APPENDIX A

GEOTECHNICAL ANALYTICAL REPORTS

SOILTECH CONSULTANTS, INC.
Geotechnical and Environmental Engineering
230 Highpoint Drive
Ridgeland, Mississippi 39157
(601)952-2995/(601)952-2944 fax

June 10, 2004

Eco-Systems, Inc.
439 Katherine Drive – Suite 2A
Jackson, Mississippi 39232

Attention: Mr. Jeffrey L. Allen, P. E.

Gentlemen:

Submitted herein are the results of laboratory tests performed on soil samples delivered to our office on June 3, 2004. These tests included Atterberg (liquid and plastic) limits, sieve analyses, washes over the No. 200 sieve, permeability and consolidation. The difference between the liquid limit (LL) and plastic limit (PL) is defined as the plasticity index (PI). Soil particles that pass through the No. 200 sieve are fine (silts and clays) and are reported as percentage by weight of the soil sample. Permeability tests determine the hydraulic conductivity, k_{20}, of the soil. Sieve analyses determine the particle size distributions and are presented as gradation curves. Consolidation tests determine the compressibility characteristics of the soil and are presented as void ratio or volume change versus stress curves. Results of the Atterberg limits, No. 200 washes and permeability tests are presented below. Results of the sieve analyses and consolidation test are attached.

			Atterberg Limits			
Sample ID	Sample Depth	Soil Description	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	% Fines
EB-1	27.0 Ft	Hard light gray silty/sandy clay	27	19	87	67.8
EB-2	17.0 Ft	Hard tan and light gray clay w/silt	47	21	26	97.9
			Hydraulic Conductivity			
EB-1	27.0 Ft	Hard light gray silty clay	1.28 X 10^{-7} cm/sec			

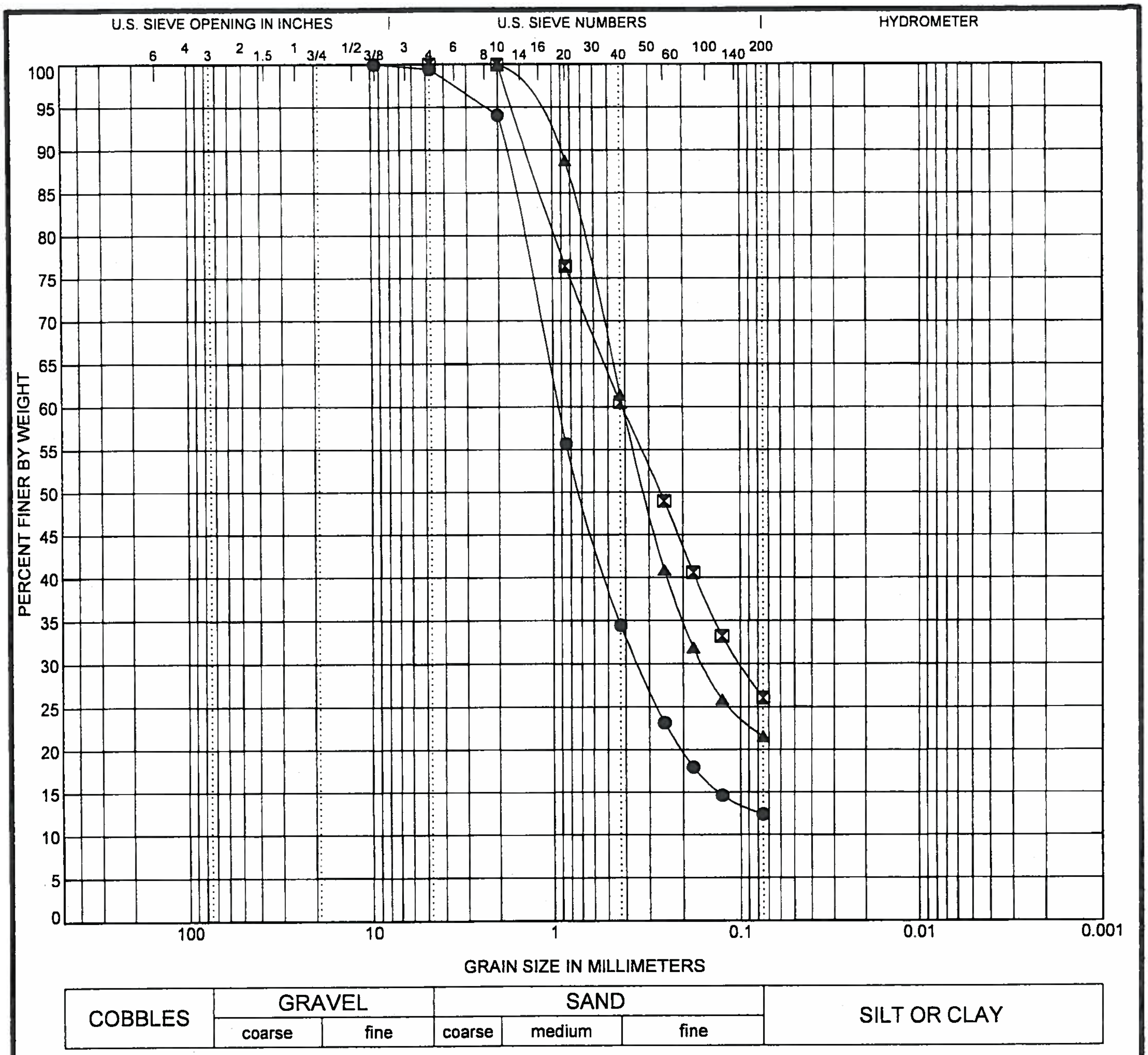
We appreciate the opportunity to provide our services to you. If you have any questions or need additional information, please call.

Very Truly Yours,
SoilTech Consultants, Inc.

Gregory L Gillen

Gregory L. Gillen, P. E.

Copies Submitted: (2)



Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	PB-1	7.0					2.96	21.83
☒	PB-2	2.0						
▲	PB-3	2.0						

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	PB-1	7.0	9.5	0.936	0.345		0.6	87.0	12.4	
☒	PB-2	2.0	4.75	0.415	0.099		0.0	73.9	26.1	
▲	PB-3	2.0	4.75	0.41	0.159		0.0	78.4	21.6	

SoilTech Consultants, Inc.

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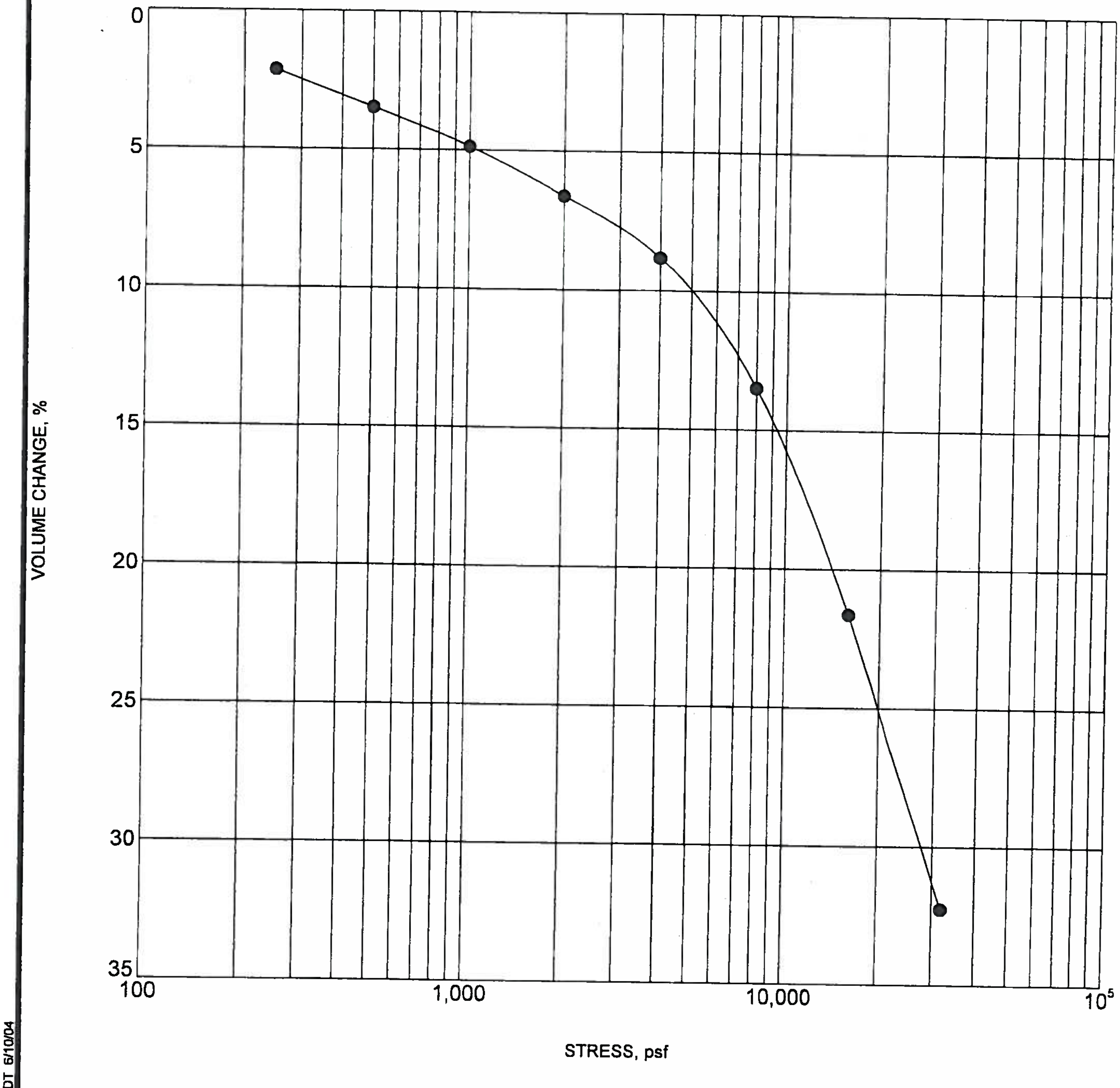
GRAIN SIZE DISTRIBUTION

Project Name: EcoSystem
Location:
Number: 1031.01



	Specimen Identification		Classification	γ_d	MC%
●	PB-3	2.0	Dark gray silty clay (CL), slightly sandy	29	103

US EM CONSOL STRAIN 1031.01.ECOSYSTEM.GPJ NEEL SCHAFFER.GDT 6/10/04

SoilTech Consultants, Inc.
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Ridgeland, Mississippi 39157
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CONSOLIDATION TEST

Project Name: EcoSystem
Location:
Number: 1031.01

APPENDIX B

BORING LOGS

Eco-Systems, Inc.
Consultants, Engineers and Scientists

BORING LOG

Sheet: 1 of 2

Project: Hercules - Hattiesburg
Well/Boring No.: EB-1
Project No.: HER24100
Date(s): 25-May-04
Logged By: CVC
Well/Boring Location: North of sludge pits
Drilling Method: Hollow Stem Auger
Drilling Contractor: Singley Construction Company
Depth to Groundwater: 6
Date: 25-May-04
Reference: GS
Elevation - Top of Casing: na
Inner Casing: na
Outer Casing: na
Water Table: na
Date:
Reference: na
Remarks: TD = 32 feet b.g.s
No well installed

Depth, Sample Pt.	Sample Location	Blows	Lithologic Description	Graphical Logs Strata	 Well Construction	Organic Vapor Headspace Analysis (ppm)
			dark brown, fine, sand (SP);	░	NO WELL INSTALLED	
5	1	4-18-11-13	tan and gray, gravelly, fine, sand (SP), saturated;	░		
10	2	4-6-8-11	as above	░		
15	3	6-11-14-21	gray, firm-stiff, slightly sitly, sandy, clay (CH)	▨		
20	4	8-10-13-15	as above, stiff;	▨		

Note: Not all portions of this form are applicable to all projects

Eco-Systems, Inc.
Consultants, Engineers and Scientists

BORING LOG

Sheet: 2 of 2

Project: Hercules - Hattiesburg

Project No.: HER24100

Date(s): 25-May-04

Well/Boring No.: EB-1

Logged By: CVC

Depth, Sample Pt.	Sample Location	Blows	Lithologic Description	Graphical Logs		Organic Vapor Headspace Analysis (ppm)
				Strata	Well Construction	
25	5	Shelby Tube	as above, a few sand partings;	▨	NO WELL INSTALLED	
30	6	6-7-11-12	as above;	▨		
			Boring terminated at 32 feet below ground surface			
35						
40						
45						

Eco-Systems, Inc.
Consultants, Engineers and Scientists

BORING LOG

Sheet: 1 of 1

Project: Hercules - Hattiesburg
Well/Boring No.: **EB-2**
Project No.: HER24100
Date(s): 25-May-04
Logged By: CVC
Well/Boring Location: North of landfill
Drilling Method: Hollow Stem Auger
Drilling Contractor: Singley Construction Company
Depth to Groundwater: 6
Date: 25-May-04
Reference: GS
Elevation - Top of Casing: na
Inner Casing: na
Outer Casing: na
Water Table: na
Date:
Reference: na
Remarks: TD = 17 feet b.g.s
No well installed

Depth, Sample Pt.	**Sample Location**	**Blows**	**Lithologic Description**	**Graphical Logs** **Strata**	**Graphical Logs** **Well Construction**	**Organic Vapor Headspace Analysis (ppm)**
			gravel (GW) (fill);		**NO WELL INSTALLED**	
			dark brown, sandy, clayey, silt (ML), (fill);			
5	1	4--4-4-4	as above			
			gray, v. silty, sand (SM);			
10	2	1-1-2-4	gray, soft, few pea gravel, sandy clay (CL) saturated;			
			gray, stiff-hard, slightly sandy, high plasticity, clay (CH)			
15	3	4-6-8-12	as above, some iron staining;			
			Boring terminated at 17 feet below ground surface			
20						

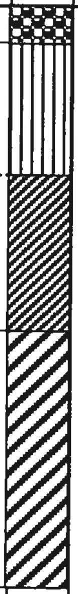
Note: Not all portions of this form are applicable to all projects

Eco-Systems, Inc.
Consultants, Engineers and Scientists

BORING LOG

Sheet: 1 of 1

Project: Hercules - Hattiesburg
Well/Boring No.: EB-3
Project No.: HER24100
Date(s): 25-May-04
Logged By: CVC
Well/Boring Location: Northeast of landfill
Drilling Method: Hollow Stem Auger
Drilling Contractor: Singley Construction Company
Depth to Groundwater: 6
Date: 25-May-04
Reference: GS
Elevation - Top of Casing: na
Inner Casing: na
Outer Casing: na
Water Table: na
Date:
Reference: na
Remarks: TD = 12 feet b.g.s
No well installed

Depth, Sample Pt.	Sample Location	Blows	Lithologic Description	Graphical Logs Strata	Graphical Logs Well Construction	Organic Vapor Headspace Analysis (ppm)
			gravel (GW) (fill);		NO WELL INSTALLED	
			dark brown, sandy, clayey, silt (ML), (fill);			
5	1	2-4-6-9	gray, soft, few pea gravel, sandy clay (CL) moist;			
			lt. gray, stiff-hard, slightly silty, high plasticity, clay (CH), few sand partings			
10	2	5-8-10-13	as above, some iron staining;			
			Boring terminated at 12 feet below ground surface			
15						
20						

Note: Not all portions of this form are applicable to all projects

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BORING LOG

Sheet: 1 of 1

Project: Hercules - Hattiesburg
Well/Boring No.: **EB-4**
Project No.: HER24100
Date(s): 25-May-04
Logged By: CVC
Well/Boring Location: East of landfill
Drilling Method: Hollow Stem Auger
Drilling Contractor: Singley Construction Company
Depth to Groundwater: 6
Date: 25-May-04
Reference: GS
Elevation - Top of Casing: na
Inner Casing: na
Outer Casing: na
Water Table: na
Date:
Reference: na
Remarks: TD = 27 feet b.g.s
No well installed

Depth, Sample Pt.	**Sample Location**	**Blows**	**Lithologic Description**	**Graphical Logs**		**Organic Vapor Headspace Analysis (ppm)**
				Strata	**Well Construction**	
			dark brown, sandy, clayey, silt (ML), (fill);	▥	NO WELL INSTALLED	
5	1	6-1-1-1	no recovery	▥		
10	2	1-1-2-4	dark brown, sandy, clayey, silt (ML), (fill), saturated;	▥		
15	3	4-6-8-12	as above, black;	▥		
			as above;	▥		
20	4		gray, soft, slightly sandy, clay (CH), wet;	▨		

Note: Not all portions of this form are applicable to all projects

Eco-Systems, Inc.
Consultants, Engineers and Scientists

BORING LOG

Sheet: 2 of 2

Project: Hercules - Hattiesburg

Well/Boring No.: **EB-4**

Project No.: HER24100

Date(s): 25-May-04

Logged By: CVC

Depth, Sample Pt.	Sample Location	Blows	Lithologic Description	Graphical Logs Strata	Graphical Logs Well Construction	Organic Vapor Headspace Analysis (ppm)
25	5	**Shelby Tube**	as above, firm to stiff;	▨	**NO WELL INSTALLED**	
			Boring terminated at 27 feet below ground surface			
30						
35						
40						
45						

Note: Not all portions of this form are applicable to all projects

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Eco-Systems, Inc.
Consultants, Engineers and Scientists

BORING LOG

Sheet: 1 of 1

Project: Hercules - Hattiesburg
Well/Boring No.: **PB-1**
Project No.: HER24100
Date(s): 25-May-04
Logged By: CVC
Well/Boring Location: Central area of sludge pits
Drilling Method: Hollow Stem Auger
Drilling Contractor: Singley Construction Company
Depth to Groundwater: 6
Date: 25-May-04
Reference: GS
Elevation - Top of Casing: na
Inner Casing: na
Outer Casing: na
Water Table: na
Date:
Reference: na
Remarks: TD = 12 feet b.g.s
No well installed

Depth, Sample Pt.	Sample Location	Blows	Lithologic Description	Graphical Logs: Strata	Graphical Logs: Well Construction	Organic Vapor Headspace Analysis (ppm)
			black & orange, sludge.	▩	NO WELL INSTALLED	
5	1	Shelby Tube	as above, saturated.	▩		
			black & gray, few gravel, sand (SP), saturated.	░		
10	2	5-8-10-13	as above, gray.	░		
			Boring terminated at 12 feet below ground surface			
15						
20						

Note: Not all portions of this form are applicable to all projects

Eco-Systems, Inc.
Consultants, Engineers and Scientists

BORING LOG

Sheet: 1 of 1

Project: Hercules - Hattiesburg
Well/Boring No.: **PB-2**
Project No.: HER24100
Date(s): 25-May-04
Logged By: CVC
Well/Boring Location: Central area of sludge pits
Drilling Method: Hollow Stem Auger
Drilling Contractor: Singley Construction Company
Depth to Groundwater: 6
Date: 25-May-04
Reference: GS
Elevation - Top of Casing: na
Inner Casing: na
Outer Casing: na
Water Table: na
Date:
Reference: na
Remarks: TD = 7 feet b.g.s
No well installed

Depth, Sample Pt.	Sample Location	Blows	Lithologic Description	Graphical Logs		Organic Vapor Headspace Analysis (ppm)
				Strata	Well Construction	
		Shelby Tube	black & orange, sludge. as above, saturated.	▩	NO WELL INSTALLED	
5	1		tan, fine grained, sand (SP), saturated.	░		
			Boring terminated at 7 feet below ground surface			
10						
15						
20						

Note: Not all portions of this form are applicable to all projects

Eco-Systems, Inc.
Consultants, Engineers and Scientists

BORING LOG

Sheet: 1 of 1

Project: Hercules - Hattiesburg
Well/Boring No.: **PB-3**
Project No.: HER24100
Date(s): 25-May-04
Logged By: CVC
Well/Boring Location: Central area of sludge pits
Drilling Method: Hollow Stem Auger
Drilling Contractor: Singley Construction Company
Depth to Groundwater: 6
Date: 25-May-04
Reference: GS
Elevation - Top of Casing: na
Inner Casing: na
Outer Casing: na
Water Table: na
Date:
Reference: na
Remarks: TD = 7 feet b.g.s
No well installed

Depth, Sample Pt.	Sample Location	Blows	Lithologic Description	Graphical Logs Strata	Graphical Logs Well Construction	Organic Vapor Headspace Analysis (ppm)
		Shelby Tube	black & orange, dry, sludge. as above, saturated.	▩	NO WELL INSTALLED	
5	1		tan, fine grained, sand (SP), saturated.	░		
			Boring terminated at 7 feet below ground surface			
10						
15						
20						

Note: Not all portions of this form are applicable to all projects

APPENDIX C

HYDRAULIC CONDUCTIVITY ESTIMATES AND SEEPAGE VELOCITY CALCULATIONS

Horizontal Seepage Velocity Calculation Worksheet
Hercules, Incorporated
Hattiesburg, Mississippi
ESI Project No. **HER24100**

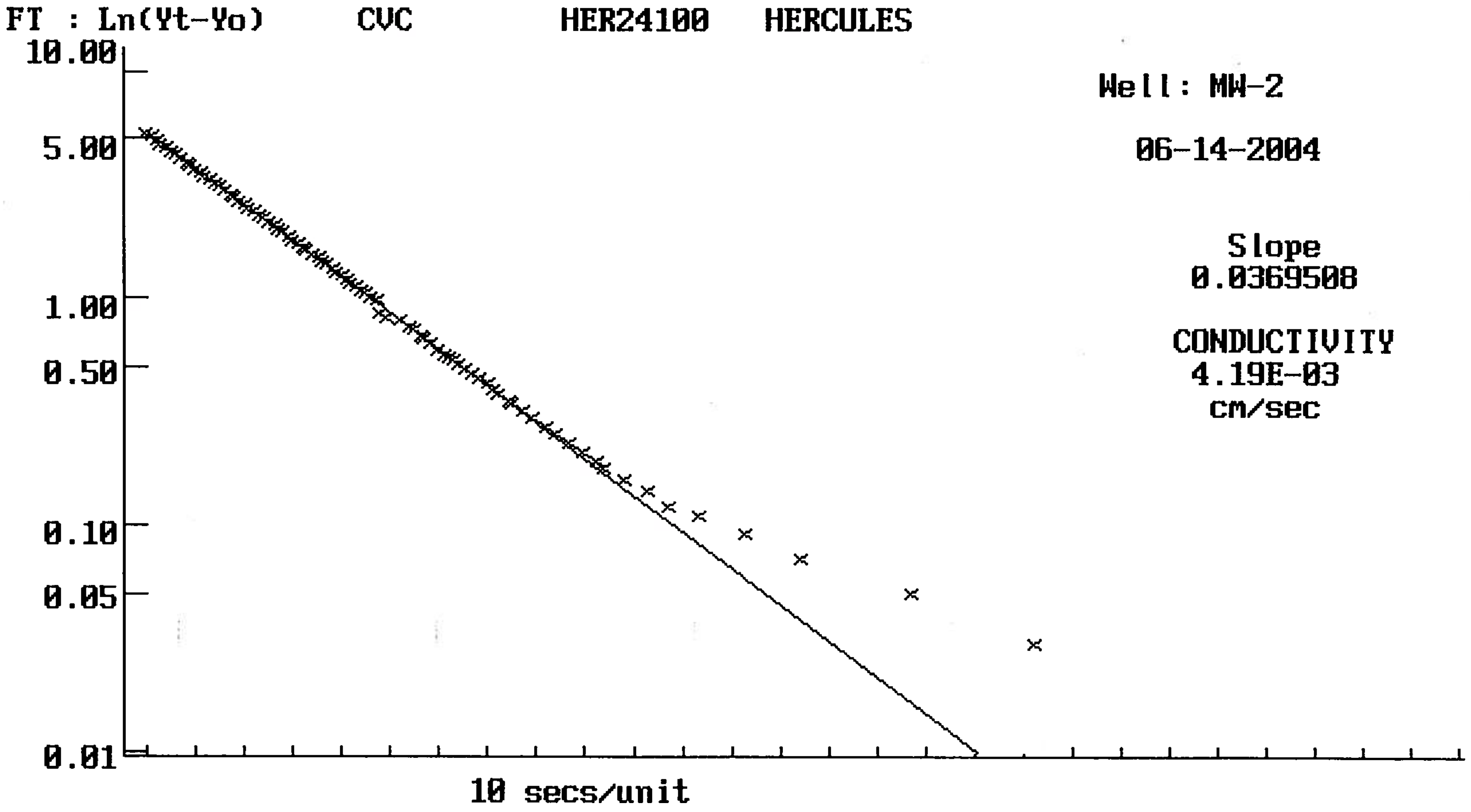
Date of Field Data: **03-Jun-04**
Date of Calculation: **15-Jun-04**
Calculations by: **CVC**

Variable	**Western Area**	**Landfill**	**Sludge Pits**
Hydraulic Cond.(k) cm/s	0.00251	0.00251	0.00251
Horiz. Change (dh) ft.	350	415	400
Vert. Change (dv) ft.	5	10	1.5
Gradient (i) ft/ft	0.01429	0.02410	0.00375
Effective Porrosity (n)	0.35	0.35	0.35
Horiz. Seepage Velocity			
Q=ki/n (cm/s)	1.02E-04	1.73E-04	2.69E-05
Q=ki/n (**ft/yr**)	**106.0**	**178.8**	**27.8**

Hydraulic Gradient calculated using the potentiometric surface map prepared from water level measurements on October 31, 2003.

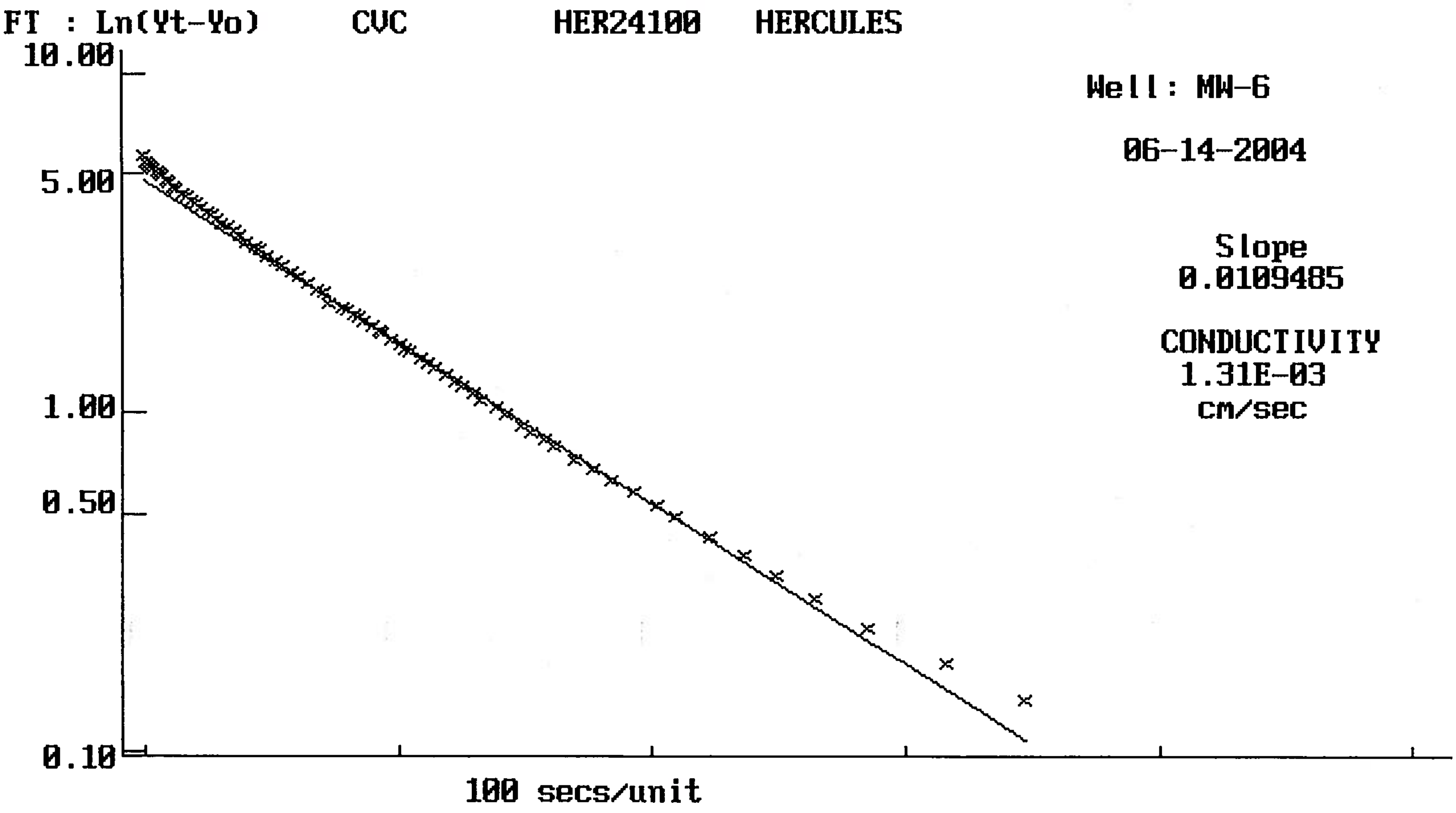
```
                       HYDROCON -  1.2
                    HYDRAULIC CONDUCTIVITY
                    Bouwer and Rice Method

Well: MW-2

PROJECT NAME: HERCULES                              USER NAME: CVC
PROJECT NUMBER: HER24100                            DATE: 06-14-2004
FIELD WORK DATE(S): 06-03-2004

Rw - BORING RADIUS (IN):  3.25                      Rc - WELL RADIUS (IN):  1
L - SCREEN LENGTH (FT):  10                         D - AQUIFER THICKNESS (FT)21
HT - SCREEN BASE TO WATER TABLE (FT):  17.67        STATIC WATER LEVEL (FT):4.68
START TIME (H,M,S): 0,0,0

Rc was corrected for response in well screen filter material to  1.967 in

-----------------------------------------------------------------------

TIME (H,M,S)   DEPTH (FT)                      TIME (H,M,S)   DEPTH (FT)
0,0,0          10.01                           0,0,30         6.47
0,0,1.2        9.78                            0,0,31.2       6.41
0,0,2.4        9.58                            0,0,32.4       6.35
0,0,3          9.41                            0,0,33         6.28
0,0,4.2        9.24                            0,0,34.2       6.23
0,0,5.4        9.08                            0,0,35.4       6.18
0,0,6          8.92                            0,0,36         6.11
0,0,7.2        8.76                            0,0,37.2       6.07
0,0,8.4        8.62                            0,0,38.4       6.01
0,0,9          8.48                            0,0,39         5.97
0,0,10.2       8.33                            0,0,40.2       5.92
0,0,11.4       8.22                            0,0,41.4       5.88
0,0,12         8.09                            0,0,42         5.83
0,0,13.2       7.98                            0,0,43.2       5.8
0,0,14.4       7.86                            0,0,44.4       5.75
0,0,15         7.74                            0,0,45         5.71
0,0,16.2       7.65                            0,0,46.2       5.68
0,0,17.4       7.53                            0,0,47.4       5.65
0,0,18         7.44                            0,0,48         5.52
0,0,19.2       7.33                            0,0,49.2       5.49
0,0,20.4       7.25                            0,0,52.2       5.46
0,0,21         7.15                            0,0,54         5.41
0,0,22.2       7.06                            0,0,55.2       5.39
0,0,23.4       6.98                            0,0,56.4       5.35
0,0,24         6.9                             0,0,57         5.33
0,0,25.2       6.83                            0,0,58.2       5.3
0,0,26.4       6.75                            0,1,0          5.26
0,0,27         6.67                            0,1,1.200001   5.24
0,0,28.2       6.61                            0,1,2.400002   5.22
0,0,29.4       6.54                            0,1,3          5.21
```

```
TIME (H,M,S)   DEPTH (FT)                    TIME (H,M,S)    DEPTH (FT)
0,1,4.199997   5.19                          0,1,53.4        4.79
0,1,5.400002   5.16                          0,2,3           4.77
0,1,7.199997   5.14                          0,2,14.39999    4.75
0,1,8.400002   5.12                          0,2,37.2        4.73
0,1,10.2       5.1                           0,3,2.399994    4.71
0,1,11.4       5.07
0,1,12         5.05
0,1,14.4       5.03
0,1,15         5.02
0,1,17.4       5
0,1,19.2       4.98
0,1,22.2       4.95
0,1,24         4.93
0,1,27         4.91
0,1,30         4.89
0,1,32.4       4.87
0,1,34.2       4.86
0,1,38.4       4.84
0,1,43.2       4.82
0,1,47.4       4.8

(1/t) (ln(Yo/Yt))=  0.0369508

PARTIALLY PENETRATING: A=   2.66      B=   0.45

HYDRAULIC CONDUCTIVITY: 1.37E-04 ft/sec
                        4.19E-03 cm/sec
```


FT : Ln(Yt-Yo)
CVC
HER24100
HERCULES
Well : MW-2
06-14-2004
Slope
0.0369508
CONDUCTIVITY
4.19E-03
cm/sec
10.00
5.00
1.00
0.50
0.10
0.05
0.01
10 secs/unit

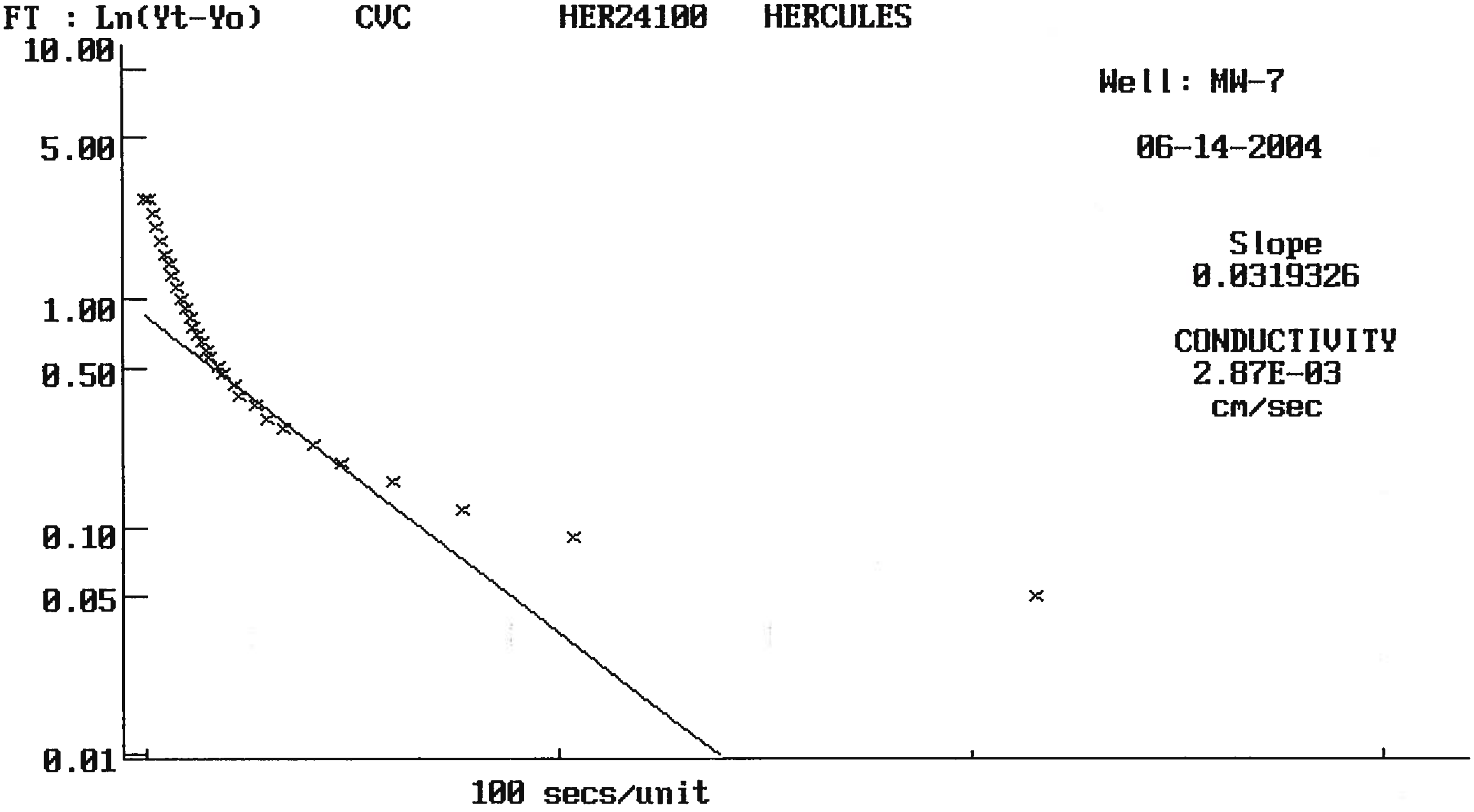
```
                        HYDROCON -  1.2
                     HYDRAULIC CONDUCTIVITY
                     Bouwer and Rice Method

Well: MW-6

PROJECT NAME: HERCULES                              USER NAME: CVC
PROJECT NUMBER: HER24100                            DATE: 06-14-2004
FIELD WORK DATE(S): 06-03-2004

Rw - BORING RADIUS (IN):  3.25                      Rc - WELL RADIUS (IN):  1
L - SCREEN LENGTH (FT):  10                         D - AQUIFER THICKNESS (FT)
HT - SCREEN BASE TO WATER TABLE (FT):  14.18        STATIC WATER LEVEL (FT):
START TIME (H,M,S): 0,0,0

Rc was corrected for response in well screen filter material to  1.967 i

-----------------------------------------------------------------------

TIME (H,M,S)    DEPTH (FT)                 TIME (H,M,S)   DEPTH (FT)
0,0,0           12.58                      0,0,59         9.5
0,0,1           12.38                      0,1,1          9.43
0,0,2           12.28                      0,1,5          9.32
0,0,3           12.19                      0,1,9          9.21
0,0,4           12.1                       0,1,11         9.16
0,0,5           12.01                      0,1,13         9
0,0,6           11.92                      0,1,19         8.94
0,0,7           11.85                      0,1,20         8.91
0,0,9           11.7                       0,1,23         8.85
0,0,10          11.64                      0,1,25         8.81
0,0,12          11.51                      0,1,27         8.76
0,0,13          11.44                      0,1,30         8.7
0,0,15          11.32                      0,1,33         8.64
0,0,17          11.21                      0,1,34         8.62
0,0,19          11.11                      0,1,38         8.54
0,0,21          11                         0,1,41         8.5
0,0,23          10.9                       0,1,43         8.44
0,0,25          10.8                       0,1,45         8.42
0,0,27          10.7                       0,1,49         8.36
0,0,29          10.61                      0,1,52         8.31
0,0,31          10.52                      0,1,55         8.26
0,0,33          10.43                      0,1,59         8.21
0,0,36          10.31                      0,2,3          8.15
0,0,38          10.22                      0,2,6          8.11
0,0,41          10.1                       0,2,10         8.05
0,0,44          10                         0,2,13         8.01
0,0,46          9.93                       0,2,19         7.95
0,0,49          9.81                       0,2,23         7.91
0,0,52          9.7                        0,2,29         7.84
0,0,55          9.62                       0,2,33         7.8
```

```
TIME (H,M,S)   DEPTH (FT)
0,2,38         7.75
0,2,42         7.71
0,2,50         7.65
0,2,57         7.6
0,3,4          7.55
0,3,13         7.5
0,3,22         7.45
0,3,30         7.41
0,3,43         7.35
0,3,57         7.3
0,4,9          7.25
0,4,25         7.2
0,4,46         7.15
0,5,16         7.1
0,5,47         7.06

(1/t) (ln(Yo/Yt))=  0.0109485

FULLY PENETRATING: C=   2.34

HYDRAULIC CONDUCTIVITY: 4.31E-05 ft/sec
                        1.31E-03 cm/sec
```


FT : Ln(Yt-Yo)
CVC
HER24100
HERCULES
Well: MW-6
06-14-2004
Slope
0.0109485
CONDUCTIVITY
1.31E-03
cm/sec
10.00
5.00
1.00
0.50
0.10
100 secs/unit

```
                HYDROCON -  1.2
             HYDRAULIC CONDUCTIVITY
             Bouwer and Rice Method

Well: MW-7

PROJECT NAME: HERCULES                                 USER NAME: CVC
PROJECT NUMBER: HER24100                               DATE: 06-14-2004
FIELD WORK DATE(S): 06-03-2004

Rw - BORING RADIUS (IN):  2.75                         Rc - WELL RADIUS (IN):  1
L - SCREEN LENGTH (FT):  10                            D - AQUIFER THICKNESS (FT)10.2'
HT - SCREEN BASE TO WATER TABLE (FT):  10.22           STATIC WATER LEVEL (FT):12.93
START TIME (H,M,S): 0,0,0

Rc was corrected for response in well screen filter material to  1.723 in

------------------------------------------------------------------------

TIME (H,M,S)   DEPTH (FT)
0,0,0          15.64
0,0,1          15.6
0,0,2          15.25
0,0,3          14.95
0,0,4          14.69
0,0,5          14.49
0,0,6          14.32
0,0,7          14.17
0,0,8          14.04
0,0,9          13.93
0,0,10         13.84
0,0,11         13.75
0,0,12         13.68
0,0,13         13.63
0,0,14         13.58
0,0,15         13.53
0,0,16         13.49
0,0,18         13.44
0,0,19         13.4
0,0,22         13.35
0,0,23         13.3
0,0,27         13.27
0,0,30         13.23
0,0,34         13.2
0,0,41         13.16
0,0,48         13.12
0,1,0          13.09
0,1,17         13.05
0,1,44         13.02
0,3,36         12.98
```

```
(1/t) (ln(Yo/Yt))=  0.0319121

FULLY PENETRATING: C=   2.60

HYDRAULIC CONDUCTIVITY: 9.42E-05 ft/sec
                        2.87E-03 cm/sec
```


FT : Ln(Yt-Yo)
CVC
HER24100
HERCULES
Well: MW-7
06-14-2004
Slope
0.0319326
CONDUCTIVITY
2.87E-03
cm/sec
10.00
5.00
1.00
0.50
0.10
0.05
0.01
100 secs/unit

SUPPLEMENTAL
SITE INVESTIGATION
REPORT

FILE COPY

PREPARED FOR:

HERCULES, INC.

CHEMICAL SPECIALTIES

HATTIESBURG, MISSISSIPPI

NOVEMBER, 2003

PREPARED BY:

Eco·Systems, Inc.

Consultants, Engineers and Scientists

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JACKSON, MISSISSIPPI 39232
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JACKSON, MS • MERIDIAN, MS • MOBILE, AL • HOUSTON, TX

Eco•Systems, Inc.
Consultants, Engineers, and Scientists
Our 10th Year

DEPT OF ENVIRONMENTAL QUALITY
REC'D
NOV 10 2003

November 7, 2003

Mr. William McKercher
Environmental Engineer
Office of Pollution Control
Mississippi Department of Environmental Quality (MDEQ)
Jackson, Mississippi 39289-0385

Re: ***Supplemental Site Investigation Report***
Hercules Incorporated
Hattiesburg, Mississippi
ESI Project No. HER22173

Dear Mr. Mckercher:

Eco-Systems, Inc. (Eco-Systems) is pleased to submit the enclosed *Supplemental Site Investigation Report* prepared on behalf of Hercules, Incorporated (Hercules). The investigation was conducted in accordance with the *Work Plan Supplemental Site Investigation* (Eco-Systems, June 2003). The report includes discussion of the following tasks:

- Groundwater investigation,
- Surface water and stream sediment investigation,
- Geophysical survey of the former landfill area, and
- Geophysical survey of an area in the western portion of the site.

Following your review of the enclosed report, Hercules would like to arrange a meeting with the Mississippi Department of Environmental Control. Please contact Mr. Timothy Hassett of Hercules to schedule the meeting.

If you have any questions or require additional information, please do not hesitate to call Mr. Timothy Hassett at (302) 995-3456 or Caleb Dana (Eco-Systems) at (601) 936-4440.

Sincerely,

Charles V. Coney

Charles V. Coney, P.G.
Senior Scientist

Caleb A. Dana, Jr.

Caleb H. Dana, Jr., P.E., CHMM
Senior Principal Engineer

cc: Timothy Hassett – Hercules Inc. w/ enclosure
C. S. Jordan – Hercules, Hattiesburg w/ enclosure

439 Katherine Drive, Suite 2A • Jackson, MS 39232 • Phone (601) 936-4440 • Fax (601) 936-4463

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APPENDICES

1.0 INTRODUCTION

Eco-Systems, Inc. (Eco-Systems) has been retained by Hercules Incorporated (Hercules) to conduct supplemental site investigation at the Hercules facility in Hattiesburg, Mississippi. The site location is shown on **Figure 1**. The supplemental site investigation was conducted in accordance with the *Work Plan for Supplemental Site Investigation* (Eco-Systems, June 2003) as approved by the Mississippi Department of Environmental Quality (MDEQ) in a letter dated July 11, 2003. The *Work Plan Supplemental Site Investigation* was prepared and implemented in response to a letter from the MDEQ dated February 3, 2003. The February 3, 2003, letter from MDEQ was sent after review by the MDEQ of the *Interim Groundwater Monitoring Report* (Eco-Systems, January 2003). *The Interim Groundwater Monitoring Report* was submitted voluntarily by Hercules after receipt of groundwater analytical results for groundwater monitoring conducted in accordance with the *Hercules' Site Investigation Work Plan* (Eco-Systems, February 1999) and additional comments of the MDEQ approval letter dated April 5, 1999.

1.1 BACKGROUND

Previous site investigations, which were conducted between April 1999 and March 2003, are discussed in the *Interim Groundwater Monitoring Report* (Eco-Systems, January 2003) and the *Hercules Site Investigation Report* (Eco-Systems, April 2003). The findings of the site investigations that are discussed in the *Interim Groundwater Monitoring Report* and the *Hercules Site Investigation Report* include the detection of volatile organic compounds (VOCs) in groundwater at concentrations above Target Remediation Goals (TRGs) identified in the MDEQ Brownfields program. The highest concentrations of VOCs were detected in the groundwater sample collected from monitoring well MW-8. Monitoring well MW-8 is located near the former dioxathion production area.

The February 3, 2003, letter from MDEQ requested that Hercules submit a work plan for supplemental site assessment to delineate the vertical and horizontal extent of VOCs detected in shallow groundwater at the facility. That work plan was submitted to the MDEQ on April 4, 2003. The letter from MDEQ also requested that Hercules conduct a geophysical investigation to delineate the lateral limits of the closed landfill on the site and to locate accumulations of buried metal within the landfill. The MDEQ letter requested the location of buried drums. It should be noted that geophysical methods will only allow for the identification of magnetic anomalies in subsurface soils that may be interpreted as accumulations of buried metallic objects.

After review of the *Work Plan for Supplemental Site Assessment* (Eco-Systems, April 2003), the MDEQ sent a letter to Hercules dated April 24, 2003, which addressed 12 issues in the work plan and requested a revised work plan. Those issues were further discussed in a meeting between Hercules and the MDEQ on June 6, 2003, and in a letter from the MDEQ to Hercules dated June

11, 2003. This revised *Work Plan for Supplemental Site Assessment* (Eco-Systems, June 2003) encompasses the revisions agreed upon between Hercules and the MDEQ.

1.2 PURPOSE AND SCOPE

The original purpose of the supplemental site investigation was to investigate the lateral and vertical extent of the VOCs that were detected in the groundwater samples collected from monitoring wells MW-4, MW-8, MW-9, and MW-11. The original supplemental site investigation also included a geophysical investigation to delineate the lateral limits of the landfill and, if possible, locate accumulations of buried metal. In response to comments from the MDEQ, the supplemental site investigation has been revised to include additional analytical parameters, investigation of the surface water and stream sediments upstream from previously sampled locations, investigation of groundwater quality in the vicinity of piezometers, TP-1, TP-4, TP-5, and TP-11, and additional geophysical investigation in the area west of the landfill.

The scope of this investigation will include the following:

- Mobilize a hydraulic probing unit to the site,
- Install probe borings and temporary monitoring wells, as necessary,
- Collect groundwater samples and have those samples analyzed for constituents of concern,
- Collect hydrogeologic information from probe borings and temporary monitoring wells,
- Evaluate the lateral and vertical limits of the constituents of concern in groundwater and the effectiveness of the existing monitoring well system,
- Collect stream sediment and surface water samples from Green's Creek at locations upstream from previous stream sampling locations,
- Conduct single well response tests and analyze the test data to provide hydraulic conductivity estimates,
- Conduct a geophysical survey to delineate the lateral boundaries of the waste in the former landfill area and locate accumulations of buried metal within the landfill and other areas of the site, and
- Prepare a supplemental site characterization report.

2.0 SITE SETTING

2.1 FACILITY LOCATION AND SITE DESCRIPTION

The Hercules facility is located on approximately 200 acres of land north of West Seventh Street in Hattiesburg, Forrest County, Mississippi. More specifically, the Site is located in Sections 4 and 5, Township 4 North, Range 13 West, just north of Hattiesburg, Mississippi (**Figure 1**). The facility has been in operation since 1923. The facility is bordered to the north by Highway 43 and Illinois-Central & Gulf Railroad, along with various residential and commercial properties. The southern property boundary is bordered by 7th Avenue; and by a cemetery and Zeon Chemical Company to the southwest. Across from these locations are residential areas. The eastern and western boundaries are bordered by sparsely populated residential areas.

The facility's historical operations consisted of wood grinding, shredding extraction, fractionation, refining, distillation, and processing of rosin from pine tree stumps. Historically, over 250 products were produced from the above-referenced operations and included: modified resins, polyamides, ketene dimer, crude tall oil wax emulsions, and Delnav, an agricultural miticide. Structures at the facility include offices, a laboratory, a powerhouse, production buildings, a wastewater treatment plant, settling ponds, a landfill, and central loading and packaging areas.

2.2 TOPOGRAPHY AND SURFACE DRAINAGE

Surface water drainage patterns at the Site conform generally to the topography, which slopes toward Green's Creek on either side (**Figure 2**). Topography slopes generally to the south in the Wastewater Sludge Disposal Area, and to the north/northwest in the Former Industrial Landfill Area and the Former Delnav Production Area. A topographic divide located south/southwest of the Former Delnav Production Area separates north flowing surface water drainage to more east/southeast-trending drainage. The east-trending, perennial stream Green's Creek and its natural and man-made tributaries are the main surface drainage features in the area. Green's Creek leaves the Site at its northeast corner and subsequently runs into Bowie River, located approximately one (1) mile to the north/northeast.

2.3 SITE GEOLOGY AND HYDROGEOLOGY

The Site is located within the Pine Hills physiographic region of the Coastal Plain physiographic province. The topography of the region is characterized by a maturely dissected plain which slopes generally toward the southeast. The topography is dominated by the valleys of the Bowie and Leaf Rivers coupled with the nearly flat or gently rolling bordering terrace uplands.

The geologic formations beneath the Site are as follows (in descending order): Pleistocene alluvial and terrace deposits, the Miocene-aged Hattiesburg and Catahoula Sandstone formations, the Oligocene-aged Baynes Hammock Sand and Chickasawhay Limestone formations, and the Oligocene-aged Bucatunna Clay member of the Byron formation of the Vicksburg group. A conceptual cross section of the regional geology is shown on **Figure 3**.

The recent-aged alluvial and terrace deposits consist of flood plains and gravel, silts, and clays. The thicknesses of the alluvial and terrace deposits are variable due to erosion. Based upon drillers logs of wells located in the vicinity of the Site, thickness of the alluvial and terrace deposits is estimated to be approximately 50 feet. Groundwater at the site occurs within the alluvial and terrace deposits. A potentiometric surface map of the groundwater elevations within the alluvial and terrace deposits at the site is shown on **Figure 4**

Beneath the alluvial and terrace deposits lies the Hattiesburg formation, which is comprised predominantly of clay. Regionally, beneath Forrest County, the formation contains at least two (2) prominent sand beds from which a viable water supply is obtained. Logs from area wells indicate that the Hattiesburg formation ranges from approximately 130 feet to 260 feet in thickness.

The Catahoula sandstone underlies the Hattiesburg formation. It is not exposed near the facility, but is penetrated by numerous wells in the area. A drillers log of a municipal well approximately 1.25 miles northwest of the facility indicated that approximately 770 feet of Catahoula sandstone was encountered.

Near the Site, the Catahoula sandstone overlies the Chickasawhay limestone. Neither the Chickasawhay limestone nor the Bucatunna formation are considered to be very viable aquifers. The Bucatunna formation is comprised of clay and effectively act as a confining layer for the underlying Oligocene aquifer.

The Miocene aquifer is comprised of both the Hattiesburg and Catahoula sandstone formations. The aquifer system is composed of numerous interbedded layers of sand and clay. Because of their interbedded nature, the Hattiesburg and Catahoula sandstone cannot be reliably separated. The formations dip southeastward approximately 30 feet to 100 feet per mile. While this dip steepens near the coast, the formations thicken. The shallowest portions of the aquifer system are unconfined with the surficial water table ranging from a few inches to greater than six (6) feet below land surface. Deeper portions of the aquifer are confined, with artesian conditions common.

3.0 FIELD ACTIVITIES

During the supplemental site investigation, a Geoprobe® was used to investigate site conditions and define the lateral extent and vertical extent of the VOCs previously detected in groundwater samples. The Geoprobe® was also used to investigate groundwater quality in the vicinity of piezometers TP-1, TP-4, TP-5, and TP-11. Surface water and stream sediment samples were collected from Green's Creek at locations up stream from previous sampling locations to investigate the upstream limits of the constituents detected in previous surface water and stream sediment locations.

A geophysical survey was conducted this investigation. The geophysical survey involved data collection with non-intrusive instrumentation to delineate the lateral limits of the landfill area and to locate accumulations of buried metal within the waste matrix. As requested by the MDEQ, the geophysical survey also included a smaller, approximately ¾-acre, area in the western portion of the site. The survey in the western area of the site was intended to locate a potential burial area.

3.1 GROUNDWATER INVESTIGATION

The groundwater investigation conducted during this supplemental investigation consisted of the three following components:

1. Investigation of the extent of VOCs
2. Investigation of groundwater quality in the vicinity of TP-1, TP-4, TP-5, and TP-11
3. Re-sampling of permanent monitoring wells MW-1, MW-4, MW-10 and MW-11.

3.1.1 Investigation of the extent of VOCs

Investigation of the extent of the VOCs previously detected in permanent monitoring wells at the site centered on monitoring well MW-8 and, to a lesser extent, monitoring well MW-9. Although VOCs have been detected in monitoring wells MW-4 and MW-11, the locations of these two monitoring wells between the sludge pits and Green's Creek left little room for additional sampling points. More importantly, the investigation was centered on monitoring well MW-8 due to the concentrations of VOCs detected during previous monitoring events. A representative of the MDEQ was on site during the investigation of the extent of VOCs.

The investigation in the vicinity of MW-8 was conducted by installing temporary monitoring wells in a radial pattern from MW-8. After installing initial temporary monitoring wells, groundwater samples were collected for VOC and Dioxathion analysis. The samples were submitted to by Bonner Analytical and Testing Company (BATCO) for analysis. VOC analyses were conducted on a rapid turn around (approximately 24 hours), and the VOC analytical results were used to determine the need for additional sampling points. Dioxathion analyses were conducted on a standard laboratory turn around of approximately two weeks, and the Dioxathion results were, therefore, not used to determine sample point placement. Sampling continued until VOC analytical results for samples collected from downgradient locations indicated that constituents detected were less than their respective Target Remedial Goals (TRGs). The TRGs are found in the Tier 1 Target Remedial Goal Table of the Final Regulations Governing Brownfields Voluntary Cleanup And Redevelopment In Mississippi, published by the Mississippi Commission on Environmental Quality and adopted May 1999 and revised March 2002.

To investigate the extent of the VOCs previously detected in groundwater samples collected from MW-8 and MW-9, fifteen borings, GP-1 through GP-9 and GP-13 through GP-18, were installed using a Geoprobe® on August 11, 2003 through August 14, 2003. Geoprobe® boring locations are shown on **Figure 2**. Boring GP-1 refused at shallow depth and groundwater was not encountered. Temporary groundwater monitoring wells were installed in the remaining 14 borings. Groundwater samples were collected from the temporary monitoring wells installed in borings GP-2, GP-4 GP-5, GP-6, GP-7, GP-8, GP-9, GP-13, GP-14, GP-15, GP-17 and GP-18. The temporary monitoring wells installed in borings GP-3 and GP-16 yielded insufficient water for sample collection. As previously discussed, the investigation was conducted in an iterative manner, and concentrations of VOCs above applicable TRGs were not detected in the groundwater sample collected from GP-6. Therefore, the sample collected from GP-17, which is located downgradient of GP-6, was not analyzed.

Groundwater encountered in the temporary monitoring wells occurred in saturated alluvial sediments and fill overlying a dense clay unit interpreted to be the Hattiesburg formation. Borings installed for the temporary groundwater monitoring wells refused within the upper 2 feet to 4 feet of the clay. Some borings refused on solid objects in fill material prior to encountering clay, therefore, not all borings could be extended to the top of the dense clay. Temporary groundwater monitoring wells installed during this investigation were installed to the top of the clay or to Geoprobe® refusal, whichever was shallower. In most locations, the alluvium and any overlying fill had a combined thickness of approximately 20 feet, and the saturated zone ranged from approximately 4-feet to 8-feet in thickness.

During the investigation of the extent of the VOCs in groundwater, one soil sample was collected from the boring for temporary monitoring well GP-4. Temporary monitoring well GP-4 was located south of MW-8 in a suspected potential source area. Strong odors were observed from soil core recovered from the boring, and a representative of the MDEQ present at the site requested a sample of the soil core retrieved from 7 feet below ground surface (bgs) to 8 feet bgs. A vertical split of the soil core was also collected and submitted to BATCO for analysis of VOCs.

3.1.2 Investigation In The Vicinity Of Selected Piezometers

The groundwater investigation also included groundwater sample collection from the vicinity of piezometers TP-1, TP-4, TP-5, and TP-11. The groundwater samples were collected by installing temporary monitoring wells with a Geoprobe® within a few feet of each of the piezometers. Temporary monitoring well GP-12 was installed to provide a groundwater quality sample in the vicinity of TP-1, which is located in the central portion of the active plant area. Temporary monitoring well GP-11 was installed to provide a groundwater quality sample in the vicinity of TP-4, which is located in the northwest corner of the extreme western portion of the site. Temporary monitoring well GP-10 was installed to provide a groundwater quality sample in the vicinity of TP-5, which is located in the central portion of the western end of the site. Temporary monitoring well GP-9 was installed to provide a groundwater quality sample in the vicinity of TP-11, which is located west of the former landfill area. Temporary monitoring well GP-9 was a dual purpose sampling point that was also installed to provide data regarding the extent of VOC detected in previous groundwater samples as discussed in Section 3.1.1. The piezometers and temporary monitoring wells are shown on **Figure 2**. Temporary monitoring wells GP-9, GP-10, GP-11 and GP-12 were installed and sampled on August 12, 2003 through August 14, 2003.

As requested by MDEQ, groundwater samples collected from the temporary monitoring wells installed adjacent to piezometers TP-1, TP-4, TP-5, and TP-11 were analyzed for VOCs, semi-volatile organic compounds (SVOCs) and Dioxathion.

3.1.3 Re-sampling of Selected Monitoring Wells

Collection and analysis of groundwater samples from monitoring wells MW-1, MW-4, MW-10, and MW-11 was also included in the groundwater investigation. These four permanent monitoring wells were sampled on August 28, 2003. Other site monitoring wells were not installed during this sampling event. Monitoring wells MW-4, MW-10, and MW-11 were sampled at the request of the MDEQ. Monitoring well MW-1 was included to provide background groundwater data.

As requested by the MDEQ, groundwater samples collected from the permanent monitoring wells were analyzed for VOCs and Dioxathion.

3.2 GEOPHYSICAL INVESTIGATION

On September 2, 2003 through September 6, 2003, geophysical investigation was conducted in two areas of the site, the former landfill area and a smaller area identified in the field by the MDEQ. The geophysical survey areas are shown on **Figure 2**. The purpose of the geophysical investigation of landfill was to identify the limits of the filled area. The purpose of the geophysical investigation of the smaller area identified by the MDEQ was to locate accumulations of subsurface metal. Ground conductivity methods and magnetic intensity methods were used for the geophysical surveys of both areas. Electrical conductivities of subsurface materials were measured using a Geonics, Ltd., Model EM31. The EM31 is useful in detecting buried metal, inorganic groundwater plumes, and landfill cells. Magnetic intensity enhances data interpretation for subsurface magnetic materials such as buried metallic objects and was measured using a Geometrics, Inc., Model G-858 cesium vapor magnetometer. Details of the geophysical survey methods and procedures are described in **Section 4.9**.

3.2.1 Former Landfill Area

A former landfill is located north of the active plant area. The landfill was reported to have operated from approximately 1950 to approximately the early 1970's. The landfill was reportedly used to dispose of boiler ash, miscellaneous trash and debris, and other metallic objects such as empty drums. The practice at the plant at that time was to burn any organic waste materials containing fuel value in the industrial boiler. The approximate boundaries of the former landfill can be topographically identified. A previous geophysical investigation was conducted in 1993 by Black and Veatch Waste Science and Technology Corporation (Black and Veatch) for the U.S. Environmental Protection Agency. The results of the previous geophysical investigation were discussed the *Site Inspection Report* (Black and Veatch, 1993). The landfill area investigated was reported to have the approximate dimensions of 150 by 250 feet in the Black and Veatch report.

In general, conductivity and magnetic intensity data were collected at ten-foot intervals along lines spaced ten feet apart over an area 400 feet east-west and approximately 560 feet north-south. However, various site features, such as wooded areas and fences, made complete coverage of the area impractical. Survey lines were terminated approximately 10 feet south of the fence along the northern property boundary. Dense undergrowth in the wooded area on the north side of the survey area resulted in difficult and time consuming efforts to open survey lines through the wooded area. In order to efficiently open lines through the wooded area, yet maintain effective data density, lines were opened on 20-foot centers through the wooded area. Measurements of both components of terrain conductivity (quadrature and inphase) and magnetic intensity were recorded at 2,141 discrete locations across the former landfill area. Geophysical data are included in **Appendix A**.

3.2.2 Small Geophysical Grid

Geophysical investigation was also conducted in an area 160 feet east-west and 200 feet north-south that was designated in the field by a representative of the MDEQ. The small grid is located west of the main plant area near the intersection of Europa Road and Bacchus Ave. Conductivity and magnetic intensity data were collected at 10-foot intervals along lines spaced 20 feet apart. Measurements of both components of terrain conductivity (quadrature and inphase) and magnetic intensity were recorded at 189 discrete locations in the small geophysical grid. Geophysical data are included in **Appendix A**. A representative of the MDEQ was present during data collection for the small geophysical grid.

3.3 SURFACE WATER AND STREAM SEDIMENT INVESTIGATION

As requested by the MDEQ, surface water and stream sediment samples were collected from Green's Creek at the closest practical location to the point where Green's Creek enters the Hercules property. This sample location, CM-0, is shown on **Figure 2**. For comparison, a surface water sample was also collected from the previous surface water sampling location CM-1. The surface water samples and the stream sediment samples were analyzed for VOCs and Dioxathion.

4.0 METHODS AND PROCEDURES

Unless otherwise stated, field activities will be conducted in accordance with the Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EPA Region IV, November, 2001), (EISOPQAM).

4.1 BORING ADVANCEMENT

Borings were advanced using a direct-push technology, hydraulic probing apparatus (Geoprobe® or similar) equipped with a soil coring device (MacroCore® or similar). The MacroCore® device was driven to the target depth by the Geoprobe, opened to allow soil to enter the device, and driven across the desired sample interval. Ideally, a four-foot long soil core, collected from a precise interval, would then be retrieved from the boring. In practice, the nature of the soil matrix, the presence of fill materials, caving of the side walls of the boring, or equipment malfunctions often prevent full recovery of the soil core. Each boring was cored continuously from the surface to the total depth of the boring. Copies of the boring logs are included in **Appendix B**.

4.2 SOIL SAMPLE COLLECTION

Soil samples were collected using the Geoprobe® with MacroCore®, 2.5-inch diameter, 4-foot long soil coring device. Each soil samples was collected in a new, disposable, plastic liner tube. Soil core lithology was described in the field based on visual characteristics, and the cores were screened immediately after opening using a photo-ionization detector (PID). The PID was calibrated according to manufacturer's instructions each day before initiating soil boring activities.

4.3 GROUNDWATER SAMPLING

Groundwater samples were obtained through the installation of temporary monitoring wells. Immediately following the completion of borehole advancement a temporary monitoring well was installed into the open borehole. Temporary monitoring wells were installed to bracket the observed water table. For each temporary monitoring well, a 10-foot long well screen was installed to the total depth of the boring. Boring and temporary monitoring wells were installed to the top the dense clay interpreted to be the Hattiesburg formation.

Temporary monitoring wells were completed by installing a one-inch (I.D.) PVC screen and riser into the uppermost water-bearing interval. Filter sock was placed over the well screen and secured to the screened interval prior to installation into the borehole. The filter sock has a screen mesh of approximately 240 microns, which is sufficient to retain most fine sand and larger particles. 20/40 silica sand was then added around the screen to a depth of approximately two feet above the top of the screen. A two-foot thick bentonite seal was then placed above the sand. To prevent surface water from entering the boring, the remaining portion of the open hole was also filled with a high solids bentonite seal.

4.3.1 Well Development

Temporary monitoring wells were developed by pumping with a peristaltic pump until the discharge from the well was relatively free and clear of suspended sediment.

4.3.2 Groundwater Sample Collection

Prior to collecting a groundwater samples, the temporary monitoring wells were purged using either *low-flow/low-stress* or traditional volume-based bailer, or similar, techniques. The *low flow/low stress* technique consisted of slowly lowering dedicated tubing connected to a peristaltic pump (or similar device) into the water-bearing zone. Purging consisted of withdrawal of water at a rate that was in equilibrium with recharge (e.g., stabilized water table). Purging continued until field parameters (temperature, pH, specific conductance, and turbidity) stabilized.

If temporary and permanent monitoring wells where the yield of the well is insufficient to support the application of the *low flow/low stress*, traditional volume-based purging using a peristaltic pump were employed. Volume based purging will be continued until at least three (3) volumes of water were evacuated and field parameters stabilize or until five (5) well volumes of water were purged. The field parameters were measured with calibrated instruments and recorded in the field book along with the cumulative amount of water evacuated and time of batch parameter testing.

After the field parameters stabilized (regardless of the purge method), groundwater to be collected for VOC analysis was sampled by stopping the peristaltic pump, removing the influent tubing from the well, and allowing the groundwater contained in the influent tubing to drain into the sample containers. Groundwater collected for other analyses was collected from the discharge stream (tubing or bailer) directly into the laboratory-supplied sample containers for subsequent laboratory analysis. When field replicates were collected for Quality Assurance/Quality Control (QA/QC) concerns, the sample bottles were filled by alternating aliquots in each replicate bottle until each bottle was filled.

Subsequent to sampling, sample containers were placed on ice and delivered to BATCO for analysis. Chain-of-custody documentation accompanied all samples. Personnel involved in sampling wore clean, disposable gloves, which were changed between each sample collection. Non-disposable sampling equipment was decontaminated as outlined in **Section 4.6**.

4.4 SURFACE WATER AND STREAM SEDIMENT SAMPLING

Surface water was collected from Green's Creek by submerging the laboratory supplied sample containers into the flow of the creek to a depth sufficient to fill the containers. Samples were collected beginning downstream and working upstream to mitigate the potential for cross-contamination related to disturbed materials drifting downstream to subsequent sampling locations. To prevent disturbed particles from entering the sample containers, the samples were collected upstream of the sampler. Surface water samples were placed in a iced cooler and delivered under chain-of-custody to BATCO for analysis.

Stream sediments were sampled immediately after collecting the surface water sample from the same location. Sediments to be analyzed for Dioxathion were collected using a stainless steel spoon. The spoon was decontaminated prior to each use. Sediments to be analyzed for VOC were collected using single-use, sampling syringes provided by BATCO. Sediment samples were placed into iced coolers and delivered under chain-of-custody to BATCO for analysis.

4.5 ANALYTICAL METHODS

Groundwater samples were analyzed by BATCO for volatile organic compounds (VOC) according U.S. EPA SW-846 method 8260B and Dioxathion according to Hercules' *Sampling and Analysis Protocol for Determination of Dioxathion in Water*. The groundwater samples collected from locations adjacent to piezometers TP-1, TP-4, TP-5, and TP-11 were also analyzed for semi-volatile organic compounds (SVOCs) according to U.S. EPA SW-846 method 8270.

Surface water and stream sediment samples were analyzed for VOC according U.S. EPA SW-846 method 8260B and Dioxathion according to Hercules' *Sampling and Analysis Protocol for Determination of Dioxathion in Water*.

4.6 DECONTAMINATION

Probe equipment used to collect subsurface soil and groundwater samples (rods and samplers, temporary downhole casings, screens points) and other equipment used in sample collection were decontaminated by the following procedure:

1) Phosphate-free detergent wash.
2) Potable water rinse.
3) Deionized water rinse.
4) Isopropanol rinse.
5) Organic-free water rinse or air dry.
6) Individual tin foil wrap.

For boring activities, new disposable sample liners were used between sample intervals within the same boring, thereby requiring decontamination between boring locations only.

4.7 QA/QC PROCEDURES

To attain Site QA/QC objectives in terms of accuracy, precision, completeness, comparability, and representativeness, QA/QC samples were collected and sent to the analytical laboratory for analysis. QA/QC samples collected in the field consisted of field duplicates, splits, and equipment rinsate blanks.

Field split samples of groundwater were collected by alternating groundwater aliquots into the container for the split and the container for the normal sample. Split samples were collected in this manner for both regulatory oversight and internal QA/QC. During this investigation one equipment rinsate sample, RS-01, was collected during temporary well installation by running deionized water through a decontaminated core tube and disposable liner. A field duplicate groundwater sample was collected from temporary monitoring well GP-8. Matrix spike and matrix spike duplicate groundwater samples were also collected from temporary monitoring well GP-8. Blind duplicate groundwater samples were collected from three locations. Blind duplicate sample BD-1 was collected from temporary monitoring well GP-7. Blind duplicate sample BD-2 was collected from temporary monitoring well GP-10. Blind duplicate sample BD-3 was collected from permanent monitoring well MW-1.

One groundwater split sample was collected from temporary monitoring well GP-6 for the MDEQ. One soil split sample was also collected for MDEQ from the boring for GP-4 from 7 feet bgs to 8 feet bgs. Both the soil and groundwater splits were collected at the request of the MDEQ and delivered to the MDEQ representative at the site immediately after sample collection.

The soil sample was collected by splitting sampled section of the soil core vertically. The smeared portion of the sample material that had been in contact with the soil sample liner was removed from the sample material using a decontaminated stainless steel spatula. The soil sample material was to be analyzed for VOCs, and, per EISOP procedures, was not homogenized prior to placing in containers. The sample material was placed directly into new, pre-cleaned, soil sample containers. One container was delivered to the MDEQ representative, the other sample container was placed in an iced cooler. The soil sample was delivered, under chain-of-custody, to BATCO for analysis.

4.8 DERIVED WASTE MANAGEMENT

Waste derived during the temporary monitoring well installation and sampling, (e.g., soil cuttings, plastic sampling tubes, decontamination water, well purge water, personal protective equipment, etc.) were containerized immediately following generation and staged near the road for subsequent management. Containers generated during investigative activities were marked in the field. Groundwater generated during sampling of permanent monitoring wells was managed through the wastewater treatment plant at the site. After review of the analytical data, it is expected that purge water and decontamination water generated during temporary monitoring well installation and sampling will also be handled through Hercules' wastewater treatment facility. Soil cuttings generated during temporary monitoring well installation will be sampled to determine how they may best be handled.

4.9 GEOPHYSICAL SURVEY

4.9.1 Electromagnetic Terrain Conductivity

Ground conductivity is a non-intrusive method of measuring lateral variation in the electrical conductivity of subsurface materials. Measurements of electrical conductivity will be made with an EM31 Meter. The device is manufactured by Geonics Limited, of Mississauga, Ontario. The EM31 is simple in form, consisting of a magnetic field transmitting coil, a magnetic field receiving coil, and associated electronics. The coils of the instrument are held co-planar, at a fixed inter-coil spacing of twelve (12) feet. The transmitter coil is energized with an audio frequency alternating current. The resulting primary magnetic field (Hp) induces small electrical currents in the ground. These currents induce secondary magnetic fields (Hs) which, together with the primary field, are sensed by the receiver coil. Electrical conductivities of subsurface materials are deduced from the ratios of secondary to primary fields.

The EM31 is constructed in such a way that the secondary to primary magnetic field ratio (Hs/Hp) is proportional to ground conductivity. The phase of the secondary field lags that of the primary by at least 90°, due to inductive coupling between the transmitter coil and the target conductive material. Additional lag is determined by the properties of the conductor as an electrical circuit. For very poor conductors, the additional lag is close to zero. For very good conductors, it is close to 90°. Generally, the secondary field is somewhere between 90° and 180° out of phase with the primary. That portion of Hs which is only 90° out of phase is called the quadrature component. The EM31 is calibrated to provide quadrature values directly in standard conductivity units of milliSiemens per meter (mS/m). The fraction of Hs which is fully 180° out of phase with Hp is called the inphase component. Inphase values are provided in parts per thousand (ppt) of the primary field.

Both quadrature and inphase values were simultaneously recorded by an automatic data logger for each survey point in the subject area. Both are influenced by the broad range of subsurface conductivities resulting from minute dissolution of soil particles, inorganic groundwater plumes, fill materials and buried metals. Being generally more sensitive to variations in relatively poor conductors, quadrature readings are used to interpret such features as relative inorganic groundwater concentrations. Being generally more sensitive to good conductors, on the other hand, inphase readings are the primary indicators of subsurface metal. Both quadrature and inphase values were recorded during this survey.

The secondary field signal received and processed by the EM31 does not represent ground conductivity at a particular depth. Instead, it represents an integration of conductivities through thicknesses of tens of feet. Eighty (80%) percent of the instrument reading, for example, is due to materials lying at depths shallower than about thirty (30) feet. The thirty (30) foot level may be considered an "effective" exploration depth for detection of significant groundwater plumes. The maximum depth for detection of metallics is a function of the type and amount of buried material. Tightly packed accumulations low-grade steel can be found at depths of over 20 feet.

The EM31 was calibrated according to manufacturer instructions, at the beginning of each survey session. Calibrations were carried out at a fixed location within the survey area. For this survey the GP-17 location was used as a base station. The GP-17 location was relatively free of magnetic interference and near enough to both survey areas to be convenient. Both quadrature and inphase values were recorded. After data collection, the devices was taken back to the calibration point. Quadrature and inphase values were, again, recorded. The differences in the two data sets were used to determine and correct for "machine drift".

4.9.2 Magnetic Intensity

Total magnetic field intensity was measured with a Geometrics, model G858 cesium vapor magnetometer. The device measures total field intensities by detecting a self-oscillating split-beam cesium vapor mechanism. The G-858 was rigged with one sensor at waist height of the operator. The device has a data logging capability that was used to record total magnetic field intensity at each survey location. A series of manual readings was collected at a fixed location at approximately one-hour intervals. The intensity versus time curves generated from the manual readings were used to correct the G-858 survey data for diurnal variations of the earth's magnetic field. The data set produced reflect the anomalous fields produced by buried magnetic material, surficial magnetic material and other magnetic field from cultural sources (electric utilities, etc.). The effective exploration depth of the device is a function of the type and amount of underlying metal. A manual summarizing the theory and operation of magnetometers is provided by the manufacturer (Breiner, 1973).

4.10 OTHER PROCEDURES

Procedures for soil boring and well installation, sample collection, sample containerization and packing, sample shipment, cross-contamination control, drummed material disposal, field documentation, chain-of-custody, data review, and other work items not specifically covered in this document were conducted in accordance with the EISOPQAM.

5.0 RESULTS

5.1 GEOLOGY AND HYDROGEOLOGY

Borings installed during this investigation encountered soils that are generally described as gray and tan, fine-grained, sand with varying amounts of fill material, silt, clay and gravel from the surface to depths ranging from 5 feet below ground surface to greater than 22 feet below ground surface. These sandy soils are typical of the alluvial and terrace deposits discussed in Section 2.3. Underlying the fill material and/or sandy soils is a gray, stiff, silty and/or sandy clay. Descriptions of the clay are consistent with descriptions of the Hattiesburg formation described in Section 2.3. Geoprobe® borings at the site refused in the clay, and the thickness of the clay beneath the site was not determined. However, published sources discussed in Section 2.3 indicate that the Hattiesburg formation may be over 130 feet thick beneath the site.

Observations during this investigation and previous investigations indicate that groundwater occurs in the alluvium and fill at the top of the clay. Water level information was collected from monitoring wells MW-1 through MW-6, the 14 piezometers, 13 temporary monitoring wells, and the four (4) staff gauges on October 31, 2003. Based on the surveyed elevations of the wells, piezometers, and staff gauges, water level elevations were calculated. A summary of the water level information data is provided in **Table 1**. Based on the water level information, a potentiometric surface map has been prepared for the uppermost saturated interval and Green's Creek. The potentiometric surface map is shown on **Figure 4**.

As reported during previous investigations, groundwater in the uppermost, saturated interval beneath the site tends to mimic surface topography. In the active portions of the plant operations, which are located in the southeastern portion of the site, the potentiometric surface indicates the presence of a southwest to northeastward trending divide. The potentiometric surface map indicates that groundwater located to the northwest of the divide would tend to move northwestward towards Green's Creek. Likewise, groundwater southeast of the divide would tend to move southeastward. On the north side of Green's Creek, the potentiometric surface indicates that groundwater in the uppermost, saturated interval moves generally southward towards Green's Creek.

Surface water enters the site on the west side of the property via Green's Creek. Green's Creek flows towards the east in the northern portion of the property. Elevations of the stream surface are significantly lower than the groundwater. This indicates that, while groundwater may contribute to flow in Green's Creek, hydraulic connection between the uppermost saturated interval and Green's Creek is retarded. The retardation of the water moving from the sand to the creek is likely due to silt and clay in the sand adjacent to the creek.

5.2 GROUNDWATER QUALITY

Analytical results for groundwater samples analyzed during this investigation are summarized in **Tables 2, 3, and 5**. Copies of the laboratory analytical reports are included in **Appendix C**. Sample locations are shown on **Figure 2**.

The following sections are intended to provide a brief overview of the laboratory analytical results, and not an exhaustive discussion of the analytical data.

5.2.1 Investigation of the Extent of VOCs

Analytical results for VOCs and Dioxathion detected in the samples collected from the temporary monitoring wells are summarized in Table 2 and Table 3, respectively.

Thirty-one VOCs were detected in the groundwater sample collected from temporary monitoring well GP-2. Fifteen of the thirty-one VOCs detected in the groundwater sample collected from temporary monitoring well GP-2 were above their respective target remedial goals (TRGs). The TRGs are found in the Tier 1 Target Remedial Goal Table of the Final Regulations Governing Brownfields Voluntary Cleanup And Redevelopment In Mississippi, published by the Mississippi Commission on Environmental Quality and adopted May 1999 and revised March 2002. Those 15 VOCs are 1,1-Dichloroethane, Benzene, Toluene, Bromodichloromethane, Carbon Tetrachloride, Chloroethane, Chloroform, 1,2-Dibromo-3-chloropropane, 1,2-Dichloroethane, 1,2-Dichloropropane, Hexachlorobutadiene, Naphthalene, Tetrachloroethene, 1,1,2-Trichloroethane, and Vinyl Chloride.

Thirteen VOCs were detected in the groundwater sample collected from temporary monitoring well GP-4. Two of the five VOCs, Benzene and Naphthalene, were above their respective TRGs.

One VOC, Toluene, was detected in the groundwater samples collected from temporary monitoring wells GP-5, GP-6, and GP-8. The concentrations of Toluene detected in these samples were below the TRG for Toluene of 1000 µg/L.

Two VOCs were detected in the groundwater sample collected from GP-7. One of the two VOCs, Benzene, was detected at a concentration above the TRG for Benzene of 5 µg/L.

VOCs were not detected in the groundwater samples collected from temporary monitoring wells GP-9, GP-13, and GP-18.

One VOC, Benzene, was detected in the groundwater samples collected from temporary monitoring wells GP-14. The concentration of Benzene detected in the groundwater sample collected from GP-14 was above the TRG.

Seventeen VOCs were detected in the groundwater sample collected from temporary monitoring well GP-15. One of the seventeen VOCs, Benzene, was detected at a concentration above the TRG.

The investigation of the VOCs in groundwater did not indicate a definitive source area for the VOCs detected in groundwater. Instead, multiple source areas appear to be involved. The proximity of MW-8 and GP-2 to the former landfill and the lack of more elevated concentrations of the constituents detected in these two locations would indicate that constituents detected in these two locations are related to the landfill. However, the detection of VOCs, primarily the VOC Benzene, at locations up gradient of GP-2 and MW-8 (e.g. GP-4 and GP-7) indicates that other sources of Benzene may be present. The detection of elevated concentrations of Benzene as well as other VOCs not detected at other sampling locations (e.g. sec-Butylbenzene, Chlorotoluenes, and Dichlorobenzenes) indicates that the adjacent rail spurs may also be an area where release of constituents has historically occurred.

The extent of the VOCs in groundwater appears limited. With the exception of the Naphthalene detection in the groundwater sample collected from GP-8, concentrations of VOCs above TRGs were not detected in groundwater samples collected from down gradient locations on the east side of the railroad that borders the western side of the former landfill area. Naphthalene was not detected in the groundwater sample collected from GP-9, which is located down gradient of GP-8.

Trans-Dioxathion was detected in the groundwater samples collected from GP-4, GP-7, and GP-8. Trans-Dioxathion was not detected in the groundwater samples collected from GP-2, GP5, GP-6, GP-9, GP-13, GP-14, GP-15, GP-17 and GP-18. The detections of Trans-Dioxathion were less than the TRG for total Dioxathion of 54.8 μg/L

Neither Cis-Dioxathion nor Dioxenethion were detected in the groundwater samples collected from the temporary monitoring wells.

5.2.2 Investigation in the Vicinity of Selected Piezometers

Groundwater samples were collected and analyzed from temporary monitoring wells GP-9, GP-10, GP-11, and GP-12, which were located near piezometers TP-11, TP-5, TP-4, and TP-1, respectively. Analytical results for VOCs and Dioxathion detected in the samples collected from temporary monitoring wells are summarized in Table 2 and Table 3, respectively.

One VOC, Benzene, was detected in the groundwater samples collected temporary monitoring wells GP-11 and GP-12 at concentrations above the TRG.

VOCs were not detected in the groundwater samples collected from temporary monitoring wells GP-9 and GP-10.

Dioxenethion, Trans-Dioxathion, and Cis-Dioxathion were not detected in the groundwater samples collected from GP-9, GP-10, GP-11, and GP-12.

SVOCs were not detected in the groundwater samples collected from GP-9, GP-10, GP-11, and GP-12.

5.2.3 Re-sampling of Selected Monitoring Wells

Analytical results for VOCs detected in the samples collected from permanent monitoring wells are summarized in Table 5.

Eight VOCs were detected in the groundwater samples collected from MW-1. One of those eight VOCs, Hexachlorobutadiene, was detected at a concentration above the TRG for Hexachlorobutadiene of 0.859 µg/L.

One VOC, Bromoform, was detected in the groundwater sample collected from permanent monitoring well MW-10. The concentration of Bromoform detected in the sample collected from MW-1 was less than the TRG of 8.48 µg/L.

VOCs were not detected in the VOC samples collected from permanent monitoring wells MW-4 and MW-11. Dioxathion (cis or trans) and Dioxenethion were not detected in the groundwater samples collected from MW-1, MW-4, MW-10, and MW-11.

5.3 GEOPHYSICAL INVESTIGATION

Geophysical investigation using conductivity and magnetic methods was conducted in two areas of the site. The geophysical investigation in the former landfill area was conducted to delineate the limits of the fill. The geophysical investigation of the smaller area in the western portion of the site was conducted to locate accumulations of buried metal.

5.3.1 Former Landfill Area

Terrain in the former landfill area is generally grassed with a section in the northeastern portion of the survey area that is covered with a few large trees and very heavy underbrush. The forested area is bounded on the north end by the road, and is approximately 200 feet from east to west. The forested area is approximately 50 feet wide on the western end and widens to over 200 feet wide on the eastern end. Historically, the landfill area has been defined by topography and site features. The former landfill area is generally flat and approximately the same elevation as Europa Road, which was immediately south of the assumed southern limit of the fill. The former landfill area slopes to the west, north and east. The bottom of the slope on the west, north and east has been considered the limits of the filled area. However, in the southeastern and southwestern corners of the former landfill area, the slope is gentle and the relief is low.

Therefore, marking the exact limits of the fill based on topography is relatively difficult in these areas.

The geophysical survey area for the former landfill area was designed to cover and extend somewhat beyond the topographically-defined boundaries of the filled area. The geophysical survey area is bounded on the east by the ethylene oxide storage area and the north by the fence marking the property boundary. On the south, the survey extended to within a few feet of Europa Road where cultural interference from remnant building foundations, buried utilities, and other cultural interference precluded useful data collection. In the southwestern corner of the landfill, where topographic relief indicating the limits of the fill was less obvious, the geophysical survey limit was based on the judgement of the geophysicist in the field.

Conductivity and magnetic intensity values in the vicinity of the former landfill area have been contoured using a commercially available contouring software and the contours are shown on **Figures 8, 9,** and **10**. To the extent possible, surface metal and other cultural interference that were noted in the field have been evaluated. The largest surface feature that has resulted in geophysical data anomalies is the railroad tracks, which arc through the northwestern corner of the survey area. The effect of the railroad tracks on the geophysical data is particularly obvious in the magnetic intensity data, which is shown on **Figure 10**. The remnant building foundations, which are located along the southern edge of the survey area, and monitoring well MW-8 and piezometer TP-10, which are located along the southern edge of the survey area, also produce obvious data anomalies. Other surface features have been accounted for in the analysis of the data, but they will not be listed individually.

Based on conductivity and magnetic intensity data not affected by surface features and other cultural interference, the limits of the fill have been interpreted. The limits of the former landfill area that were interpreted from the geophysical data are shown on **Figure 11**. The interpreted limits of the fill are based primarily on the large cluster of anomalies observed in all three geophysical data sets. These anomalies are, apparently, due to the presence of subsurface metal. However, the size, shape, and magnitude of the anomalies that comprise the cluster are indicative of multiple metal objects of varying size, shape, depth and composition. This cluster of overlapping anomalies is typical of what is expected from a landfill.

The magnitude of the magnetic anomalies in the southwestern portion of the filled area is somewhat less than other portions of the filled area. Also, in this same area, conductivity data indicate fewer, more isolated buried metal objects, but quadrature conductivity values remain elevated. This indicates a difference in the character of the fill in the southwestern portion of the filled area. The difference in the character of the fill may be due to the thickness, the type of fill material, or both.

5.3.2 Small Geophysical Grid

The terrain in the small geophysical survey grid is approximately level and grassed. It is bounded on the west by Bacchus Avenue and on the east by a metal shed used to store fire fighting equipment. As with many areas of the Hercules site, pieces of scrap metal of varying sizes and compositions are present at the surface.

Conductivity and magnetic intensity values measured in the small geophysical grid have been contoured using commercially available contouring software and the contours are shown on **Figures 12, 13, and 14**. To the extent possible, surface metal and other cultural interference that were noted in the field have been evaluated. The most prominent geophysical data anomaly is the series of high/low conductivity and magnetic intensity measurement that cross the southeastern corner of the site. This anomaly runs from approximately the metal fire fighting equipment shed towards a similar shed southwest of the survey area. This anomaly is interpreted to be a water pipe. Other anomalies related to surface metal and cultural features have been evaluated but will not be listed individually.

Figure 12, **13**, and **14** show several anomalies that can not be readily attributed to surface features/cultural interference. Therefore, the anomalies are interpreted to be related to accumulations of buried metal. The approximate limits of the buried metal producing the anomalies in the geophysical data are shown on **Figure 15**.

5.4 SURFACE WATER AND STREAM SEDIMENT QUALITY

During this investigation, two surface water samples and two stream sediment samples were collected from Green's Creek and those samples were analyzed for VOCs and Dioxathion. The samples were collected from locations CM-0 and CM-1, which are shown on **Figure 2**. Analytical results for these samples are summarized in **Table 6** for parameters detected.

Concentrations of 17 VOCs were detected in the surface water sample collected from sampling location CM-1. Ten of the 17 VOCs detected in the surface water sample collected from sampling location CM-1 were also detected in the surface water sample collected from CM-0. Sampling location CM-0 is located a few feet from the point where Green's Creek enters the Hercules property. It would appear that many of the constituents detected in the surface water collected from Green's Creek are from a source upstream of the Hercules facility.

Concentration of four VOCs were detected in the sediment sample collected from sampling location CM-1. Two of the four VOCs detected in the sediment sample collected from sampling location CM-1 were also detected in the sediment sample collected from CM-0. As stated above, sampling location CM-0 is located a few feet from the point where Green's Creek enters the Hercules property. It would appear that some of the constituents detected in the sediment collected from Green's Creek are from a source upstream of the Hercules facility.

Previous site investigation reported in the *Site Investigation Report* (Eco-Systems, 2003) indicate an upstream source for VOCs detected in surface water and stream sediments in Green's Creek. Data collected from this supplemental site investigation also indicate an upstream source for the some of the VOCs detected in samples from Green's Creek.

Dioxathion (cis or trans) and Dioxenethion were not detected in the surface water and sediment samples collected from locations CM-0 and CM-1.

6.0 FINDINGS AND CONCLUSIONS

The findings and conclusions of this report are based on, or reasonably ascertainable from, published information, field observations, and the results of specific laboratory analyses.

6.1 GEOLOGY AND HYDROGEOLOGY

Selected highlights of the geology and hydrogeology of the site are:

- Soils encountered in borings installed during this supplemental site investigation were described as silty, sandy, clayey alluvial deposits and fill materials overlying a dense, gray, sandy clay, which is interpreted to be the Hattiesburg formation. These results confirm information obtained during previous investigation.

- Groundwater occurs at the top of the dense clay.

- As described in previous investigations, in the active portions of the plant operations, the potentiometric surface indicates the presence of a southwest to northeast trending divide. Groundwater northwest of the divide would tend to move northwestward towards Green's Creek. Groundwater southeast of the divide would tend to move southeastward. North of Green's Creek, the potentiometric surface indicates that groundwater moves generally southward towards Green's Creek. Green's Creek enters the site at the western extremity of the site and flows generally eastward across the northern end of the site.

6.2 GROUNDWATER QUALITY

The findings and conclusions of the groundwater quality investigations conducted during this project are discussed in the following subsections.

6.2.1 Extent of VOCs in Groundwater

The highlights of the investigation of VOCs in groundwater include:

- Concentrations of VOCs above TRGs were detected in samples collected from temporary monitoring wells GP-2, GP-4, GP-7, GP-8, GP-14, and GP-15, that were installed to investigate the extent of the VOCs previously detected in groundwater samples from the site. Isoconcentration contour maps for carbon tetrachloride, benzene and naphthalene are shown on **Figures 5**, **6**, and **7** respectively. Due to the concentrations and/or prevalence, these constituents are deemed representative of the nature and extent of the VOCs detected in groundwater at the site.

- The concentrations of VOCs detected in the samples collected from the temporary monitoring wells do not indicate a single source area for the VOCs.
- The extent of the concentrations of VOCs in the vicinity of monitoring well MW-8 have been defined within the limits of the temporary monitoring wells installed during this investigation. With the exception of Naphthalene in the groundwater sample collected from GP-4, concentrations of VOCs in groundwater above TRGs were not present in samples collected from temporary monitoring wells GP-6, GP-8, and GP-18, which are located down gradient of temporary monitoring wells GP-2 and GP-15. Naphthalene was not detected in the groundwater sample collected from GP-9, which is located down gradient of GP-8.

6.2.2 Extent of Dioxathion in Groundwater

Concentrations of Trans-Dioxathion were detected in groundwater samples collected from temporary monitoring wells GP-4, GP-7, and GP-8 at concentration less than the TRG for total Dioxathion of 54.8 µg/L. Cis-Dioxathion and Dioxenethion were not detected in groundwater samples collected from the site.

6.3 GEOPHYSICAL INVESTIGATION

Conductivity and total magnetic intensity data were used to delineate the limits of the former landfill located north of the main plant area. The limits of the filled are interpreted from the geophysical data are shown on **Figure 11**.

Conductivity and total magnetic intensity data were used to identify accumulations of buried metal in an area west of the main plant area. Accumulations of subsurface metal indicated by the geophysical data are shown on **Figure 15**. Five areas of buried metal are identified on **Figure 15**.

6.4 SURFACE WATER AND STREAM SEDIMENT QUALITY

The highlights of the supplemental investigation of surface water and stream sediment in Green's Creek include the following:

- Concentrations of 17 VOCs were detected in the surface water sample collected from sampling location CM-1. Ten of the 17 VOCs detected in the surface water sample collected from sampling location CM-1 were also detected in the surface water sample collected from CM-0.

- Concentrations of four VOCs were detected in the sediment sample collected from sampling location CM-1. Two of the four VOCs detected in the sediment sample collected from sampling location CM-1 were also detected in the sediment sample collected from CM-0.
- Sampling location CM-0 is located a few feet from the point where Green's Creek enters the Hercules property. It would appear that many of the constituents detected in the surface water and sediments collected from Green's Creek are from a source upstream of the Hercules facility.
- Existing data do not indicate a definite onsite source for the VOCs detected in samples collected from Green's Creek.