EA Engineering, P.C.

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18 January 2000

Mr. Dennis Weiss, P.E.
Environmental Engineer II
Division of Solid Waste, Region 9
New York State Department of Environmental Conservation
270 Michigan Avenue
Buffalo, New York 14203-2999

RE: Variance Request from Title 6, Part 360 of the Official Compilation of Codes, Rules, and Regulations for the Witmer Road Design-Build Site Closure Project
Niagara Falls, New York
EA Project No. 12040.33

Dear Mr. Weiss:

EA Engineering, P.C. and its Affiliate, EA Engineering, Science, and Technology, are pleased to submit this variance request letter. During our 16 November 1999 meeting, EA proposed two alternative design components in the conceptual cap closure design. These two elements included eliminating the 12-in. gas vent layer, and reducing the barrier protection layer from a 24-in. to a 12-in. layer. The following sections outline the necessary information supporting why these two variances should be granted as required under Title 6 of the official compilation of New York Codes, Rules, and Regulations (NYCRR), Part 360-1.7(c).

1. SITE HISTORY

The Witmer Road Landfill was owned and used by the Vanadium Corporation of America from 1920 to 1964 for disposal of the following materials: stainless steel (lime) slag, ferromanganese slag, ferrochrome silicon slag and dust, and ferrosilicon dust. It is estimated that during the 44 years of operation by Vanadium, 600,000 tons of slag and dust, and 90,000 tons of wood, brick, and ash refuse, were dumped throughout the Airco subsite and adjacent SKW and Niagara Mohawk Power Corporation/Power Authority of the State of New York subsites.

In 1964, the subsite was sold to Airco Inc., and operated by the Airco Alloys Division. At the time of purchase, the majority of slags onsite were sold to an independent contractor and removed from the subsite. Wastes similar to the Vanadium wastes were generated and disposed of onsite from 1964 to 1971. In 1971, the disposal of slurried baghouse dusts was also initiated at the subsite.

Reportedly, between 1971 and 1979, up to 5,600 tons per year of slurried ferrochromium silicon dust and an unknown quantity of other slags and dusts were deposited on the Witmer Road Landfill and adjacent SKW subsite. From 1976 to 1979, an additional 8,000 tons per year of slurried ferrosilicon dusts were also disposed on two subsites. From 1979 to 1981, no wastes were disposed on the Airco subsite.

From 1981 through 1988, the subsite was operated as a New York State Department of Environmental Conservation-permitted landfill by the Airco Carbon Division of Airco, Inc. During this period, inert fire bricks, concrete blocks, coke, and graphite wastes were deposited on the subsite in an effort to obtain a final grade for capping and closure. By 1988, 4 acres in the southern portion of the subsite had been capped through this approach.

In August 1988, Airco, Inc. sold its Niagara Falls production facilities, but not the landfill, to the Carbide/Graphite Group. From 1988 to 1990, no wastes from the Carbide/Graphite Group production facilities were deposited at the subsite, and the landfill permit lapsed. Attempts by Carbide/Graphite Group in 1990 to renew the landfill permit were unsuccessful and, therefore, no waste disposal has occurred at the subsite since 1988.

2. GAS VENT LAYER VARIANCE

In accordance with 6 NYCRR, Part 360-2.13(p), the following is required:

> *A gas venting layer must be located directly below the barrier layer of the final cover system and above the compacted waste layer. Such a layer must be designed and constructed in accordance with the requirements of this subdivision for a soil venting layer or as a geosynthetic venting layer designed and constructed to effectively perform the equivalent functions of the soil venting layer and found acceptable to the department.*

Historically, the wastes deposited at the site, including lime slag, ferromanganese slag, ferrochrome silicon slag and dust, ferrosilicon dust, ferrochromium dust, fire brick, and other inert materials, do not exhibit landfill gas production. In order to support the variance request for eliminating the gas vent layer and to obtain other pre-design information, a field investigation was performed to provide the necessary data to confirm that landfill gas production is not occurring.

A total of 29 test pits and 16 borings were advanced into the waste mass at locations depicted in Figure 1. The locations are approximate and the figure was generated from field notes. The actual test pit and boring locations were flagged and surveyed as part of the investigation. At the time this letter was prepared, final survey plans were not available. Test pit logs are provided in Attachment A. Boring logs are provided in Attachment B.

Monitoring of excavation and boring activities for the presence of volatile organic compounds and methane was performed utilizing a Foxboro TVA-1000® combination photoionization detector and flame ionization detector, and a Landtec® GA-90 methane detector.

Table 1 summarizes the data collected at the 16 boring locations. As indicated in Table 1, low level flame ionization detector responses were recorded, with no corresponding detections of methane noted with the GA-90 methane detector. These minor responses are most likely due to elevated moisture content within the waste sample during the headspace analysis.

Table 2 summarizes the field screening data collected at the 29 test pit locations. Data collection at the test pits included the breathing zone, background, and headspace analysis for each material/layer encountered across the site. No indication of methane gas generation and no organic wastes were observed in the test pits or borings.

Based upon the results from the field investigation, a conceptual design cross-section was developed and is provided in Figure 2. The cross-section depicts a 6-in. bedding layer under the impermeable liner. The 6-in. layer is proposed to provide a buffer between the waste mass, and the liner system. This would normally be accomplished with the gas vent layer. However, since the proposed cross-section involves removal of the 12-in. gas vent layer, the 6-in. layer has been added to provide a buffer zone between the waste mass and the liner system.

A review of this variance request, as specified under 6 NYCRR Part 360-1.7(c)(ii), requires that this request:

> *Demonstrate that compliance with the identified provisions would, on the basis of conditions unique to the person's particular situation, tend to impose an unreasonable economic, technological, or safety burden on the person or the public.*

In this particular case, the requirement for a 12-in. gas vent layer would place an unreasonable economic burden on the responsible party, with no apparent realized gain. Since landfill gases have not been identified, organic wastes were not predominantly deposited at the site, and no organic wastes were observed during the field investigation, placement of this layer would be considered unwarranted, and an unreasonable burden. Therefore, a variance should be granted to eliminate this burden, decrease construction costs, and significantly reduce the time required to complete the project.

Further, 6 NYCRR Part 360-1.7(c)(ii) requires that this request:

> *Demonstrate that proposed activity will have no significant adverse impact on the public health, safety, or welfare; the environment or natural resources; and will be consistent with the provisions of the ECL and the performance expected from application of this part.*

Since the proposed conceptual design includes provisions to add a 6-in. bedding layer as a buffer zone to protect the liner system from contact with the waste, and given that landfill gases and organic wastes were not observed in the waste material, significant impact to the public health or the environment is not likely to occur.

3. BARRIER PROTECTION LAYER VARIANCE

In accordance with 6 NYCRR, Part 360-2.13(r)(2)(iii), the following is required:

> *A barrier protection layer of soil not less than 24 in. thick must be installed on top of the low permeability barrier soil cover. The material thickness, specifications, installation methods, and compaction specifications must be adequate to protect the low permeability soil barrier cover from anticipated desiccation cracking, frost action, and root penetration, as well as to resist erosion and anticipated seepage forces to allow for a stable condition on the final slopes of the landfill cover.*

The landfill cap will be constructed using a low-permeability geomembrane in lieu of a barrier soil layer, and the low-permeability layer will not be subject to desiccation cracking, frost action, nor root penetration. Geomembranes are resistant to low temperatures and temperature changes (GSE's UltraFlex performs acceptably at -107°F for American Society of Testing and Materials [ASTM] D 746, "Low Temperature Brittleness" and 1,500 hours for ASTM D 1693, "Environmental Stress Crack Resistance"). Grass will be planted on top of the landfill cap for erosion control as grass roots are typically short and cannot penetrate polyethylene geomembranes.

The 12-in. barrier protection layer, in lieu of the required 24-in. barrier protection layer, will provide suitable cover to protect the geomembrane from surface loading and allow for a stable condition on the final slopes, including an adequate zone for supporting the vegetative layer. It will be sufficient to protect the geomembrane from frost action and root penetration without adversely impacting the efficiency of the final cover system.

The advantages of reducing the barrier protection layer thickness by 12 in. are as follows:

- Significant reduction in the amount of material which must be hauled onsite, in turn reducing the use of local natural resources, disruptive truck traffic on the local roads and businesses, and potential dust problems caused by placing the fill
- Significant acceleration of the cap closure schedule which will more quickly reduce potential environmental impacts from the uncapped waste site
- Reduction in total cost of the final cover system without compromising cap integrity.

As indicated in Figure 2, a geocomposite drainage net has been incorporated into the cap system. The drainage net was added to provide positive drainage of the cap system thereby replacing a higher permeable layer that would be incorporated as part of the 24-in. barrier protection layer.

A review of this variance request, as specified under 6 NYCRR Part 360-1.7(c)(ii), requires that this request:

> *Demonstrate that compliance with the identified provisions would, on the basis of conditions unique to the person's particular situation, tend to impose an unreasonable economic, technological, or safety burden on the person or the public.*

In this particular case, the requirement for a 24-in. layer verses a 12-in. layer with a geocomposite drainage net would place an unreasonable economic burden on the responsible party, with no apparent realized gain. Since the addition of the geocomposite drainage net will provide a technically equivalent cross-section for drainage control, and since that the reduced frost protection will not adversely impact the performance of the cap system, placement of a 24-in. barrier protection layer versus the 12-in layer with geocomposite drainage net, would be considered unwarranted, and an unreasonable burden. Therefore, a variance should be granted to eliminate this burden, decrease construction costs, and significantly reduce the time required to complete the project.

Further, 6 NYCRR Part 360-1.7(c)(ii) requires that this request:

> *Demonstrate that proposed activity will have no significant adverse impact on the public health, safety, or welfare; the environment or natural resources; and will be consistent with the provisions of the ECL and the performance expected from application of this part.*

The proposed variance for elimination of the 24-in. barrier protection layer as replacement of this layer with a 12-in. barrier protective layer, in conjunction with a geocomposite drainage net, will not pose any threat of adverse impact to the public health or the environment. The proposed cross-section provides for adequate cover to eliminate contact with the waste, retard infiltration of water, and convey surface water runoff to stormwater control devices.

4. CONCLUSIONS

Based upon the types of waste materials historically deposited at the site, the absence of detectable methane during the field investigation of the waste mass, and the technical data regarding cap integrity and performance, EA respectfully requests, on behalf of BOC Gases, that the two variances pursued be granted.

If you require additional information, or have questions with regard to the variances requested, please contact either of the undersigned (David Santoro at 410-584-7000, or Charles McLeod at 914-565-8100).

Sincerely,

EA ENGINEERING, P.C.

David S. Santoro, P.E., L.S.
President

EA ENGINEERING, SCIENCE,
AND TECHNOLOGY

Charles M. McLeod, Jr., P.E.
Project Manager

DSS/mkp
Attachments

cc: M. Resh (BOC)
M. Hinton (NYSDEC)
S. Cheruva (NYSDEC)
M. Graham (Phillips Lytle)
P. Pellissier (EA)

N

LEGEND:

- APPROXIMATE TEST PIT LOCATION
- EXISTING MONITORING WELL
- APPROXIMATE SOIL BORING LOCATION

TP-14, TP-15, TP-16, TP-17, TP-18, TP-19, TP-20, TP-22, TP-24, TP-23, TP-25, TP-26, TP-27, TP-28, TP-29, TP-1, TP-2, TP-3, TP-4, TP-5, TP-6, TP-7, TP-8, TP-9, TP-10, TP-11, TP-12, TP-13

MW 4, MW 4A, MW 13A, MW 13, MW 1, MW 1A, MW 2, MW 2A

B-1, B-2, B-3, B-4, B-5, B-6, B-7, B-8, B-9, B-10, B-11, B-12, B-13, B-14, B-15, B-16

610, 615, 620, 625, 630, 635, 605

54
621.67

DITCH

3.5" = 400'
1" = 114'

0 200 400

GRAPHIC SCALE IN FEET

NOTE:
THE SOIL BORING AND TEST PIT LOCATIONS WILL BE SURVEYED BY A LICENSED LAND SURVEYOR.

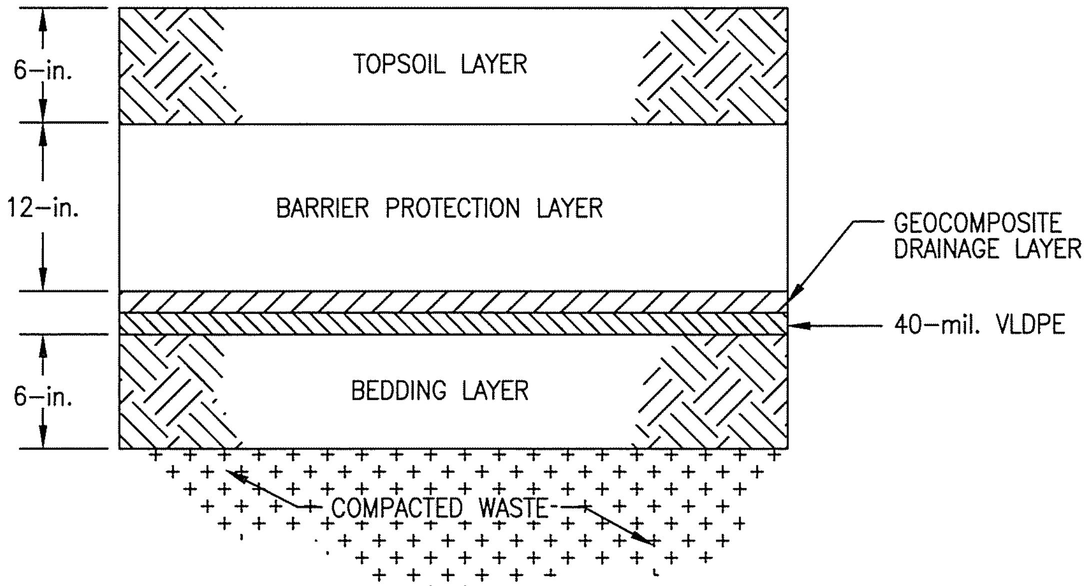
FILE: F:\INDUSTRIAL&OTHER\BOC CASES\12040333\CAD\REVISED\TP&B-LOCATION.DWG

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

WITMER ROAD LANDFILL DESIGN-BUILD
SITE CLOSURE
NIAGARA FALLS, NEW YORK

FIGURE 1
APPROXIMATE TEST PIT AND BORING LOCATIONS

DESIGNED BY	DRAWN BY	DATE	PROJECT NO.
GMC	BT	12-27-99	12040.33
CHECKED BY	PROJECT MGR.	SCALE	FIGURE
GMC	CEM	AS SHOWN	1



FILE: Q:\PROJECTS\1204033\fig-2-varianceletter.DWG

EA ENGINEERING, SCIENCE, AND TECHNOLOGY	WITMER ROAD LANDFILL DESIGN–BUILD SITE CLOSURE NIAGARA FALLS, NEW YORK	FIGURE 2 PROPOSED CAP SECTION

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
CEM	DOK	JBS	PAP	NONE	9–22–99	12040.33	2

TABLE 1 SUMMARY OF HEADSPACE ANALYSIS FROM BORINGS COLLECTED DURING THE PERIOD 7-10 DECEMBER 1999 WITMER ROAD LANDFILL, NIAGARA FALLS, NEW YORK

Location	Depth (ft)	PID (ppm)	FID (ppm)	Methane (%)
B-1	0-2	1.50	3.80	0
	2-4	6.80	59.00	0
	4-6	5.20	11.20	0
	6-8	4.70	16.20	0
	8-10	1.80	0.48	0
	10-12	1.20	0.32	0
	12-14	1.30	0.00	0
B-2	0-2	2.70	1.30	0
	2-4	3.40	2.80	0
	4-6	0.00	0.00	0
	6-8	0.00	0.00	0
	8-10	2.80	3.10	0
B-3	0-2	0.00	0.20	0
	2-4	0.83	1.13	0
	4-6	0.66	0.98	0
	6-8	0.50	0.31	0
	8-10	0.36	0.11	0
B-4	0-2	0.00	0.41	0
	2-4	0.00	1.80	0
	4-6	2.80	0.00	0
	6-8	0.00	0.80	0
	8-10	No data	No data	No data
	10-12	0.00	0.41	0
	12-14	0.40	0.00	0
	14-16	0.00	0.74	0
	16-18	0.00	2.30	0
	18-20	0.00	6.60	0
B-5	0-2	0.00	0.00	0
	2-4	1.20	3.80	0
	4-6	0.00	0.00	0
	6-8	0.00	0.00	0
	8-10	0.00	68.00[a]	0
B-6	0-2	No data	No data	No data
	2-4	0.00	0.00	0
	4-6	0.00	0.00	0
	6-8	0.00	0.30	0
	8-10	0.00	0.30	0
	10-12	0.00	0.20	0
B-7	0-2	0.00	0.00	0
	2-4	0.00	0.14	0
	4-6	0.00	7.90	0
	6-8	3.00	61.40[a]	0
	8-10	0.00	8.30	0
B-8	0-2	0.00	0.00	0
	2-4	0.00	0.00	0
	4-6	0.00	0.00	0
	6-8	0.00	0.00	0
	8-10	1.30	1.90	0
	10-12	1.20	3.05	0
	12-14	2.13	14.30[a]	0
	14-16	2.90	20.40[a]	0

(a) Possible high FID reading due to presence of water.

NOTE: PID = Photoionization detector.
FID = Flame ionization detector.

TABLE 1 (Continued)

Location	Depth (ft)	PID (ppm)	FID (ppm)	Methane (%)
B-9	0-2	0.00	0.13	0
	2-4	0.00	0.00	0
	4-6	0.60	0.20	0
	6-8	0.00	0.31	0
	8-10	0.00	0.68	0
	10-12	1.07	1.20	0
	12-14	No data	No data	No data
	14-16	1.40	48.80[(a)]	0
	16-18	0.60	118.00[(a)]	0
	18-20	1.25	273.00[(a)]	0
	20-21	0.90	196.00[(a)]	0
	21-22	0.20	617.00[(a)]	0
	22-24	No data	No data	No data
B-10	0-2	0.06	0.22	0
	2-4	0.20	0.31	0
	4-6	0.86	14.44	0
	6-8	0.30	10.51	0
	8-10	0.31	13.12	0
	10-12	0.20	1.67	0
B-11	0-2	0.30	0.50	0
	2-4	0.60	44.10	0
	4-6	0.80	22.30	0
B-12	0-2	0.00	0.40	0
	2-4	0.00	0.30	0
B-13	0-2	0.00	0.00	0
	2-4	0.00	0.00	0
	4-6	0.00	0.00	0
	6-8	0.00	0.00	0
B-14	0-2	0.00	0.00	0
	2-4	0.00	0.00	0
	4-6	0.00	0.00	0
	6-8	0.00	0.00	0
	8-10	0.00	0.00	0
	10-12	0.00	0.00	0
	12-14	0.00	0.00	0
	14-16	0.00	0.00	0
B-15	0-2	0.00	0.00	0
	2-4	0.00	0.00	0
	4-6	0.00	0.00	0
	6-8	0.00	0.00	0
	8-10	0.00	0.00	0
	10-12	0.00	0.00	0
	12-14	0.00	0.00	0
	14-16	0.00	0.00	0
B-16	0-2	0.00	0.00	0
	2-4	0.00	0.00	0
	4-6	0.00	0.60	0
	6-8	0.00	9.3	0
	8-10	No data	No data	No data
	10-12	0.00	53	0
	12-14	No data	No data	No data
	14-16	0.00	0.00	0

TABLE 2 SUMMARY OF HEADSPACE ANALYSIS FROM TEST PITS COLLECTED DURING THE PERIOD 7-10 DECEMBER 1999, WITMER ROAD LANDFILL, NIAGARA FALLS, NEW YORK

Location	PID (ppm)	FID (ppm)
TP-01-BZ	0	0
TP-01 Headspace	0	0
TP-02-BZ	0	0
TP-03-BZ	0	0
TP-03 Headspace	0	0
Background TP-01 – TP-03	0	0
TP-04-BZ	ND	ND
TP-05-BZ	0	0
TP-06-BZ	0	0
TP-07-BZ	0	0
TP-08-BZ	0	0
TP-08 Headspace	0	1
Background TP-05 – TP-08	0	0
TP-09-BZ	0	0
TP-09 Headspace	0	0
TP-10-BZ	0	0
TP-10 Headspace	0	0
TP-11-BZ	0	0
TP-12-BZ	0	0
TP-12 Headspace	0	0
TP-13-BZ	0	0
TP-14-BZ	0	0
TP-15-BZ	0	0
TP-16-BZ	0	0
TP-17-BZ	0	0
TP-18-BZ	0	0
TP-19-BZ	0	0
TP-21-BZ	0	0
TP-21 Headspace	0	0
TP-22-BZ	0	0
TP-22 Headspace	3	0
TP-23-BZ	0	0
TP-24-BZ	0	0
TP-25-BZ	0	0
TP-26-BZ	0	0
TP-26 Headspace	0	1.5
TP-27-BZ	0	1.5
TP-27 Headspace	0	1.0

NOTE: PID = Photoionization detector.
FID = Flame ionization detector.
BZ = Breathing zone.
ND = No data available.

Attachment A

Test Pit Logs

EA Engineering, Science and Technology

TEST PIT LOG

Project: ARCO CF	Test Pit No: TP-21
Project No.: 12040.33 Date 12-7-99	1333
Location: 1	
Field Geologist: MJG, BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
0.5		Topsoil		
		Clay		
2.5				
	End T.P.	Black granular Material		FID = 0

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log Photo 14

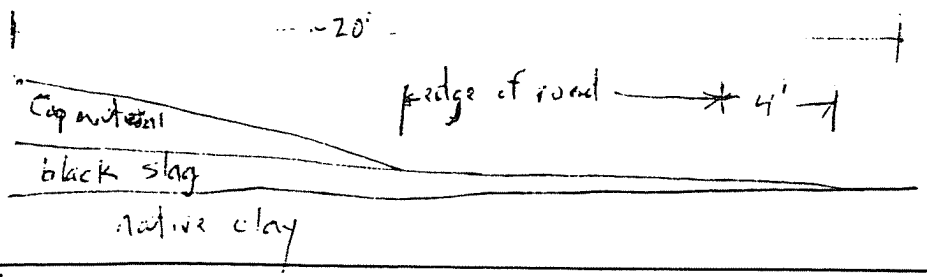
EA Engineering, Science and Technology

TEST PIT LOG

Project: Airco LP	Test Pit No: TP-02
Project No.: 12040.33	Date 12-7-99
Location:	
Field Geologist: RJG, BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
0.5		Topsoil		
5.5		clay		
2ft		Black granular material		
		Native clay > 4' deep		
4'				
	End T.P.			

Test Pit Cross-Section and/or Plan View



Remarks

Photo Log Photo 15

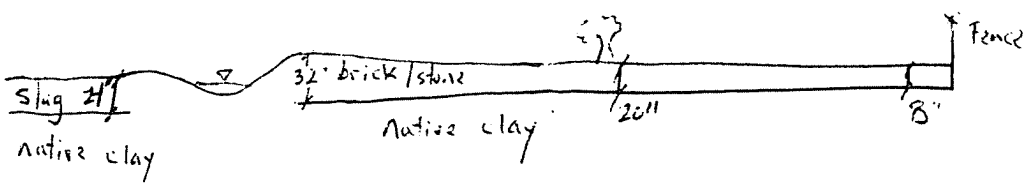
EA Engineering, Science and Technology

TEST PIT LOG

Project: ARCC LF	Test Pit No: TP-03
Project No.: 12040.33 Date 12-7-11	1527
Location:	
Field Geologist: NJE. BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
		slag - brown / gray granular		
		brick / stone - red bricks (intact; broken)		
		gray chalky sandstone material - breaks easily		PID/FID = 0
		dark brown soil w/stone		
		GW @ ~3' rock		

Test Pit Cross-Section and/or Plan View



Remarks

Photo Log Photo 17, 15

Science and Technology

TEST PIT LOG

Project: ARCO LF	Test Pit No: TP-4
Project No.: 12040.33 Date 12-7-99	HT 1545
Location:	
Field Geologist: MJG, BxB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
8"		Topsoil - dark brown		
21"		Gray/white sand w/gravel		
		some sandstone typ unrefined		
	End T.P.	Native clay		
		Water @ ~ 26"		

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log

EA Engineering, Science and Technology

TEST PIT LOG

Project: ARCO LF	Test Pit No: TR-CS
Project No.: 12016.33	Date 12-5-99 0800
Location:	
Field Geologist: MJG. BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
20"		dark brown soil with brick and		
		rocks; piece of pipe		
		native clay		

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log #1

EA Engineering, Science and Technology

TEST PIT LOG

Project: AIRCO LF	Test Pit No: TP-06
Project No.: 1204.33 Date 12-5-99 0810	
Location:	
Field Geologist: MJG, BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
		gray/black slag, 12" rocks		
		Some clay		
~7'				
	End T.P. @ 7'	Water @ 6.5'		

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log #7

EA Engineering, Science and Technology

TEST PIT LOG

Project: AIRCO LF	Test Pit No: TP-07
Project No.: 12040.33 Date 12-8-99	0835
Location:	
Field Geologist: MJG, BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
		gray granular slag w/ gravel		
		Water @ 24"		
		seeping into pit rapidly		
	End T.P. @ ~30"			

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log #3

EA Engineering, Science and Technology

TEST PIT LOG

Project: AIRCO LF		Test Pit No: TP-05	
Project No.: 12042.33	Date 12-8-94 0850		
Location:			
Field Geologist: MJC, BCB			

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
12"		dark brown topsoil		
		gray unconsolidated slag		PID = 0 FID = 1 ppm
5'		rock-like for excavating purposes - need ripper		sample hand-excavated before testing
		water @ 3' bgs, rapid infiltration		
	End T.P.	native clay		

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log #4

EA Engineering, Science and Technology

TEST PIT LOG

Project:	AIRCO LF	Test Pit No:	TP-09
Project No.:	12040.33	Date	12-5-91 0925
Location:			
Field Geologist:	MJC, BCB		

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
12"		dark brown topsoil		
		gray, consolidated slag		PID/FID = 0
		very dense		
		water @ 5' entering rapidly		
	End T.P. @ 7.5'	little to no advance with bucket		

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log #5, #6

EA Engineering,
Science and
Technology

TEST PIT LOG

Project: ARCO LF	Test Pit No: TP-10
Project No.: 12010.33 Date 12-8-99 1007	
Location:	
Field Geologist: MJG, BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
18"		dark brown topsoil		
		gray/white consolidated slag		PID/FID = 0
		cemented, rock-like		
	End T.P. @ 8.5'			
		no water in T.P.		

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log #7, 8, #9

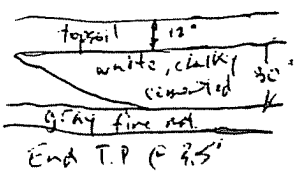
EA Engineering, Science and Technology

TEST PIT LOG

Project: AIRCO LF	Test Pit No: TP-11
Project No.: 12040.33 Date 12-8-99 1128	
Location:	
Field Geologist: MJG BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
1'		dark brown topsoil		
		fine, white clalky mat., cemented		
		some pink coloration in localized areas		
		fine, gray mat. cemented		

Test Pit Cross-Section and/or Plan View



Remarks

Photo Log #10, #11

EA Engineering, Science and Technology

TEST PIT LOG

Project: AIRCO LF	Test Pit No: TP-12
Project No.: 12040.33 Date 12-8-99 1312	
Location:	
Field Geologist: MJG BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
8"		dark brown topsoil		
		gray/white cemented matl		PID/FID = 0
		some black matl.		
	End T.P. @ 5.5'	little to no advance		
		seepage in T.P.		

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log #12, 13

EA Engineering, Science and Technology

TEST PIT LOG

Project: AIRCO LF	Test Pit No: TP-13
Project No.: 12640.33 Date 12-8-99 1340	
Location:	
Field Geologist: MJG, BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
8"		dark brown topsoil		
28"		gray/white coated mat. mixed		primarily soil - L.aw may not be far beyond fence
		in w/ lt. black mat. and brown soil		
		some pink ~~not~~ stained mat.		
		native clay		
24"+	End T.P. @ 5'			

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log #14, TP15

EA Engineering, Science and Technology

TEST PIT LOG

Project: AIRCO LF	Test Pit No: TP-14
Project No.: 120-10.33 Date 12-5-99 1407	
Location:	
Field Geologist: MJG, BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
8"		dark brown topsoil		
8"		black material with black bricks gravels with some plastic fines		
2'-8"	End T.P. @ 4'	native clay		

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log #16

EA Engineering, Science and Technology

TEST PIT LOG

Project: AIRCO LF	Test Pit No: TP-15
Project No.: 12040.33 Date 12-8-99 1424	
Location:	
Field Geologist: MJC BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
2'		moist brown clay and rip-rap (<12")		ground is wet - ponded water
		brown/red native clay		
	End T.P. @ 4'			

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log #17, #18

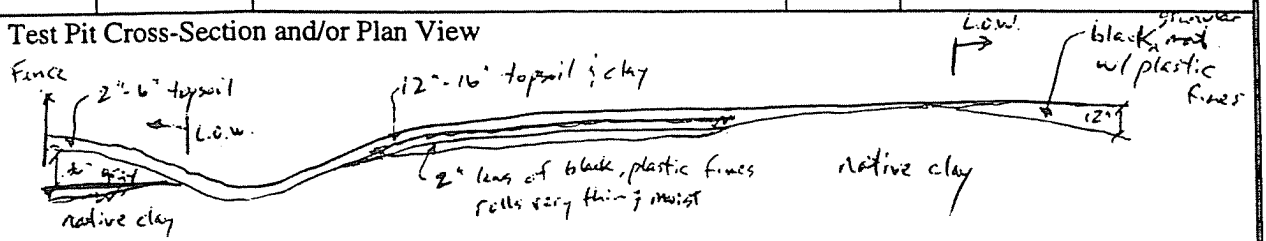
EA Engineering, Science and Technology

TEST PIT LOG

Project: AIRCO LF	Test Pit No: TP-16
Project No.: 12040.33 Date 12-8-99 1530	
Location:	
Field Geologist: MJC, BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
		dark brown topsoil		
		gray/white material - partially reacted some gravel		
		native brown/red clay		

Test Pit Cross-Section and/or Plan View



Remarks

Photo Log #19, 20, 21, 22

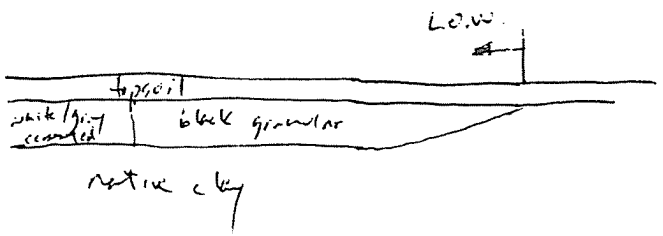
EA Engineering, Science and Technology

TEST PIT LOG

Project: Airco LF	Test Pit No: TP-17
Project No.: 12040.33 Date 12-9-99 0905	
Location:	
Field Geologist: MJG BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
6"		dark brown topsoil		
5"		black granular matl		
	End T.P. @ 2'	native brown/red clay		

Test Pit Cross-Section and/or Plan View



Remarks

Photo Log #1, 2

EA Engineering,
Science and
Technology

TEST PIT LOG

Project: AIRCRAFT	Test Pit No: TP-15
Project No.: 12040.33 Date 12-9-99	0814
Location:	
Field Geologist: MJG, BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
4-6"		Black topsoil		
		Reddish-brown cohesive clay		
	End T.P. @ 20"			

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log @ 3, 4

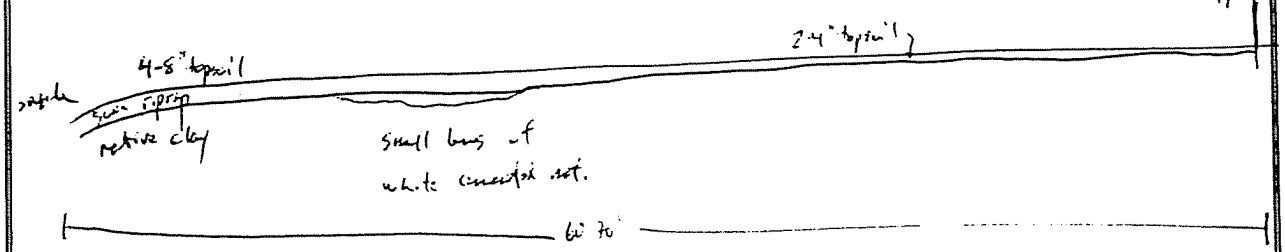
EA Engineering, Science and Technology

TEST PIT LOG

Project: AIRCO CF	Test Pit No: TP-19
Project No.: 12040.33 Date 12-9-99 0829	
Location:	
Field Geologist: MJG BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks

Test Pit Cross-Section and/or Plan View



Remarks Stopped for re-fueling; resumed @ 0930

Photo Log #5, #6

EA Engineering, Science and Technology

TEST PIT LOG

Project: AIRCO LF	Test Pit No: TP-20
Project No.: 12040.33 Date 12-9-99 0955	
Location:	
Field Geologist: MTG BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
		black topsoil		
4'+		stockpile 5-6' high		
	End T.P. @ 4'			

Test Pit Cross-Section and/or Plan View

Remarks mice scurried out when ground was broken

Photo Log ~~N.A.~~

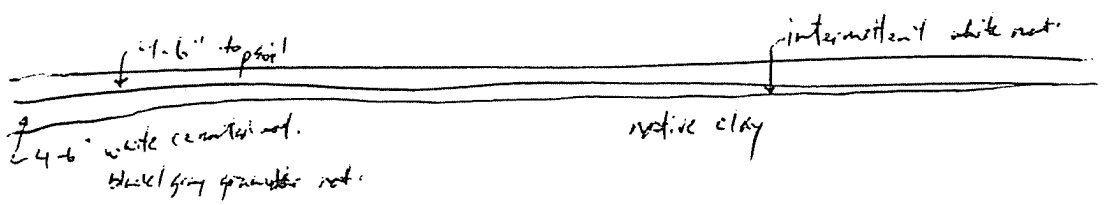
EA Engineering, Science and Technology

TEST PIT LOG

Project: ARCO LF	Test Pit No: TP-21
Project No.: 12040.33 Date 12-9-99 1016	
Location:	
Field Geologist: NMJG BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
~~4-6"~~		black topsoil		
		white/gray cemented mat.		
4-6"		black/gray granular mat.		PID/FID = 0
				warmed in sun
		reddish-brown native clay		
		water slowly seeping in clay		

Test Pit Cross-Section and/or Plan View



Remarks

Photo Log A7, 8, 9

EA Engineering, Science and Technology

TEST PIT LOG

Project: Airco LF	Test Pit No: TP-22
Project No.: 12CM0.33 Date 12-9-99	1100
Location:	
Field Geologist: MJG BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
		grey/black granular mat. w/some fines		
5.5'				PID = 3 ppm, FID = 0
		Shale-like at depth - not hard to rip		
		native clay		
	End. T.P. @ 6'	water seeping in from clay		

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log ~~#10~~ #12, 13

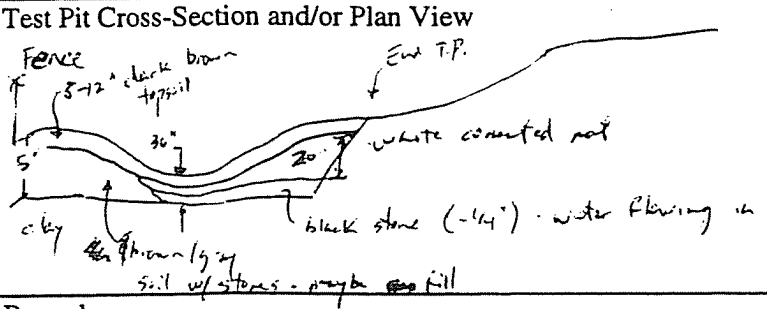
EA Engineering, Science and Technology

TEST PIT LOG

Project: Airco LF	Test Pit No: TP-23
Project No.: 12040.33 Date 12-9-99 1115	
Location:	
Field Geologist: MJG, BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks

Test Pit Cross-Section and/or Plan View



Remarks

Photo Log #14 15 16

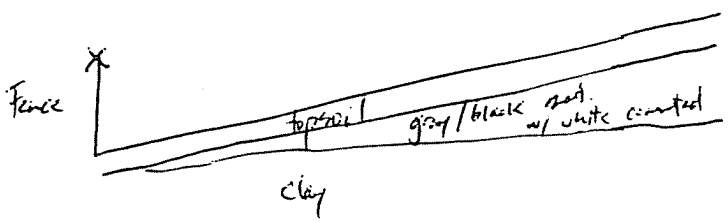
EA Engineering, Science and Technology

TEST PIT LOG

Project: AIRCO LF	Test Pit No: TP-24
Project No.: 12040.33 Date 12-9-99	1334
Location:	
Field Geologist: MJG, BCA	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
10-12"		dark brown/black topsoil		
		white cemented mat. in gray/black		
		grindar mat.		
	End T.P. @ 42"	native clay		
		no water encountered		

Test Pit Cross-Section and/or Plan View



Remarks

Photo Log #17, 18

EA Engineering, Science and Technology

TEST PIT LOG

Project: ARCO LF	Test Pit No: TP-25
Project No.: 12040.33 Date 12-9-99 1349	
Location:	
Field Geologist: MJG, BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
4-6"		dark brown/black topsoil		
		brown and black and white		
		~~cemented~~ not.		
4'		rocks up to 12"		
		water @ 42" bgs rushing in		
		native clay		

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log #19, 20

EA Engineering,
Science and
Technology

TEST PIT LOG

Project: AIRCO LF	Test Pit No: TP-26
Project No.: 12040.33 Date 12-9-99 1413	
Location:	
Field Geologist: MJG BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
4-6"		dark brown topsoil - 4" pipe on surface		
10"		gray cemented soil		
16"		tan fine sand		
12"		black/gray stone (4" minus)		
		black granular soil w/ gravel		PID = 0, FID = 15ppm
		Water @ 56" bgs		
	End T.P. @ 64"	little to no advance		

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log #21, 22

EA Engineering, Science and Technology

TEST PIT LOG

Project: AIRCO LF	Test Pit No: TP-27
Project No.: 12040.33 Date 12-9-97 1441	
Location:	
Field Geologist: MJG, BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
6"		topsoil		
36"		gray/white cemented mat.		
~~36" bgs~~		some black granular mat.		PID = 0, FID = 10 ppm
~~44"~~				
		water @ 38' bgs seeping in slowly		
	End T.P. @ 50"	native clay		

Test Pit Cross-Section and/or Plan View

Remarks slight hydrocarbon odor while excavating

Photo Log #23, 24

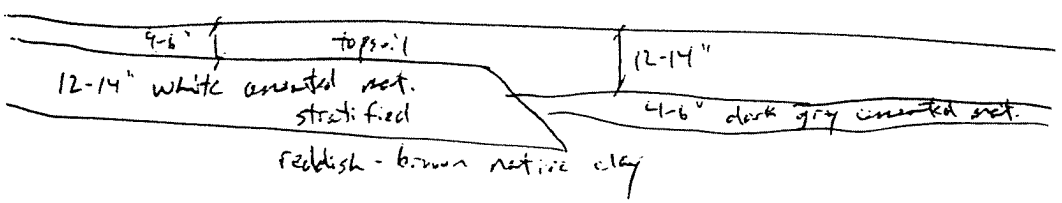
EA Engineering, Science and Technology

TEST PIT LOG

Project: AIRCO LF	Test Pit No: TP-25
Project No.: 2040.33	Date 12-9-99 1503
Location:	
Field Geologist: MJG, BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
4-6"		brown topsoil		
		water @ 30" trickling in through dark gray cem. mat.		
	End T.P. @ 42"			

Test Pit Cross-Section and/or Plan View



Remarks

Photo Log #25 26

EA Engineering, Science and Technology

TEST PIT LOG

Project: ARCO CF	Test Pit No: TP-29
Project No.: 12040.33 Date 12-9-99 1530	
Location:	
Field Geologist: MJG, BCB	

Depth (ft)	Lithology Change (depth ft)	Material Description (Soil Density/Consistency, Color)	USCS	Remarks
4"		brown topsoil		
12"		dark gray cemented mat.		
		some white cemented mat.	some	bluish-gray granular mat. gritty & metalic
8"		black slag (1/4" minus) - water @ 24" in slag layer		
End T.P. @ 32"		native clay		

Test Pit Cross-Section and/or Plan View

Remarks

Photo Log #27, 28, 29

Attachment B

Boring Logs

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BOC - Landfill Witmer Rd	B-1

Drilling Method: hollow Stem Auger, Split Spoon — Boring No. 1

Sampling Method: 140 lb fall 30 in fall — Sheet 1 of 1

Water Level ↓ 3.8 ft

	Drilling Start	Drilling Finish
Time	1143	1248
Date	12/8	12/8

Time: _____ Date: _____

Surface Conditions:

Drilling Contractor: SJB Inc

Driller: Matt Dale Lic.No. _____

By: _____ Checked By: _____

Date: 12/15/97

Sampler Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log	
	24/19	0	0/2	2, 3	0		0-2" overburden topsoil
				3, 10	1		2"-23" Clay red/br.
					2		bottom 1" - Black Ash
							CH4 - 0% FID 3.8 ppm
							PID - 1.50 ppm
	24/11	2	2/4	10, 7	3		wet, C. gravel, grey fill
				5, 5	4		4"-11" - grey clay
					5		CH4 - 0% FID - 59.0
							PID - 6.8
	24/24	4	4/6	4, 4	6		3" Black fill
				8, 9	7		3"-24" Red insitu clay w/ grey Mottling
	24/24	6	6/8	10, 10	8		CH4 - 0 FID - 11.2
				11, 12	9	Fill	PID - 5.2
					0	Clay	4" Black fill
	24/24	8	8/10	3, 7	1		4"-24" red clay to bottom
				8, 10	2		CH4 - 0 FID. 10.2
					3		PID - 4.7
	24/24	10	10/12	7, 9	4	Clay	Red Clay
				11, 11	5		CH4 - 0 FID - 0.48
					6		PID - 1.8
	24/24	12	12/14	7, 5	7		Red Clay
				5, 7	8		CH4 - 0 FID - 0.32
					9		PID - 1.2
					0		Red Clay, bottom grey/Red Clay
							CH4 - 0 FID - 0.0
							PID - 1.3
							end of hole 14 ft

Water level in hole - 3.8 ft from grade

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates:

Surface Elevation:

Casing Above Surface:

Reference Elevation:

Reference Description:

Job No.:

Client: BOC - Witmer Rd Landfill

Location: B-2

Drilling Method: Split Spoon

Boring No.:

Sampling Method:

Sheet of

Water Level | Time | Date | Reference

Drilling: Start Time 1:24, Date 12/8/99; Finish Time, Date

Surface Conditions:

Sampler Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 In Sampler	Depth in Feet	USCS Log	Description
	24 / 10	0	0 / 2	3, 7, 50/3	0		0-3" grey, m-c gravel; 3"-5" c-m gravel, 5" - grey/br clay; PID - 2.7, FID - 1.3, CH4 - 0
					1		
					2		M-C silt and clay
	24 / 1	2	2 / 4	24, 9, 5, 7	3		PID - 2.8, FID - 3.4, CH4 - 0
					4		
					5		
	24 / 8	4	4 / 6	12, 14, 11, 14	6		1" br. dense silt (some roots); 7" Red Silty Clay; PID - 0, FID - 0, CH4 - 0
					7		
					8		
	24 / 24	6	6 / 8	17, 12, 12, 15	9		1" black/br. m-f silt, some roots; 23" Red clay, trace, v.f silt
					0		
					1		CH4 - 0, PID - 0, FID - 0
					2		
	24 / 24	8	8 / 10	7, 7, 7, 7	3		1" tan m-f sand and silt; 23" Red clay trace silt varved (in situ)
					4		PID - 2.8, FID - 3.1, CH4 - 0.0
					5		
					6		
					7		End of Hole in Red Clay 10 ft
					8		
					9		
					0		

Drilling Contractor: SJB

Driller: Matt/Dale

Lic. No.:

By: [illegible]

Date: 12/15/99

Checked By:

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates:

Surface Elevation:
Casing Above Surface:
Reference Elevation:
Reference Description:

Job No.:
Client: BOC-Witmer Landfill
Location: B-3
Drilling Method: Split Spoon
Boring No.:
Sampling Method:
Sheet 1 of 1

Water Level			
Time			
Date			
Reference			

Drilling: Start Time 2:12pm; Finish Time
Start Date 12/8; Finish Date

Surface Conditions:

Sampler Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 In Sampler	Depth in Feet	USCS Log	Description
	24 / 10	0	0 / 2	2, 2, 50/3	0–1		grey / black / brown m-c sand and gravel, ash-material; CH4 – 0; FID – 0.2; PID – 0
	24 / 9	2	2 / 4	50/2	4		Brown / black ashy fill c-m gravel & sand greenish color; CH4 – 0; FID – 1.13; PID – 0.83
	24 / 12	4	4 / 6	50/2	8		Dense black / tan c-m gravel / some c-m sand (black); CH4 – 0; FID – 0.98; PID – 0.66
	24 / 4	6	6 / 8	50/1	2		very dense "extreme!" augering white c. gravel some black sand; CH4 – 0; PID – 0.5; FID – 0.31
	24 / 5	8	8 / 10	5, 50/1	6		grey tan m-f sand dense, some silt; FID – 0.11; PID – 0.36; CH4 – 0

Augers driven to 10 ft - Refusal

last Spoon – 8 ft – "Spoon Cracked @ 7.5'"
Refusal – 10 ft

Driller:
Drilling Contractor: [illegible]
Lic. No.
By:
Date: 12/5/94
Checked By:

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BOC - Witmer Landfill	B-4

Drilling Method:

Sampling Method:

Boring No.

Sheet 1 of 2

Water Level ↓		
Time		
Date		
Reference		

Drilling: Start Time 3:25, Date 12/8/99; Finish Time, Date

Surface Conditions: Black fine sand loose @ surface vegetated

Drilling Contractor: _____ Lic.No. _____

Driller: _____

Sample Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log	
	24/19	0	0/2	5, 10	0		Black, m-c sand and f. gravel some rust color
				8	1		
				15			
					2		PID - 0
					3		FID - 0.41
							CH4 - 0
	24/9	2	2/4	17	4		low recovery
				5			Black m-c sand and f. gravel
				4	5		
				50/2			PID - 0
					6		FID - 1.8
							CH4 - 0
					7		
	24/8	4	4/6	35			
				50/2	8		1" Black m-c sand
				-	9		7" Grey tan m-f sand and M gravel, little dense - material
					0		
							PID - 2.8
					1		FID - 0
							CH4 - 0
					2		
	24/13	6	6/8	6			3' C. - white gravely fill
				2	3		10" m-f Black sandy fill (bluish)
				2			metallic-look (x falling)
				2	4		PID - 0
							FID - 0.5
					5		CH4 - 0
					6		
	24/12	10	10/12	4			8" loose, fine, black sand
				2	7		Some m-f Black sand
				1			metallic-like
				1	8		
							CH4 - 0
					9		PID - 0
							FID - 0.41
					0		

By: _____ Checked By: _____

Date: 12/8/99

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BOC-Witmer Landfill	B-4

Drilling Method:

Sampling Method:

Boring No.

Sheet 2 of 2

Water Level ↓			
Time			
Date			
Reference			

Drilling Start Time	Drilling Finish Time
Date 12/6/99	Date

Surface Conditions:

Driller: _____ Lic.No. _____

Checked By: _____

By: _____ Date: _____

Sampler Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log	
	24/11	12	12/14	1 11	0		m-f black sand some m. gravel loose material.
				5 2	1		CH4 - 0.0 FID - 0.0
					2		PID - 0.4
					3		
	24/3	14	14/16	14 17	4		1"-2": c. gravel (3mm) m-c black sand some c. white sand
				12 9	5		CH4 - 0 PID - 0 FID - 0.74
					6		
					7		
	24/12	16	16/18	9 20	8		
				50/2	9		m-f black sand (top 4") bottom 8" green-tan, c. sand and m-f gravel.
					0		
					1		CH4 - 0 PID - 0 FID - 2.3
					2		
	24/18	18	18/20	15 17	3		— — —
				14 14	4		1" wood 3" grey-blue, f. sand / some silt
					5		14" black, silt, v.f sand some
					6		CH4 - 0 PID - 0 FID - 1.6
					7		
					8		End of Hole @ 20'
					9		
					0		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BOC-Witmer Rd Landfill	B-5

Drilling Method:

Sampling Method: Black cover vegetated

Boring No.

Sheet of

Water Level ↓			
Time			
Date			
Reference			

Drilling Start Time: 7:59 Date: 12/9/99

Drilling Finish Time: _____ Date: _____

Surface Conditions:

Drilling Contractor: _____ Lic.No. _____

Driller: _____

Checked By: _____

By: _____

Date: _____

Sampler Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log	
	24/12	0	0/2	1, 5	0		Black, m-c sand
				50/1	1		some m-f gravel
					2		PID - 0
							FID - 0
					3		CH4 - 0
	24/8	2	2/4	9, 14	4		Black, m-c, sand
				11, 12	5		some m-f gravel
							stone (rock fragments (angular)
					6		PID - 1.2
					7		FID - 3.8
							CH4 - 0
	24/8	4	4/6	9, 2	8		
				7, 5	9		same (less m-f gravel)
					0		
							PID - 0
					1	fill	FID - 0
	24/8	6	6/8	17, 18	2		CH4 - 0
				12, 14		Silt	4" Black m-f sand
					3		- some m-f gravel
					4		PID - 0
							FID - 0
					5		CH4 - 0
	24/10	8	8/10	25, 5	6		
				7, 7		clay	Red/brown clay
					7		trace f. gravel
							some mottled grey clay
					8		
							PID - 0
					9		FID - 68.0
					0		CH4 - 0

End of Hole 10ft

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BOC - Witmer Rd Landfill	B-6

Drilling Method:

Sampling Method:

Boring No.

Sheet of

Water Level ↓			
Time			
Date			
Reference			

Drilling Start Time	Drilling Finish Time
9:04	
Date: 12/9/99	Date

Surface Conditions:
loose black gravel
m-c gravel

Driller: _____ Lic. No. _____

Logged By: _____ Checked By: _____

Date: _____

Sample Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No. / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log	
	24/15	0	0/2	12, 12	0		Black m-c gravel, some c-sand (3")
				12, 14	1		
					2		12" compacted, white, greenish, pinkish v.f sand + silt (concrete-like)
	24/16	2	2/4	21, 21	3		16" compacted, white, green, pink v.f. sand and silt
				11, 11	4		concrete-like fill
					5		PID – 0
					6		FID – 0
	24/15	4	4/6	45, 35	7		CH4 – 0
				25, 30	8		Same as above
					9		inclusions of pink, green white, nodules in matrix
					0		PID – 0
	24/13	6	6/8	50/4	1		CH4 – 0
					2		FID – 0
					3		2" Black f. sandy fill
					4		some white-xtalline nodules + powder (tan)
					5		~11" white/pink compacted fine sandy fill w/ nodules (green) in matrix
					6		FID – 0.3
	24/18	8	8/10	18, 50/4	7		PID – 0
					8		CH4 – 0
					9		Same - white compacted w/ filled nodules
	24/14	10	10/12	25, 50/3	0		PID – 0 CH4 – 0 FID – 0.3
							Same PID – 0, CH4 – 0, FID – 0.2

End of Hole @ 12 ft.

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BOC-Witmer Rd-landfill	B-7

Drilling Method:

Sampling Method:

Boring No.

Sheet of

Water Level ↓			
Time			
Date			
Reference			

Drilling Start Time	Drilling Finish Time
1024	1100
Date 12/9/99	Date

Surface Conditions: Swale - drainage by MW-4/4A

Drilling Contractor: _____ Lic.No. _____

Driller: _____

By: _____ Checked By: _____

Date: _____

Sampler Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log	
	24/24	0	0/2	2 5	0		8" topsoil 8" red, m-f sand/some silt 8" moist grey sand (m-f) and silt
				24 17	1		
					2		
					3		FID - 0 PID - 0 CH4 - 0
	24/20	2	2/4	25 21	4		
				50/1	5		20" white/grey v.f sand, some silt fill
					6		
					7		PID - 0 FID - 0.14 CH4
	24/24	4	4/6	14 30	8		
				40 21	9		white, reddish, v.f sand and silt very compacted fill material
					10		
					11		PID - 0 FID - 7.9 CH4 - 0
					12		
	24/10	6	6/8	7 4	13	fill	4" grey/white fill (wet)
				7 11	14	clay	4"/10" Red Clay (native)
					15		PID - 3.0 FID - 61.4 CH4 - 0
					16		
	24/24	8	8/10	7 11	17		5" grey/white m-f sand fill 19" Red Clay, some silt, fine mottling in situ
				14 7	18		
					19		End of hole at 10ft.
					20		FID - 8.30 CH_4 - 0 PID - 0

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BOC - Witmer Landfill	B-8
Drilling Method:		Boring No.
Sampling Method:		Sheet 1 of 2
Water Level ↓		Drilling Start / Finish
Time		Time 1102 / 1130
Date		Date 12/9/99
Reference		

Surface Conditions: Drainage ditch N.E. corner in swale

Logged By: _____ Lic. No. _____

Driller: _____

Checked By: _____

Date: 12/15/99

Sample Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log	
	24/2	0	0/2	1, 3	0		7" topsoil Red/brown clay, some silt white inclusions 5" brown/white, m-f sand fill PID - 0 FID - 0 CH4 - 0
				30, 40	1		
					2		
					3		
	24/19	2	2/4	33, 30	4		2" br/white m-f sand white fill intermixed w/ topsoil 17" white, pink, green compacted v.f. sand/silt powder chalky fill. PID - 0 FID - 0 CH4 - 0
				12, 7	5		
					6		
					7		
					8		
	24/15	4	4/6	9, 17	9		
				17, 25	10		White/Green/Pink v.f sand Compact fill FID - 0 PID - 0 CH4 - 0
					11		
					12		
	24/14	6	6/8	14, 50/3	13		White/mint green/light pink v.f. silt./powder/chalk chalk-like fill material PID - 0 PID - 0 CH4 - 0
					14		
					15		
					16		
	24/24	8	8/10	7, 5	17		Same - finer grained denser/chalk darker white/grey, f. silt./chalk PID - 1.3 FID - 1.9 CH4 - 0
				50/4	18		
					19		
					20		

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

_____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BOC - Witmer Landfill	B-8

Drilling Method:

Sampling Method:

Boring No.

Sheet 2 of 2

Water Level ↓			
Time			
Date			
Reference			

Drilling: Start Time 1102 | Finish Time 1130

Date 12/9/99 | Date

Surface Conditions:

Drilling Contractor: _____ Lic. No. _____

Driller: _____

By: _____ Checked By: _____

Date: _____

Sample Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log
	24/13	10	10/12	27 50/3	0	
					1	
					2	
					3	
	24/14	12	12/14	22 15	4	
				2 3	5	
					6	
	24/17	14	14/16	7 7	7	
				9 10	8	
					9	
					10	
					1	
					2	
					3	
					4	
					5	
					6	
					7	
					8	
					9	
					10	

2" grey clay intermixed w/ chalky fill

11" white m-f sand / silty chalky fill

PID - 1.20

FID - 3.05

CH_4 - 0

white chalky fill material

14" R

PID - 2.13

FID - 14.3

CH_4 - 0

6" white chalky fill

11" Red Clay

PID - 2.9

FID - 20.4

CH_4 - 0

end of hole 16 ft

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BCC-Witmer Rd-Landfill	B-9

Drilling Method:

Sampling Method:

Boring No.

Sheet 1 of 2

Water Level ↓			Drilling Start Time	Drilling Finish Time
Time			1130	
Date			Date 12/9/99	Date
Reference				

Surface Conditions:

Driller: _____ Lic.No. _____

Checked By: _____

Sampler Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log	
	24/16	6	0/2	1, 2	0		2" Topsoil 8" Red Clay 6" white, green chalky fill PID - 0 FID - 0.13 CH4 - 0
				11, 11	1		
					2		
					3		
	24/12	2	2/4	27, 12	4		12" Pink, white, green chalk material v.f. sand / silt (powder-like)
				15, 15	5		
					6		FID - 6 PID - 0 CH4 - 0
					7		
	24/12	4	4/6	14, 50/2	8		grey fill grey m-f sand and silt (moist) 3" 9" Pink, white loose, m-f sand, chalk-like
					9		
					10		PID - 0.6 CH4 - 0 FID - 0.2
					11		
	24/24	6	6/8	25/7	12		same FID - 0.31 PID - 6 -- CH4 - 0
				25, 15	13		
					14		
	24/17	8	8/10	7, 11	15		same (more green color) - chromium?
				10/3	16		
					17		PID - 0 FID - 0.66 CH4 - 0
	24/24	10	10/12	7, 4	18		
				5, 7	19		PID - 1.07 FID - 1.2 CH4 - 0 Blows (12'-14') = 8, 12, 20, 14 compact white, chalky, Pink w/ Black Xtalline f gravel + sandy fill
	24/24	12	12/14	8, 12	20		
	24/24	14	14/16	14, 7, 10, 11			same; (Pasty) Milky white green, Pink Chalk-like - fill FID - 48.8 PID - 1.4 CH4 - 0

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
		B-9

Drilling Method:

Boring No.

Sampling Method:

Sheet 2 of 2

Water Level ↓			
Time			
Date			
Reference			

Drilling: Start Time 1150 Date 12/9/99; Finish Time 2:26 Date

Surface Conditions:

Drilling Contractor: _____ Lic. No. _____

Driller: _____

Sampler Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 In Sampler	Depth in Feet	USCS Log	
	24/24	16	16/18	14 28	0		wet at top 6" (green) m-f -sand. Chalky material
				25 27	1		18" dense white, grey, chalky-fill
					2		PID - 0.6 FID - 118 CH4 - 0
	24/24	18	18/20	9 19	3		
				24 12	4		Top 10" wet loose grey m-c gravel (fill) 14" dense grey/white, v.f. sand/silt chalky fill
					5		
					6		FID - 273 PID - 1.25 CH4 - 0
	24/11	20	20/22	10 7	7		
				11 8	8	∇	Saturated Spoon 5" fill 5"-6" root zone (former ground surface) 6"-11" Black silty clay
					9		
					10		
					11		PID - 0.9 CH4 - 0 FID - 196 } Fill 20'-21'
					12		
					13		PID - 0.2 CH4 0 FID - 617 * -- } Clay 21'-22'
					14		* Possibly high FID due to presence of H2O
	24/16	22	22/24	10 7	15		Saturated 8" Black clay w/ some f silt 8" Red Clay
				11 8	16		
					17		End of Hole @ 24'
					18		
					19		
					20		

By: _____ Checked By: _____

Date: _____

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BCC-Witmer Landfill	B-10
Drilling Method:		Boring No.
Sampling Method:		Sheet of
Water Level ⊥		Drilling Start Time: 3:00 Finish Time:
Time		
Date		Date: 12/9/91 Date
Reference		

Surface Conditions: drain swale east side

Sample Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log	
	24/24	0	0/2	2/2/7	0		6" topsoil 18" grey silty chalk-like fill
				11/10	1		
					2		FID - 0.22 CH4 - 0 PID - 0.06
	24/24	2	2/4	30/50/4	3		white, pink, chalk-like fill green inclusions in matrix (xtalline green inclusions)
					4		
					5		FID - 0.31 CH4 - 0 PID - 0.20
					6		
	24/24	4	4/6	12/17	7		24" White chalky-like fill Pink, yellow, green inclusions w/ brown oxidized rims m-f sand-sized grains. PID - 0.86 FID - 14.44 CH4 - 0
				24/30	8		
					9		
					0		
	24/18	6	6/8	21/30	1		white chalky fill (18")
				9/7	2		
					3		PID - 0.3 FID - 10.51 CH4 - 0
	24/15	8	8/10	4/4	4		
				3/7	5		6" white ash / chalky fill 9" Br. Black clay some silt
					6		
					7		PID - 0.31 FID - 13.12 CH4 - 0
	24/22	10	10/12	4/7	8		
				9/7	9		4" Black clay some silt 18" Red clay
					0		END of Hole = 12f PID - 0.2 FID - 1.67 CH4 - 0

Driller: Dale Matt Lic.No. _____

Checked By: _____

Date: 12/9/91

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BOC - Witmer Landfill	B-11
Drilling Method:		Boring No.
Sampling Method:		Sheet of
Water Level ↓		Drilling Start Time: 3:40 Finish Time: 4:00
Time		
Date		Date: 12/9/19
Reference		

Surface Conditions:

Drilling Contractor: _____ Lic.No. _____

Driller: _____

Sample Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log	
	24/22	0	0/2	17, 17	0		8" topsoil 8" grey chalky - ash, m-f sand (fill) 6" V Black m-c sand/silt fill
				18, 25	1		
					2		
					3		FIP - 0.5 CH4 - 0 PID - 0.3
	24/10	2	2/4	14, 5	4		Wet - White chalky fill 5" m-c sand and m-f gravel fill
				4, 10	5		5" grey clay PID - 0.6 FID - 44.1
					6		CH4 - 0
	24/22	4	4/6	7, 5	7		
				7, 9	8		4" grey chalky - fill 6" V Black/grey clay some silt
					9		12" Red clay mottling gleyed
					10		CH4 - 0 PID - 0.8 FID - 22.3
					11		
					12		- water level 11.5 ft from grade
					13		
					14		End of Hole at 14 ft.
					15		
					16		
					17		
					18		
					19		
					20		

By: _____ Checked By: _____

Date: _____

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BOC - Witmer Rd landfill	B-12

Drilling Method:

Sampling Method:

Boring No.

Sheet of

Water Level ↓		
Time		
Date		
Reference		

Drilling: Start Time 800 AM, Date 12/10/99; Finish Time, Date

Surface Conditions: RAIN ALL DAY Pooling Due to RAIN No PID readings.

Driller: _____ Lic.No. _____

Drilling Contractor. _____

Checked By: _____

Date: _____

B.

Sample Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log
	24/12	0	0/2	2, 3	0	
				3, 2	1	
					2	
	24/12	2	2/4	4, 3	3	
				3, 4	4	
					5	
					6	
					7	
					8	
					9	
					0	
					1	
					2	
					3	
					4	
					5	
					6	
					7	
					8	
					9	
					0	

Black fill

CH4 - 0

FID - 0.4

PID - Ø

5" Fill

7" Red/grey clay

PID Ø

FID - 0.3

CH4 - 0

End of Hole 4 ft in Clay

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: ______

Surface Elevation: ______
Casing Above Surface: ______
Reference Elevation: ______
Reference Description: ______

Job No.	Client	Location
	BCC-Witmer Landfill	B-13

Drilling Method:
Sampling Method:

Boring No.
Sheet 1 of 1

Water Level			
Time			
Date			
Reference			

Drilling	
Start	Finish
Time 08:11	Time
Date 12/10/99	Date

Surface Conditions: Rain all day - No PID readings. Drainage swale on east side

Sampler Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 In Sampler	Depth in Feet	USCS Log	
	24/24	0	0/2	3	0		6" topsoil
					1		18" fill
					2		PID - 0
							FID - 0
					3		CH4 - 0
	24/24	2	2/4	10	4		24" fill
				7			
				7	5		
				4			FID - 0
					6		PID - 0
							CH4 - 0
	24/15	4	4/6	14	7		
				18			2" grey fill
				9	8		3" tan/orange fill
				5			10" grey fill
					9		
					0		PID - 0
							FID - 0
					1		CH4 - 0
	24/15	6	6/8	2	2		5" fill
				2			10" Red Clay
				5	3		
				5			FID - 0
					4		CH4 - 0
					5		PID - 0
					6		End of Hole 8 ft
					7		
					8		
					9		
					0		

Drilling Contractor: ______ Lic. No. ______
Driller: ______

By: [illegible signature] Checked By: ______
Date: 12/10/99

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
		B-14

Drilling Method: | Boring No.

Sampling Method: | Sheet of

Water Level ⊥ | Drilling Start Time | Drilling Finish Time

Time | 0850

Date | 12/10/99 | Date

Surface Conditions: Rain - No PID

On top of Waste Mass.

Driller: _____ Lic.No. _____

Checked By: _____

Date: _____

Sample Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log	
	24/15	0	0/2	5, 3	0		V.f Sand and Silt Black fill
				3, 5	1		
					2		PID - 0
					3		FID - 0
							CH4 - 0
	24/18	2	2/4	4, 2	4		same
				2, 3	5		FID - 0
							PID - 0
					6		CH4 - 0
	24/15	4	4/6	2, 2	7		
				1, 7	8		V.f Silt/Powder Chalky fill
							Black last 1" coarse sand
					9		Black fill
					0		PID - 0
	24/13	6	6/8	17, 20	1		FID - 0
				50/3	2		CH4 - 0
							1" Black fill
					3		12" white pink green, Chalky fill
					4		PID - 0 CH4 - 0
	24/24	8	8/10	11, 11	5		FID - 0
				21, 50/4	6		white very dense chalky fill
					7		PID - 0 CH4 - 0
	24/15	10	10/12	50/4	8		FID - 0
							15" white/green fill
					9		FID - 0 CH4 - 0
	24/5	12	12/14	50/4	0		PID - 0
	24/12	14	14/16	24, 24, 50/4			same PID - 0 FID - 0 CH4 - 0

END HOLE at 16 ft

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BOC Witmer Landfill	B-15

Drilling Method: SPLIT SPOON

Sampling Method:

Boring No.

Sheet 1 of 2

Water Level ↓			
Time			
Date			
Reference			

Drilling: Start Time 10:02 | Finish Time

Date 12/10/99 | Date

Surface Conditions:

Drilling Contractor: SJB Inc.
Driller: Matt Dale Lic.No.

By: [illegible] Checked By:
Date: 12/15/99

Sampler Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log	
	24/2	0	0/2	2, 10	0		Black fill PID - 0 low recovery FID - 0 CH4 - 0
				50/1	1		
	24/8	2	2/4	7, 8	2		same FID - 0
				8, 4	3		PID - 0
					4		CH4 - 0
	24/24	4	4/6	4, 4	5		4" c-f Black sandy fill
				4, 4	6		20" Powder-like Black v.f sand/silt fill
					7		PID - 0
					8		FID - 0 CH4 - 0
	24/24	6	6/8	4, 3	9		Black fill
				3, 2	0		v.f. grained silt-sized fill
					1		CH4 - 0 PID - 0
	24/19	8	8/10	2, 2	2		FID - 0
				1, 1	3		Black light brown v.f silt/chalk-like fill
					4		CH4 - 0
					5		PID - 0 FID - 0
	24/24	10	10/12	2, 2	6		
				1, 1	7		Black/br. v.f sand/silt fill with white xtalline solid inclusions
					8		PID - 0 FID - 0
					9		CH4 - 0
	24/24	12	12/14	4, 5	0		same (wet)
				7, 4			FID - 0 CH4 - 0

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BOC-Witmer Rd landfill	B-15
Drilling Method:		Boring No.
Sampling Method:		Sheet 2 of 2
		Drilling Start / Finish
Water Level ↓		
Time		Time: 1032 / Time:
Date		Date: 12/10/99 / Date:
Reference		

Surface Conditions:

Sampler Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log
	24/24	14	14/16	1 4 4	0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0	

same.

CH4-0

FID-0

PID-0

end of hole. @ 16 ft

Engineer: _____ Checked By: _____

Date: _____

...ng C...tor: _____ Lic.No. _____

Driller: _____

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

_____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BCC-Witmer Landfill	B-16

Drilling Method:

Sampling Method:

Boring No.

Sheet 1 of 2

Water Level ↓		
Time		
Date		
Reference		

Drilling: Start Time 1200 Date 12/9/99; Finish Time ____ Date ____

Surface Conditions:

On Perimeter
By Test Pit 26

Drilling Contractor: _____ Lic.No. _____

Driller: _____

By: _____ Checked By: _____

Date: _____

Sample Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log	
	24/24	0	0/2	10 12	0		6" topsoil 8" fill
				12 7	1		
					2		FID - 0 PID - 0
					3		CH4 - 0
	24/10	2	2/4	50/2	4		White dense fill
					5		FID - 0
					6		PID - 0
					7		CH4 - 0
	24/10	4	4/6	6 4	8		5" White/Grey silt powder
				9 29	9		5" m-c Black/Blue sandy fill
					10		CH4 - 0
					11		FID - 0.6
					12		PID - 0
	24/9	6	6/8	17 17	2		9" c gravel and c. sandy fill
				12 15	3		FID - 9.3
					4		PID - 0
							CH4 - 0
	24/0	8	8/10	50/1	5		
					6		No recovery
	24/4	10	10/12	10 12	7		c. gravel - fill
				11 7	8		FID - 53
					9		PID - 0
							CH4 - 0
	24/0	12	13/14	7 8	10		No Recovery

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Co-ordinates: _____

Surface Elevation: _____

Casing Above Surface: _____

Reference Elevation: _____

Reference Description: _____

Job No.	Client	Location
	BCC-Witmer Landfill	B-16
Drilling Method:		Boring No.
Sampling Method:		Sheet 2 of 2
Water Level ↓		Drilling Start Time / Finish Time
Time		
Date		Date / Date
Reference		
Surface Conditions:		

Driller: _____ Lic.No. _____

Checked By: _____

Date: _____

Sampler Type	Inches Driven / Inches Recovered	Depth of Casing	Sample No / Sample Depth	Blows/6 in Sampler	Depth in Feet	USCS Log
	24 / 24	14	17 / 16	19	0	
				9		
				8	1	
				17		
					2	
					3	
					4	
					5	
					6	
					7	
					8	
					9	
					0	
					1	
					2	
					3	
					4	
					5	
					6	
					7	
					8	
					9	
					0	

2" Black fill

22" Red dense clay

FID - 0

PID - 8

CH_4 - 0

End of Hole @ 16 ft.