(7N)	5/5/2010	Total Organic Carbon	23.2		mg/L	0.96	4	4
TA-NC	P-5W(7N)	5/5/2010	Total Organic Carbon	22.2		mg/L	0.96	4	4
			Average TOC	23.2					
MONITORING TRENCHES									
General									
J & H	T-1E(1N)	5/5/2010	Conductivity	1120		umhos/cm		1	
J & H	T-1E(1N)	5/5/2010	pH	7.20		SU		1.00	
J & H	T-1E(1N)	5/5/2010	Chloride	19.4		mg/L		1	
J & H	T-1E(1N)	5/5/2010	Sulfate	408		mg/L		5	
J & H	T-1E(1N)	5/5/2010	Total Suspended Solids	6		mg/L		5	
TA-NC	T-1E(1N)	5/5/2010	Chemical Oxygen Demand (COD)	13.3		mg/L	5.1	10	1
Dissolved Metals									
TA-NC	T-1E(1N)	5/5/2010	Barium-DISS	66.2	B J	ug/L	0.67	200	1
TA-NC	T-1E(1N)	5/5/2010	Magnesium-DISS	55100	B	ug/L	34	5000	1
TA-NC	T-1E(1N)	5/5/2010	Sodium-DISS	15700		ug/L	590	5000	1
Polychlorinated Biphenyls (PCBs)									
Volatile Organic Compounds (VOC)									
TA-NC	T-1E(1N)	5/5/2010	1,1-Dichloroethane	0.3	J	ug/L	0.15	1	1
Semi-Volatile Organic Compounds (SVOC)									

Table 2
Analytical Results
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Envirosafe Services of Ohio, Inc.

Lab	Sump	Sample Date	Constituent	Result	Q	Unit	MDL	PQL	Dilution
TA-NC	T-1E(1N)	5/5/2010	bis(2-Ethylhexyl) phthalate	1.3	J	ug/L	0.8	10	1
TA-NC	T-1E(1N)	5/5/2010	Diethyl phthalate	1.1	J	ug/L	0.6	10	1
Total Organic Halogens (TOX)									
Total Organic Carbon (TOC)									
TA-NC	T-1E(1N)	5/5/2010	Total Organic Carbon	4.0		mg/L	0.24	1	1
TA-NC	T-1E(1N)	5/5/2010	Total Organic Carbon	3.9		mg/L	0.24	1	1
TA-NC	T-1E(1N)	5/5/2010	Total Organic Carbon	3.8		mg/L	0.24	1	1
TA-NC	T-1E(1N)	5/5/2010	Total Organic Carbon	3.6		mg/L	0.24	1	1
			Average TOC	3.8					
General									
J & H	T-1M(2N)	5/5/2010	Conductivity	1110		umhos/cm		1	
J & H	T-1M(2N)	5/5/2010	pH	7.03		SU		1.00	
J & H	T-1M(2N)	5/5/2010	Chloride	19.2		mg/L		1	
J & H	T-1M(2N)	5/5/2010	Sulfate	408		mg/L		5	
J & H	T-1M(2N)	5/5/2010	Total Suspended Solids	106		mg/L		5	
TA-NC	T-1M(2N)	5/5/2010	Chemical Oxygen Demand (COD)	13		mg/L	5.1	10	1
Dissolved Metals									
TA-NC	T-1M(2N)	5/5/2010	Barium-DISS	66.9	B J	ug/L	0.67	200	1
TA-NC	T-1M(2N)	5/5/2010	Magnesium-DISS	53500	B	ug/L	34	5000	1
TA-NC	T-1M(2N)	5/5/2010	Sodium-DISS	15200		ug/L	590	5000	1
Polychlorinated Biphenyls (PCBs)									
Volatile Organic Compounds (VOC)									
TA-NC	T-1M(2N)	5/5/2010	1,1-Dichloroethane	0.46	J	ug/L	0.15	1	1
Semi-Volatile Organic Compounds (SVOC)									
TA-NC	T-1M(2N)	5/5/2010	bis(2-Ethylhexyl) phthalate	1.7	J	ug/L	0.8	10	1
TA-NC	T-1M(2N)	5/5/2010	Diethyl phthalate	0.98	J	ug/L	0.6	10	1
TA-NC	T-1M(2N)	5/5/2010	Di-n-butyl phthalate	1.8	J	ug/L	0.67	10	1
Total Organic Halogens (TOX)									
Total Organic Carbon (TOC)									
TA-NC	T-1M(2N)	5/5/2010	Total Organic Carbon	4.0		mg/L	0.24	1	1
TA-NC	T-1M(2N)	5/5/2010	Total Organic Carbon	4.2		mg/L	0.24	1	1
TA-NC	T-1M(2N)	5/5/2010	Total Organic Carbon	4.0		mg/L	0.24	1	1
TA-NC	T-1M(2N)	5/5/2010	Total Organic Carbon	4.0		mg/L	0.24	1	1
			Average TOC	4.1					
General									
J & H	T-1W(3N)	5/5/2010	Conductivity	1220		umhos/cm		1	
J & H	T-1W(3N)	5/5/2010	pH	6.89		SU		1.00	
J & H	T-1W(3N)	5/5/2010	Chloride	23.3		mg/L		1	
J & H	T-1W(3N)	5/5/2010	Sulfate	403		mg/L		5	
TA-NC	T-1W(3N)	5/5/2010	Chemical Oxygen Demand (COD)	10.5		mg/L	5.1	10	1
Dissolved Metals									
TA-NC	T-1W(3N)	5/5/2010	Barium-DISS	64.5	B J	ug/L	0.67	200	1
TA-NC	T-1W(3N)	5/5/2010	Iron-DISS	233		ug/L	81	100	1
TA-NC	T-1W(3N)	5/5/2010	Magnesium-DISS	59000	B	ug/L	34	5000	1
TA-NC	T-1W(3N)	5/5/2010	Sodium-DISS	16300		ug/L	590	5000	1
Polychlorinated Biphenyls (PCBs)									
Volatile Organic Compounds (VOC)									
TA-NC	T-1W(3N)	5/5/2010	1,1-Dichloroethane	0.45	J	ug/L	0.15	1	1
Semi-Volatile Organic Compounds (SVOC)									
TA-NC	T-1W(3N)	5/5/2010	bis(2-Ethylhexyl) phthalate	1.4	J	ug/L	0.8	10	1
TA-NC	T-1W(3N)	5/5/2010	Di-n-butyl phthalate	1.6	J	ug/L	0.67	10	1
Total Organic Halogens (TOX)									
Total Organic Carbon (TOC)									
TA-NC	T-1W(3N)	5/5/2010	Total Organic Carbon	4.0		mg/L	0.24	1	1
TA-NC	T-1W(3N)	5/5/2010	Total Organic Carbon	3.8		mg/L	0.24	1	1
TA-NC	T-1W(3N)	5/5/2010	Total Organic Carbon	3.2		mg/L	0.24	1	1
TA-NC	T-1W(3N)	5/5/2010	Total Organic Carbon	3.1		mg/L	0.24	1	1

Table 2
Analytical Results
May 2010 City of Toledo Water Line Trench
Envirosafe Services of Ohio, Inc.

Lab	Sump	Sample Date	Constituent	Result	Q	Unit	MDL	PQL	Dilution
			Total TOC	3.5					
General									
J & H	T-2E(1S)	5/5/2010	Conductivity	1220		umhos/cm		1	
J & H	T-2E(1S)	5/5/2010	pH	7.27		SU		1.00	
J & H	T-2E(1S)	5/5/2010	Chloride	37.3		mg/L		1	
J & H	T-2E(1S)	5/5/2010	Total Phenols	9		ug/L	2.5	5	
J & H	T-2E(1S)	6/24/2010	Total Phenols	3	J	ug/L	1	5	
J & H	T-2E(1S)	5/5/2010	Sulfate	412		mg/L		5	
J & H	T-2E(1S)	5/5/2010	Total Suspended Solids	6		mg/L		5	
TA-NC	T-2E(1S)	5/5/2010	n-Hexane Extractable Material (O&G)	3.7	J	mg/L	0.77	5	1
TA-NC	T-2E(1S)	5/5/2010	Chemical Oxygen Demand (COD)	13.3		mg/L	5.1	10	1
Dissolved Metals									
TA-NC	T-2E(1S)	5/5/2010	Barium-DISS	63.1	B J	ug/L	0.67	200	1
TA-NC	T-2E(1S)	5/5/2010	Magnesium-DISS	56400	B	ug/L	34	5000	1
TA-NC	T-2E(1S)	5/5/2010	Sodium-DISS	21500		ug/L	590	5000	1
Polychlorinated Biphenyls (PCBs)									
Volatile Organic Compounds (VOC)									
Semi-Volatile Organic Compounds (SVOC)									
TA-NC	T-2E(1S)	5/5/2010	bis(2-Ethylhexyl) phthalate	2.5	J	ug/L	0.8	10	1
TA-NC	T-2E(1S)	5/5/2010	Di-n-butyl phthalate	1.6	J	ug/L	0.67	10	1
TA-NC	T-2E(1S)	5/5/2010	Di-n-octyl phthalate	3	J	ug/L	0.8	10	1
TA-NC	T-2E(1S)	5/5/2010	Naphthalene	0.78	J	ug/L	0.1	10	1
Total Organic Halogens (TOX)									
TA-NC	T-2E(1S)	5/5/2010	Total Organic Halogens	24.5	J	ug/L	19	30	1
TA-NC	T-2E(1S)	5/5/2010	Total Organic Halogens	19.7	J	ug/L	19	30	1
			Average TOX	18.6	J				
Total Organic Carbon (TOC)									
TA-NC	T-2E(1S)	5/5/2010	Total Organic Carbon	4.6		mg/L	0.24	1	1
TA-NC	T-2E(1S)	5/5/2010	Total Organic Carbon	4.4		mg/L	0.24	1	1
TA-NC	T-2E(1S)	5/5/2010	Total Organic Carbon	4.4		mg/L	0.24	1	1
TA-NC	T-2E(1S)	5/5/2010	Total Organic Carbon	4.4		mg/L	0.24	1	1
			Average TOC	4.5					
General									
J & H	T-2M(2S)	5/5/2010	Conductivity	1430		umhos/cm		1	
J & H	T-2M(2S)	5/5/2010	pH	7.07		SU		1.00	
J & H	T-2M(2S)	5/5/2010	Chloride	44.8		mg/L		1	
J & H	T-2M(2S)	5/5/2010	Sulfate	459		mg/L		5	
TA-NC	T-2M(2S)	5/5/2010	n-Hexane Extractable Material (O&G)	1.2	J	mg/L	0.77	5	1
TA-NC	T-2M(2S)	5/5/2010	Chemical Oxygen Demand (COD)	12.4		mg/L	5.1	10	1
Dissolved Metals									
TA-NC	T-2M(2S)	5/5/2010	Barium-DISS	56	B J	ug/L	0.67	200	1
TA-NC	T-2M(2S)	5/5/2010	Magnesium-DISS	65500	B	ug/L	34	5000	1
TA-NC	T-2M(2S)	5/5/2010	Sodium-DISS	22800		ug/L	590	5000	1
Polychlorinated Biphenyls (PCBs)									
Volatile Organic Compounds (VOC)									
Semi-Volatile Organic Compounds (SVOC)									
TA-NC	T-2M(2S)	5/5/2010	Diethyl phthalate	1.2	J	ug/L	0.6	10	1
Total Organic Halogens (TOX)									
Total Organic Carbon (TOC)									
TA-NC	T-2M(2S)	5/5/2010	Total Organic Carbon	4.0		mg/L	0.24	1	1
TA-NC	T-2M(2S)	5/5/2010	Total Organic Carbon	3.7		mg/L	0.24	1	1
TA-NC	T-2M(2S)	5/5/2010	Total Organic Carbon	3.5		mg/L	0.24	1	1
TA-NC	T-2M(2S)	5/5/2010	Total Organic Carbon	3.7		mg/L	0.24	1	1
			Average TOC	3.7					
General									
J & H	T-2W(3S)	5/5/2010	Conductivity	1260		umhos/cm		1	
J & H	T-2W(3S)	5/5/2010	pH	7.83		SU		1.00	

Table 2
Analytical Results
May 2010 City of Toledo Water Line Trench
Envirosafe Services of Ohio, Inc.

Lab	Sump	Sample Date	Constituent	Result	Q	Unit	MDL	PQL	Dilution
J & H	T-2W(3S)	5/5/2010	Chloride	57.0		mg/L		1	
J & H	T-2W(3S)	5/5/2010	Sulfate	408		mg/L		5	
J & H	T-2W(3S)	5/5/2010	Total Suspended Solids	509		mg/L		5	
TA-NC	T-2W(3S)	5/5/2010	n-Hexane Extractable Material (O&G)	1.2	J	mg/L	0.77	5	1
TA-NC	T-2W(3S)	5/5/2010	Chemical Oxygen Demand (COD)	21.6		mg/L	5.1	10	1
Dissolved Metals									
TA-NC	T-2W(3S)	5/5/2010	Barium-DISS	78.9	B J	ug/L	0.67	200	1
TA-NC	T-2W(3S)	5/5/2010	Magnesium-DISS	60000	B	ug/L	34	5000	1
TA-NC	T-2W(3S)	5/5/2010	Sodium-DISS	30200		ug/L	590	5000	1
Polychlorinated Biphenyls (PCBs)									
Volatile Organic Compounds (VOC)									
Semi-Volatile Organic Compounds (SVOC)									
TA-NC	T-2W(3S)	5/5/2010	Diethyl phthalate	1.1	J	ug/L	0.6	10	1
Total Organic Halogens (TOX)									
Total Organic Carbon (TOC)									
TA-NC	T-2W(3S)	5/5/2010	Total Organic Carbon	6.0		mg/L	0.24	1	1
TA-NC	T-2W(3S)	5/5/2010	Total Organic Carbon	5.8		mg/L	0.24	1	1
TA-NC	T-2W(3S)	5/5/2010	Total Organic Carbon	5.8		mg/L	0.24	1	1
TA-NC	T-2W(3S)	5/5/2010	Total Organic Carbon	5.8		mg/L	0.24	1	1
			Average TOC	5.9					
General									
J & H	TR-6(8N)	5/5/2010	Conductivity	954		umhos/cm		1	
J & H	TR-6(8N)	5/5/2010	pH	7.17		SU		1.00	
J & H	TR-6(8N)	5/5/2010	Chloride	10.8		mg/L		1	
J & H	TR-6(8N)	5/5/2010	Sulfate	286		mg/L		5	
TA-NC	TR-6(8N)	5/5/2010	n-Hexane Extractable Material (O&G)	1.4	J	mg/L	0.77	5	1
Dissolved Metals									
TA-NC	TR-6(8N)	5/5/2010	Barium-DISS	30.8	B J	ug/L	0.67	200	1
TA-NC	TR-6(8N)	5/5/2010	Magnesium-DISS	49900	B	ug/L	34	5000	1
TA-NC	TR-6(8N)	5/5/2010	Sodium-DISS	12500		ug/L	590	5000	1
Polychlorinated Biphenyls (PCBs)									
Volatile Organic Compounds (VOC)									
TA-NC	TR-6(8N)	5/5/2010	Toluene	0.25	J	ug/L	0.13	1	1
Semi-Volatile Organic Compounds (SVOC)									
TA-NC	TR-6(8N)	5/5/2010	bis(2-Ethylhexyl) phthalate	2.3	J	ug/L	0.8	10	1
Total Organic Halogens (TOX)									
Total Organic Carbon (TOC)									
TA-NC	TR-6(8N)	5/5/2010	Total Organic Carbon	2.9		mg/L	0.24	1	1
TA-NC	TR-6(8N)	5/5/2010	Total Organic Carbon	2.7		mg/L	0.24	1	1
TA-NC	TR-6(8N)	5/5/2010	Total Organic Carbon	2.7		mg/L	0.24	1	1
TA-NC	TR-6(8N)	5/5/2010	Total Organic Carbon	2.8		mg/L	0.24	1	1
			Average TOC	2.8					
WYNN ROAD TRENCHES									
General									
J & H	WT-1	5/5/2010	Conductivity	1790		umhos/cm		1	
J & H	WT-1	5/5/2010	pH	7.1		SU		1.00	
J & H	WT-1	5/5/2010	Chloride	25.8		mg/L		1	
J & H	WT-1	5/5/2010	Sulfate	864		mg/L		5	
J & H	WT-1	5/5/2010	Total Suspended Solids	13		mg/L		5	
TA-NC	WT-1	5/5/2010	Chemical Oxygen Demand (COD)	8	B	mg/L	5.1	10	1
Dissolved Metals									
TA-NC	WT-1	5/5/2010	Barium-DISS	11.4	J	ug/L	0.67	200	1
TA-NC	WT-1	5/5/2010	Magnesium-DISS	117000		ug/L	34	5000	1
TA-NC	WT-1	5/5/2010	Sodium-DISS	27700		ug/L	590	5000	1
Volatile Organic Compounds (VOC)									
Semi-Volatile Organic Compounds (SVOC)									

Table 2
Analytical Results
May 2010 City of Toledo Water Line Trench
Envirosafe Services of Ohio, Inc.

Lab	Sump	Sample Date	Constituent	Result	Q	Unit	MDL	PQL	Dilution
TA-NC	WT-1	5/5/2010	bis(2-Ethylhexyl) phthalate	8.5	J	ug/L	0.8	10	1
Total Organic Halogens (TOX)									
Total Organic Carbon (TOC)									
TA-NC	WT-1	5/5/2010	Total Organic Carbon	3.8		mg/L	0.24	1	1
TA-NC	WT-1	5/5/2010	Total Organic Carbon	3.6		mg/L	0.24	1	1
TA-NC	WT-1	5/5/2010	Total Organic Carbon	3.5		mg/L	0.24	1	1
TA-NC	WT-1	5/5/2010	Total Organic Carbon	3.6		mg/L	0.24	1	1
			Average TOC	3.6					
General									
J & H	WT-2	5/5/2010	Conductivity	2290		umhos/cm		1	
J & H	WT-2	5/5/2010	pH	7.94		SU		1.00	
J & H	WT-2	5/5/2010	Chloride	28.2		mg/L		1	
J & H	WT-2	5/5/2010	Sulfate	1300		mg/L		5	
TA-NC	WT-2	5/5/2010	n-Hexane Extractable Material (O&G)	0.78	J	mg/L	0.77	5	1
Dissolved Metals									
TA-NC	WT-2	5/5/2010	Barium-DISS	14.7	J	ug/L	0.67	200	1
TA-NC	WT-2	5/5/2010	Magnesium-DISS	140000		ug/L	34	5000	1
TA-NC	WT-2	5/5/2010	Sodium-DISS	47000		ug/L	590	5000	1
Volatile Organic Compounds (VOC)									
Semi-Volatile Organic Compounds (SVOC)									
TA-NC	WT-2	5/5/2010	Diethyl phthalate	1.2	J	ug/L	0.6	10	1
General									
J & H	WT-3	5/5/2010	Conductivity	2770		umhos/cm		1	
J & H	WT-3	5/5/2010	pH	6.77		SU		1.00	
J & H	WT-3	5/5/2010	Chloride	34.3		mg/L		1	
J & H	WT-3	5/5/2010	Sulfate	1780		mg/L		5	
J & H	WT-3	5/5/2010	Total Suspended Solids	16		mg/L		5	
TA-NC	WT-3	5/5/2010	Chemical Oxygen Demand (COD)	6.2	B	mg/L	5.1	10	1
Dissolved Metals									
TA-NC	WT-3	5/5/2010	Barium-DISS	14.6	J	ug/L	0.67	200	1
TA-NC	WT-3	5/5/2010	Magnesium-DISS	201000		ug/L	34	5000	1
TA-NC	WT-3	5/5/2010	Sodium-DISS	49600		ug/L	590	5000	1
Volatile Organic Compounds (VOC)									
Semi-Volatile Organic Compounds (SVOC)									
TA-NC	WT-3	5/5/2010	bis(2-Ethylhexyl) phthalate	0.94	J	ug/L	0.8	10	1
TA-NC	WT-3	5/5/2010	Diethyl phthalate	0.75	J	ug/L	0.6	10	1
Total Organic Halogens (TOX)									
Total Organic Carbon (TOC)									
TA-NC	WT-3	5/5/2010	Total Organic Carbon	2.9		mg/L	0.24	1	1
TA-NC	WT-3	5/5/2010	Total Organic Carbon	2.9		mg/L	0.24	1	1
TA-NC	WT-3	5/5/2010	Total Organic Carbon	2.6		mg/L	0.24	1	1
TA-NC	WT-3	5/5/2010	Total Organic Carbon	2.7		mg/L	0.24	1	1
			Average TOC	2.8					
General									
J & H	WT-4	5/5/2010	Conductivity	1870		umhos/cm		1	
J & H	WT-4	5/5/2010	pH	6.92		SU		1.00	
J & H	WT-4	5/5/2010	Chloride	22.6		mg/L		1	
J & H	WT-4	5/5/2010	Sulfate	1000		mg/L		5	
TA-NC	WT-4	5/5/2010	n-Hexane Extractable Material (O&G)	2.7	J	mg/L	0.77	5	1
TA-NC	WT-4	5/5/2010	Chemical Oxygen Demand (COD)	6.8	B	mg/L	5.1	10	1
Dissolved Metals									
TA-NC	WT-4	5/5/2010	Barium-DISS	16.2	J	ug/L	0.67	200	1
TA-NC	WT-4	5/5/2010	Magnesium-DISS	98300		ug/L	34	5000	1
TA-NC	WT-4	5/5/2010	Sodium-DISS	23500		ug/L	590	5000	1
Volatile Organic Compounds (VOC)									
Semi-Volatile Organic Compounds (SVOC)									
TA-NC	WT-4	5/5/2010	bis(2-Ethylhexyl) phthalate	3	J	ug/L	0.8	10	1

Table 2
Analytical Results
May 2010 City of Toledo Water Line Trench
Envirosafe Services of Ohio, Inc.

Lab	Sump	Sample Date	Constituent	Result	Q	Unit	MDL	PQL	Dilution
TA-NC	WT-4	5/5/2010	Diethyl phthalate	0.72	J	ug/L	0.6	10	1
Total Organic Halogens (TOX)									
Total Organic Carbon (TOC)									
TA-NC	WT-4	5/5/2010	Total Organic Carbon	2.4		mg/L	0.24	1	1
TA-NC	WT-4	5/5/2010	Total Organic Carbon	2.2		mg/L	0.24	1	1
TA-NC	WT-4	5/5/2010	Total Organic Carbon	2.0		mg/L	0.24	1	1
TA-NC	WT-4	5/5/2010	Total Organic Carbon	1.9		mg/L	0.24	1	1
			Average TOC	2.1					

MDL: Method Detection Limit

PQL: Practical Quantitation Limit

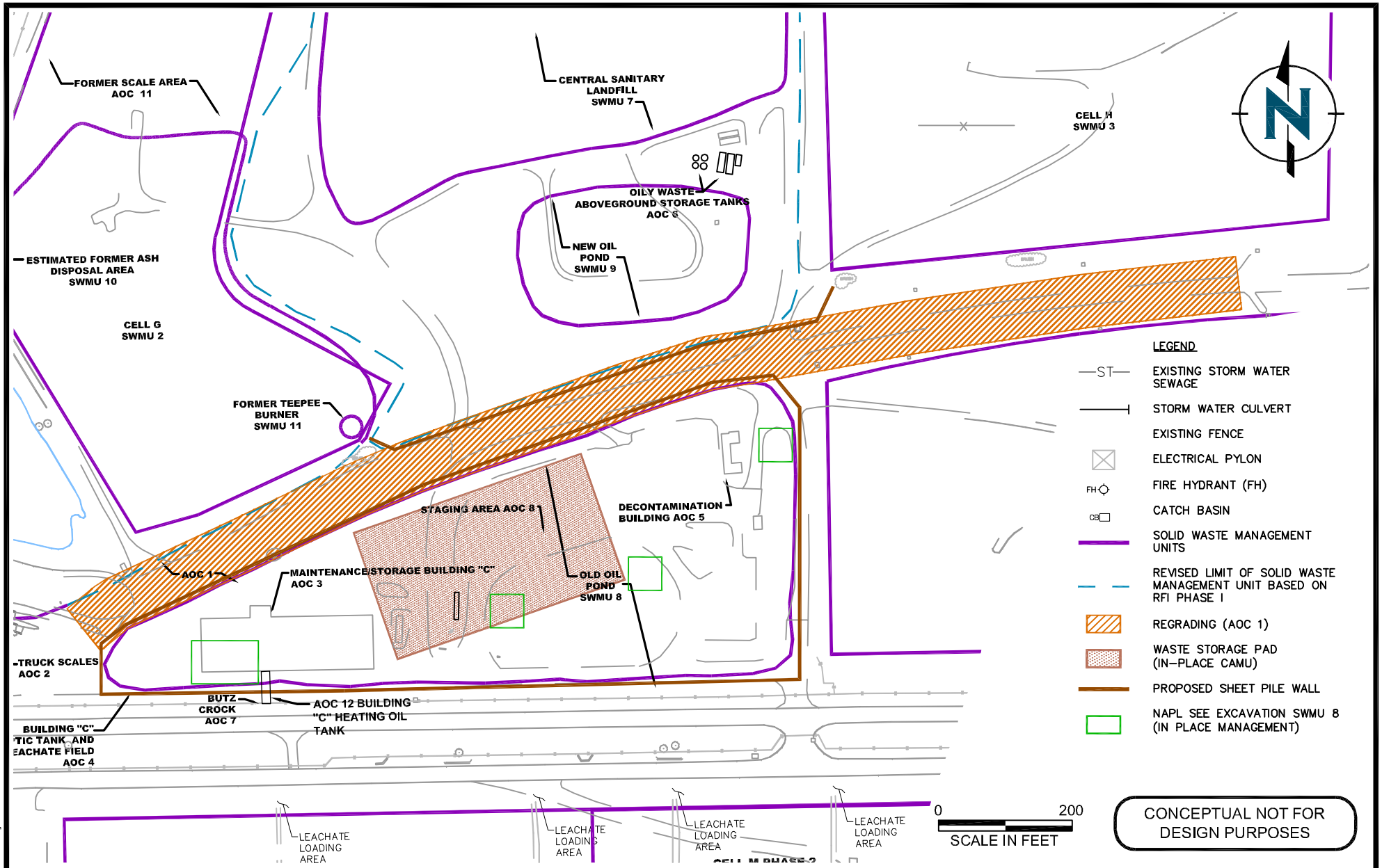
Q: Qualifier

U: Constituent not detected between the MDL and PQL

B: Constituent detected in Laboratory Blank

J: Constituent detected between the MDL and PQL - estimated value

Cost Estimates – AOC 1 Alternatives



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CORRECTIVE MEASURES EVALUATION SWMU 8 & AOC 1

ENVIROSAFE SERVICES OF OHIO, INC.
OTTER CREEK ROAD FACILITY
OREGON, OHIO

FIGURE

1

026174M14B

DRAFTED BY: BJK

DATE: 1/7/2011

Environsafe Services of Ohio, Inc.
Cap and Storm Water Cost Estimates

Alternative 2: AOC 1 - Recap Waterline Right-of-Way

Cumulative Cost Deflator, 2005 to (See Revision Date) ->

1.11160

Scope and Assumptions

-Regrade/recompact cover soil to promote drainage, 1,800' x 80' along Trench III and IV and 50% of Trench I and II, an area of 144,400 square feet

'-Install liner in entire stormwater drainage ditches to prevent infiltration (2000' on north side and 800' on southside).

Regrading AOC 1

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total</u>
1	Protective Cover Removal	5,333	1 yd ³	\$5.00	\$26,679
2	Backfilling and Regrading	5,333	1 yd ³	\$5.00	\$26,667
3	Vegetative Layer Establishment	3.3	acre	\$1,334	\$4,410
4	40 mil HDPE Liner Installation	42,000	1 ft ²	\$0.56	\$23,344
Subtotal					\$81,000

SUBTOTAL - CONSTRUCTION \$ 81,000

Engineering

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total</u>
1	Engineering (12%)	1	project	\$9,720	\$9,720
2	Construction Quality Assurance (10%)	1	project	\$8,100	\$8,100
3	Contingency (20%)	1	percentage	\$16,200	\$16,200
Subtotal					\$34,000

ALTERNATIVE 2, TOTAL COST \$115,000

Environsafe Services of Ohio, Inc.
Cap and Storm Water Cost Estimates

Alternative 3: AOC 1 - Installation of a Sheet Pile Wall

Cumulative Cost Deflator, 2005 to (See Revision Date) ->

1.11160

Scope and Assumptions

-Installation of a sheet pile wall on north side of unit from eastern corner of Cell G to eastern corner of SWMU 9 - estimated 660 feet - between limits of waste and sumps
-Wall is 35' deep.
-Regrade/recompact cover soil to promote drainage, 1,800' x 80' along Trench III and IV and 50% of Trench I and II
'-Install liner in entire stormwater drainage ditches to prevent infiltration (2000' on north side and 800' on southside).

Installation of Boundary Wall

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total</u>
1	Sheet Pile Wall (35')	23,100	1 ft ²	\$29	\$667,629
Subtotal					\$668,000

Regrading AOC 1

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total</u>
1	Protective Cover Removal	5,333	1 yd ³	\$5.00	\$26,679
2	Backfilling and Regrading	5,333	1 yd ³	\$5.00	\$26,667
3	Vegetative Layer Establishment	3.3	acre	\$1,334	\$4,410
4	40 mil HDPE Liner Installation	42,000	1 ft ²	\$0.56	\$23,344
Subtotal					\$81,000

SUBTOTAL - CONSTRUCTION \$ 749,000

Engineering

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total</u>
1	Engineering (12%)	1	project	\$89,880	\$89,880
2	Construction Quality Assurance (10%)	1	project	\$74,900	\$74,900
3	Contingency (20%)	1	percentage	\$149,800	\$149,800
Subtotal					\$315,000

ALTERNATIVE 3, TOTAL COST \$1,064,000

APPENDIX I

Groundwater Monitoring

C O N T E N T S

Leachate Recovery

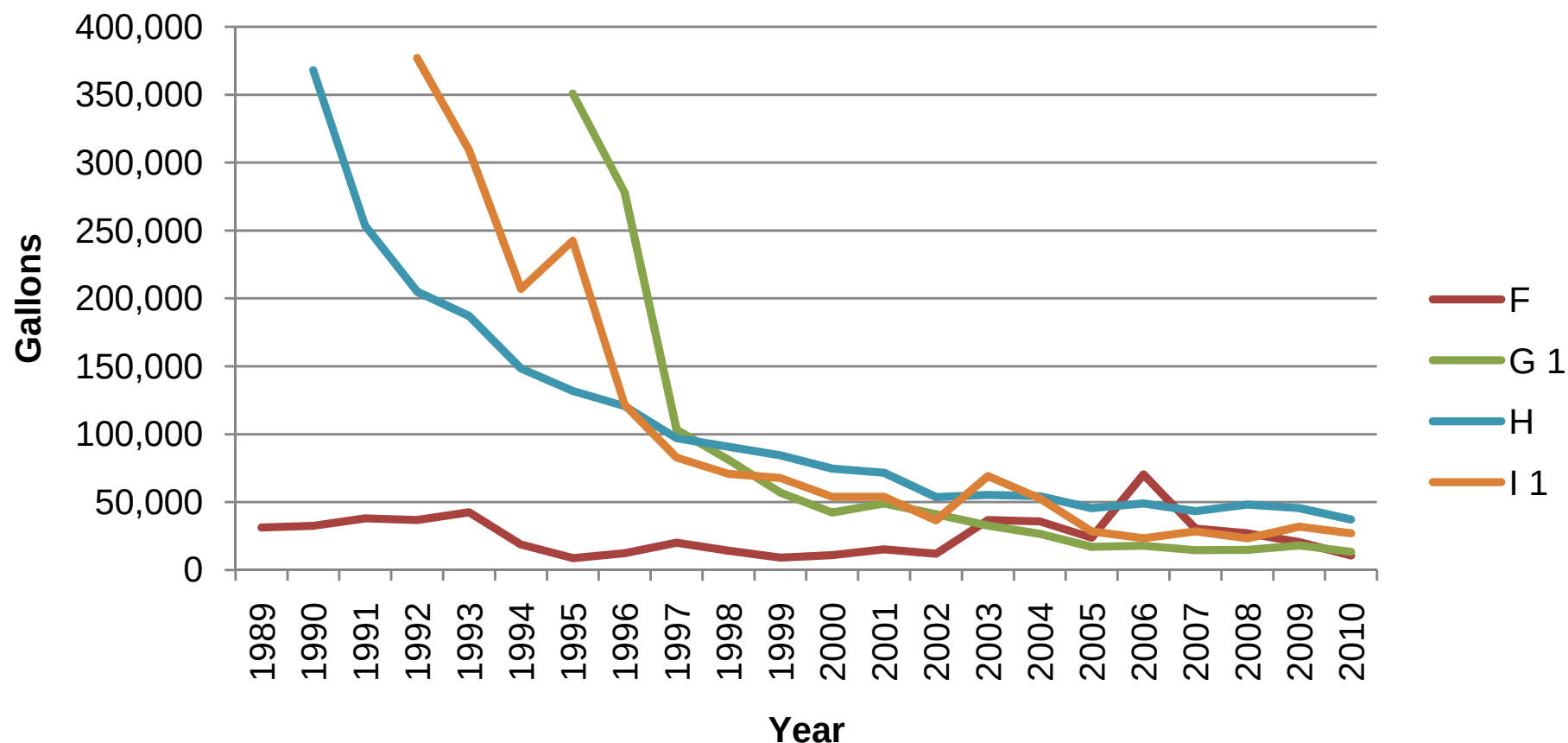
Leachate Levels Relative to Shallow Well Screen Intervals

Pages from Permit Module K

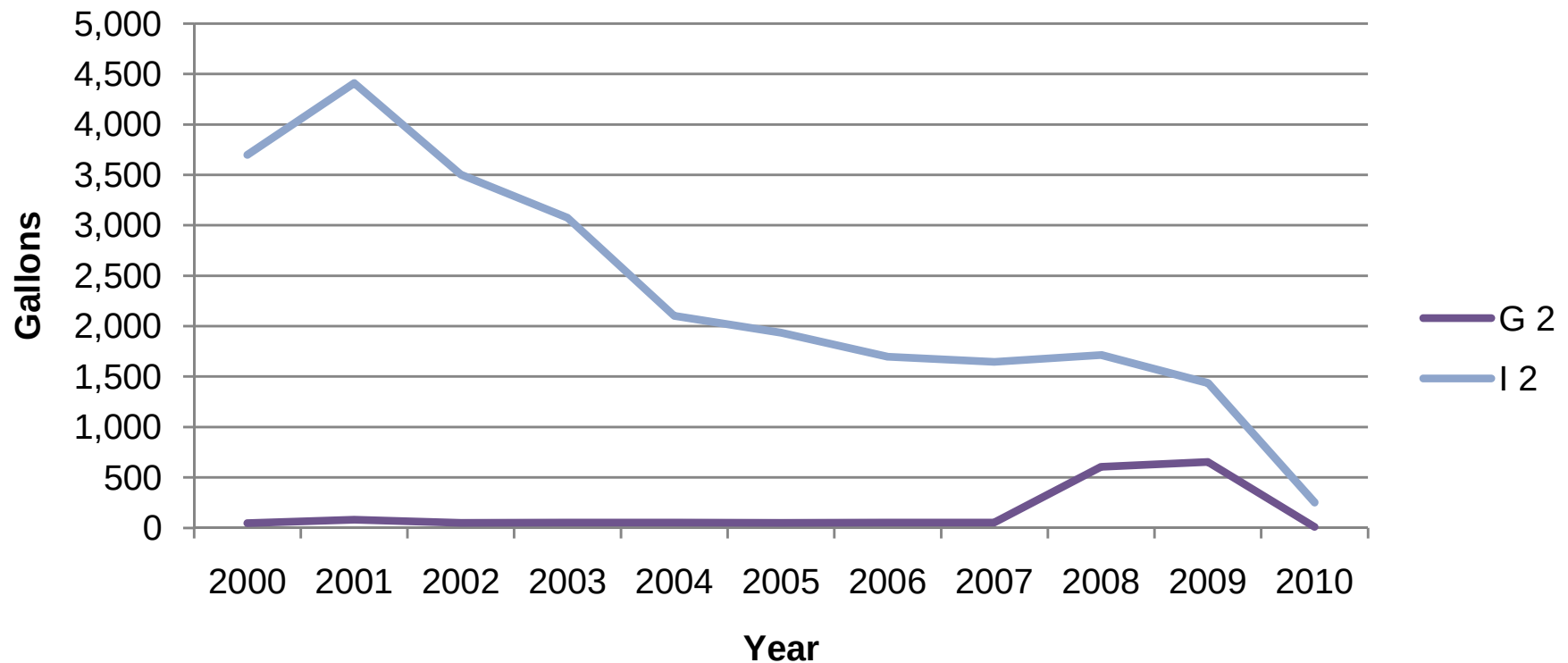
Groundwater Screening Criteria

Leachate Recovery

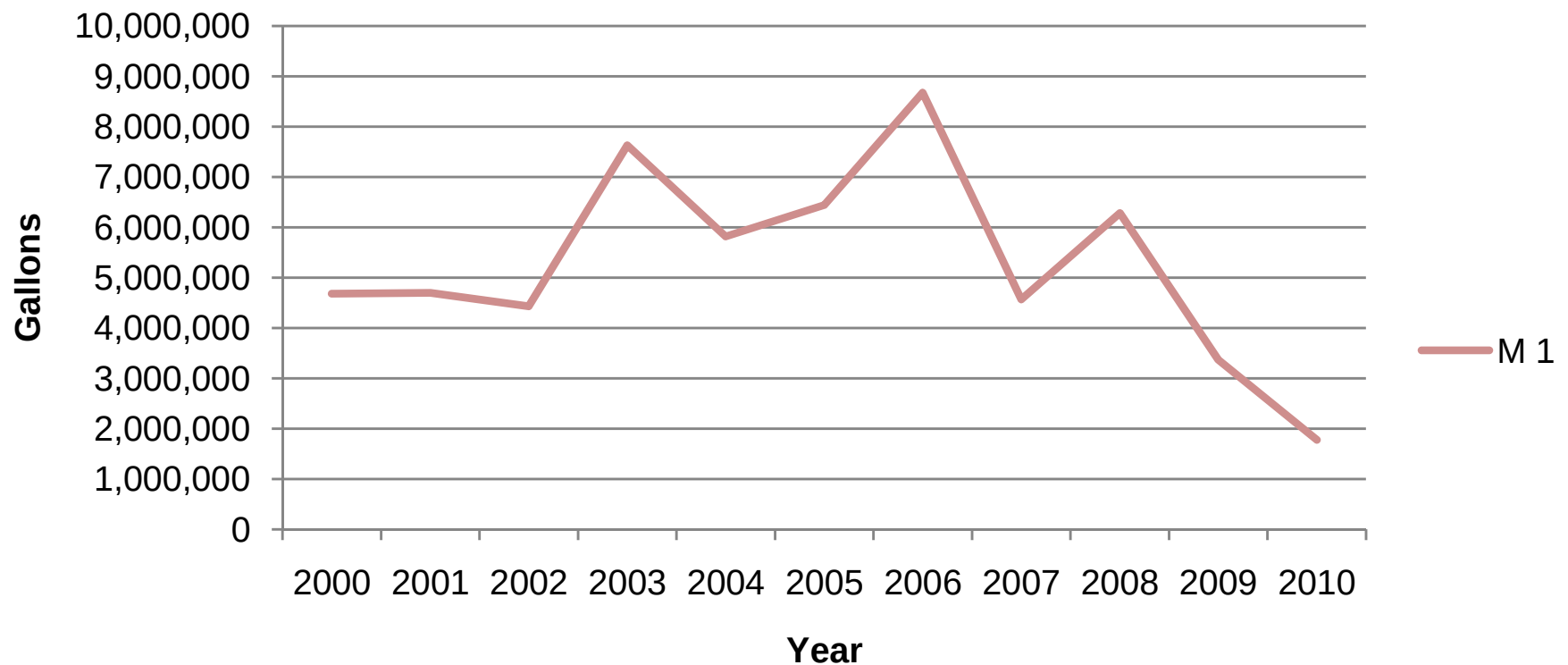
Leachate Recovery at Cell F, G, H, and I ESOI Otter Creek Facility, Oregon, Ohio



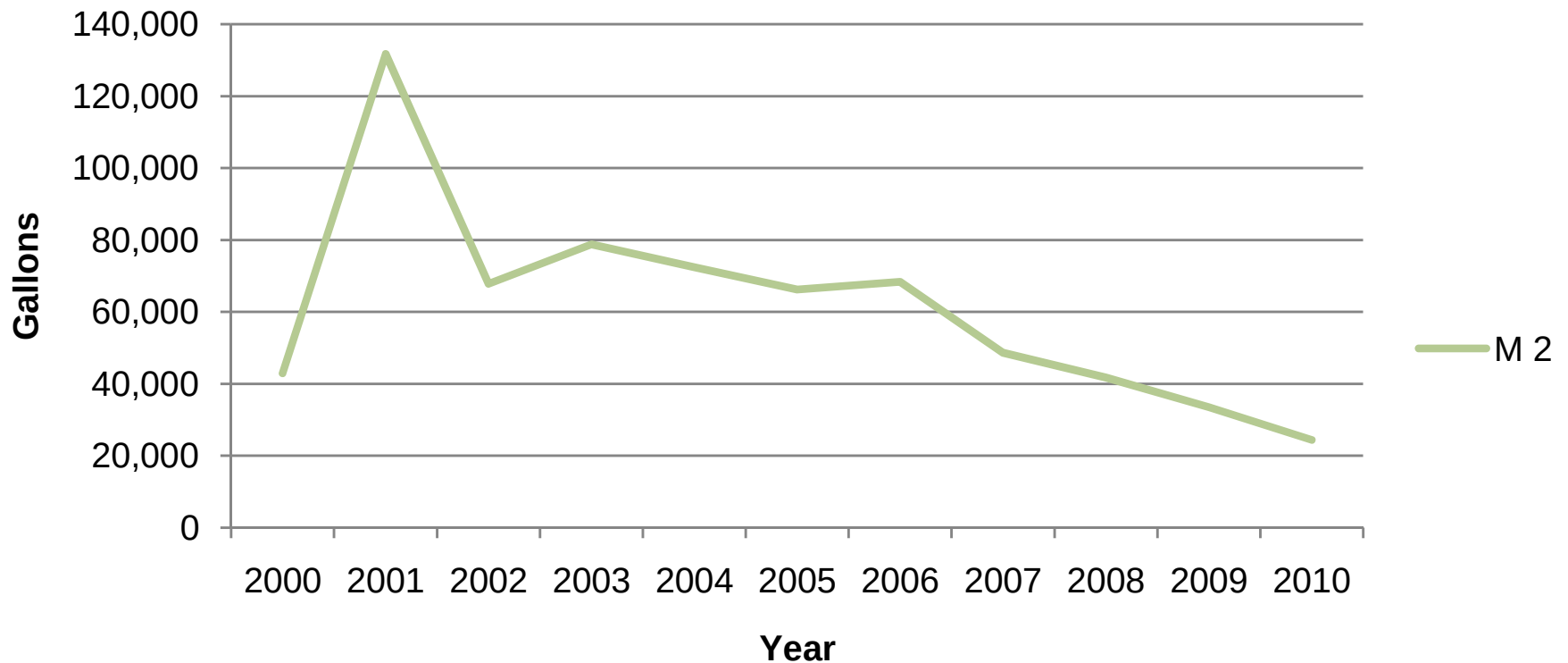
Leachate Recovery from Secondary Liner at Cell G and I ESOI Otter Creek Facility, Oregon, Ohio



Leachate Recovery from Primary Liner at Cell M ESOI Otter Creek Facility, Oregon, Ohio



Leachate Recovery from Secondary Liner at Cell M ESOI Otter Creek Facility, Oregon, Ohio



Leachate Levels Relative to Shallow Well Screen Intervals

Leachate Levels Relative to Shallow Well Screen Intervals ESOI Otter Creek Facility, Oregon, Ohio						
Associated Unit/Cell	Well ID	Well Zone	Top of Screen Elevation	Bottom of Screen Elevation	Target Leachate Elevation (ft)	Measured Leachate Elevation (ft)
5 - Central	F-1S	Shallow	576.5	571.5	557	577.5
5 - Central	G-1S	Shallow	577	572	557	577.5
5 - Central	MR-1SA	Shallow	571.1	566.1	557	577.5
5 - Central	MR-4S	Shallow	576.7	571.7	557	577.5
5 - Central	MR-5S	Shallow	572.9	567.9	557	577.5
5 - Central	MR-7S	Shallow	568.4	563.4	557	577.5
5 - West	MR-2S	Shallow	565.5	560.5	565	565.8
5 - West	MR-3S	Shallow	567	562	565	565.8
5 - West	MR-6S	Shallow	570.4	565.4	565	565.8
6	H-2S	Shallow	580.5	575.5	567	581.7
6	SW-1S	Shallow	571	566	567	581.7
6	SW-2S	Shallow	577.4	572.4	567	581.7
6	SW-3S	Shallow	577	572	567	581.7
6	T-8S	Shallow	576.3	571.3	567	581.7
7	T-5S	Shallow	580.3	575.3	571	583.03
7	T-8S	Shallow	576.3	571.3	571	583.03
7	T-15S	Shallow	581.5	576.5	571	583.03
7	T-43S	Shallow	576.7	571.7	571	583.03
F	F-1S	Shallow	576.5	571.5	538	<538
F	F-2S	Shallow	575	570	538	<538
F	F-3S	Shallow	573	568	538	<538
G	G-1S	Shallow	577	572	546	<546
G	G-2S	Shallow	574.3	569.3	546	<546
G	G-3S	Shallow	576	571	546	<546
G	G-4S	Shallow	579	574	546	<546
H	H-1S	Shallow	579.5	574.5	541	<541
H	H-2S	Shallow	580.5	575.5	541	<541
H	H-3S	Shallow	581	576	541	<541
H	H-4S	Shallow	581.5	576.5	541	<541
H	H-5S	Shallow	569.5	564.5	541	<541
H	H-6S	Shallow	582.5	577.5	541	<541
I	I-3SA	Shallow	579.5	574.5	543.5	<543.5
I	I-4S	Shallow	579.6	574.6	543.5	<543.5
I	I-5SA*	Shallow	578.5	573.5	543.5	<543.5
I	I-6S	Shallow	582.3	577.3	543.5	<543.5
I	I-7S	Shallow	584.1	579.1	543.5	<543.5
I	I-8S	Shallow	584.8	579.8	543.5	<543.5
M	M-2S	Shallow	584	579	550	<550
M	M-3S	Shallow	585.5	580.5	550	<550
M	M-5S	Shallow	583	578	550	<550
M	M-6S	Shallow	583.5	578.5	550	<550
M	M-10S	Shallow	584.1	579.1	550	<550
M	M-11S	Shallow	583.5	578.5	550	<550
M	M-12S	Shallow	581.7	576.7	550	<550
M	M-13S	Shallow	584.3	579.3	550	<550
M	M-14S	Shallow	585.6	580.6	550	<550
M	M-15S	Shallow	585.2	580.2	550	<550
M	M-16S	Shallow	582.4	577.4	550	<550
M	M-17S	Shallow	581.1	576.1	550	<550
M	M-18S	Shallow	579.1	574.1	550	<550
M	M-19S	Shallow	582.5	577.5	550	<550
M	M-1SA*	Shallow	583	578	550	<550
M	M-20S	Shallow	585.5	580.5	550	<550
M	M-21S	Shallow	583.9	578.9	550	<550
M	M-22S	Shallow	584.7	579.7	550	<550
M	M-23S	Shallow	582.6	577.6	550	<550
M	CR-1				550	
Notes:						
* Well screen elevation estimated from the screen interval from M-1S from the DOCC.						
Target leachate elevations for SWMUs 5, 6, and 7 are the target leachate levels established in the RCRA permit.						
Target leachate elevations for Cells F, G, H, I, and M are based on liner elevations, plus one foot.						
Measured leachate elevations for SWMUs 5, 6, 7 are the average of the levels inside the cell from January through August 2009.						
Measured leachate elevations for Cells F, G, H, I, and M are less than the permit required limits based on continued compliance with the required leachate levels at these units.						
Gray shaded cells indicate leachate levels within or above the screen interval.						

Pages from Permit Module K

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must be considered elevated if its concentration is equal to or greater than the comparison standard in Permit Condition K.2(b)(i) or greater than a comparison standard determined in accordance with Permit Condition K.2(b)(ii) and an alternate source demonstration in accordance with Permit Condition K.6(i) has not been submitted.

(i) Table K-1. Constituents With Specified Comparison Standards

Constituent	Comparison Standard for Unaffected Wells (µg/L)
acetone	10
Benzene	1
chloroform	1
1,1-dichloroethane	1
1,2-dichloroethane	1
1,4-dioxane	50
ethylbenzene	1
methylene chloride	1
methyl ethyl ketone	10
total phenols	5
tetrahydrofuran	2
toluene	1
1,1,1-trichloroethane	1
trichloroethene	1
vinyl chloride	2
total xylenes	1
cadmium (dissolved)	1
chromium (dissolved)	25
dissolved lead	5
cyanide	10

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- (ii) Table K-2. Constituents With Comparison Standards listed in Appendix E.7 of the approved Part B permit application:

Constituent
Barium (dissolved)
Cyanide at R-6

- (iii) For constituents without comparison standards listed in Appendix E.7 of the approved Part B permit application (e.g., new or replacement wells or Appendix to OAC Rule 3745-54-98 constituents where comparison standards are required as a result of a well being identified as affected), comparison standards must be developed in accordance with the following requirements and submitted as a permit modification to Appendix E.7 of the approved Part B permit application.

- (a) The Permittee must evaluate currently available analytical results and determine, based on historical data at the site, regional data, geologic information and other relevant information, whether the constituent concentration at each well has been affected by past or current operations at the facility per Permit Condition K.6(c). The determination and justification supporting the determination must be submitted with the first semi-annual final data.
- (b) In the case that the Permittee finds, in accordance with Permit Condition K.2(b)(iii)(a), that the concentration of a constituent at a well has been affected by past or current operations at the facility or the director does not concur with the Permittee's findings that it is not elevated, then that constituent at that well will be considered elevated until demonstrated, to the director's satisfaction, that it is not elevated due to past or current operations of the facility.

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Table K-3. Ground Water Quality Parameters

Parameters
pH
specific conductance
temperature
turbidity

Note: The parameters in Table K-3 will be measured in the field in accordance with the Permittee's Standard Operating Procedures for the collection of ground water samples as described in Appendix E.9 of the Part B Permit Application. These parameters will be collected to demonstrate that the collected ground water samples are representative of formation water.

(c) Concentration Limits

In lieu of establishing individual concentration limits for elevated constituents determined in Permit Condition K.2(b)(i), (ii) and (iii), K.6(c), (d), (e)(iii) and (g), per OAC Rule 3745-54-94 for the affected wells and their constituents, the Permittee must **apply the ACL Model** in accordance with Appendix E-11 of the approved Part B permit application.

(d) Compliance Period

The Permittee must monitor for the constituents identified in Tables K-1, K-2 and K-3 in Permit Condition K.2(b) during the compliance period described in Permit Condition I.1(c).

K.3 Corrective Action Program

OAC Rules 3745-54-98, 3745-54-99, 3745-54-100 and 3745-54-101.

When target risk levels, calculated in accordance with the ACL model in Appendix E-11 of the approved Part B permit application, are exceeded in the wells listed in Permit Condition K.2(a), the Permittee must:

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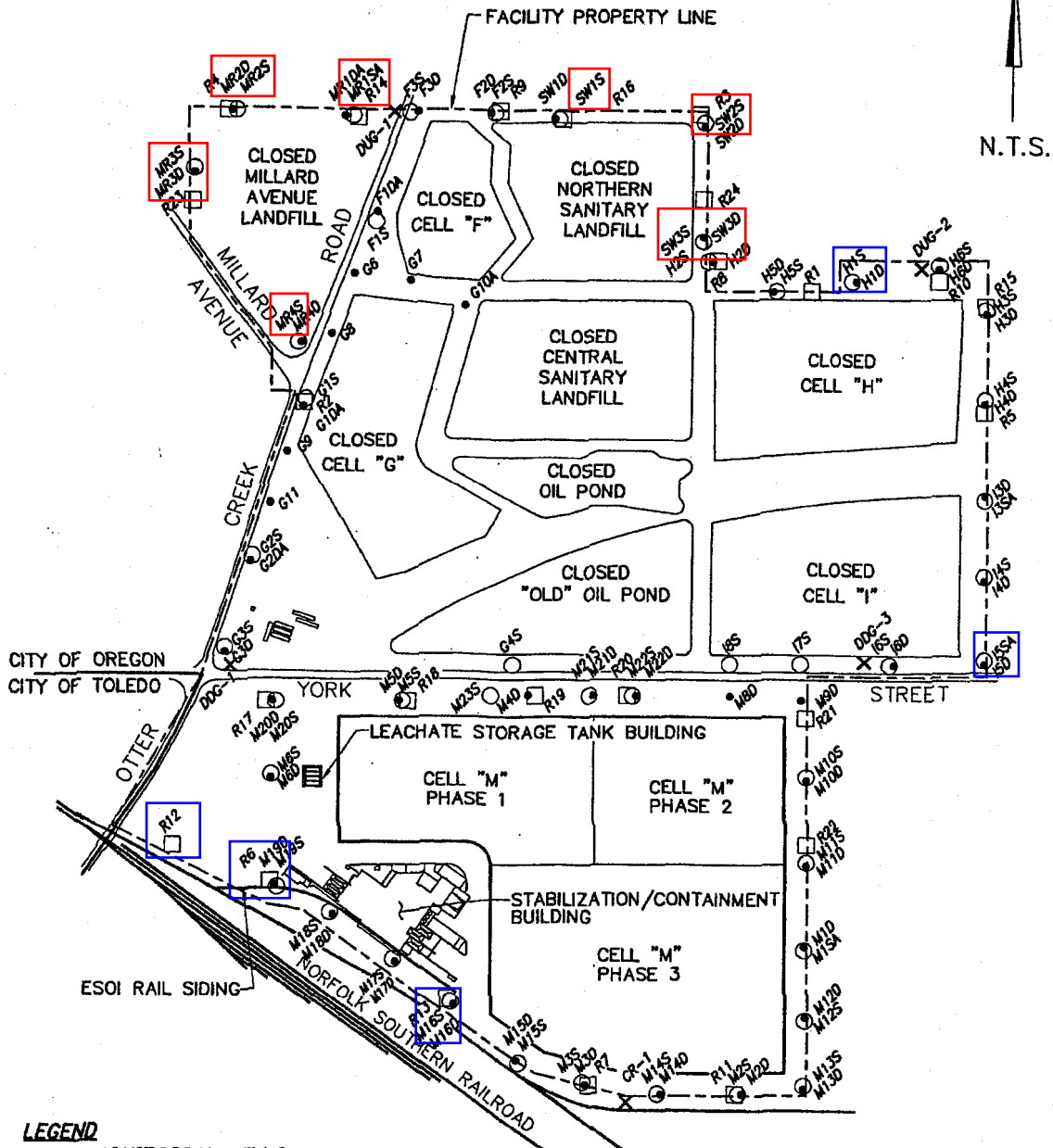
ATTACHMENT K-1
Monitoring Wells in the Integrated Ground Water Monitoring Program
Permit Condition K.1.(a)

"S" Wells		"D" Wells		Bedrock Wells
F1S	M6S	F1DA	M4D	R-1
F2S	M10S	F2D	M5D	R-2
F3S	M11S	F3D	M6D	R-3
G1S	M12S	G1DA	M8D	R-4
G2S	M13S	G2DA	M9D	R-5
G3S	M14S	G3D	M10D	R-6
G4S	M15S	G6	M11D	R-7
H1S	M16S	G7	M12D	R-8
H2S	M17S	G8	M13D	R-9
H3S	M18S	G9	M14D	R-10
H4S	M19S	G10A	M15D	R-11
H5S	M20S	G11	M16D	R-12
H6S	M21S	H1D	M17D	R-13
I3SA	M22S	H2D	M18D	R-14
I4S	M23S	H3D	M19D	R-15
I5SA	MR1SA	H4D	M20D	R-16
I6S	MR2S	H5D	M21D	R-17
I7S	MR3S	H6D	M22D	R-18
I8S	MR4S	I3D	MR1DA	R-19
M1S	SW1S	I4D	MR2D	R-20
M2S	SW2S	I5D	MR3D	R-21
M3S	SW3S	I6D	MR4D	R-22
M5S		M1D	SW1D	R-23
		M2D	SW2D	R-24
		M3D	SW3D	CR-1*
				DDG-1*
				DDG-3*
				DUG-1*
				DUG-2*

*Bedrock Water Level Monitoring Wells. These wells are utilized for collecting water level measurements only.

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ATTACHMENT K-2
INTEGRATED GROUND WATER MONITORING PROGRAM
MAP OF MONITORING WELL LOCATIONS



LEGEND

MONITORING WELLS

- R11 □ BEDROCK WELL
- M20 • DEEP WELL TILL
- M25 ○ SHALLOW WELL
- CR-1 × CHART RECORDER WELL

NOTE

SYMBOLS REPRESENT MONITOR WELL TYPE WITHIN EACH CLUSTER BUT DO NOT REFLECT EXACT LOCATION WITHIN THE CLUSTER.

THE MANNIK & SMITH GROUP, INC.

Groundwater Screening Criteria

**Shallow Till Groundwater Screening Criteria for Table K-1 and K-2 Constituents
ESOI Otter Creek Facility, Oregon, Ohio**

Chem Group	Chemical	CASRN	Shallow Till GW Screening Level (non-SWMU 5 & 6) (ug/L)	Shallow Till GW Screening Level - SWMU 5 (ug/L)	Shallow Till GW Screening Level - SWMU 6 (ug/L)
VOC	Acetone	67-64-1	9.18E+05	1.35E+04	9.18E+05
VOC	Benzene	71-43-2	2.49E+02	2.49E+02	2.49E+02
VOC	2-Butanone (methyl ethyl ketone)	78-93-3	2.68E+05	1.75E+04	2.68E+05
VOC	Chloroform	67-66-3	8.86E+02	8.86E+02	8.86E+02
VOC	1,1-Dichloroethane	75-34-3	8.90E+04	3.75E+02	7.27E+04
VOC	1,2-Dichloroethane	107-06-2	1.43E+02	1.28E+02	1.43E+02
VOC	1,4-Dioxane	123-91-1	5.87E+03	1.08E+03	5.87E+03
VOC	Ethyl Benzene	100-41-4	2.24E+03	1.12E+02	2.24E+03
VOC	Methylene Chloride	75-09-2	9.19E+03	1.59E+03	9.19E+03
VOC	Tetrahydrofuran	109-99-9	9.05E+03	9.05E+03	9.05E+03
VOC	Toluene	108-88-3	2.31E+04	4.94E+02	2.31E+04
VOC	1,1,1-Trichloroethane	71-55-6	1.18E+05	6.06E+02	1.18E+05
VOC	Trichloroethene	79-01-6	3.30E+02	3.30E+02	3.30E+02
VOC	Vinyl Chloride	75-01-4	6.65E+01	1.62E+01	6.65E+01
VOC	Xylenes (total)	1330-20-7	2.98E+03	2.15E+02	2.98E+03
SVOC	Phenol	108-95-2	5.86E+04	3.37E+01	3.06E+04
INORG	Barium (dissolved)	7440-39-3	5.23E+04	1.75E+03	5.23E+04
INORG	Cadmium (dissolved)	7440-43-9	2.72E+01	1.20E+00	2.72E+01
INORG	Chromium (dissolved)	7440-47-3	2.83E+02	2.83E+02	2.83E+02
INORG	Cyanide (dissolved)	57-12-5	1.10E+04	4.14E+01	8.05E+03
INORG	Lead (dissolved)	7439-92-1		9.32E+00	1.81E+03
Notes:					
Criteria is the lower of the values calculated for protection of facility workers for:					
-potential exposure of maintenance workers to on-site groundwater					
-potential exposure of ESOI facility workers to constituents in groundwater via vapor intrusion,					
-discharge to surface water (SWMUs 5 and 6 only).					
Risk-based criteria are calculated at a target cancer risk of 10^{-6} and a target HQ of 0.1.					

Deep Till Groundwater Screening Criteria for Table K-1 and K-2 Constituents ESOI Otter Creek Facility, Oregon, Ohio			
Chem Group	Chemical	CASRN	Deep Till GW Screening Level (ug/L)
VOC	Acetone	67-64-1	1.64E+05
VOC	Benzene	71-43-2	2.50E+01
VOC	2-Butanone (methyl ethyl ketone)	78-93-3	1.10E+05
VOC	Chloroform	67-66-3	4.00E+02
VOC	1,1-Dichloroethane	75-34-3	3.65E+04
VOC	1,2-Dichloroethane	107-06-2	2.50E+01
VOC	1,4-Dioxane	123-91-1	5.00E+01*
VOC	Ethyl Benzene	100-41-4	3.50E+03
VOC	Methylene Chloride	75-09-2	2.50E+01
VOC	Tetrahydrofuran	109-99-9	3.65E+04
VOC	Toluene	108-88-3	5.00E+03
VOC	1,1,1-Trichloroethane	71-55-6	1.00E+03
VOC	Trichloroethene	79-01-6	2.50E+01
VOC	Vinyl Chloride	75-01-4	1.00E+01
VOC	Xylenes (total)	1330-20-7	5.00E+04
SVOC	Phenol	108-95-2	5.48E+04
INORG	Barium (dissolved)	7440-39-3	1.00E+04
INORG	Cadmium (dissolved)	7440-43-9	2.50E+01
INORG	Chromium (dissolved)	7440-47-3	5.00E+02
INORG	Cyanide (dissolved)	57-12-5	1.00E+03
INORG	Lead (dissolved)	7439-92-1	7.50E+01
Notes:			
Criteria calculated for protection of uppermost (bedrock) aquifer, calculated as follows (if less than the PQL, then the PQL is shown, noted with "*"):			
$\text{Criteria} = C_{gw} \times DF$ where C_{gw} = drinking water criteria (lower of state and federal MCL, divided by 10, or equivalent drinking water criteria calculated at a target cancer risk of 10^{-6} and a target HQ of 0.1) DF = dilution factor, calculated by SSG Equation 11 The following is USEPA's Soil Screening Guidance (1996) Equation 11. It is used with parameter values from the ACL model for SWMU 6: $DF = 1 + (K i d)/(I L)$ where K = hydraulic conductivity of bedrock aquifer, 6.56E-5 ft/s (631 m/yr) i = hydraulic gradient in the bedrock aquifer, 0.006429 I = infiltration rate through the deep till, 0.0084 m/yr, which is estimated by the product of a hydraulic gradient of 2.041 and a hydraulic conductivity of 1.3E-8 cm/s L = source length parallel to groundwater flow, 100 m (approximate length of SWMU 6) d = depth of mixing zone, calculated using SSG Equation 12 SSG Equation 12 is: $d = 0.0112^{0.5} L = d_a (1 - e^{-(L I) / (K i d_a)})$ where d_a = bedrock aquifer thickness, 30 m (at least)			