DENR USE ONLY: ☐ Paper Report ☐ Electronic Data - Email CD (data loaded: Yes / No) Doc/Event #:

NC DENR
Division of Waste Management - Solid Waste

Environmental Monitoring Reporting Form

Notice: This form and any information attached to it are "Public Records" as defined in NC General Statute 132-1. As such, these documents are available for inspection and examination by any person upon request (NC General Statute 132-6).

Instructions:

- **Prepare one form for each individually monitored unit.**
- **Please type or print legibly.**
- Attach a notification table with values that attain or exceed NC 2L groundwater standards or NC 2B surface water standards. The notification must include a preliminary analysis of the cause and significance of each value. (e.g. naturally occurring, off-site source, pre-existing condition, etc.).
- Attach a notification table of any groundwater or surface water values that equal or exceed the reporting limits.
- Attach a notification table of any methane gas values that attain or exceed explosive gas levels. This includes any structures on or nearby the facility (NCAC 13B .1629 (4)(a)(i).
- Send the original signed and sealed form, any tables, and Electronic Data Deliverable to: Compliance Unit, NCDENR-DWM, Solid Waste Section, 1646 Mail Service Center, Raleigh, NC 27699-1646.

Solid Waste Monitoring Data Submittal Information

Name of entity submitting data (laboratory, consultant, facility owner):

Smith Gardner, Inc.

Contact for questions about data formatting. Include data preparer's name, telephone number and E-mail address:

Name: Madeline German Phone: 919-828-0577 x222

E-mail: madeline@smithgardnerinc.com

Facility name:	Facility Address:	Facility Permit #	NC Landfill Rule: (.0500 or .1600)	Actual sampling dates (e.g., October 20-24, 2006)
Halifax County Closed MSW Landfill	921 Liles Rd, Aurelian Springs, NC	42-04	.0500	August 27-29, 2013

Environmental Status: (Check all that apply)

☐ Initial/Background Monitoring ☐ Detection Monitoring ☒ Assessment Monitoring ☒ Corrective Action

Type of data submitted: (Check all that apply)

☒ Groundwater monitoring data from monitoring wells
☐ Groundwater monitoring data from private water supply wells
☐ Leachate monitoring data
☒ Surface water monitoring data
☐ Methane gas monitoring data
☒ Corrective action data (specify) MNA Parameters
☐ Other(specify)

Notification attached?

☐ No. No groundwater or surface water standards were exceeded.
☒ Yes, a notification of values exceeding a groundwater or surface water standard is attached. It includes a list of groundwater and surface water monitoring points, dates, analytical values, NC 2L groundwater standard, NC 2B surface water standard or NC Solid Waste GWPS and preliminary analysis of the cause and significance of any concentration.
☐ Yes, a notification of values exceeding an explosive methane gas limit is attached. It includes the methane monitoring points, dates, sample values and explosive methane gas limits.

Certification

To the best of my knowledge, the information reported and statements made on this data submittal and attachments are true and correct. Furthermore, I have attached complete notification of any sampling values meeting or exceeding groundwater standards or explosive gas levels, and a preliminary analysis of the cause and significance of concentrations exceeding groundwater standards. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of a fine and imprisonment.

Madeline German, PG — Geologist — 919-828-0577 x 222

Facility Representative Name (Print) — Title — (Area Code) Telephone Number

Signature — Date: 10-14-13

Affix NC Licensed/ Professional Geologist Seal

NORTH CAROLINA LICENSED SEAL 2125 10/14/13 GEOLOGIST MADELINE GERMAN

14 N. Boylan Avenue, Raleigh, NC 27603

Facility Representative Address

C0828

NC PE Firm License Number (if applicable effective May 1, 2009)

Revised 6/2009

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August 2013 Groundwater Monitoring Report

Halifax County Closed MSW Landfill
NC Solid Waste Permit No. 42-04

Prepared for:

Halifax County Solid Waste Department
P.O. Box 70
Halifax, North Carolina 27839

October 2013

Prepared by:

SMITH+GARDNER

14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

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Groundwater Monitoring Report – August 2013

Halifax County Closed MSW Landfill
NC Solid Waste Permit 42-04

Prepared For:

Halifax County Solid Waste Department
Halifax, North Carolina

S+G Project No. Halifax-8

NORTH CAROLINA LICENSED SEAL 2275 GEOLOGIST MADELINE GERMAN 10/14/13

Madeline German, P.G.
Project Geologist

NORTH CAROLINA LICENSED SEAL 1369 GEOLOGIST JOAN A. SMYTH

10/14/13

Joan A. Smyth, P.G.
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October 2013

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Halifax County Closed MSW Landfill
NC Solid Waste Permit No. 42-04

August 2013 Groundwater Monitoring Report

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1.0 INTRODUCTION

The Halifax County Landfill, operating under Solid Waste Permit #42-04, is required to submit semi-annual ground water monitoring reports (15A NCAC 13B .0544) for assessment monitoring. This report presents the results from the semi-annual monitoring event conducted August 27-29, 2013.

The Halifax County Landfill is currently accepting C&D waste over the closed municipal solid waste (MSW) landfill. In December 1997 the landfill stopped accepting MSW; and the County is currently transferring MSW waste off-site to a lined landfill. The old landfill was closed per Solid Waste Regulations and a certification report was submitted to the Solid Waste Section (SWS) in September 1998. In 2007 an Assessment of Corrective Measures[1] was prepared to evaluate previously detected groundwater quality issues as well as remedial options for the site. A Corrective Action Plan (CAP)[2] for the site was approved June 8, 2009. **Section 7.0** of this report provides an update regarding the current corrective action situation for this facility.

This report includes a field procedure summary, laboratory analyses, statistical analyses and ground water characterization. Summary tables and graphs, laboratory analytical reports and statistical results are also provided.

2.0 SITE HYDROGEOLOGY

According to the *1985 North Carolina Geological Map* and *Ground Water in the Halifax Area, North Carolina* (Dept. of Conservation and Development Bulletin #51, 1946) the landfill is situated on the eastern edge of the Eastern Piedmont Physiographic Province; slightly west of the Coastal Plain overlap. Generally, Western Halifax County is underlain by felsic to intermediate, crystalline igneous and metamorphic rocks of early to late Paleozoic age. Eastern Piedmont rocks generally exhibit a northeastern strike and locally dip gently eastward due to regional metamorphism and folding that produced a broad plunging anticline. The area was simultaneously intruded by a number of felsic (granite) plutons. The granitic pluton underlying the landfill is the Butterwood Creek intrusion.

Groundwater depths generally range from near surface level in the lowland areas along Brewer's Creek and its tributary up to 45 ft. below grade along the ridge east of the landfill. Ground water at the site flows generally west towards Brewer's Creek and its tributary. There are minor seasonal variations in the flow pattern, but overall flow direction is consistent.

[1] Richardson Smith Gardner and Associates, Inc., Assessment of Corrective Measures Halifax County Landfill 12/07.

[2] Richardson Smith Gardner and Associates, Inc., Corrective Action Plan Halifax County Landfill 5/09.

3.0 SAMPLING LOCATIONS

The sampling event performed by Environment 1, Inc. utilized the ground water monitoring network that includes eleven monitoring wells (MW-1, MW-2A, MW-2AD, MW-3AS, MW-3D, MW-6D, MW-7D, MW-15R, MW-16A, MW-17 and MW-18S) located around the landfill perimeter, two piezometers (G-13 and G-13D) and three surface water sampling points (SW-1, SW-2 and SW-3) up and downstream of the landfill. Water levels were collected at two piezometer locations (BP-3 and BP-4) located upgradient of the landfill. Trip and equipment blanks were also analyzed for quality control.

Figure 1 illustrates sampling locations. Boring logs for the groundwater monitoring wells are included in **Appendix A**.

4.0 SAMPLING PROCEDURES

Sampling methods followed the protocol outlined in the North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities (DENR, DWM) and the approved site Water Quality Monitoring Plan[3]. Each well was gauged to determine ground water depth and then purged three to five well volumes or until dry. Depth to groundwater is presented in **Table 1**. Field measurements for pH, specific conductivity and temperature were recorded at each well.

Samples were collected by Environment 1 personnel in laboratory prepared containers for the specified analytical procedures. Ground water samples were properly preserved, placed on ice and transported to the laboratory facility within the specified hold times for each analysis. Trip and equipment blanks were also analyzed for quality control.

5.0 FIELD & LABORATORY RESULTS

5.1 Field Results

Temperature, pH, and specific conductance were measured in the field at the time of sampling via direct read instruments. The field parameter results are summarized in **Table 2** and have remained consistent with previously reported sampling events.

5.2 Laboratory Analysis

Samples were transported to Environment 1, Inc., in Greenville, NC, a North Carolina certified laboratory (NC Wastewater ID #10). Laboratory analysis included the following:

- metals via EPA Test Method 200.8,
- Appendix II Volatile Organic Compounds (VOCs) via EPA Test Method 8260B,
- pesticides and PCBs via EPA Test Method 8081B and 8151A and
- semi-volatile organics via EPA Test Method 8270C.

3 Water Quality Monitoring Plan, Halifax County Landfill, Richardson Smith Gardner & Associates, May 2009.

Designated wells (MW-2A, MW-2AD, MW-3AS, MW-3D and MW-6D) were also analyzed for MNA and indicator parameters by Solid Waste Section approved methods as reported on the laboratory report included in **Appendix B** and summarized in **Table 5**. Parameters were reported to the established Solid Waste Section Reporting Limits (SWSLs).

5.3 Laboratory Results

Analytical results were compared to the NCDWM Solid Waste Section Quantitation Limits (SWSLs) and 15A NCAC 2L.0200 (2LStandard).

5.3.1 Inorganic Constituents

Four inorganic constituents barium (MW-2A, MW-6D, MW-16A and G-13), beryllium (G-13), iron (MW-2A, MW-2AD, MW-3AS and G-13) and zinc (MW-2A, MW-2AD, MW-3D, MW-6D, MW-7D, MW-16A, MW-17, G-13 and G-13D) were detected above their respective SWSL standards. Antimony (G-13D) was the only constituent detected above the Groundwater Protection Standard. Two inorganic constituents were detected above the 2L Standard:

- Beryllium (G-13) and
- iron (MW-2A, MW-2AD, MW-3AS and G-13)

Most inorganic constituents were either below the method detection limit (MDL) or were non-quantifiable values, which are noted as "J-values". Inorganic detections are summarized in **Table 3**.

No inorganic constituents were detected above 2B Standards in surface water samples.

5.3.2 Organic Constituents

The following constituents: 1,1-dichloroethane, 1,4-dichlorobenzene, cis-1,2–dichloroethene, benzene, methylene chloride, tetrachloroethene, trichloroethene and vinyl chloride were detected above their respective SWSL. The following constituents were found at concentrations above their respective 2L Standards:

- Benzene (MW-6D and MW-16A);
- 1,1-Dichloroethane (MW-2AD, MW-3D and MW-16A);
- Vinyl chloride (MW-2A, MW-2AD and MW-3AS).

Constituent concentrations reported by the laboratory between the MDL and SWSL are estimated values and are denoted with a "J" qualifier. Organic detections are provided on **Table 4**. Time versus concentration graphs for the constituents detected above their respective SWSL's are included in **Appendix C**.

No organic constituents were detected in surface water samples collected during this event.

5.3.3 MNA Constituents

The general chemistry parameters COD, nitrate nitrogen, TOC, chloride, turbidity, ORP and dissolved oxygen were measured for MNA associated wells MW-2A, MW-2AD, MW-3AS, MW-3D and G-13 this sampling event. General groundwater chemistry indicates anaerobic conditions. MNA indicator results from this event are summarized in **Table 5**, and will be utilized for future site geochemistry and remedial strategy evaluation.

Biochlor analysis using the low and high levels of biotransformation, indicate degradation is occurring. Both downgradient plume models indicate decreases in PCE and TCE with increases in the ethene daughter product. Additionally, the Natural Attenuation Screening protocol indicates limited evidence for anaerobic biodegradation, based on available data. Biochlor evaluation of the downgradient plume is provided in **Appendix D**.

6.0 GROUNDWATER CHARACTERIZATION

A potentiometric surface map was prepared from ground water data for this sampling event. The data indicates that ground water is flowing generally to the west towards Brewer's Creek. This is consistent with ground water flow patterns previously reported for the site. The potentiometric surface map is attached as **Figure 1**.

Ground water flow velocities during the sampling event were calculated for two monitoring wells using the equation:

$$V = KI/n$$

where: K = hydraulic conductivity
I = ground water gradient
n = porosity

Ground water flow velocities ranged from 0.003 ft/day (MW-16A) to 0.110 ft/day (MW-2A). These calculated flow velocities are included in **Table 1**.

7.0 CONCLUSIONS

In general, the detected constituents are consistent with historical analytical data. Tetrachloroethene and trichloroethene concentrations in MW-16A continue to demonstrate an increasing trend. We will continue to watch the trends in this well to evaluate the effectiveness of the passive solar flare installed on the nearby vent well. The next groundwater monitoring event is scheduled for February 2014. A groundwater monitoring report will be submitted to NCDENR after receipt and analysis of laboratory data.

FIGURES

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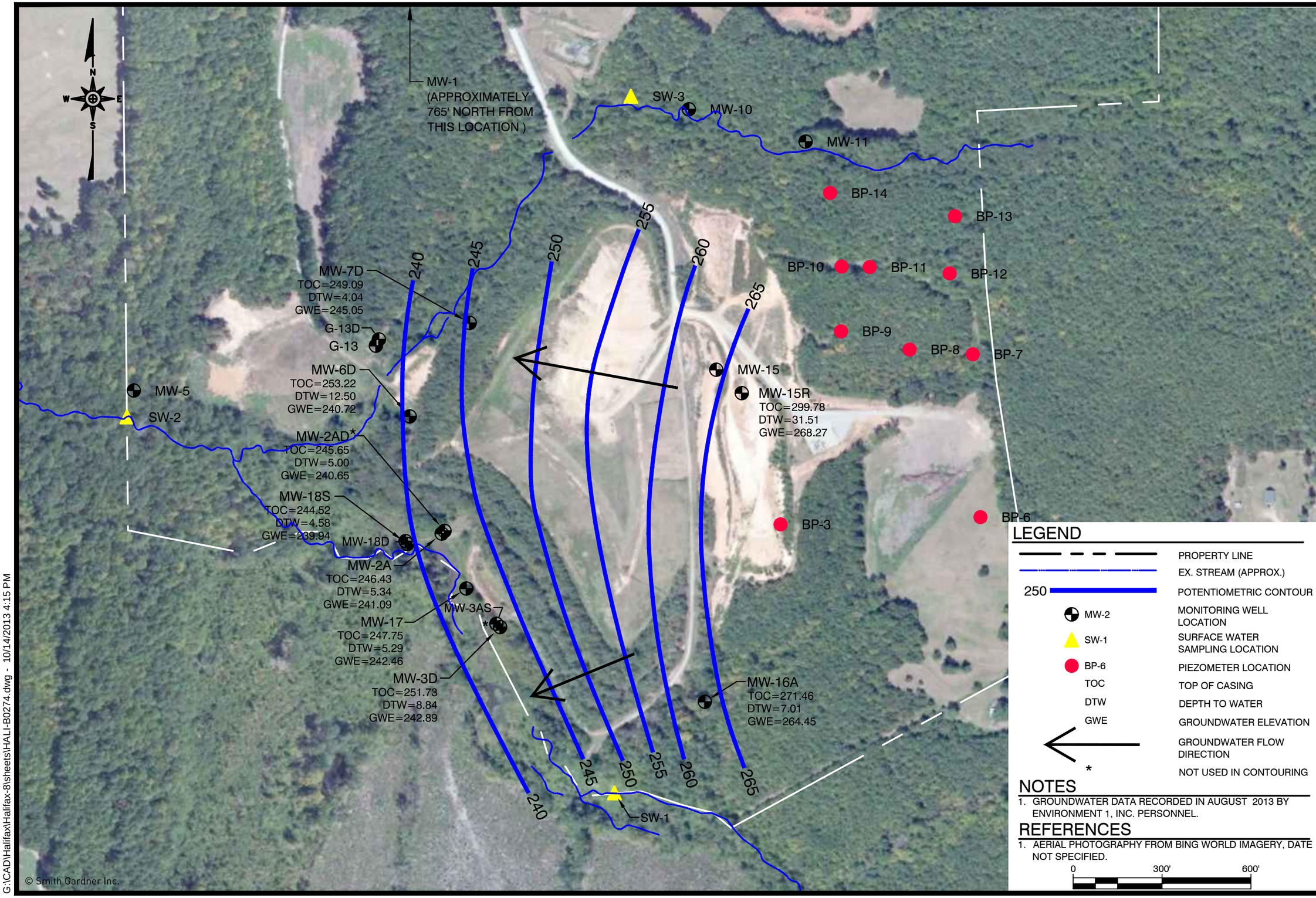

LEGEND

	PROPERTY LINE
	EX. STREAM (APPROX.)
250	POTENTIOMETRIC CONTOUR
MW-2	MONITORING WELL LOCATION
SW-1	SURFACE WATER SAMPLING LOCATION
BP-6	PIEZOMETER LOCATION
TOC	TOP OF CASING
DTW	DEPTH TO WATER
GWE	GROUNDWATER ELEVATION
	GROUNDWATER FLOW DIRECTION
*	NOT USED IN CONTOURING

NOTES

1. GROUNDWATER DATA RECORDED IN AUGUST 2013 BY ENVIRONMENT 1, INC. PERSONNEL.

REFERENCES

1. AERIAL PHOTOGRAPHY FROM BING WORLD IMAGERY, DATE NOT SPECIFIED.

0 300' 600'

PREPARED BY:

NC LIC. NO. C-0928 (ENGINEERING)

SMITH+GARDNER

14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

PREPARED FOR:

HALIFAX COUNTY
CLOSED MSW LANDFILL
POTENTIOMETRIC SURFACE MAP
AUGUST 2013

FIGURE NO.	1
FILENAME:	HALI-B0274
SCALE:	AS SHOWN
PROJECT NO:	HALIFAX-8
APPROVED:	M.M.G.
DATE:	Oct 2013
DRAWN:	K.C.B.

G:\CAD\Halifax\Halifax-8\sheets\HALI-B0274.dwg - 10/14/2013 4:15 PM

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TABLES

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Table 1
Groundwater Elevations Velocities
Halifax County Closed Landfill
August 27-29, 2013

By: MG
Date: 10/2/2013

Monitoring Location	TOC Elevation (ft)	Depth to Water (ft)	Water Table Elevation (ft)	Hydraulic Conductivity (ft/day)	Assumed Porosity	Hydraulic Gradient (ft/ft)	Ground Water Velocity (ft/day)
MW-1	--	31.25	--	--	--	--	--
MW-2A	246.43	5.34	241.09	1.835	0.2	0.012	0.110
MW-2AD	245.65	5.00	240.65	--	--	--	--
MW-3AS	--	9.38	--	--	--	--	--
MW-3D	251.73	8.84	242.89	--	--	--	--
MW-6D	253.22	12.50	240.72	--	--	--	--
MW-7D	249.09	4.04	245.05	--	--	--	--
MW-15R	299.78	31.51	268.27	--	--	--	--
MW-16A	271.46	7.01	264.45	0.057	0.2	0.011	0.003
MW-17	247.75	5.29	242.46	--	--	--	--
MW-18S	244.52	4.58	239.94	--	--	--	--
MW-18D	244.04	NS	-	--	--	--	--
BP-3	--	30.94	-	--	--	--	--
BP-9	--	28.19	-	--	--	--	--

NOTE:

1.) MW-1 is not used in the ground water characterization calculations due to its remote location from the landfill
2.) NS = Not Sampled
3.) Hydraulic Conductivity data from slug tests performed by G.N. Richardson and Associates in 1997.
4.) Porosity values assumed from Groundwater & Wells (Driscoll)
5.) Velocity Calculated from V=K*I/n
    V = velocity
    K = Hydraulic Conductivity
    I = Gradient
    n = Porosity
6.) Deep wells not used in velocity calculations

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Table 2
Field Parameters
Halifax County Closed Landfill
August 27-29, 2013

By: SH
Date: 10/1/2013

Monitoring Location	pH (std units)	Specific Conductivity (umhos/cm)	Temperature (^oC)	Turbidity (NTU)	Dissolved Oxygen (DO) (mg/l)	Oxygen Reduction Potential (ORP) (mv)
MW-1	1.5	24	16	45	12.03	536.3
MW-2A	6	240	22	180	2.54	-38.7
MW-2AD	5.7	403	16	20	0.75	67.8
MW-3AS	6.1	422	19	180	0.65	-43.4
MW-3D	5.8	187	19	9.9	0.66	209.2
MW-6D	5.7	558	18	24	1.06	138.3
MW-7D	5.6	40	18	60	8.49	341
MW-15R	5	56	17	50	6.56	343.6
MW-16A	5.8	156	17	5.8	4.46	280.9
MW-17	5.6	137	20	65	0.75	176.4
MW-18S	6.1	176	21	230	0.9	11.6
G-13	4.6	108	18	340	0.66	242
G-13D	5.1	79	18	19	4.3	248.8
SW-1	6.3	99	21	NA	NA	NA
SW-2	6.3	287	23	NA	NA	NA
SW-3	6.4	486	19	NA	NA	NA

Note: Field data collected by Environment 1 personnel.
NA = Not Analyzed

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Table 3
Detected Inorganic Constituents
Halifax County Closed Landfill
August 27-29, 2013

By: SH
Date: 10/1/2013

Monitoring Location	MDL	SWSL	2L or GWP* Standard	2B Standard	MW-1	MW-2A	MW-2AD	MW-3AS	MW-3D	MW-6D	MW-7D	MW-15R	MW-16A	MW-17	MW-18S	G-13	G-13D	SW-1	SW-2	SW-3
Antimony	0.02	6	1 *	640	3.2 J	0.12 J	0.26 J	0.25 J	0.40J	0.29 J	1.5 J	2.1 J	0.06 J	0.10 J	0.24 J	0.38 J	5.1	<0.02	0.14 J	<0.02
Arsenic	0.05	10	10	10	0.23 J	1.8 J	1.3 J	2.9 J	0.17 J	<0.05	0.16 J	0.08 J	0.92 J	0.28 J	2.8 J	1.9 J	0.12 J	0.94 J	1.2 J	0.93 J
Barium	0.06	100	700	2000000	32.9 J	**143**	92.7 J	35.6 J	71 J	**632**	45.3 J	50.9 J	**115**	45.3 J	82.5 J	**134**	13.9 J	25.5 J	40.7 J	18.6 J
Beryllium	0.03	1	4 *	6.5	0.19 J	0.79 J	0.08 J	0.23 J	0.16 J	0.58 J	0.18 J	0.14 J	0.98 J	0.46 J	0.07 J	**7**	0.32 J	0.03 J	0.04 J	0.66 J
Cadmium	0.05	1	2	2	0.15 J	0.20 J	0.20 J	0.28 J	0.36 J	0.58 J	0.25 J	0.24 J	0.77 J	0.24 J	0.22 J	0.85 J	0.44 J	<0.05	0.09 J	0.30 J
Cobalt	0.02	10	1 *	270	0.62 J	3.6 J	4.8 J	3.1 J	0.09 J	2.4 J	0.26 J	0.43 J	0.82 J	0.64 J	5.2 J	7.7 J	0.56 J	0.35 J	0.44 J	0.66 J
Copper	0.06	10	1000	7	1.1 J	2.1 J	0.83 J	1.3 J	2.5 J	1.7 J	1.2 J	0.96 J	0.70 J	1.4 J	1.8 J	6.1 J	3.8 J	0.64 J	0.32 J	0.45 J
Chromium, total	0.04	10	10	50	0.56 J	2.2 J	<0.04	0.26 J	0.13 J	0.14 J	0.08 J	0.10 J	<0.04	0.4 J	0.39 J	1.3 J	<0.04	0.22 J	<0.04	<0.04
Iron	13.6	300	300	1000	NA	**31275**	**4820**	**88900**	291 J	NA	NA	NA	NA	NA	NA	**24775**	NA	NA	NA	NA
Lead	0.02	10	15	25	1.1 J	2.3 J	0.21 J	1 J	0.4 J	0.48 J	0.98 J	0.32 J	3.8 J	1.8 J	0.38 J	8.4 J	0.61 J	0.34 J	0.19 J	0.08 J
Mercury	0.01	0.2	1	0.012	NA	<0.01	<0.01	<0.01	<0.01	<0.01	NA	0.05 J	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA
Nickel	0.45	50	100	88	0.96 J	1.5 J	1.8 J	0.89 J	0.87 J	2.3 J	0.83 J	0.78 J	1.0 J	1.0 J	1.6 J	3.2 J	0.96 J	1.8 J	1.3 J	2.0 J
Selenium	0.06	10	20	5	<0.06	0.21 J	<0.06	0.14 J	<0.06	0.37 J	<0.06	<0.06	<0.06	0.20 J	0.06 J	1.2 J	<0.06	0.07 J	1.5 J	3.2 J
Silver	0.03	10	20	0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03 J	<0.03
Thallium	0.02	5.5	0.28 *	0.47	<0.02	0.08 J	0.28 J	0.03 J	<0.02	0.03 J	0.03 J	0.12 J	<0.02	0.04 J	0.03 J	0.30 J	0.03 J	<0.02	0.03 J	<0.02
Tin	0.06	100	2000 *	NE	NA	0.45 J	0.35 J	2.0 J	0.32 J	0.65 J	NA	0.59 J	0.38 J	0.45 J	0.46 J	NA	NA	NA	NA	NA
Vanadium	0.07	25	0.3 *	NE	1.1 J	6.2 J	0.36 J	2.1 J	0.31 J	1.1 J	0.88 J	0.43 J	1.3 J	2.2 J	1.7 J	14.1 J	0.39 J	1.7 J	0.88 J	2.1 J
Zinc	0.47	10	1000	50	5.4 J	**19**	**11**	8.0 J	**13**	**17**	**11**	8.4 J	**13**	**13**	9.9 J	**61**	**13**	4.1 J	2.9 J	11

SWSL	-	Solid Waste Section Quantitation Limits
2L	-	Groundwater Standards (15A NCAC 2L 0200)
GWP	-	Groundwater Protection Standards (noted by *)
2B	-	NCAC 2B Standard for Class C waters
MDL	-	Method Detection Limit
Shading	-	Detection above 2L Standard
Bold	-	Constituents detected above SWSL
J	-	Laboratory defined detection between MDL and SWSL limit
< MDL	-	Not detected at or above MDL
NA	-	Not analyzed

Table units are presented in ug/l.
Lab data analysis by Environment 1, Inc. Report dated 10/01/2013, Client ID#6015

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Table 4
Detected Organic Constituents
Halifax County Closed Landfill
August 27-29, 2013

By:SH
Date: 10/1/2013

Monitoring Location	MDL	SWSL	2L Standard	MW-2A	MW-2AD	MW-3AS	MW-3D	MW-6D	MW-15R	MW-16A	MW-17	MW-18S
Benzene	0.24	1	1	<0.24	0.5 J	0.8 J	0.4 J	**2.0**	<0.24	**3.0**	<0.24	<0.24
1,1-Dichloroethane	0.20	5	6	1.8 J	**7.9**	**6.3**	**7.5**	0.3 J	2.9 J	**14.0**	3.6 J	0.4 J
1,1-Dichloroethene	0.17	5	7	<0.17	<0.17	<0.17	0.20 J	<0.17	<0.17	0.6 J	<0.17	<0.17
1,2-Dichlorobenzene	0.32	5	20	<0.32	<0.32	<0.32	<0.32	<0.32	<0.32	1.0 J	<0.32	<0.32
1,2- Dichloropropane	0.21	1	0.6	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	0.40 J	<0.21	<0.21
2,4-D	0.36	2	70	0.39 J	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36
1,4-Dichlorobenzene	0.39	1	6	<0.39	1.0	0.5 J	0.4 J	**3.1**	<0.39	**1.6**	<0.39	<0.39
Bis (2-Ethylhexyl) Phthalate	9.97	15	3	10.2 J	<9.97	<9.97	11.7 J	<9.97	<9.97	<9.97	<9.97	<9.97
Dichlorodifluoromethane	0.51	5	1000	<0.51	<0.51	<0.51	0.80 J	<0.51	<0.51	8.5	0.8 J	<0.51
Cis-1,2-Dichlorethene	0.25	5	70	<0.25	**10.5**	5.0	**8.5**	0.5 J	0.80 J	**37.4**	2.4 J	<0.25
Chlorobenzene	0.30	3	50	0.3 J	2.2 J	1.1 J	0.4 J	10.1	<0.30	1.1 J	<0.30	<0.30
Chloroethane	0.48	10	3000	<0.48	<0.48	0.70 J	<0.48	1.10 J	<0.48	0.7 J	<0.48	<0.48
Methylene chloride	0.64	1	5	<0.64	<0.64	<0.64	<0.64	<0.64	0.7 J	**1.7**	<0.64	<0.64
Tetrachloroethene	0.17	1	0.7	<0.17	<0.17	<0.17	**1.4**	<0.17	**1.30**	**58.9**	**1.1 J**	<0.17
Trans-1,2 Dichloroethene	0.23	5	100	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	0.50 J	<0.23	<0.23
Trichloroethene	0.23	1	3	<0.23	**2.4**	0.7 J	**1.3**	<0.23	0.50 J	**26.4**	0.9 J	<0.23
Trichlorofluoromethane	0.24	1	2000	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	0.40 J	<0.24	<0.24
Vinyl Chloride	0.63	1	0.03	**2.7**	**3.8**	**2.2**	<0.63	<0.63	<0.63	<0.63	<0.63	<0.63

SWSL - Solid Waste Section Quantitation Limits .
2L - Groundwater Standards (15A NCAC 2L 0200)
GWP - Groundwater Protection Standards (noted by *)
MDL - Method Detection Limit
Shading - Detection above 2L standard or GWP standard
Bold - Constituents detected above SWSL
J - Laboratory defined detection between the MDL and SWSL
<MDL - Not detected at or above MDL
NA - Not applicable

Table units are presented in ug/l.
Lab data analysis by Environment 1, Inc. Report dated 10/01/2013, Client ID#6015

SMITH+GARDNER

Table 5
MNA Parameter Summary
Halifax County Closed Landfill
August 27-29, 2013

By: SH
Date: 10/1/2013

	MDL*	SWSL	MW-2A	MW-2AD	MW-3AS	MW-3D	G-13
COD, ug/l	20000	NE	29000	<20000	22000	<20000	27000
Nitrate Nitrogen as N, ug/l	30	10000	<30	130 J	70 J	50 J	120 J
Total Organic Carbon, ug/l	300	NE	7250	1220	3300	<300	2650
Chloride, ug/l	5000	NE	8000	7000	11000	10000	11000
Turbidity, NTU	1	NE	180	20	180	9.9	340
Dissolved Oxygen, ug/l	100	NE	2540	750	650	660	0.66
ORP, mv	--	NE	-38.7	67.8	-43.4	209.2	242

MDL	-	Method Detection Limit
SWSL	-	Solid Waste Section Quantitation Limits
J	-	Laboratory defined detection between the MDL and SWSL
< MDL	-	Not detected at or above MDL
NE	-	not established

Lab data analysis by Environment 1, Inc. Report dated 10/01/2013, Client ID#6015

Appendix A

Boring Logs

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FIELD BOREHOLE LOG

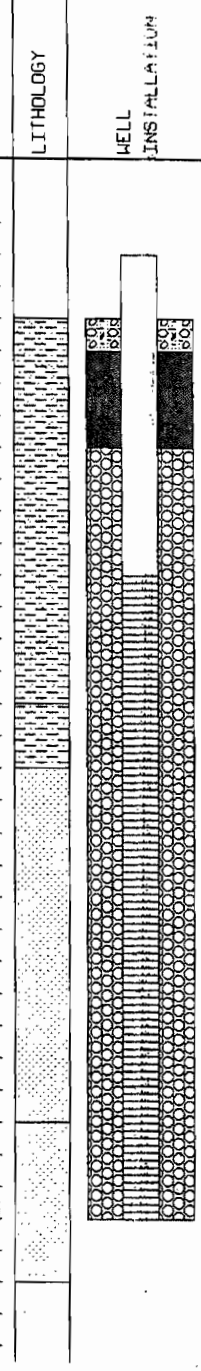
BOREHOLE NUMBER: MW-2A

PROJECT NUMBER HALIFAX-2
PROJECT NAME: HALIFAX COUNTY LANDFILL
LOCATION HALIFAX, NC
DRILLING COMPANY BORE & CORE
RIG TYPE & NUMBER MOBILE B-57 ATV
DRILLING METHOD HOLLOW STEM AUGER
WEATHER: HOT, HUMID
FIELD PARTY: BILL BROW
GEOLOGIST DAVID GARRETT
DATE BEGUN: 7/25/95 DATE COMPLETED: 7/26/95

TOP OF CASING ELEVATION -
TOTAL DEPTH: 16.0
GROUND SURFACE ELEVATION -
SHEET 1 OF 1

STATIC WATER LEVEL (BLS)		
WD=While Drilling AB=After Boring		
Depth(ft)	7.3 FT	
Time	2:00 PM	
Date	7/25/95	

DEPTH	BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	MOISTURE	CONSISTANCY	SAMPLE RECOVERY	DRILL METHOD	LITHOLOGY DESCRIPTION
0.0–3.0				D				SILTY SAND: Loose red-brown very silty clayey coarse-fine SAND; SM-ML; fill pad.
3.0–6.0	2, 3, 3	Ss	S1					SILT: M. stiff black-gray fine sandy clayey SILT; wet; alluvium; ML.
6.0–9.0	8, 10, 11	Ss	S2					SAND: Loose light-gray and red-gray slightly silty-clayey fine-coarse SAND; alluvium; very clayey from 9.5' to 10.5'; fine rounded gravel from 10.5' to 12.5'; Water level at 7.3 ft; SW-SM; SC, CL, SW.
9.0–12.0	10, 7, 7	Ss	S3	W				
12.0–15.0	26, 50/0	Ss	4'					SAND: V. dense brown clayey fine SAND w/ scattered coarse sand; SM-ML; residual soil; well developed upon completion by surging and overpumping.



FIELD BOREHOLE LOG

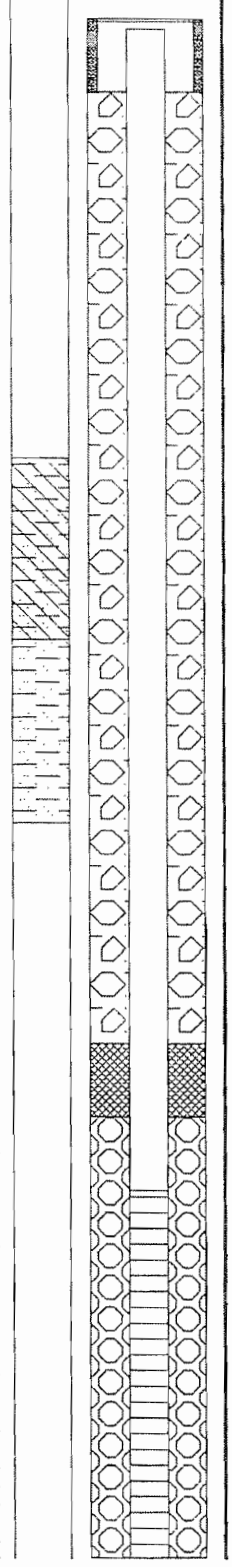
BOREHOLE NUMBER: MW-2aa

PROJECT NUMBER: HALIFAX-14
PROJECT NAME: Halifax County LandFill
LOCATION: Aurelian Springs, North Carolina
DRILLING COMPANY: Engineering Tectonics, P.A.
RIG TYPE & NUMBER: MOBILE B-60
DRILLING METHOD: Hollow Stem Auger
WEATHER: Cloudy, 70 degrees
FIELD PARTY: David Barron
GEOLOGIST: Philip May
DATE BEGUN: 9/1/99 DATE COMPLETED: 9/1/99

TOP OF CASING ELEVATION: TBD
TOTAL DEPTH: 40.0 FT
GROUND SURFACE ELEVATION: TBD
SHEET 1 OF 1

STATIC WATER LEVEL (BLS)		
WD-While Drilling AB-After Boring		
Depth(ft)	6.0'	5.25'
Time	12:00	9:00
Date:	9/1/99	9/2/99

DEPTH	BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	MOISTURE	CONSISTANCY	SAMPLE RECOVERY	DRILL METHOD	LITHOLOGY DESCRIPTION
10.0	5 5 6	Ss	61	W		10"		CLAYEY SILTY SAND: Grey clayey silty sand, wet, Fe staining and quartz gravel.
15.0	15 29 34	Ss	62	W		12"		SILTY SAND: Mottled white, tan-pink, grey & rust M-C slightly silty sand, moist, relict rock, quartz, some mica.
20.0	50/4	Ss	63	W		2"		PWR: Wet C sand, partially weathered rock, tan-pink gravel w/ white, brown, & grey mottling, micaceous;
25.0	50/3	Ss	64	W		1"		25.0' same as above;
30.0	50/4	Ss	65	W		2"		30.0' same as above;
35.0	50/2	Ss	66	W		0"		35.0' same as above;
40.0								40.0' Boring terminated at 40'.



North Carolina - Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section
P.O. Box 29578 - Raleigh, N.C. 27626-0578-Phone (919) 733-3221

'VELL CONSTRUCTION RECORD

Well ID: MW-2ad

DRILLING CONTRACTOR: Engineering Tectonics, P.A.
DRILLER REGISTRATION #: 835
STATE WELL CONSTRUCTION PERMIT#:

1. WELL USE (Check Applicable Box): Residential ☐ Municipal ☐ Industrial ☐ Agricultural ☐ Monitoring ☒
Recovery ☐ Heat Pump Water Injection ☐ Other ☐ If Other, List Use:

2. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Aurelian Springs County: Halifax
Liles Road
(Road, Community, or Subdivision and Lot No.)

3. OWNER Halifax County
ADDRESS
(Street or Route No.)
Halifax NC
City or Town State Zip Code

4. DATE DRILLED 9/1/99
5. TOTAL DEPTH 40.0
6. CUTTINGS COLLECTED YES ☐ NO ☒
7. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
8. STATIC WATER LEVEL Below Top of Casing: 5.26 FT.
(Use '+' if Above Top of Casing)
9. TOP OF CASING IS 2.5 FT. Above Land Surface *
* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .01 18
10. YIELD(gpm): METHOD OF TEST
11. WATER ZONES (depth):

12. CHLORINATION: Type Amount

DEPTH From	To	DRILLING LOG Formation Description
See attached boring log		

If additional space is needed use back of form

13. CASING:

	Depth From	TO	Ft.	Diameter	Wall Thickness or Weight/Ft	Material
	2.0	30.0		2"		PVC

14. GROUT:

	Depth From	TO	Ft.	Material	Method
	0	26.0		Portland cement	Tremie
	26.0	28.0		Bentonite	

15. SCREEN:

	Depth From	TO	Ft	Diameter	Slot Size	Material
	30.0	40.0		2 in.	10 in.	PVC
				in.	in.	
				in.	in.	

16. SAND/GRAVEL PACK:

	Depth From	To	Ft.	Size	Material
	28.0	40.0		No. 2 Filter Sand	

17. REMARKS:

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

FOR OFFICE USE ONLY
Quad No:

SIGNATURE OF CONTRACTOR OR AGENT DATE
Submit original to Division of Water Quality and copy to well owner.

FIELD BOREHOLE LOG

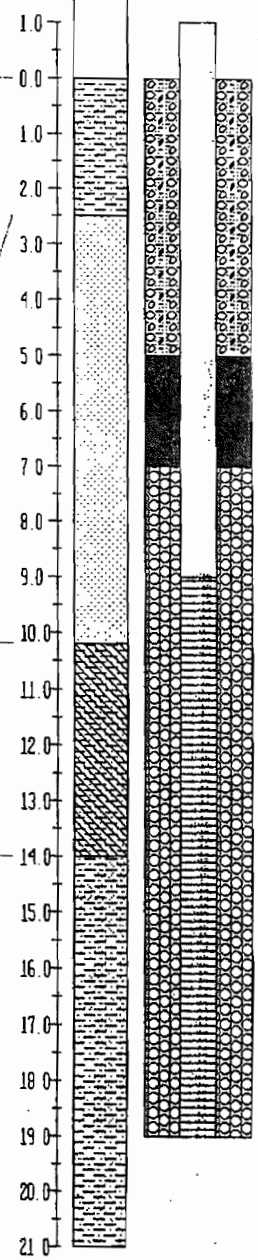
BOREHOLE NUMBER: MW-3A-S

PROJECT NUMBER HALIFAX-2
PROJECT NAME HALIFAX COUNTY LANDFILL
LOCATION HALIFAX, NC
DRILLING COMPANY BORE & CORE
RIG TYPE & NUMBER MOBILE B-57 ATV
DRILLING METHOD HOLLOW STEM AUGER
WEATHER HOT, HUMID
FIELD PARTY BILL BROW
GEOLOGIST DAVID GARRETT
DATE BEGUN 7/25/95 DATE COMPLETED 7/25/95

TOP OF CASING ELEVATION -
TOTAL DEPTH 21
GROUND SURFACE ELEVATION -
SHEET 1 OF 1

STATIC WATER LEVEL (BLS)		
WD=While Drilling AB=After Boring		
Depth(ft)	6.0 FT	
Time	3:45PM	
Date	7/25/95	

DEPTH	BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	MOISTURE	CONSISTANCY	SAMPLE RECOVERY	DRILL METHOD	LITHOLOGY DESCRIPTION
1.0								
0.0								SILTY SAND: Loose brwon-gray dry silty fine SAND w/ scattered roots, sticks, and inert debris on surface; SM.
1.0								
2.0				D				
3.0	2	Ss	S1					
4.0	1							SAND: Soft, dark brown wet clayey silty fine SAND w/ small sticks, rounded pebbles; alluvium; CL/ML.
	1							
5.0								
6.0								
7.0								
8.0								
9.0	4	Ss	S2					
10.0	4			W				
	6							
11.0								CLAYEY SILT: Stiff orange-yellow clayey SILT w/ coarse sand, scattered mica; relict rock texture; residual soil; ML; saturated below 11'.
12.0								
13.0								
14.0	6	Ss	S3					SILTY SAND: Orange-white mottled silty fine-coarse SAND, trace clay, mica; residual soil, weathered granite; SM.
15.0	6							
	7							
16.0								
17.0								
18.0								
19.0	8	Ss	S4					
20.0	9							
	13							
21.0								



N. C. Department of Human Resources
Division of Health Services

MW 6S

WELL COMPLETION RECORD

...MPLETE ALL INFORMATION REQUESTED BELOW FOR EACH WELL INSTALLED, AND RETURN FORM TO THE N.C
...EPARTMENT OF HUMAN RESOURCES, SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH
...P. O. BOX 2091, RALEIGH, N.C. 27602

SOLID WASTE SECTION
JAN 27 ...

NAME OF SITE: Halifax County Landfill	PERMIT NO.: 41-0176-WM-0033
ADDRESS: S.R. 1417 Aurelian Springs, N.C.	OWNER (print): Halifax County
DRILLING CONTRACTOR: Bore and Core, Inc.	REGISTRATION NO.: 763

Casing Type:	PVC	dia.	2	in.	Grout Depth:	from	0	to	-6'	ft. - dia.	7 in
Casing Depth:	from 2'2	to	-8'8	ft. - dia.	2 in.	Bentonite Seal:	from	-6	to	-7'	ft. - dia. 7 in
Screen Type:	.010 slotted PVC	dia.	2	in.	Sand/Gravel PK:	from	-7	to	-23	ft. - dia. 7 in	
Screen Depth:	from -8'8	to	-23'	ft. - dia.	2 in.	Total Well Depth:	from	3	to	-23'	ft. - dia. 7 in

Static Water Level: 11'4" ~~feet from top of casing~~ below ground surface Date Measured 1 / 6 / 92

Yield (gpm): _____ Method of Testing: _____ Casing is _____ feet above land surface

DRILLING LOG

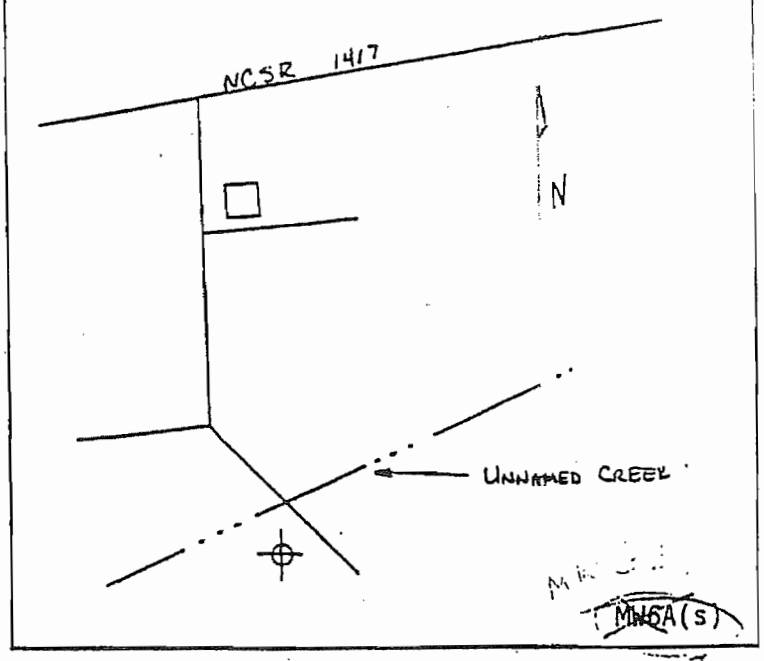
DEPTH FROM	TO	FORMATION DESCRIPTION
0.0	8.4	Brown fine sandy silt
8.4	23.0	Wet, brown, silty fine to medium sand

Well numbering scheme changed on 12-13-93 to match scheme used during past sampling episodes.

LK

LOCATION SKETCH

(show distance to numbered roads, or other map reference points)



DATE: 1/6/92 SIGNATURE: John D Barnard

S 3342 (6/85)

MW 6S

MW 6 E

AW-7

TEST BORING FIELD REPORT

Name Halifax County Landfill Aurelian Springs, N.C. Job No. 3720

ield Supervisor Tony Crew Ken Hrs. Drilling ___ Hrs. Moving ___ Boring # ~~MW6A(S)~~

a e 1/6/92 Weather Cool Ground Surface Elevation ___

	Soil Strata		Sampling	Blows per F			
c...	To	Soil Description and Remarks	No.	Depth	1st6"	2nd6"	3r
.0	8.4	Brown fine sandy silt					
..	23.0	Wet brown silty fine to medium sand/gravel B.T. 23.0'					
		Set 2"x 15' screen at 23.0 with 10' riser 4 bags sand					
		½ bucket bentonite, grout to top, 1 2" locking cap 1 4"x 5'					
		protective casing					

Level 11'4" at TOB

Level ___ at ___

t... Level ___ at 24 Hours

t r Losses ___

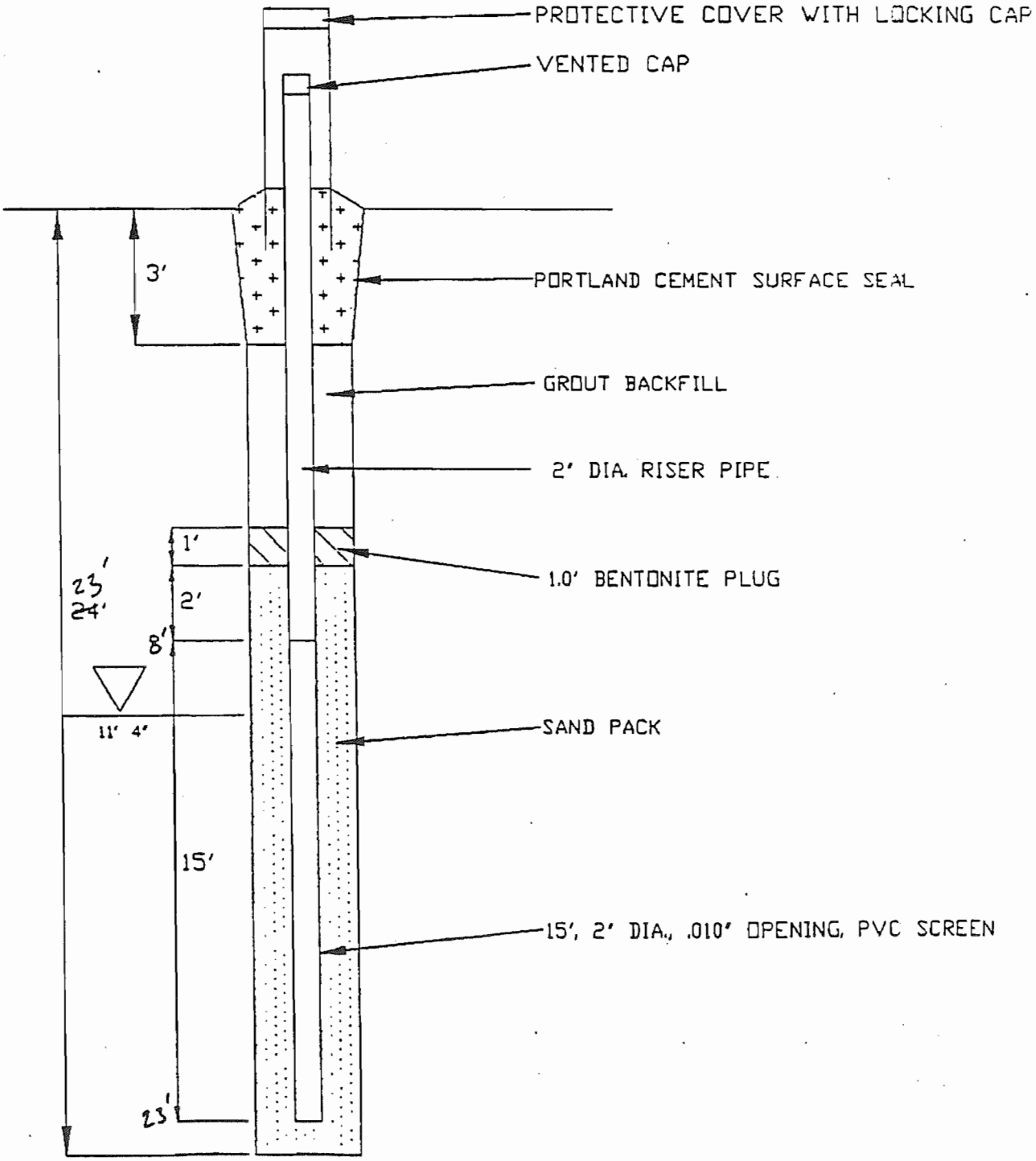
sing, Size Length ___

Note: (Record Methods of Drilling & Depths)

CME 450 ATV
4¼" I.D. H.S.A.
0.0' - 23.0'

TYPICAL MONITORING WELL SCHEMATIC

PROJECT HALIFAX COUNTY LANDFILL VERTICAL EXPANSION
WELL NUMBER MW-6a(s)



WELL COMPLETION RECORD

MW-6A MW-6d

'I ETE ALL INFORMATION REQUESTED BELOW FOR EACH WELL INSTALLED, AND RETURN FORM TO THE N.C. ' MENT OF HUMAN RESOURCES, SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH, 91, RALEIGH, N.C. 27602

OF SITE: Halifax County Sanitary Landfill	PERMIT NO.: 41-0176-WM-0033
ES: R. 1417 Aurelian Springs, N.C.	OWNER (print): Halifax County
G CONTRACTOR: ore & Core, Inc.	REGISTRATION NO.: 763

Type:	PVC dia. 2 in.	Grout Depth:	from 0' to -21' ft. - dia. 4 in.
Depth:	from 2' to -25 ft. - dia. 2 in.	Bentonite Seal:	from -21' to -23 ft. - dia. 4 in.
Type:	slotted .010 dia. 2 in.	Sand/Gravel PK:	from -23 to -40 ft. - dia. 4 in.
Depth:	from -25 to -40 ft. - dia. 2 in.	Total Well Depth:	from 2' to -41 ft. - dia. 4 in.

Water Level: 11' 7" Below ground surface ~~feet from top of casing~~ Date Measured 11 / 26 / 91

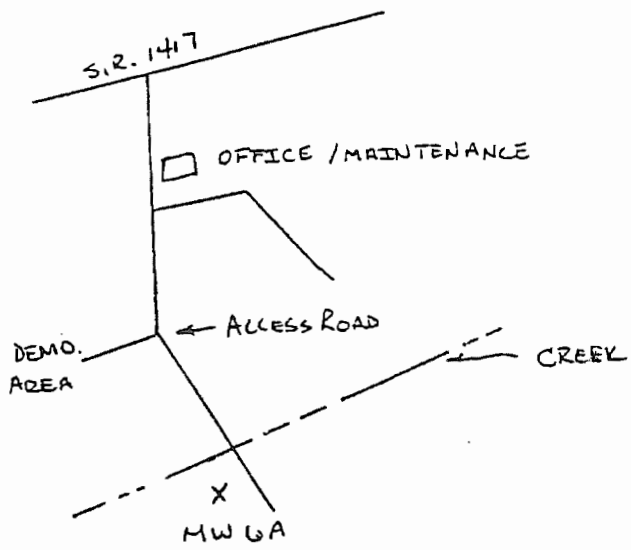
(m): _____ Method of Testing: _____ Casing is _____ feet above land surface

DRILLING LOG

DEPTH FROM	TO	FORMATION DESCRIPTION
	2.8	Brown fine sandy silt
	10.6	Brown medium to fine silt
C 6	22.4	Damp DrkBr.Med. sandy silt
2.4	40.0	Wet Br. fine sandy silt

LOCATION SKETCH

(show distance to numbered roads, or other map reference points)



RKS: Well screened too deep.
Static water level is above the screen.

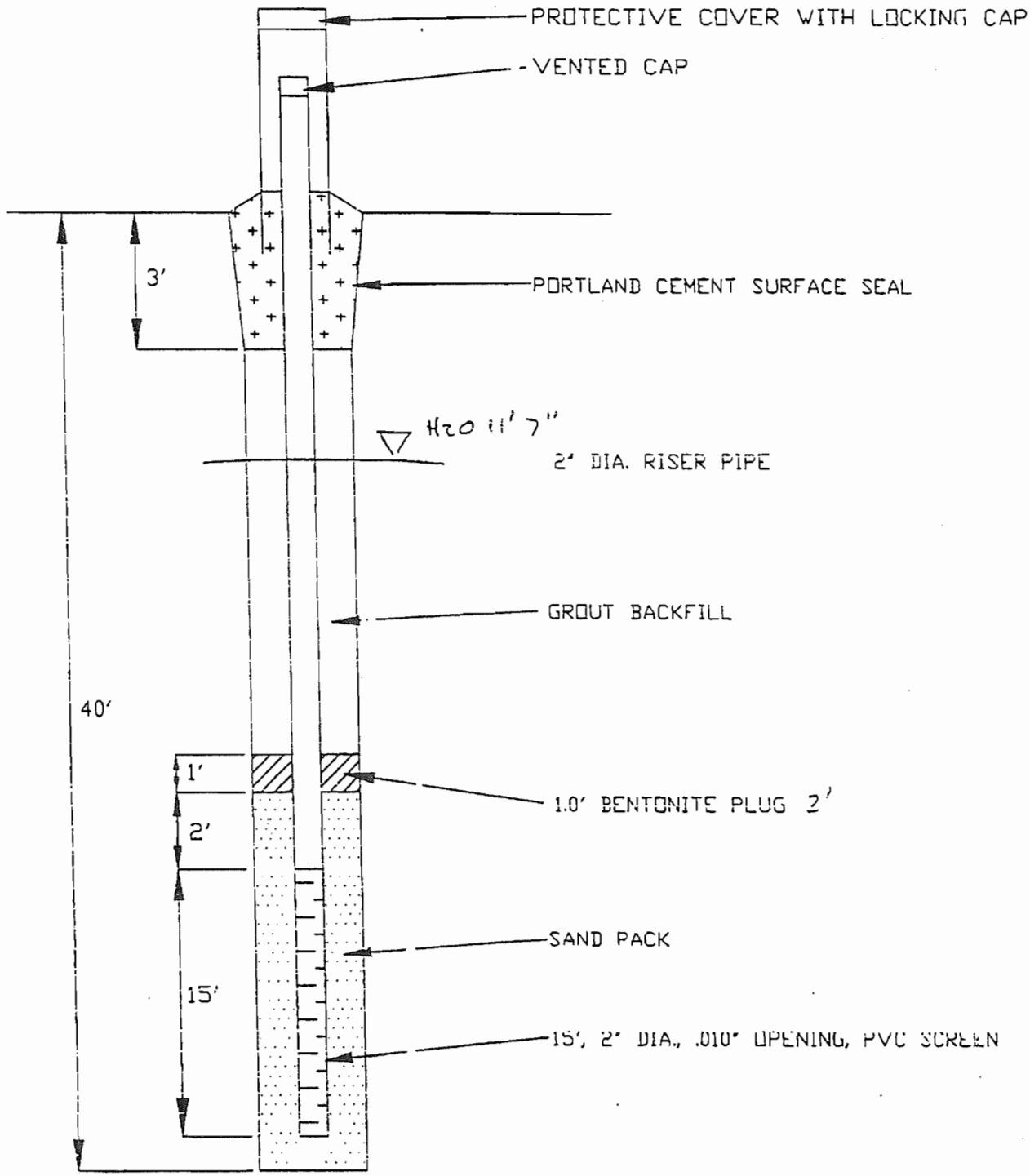
_____ SIGNATURE: _____

3342 (6/85)
& Hazardous Waste Management Branch

TYPICAL MONITORING WELL SCHEMATIC

PROJECT HALIFAX COUNTY LANDFILL VERTICAL EXPANSION
WELL NUMBER MW-6A

6d



TEST BORING FIELD REPORT

MW6d

Name Halifax County Landfill Vertical Expansion Job No. _____

Supervisor Tony Crew Ben Hrs. Drilling ____ Hrs. Moving ____ Boring # MW6

a e 10/30/91 Weather _____ Ground Surface Elevation _____

Soil Strata			Sampling/Blows per Ft.				
o	To	Soil Description and Remarks	No.	Depth	1st6"	2nd6"	3rd6"
.0	2.8	Brown fine sandy silt w/rocks					
.8	10.6	Brown medium to fine sandy silt					
.6	22.4	Damp dark brown medium sandy silt					
.4	40.0	Wet brown fine sandy silt					
		B.T. 40.0					
		Set 2"x15' PVC screen at 40.0 with 30' PVC riser 4 bags					
		sand, ½ bucket bentonite 1 2" locking cap, 1 4"x5'					
		protective casing					

ter Level _____ at TOB

er Level _____ at _____

er Level _____ at 24 Hours

Losses _____

sing, Size _____ Length _____

Note: (Record Methods of Drilling & Depths)

CME 450 ATV
4¼" ID hollow stem auger
0.0 - 40.0

N. C. Department of Human Resources
Division of Health Services

MW 7S

WELL COMPLETION RECORD

)MPLETE ALL INFORMATION REQUESTED BELOW FOR EACH WELL INSTALLED, AND RETURN FORM TO THE N.C
EPARTMENT OF HUMAN RESOURCES, SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH
P. O. BOX 2091, RALEIGH, N.C. 27602

NAME OF SITE: Halifax County Landfill	PERMIT NO.: 41-0176-WW-0033
ADDRESS: S.R. 141/ Aurelian Springs, NC	OWNER (print): Halifax County
DRILLING CONTRACTOR: Bore and Core, Inc.	REGISTRATION NO.: 763

Casing Type: PVC dia. 2 in. Grout Depth: from 0 to -1 ft. - dia. 7 in
Casing Depth: from 2.5 to -2.5 ft. - dia. 2 in. Bentonite Seal: from -1 to -2 ft. - dia. 7 in
Screen Type: .010 slotted PVC dia. 2 in. Sand/Gravel PK: from -2 to -17 ft. - dia. 7 in
Screen Depth: from -2.5 to -17.5 ft. - dia. 2 in. Total Well Depth: from 2.5 to -17.5 ft. - dia. 7 in

Static Water Level: 3'2" ~~feet from top of casing~~ below ground surface Thin sand pack between bentonite + screen. Date Measured 1 / 7 / 92

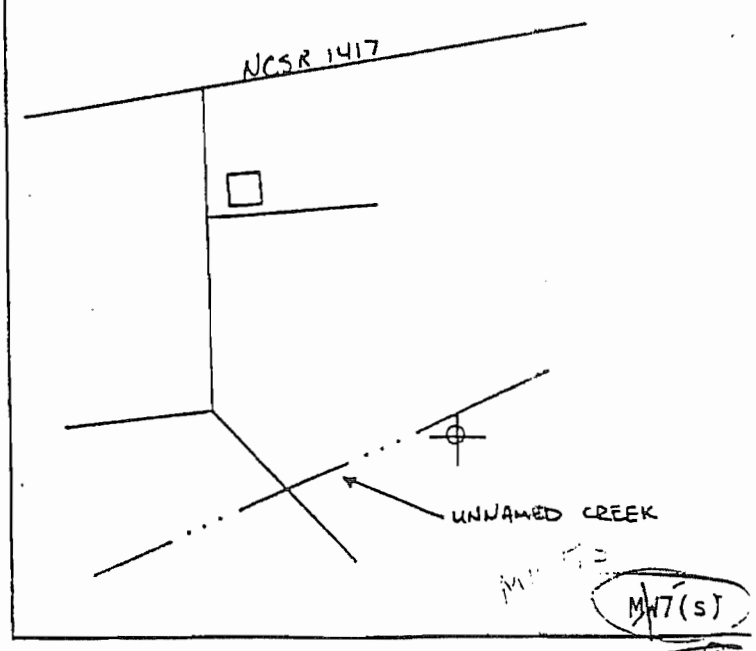
Yield (gpm): _____ Method of Testing: _____ Casing is _____ feet above land surface

DRILLING LOG

DEPTH FROM	TO	FORMATION DESCRIPTION
.0	3.4	Brown fine to medium sandy silt
.4	17.0	Damp brown fine to medium sand/gravel

LOCATION SKETCH

(show distance to numbered roads, or other map reference points)



REMARKS: _____

DATE: 1-7-92 SIGNATURE: John O Barnard

MW 7S

TEST BORING FIELD REPORT

Name Halifax County Landfill - Aurelian Springs, N.C. Job No. 3720

Field Supervisor Tony Crew Ken Hrs. Drilling ___ Hrs. Moving ___ Boring # MW7S

Date 1-7-92 Weather Cool Ground Surface Elevation ___

Soil Strata			Sampling/Blows per				
From	To	Soil Description and Remarks	No.	Depth	1st6"	2nd6"	3
0.0	3.4	Brown fine to medium sandy silt					
3.4	17.0	Damp brown fine to medium sand/gravel B.T. 17.0					
		Set 2"x 15' screen at 17.~~0~~5' with 5.0' riser 4 bags					
		sand, ½ bucket bentonite, grout to top. 1, 2" locking cap					
		1, 4"x 5' protective casing.					

Water Level 3'2" at TOB
Water Level ___ at ___
Water Level ___ at 24 Hours

Water Losses ___

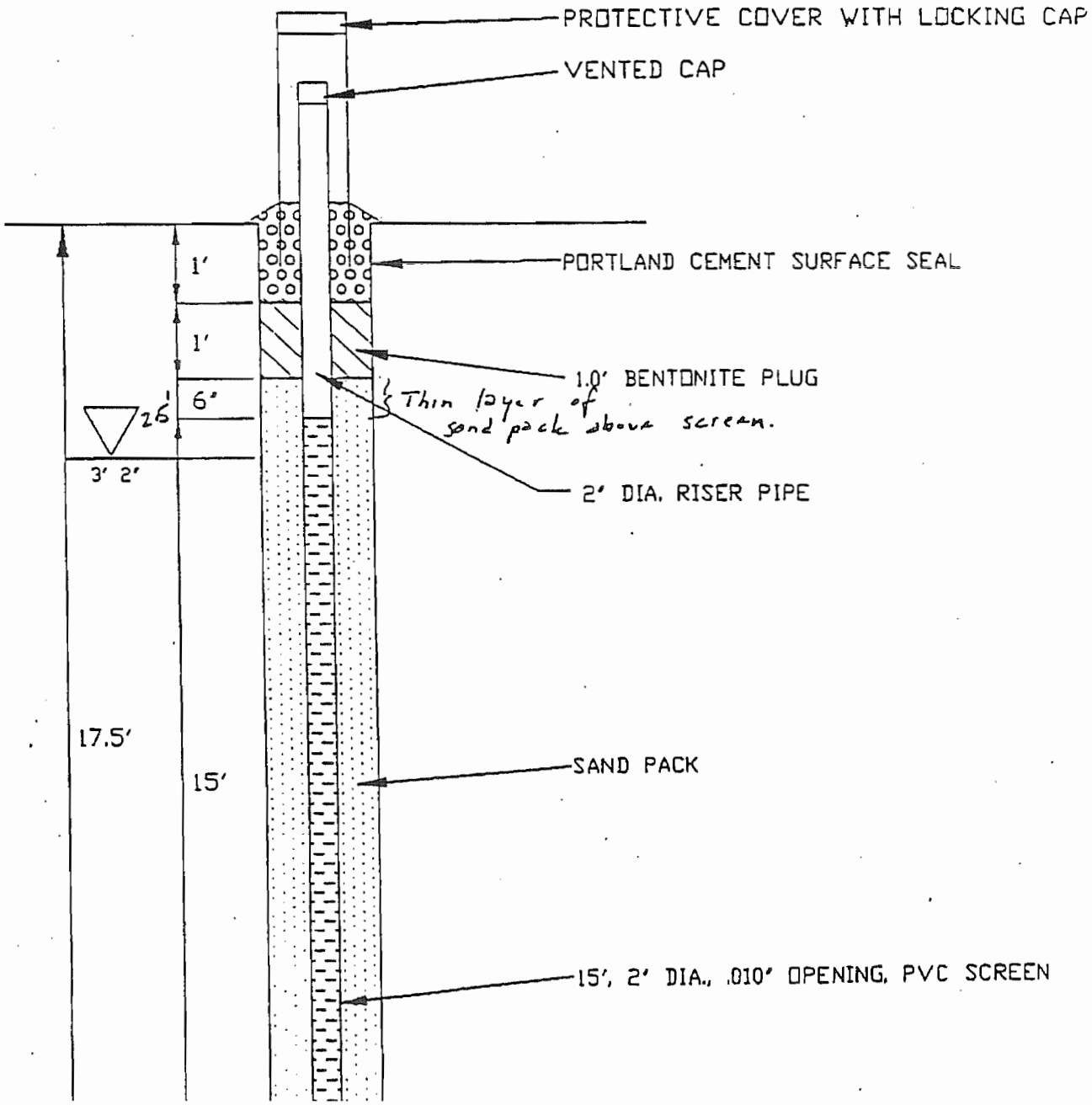
Casing, Size ___ Length ___

Note: (Record Methods of Drilling & Depths)

CME 450 ATV
4¼" I.D. H.S.A.
0.0' - 17.0'

TYPICAL MONITORING WELL SCHEMATIC

PROJECT HALIFAX COUNTY LANDFILL VERTICAL EXPANSION
WELL NUMBER MW-7(s)



WELL COMPLETION RECORD

MW-7 MW-7d

'I ETE ALL INFORMATION REQUESTED BELOW FOR EACH WELL INSTALLED, AND RETURN FORM TO THE N.C. ' MENT OF HUMAN RESOURCES, SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH, 091, RALEIGH, N.C. 27602

.C.F SITE: ifax County Sanitary Landfill	PERMIT NO.: 41-0176-WM-0033
.E S: .. 1417 Aurelian Springs, N.C.	OWNER (print): Halifax County
.I G CONTRACTOR: 'e & Core, Inc.	REGISTRATION NO.: 763

'pe:	PVC	dia.	2 in.	Grout Depth:	from	0	to	-21'	ft. - dia. 4" in.
epth:	from 2	to -25	ft. - dia. 2 in.	Bentonite Seal:	from	-21'	to	-23'	ft. - dia. 4" in.
Type:	slotted PVC .010	dia.	2 in.	Sand/Gravel PK:	from	-23'	to	40'	ft. - dia. 4" in.
Depth:	from -25	to -40	ft. - dia. 2 in.	Total Well Depth:	from	2'	to	-40'	ft. - dia. 4" in.

W. ater Level: 3' 11" Below ground surface feet from top of casing Date Measured 11 / 26 / 91

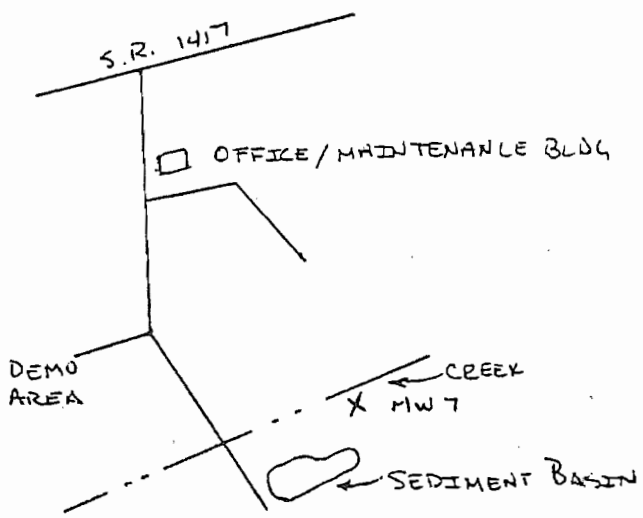
(g m): _____ Method of Testing: _____ Casing is _____ feet above land surface

DRILLING LOG

DEPTH FROM	TO	FORMATION DESCRIPTION
	1.4	Brown fine sandy silt
4	6.7	Brown fine sandy silt
.7	14.3	Damp DrkBr. fine very sandy silt.
4 ?	40.0	Wet Brown medium sandy silt/gravel

LOCATION SKETCH

(show distance to numbered roads, or other map reference points)



1 RKS: Well screened too deep.
Static water table is above the screen.

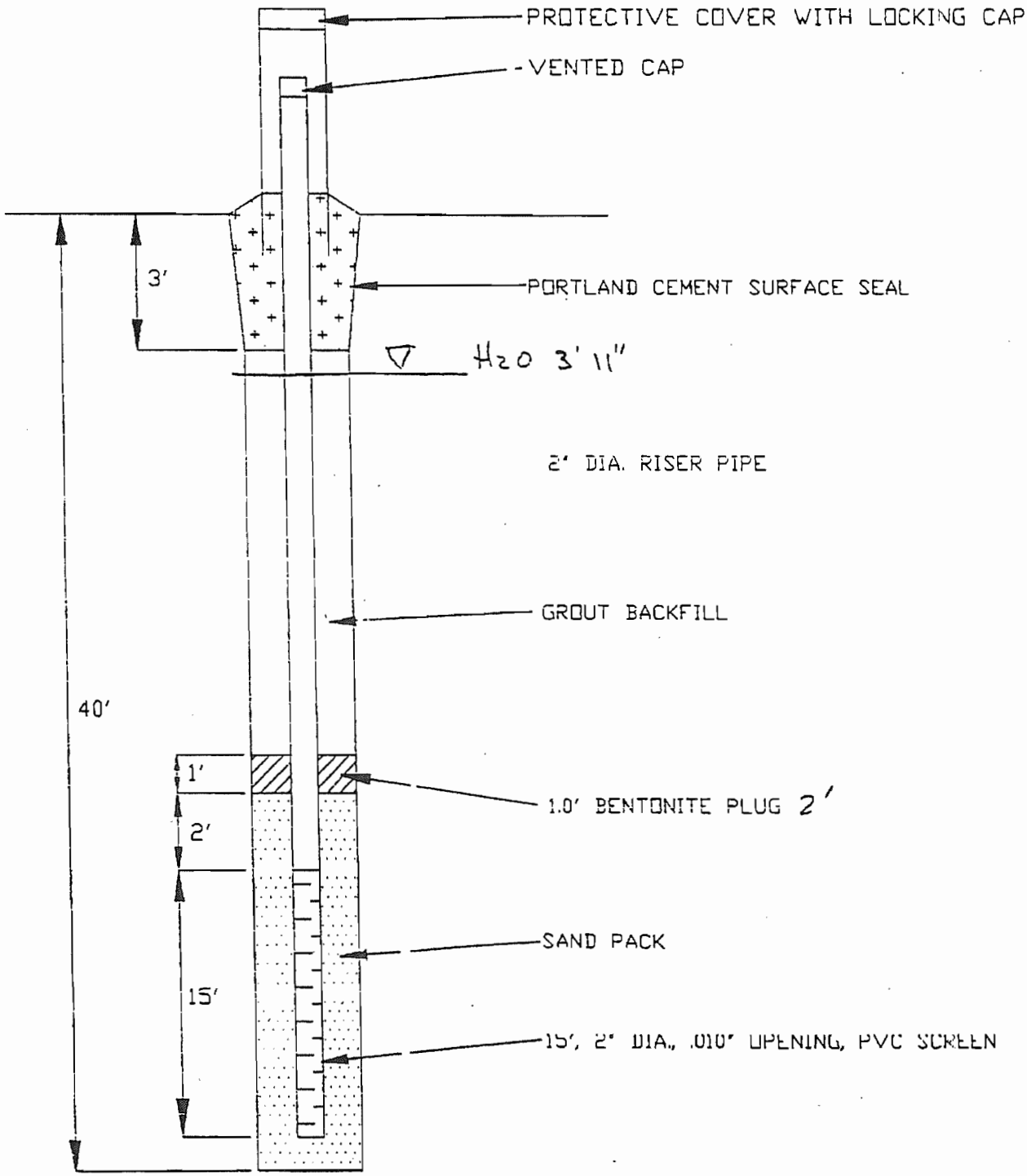
SIGNATURE: _____

3342 (6/85)
& Hazardous Waste Management Branch

TYPICAL MONITORING WELL SCHEMATIC

PROJECT HALIFAX COUNTY LANDFILL VERTICAL EXPANSION
WELL NUMBER MW-7

7d



TEST BORING FIELD REPORT

MW7d

Name Halifax County Landfill Vertical Expansion Job No. _____

Supervisor Tony Crew Ben Hrs. Drilling ____ Hrs. Moving ____ Boring # MW7

Date 10/31/91 Weather _____ Ground Surface Elevation _____

Soil Strata			Sampling/Blows per Ft				
From	To	Soil Description and Remarks	No.	Depth	1st6"	2nd6"	3rd6"
.0	1.4	Brown fine sandy silt with roots					
.4	6.7	Brown fine sandy silt					
.	14.3	Damp dark brown fine very sandy silt					
.3	40.0	Wet brown medium sandy silt with gravel B.T. 40.0					
		Set 2" PVC screen (15') at 40.0 with 30' PVC riser 4 bags					
		sand, ½ bucket Bentonite 1 2" locking cap, 1 4"x5'					
		protective casing					

ater Level _____ at TOB

er Level _____ at _____

Level _____ at 24 Hours

Losses _____

asing, Size _____ Length _____

Note: (Record Methods of Drilling & Depths)

CME 450 ATV
4¼" ID hollow stem auger
0.0 - 40.0

FIELD BOREHOLE LOG

BOREHOLE NUMBER: MW-15R

PROJECT NUMBER: HALIFAX-14
PROJECT NAME: Halifax County Landfill
LOCATION: Aurelian Springs, North Carolina
DRILLING COMPANY: Engineering Tectonics, P.A.
RIG TYPE & NUMBER: MOBILE B-60
DRILLING METHOD: Hollow Stem Auger
WEATHER: Cloudy, 70 degrees
FIELD PARTY: David Barron
GEOLOGIST: Philip May
DATE BEGUN: 8/31/99 DATE COMPLETED: 8/31/99

TOP OF CASING ELEVATION TBD
TOTAL DEPTH 43.0 FT
GROUND SURFACE ELEVATION: TBD
SHEET: 1 OF: 1

STATIC WATER LEVEL (BLS)		
WD=While Drilling AB=After Boring		
Depth(Ft)	31.5'	31.55'
Time	2:00	12:00
Date	8/31/99	9/1/99

DEPTH	BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	MOISTURE	CONSISTANCY	SAMPLE RECOVERY	DRILL METHOD	LITHOLOGY DESCRIPTION
5.0	5 6 8	Ss	81	SM		8"		SANDY CLAYEY SILT: Slightly moist rust-brown F sandy clayey silt, mottled (20%) w/ grey clay & some gravel, lower 1" moist white F sandy silt w/ rust mottling, some Mn & quartz throughout.
10.0	6 10 15	Ss	82	SM		12"		CLAYEY SILTY SAND: Slightly moist tan-pink clayey silty F sand w/ grey, white, yellow, & rust mottles (50%);
15.0	9 12 15	Ss	83	SM		12"		15.0' same as above, grading into rust orange matrix w/ other mottles, some mica & quartz.
20.0	10 14 17	Ss	84	M		12"		SANDY CLAYEY SILT: Moist M-C sandy clayey silt, mottled tan-pink, grey-black, white, & rust, quartz gravel;
25.0	8 11 15	Ss	85	M		6"		25.0' Moist M-C sandy clayey silt, grey-tan-pink, brown-black, grey-tan, & white mottles, quartz, Feldspar, Mn, Mica;
30.0	9 17 25	Ss	86	M		8"		30.0' same as above;
35.0	20 29 11	Ss	87	W		12"		35.0' same as above, very moist;
43.0	11 20 33	Ss	88	W		14"		43.0' same as above, wet, boring terminated at 43.0'.

LITHOLOGY

WELL INSTALLATION

North Carolina - Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section
P.O. Box 29578 - Raleigh, N.C. 27626-0578-Phone (919) 733-3221

WELL CONSTRUCTION RECORD

Well ID: MW-15r

DRILLING CONTRACTOR: Engineering Tectonics, P.A.
DRILLER REGISTRATION #: 835
STATE WELL CONSTRUCTION PERMIT#:

1. WELL USE (Check Applicable Box): Residential ☐ Municipal ☐ Industrial ☐ Agricultural ☐ Monitoring ☒
Recovery ☐ Heat Pump Water Injection ☐ Other ☐ If Other, List Use:

2. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Aurelian Springs County: Halifax
Liles Road
(Road, Community, or Subdivision and Lot No.)

3. OWNER Halifax County
ADDRESS
(Street or Route No.)
Halifax NC
City or Town State Zip Code

4. DATE DRILLED 8/31/99
5. TOTAL DEPTH 43.0
6. CUTTINGS COLLECTED YES ☐ NO ☒
7. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
8. STATIC WATER LEVEL Below Top of Casing: 31.55 FT
(Use + if Above Top of Casing)
9. TOP OF CASING IS 2.5 FT. Above Land Surface *
* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .01 18
10. YIELD(gpm): METHOD OF TEST
11. WATER ZONES (depth):

DEPTH From	DEPTH To	DRILLING LOG Formation Description
See attached boring log		

If additional space is needed use back of form

12. CHLORINATION: Type Amount

13. CASING:

	Depth From	Depth TO	Ft.	Diameter	Wall Thickness or Weight/Ft	Material
	2.0	33.0		2"		PVC

14. GROUT:

	Depth From	Depth TO	Ft.	Material	Method
	0	29.0		Portland cement	Tremie
	29.0	31.0		Bentonite	

15. SCREEN:

	Depth From	Depth TO	Ft	Diameter	in.	Slot Size	in.	Material
	33.0	43.0		2		10		PVC

16. SAND/GRAVEL PACK:

	Depth From	Depth To	Ft.	Size	Material
	31.0	43.0		No. 2 Filter Sand	

17. REMARKS:

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

FOR OFFICE USE ONLY
Quad No:

SIGNATURE OF CONTRACTOR OR AGENT DATE
Submit original to Division of Water Quality and copy to well owner.

FIELD BOREHOLE LOG

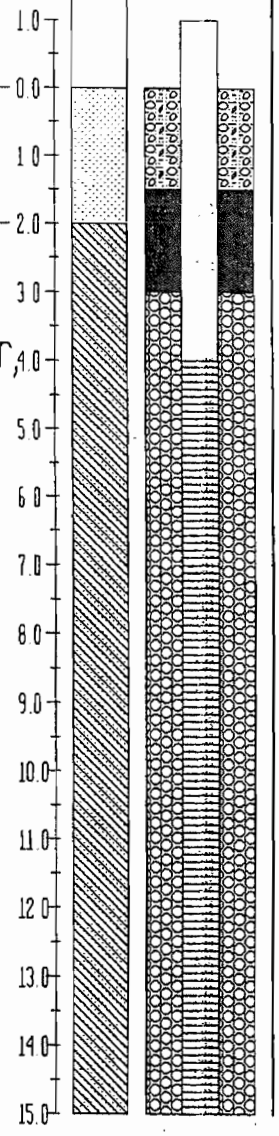
BOREHOLE NUMBER: MW-16A

PROJECT NUMBER HALIFAX-2
PROJECT NAME HALIFAX COUNTY LANDFILL
LOCATION HALIFAX, NC
DRILLING COMPANY: BORE & CORE
RIG TYPE & NUMBER: MOBILE B-57 ATV
DRILLING METHOD: HOLLOW STEM AUGER
WEATHER HOT, HUMID
FIELD PARTY: BILL BROW
GEOLOGIST: GREG MILLS
DATE BEGUN: 7/26/95 DATE COMPLETED: 7/26/95

TOP OF CASING ELEVATION -
TOTAL DEPTH 16.0
GROUND SURFACE ELEVATION -
SHEET 1 OF 1

STATIC WATER LEVEL (BLS)		
WO=While Drilling AB=After Boring		
Depth(Ft)	7.2 FT	
Time	3:00 PM	
Date	7/26/95	

DEPTH	BLOW COUNTS	SAMPLING METHOD	SAMPLE NUMBER	MOISTURE	CONSISTANCY	SAMPLE RECOVERY	DRILL METHOD	LITHOLOGY DESCRIPTION
1.0								
0.0								SAND: Tan coarse grained SAND w/ some organics.
1.0								
2.0				D				CLAYEY SAND: White, pink and orange coarse grained clayey SAND with mica, feldspar, K-feldspar, and some quartz; weathered granite; residual soil; SC.
3.0								
4.0	6	Ss	S1					
5.0	7 9							
6.0								
7.0								
8.0								
9.0	5	Ss	S2					
10.0	8 8			W				
11.0								
12.0								
13.0								
14.0	86	Ss	S3					
15.0	50/0	4'						



Richardson Smith Gardner and Assoc
14 North Boylan Avenue, Raleigh NC 27603
(919) 828-0577

FIELD BOREHOLE LOG

BOREHOLE NUMBER **MW-17**

PROJECT NAME: **Halifax Landfill**
OCATION: **Halifax Co.**
DRILLING CO: **McCall Bros.**
DRILLING METHOD: **HSA**
FIELD PARTY: **Ken McDonald**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **10/03/07** DATE COMPLETED: **10/03/07**

TOTAL DEPTH: **25**
GROUND SURFACE ELEVATION:
TOP OF CASING ELEVATION:

STATIC WATER LEVEL (TOC)		
Depth (ft)		
Time		
Date		

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY	DEPTH	WELL INSTALLATION
0.0				HSA	SILTY CLAY: Wet, dark brown silty clay with organic matter.		0.0	
1.0							1.0	
2.0							2.0	
3.0							3.0	
4.0							4.0	
5.0	2,2,4,6	SS	16"				5.0	
6.0							6.0	
7.0							7.0	
8.0							8.0	
9.0							9.0	
10.0	4,6,10,12	SS	14"		SAPROLITE: Wet, very weathered to weathered K-spar granitic saprolite. Boring terminated at 25' below grade.		10.0	
11.0							11.0	
12.0							12.0	
13.0							13.0	
14.0							14.0	
15.0	11,16,22,27	SS	8"				15.0	
16.0							16.0	
17.0							17.0	
18.0							18.0	
19.0							19.0	
20.0	7,22,29,33	SS	6"				20.0	
21.0							21.0	
22.0							22.0	
23.0							23.0	
24.0							24.0	
25.0							25.0	

Richardson Smith Gardner and Assoc
14 North Boylan Avenue, Raleigh NC 27603
(919) 828-0577

FIELD BOREHOLE LOG

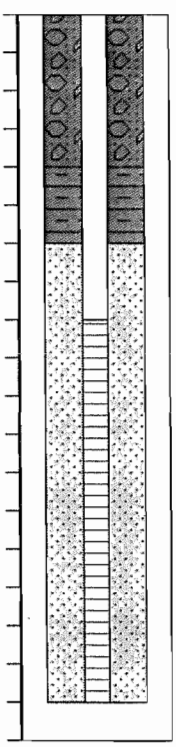
BOREHOLE NUMBER **MW-18s**

PROJECT NAME: **Halifax Landfill**
LOCATION: **Halifax Co.**
DRILLING CO: **McCall Bros.**
DRILLING METHOD: **HSA**
FIELD PARTY: **Ken McDonald**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **10/16/07** DATE COMPLETED: **10/16/07**

TOTAL DEPTH: **19**
GROUND SURFACE ELEVATION:
TOP OF CASING ELEVATION:

STATIC WATER LEVEL (TOC)		
Depth (ft)		
Time		
Date		

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY	DEPTH	WELL INSTALLATION
0.0				HSA	SILTY CLAY: Moist to Wet gray green silty clay		0.0	
1.0							1.0	
2.0							2.0	
3.0							3.0	
4.0							4.0	
5.0	2,2,1,2	SS	6"				5.0	
6.0							6.0	
7.0							7.0	
8.0							8.0	
							9.0	
10.0	3,2,3,11	SS	8"		CLAYEY SILTY SAND: Wet, dark gray, clayey silty sand with some partially weathered rock.		10.0	
11.0							11.0	
12.0							12.0	
13.0							13.0	
14.0							14.0	
15.0	18,26,27,26	SS	12"		SAPROLITE: Wet weathered potassium feldspar granite saprolite. Auger Refusal at 19 feet. Running sands backfilled hole to 18' where well was then set.		15.0	
16.0							16.0	
17.0							17.0	
18.0							18.0	
19.0							19.0	



Richardson Smith Gardner and Assoc
14 North Boylan Avenue, Raleigh NC 27603
(919) 828-0577

FIELD BOREHOLE LOG

BOREHOLE NUMBER **MW-18d**

PROJECT NAME: **Halifax Landfill**
LOCATION: **Halifax Co.**
DRILLING CO: **McCall Bros.**
DRILLING METHOD: **HSA**
FIELD PARTY: **Ken McDonald**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **10/16/07** DATE COMPLETED: **10/17/07**

TOTAL DEPTH: **52**
GROUND SURFACE ELEVATION:
TOP OF CASING ELEVATION:

STATIC WATER LEVEL (TOC)		
Depth (ft)		
Time		
Date		

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY	DEPTH	WELL INSTALLATION
0.0				HSA	SILTY CLAY: Moist to Wet gray green silty clay		0.0	
1.0							1.0	
2.0							2.0	
3.0							3.0	
4.0							4.0	
5.0	2,2,1,2	SS	6"				5.0	
6.0							6.0	
7.0							7.0	
8.0							8.0	
							9.0	
10.0	3,2,3,11	SS	8"		CLAYEY SILTY SAND: Wet, dark gray, clayey silty sand with some partially weathered rock.		10.0	
11.0							11.0	
12.0							12.0	
13.0							13.0	
14.0							14.0	
15.0	18,26,27,26	SS	12"		SAPROLITE: Wet weathered potassium feldspar granite saprolite. Auger Refusal at 32 feet.		15.0	
16.0							16.0	
17.0							17.0	
18.0							18.0	
19.0							19.0	
20.0		Grab					20.0	
21.0							21.0	
22.0							22.0	
23.0							23.0	
24.0							24.0	
25.0		Grab					25.0	
26.0							26.0	
27.0							27.0	
28.0							28.0	
29.0							29.0	
		Grab					30.0	

Richardson Smith Gardner and Assoc
14 North Boylan Avenue, Raleigh NC 27603
(919) 828-0577

FIELD BOREHOLE LOG

BOREHOLE NUMBER **MW-18d**

PROJECT NAME: **Halifax Landfill**
LOCATION: **Halifax Co.**
DRILLING CO: **McCall Bros.**
DRILLING METHOD: **HSA**
FIELD PARTY: **Ken McDonald**
GEOLOGIST: **J. Smyth**
DATE BEGUN: **10/16/07** DATE COMPLETED: **10/17/07**

TOTAL DEPTH: **52**
GROUND SURFACE ELEVATION:
TOP OF CASING ELEVATION:

STATIC WATER LEVEL (TOC)		
Depth (ft)		
Time		
Date		

DEPTH	BLOW COUNT	SAMPLING METHOD	RECOVERY	DRILL METHOD	DESCRIPTION	LITHOLOGY	DEPTH	WELL INSTALLATION
31.0							31.0	
32.0				AH	GRANITE: Wet Potassium Feldspar Granite (observed by cuttings). Boring terminated at 52'.		32.0	
33.0							33.0	
34.0							34.0	
35.0		Grab					35.0	
36.0							36.0	
37.0							37.0	
38.0							38.0	
39.0							39.0	
40.0		Grab					40.0	
41.0							41.0	
42.0							42.0	
43.0							43.0	
44.0							44.0	
45.0		Grab					45.0	
46.0							46.0	
47.0							47.0	
48.0							48.0	
49.0							49.0	
50.0		Grab					50.0	
51.0							51.0	
52.0							52.0	

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Appendix B

Laboratory Analytical Report

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Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

ID#: 6015

HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX ,NC 27839

DATE COLLECTED: 08/28/13
DATE REPORTED : 10/01/13

REVIEWED BY:

PARAMETERS	MDL	SWSL	MW-1	MW-7D	MW-15R	MW-16A	Equipment Blank	Analysis Date	Analyst	Method Code
PH (field measurement), Units			1.5	5.6	5.0	5.8		08/28/13	BF	4500HB-00
Antimony, ug/l	0.02	6.0	3.2 J	1.5 J	2.1 J	0.06 J		09/03/13	LFJ	EPA200.8
Arsenic, ug/l	0.05	10.0	0.23 J	0.16 J	0.08 J	0.92 J		09/03/13	LFJ	EPA200.8
Barium, ug/l	0.06	100.0	32.9 J	45.3 J	50.9 J	115		09/03/13	LFJ	EPA200.8
Beryllium, ug/l	0.03	1.0	0.19 J	0.18 J	0.14 J	0.98 J		09/03/13	LFJ	EPA200.8
Cadmium, ug/l	0.05	1.0	0.15 J	0.25 J	0.24 J	0.77 J		09/03/13	LFJ	EPA200.8
Cobalt, ug/l	0.02	10.0	0.62 J	0.26 J	0.43 J	0.82 J		09/03/13	LFJ	EPA200.8
Copper, ug/l	0.06	10.0	1.1 J	1.2 J	0.96 J	0.70 J		09/03/13	LFJ	EPA200.8
Total Chromium, ug/l	0.04	10.0	0.56 J	0.08 J	0.10 J	--- U		09/03/13	LFJ	EPA200.8
Lead, ug/l	0.02	10.0	1.1 J	0.98 J	0.32 J	3.8 J		09/03/13	LFJ	EPA200.8
Mercury, ug/l	0.01	0.20			0.05 J	--- U		09/09/13	ADD	245.1 R3-94
Nickel, ug/l	0.45	50.0	0.96 J	0.83 J	0.78 J	1.0 J		09/03/13	LFJ	EPA200.8
Selenium, ug/l	0.06	10.0	--- U	--- U	--- U	--- U		09/03/13	LFJ	EPA200.8
Silver, ug/l	0.03	10.0	--- U	--- U	--- U	--- U		09/03/13	LFJ	EPA200.8
Thallium, ug/l	0.02	5.5	--- U	0.03 J	0.12 J	--- U		09/03/13	LFJ	EPA200.8
Tin, ug/l	0.06	100.0			0.59 J	0.38 J		09/03/13	LFJ	EPA200.8
Vanadium, ug/l	0.07	25.0	1.1 J	0.88 J	0.43 J	1.3 J		09/03/13	LFJ	EPA200.8
Zinc, ug/l	0.47	10.0	5.4 J	11	8.4 J	13		09/03/13	LFJ	EPA200.8
Turbidity, NTU	1.0	1.0	45	60	50	5.8		08/28/13	HMB	2130B-01
Conductivity (at 25c), uMhos/cm	1.0	1.0	24	40	56	156		08/28/13	BF	2510B-97
Dissolved Oxygen, mg/l	0.1	0.1	12.03	8.49	6.56	4.46		08/28/13	BF	4500OG-01
Temperature, °C			16	18	17	17		08/28/13	BF	2550B-00
Static Water Level, feet			31.25	4.04	31.51	7.01		08/28/13	BF	
Well Depth, feet			42.86	39.33	46.39	22.38		08/28/13	BF	
ORP, mv			+536.3	+341	+343.6	+280.9		08/28/13	BF	2580B

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/28/13
DATE EXTRACTED: 08/29/13
DATE ANALYZED: 09/30/13
DATE REPORTED: 10/01/13

REVIEWED BY:

PESTICIDES AND PCB'S
EPA METHOD 8081B R2(07)

PARAMETERS, ug/l	MDL	SWSL	MW-15R	MW-16A
1. Aldrin	0.029	0.05	--- U	--- U
2. Alpha-BHC	0.032	0.05	--- U	--- U
3. Beta-BHC	0.031	0.05	--- U	--- U
4. Delta-BHC	0.030	0.05	--- U	--- U
5. Gamma-BHC (Lindane)	0.032	0.05	--- U	--- U
6. Chlordane	0.320	0.50	--- U	--- U
7. 4,4-DDD	0.051	0.10	--- U	--- U
8. 4,4-DDE	0.049	0.10	--- U	--- U
9. 4,4-DDT	0.052	0.10	--- U	--- U
10. Dieldrin	0.042	0.075	--- U	--- U
11. Endosulfan I	0.056	0.10	--- U	--- U
12. Endosulfan II	0.046	0.10	--- U	--- U
13. Endosulfan Sulfate	0.072	0.10	--- U	--- U
14. Endrin	0.053	0.10	--- U	--- U
15. Endrin Aldehyde	0.068	0.10	--- U	--- U
16. Heptachlor	0.039	0.05	--- U	--- U
17. Heptachlor Epoxide	0.042	0.075	--- U	--- U
18. Methoxychlor	0.530	1.00	--- U	--- U
19. Pcb's (Aroclors)	0.500	2.00	--- U	--- U
20. Toxaphene	0.690	1.50	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/28/13
DATE EXTRACTED: 09/04/13
DATE ANALYZED: 09/09/13
DATE REPORTED: 10/01/13

REVIEWED BY:

LANDFILL APPENDIX II
EPA METHOD 8151A R1(96)

PARAMETERS, ug/l	MDL	SWSL	MW-15R	MW-16A
1. 2,4-D	0.36	2.0	--- U	--- U
2. Dinoseb	0.54	1.0	--- U	--- U
3. 2,4,5-TP	0.42	2.0	--- U	--- U
4. 2,4,5-T	0.47	2.0	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: MAO
DATE COLLECTED: 08/28/13
DATE ANALYZED: 08/30/13
DATE REPORTED: 10/01/13

REVIEWED BY: _____

VOLATILE ORGANICS
EPA METHOD 8260B R1(96)

PARAMETERS, ug/l	MDL	SWSL	MW-1	MW-7D
1. Chloromethane	0.77	1.0	--- U	--- U
2. Vinyl Chloride	0.63	1.0	--- U	--- U
3. Bromomethane	0.67	10.0	--- U	--- U
4. Chloroethane	0.48	10.0	--- U	--- U
5. Trichlorofluoromethane	0.24	1.0	--- U	--- U
6. 1,1-Dichloroethene	0.17	5.0	--- U	--- U
7. Acetone	9.06	100.0	--- U	--- U
8. Iodomethane	0.26	10.0	--- U	--- U
9. Carbon Disulfide	0.23	100.0	--- U	--- U
10. Methylene Chloride	0.64	1.0	--- U	--- U
11. trans-1,2-Dichloroethene	0.23	5.0	--- U	--- U
12. 1,1-Dichloroethane	0.20	5.0	--- U	--- U
13. Vinyl Acetate	0.20	50.0	--- U	--- U
14. Cis-1,2-Dichloroethene	0.25	5.0	--- U	--- U
15. 2-Butanone	2.21	100.0	--- U	--- U
16. Bromochloromethane	0.27	3.0	--- U	--- U
17. Chloroform	0.25	5.0	--- U	--- U
18. 1,1,1-Trichloroethane	0.19	1.0	--- U	--- U
19. Carbon Tetrachloride	0.22	1.0	--- U	--- U
20. Benzene	0.24	1.0	--- U	--- U
21. 1,2-Dichloroethane	0.27	1.0	--- U	--- U
22. Trichloroethene	0.23	1.0	--- U	--- U
23. 1,2-Dichloropropane	0.21	1.0	--- U	--- U
24. Bromodichloromethane	0.21	1.0	--- U	--- U
25. Cis-1,3-Dichloropropene	0.24	1.0	--- U	--- U
26. 4-Methyl-2-Pentanone	1.19	100.0	--- U	--- U
27. Toluene	0.23	1.0	--- U	--- U
28. trans-1,3-Dichloropropene	0.28	1.0	--- U	--- U
29. 1,1,2-Trichloroethane	0.25	1.0	--- U	--- U
30. Tetrachloroethene	0.17	1.0	--- U	--- U
31. 2-Hexanone	1.57	50.0	--- U	--- U
32. Dibromochloromethane	0.24	3.0	--- U	--- U
33. 1,2-Dibromoethane	0.26	1.0	--- U	--- U
34. Chlorobenzene	0.30	3.0	--- U	--- U
35. 1,1,1,2-Tetrachloroethane	0.22	5.0	--- U	--- U
36. Ethylbenzene	0.21	1.0	--- U	--- U
37. Xylenes	0.68	5.0	--- U	--- U
38. Dibromomethane	0.28	10.0	--- U	--- U
39. Styrene	0.19	1.0	--- U	--- U
40. Bromoform	0.20	3.0	--- U	--- U
41. 1,1,2,2-Tetrachloroethane	0.26	3.0	--- U	--- U
42. 1,2,3-Trichloropropane	0.43	1.0	--- U	--- U
43. 1,4-Dichlorobenzene	0.39	1.0	--- U	--- U
44. 1,2-Dichlorobenzene	0.32	5.0	--- U	--- U
45. 1,2-Dibromo-3-Chloropropane	0.34	13.0	--- U	--- U
46. Acrylonitrile	2.72	200.0	--- U	--- U
47. trans-1,4-Dichloro-2-Butene	0.42	100.0	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/28/13
DATE EXTRACTED: 08/29/13
DATE ANALYZED: 09/27/13
DATE REPORTED: 10/01/13

REVIEWED BY:

SEMI-VOLATILE ORGANICS
EPA METHOD 8270D R4(07)

PARAMETERS, ug/l	MDL	SWSL	MW-15R	MW-16A
1. Acenaphthene	2.66	10.0	--- U	--- U
2. Acenaphthylene	2.60	10.0	--- U	--- U
3. Anthracene	2.97	10.0	--- U	--- U
4. Benzo[a]antrhacene	4.16	10.0	--- U	--- U
5. Benzo[b]fluoranthene	3.32	10.0	--- U	--- U
6. Benzo[k]fluoranthene	4.23	10.0	--- U	--- U
7. Benzo[g,h,i]perylene	2.61	10.0	--- U	--- U
8. Benzo[a]pyrene	3.27	10.0	--- U	--- U
9. 4-Bromophenyl Phenyl Ether	2.63	10.0	--- U	--- U
10. Butyl Benzyl Phthalate	5.78	10.0	--- U	--- U
11. Bis-(2-Chloroethoxy) Methane	3.14	10.0	--- U	--- U
12. Bis-(2-Chloroethyl) Ether	2.58	10.0	--- U	--- U
13. Bis-(2-Chloroisopropyl) Ether	2.58	10.0	--- U	--- U
14. 2-Chloronaphthalene	2.17	10.0	--- U	--- U
15. 4-Chlorophenyl Phenyl Ether	2.42	10.0	--- U	--- U
16. Chrysene	4.04	10.0	--- U	--- U
17. Dibenzo[a,h]anthracene	2.78	10.0	--- U	--- U
18. Di-N-Butyl Phthalate	3.09	10.0	--- U	--- U
19. Dimethyl Phthalate	3.78	10.0	--- U	--- U
20. Diethyl Phthalate	3.92	10.0	--- U	--- U
21. 2,4-Dinitrotoluene	3.95	10.0	--- U	--- U
22. 2,6-Dinitrotoluene	3.88	10.0	--- U	--- U
23. Di-N-Octyl Phthalate	2.81	10.0	--- U	--- U
24. Bis-(2-Ethylhexyl) Phthalate	9.97	15.0	--- U	--- U
25. Fluoranthene	3.92	10.0	--- U	--- U
26. Fluorene	2.95	10.0	--- U	--- U
27. Hexachlorobenzene	2.61	10.0	--- U	--- U
28. Hexachlorocyclopentadiene	4.16	10.0	--- U	--- U
29. Indeno[1,2,3-Cd]pyrene	2.91	10.0	--- U	--- U
30. Isophorone	3.74	10.0	--- U	--- U
31. Nitrobenzene	2.85	10.0	--- U	--- U
32. N-Nitrosodimethylamine	4.25	10.0	--- U	--- U
33. N-Nitrosodiphenylamine	3.95	10.0	--- U	--- U
34. N-Nitrosodi-N-Propylamine	4.06	10.0	--- U	--- U
35. Phenanthrene	3.24	10.0	--- U	--- U
36. Pyrene	3.63	10.0	--- U	--- U
37. 4-Chloro-3-Methylphenol	3.79	20.0	--- U	--- U
38. 2-Chlorophenol	2.75	10.0	--- U	--- U
39. O-Cresol	3.68	10.0	--- U	--- U
40. P-Cresol	4.12	10.0	--- U	--- U
41. 2,4-Dichlorophenol	5.19	10.0	--- U	--- U
42. 2,6-Dichlorophenol	4.89	10.0	--- U	--- U
43. 2,4-Dimethylphenol	3.21	10.0	--- U	--- U
44. 4,6-Dinitro-2-Methylphenol	4.77	50.0	--- U	--- U
45. 2,4-Dinitrophenol	4.37	50.0	--- U	--- U
46. Ethyl Methanesulfonate	5.26	20.0	--- U	--- U
47. Methyl Methanesulfonate	4.92	10.0	--- U	--- U
48. 2-Nitrophenol	3.64	10.0	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/28/13
DATE EXTRACTED: 08/29/13
DATE ANALYZED: 09/27/13
DATE REPORTED: 10/01/13

REVIEWED BY: _____

SEMI-VOLATILE ORGANICS
EPA METHOD 8270D R4(07)

PARAMETERS, ug/l	MDL	SWSL	MW-15R	MW-16A
49. 4-Nitrophenol	3.17	50.0	--- U	--- U
50. Pentachlorophenol	5.33	25.0	--- U	--- U
51. Phenol	1.86	10.0	--- U	--- U
52. 2,3,4,6-Tetrachlorophenol	3.12	10.0	--- U	--- U
53. 2,4,5-Trichlorophenol	4.17	10.0	--- U	--- U
54. 2,4,6-Trichlorophenol	3.84	10.0	--- U	--- U
55. Acetophenone	2.89	10.0	--- U	--- U
56. 2-Acetylaminofluorene	3.98	20.0	--- U	--- U
57. 4-Aminobiphenyl	4.12	20.0	--- U	--- U
58. Benzyl Alcohol	4.47	20.0	--- U	--- U
59. 4-Chloroaniline	3.36	20.0	--- U	--- U
60. Chlorobenzilate	5.12	10.0	--- U	--- U
61. Diallate	2.98	10.0	--- U	--- U
62. Dibenzofuran	4.28	10.0	--- U	--- U
63. 3,3-Dichlorobenzidine	4.22	20.0	--- U	--- U
64. Dimethoate	3.98	20.0	--- U	--- U
65. P-Dimethylaminoazobenzene	2.89	10.0	--- U	--- U
66. 7,12-Dimethylbenz[a]anthracene	5.26	10.0	--- U	--- U
67. 3,3-Dimethylbenzadine	3.21	10.0	--- U	--- U
68. 1,3-Dinitrobenzene	2.89	20.0	--- U	--- U
69. Diphenylamine	5.10	10.0	--- U	--- U
70. Disulfoton	4.28	10.0	--- U	--- U
71. Famphur	3.98	20.0	--- U	--- U
72. Hexachloropropene	4.31	10.0	--- U	--- U
73. Isosafrole	2.88	10.0	--- U	--- U
74. Kepone	2.78	20.0	--- U	--- U
75. Methapyrilene	3.54	100.0	--- U	--- U
76. 3-Methylchloroanthrene	4.21	10.0	--- U	--- U
77. 2-Methylnaphthalene	3.79	10.0	--- U	--- U
78. Methyl Parathion	4.32	10.0	--- U	--- U
79. m-Cresol	3.81	10.0	--- U	--- U
80. 1,4-Naphthoquinone	4.00	10.0	--- U	--- U
81. 1-Naphthylamine	5.61	10.0	--- U	--- U
82. 2-Naphthylamine	4.62	10.0	--- U	--- U
83. 2-Nitroaniline	3.61	50.0	--- U	--- U
84. 3-Nitroaniline	4.81	50.0	--- U	--- U
85. 4-Nitroaniline	4.22	20.0	--- U	--- U
86. 5-Nitro-O-Toluidine	4.01	10.0	--- U	--- U
87. N-Nitrosodi-n-butylamine	3.63	10.0	--- U	--- U
88. N-Nitrosodiethylamine	3.83	20.0	--- U	--- U
89. N-Nitrosomethylethylamine	3.83	10.0	--- U	--- U
90. N-Nitrosopiperidine	5.19	20.0	--- U	--- U
91. N-Nitrosopyrrolidine	2.89	10.0	--- U	--- U
92. Parathion	3.12	10.0	--- U	--- U
93. Pentachlorobenzene	3.92	10.0	--- U	--- U
94. Pentachloronitrobenzene	3.71	20.0	--- U	--- U
95. Phenacetin	4.41	20.0	--- U	--- U
96. 1,4 Benzenediamine	2.99	10.0	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/28/13
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REVIEWED BY: _____

SEMI-VOLATILE ORGANICS
EPA METHOD 8270D R4(07)

PARAMETERS, ug/l	MDL	SWSL	MW-15R	MW-16A
97. Phorate	3.86	10.0	--- U	--- U
98. Pronamide	3.69	10.0	--- U	--- U
99. Safrole	4.12	10.0	--- U	--- U
100. 1,2,4,5-Tetrachlorobenzene	5.01	10.0	--- U	--- U
101. Thionazin	4.62	20.0	--- U	--- U
102. O-Toluidine	4.11	10.0	--- U	--- U
103. 1,3,5-Trinitrobenzene	3.98	10.0	--- U	--- U
104. 0,0,0-Triethyl Phosphorothioate	3.61	10.0	--- U	--- U
105. Hexachloroethane	1.49	10.0	--- U	--- U
106. Isodrin	3.11	20.0	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

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CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: MAO
DATE COLLECTED: 08/28/13
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DATE REPORTED: 10/01/13

REVIEWED BY: _____

LANDFILL APPENDIX II
EPA METHOD 8260B R1(96)

PARAMETERS, ug/l	MDL	SWSL	MW-15R	MW-16A	Equipment Blank	Trip Blank
1. Chloromethane	0.77	1.0	--- U	--- U	--- U	--- U
2. Vinyl Chloride	0.63	1.0	--- U	--- U	--- U	--- U
3. Bromomethane	0.67	10.0	--- U	--- U	--- U	--- U
4. Chloroethane	0.48	10.0	--- U	0.70 J	--- U	--- U
5. Trichlorofluoromethane	0.24	1.0	--- U	0.40 J	--- U	--- U
6. 1,1-Dichloroethene	0.17	5.0	--- U	0.60 J	--- U	--- U
7. Acetone	9.06	100.0	--- U	--- U	--- U	--- U
8. Iodomethane	0.26	10.0	--- U	--- U	--- U	--- U
9. Carbon Disulfide	0.23	100.0	--- U	--- U	--- U	--- U
10. Methylene Chloride	0.64	1.0	0.70 J	1.70	--- U	--- U
11. trans-1,2-Dichloroethene	0.23	5.0	--- U	0.50 J	--- U	--- U
12. 1,1-Dichloroethane	0.20	5.0	2.90 J	14.00	--- U	--- U
13. Vinyl Acetate	0.20	50.0	--- U	--- U	--- U	--- U
14. Cis-1,2-Dichloroethene	0.25	5.0	0.80 J	37.40	--- U	--- U
15. 2-Butanone	2.21	100.0	--- U	--- U	--- U	--- U
16. Bromochloromethane	0.27	3.0	--- U	--- U	--- U	--- U
17. Chloroform	0.25	5.0	--- U	--- U	--- U	--- U
18. 1,1,1-Trichloroethane	0.19	1.0	--- U	--- U	--- U	--- U
19. Carbon Tetrachloride	0.22	1.0	--- U	--- U	--- U	--- U
20. Benzene	0.24	1.0	--- U	3.00	--- U	--- U
21. 1,2-Dichloroethane	0.21	1.0	--- U	--- U	--- U	--- U
22. Trichloroethene	0.23	1.0	0.50 J	26.40	--- U	--- U
23. 1,2-Dichloropropane	0.21	1.0	--- U	0.40 J	--- U	--- U
24. Bromodichloromethane	0.21	1.0	--- U	--- U	--- U	--- U
25. Cis-1,3-Dichloropropene	0.24	1.0	--- U	--- U	--- U	--- U
26. 4-Methyl-2-Pentanone	1.19	100.0	--- U	--- U	--- U	--- U
27. Toluene	0.23	1.0	--- U	--- U	--- U	--- U
28. trans-1,3-Dichloropropene	0.28	1.0	--- U	--- U	--- U	--- U
29. 1,1,2-Trichloroethane	0.25	1.0	--- U	--- U	--- U	--- U
30. Tetrachloroethene	0.17	1.0	1.30	58.90	--- U	--- U
31. 2-Hexanone	1.57	50.0	--- U	--- U	--- U	--- U
32. Dibromochloromethane	0.24	3.0	--- U	--- U	--- U	--- U
33. 1,2-Dibromoethane	0.26	1.0	--- U	--- U	--- U	--- U
34. Chlorobenzene	0.30	3.0	--- U	1.10 J	--- U	--- U
35. 1,1,1,2-Tetrachloroethane	0.22	5.0	--- U	--- U	--- U	--- U
36. Ethylbenzene	0.21	1.0	--- U	--- U	--- U	--- U
37. Xylenes	0.68	5.0	--- U	--- U	--- U	--- U
38. Dibromomethane	0.28	10.0	--- U	--- U	--- U	--- U
39. Styrene	0.19	1.0	--- U	--- U	--- U	--- U
40. Bromoform	0.20	3.0	--- U	--- U	--- U	--- U
41. 1,1,2,2-Tetrachloroethane	0.26	3.0	--- U	--- U	--- U	--- U
42. 1,2,3-Trichloropropane	0.43	1.0	--- U	--- U	--- U	--- U
43. 1,4-Dichlorobenzene	0.39	1.0	--- U	1.60	--- U	--- U
44. 1,2-Dichlorobenzene	0.32	5.0	--- U	1.00 J	--- U	--- U
45. 1,2-Dibromo-3-Chloropropane	0.34	13.0	--- U	--- U	--- U	--- U
46. Acrylonitrile	2.72	200.0	--- U	--- U	--- U	--- U
47. trans-1,4-Dichloro-2-Butene	0.42	100.0	--- U	--- U	--- U	--- U
48. Acrolein	40.57	53.0	--- U	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: MAO
DATE COLLECTED: 08/28/13
DATE ANALYZED: 08/30/13
DATE REPORTED: 10/01/13

REVIEWED BY: _____

LANDFILL APPENDIX II
EPA METHOD 8260B R1(96)

PARAMETERS, ug/l	MDL	SWSL	MW-15R	MW-16A	Equipment Blank	Trip Blank
49. Allyl Chloride	0.20	10.0	--- U	--- U	--- U	--- U
50. Chloroprene	0.21	20.0	--- U	--- U	--- U	--- U
51. 1,3-Dichlorobenzene	0.41	5.0	--- U	--- U	--- U	--- U
52. Dichlorodifluoromethane	0.51	5.0	--- U	8.50	--- U	--- U
53. 1,3-Dichloropropane	0.28	1.0	--- U	--- U	--- U	--- U
54. 2,2-Dichloropropane	0.17	15.0	--- U	--- U	--- U	--- U
55. 1,1-Dichloropropene	0.22	5.0	--- U	--- U	--- U	--- U
56. Ethyl Methacrylate	0.16	10.0	--- U	--- U	--- U	--- U
57. Hexachlorobutadiene	0.57	10.0	--- U	--- U	--- U	--- U
58. Isobutyl Alcohol	12.80	100.0	--- U	--- U	--- U	--- U
59. Methacrylonitrile	1.93	100.0	--- U	--- U	--- U	--- U
60. Methyl Methacrylate	0.25	30.0	--- U	--- U	--- U	--- U
61. Naphthalene	0.47	10.0	--- U	--- U	--- U	--- U
62. Propionitrile	3.26	150.0	--- U	--- U	--- U	--- U
63. 1,2,4-Trichlorobenzene	0.50	10.0	--- U	--- U	--- U	--- U
64. Acetonitrile	36.29	55.0	--- U	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Inc.
P.O. Box 7085, 114 Oakmont Dr.
Greenville, NC 27858

Phone (252) 756-6208 • Fax (252) 756-0633

CHAIN OF CUSTODY RECORD

CLIENT: 6015 **Week:** 35

HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX NC 27839

(252) 583-1807

DISINFECTION
- [ ] CHLORINE
- [ ] UV
- [ ] NONE
- [ ] _____

SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	TOTAL CHLORINE, mg/l OR ug/l AT COLLECTION	TEMPERATURE, °C AT COLLECTION	# OF CONTAINERS	Field pH	COD	Nitrate	TOC	Chloride	Metals	Turbidity	Sulfide	Conductivity	DO	Temperature	Field Parameter	EPA 8260B	8260 Dup. 1	EPA 8270D	8270D Dup. 1
CHLORINE NEUTRALIZED AT COLLECTION																					
pH CHECK (LAB)											12							12	12		
CONTAINER TYPE, P/G						P	P	P	P	P	P	P	P	P	P	P		G	G	G	G
CHEMICAL PRESERVATION						A	C	A	C	A	A	A	F	A	A	A		E	E	A	A
MW-1	8-28-13	0915		16	5	G					G	G		G	G	G	G	G	G		
[redacted]																					
[redacted]																					
[redacted]																					
MW-7D	8-28-13	1050		18	6	G					G	G		G	G	G	G	G	G		
[redacted]																					
MW-15R	8-28-13	1035		17	9	G					G	G		G	G	G	G			G	G
[redacted]																					
MW-16A	8-28-13	1020		17	9	G					G	G		G	G	G	G			G	G
Equipment Blank	8-28-13	0900			2																
Trip Blank					2																

PARAMETERS

A - NONE D - NAOH
B - HNO_3 E - HCL
C - H_2SO_4 F - ZINC ACETATE/NAOH
G - NA THIOSULFATE

CLASSIFICATION:
- [ ] WASTEWATER (NPDES)
- [ ] DRINKING WATER
- [ ] DWQ/GW
- [X] SOLID WASTE SECTION

CHAIN OF CUSTODY MAINTAINED DURING SHIPMENT/DELIVERY: (Y) N

SAMPLES COLLECTED BY: (Please Print) Bobby / Tom

SAMPLES RECEIVED IN LAB AT 1-2 °C

RELINQUISHED BY (SIG.) (SAMPLER)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
Bobby Fox	8-28-13 1410	[signature]	8/28/13 2:14
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME

COMMENTS:

PLEASE READ Instructions for completing this form on the reverse side.

Sampler must place a "C" for composite sample or a "G" for Grab sample in the blocks above for each parameter requested.

FORM #5

№ 262648

Environment 1, Inc.
P.O. Box 7085, 114 Oakmont Dr.
Greenville, NC 27858

Phone (252) 756-6208 • Fax (252) 756-0633

CHAIN OF CUSTODY RECORD

CLIENT: 6015 **Week:** 35

HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX NC 27839

(252) 583-1807

DISINFECTION
- [ ] CHLORINE
- [ ] UV
- [ ] NONE
- [ ] _____

SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	TOTAL CHLORINE, mg/l OR ug/l AT COLLECTION	TEMPERATURE, °C AT COLLECTION	# OF CONTAINERS	EPA 8081B	8260B App. II	8260 App. II 1	8260 App. II 2	8151A Landfill	ORP
CHLORINE NEUTRALIZED AT COLLECTION											
pH CHECK (LAB)								LZL			
CONTAINER TYPE, P/G						G	G	G	G	G	P
CHEMICAL PRESERVATION						A	E	E	E	A	A
MW-1	8-28-13	0915			5						C
[redacted]											
[redacted]											
[redacted]											
MW-7D	8-28-13	1050			6						C
[redacted]											
MW-15R	8-28-13	1035			9	C	C	C		C	C
[redacted]											
MW-16A	8-28-13	1020			9	C	C	C		C	C
Equipment Blank	8-28-13	0900			2		C	C			
Trip Blank					2		C	C			

PARAMETERS

A - NONE D - NAOH
B - HNO_3 E - HCL
C - H_2SO_4 F - ZINC ACETATE/NAOH
G - NA THIOSULFATE

CLASSIFICATION:
- [ ] WASTEWATER (NPDES)
- [ ] DRINKING WATER
- [ ] DWQ/GW
- [x] SOLID WASTE SECTION

CHAIN OF CUSTODY MAINTAINED DURING SHIPMENT/DELIVERY
Y N

SAMPLES COLLECTED BY: (Please Print)
Bobby Fox

SAMPLES RECEIVED IN LAB AT 1-2 °C

RELINQUISHED BY (SIG.) (SAMPLER)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
Bobby Fox	8-28-13 1410	[signature]	8/28/13 214
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME

COMMENTS:

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FORM #5

№ 262647

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

ID#: 6015

HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX ,NC 27839

DATE COLLECTED: 08/29/13
DATE REPORTED : 10/01/13

REVIEWED BY:

PARAMETERS	MDL	SWSL	MW-2A	MW-2AD	MW-3D	MW-3AS	MW-6D	Analysis Date	Analyst	Method Code
PH (field measurement), Units			6.0	5.7	5.8	6.1	5.7	08/29/13	BF	4500HB-00
COD, mg/l	20.0	20.0	29	--- U	--- U	22		09/09/13	TRB	H8000-79
Nitrate Nitrogen as N, mg/l	0.03	10.0	--- U	0.13 J	0.05 J	0.07 J		08/30/13	ANO	353.2 R2-93
Total Organic Carbon, mg/l	0.30	1.0	7.25	1.22	--- U	3.30		09/04/13	SEJ	5310C-00
Chloride, mg/l	5.0	5.0	8	7	10	11		09/03/13	HMB	4500CLB-97
Antimony, ug/l	0.02	6.0	0.12 J	0.26 J	0.40 J	0.25 J	0.29 J	09/09/13	LFJ	EPA200.8
Arsenic, ug/l	0.05	10.0	1.8 J	1.3 J	0.17 J	2.9 J	--- U	09/09/13	LFJ	EPA200.8
Barium, ug/l	0.06	100.0	143	92.7 J	71.0 J	35.6 J	632	09/09/13	LFJ	EPA200.8
Beryllium, ug/l	0.03	1.0	0.79 J	0.08 J	0.16 J	0.23 J	0.58 J	09/09/13	LFJ	EPA200.8
Cadmium, ug/l	0.05	1.0	0.20 J	0.20 J	0.36 J	0.28 J	0.58 J	09/09/13	LFJ	EPA200.8
Cobalt, ug/l	0.02	10.0	3.6 J	4.8 J	0.09 J	3.1 J	2.4 J	09/09/13	LFJ	EPA200.8
Copper, ug/l	0.06	10.0	2.1 J	0.83 J	2.5 J	1.3 J	1.7 J	09/09/13	LFJ	EPA200.8
Total Chromium, ug/l	0.04	10.0	2.2 J	--- U	0.13 J	0.26 J	0.14 J	09/09/13	LFJ	EPA200.8
Iron, ug/l	13.6	300.0	31275	4820	291 J	88900		09/24/13	ADD	3111B-99
Lead, ug/l	0.02	10.0	2.3 J	0.21 J	0.40 J	1.0 J	0.48 J	09/09/13	LFJ	EPA200.8
Mercury, ug/l	0.01	0.20	--- U	--- U	--- U	--- U	--- U	09/09/13	ADD	245.1 R3-94
Nickel, ug/l	0.45	50.0	1.5 J	1.8 J	0.87 J	0.89 J	2.3 J	09/09/13	LFJ	EPA200.8
Selenium, ug/l	0.06	10.0	0.21 J	--- U	--- U	0.14 J	0.37 J	09/09/13	LFJ	EPA200.8
Silver, ug/l	0.03	10.0	--- U	--- U	--- U	--- U	--- U	09/09/13	LFJ	EPA200.8
Thallium, ug/l	0.02	5.5	0.08 J	0.28 J	--- U	0.03 J	0.03 J	09/09/13	LFJ	EPA200.8
Tin, ug/l	0.06	100.0	0.45 J	0.35 J	0.32 J	2.0 J	0.65 J	09/09/13	LFJ	EPA200.8
Vanadium, ug/l	0.07	25.0	6.2 J	0.36 J	0.31 J	2.1 J	1.1 J	09/09/13	LFJ	EPA200.8
Zinc, ug/l	0.47	10.0	19	11	13	8.0 J	17	09/09/13	LFJ	EPA200.8
Turbidity, NTU	1.0	1.0	180	20	9.9	180	24	08/29/13	HMB	2130B-01
Sulfide, ug/l	100	1000	--- U	--- U	--- U	--- U		08/30/13	LFJ	4500S2D-00
Conductivity (at 25c), uMhos/cm	1.0	1.0	240	403	187	422	558	08/29/13	BF	2510B-97
Dissolved Oxygen, mg/l	0.1	0.1	2.54	0.75	0.66	0.65	1.06	08/29/13	BF	4500OG-01
Temperature, °C			22	16	19	19	18	08/29/13	BF	2550B-00
Static Water Level, feet			5.34	5.00	8.84	9.38	12.50	08/29/13	BF	
Well Depth, feet			16.83	41.15	52.19	22.31	42.20	08/29/13	BF	
ORP, mv			-38.7	+67.8	+209.2	-43.4	+138.3	08/29/13	BF	2580B

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

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FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/29/13
DATE EXTRACTED: 08/30/13
DATE ANALYZED: 09/30/13
DATE REPORTED: 10/01/13

REVIEWED BY:

PESTICIDES AND PCB'S
EPA METHOD 8081B R2(07)

PARAMETERS, ug/l	MDL	SWSL	MW-2A	MW-2AD	MW-3D	MW-3AS	MW-6D
1. Aldrin	0.029	0.05	--- U	--- U	--- U	--- U	--- U
2. Alpha-BHC	0.032	0.05	--- U	--- U	--- U	--- U	--- U
3. Beta-BHC	0.031	0.05	--- U	--- U	--- U	--- U	--- U
4. Delta-BHC	0.030	0.05	--- U	--- U	--- U	--- U	--- U
5. Gamma-BHC (Lindane)	0.032	0.05	--- U	--- U	--- U	--- U	--- U
6. Chlordane	0.320	0.50	--- U	--- U	--- U	--- U	--- U
7. 4,4-DDD	0.051	0.10	--- U	--- U	--- U	--- U	--- U
8. 4,4-DDE	0.049	0.10	--- U	--- U	--- U	--- U	--- U
9. 4,4-DDT	0.052	0.10	--- U	--- U	--- U	--- U	--- U
10. Dieldrin	0.042	0.075	--- U	--- U	--- U	--- U	--- U
11. Endosulfan I	0.056	0.10	--- U	--- U	--- U	--- U	--- U
12. Endosulfan II	0.046	0.10	--- U	--- U	--- U	--- U	--- U
13. Endosulfan Sulfate	0.072	0.10	--- U	--- U	--- U	--- U	--- U
14. Endrin	0.053	0.10	--- U	--- U	--- U	--- U	--- U
15. Endrin Aldehyde	0.068	0.10	--- U	--- U	--- U	--- U	--- U
16. Heptachlor	0.039	0.05	--- U	--- U	--- U	--- U	--- U
17. Heptachlor Epoxide	0.042	0.075	--- U	--- U	--- U	--- U	--- U
18. Methoxychlor	0.530	1.00	--- U	--- U	--- U	--- U	--- U
19. Pcb's (Aroclors)	0.500	2.00	--- U	--- U	--- U	--- U	--- U
20. Toxaphene	0.690	1.50	--- U	--- U	--- U	--- U	--- U

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MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/29/13
DATE EXTRACTED: 09/04/13
DATE ANALYZED: 09/09/13
DATE REPORTED: 10/01/13

REVIEWED BY:

LANDFILL APPENDIX II
EPA METHOD 8151A R1(96)

PARAMETERS, ug/l	MDL	SWSL	MW-2A	MW-2AD	MW-3D	MW-3AS	MW-6D
1. 2,4-D	0.36	2.0	0.39 J	--- U	--- U	--- U	--- U
2. Dinoseb	0.54	1.0	--- U	--- U	--- U	--- U	--- U
3. 2,4,5-TP	0.42	2.0	--- U	--- U	--- U	--- U	--- U
4. 2,4,5-T	0.47	2.0	--- U	--- U	--- U	--- U	--- U

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ANALYST: CHS
DATE COLLECTED: 08/29/13
DATE EXTRACTED: 09/02/13
DATE ANALYZED: 09/28/13
DATE REPORTED: 10/01/13

REVIEWED BY: _____

SEMI-VOLATILE ORGANICS
EPA METHOD 8270D R4(07)

PARAMETERS, ug/l	MDL	SWSL	MW-2A	MW-2AD	MW-3D	MW-3AS	MW-6D
1. Acenaphthene	2.66	10.0	--- U	--- U	--- U	--- U	--- U
2. Acenaphthylene	2.60	10.0	--- U	--- U	--- U	--- U	--- U
3. Anthracene	2.97	10.0	--- U	--- U	--- U	--- U	--- U
4. Benzo[a]antrhacene	4.16	10.0	--- U	--- U	--- U	--- U	--- U
5. Benzo[b]fluoranthene	3.32	10.0	--- U	--- U	--- U	--- U	--- U
6. Benzo[k]fluoranthene	4.23	10.0	--- U	--- U	--- U	--- U	--- U
7. Benzo[g,h,i]perylene	2.61	10.0	--- U	--- U	--- U	--- U	--- U
8. Benzo[a]pyrene	3.27	10.0	--- U	--- U	--- U	--- U	--- U
9. 4-Bromophenyl Phenyl Ether	2.63	10.0	--- U	--- U	--- U	--- U	--- U
10. Butyl Benzyl Phthalate	5.78	10.0	--- U	--- U	--- U	--- U	--- U
11. Bis-(2-Chloroethoxy) Methane	3.14	10.0	--- U	--- U	--- U	--- U	--- U
12. Bis-(2-Chloroethyl) Ether	2.58	10.0	--- U	--- U	--- U	--- U	--- U
13. Bis-(2-Chloroisopropyl) Ether	2.58	10.0	--- U	--- U	--- U	--- U	--- U
14. 2-Chloronaphthalene	2.17	10.0	--- U	--- U	--- U	--- U	--- U
15. 4-Chlorophenyl Phenyl Ether	2.42	10.0	--- U	--- U	--- U	--- U	--- U
16. Chrysene	4.04	10.0	--- U	--- U	--- U	--- U	--- U
17. Dibenzo[a,h]anthracene	2.78	10.0	--- U	--- U	--- U	--- U	--- U
18. Di-N-Butyl Phthalate	3.09	10.0	--- U	--- U	--- U	--- U	--- U
19. Dimethyl Phthalate	3.78	10.0	--- U	--- U	--- U	--- U	--- U
20. Diethyl Phthalate	3.92	10.0	--- U	--- U	--- U	--- U	--- U
21. 2,4-Dinitrotoluene	3.95	10.0	--- U	--- U	--- U	--- U	--- U
22. 2,6-Dinitrotoluene	3.88	10.0	--- U	--- U	--- U	--- U	--- U
23. Di-N-Octyl Phthalate	2.81	10.0	--- U	--- U	--- U	--- U	--- U
24. Bis-(2-Ethylhexyl) Phthalate	9.97	15.0	10.20 J	--- U	11.70 J	--- U	--- U
25. Fluoranthene	3.92	10.0	--- U	--- U	--- U	--- U	--- U
26. Fluorene	2.95	10.0	--- U	--- U	--- U	--- U	--- U
27. Hexachlorobenzene	2.61	10.0	--- U	--- U	--- U	--- U	--- U
28. Hexachlorocyclopentadiene	4.16	10.0	--- U	--- U	--- U	--- U	--- U
29. Indeno[1,2,3-Cd]pyrene	2.91	10.0	--- U	--- U	--- U	--- U	--- U
30. Isophorone	3.74	10.0	--- U	--- U	--- U	--- U	--- U
31. Nitrobenzene	2.85	10.0	--- U	--- U	--- U	--- U	--- U
32. N-Nitrosodimethylamine	4.25	10.0	--- U	--- U	--- U	--- U	--- U
33. N-Nitrosodiphenylamine	3.95	10.0	--- U	--- U	--- U	--- U	--- U
34. N-Nitrosodi-N-Propylamine	4.06	10.0	--- U	--- U	--- U	--- U	--- U
35. Phenanthrene	3.24	10.0	--- U	--- U	--- U	--- U	--- U
36. Pyrene	3.63	10.0	--- U	--- U	--- U	--- U	--- U
37. 4-Chloro-3-Methylphenol	3.79	20.0	--- U	--- U	--- U	--- U	--- U
38. 2-Chlorophenol	2.75	10.0	--- U	--- U	--- U	--- U	--- U
39. O-Cresol	3.68	10.0	--- U	--- U	--- U	--- U	--- U
40. P-Cresol	4.12	10.0	--- U	--- U	--- U	--- U	--- U
41. 2,4-Dichlorophenol	5.19	10.0	--- U	--- U	--- U	--- U	--- U
42. 2,6-Dichlorophenol	4.89	10.0	--- U	--- U	--- U	--- U	--- U
43. 2,4-Dimethylphenol	3.21	10.0	--- U	--- U	--- U	--- U	--- U
44. 4,6-Dinitro-2-Methylphenol	4.77	50.0	--- U	--- U	--- U	--- U	--- U
45. 2,4-Dinitrophenol	4.37	50.0	--- U	--- U	--- U	--- U	--- U
46. Ethyl Methanesulfonate	5.26	20.0	--- U	--- U	--- U	--- U	--- U
47. Methyl Methanesulfonate	4.92	10.0	--- U	--- U	--- U	--- U	--- U
48. 2-Nitrophenol	3.64	10.0	--- U	--- U	--- U	--- U	--- U

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Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

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GREENVILLE, N.C. 27835-7085

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CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/29/13
DATE EXTRACTED: 09/02/13
DATE ANALYZED: 09/28/13
DATE REPORTED: 10/01/13

REVIEWED BY: _____

SEMI-VOLATILE ORGANICS
EPA METHOD 8270D R4(07)

PARAMETERS, ug/l	MDL	SWSL	MW-2A	MW-2AD	MW-3D	MW-3AS	MW-6D
49. 4-Nitrophenol	3.17	50.0	--- U	--- U	--- U	--- U	--- U
50. Pentachlorophenol	5.33	25.0	--- U	--- U	--- U	--- U	--- U
51. Phenol	1.86	10.0	--- U	--- U	--- U	--- U	--- U
52. 2,3,4,6-Tetrachlorophenol	3.12	10.0	--- U	--- U	--- U	--- U	--- U
53. 2,4,5-Trichlorophenol	4.17	10.0	--- U	--- U	--- U	--- U	--- U
54. 2,4,6-Trichlorophenol	3.84	10.0	--- U	--- U	--- U	--- U	--- U
55. Acetophenone	2.89	10.0	--- U	--- U	--- U	--- U	--- U
56. 2-Acetylaminofluorene	3.98	20.0	--- U	--- U	--- U	--- U	--- U
57. 4-Aminobiphenyl	4.12	20.0	--- U	--- U	--- U	--- U	--- U
58. Benzyl Alcohol	4.47	20.0	--- U	--- U	--- U	--- U	--- U
59. 4-Chloroaniline	3.36	20.0	--- U	--- U	--- U	--- U	--- U
60. Chlorobenzilate	5.12	10.0	--- U	--- U	--- U	--- U	--- U
61. Diallate	2.98	10.0	--- U	--- U	--- U	--- U	--- U
62. Dibenzofuran	4.28	10.0	--- U	--- U	--- U	--- U	--- U
63. 3,3-Dichlorobenzidine	4.22	20.0	--- U	--- U	--- U	--- U	--- U
64. Dimethoate	3.98	20.0	--- U	--- U	--- U	--- U	--- U
65. P-Dimethylaminoazobenzene	2.89	10.0	--- U	--- U	--- U	--- U	--- U
66. 7,12-Dimethylbenz[a]anthracene	5.26	10.0	--- U	--- U	--- U	--- U	--- U
67. 3,3-Dimethylbenzadine	3.21	10.0	--- U	--- U	--- U	--- U	--- U
68. 1,3-Dinitrobenzene	2.89	20.0	--- U	--- U	--- U	--- U	--- U
69. Diphenylamine	5.10	10.0	--- U	--- U	--- U	--- U	--- U
70. Disulfoton	4.28	10.0	--- U	--- U	--- U	--- U	--- U
71. Famphur	3.98	20.0	--- U	--- U	--- U	--- U	--- U
72. Hexachloropropene	4.31	10.0	--- U	--- U	--- U	--- U	--- U
73. Isosafrole	2.88	10.0	--- U	--- U	--- U	--- U	--- U
74. Kepone	2.78	20.0	--- U	--- U	--- U	--- U	--- U
75. Methapyrilene	3.54	100.0	--- U	--- U	--- U	--- U	--- U
76. 3-Methylchloroanthrene	4.21	10.0	--- U	--- U	--- U	--- U	--- U
77. 2-Methylnaphthalene	3.79	10.0	--- U	--- U	--- U	--- U	--- U
78. Methyl Parathion	4.32	10.0	--- U	--- U	--- U	--- U	--- U
79. m-Cresol	3.81	10.0	--- U	--- U	--- U	--- U	--- U
80. 1,4-Naphthoquinone	4.00	10.0	--- U	--- U	--- U	--- U	--- U
81. 1-Naphthylamine	5.61	10.0	--- U	--- U	--- U	--- U	--- U
82. 2-Naphthylamine	4.62	10.0	--- U	--- U	--- U	--- U	--- U
83. 2-Nitroaniline	3.61	50.0	--- U	--- U	--- U	--- U	--- U
84. 3-Nitroaniline	4.81	50.0	--- U	--- U	--- U	--- U	--- U
85. 4-Nitroaniline	4.22	20.0	--- U	--- U	--- U	--- U	--- U
86. 5-Nitro-O-Toluidine	4.01	10.0	--- U	--- U	--- U	--- U	--- U
87. N-Nitrosodi-n-butylamine	3.63	10.0	--- U	--- U	--- U	--- U	--- U
88. N-Nitrosodiethylamine	3.83	20.0	--- U	--- U	--- U	--- U	--- U
89. N-Nitrosomethylethylamine	3.83	10.0	--- U	--- U	--- U	--- U	--- U
90. N-Nitrosopiperidine	5.19	20.0	--- U	--- U	--- U	--- U	--- U
91. N-Nitrosopyrrolidine	2.89	10.0	--- U	--- U	--- U	--- U	--- U
92. Parathion	3.12	10.0	--- U	--- U	--- U	--- U	--- U
93. Pentachlorobenzene	3.92	10.0	--- U	--- U	--- U	--- U	--- U
94. Pentachloronitrobenzene	3.71	20.0	--- U	--- U	--- U	--- U	--- U
95. Phenacetin	4.41	20.0	--- U	--- U	--- U	--- U	--- U
96. 1,4 Benzenediamine	2.99	10.0	--- U	--- U	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

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CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
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P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: CHS
DATE COLLECTED: 08/29/13
DATE EXTRACTED: 09/02/13
DATE ANALYZED: 09/28/13
DATE REPORTED: 10/01/13

REVIEWED BY:

SEMI-VOLATILE ORGANICS
EPA METHOD 8270D R4(07)

PARAMETERS, ug/l	MDL	SWSL	MW-2A	MW-2AD	MW-3D	MW-3AS	MW-6D
97. Phorate	3.86	10.0	--- U	--- U	--- U	--- U	--- U
98. Pronamide	3.69	10.0	--- U	--- U	--- U	--- U	--- U
99. Safrole	4.12	10.0	--- U	--- U	--- U	--- U	--- U
100. 1,2,4,5-Tetrachlorobenzene	5.01	10.0	--- U	--- U	--- U	--- U	--- U
101. Thionazin	4.62	20.0	--- U	--- U	--- U	--- U	--- U
102. O-Toluidine	4.11	10.0	--- U	--- U	--- U	--- U	--- U
103. 1,3,5-Trinitrobenzene	3.98	10.0	--- U	--- U	--- U	--- U	--- U
104. 0,0,0-Triethyl Phosphorothioate	3.61	10.0	--- U	--- U	--- U	--- U	--- U
105. Hexachloroethane	1.49	10.0	--- U	--- U	--- U	--- U	--- U
106. Isodrin	3.11	20.0	--- U	--- U	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: MAO
DATE COLLECTED: 08/29/13
DATE REPORTED: 10/01/13

REVIEWED BY:

LANDFILL APPENDIX II
EPA METHOD 8260B R1(96)

PARAMETERS, ug/l	MDL	SWSL	09/04/13 MW-2A	09/04/13 MW-2AD	09/05/13 MW-3D	09/05/13 MW-3AS	09/05/13 MW-6D
	Date Analyzed:						
1. Chloromethane	0.77	1.0	--- U	--- U	--- U	--- U	--- U
2. Vinyl Chloride	0.63	1.0	2.70	3.80	--- U	2.20	--- U
3. Bromomethane	0.67	10.0	--- U	--- U	--- U	--- U	--- U
4. Chloroethane	0.48	10.0	--- U	--- U	--- U	0.70 J	1.10 J
5. Trichlorofluoromethane	0.24	1.0	--- U	--- U	--- U	--- U	--- U
6. 1,1-Dichloroethene	0.17	5.0	--- U	--- U	0.20 J	--- U	--- U
7. Acetone	9.06	100.0	--- U	--- U	--- U	--- U	--- U
8. Iodomethane	0.26	10.0	--- U	--- U	--- U	--- U	--- U
9. Carbon Disulfide	0.23	100.0	--- U	--- U	--- U	--- U	--- U
10. Methylene Chloride	0.64	1.0	--- U	--- U	--- U	--- U	--- U
11. trans-1,2-Dichloroethene	0.23	5.0	--- U	--- U	--- U	--- U	--- U
12. 1,1-Dichloroethane	0.20	5.0	1.80 J	7.90	7.50	6.30	0.30 J
13. Vinyl Acetate	0.20	50.0	--- U	--- U	--- U	--- U	--- U
14. Cis-1,2-Dichloroethene	0.25	5.0	--- U	10.50	8.50	5.00	0.50 J
15. 2-Butanone	2.21	100.0	--- U	--- U	--- U	--- U	--- U
16. Bromochloromethane	0.27	3.0	--- U	--- U	--- U	--- U	--- U
17. Chloroform	0.25	5.0	--- U	--- U	--- U	--- U	--- U
18. 1,1,1-Trichloroethane	0.19	1.0	--- U	--- U	--- U	--- U	--- U
19. Carbon Tetrachloride	0.22	1.0	--- U	--- U	--- U	--- U	--- U
20. Benzene	0.24	1.0	--- U	0.50 J	0.40 J	0.80 J	2.00
21. 1,2-Dichloroethane	0.21	1.0	--- U	--- U	--- U	--- U	--- U
22. Trichloroethene	0.23	1.0	--- U	2.40	1.30	0.70 J	--- U
23. 1,2-Dichloropropane	0.21	1.0	--- U	--- U	--- U	--- U	--- U
24. Bromodichloromethane	0.21	1.0	--- U	--- U	--- U	--- U	--- U
25. Cis-1,3-Dichloropropene	0.24	1.0	--- U	--- U	--- U	--- U	--- U
26. 4-Methyl-2-Pentanone	1.19	100.0	--- U	--- U	--- U	--- U	--- U
27. Toluene	0.23	1.0	--- U	--- U	--- U	--- U	--- U
28. trans-1,3-Dichloropropene	0.28	1.0	--- U	--- U	--- U	--- U	--- U
29. 1,1,2-Trichloroethane	0.25	1.0	--- U	--- U	--- U	--- U	--- U
30. Tetrachloroethene	0.17	1.0	--- U	--- U	1.40	--- U	--- U
31. 2-Hexanone	1.57	50.0	--- U	--- U	--- U	--- U	--- U
32. Dibromochloromethane	0.24	3.0	--- U	--- U	--- U	--- U	--- U
33. 1,2-Dibromoethane	0.26	1.0	--- U	--- U	--- U	--- U	--- U
34. Chlorobenzene	0.30	3.0	0.30 J	2.20 J	0.40 J	1.10 J	10.10
35. 1,1,1,2-Tetrachloroethane	0.22	5.0	--- U	--- U	--- U	--- U	--- U
36. Ethylbenzene	0.21	1.0	--- U	--- U	--- U	--- U	--- U
37. Xylenes	0.68	5.0	--- U	--- U	--- U	--- U	--- U
38. Dibromomethane	0.28	10.0	--- U	--- U	--- U	--- U	--- U
39. Styrene	0.19	1.0	--- U	--- U	--- U	--- U	--- U
40. Bromoform	0.20	3.0	--- U	--- U	--- U	--- U	--- U
41. 1,1,2,2-Tetrachloroethane	0.26	3.0	--- U	--- U	--- U	--- U	--- U
42. 1,2,3-Trichloropropane	0.43	1.0	--- U	--- U	--- U	--- U	--- U
43. 1,4-Dichlorobenzene	0.39	1.0	--- U	1.00	0.40 J	0.50 J	3.10
44. 1,2-Dichlorobenzene	0.32	5.0	--- U	--- U	--- U	--- U	--- U
45. 1,2-Dibromo-3-Chloropropane	0.34	13.0	--- U	--- U	--- U	--- U	--- U
46. Acrylonitrile	2.72	200.0	--- U	--- U	--- U	--- U	--- U
47. trans-1,4-Dichloro-2-Butene	0.42	100.0	--- U	--- U	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015

ANALYST: MAO
DATE COLLECTED: 08/29/13
DATE REPORTED: 10/01/13

REVIEWED BY:

LANDFILL APPENDIX II
EPA METHOD 8260B R1(96)

PARAMETERS, ug/l	MDL	SWSL	09/04/13 MW-2A	09/04/13 MW-2AD	09/05/13 MW-3D	09/05/13 MW-3AS	09/05/13 MW-6D
	Date Analyzed:						
48. Acrolein	40.57	53.0	--- U	--- U	--- U	--- U	--- U
49. Allyl Chloride	0.20	10.0	--- U	--- U	--- U	--- U	--- U
50. Chloroprene	0.21	20.0	--- U	--- U	--- U	--- U	--- U
51. 1,3-Dichlorobenzene	0.41	5.0	--- U	--- U	--- U	--- U	--- U
52. Dichlorodifluoromethane	0.51	5.0	--- U	--- U	0.80 J	--- U	--- U
53. 1,3-Dichloropropane	0.28	1.0	--- U	--- U	--- U	--- U	--- U
54. 2,2-Dichloropropane	0.17	15.0	--- U	--- U	--- U	--- U	--- U
55. 1,1-Dichloropropene	0.22	5.0	--- U	--- U	--- U	--- U	--- U
56. Ethyl Methacrylate	0.16	10.0	--- U	--- U	--- U	--- U	--- U
57. Hexachlorobutadiene	0.57	10.0	--- U	--- U	--- U	--- U	--- U
58. Isobutyl Alcohol	12.80	100.0	--- U	--- U	--- U	--- U	--- U
59. Methacrylonitrile	1.93	100.0	--- U	--- U	--- U	--- U	--- U
60. Methyl Methacrylate	0.25	30.0	--- U	--- U	--- U	--- U	--- U
61. Naphthalene	0.47	10.0	--- U	--- U	--- U	--- U	--- U
62. Propionitrile	3.26	150.0	--- U	--- U	--- U	--- U	--- U
63. 1,2,4-Trichlorobenzene	0.50	10.0	--- U	--- U	--- U	--- U	--- U
64. Acetonitrile	36.29	55.0	--- U	--- U	--- U	--- U	--- U

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Environment 1, Inc.
P.O. Box 7085, 114 Oakmont Dr.
Greenville, NC 27858

Phone (252) 756-6208 • Fax (252) 756-0633

CHAIN OF CUSTODY RECORD

CLIENT: 6015 **Week:** 35

HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX NC 27839

(252) 583-1807

DISINFECTION: ☐ CHLORINE ☐ UV ☐ NONE ☐ _____

SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	TOTAL CHLORINE, mg/l OR ug/l AT COLLECTION	TEMPERATURE, °C AT COLLECTION	# OF CONTAINERS	Field pH	COD	Nitrate	TOC	Chloride	Metals	Turbidity	Sulfide	Conductivity	DO	Temperature	Field Parameter	EPA 8260B	8260 Dup. 1	EPA 8270D	8270D Dup. 1
CHLORINE NEUTRALIZED AT COLLECTION																					
pH CHECK (LAB)											c2										
CONTAINER TYPE, P/G						P	P	P	P	P	P	P	P	P	P	P		G	G	G	G
CHEMICAL PRESERVATION						A	C	A	C	A	A	A	F	A	A	A		E	E	A	A
[redacted]																					
MW-2A	8-29-13	0920		22	13	G	G	G	G	G	G	G	G	G	G	G	G			G	G
MW-3D	8-29-13	1020		19	14	G	G	G	G	G	G	G	G	G	G	G	G			G	G
MW-6D	8-29-13	1035		18	9	G					G	G		G	G	G	G			G	G
[redacted]					6																
MW-2AD	8-29-13	0935		16	13	G	G	G	G	G	G	G	G	G	G	G	G			G	G
[redacted]																					
MW-3AS	8-29-13	1010		19	14	G	G	G	G	G	G	G	G	G	G	G	G			G	G
[redacted]																					
~~Equipment Blank~~					2																
Trip Blank					2																

PARAMETERS

A - NONE D - NAOH
B - HNO_3 E - HCL
C - H_2SO_4 F - ZINC ACETATE/NAOH
G - NA THIOSULFATE

CLASSIFICATION:
☐ WASTEWATER (NPDES)
☐ DRINKING WATER
☐ DWQ/GW
☒ SOLID WASTE SECTION

CHAIN OF CUSTODY MAINTAINED DURING SHIPMENT/DELIVERY: (Y) N

SAMPLES COLLECTED BY: (Please Print) Bobby / Tom

SAMPLES RECEIVED IN LAB AT 0-7 °C

RELINQUISHED BY (SIG.) (SAMPLER)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
Bobby Fox	8-29-13 1325	[signature]	8/29/13 1331
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME

COMMENTS:

PLEASE READ Instructions for completing this form on the reverse side.

Sampler must place a "C" for composite sample or a "G" for Grab sample in the blocks above for each parameter requested.

№ 262648

FORM #5

Environment 1, Inc.
P.O. Box 7085, 114 Oakmont Dr.
Greenville, NC 27858

Phone (252) 756-6208 • Fax (252) 756-0633

CHAIN OF CUSTODY RECORD

CLIENT: 6015 **Week: 35**

HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX NC 27839

(252) 583-1807

DISINFECTION
- [ ] CHLORINE
- [ ] UV
- [ ] NONE
- [ ] _____

SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	TOTAL CHLORINE, mg/l OR ug/l AT COLLECTION	TEMPERATURE, °C AT COLLECTION	# OF CONTAINERS	EPA 8081B	8260B App. II	8260 App. II 1	8260 App. II 2	8151A Landfill	ORP
CHLORINE NEUTRALIZED AT COLLECTION											
pH CHECK (LAB)							<2	<2	<2		
CONTAINER TYPE, P/G						G	G	G	G	G	P
CHEMICAL PRESERVATION						A	E	E	E	A	A
[redacted]											
MW-2A	8-29-13	0920		22	13	G	G	G		G	G
MW-3D	8-29-13	1020		19	14	G	G	G	G	G	G
MW-6D	8-29-13	1035		18	9	G	G	G		G	G
[redacted]											
MW-2AD	8-29-13	0935		16	13	G	G	G		G	G
[redacted]											
MW-3AS	8-29-13	1010		19	14	G	G	G	G	G	G
[redacted]											
[redacted]											
Trip Blank					2		G	G			

PARAMETERS

A - NONE D - NAOH
B - HNO_3 E - HCL
C - H_2SO_4 F - ZINC ACETATE/NAOH
G - NA THIOSULFATE

CLASSIFICATION:
- [ ] WASTEWATER (NPDES)
- [ ] DRINKING WATER
- [ ] DWQ/GW
- [x] SOLID WASTE SECTION

CHAIN OF CUSTODY MAINTAINED DURING SHIPMENT/DELIVERY
(Y) N

SAMPLES COLLECTED BY: (Please Print)
Bobby / Tom

SAMPLES RECEIVED IN LAB AT 6-7 °C

RELINQUISHED BY (SIG.) (SAMPLER)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
Bobby Tao	8-29-13 1325	[signature]	8/29/13 1315
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME

COMMENTS:

PLEASE READ Instructions for completing this form on the reverse side.

Sampler must place a "C" for composite sample or a "G" for Grab sample in the blocks above for each parameter requested.

№ 262647

FORM #5

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

ID#: 6015 C

HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX ,NC 27839

DATE COLLECTED: 08/29/13
DATE REPORTED : 10/01/13

REVIEWED BY:

PARAMETERS	MDL	SWSL	MW-17	MW-18S	BP-3	BP-9	G-13	Analysis Date	Analyst	Method Code
PH (field measurement), Units			5.6	6.1			4.6	08/29/13	BF	4500HB-00
COD, mg/l	20.0	20.0					27	09/09/13	TRB	H8000-79
Nitrate Nitrogen as N, mg/l	0.03	10.0					0.12 J	08/30/13	ANO	353.2 R2-93
Total Organic Carbon, mg/l	0.30	1.0					2.65	09/04/13	SEJ	5310C-00
Chloride, mg/l	5.0	5.0					11	09/03/13	HMB	4500CLB-97
Antimony, ug/l	0.02	6.0	0.10 J	0.24 J			0.38 J	09/09/13	LFJ	EPA200.8
Arsenic, ug/l	0.05	10.0	0.28 J	2.8 J			1.9 J	09/09/13	LFJ	EPA200.8
Barium, ug/l	0.06	100.0	45.3 J	82.5 J			134	09/09/13	LFJ	EPA200.8
Beryllium, ug/l	0.03	1.0	0.46 J	0.07 J			7	09/09/13	LFJ	EPA200.8
Cadmium, ug/l	0.05	1.0	0.24 J	0.22 J			0.85 J	09/09/13	LFJ	EPA200.8
Cobalt, ug/l	0.02	10.0	0.64 J	5.2 J			7.7 J	09/09/13	LFJ	EPA200.8
Copper, ug/l	0.06	10.0	1.4 J	1.8 J			6.1 J	09/09/13	LFJ	EPA200.8
Total Chromium, ug/l	0.04	10.0	0.40 J	0.39 J			1.3 J	09/09/13	LFJ	EPA200.8
Iron, ug/l	13.6	300.0					24775	09/24/13	ADD	3111B-99
Lead, ug/l	0.02	10.0	1.8 J	0.38 J			8.4 J	09/09/13	LFJ	EPA200.8
Mercury, ug/l	0.01	0.20	--- U	--- U				09/09/13	ADD	245.1 R3-94
Nickel, ug/l	0.45	50.0	1.0 J	1.6 J			3.2 J	09/09/13	LFJ	EPA200.8
Selenium, ug/l	0.06	10.0	0.20 J	0.06 J			1.2 J	09/09/13	LFJ	EPA200.8
Silver, ug/l	0.03	10.0	--- U	--- U			--- U	09/09/13	LFJ	EPA200.8
Thallium, ug/l	0.02	5.5	0.04 J	0.03 J			0.30 J	09/09/13	LFJ	EPA200.8
Tin, ug/l	0.06	100.0	0.45 J	0.46 J				09/09/13	LFJ	EPA200.8
Vanadium, ug/l	0.07	25.0	2.2 J	1.7 J			14.1 J	09/09/13	LFJ	EPA200.8
Zinc, ug/l	0.47	10.0	13	9.9 J			61	09/09/13	LFJ	EPA200.8
Turbidity, NTU	1.0	1.0	65	230			340	08/29/13	HMB	2130B-01
Sulfide, ug/l	100	1000					--- U	08/30/13	LFJ	4500S2D-00
Conductivity (at 25c), uMhos/cm	1.0	1.0	137	176			108	08/29/13	BF	2510B-97
Dissolved Oxygen, mg/l	0.1	0.1	0.75	0.90			0.66	08/29/13	BF	4500OG-01
Temperature, °C			20	21			18	08/29/13	BF	2550B-00
Static Water Level, feet			5.29	4.58	30.94	28.19	12.30	08/29/13	BF	
Well Depth, feet			27.04	20.12			21.20	08/29/13	BF	
ORP, mv			+176.4	+11.6			+242.0	08/29/13	BF	2580B

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

ID#: 6015 C

HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX ,NC 27839

DATE COLLECTED: 08/29/13
DATE REPORTED : 10/01/13

REVIEWED BY:

PARAMETERS	MDL	SWSL	G-13D	Analysis Date	Analyst	Method Code
PH (field measurement), Units			5.1	08/29/13	BF	4500HB-00
Antimony, ug/l	0.02	6.0	0.76 J	09/09/13	LFJ	EPA200.8
Arsenic, ug/l	0.05	10.0	0.12 J	09/09/13	LFJ	EPA200.8
Barium, ug/l	0.06	100.0	43.9 J	09/09/13	LFJ	EPA200.8
Beryllium, ug/l	0.03	1.0	0.32 J	09/09/13	LFJ	EPA200.8
Cadmium, ug/l	0.05	1.0	0.44 J	09/09/13	LFJ	EPA200.8
Cobalt, ug/l	0.02	10.0	0.56 J	09/09/13	LFJ	EPA200.8
Copper, ug/l	0.06	10.0	3.8 J	09/09/13	LFJ	EPA200.8
Total Chromium, ug/l	0.04	10.0	--- U	09/09/13	LFJ	EPA200.8
Lead, ug/l	0.02	10.0	0.61 J	09/09/13	LFJ	EPA200.8
Nickel, ug/l	0.45	50.0	0.96 J	09/09/13	LFJ	EPA200.8
Selenium, ug/l	0.06	10.0	--- U	09/09/13	LFJ	EPA200.8
Silver, ug/l	0.03	10.0	--- U	09/09/13	LFJ	EPA200.8
Thallium, ug/l	0.02	5.5	0.03 J	09/09/13	LFJ	EPA200.8
Vanadium, ug/l	0.07	25.0	0.39 J	09/09/13	LFJ	EPA200.8
Zinc, ug/l	0.47	10.0	13	09/09/13	LFJ	EPA200.8
Turbidity, NTU	1.0	1.0	19	08/29/13	HMB	2130B-01
Sulfide, ug/l	100	1000	--- U	08/30/13	LFJ	4500S2D-00
Conductivity (at 25c), uMhos/cm	1.0	1.0	79	08/29/13	BF	2510B-97
Dissolved Oxygen, mg/l	0.1	0.1	4.30	08/29/13	BF	4500OG-01
Temperature, °C			18	08/29/13	BF	2550B-00
Static Water Level, feet			12.30	08/29/13	BF	
Well Depth, feet			56.50	08/29/13	BF	
ORP, mv			+248.8	08/29/13	BF	2580B

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015 C

ANALYST: CHS
DATE COLLECTED: 08/29/13
DATE EXTRACTED: 08/30/13
DATE ANALYZED: 09/30/13
DATE REPORTED: 10/01/13

REVIEWED BY:

PESTICIDES AND PCB'S
EPA METHOD 8081B R2(07)

PARAMETERS, ug/l	MDL	SWSL	MW-17	MW-18S
1. Aldrin	0.029	0.05	--- U	--- U
2. Alpha-BHC	0.032	0.05	--- U	--- U
3. Beta-BHC	0.031	0.05	--- U	--- U
4. Delta-BHC	0.030	0.05	--- U	--- U
5. Gamma-BHC (Lindane)	0.032	0.05	--- U	--- U
6. Chlordane	0.320	0.50	--- U	--- U
7. 4,4-DDD	0.051	0.10	--- U	--- U
8. 4,4-DDE	0.049	0.10	--- U	--- U
9. 4,4-DDT	0.052	0.10	--- U	--- U
10. Dieldrin	0.042	0.075	--- U	--- U
11. Endosulfan I	0.056	0.10	--- U	--- U
12. Endosulfan II	0.046	0.10	--- U	--- U
13. Endosulfan Sulfate	0.072	0.10	--- U	--- U
14. Endrin	0.053	0.10	--- U	--- U
15. Endrin Aldehyde	0.068	0.10	--- U	--- U
16. Heptachlor	0.039	0.05	--- U	--- U
17. Heptachlor Epoxide	0.042	0.075	--- U	--- U
18. Methoxychlor	0.530	1.00	--- U	--- U
19. Pcb's (Aroclors)	0.500	2.00	--- U	--- U
20. Toxaphene	0.690	1.50	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015 C

ANALYST: CHS
DATE COLLECTED: 08/29/13
DATE EXTRACTED: 09/04/13
DATE ANALYZED: 09/09/13
DATE REPORTED: 10/01/13

REVIEWED BY:

LANDFILL APPENDIX II
EPA METHOD 8151A R1(96)

PARAMETERS, ug/l	MDL	SWSL	MW-17	MW-18S
1. 2,4-D	0.36	2.0	--- U	--- U
2. Dinoseb	0.54	1.0	--- U	--- U
3. 2,4,5-TP	0.42	2.0	--- U	--- U
4. 2,4,5-T	0.47	2.0	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015 C

ANALYST: MAO
DATE COLLECTED: 08/29/13
DATE ANALYZED: 09/04/13
DATE REPORTED: 10/01/13

REVIEWED BY:

VOLATILE ORGANICS
EPA METHOD 8260B R1(96)

PARAMETERS, ug/l	MDL	SWSL	G-13	G-13D
1. Chloromethane	0.77	1.0	--- U	--- U
2. Vinyl Chloride	0.63	1.0	--- U	--- U
3. Bromomethane	0.67	10.0	--- U	--- U
4. Chloroethane	0.48	10.0	--- U	--- U
5. Trichlorofluoromethane	0.24	1.0	--- U	--- U
6. 1,1-Dichloroethene	0.17	5.0	--- U	--- U
7. Acetone	9.06	100.0	--- U	--- U
8. Iodomethane	0.26	10.0	--- U	--- U
9. Carbon Disulfide	0.23	100.0	--- U	--- U
10. Methylene Chloride	0.64	1.0	--- U	--- U
11. trans-1,2-Dichloroethene	0.23	5.0	--- U	--- U
12. 1,1-Dichloroethane	0.20	5.0	--- U	--- U
13. Vinyl Acetate	0.20	50.0	--- U	--- U
14. Cis-1,2-Dichloroethene	0.25	5.0	--- U	--- U
15. 2-Butanone	2.21	100.0	--- U	--- U
16. Bromochloromethane	0.27	3.0	--- U	--- U
17. Chloroform	0.25	5.0	--- U	--- U
18. 1,1,1-Trichloroethane	0.19	1.0	--- U	--- U
19. Carbon Tetrachloride	0.22	1.0	--- U	--- U
20. Benzene	0.24	1.0	--- U	--- U
21. 1,2-Dichloroethane	0.27	1.0	--- U	--- U
22. Trichloroethene	0.23	1.0	--- U	--- U
23. 1,2-Dichloropropane	0.21	1.0	--- U	--- U
24. Bromodichloromethane	0.21	1.0	--- U	--- U
25. Cis-1,3-Dichloropropene	0.24	1.0	--- U	--- U
26. 4-Methyl-2-Pentanone	1.19	100.0	--- U	--- U
27. Toluene	0.23	1.0	--- U	--- U
28. trans-1,3-Dichloropropene	0.28	1.0	--- U	--- U
29. 1,1,2-Trichloroethane	0.25	1.0	--- U	--- U
30. Tetrachloroethene	0.17	1.0	--- U	--- U
31. 2-Hexanone	1.57	50.0	--- U	--- U
32. Dibromochloromethane	0.24	3.0	--- U	--- U
33. 1,2-Dibromoethane	0.26	1.0	--- U	--- U
34. Chlorobenzene	0.30	3.0	--- U	--- U
35. 1,1,1,2-Tetrachloroethane	0.22	5.0	--- U	--- U
36. Ethylbenzene	0.21	1.0	--- U	--- U
37. Xylenes	0.68	5.0	--- U	--- U
38. Dibromomethane	0.28	10.0	--- U	--- U
39. Styrene	0.19	1.0	--- U	--- U
40. Bromoform	0.20	3.0	--- U	--- U
41. 1,1,2,2-Tetrachloroethane	0.26	3.0	--- U	--- U
42. 1,2,3-Trichloropropane	0.43	1.0	--- U	--- U
43. 1,4-Dichlorobenzene	0.39	1.0	--- U	--- U
44. 1,2-Dichlorobenzene	0.32	5.0	--- U	--- U
45. 1,2-Dibromo-3-Chloropropane	0.34	13.0	--- U	--- U
46. Acrylonitrile	2.72	200.0	--- U	--- U
47. trans-1,4-Dichloro-2-Butene	0.42	100.0	--- U	--- U

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Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015 C

ANALYST: CHS
DATE COLLECTED: 08/29/13
DATE EXTRACTED: 09/02/13
DATE ANALYZED: 09/28/13
DATE REPORTED: 10/01/13

REVIEWED BY:

SEMI-VOLATILE ORGANICS
EPA METHOD 8270D R4(07)

PARAMETERS, ug/l	MDL	SWSL	MW-17	MW-18S
1. Acenaphthene	2.66	10.0	--- U	--- U
2. Acenaphthylene	2.60	10.0	--- U	--- U
3. Anthracene	2.97	10.0	--- U	--- U
4. Benzo[a]antrhacene	4.16	10.0	--- U	--- U
5. Benzo[b]fluoranthene	3.32	10.0	--- U	--- U
6. Benzo[k]fluoranthene	4.23	10.0	--- U	--- U
7. Benzo[g,h,i]perylene	2.61	10.0	--- U	--- U
8. Benzo[a]pyrene	3.27	10.0	--- U	--- U
9. 4-Bromophenyl Phenyl Ether	2.63	10.0	--- U	--- U
10. Butyl Benzyl Phthalate	5.78	10.0	--- U	--- U
11. Bis-(2-Chloroethoxy) Methane	3.14	10.0	--- U	--- U
12. Bis-(2-Chloroethyl) Ether	2.58	10.0	--- U	--- U
13. Bis-(2-Chloroisopropyl) Ether	2.58	10.0	--- U	--- U
14. 2-Chloronaphthalene	2.17	10.0	--- U	--- U
15. 4-Chlorophenyl Phenyl Ether	2.42	10.0	--- U	--- U
16. Chrysene	4.04	10.0	--- U	--- U
17. Dibenzo[a,h]anthracene	2.78	10.0	--- U	--- U
18. Di-N-Butyl Phthalate	3.09	10.0	--- U	--- U
19. Dimethyl Phthalate	3.78	10.0	--- U	--- U
20. Diethyl Phthalate	3.92	10.0	--- U	--- U
21. 2,4-Dinitrotoluene	3.95	10.0	--- U	--- U
22. 2,6-Dinitrotoluene	3.88	10.0	--- U	--- U
23. Di-N-Octyl Phthalate	2.81	10.0	--- U	--- U
24. Bis-(2-Ethylhexyl) Phthalate	9.97	15.0	--- U	--- U
25. Fluoranthene	3.92	10.0	--- U	--- U
26. Fluorene	2.95	10.0	--- U	--- U
27. Hexachlorobenzene	2.61	10.0	--- U	--- U
28. Hexachlorocyclopentadiene	4.16	10.0	--- U	--- U
29. Indeno[1,2,3-Cd]pyrene	2.91	10.0	--- U	--- U
30. Isophorone	3.74	10.0	--- U	--- U
31. Nitrobenzene	2.85	10.0	--- U	--- U
32. N-Nitrosodimethylamine	4.25	10.0	--- U	--- U
33. N-Nitrosodiphenylamine	3.95	10.0	--- U	--- U
34. N-Nitrosodi-N-Propylamine	4.06	10.0	--- U	--- U
35. Phenanthrene	3.24	10.0	--- U	--- U
36. Pyrene	3.63	10.0	--- U	--- U
37. 4-Chloro-3-Methylphenol	3.79	20.0	--- U	--- U
38. 2-Chlorophenol	2.75	10.0	--- U	--- U
39. O-Cresol	3.68	10.0	--- U	--- U
40. P-Cresol	4.12	10.0	--- U	--- U
41. 2,4-Dichlorophenol	5.19	10.0	--- U	--- U
42. 2,6-Dichlorophenol	4.89	10.0	--- U	--- U
43. 2,4-Dimethylphenol	3.21	10.0	--- U	--- U
44. 4,6-Dinitro-2-Methylphenol	4.77	50.0	--- U	--- U
45. 2,4-Dinitrophenol	4.37	50.0	--- U	--- U
46. Ethyl Methanesulfonate	5.26	20.0	--- U	--- U
47. Methyl Methanesulfonate	4.92	10.0	--- U	--- U
48. 2-Nitrophenol	3.64	10.0	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015 C

ANALYST: CHS
DATE COLLECTED: 08/29/13
DATE EXTRACTED: 09/02/13
DATE ANALYZED: 09/28/13
DATE REPORTED: 10/01/13

REVIEWED BY:

SEMI-VOLATILE ORGANICS
EPA METHOD 8270D R4(07)

PARAMETERS, ug/l	MDL	SWSL	MW-17	MW-18S
49. 4-Nitrophenol	3.17	50.0	--- U	--- U
50. Pentachlorophenol	5.33	25.0	--- U	--- U
51. Phenol	1.86	10.0	--- U	--- U
52. 2,3,4,6-Tetrachlorophenol	3.12	10.0	--- U	--- U
53. 2,4,5-Trichlorophenol	4.17	10.0	--- U	--- U
54. 2,4,6-Trichlorophenol	3.84	10.0	--- U	--- U
55. Acetophenone	2.89	10.0	--- U	--- U
56. 2-Acetylaminofluorene	3.98	20.0	--- U	--- U
57. 4-Aminobiphenyl	4.12	20.0	--- U	--- U
58. Benzyl Alcohol	4.47	20.0	--- U	--- U
59. 4-Chloroaniline	3.36	20.0	--- U	--- U
60. Chlorobenzilate	5.12	10.0	--- U	--- U
61. Diallate	2.98	10.0	--- U	--- U
62. Dibenzofuran	4.28	10.0	--- U	--- U
63. 3,3-Dichlorobenzidine	4.22	20.0	--- U	--- U
64. Dimethoate	3.98	20.0	--- U	--- U
65. P-Dimethylaminoazobenzene	2.89	10.0	--- U	--- U
66. 7,12-Dimethylbenz[a]anthracene	5.26	10.0	--- U	--- U
67. 3,3-Dimethylbenzadine	3.21	10.0	--- U	--- U
68. 1,3-Dinitrobenzene	2.89	20.0	--- U	--- U
69. Diphenylamine	5.10	10.0	--- U	--- U
70. Disulfoton	4.28	10.0	--- U	--- U
71. Famphur	3.98	20.0	--- U	--- U
72. Hexachloropropene	4.31	10.0	--- U	--- U
73. Isosafrole	2.88	10.0	--- U	--- U
74. Kepone	2.78	20.0	--- U	--- U
75. Methapyrilene	3.54	100.0	--- U	--- U
76. 3-Methylchloroanthrene	4.21	10.0	--- U	--- U
77. 2-Methylnaphthalene	3.79	10.0	--- U	--- U
78. Methyl Parathion	4.32	10.0	--- U	--- U
79. m-Cresol	3.81	10.0	--- U	--- U
80. 1,4-Naphthoquinone	4.00	10.0	--- U	--- U
81. 1-Naphthylamine	5.61	10.0	--- U	--- U
82. 2-Naphthylamine	4.62	10.0	--- U	--- U
83. 2-Nitroaniline	3.61	50.0	--- U	--- U
84. 3-Nitroaniline	4.81	50.0	--- U	--- U
85. 4-Nitroaniline	4.22	20.0	--- U	--- U
86. 5-Nitro-O-Toluidine	4.01	10.0	--- U	--- U
87. N-Nitrosodi-n-butylamine	3.63	10.0	--- U	--- U
88. N-Nitrosodiethylamine	3.83	20.0	--- U	--- U
89. N-Nitrosomethylethylamine	3.83	10.0	--- U	--- U
90. N-Nitrosopiperidine	5.19	20.0	--- U	--- U
91. N-Nitrosopyrrolidine	2.89	10.0	--- U	--- U
92. Parathion	3.12	10.0	--- U	--- U
93. Pentachlorobenzene	3.92	10.0	--- U	--- U
94. Pentachloronitrobenzene	3.71	20.0	--- U	--- U
95. Phenacetin	4.41	20.0	--- U	--- U
96. 1,4 Benzenediamine	2.99	10.0	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015 C

ANALYST: CHS
DATE COLLECTED: 08/29/13
DATE EXTRACTED: 09/02/13
DATE ANALYZED: 09/28/13
DATE REPORTED: 10/01/13

REVIEWED BY:

SEMI-VOLATILE ORGANICS
EPA METHOD 8270D R4(07)

PARAMETERS, ug/l	MDL	SWSL	MW-17	MW-18S
97. Phorate	3.86	10.0	--- U	--- U
98. Pronamide	3.69	10.0	--- U	--- U
99. Safrole	4.12	10.0	--- U	--- U
100. 1,2,4,5-Tetrachlorobenzene	5.01	10.0	--- U	--- U
101. Thionazin	4.62	20.0	--- U	--- U
102. O-Toluidine	4.11	10.0	--- U	--- U
103. 1,3,5-Trinitrobenzene	3.98	10.0	--- U	--- U
104. 0,0,0-Triethyl Phosphorothioate	3.61	10.0	--- U	--- U
105. Hexachloroethane	1.49	10.0	--- U	--- U
106. Isodrin	3.11	20.0	--- U	--- U

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Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

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CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015 C

ANALYST: MAO
DATE COLLECTED: 08/29/13
DATE ANALYZED: 09/05/13
DATE REPORTED: 10/01/13

REVIEWED BY:

LANDFILL APPENDIX II
EPA METHOD 8260B R1(96)

PARAMETERS, ug/l	MDL	SWSL	MW-17	MW-18S
1. Chloromethane	0.77	1.0	--- U	--- U
2. Vinyl Chloride	0.63	1.0	--- U	--- U
3. Bromomethane	0.67	10.0	--- U	--- U
4. Chloroethane	0.48	10.0	--- U	--- U
5. Trichlorofluoromethane	0.24	1.0	--- U	--- U
6. 1,1-Dichloroethene	0.17	5.0	--- U	--- U
7. Acetone	9.06	100.0	--- U	--- U
8. Iodomethane	0.26	10.0	--- U	--- U
9. Carbon Disulfide	0.23	100.0	--- U	--- U
10. Methylene Chloride	0.64	1.0	--- U	--- U
11. trans-1,2-Dichloroethene	0.23	5.0	--- U	--- U
12. 1,1-Dichloroethane	0.20	5.0	3.60 J	0.40 J
13. Vinyl Acetate	0.20	50.0	--- U	--- U
14. Cis-1,2-Dichloroethene	0.25	5.0	2.40 J	--- U
15. 2-Butanone	2.21	100.0	--- U	--- U
16. Bromochloromethane	0.27	3.0	--- U	--- U
17. Chloroform	0.25	5.0	--- U	--- U
18. 1,1,1-Trichloroethane	0.19	1.0	--- U	--- U
19. Carbon Tetrachloride	0.22	1.0	--- U	--- U
20. Benzene	0.24	1.0	--- U	--- U
21. 1,2-Dichloroethane	0.21	1.0	--- U	--- U
22. Trichloroethene	0.23	1.0	0.90 J	--- U
23. 1,2-Dichloropropane	0.21	1.0	--- U	--- U
24. Bromodichloromethane	0.21	1.0	--- U	--- U
25. Cis-1,3-Dichloropropene	0.24	1.0	--- U	--- U
26. 4-Methyl-2-Pentanone	1.19	100.0	--- U	--- U
27. Toluene	0.23	1.0	--- U	--- U
28. trans-1,3-Dichloropropene	0.28	1.0	--- U	--- U
29. 1,1,2-Trichloroethane	0.25	1.0	--- U	--- U
30. Tetrachloroethene	0.17	1.0	1.10	--- U
31. 2-Hexanone	1.57	50.0	--- U	--- U
32. Dibromochloromethane	0.24	3.0	--- U	--- U
33. 1,2-Dibromoethane	0.26	1.0	--- U	--- U
34. Chlorobenzene	0.30	3.0	--- U	--- U
35. 1,1,1,2-Tetrachloroethane	0.22	5.0	--- U	--- U
36. Ethylbenzene	0.21	1.0	--- U	--- U
37. Xylenes	0.68	5.0	--- U	--- U
38. Dibromomethane	0.28	10.0	--- U	--- U
39. Styrene	0.19	1.0	--- U	--- U
40. Bromoform	0.20	3.0	--- U	--- U
41. 1,1,2,2-Tetrachloroethane	0.26	3.0	--- U	--- U
42. 1,2,3-Trichloropropane	0.43	1.0	--- U	--- U
43. 1,4-Dichlorobenzene	0.39	1.0	--- U	--- U
44. 1,2-Dichlorobenzene	0.32	5.0	--- U	--- U
45. 1,2-Dibromo-3-Chloropropane	0.34	13.0	--- U	--- U
46. Acrylonitrile	2.72	200.0	--- U	--- U
47. trans-1,4-Dichloro-2-Butene	0.42	100.0	--- U	--- U
48. Acrolein	40.57	53.0	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015 C

ANALYST: MAO
DATE COLLECTED: 08/29/13
DATE ANALYZED: 09/05/13
DATE REPORTED: 10/01/13

REVIEWED BY:

LANDFILL APPENDIX II
EPA METHOD 8260B R1(96)

PARAMETERS, ug/l	MDL	SWSL	MW-17	MW-18S
49. Allyl Chloride	0.20	10.0	--- U	--- U
50. Chloroprene	0.21	20.0	--- U	--- U
51. 1,3-Dichlorobenzene	0.41	5.0	--- U	--- U
52. Dichlorodifluoromethane	0.51	5.0	0.80 J	--- U
53. 1,3-Dichloropropane	0.28	1.0	--- U	--- U
54. 2,2-Dichloropropane	0.17	15.0	--- U	--- U
55. 1,1-Dichloropropene	0.22	5.0	--- U	--- U
56. Ethyl Methacrylate	0.16	10.0	--- U	--- U
57. Hexachlorobutadiene	0.57	10.0	--- U	--- U
58. Isobutyl Alcohol	12.80	100.0	--- U	--- U
59. Methacrylonitrile	1.93	100.0	--- U	--- U
60. Methyl Methacrylate	0.25	30.0	--- U	--- U
61. Naphthalene	0.47	10.0	--- U	--- U
62. Propionitrile	3.26	150.0	--- U	--- U
63. 1,2,4-Trichlorobenzene	0.50	10.0	--- U	--- U
64. Acetonitrile	36.29	55.0	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Inc.
P.O. Box 7085; 114 Oakmont Dr.
Greenville, NC 27858

Phone (252) 756-6208 • Fax (252) 756-0633

CHAIN OF CUSTODY RECORD

CLIENT: 6015 C **Week: 35**

HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX NC 27839

(252) 583-1807

DISINFECTION: ☐ CHLORINE ☐ UV ☐ NONE ☐ _____

SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	TOTAL CHLORINE, mg/l OR ug/l AT COLLECTION	TEMPERATURE, °C AT COLLECTION	# OF CONTAINERS	Field pH	COD	Nitrate	TOC	Chloride	Metals	Turbidity	Sulfide	Conductivity	DO	Temperature	Field Parameter	EPA 8260B	8260 Dup. 1	EPA 8270D	8270D Dup. 1	PARAMETERS
CHLORINE NEUTRALIZED AT COLLECTION																						
pH CHECK (LAB)							<2		<2		<2		>9					<2	<2			
CONTAINER TYPE, P/G						P	P	P	P	P	P	P	P	P	P	P		G	G	G	G	
CHEMICAL PRESERVATION						A	C	A	C	A	A	A	F	A	A	A		E	E	A	A	
MW-17	8-29-13	0955		20	11	G					G	G		G	G	G	G			G	G	
MW-18S	8-29-13	0930		21	11	G					G	G		G	G	G	G			G	G	
BP-3	8-29-13				1												G					
BP-9	8-29-13				1												G					
G-13	8-29-13	1050		18	9	G	G	G	G	G	G	G	G	G	G	G	G	G	G			
G-13D	8-29-13	1100		18	5	G					G	G	G	G	G	G	G	G	G			

A - NONE D - NAOH
B - HNO_3 E - HCL
C - H_2SO_4 F - ZINC ACETATE/NAOH
G - NA THIOSULFATE

CLASSIFICATION:
☐ WASTEWATER (NPDES)
☐ DRINKING WATER
☐ DWQ/GW
☒ SOLID WASTE SECTION

CHAIN OF CUSTODY MAINTAINED DURING SHIPMENT/DELIVERY: (Y) N

SAMPLES COLLECTED BY: (Please Print) Bobby / Tom

SAMPLES RECEIVED IN LAB AT 0.7 °C

RELINQUISHED BY (SIG.) (SAMPLER)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
Bobby Fox	8-29-13 1325	[signature]	8/29/13 1:30
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME

COMMENTS:

PLEASE READ Instructions for completing this form on the reverse side.

Sampler must place a "C" for composite sample or a "G" for Grab sample in the blocks above for each parameter requested.

FORM #5

№ 262645

Environment 1, Inc.
P.O. Box 7085, 114 Oakmont Dr.
Greenville, NC 27858

Phone (252) 756-6208 • Fax (252) 756-0633

CHAIN OF CUSTODY RECORD

CLIENT: 6015 C **Week:** 35

HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX NC 27839

(252) 583-1807

DISINFECTION
- [ ] CHLORINE
- [ ] UV
- [ ] NONE
- [ ] _____

SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	TOTAL CHLORINE, mg/l OR ug/l AT COLLECTION	TEMPERATURE, °C AT COLLECTION	# OF CONTAINERS	EPA 8081B	8260B App. II	8260 App. II 1	8260 App. II 2	8151A Landfill	8151A Duplicate	ORP
CHLORINE NEUTRALIZED AT COLLECTION												
pH CHECK (LAB)							<2	<2	<2			
CONTAINER TYPE, P/G						G	G	G	G	G	G	P
CHEMICAL PRESERVATION						A	E	E	E	A	A	A
MW-17	8-29-13	0955		20	11	G	G	G	G	G	G	G
MW-18S	8-29-13	0930		21	11	G	G	G	G	G	G	G
BP-3	8-29-13				1							
BP-9	8-29-13				1							
G-13	8-29-13	1050		18	9							G
G-13D	8-29-13	1100		18	5							G

PARAMETERS

A - NONE D - NAOH
B - HNO_3 E - HCL
C - H_2SO_4 F - ZINC ACETATE/NAOH
G - NA THIOSULFATE

CLASSIFICATION:
- [ ] WASTEWATER (NPDES)
- [ ] DRINKING WATER
- [ ] DWQ/GW
- [x] SOLID WASTE SECTION

CHAIN OF CUSTODY MAINTAINED DURING SHIPMENT/DELIVERY
(Y) N

SAMPLES COLLECTED BY: (Please Print)
Bobby / Tom

SAMPLES RECEIVED IN LAB AT 0.7 °C

RELINQUISHED BY (SIG.) (SAMPLER)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
Bobby Tom	8-29-13 1325	[signature]	8/29/13 1130
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME

COMMENTS:

PLEASE READ Instructions for completing this form on the reverse side.

Sampler must place a "C" for composite sample or a "G" for Grab sample in the blocks above for each parameter requested.

FORM #5

№ 262644

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

ID#: 6015 A

HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX ,NC 27839

DATE COLLECTED: 08/27/13
DATE REPORTED : 09/30/13

REVIEWED BY:

PARAMETERS	MDL	SWSL	SW-1	SW-2	SW-3	Analysis Date	Analyst	Method Code
PH (field measurement), Units			6.3	6.3	6.4	08/27/13	BF	4500HB-00
Antimony, ug/l	0.02	6.0	--- U	0.14 J	--- U	09/03/13	LFJ	EPA200.8
Arsenic, ug/l	0.05	10.0	0.94 J	1.2 J	0.93 J	09/03/13	LFJ	EPA200.8
Barium, ug/l	0.06	100.0	25.5 J	40.7 J	18.6 J	09/03/13	LFJ	EPA200.8
Beryllium, ug/l	0.03	1.0	0.03 J	0.04 J	0.66 J	09/03/13	LFJ	EPA200.8
Cadmium, ug/l	0.05	1.0	--- U	0.09 J	0.30 J	09/03/13	LFJ	EPA200.8
Cobalt, ug/l	0.02	10.0	0.35 J	0.44 J	0.66 J	09/03/13	LFJ	EPA200.8
Copper, ug/l	0.06	10.0	0.64 J	0.32 J	0.45 J	09/03/13	LFJ	EPA200.8
Total Chromium, ug/l	0.04	10.0	0.22 J	--- U	--- U	09/03/13	LFJ	EPA200.8
Lead, ug/l	0.02	10.0	0.34 J	0.19 J	0.08 J	09/03/13	LFJ	EPA200.8
Nickel, ug/l	0.45	50.0	1.8 J	1.3 J	2.0 J	09/03/13	LFJ	EPA200.8
Selenium, ug/l	0.06	10.0	0.07 J	1.5 J	3.2 J	09/03/13	LFJ	EPA200.8
Silver, ug/l	0.03	10.0	--- U	0.03 J	--- U	09/03/13	LFJ	EPA200.8
Thallium, ug/l	0.02	5.5	--- U	0.03 J	--- U	09/03/13	LFJ	EPA200.8
Vanadium, ug/l	0.07	25.0	1.7 J	0.88 J	2.1 J	09/03/13	LFJ	EPA200.8
Zinc, ug/l	0.47	10.0	4.1 J	2.9 J	11	09/03/13	LFJ	EPA200.8
Conductivity (at 25c), uMhos/cm	1.0	1.0	99	287	486	08/27/13	BF	2510B-97
Temperature, °C			21	23	19	08/27/13	BF	2550B-00

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Incorporated

Drinking Water ID: 37715
Wastewater ID: 10

P.O. BOX 7085, 114 OAKMONT DRIVE
GREENVILLE, N.C. 27835-7085

PHONE (252) 756-6208
FAX (252) 756-0633

CLIENT: HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX, NC 27839

CLIENT ID: 6015 A

ANALYST: MAO
DATE COLLECTED: 08/27/13
DATE ANALYZED: 08/30/13
DATE REPORTED: 09/30/13

REVIEWED BY:

VOLATILE ORGANICS
EPA METHOD 8260B R1(96)

PARAMETERS, ug/l	MDL	SWSL	SW-1	SW-2	SW-3
1. Chloromethane	0.77	1.0	--- U	--- U	--- U
2. Vinyl Chloride	0.63	1.0	--- U	--- U	--- U
3. Bromomethane	0.67	10.0	--- U	--- U	--- U
4. Chloroethane	0.48	10.0	--- U	--- U	--- U
5. Trichlorofluoromethane	0.24	1.0	--- U	--- U	--- U
6. 1,1-Dichloroethene	0.17	5.0	--- U	--- U	--- U
7. Acetone	9.06	100.0	--- U	--- U	--- U
8. Iodomethane	0.26	10.0	--- U	--- U	--- U
9. Carbon Disulfide	0.23	100.0	--- U	--- U	--- U
10. Methylene Chloride	0.64	1.0	--- U	--- U	--- U
11. trans-1,2-Dichloroethene	0.23	5.0	--- U	--- U	--- U
12. 1,1-Dichloroethane	0.20	5.0	--- U	--- U	--- U
13. Vinyl Acetate	0.20	50.0	--- U	--- U	--- U
14. Cis-1,2-Dichloroethene	0.25	5.0	--- U	--- U	--- U
15. 2-Butanone	2.21	100.0	--- U	--- U	--- U
16. Bromochloromethane	0.27	3.0	--- U	--- U	--- U
17. Chloroform	0.25	5.0	--- U	--- U	--- U
18. 1,1,1-Trichloroethane	0.19	1.0	--- U	--- U	--- U
19. Carbon Tetrachloride	0.22	1.0	--- U	--- U	--- U
20. Benzene	0.24	1.0	--- U	--- U	--- U
21. 1,2-Dichloroethane	0.27	1.0	--- U	--- U	--- U
22. Trichloroethene	0.23	1.0	--- U	--- U	--- U
23. 1,2-Dichloropropane	0.21	1.0	--- U	--- U	--- U
24. Bromodichloromethane	0.21	1.0	--- U	--- U	--- U
25. Cis-1,3-Dichloropropene	0.24	1.0	--- U	--- U	--- U
26. 4-Methyl-2-Pentanone	1.19	100.0	--- U	--- U	--- U
27. Toluene	0.23	1.0	--- U	--- U	--- U
28. trans-1,3-Dichloropropene	0.28	1.0	--- U	--- U	--- U
29. 1,1,2-Trichloroethane	0.25	1.0	--- U	--- U	--- U
30. Tetrachloroethene	0.17	1.0	--- U	--- U	--- U
31. 2-Hexanone	1.57	50.0	--- U	--- U	--- U
32. Dibromochloromethane	0.24	3.0	--- U	--- U	--- U
33. 1,2-Dibromoethane	0.26	1.0	--- U	--- U	--- U
34. Chlorobenzene	0.30	3.0	--- U	--- U	--- U
35. 1,1,1,2-Tetrachloroethane	0.22	5.0	--- U	--- U	--- U
36. Ethylbenzene	0.21	1.0	--- U	--- U	--- U
37. Xylenes	0.68	5.0	--- U	--- U	--- U
38. Dibromomethane	0.28	10.0	--- U	--- U	--- U
39. Styrene	0.19	1.0	--- U	--- U	--- U
40. Bromoform	0.20	3.0	--- U	--- U	--- U
41. 1,1,2,2-Tetrachloroethane	0.26	3.0	--- U	--- U	--- U
42. 1,2,3-Trichloropropane	0.43	1.0	--- U	--- U	--- U
43. 1,4-Dichlorobenzene	0.39	1.0	--- U	--- U	--- U
44. 1,2-Dichlorobenzene	0.32	5.0	--- U	--- U	--- U
45. 1,2-Dibromo-3-Chloropropane	0.34	13.0	--- U	--- U	--- U
46. Acrylonitrile	2.72	200.0	--- U	--- U	--- U
47. trans-1,4-Dichloro-2-Butene	0.42	100.0	--- U	--- U	--- U

J = Between MDL and SWSL, U = Below ALL Quantitation Limits.

Environment 1, Inc.
P.O. Box 7085, 114 Oakmont Dr.
Greenville, NC 27858

Phone (252) 756-6208 • Fax (252) 756-0633

CHAIN OF CUSTODY RECORD

CLIENT: 6015 A **Week: 35**

HALIFAX CO. LANDFILL (CLOSED MSW)
MS. GWEN MATTHEWS
P.O. BOX 70
HALIFAX NC 27839

(252) 583-1807

DISINFECTION
- [ ] CHLORINE
- [ ] UV
- [ ] NONE
- [ ] _____

SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	TOTAL CHLORINE, mg/l OR ug/l AT COLLECTION	TEMPERATURE, °C AT COLLECTION	# OF CONTAINERS	Field pH	Metals	Conductivity	Temperature	EPA 8260B	8260 Dup. 1
CHLORINE NEUTRALIZED AT COLLECTION											
pH CHECK (LAB)							✓			✓	✓
CONTAINER TYPE, P/G						P	P	P	P	G	G
CHEMICAL PRESERVATION						A	A	A	A	E	E
SW-1	8-27-13	1150		21	4	G	G	G	G	G	G
SW-2	8-27-13	1225		23	4	G	G	G	G	G	G
SW-3	8-27-13	1045		19	4	G	G	G	G	G	G

PARAMETERS

A - NONE D - NAOH
B - HNO_3 E - HCL
C - H_2SO_4 F - ZINC ACETATE/NAOH
G - NA THIOSULFATE

CLASSIFICATION:
- [ ] WASTEWATER (NPDES)
- [ ] DRINKING WATER
- [ ] DWQ/GW
- [x] SOLID WASTE SECTION

CHAIN OF CUSTODY MAINTAINED DURING SHIPMENT/DELIVERY
(Y) N

SAMPLES COLLECTED BY:
(Please Print)
Bobby / Tom

SAMPLES RECEIVED IN LAB AT 1.7 °C

RELINQUISHED BY (SIG.) (SAMPLER)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
Bobby Fne	8-27-13 1510	[illegible]	8/27/13 1315
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME
RELINQUISHED BY (SIG.)	DATE/TIME	RECEIVED BY (SIG.)	DATE/TIME

COMMENTS:

PLEASE READ Instructions for completing this form on the reverse side.

Sampler must place a "C" for composite sample or a "G" for Grab sample in the blocks above for each parameter requested.

№ 262646

FORM #5

Appendix C

Biochlor Evaluation

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Natural Attenuation Screening Protocol

The following is taken from the USEPA protocol (USEPA, 1998). The results of this scoring process have no regulatory significance.

Interpretation	Score
Inadequate evidence for anaerobic biodegradation* of chlorinated organics	0 to 5
Limited evidence for anaerobic biodegradation* of chlorinated organics	6 to 14
Adequate evidence for anaerobic biodegradation* of chlorinated organics	15 to 20
Strong evidence for anaerobic biodegradation* of chlorinated organics	>20

* reductive dechlorination

Score: 10

Scroll to End of Table

Analysis	Concentration in Most Contam. Zone	Interpretation	Yes	No	Points Awarded
Oxygen*	<0.5 mg/L	Tolerated, suppresses the reductive pathway at higher concentrations	●	○	3
	> 5mg/L	Not tolerated; however, VC may be oxidized aerobically	○	○	
Nitrate*	<1 mg/L	At higher concentrations may compete with reductive pathway	●	○	2
Iron II*	>1 mg/L	Reductive pathway possible; VC may be oxidized under Fe(III)-reducing conditions	○	○	
Sulfate*	<20 mg/L	At higher concentrations may compete with reductive pathway	○	○	
Sulfide*	>1 mg/L	Reductive pathway possible	○	○	
Methane*	>0.5 mg/L	Ultimate reductive daughter product, VC Accumulates	○	○	
Oxidation Reduction Potential* (ORP)	<50 millivolts (mV)	Reductive pathway possible	●	○	1
	<-100mV	Reductive pathway likely	○	○	
pH*	5 < pH < 9	Optimal range for reductive pathway	●	○	0
TOC	>20 mg/L	Carbon and energy source; drives dechlorination; can be natural or anthropogenic	○	●	0
Temperature*	>20°C	At T >20°C biochemical process is accelerated	○	●	0
Carbon Dioxide	>2x background	Ultimate oxidative daughter product	○	○	
Alkalinity	>2x background	Results from interaction of carbon dioxide with aquifer minerals	○	○	
Chloride*	>2x background	Daughter product of organic chlorine	○	○	
Hydrogen	>1 nM	Reductive pathway possible, VC may accumulate	○	○	
Volatile Fatty Acids	>0.1 mg/L	Intermediates resulting from biodegradation of aromatic compounds; carbon and energy source	○	○	
BTEX*	>0.1 mg/L	Carbon and energy source; drives dechlorination	○	●	0
PCE*		Material released	●	○	0
TCE*		Daughter product of PCE [a/]	●	○	2
DCE*		Daughter product of TCE. If cis is greater than 80% of total DCE it is likely a daughter product of TCE[a/]; 1,1-DCE can be a chem. reaction product of TCA	○	○	
VC*		Daughter product of DCE[a/]	●	○	2
1,1,1-Trichloroethane*		Material released	○	○	
DCA		Daughter product of TCA under reducing conditions	○	○	
Carbon Tetrachloride		Material released	○	○	
Chloroethane*		Daughter product of DCA or VC under reducing conditions	○	○	
Ethene/Ethane	>0.01 mg/L	Daughter product of VC/ethene	○	○	
	>0.1 mg/L	Daughter product of VC/ethene	○	○	
Chloroform		Daughter product of Carbon Tetrachloride	○	○	
Dichloromethane		Daughter product of Chloroform	○	○	

* required analysis.

a/ Points awarded only if it can be shown that the compound is a daughter product (i.e., not a constituent of the source NAPL).

SC | R

End of Form

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BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Halifax County
Downgradient Plume
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or* 2. Calculate by filling in gray
0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	66.6	(ft/yr)
or			
Hydraulic Conductivity	K	3.785E-04	(cm/sec)
Hydraulic Gradient	i	0.034	(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	15	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc.

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.7	(kg/L)		
FractionOrganicCarbon, foc	1.0E-3	(-)		
Partition Coefficient	Koc			
PCE	426	(L/kg)	4.62	(-)
TCE	130	(L/kg)	2.11	(-)
DCE	125	(L/kg)	2.06	(-)
VC	30	(L/kg)	1.25	(-)
ETH	302	(L/kg)	3.57	(-)
Common R (used in model)* =			**2.11**	

4. BIOTRANSFORMATION

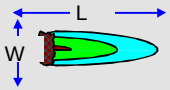
-1st Order Decay Coefficient*

	λ (1/yr)	half-life (yrs)	Yield
Zone 1			
PCE → TCE	9.900	0.07	0.79
TCE → DCE	13.860	0.05	0.74
DCE → VC	3.850	0.18	0.64
VC → ETH	5.775	0.12	0.45
Zone 2	λ (1/yr)	half-life (yrs)	
PCE → TCE	0.000		
TCE → DCE	0.000		
DCE → VC	0.000		
VC → ETH	0.000		

λ HELP

5. GENERAL

Simulation Time*	10	(yr)
Modeled Area Width*	1350	(ft)
Modeled Area Length*	150	(ft)
Zone 1 Length*	150	(ft)
Zone 2 Length*	0	(ft)



Zone 2=

6. SOURCE DATA

TYPE: Decaying
Single Planar

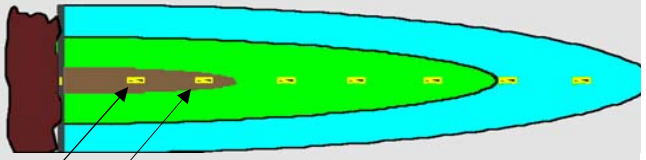
Source Options

Source Thickness in Sat. Zone* 25 (ft)

Width* (ft) Y1 1350

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	.056	0.2
TCE	15.8	0.2
DCE	98.5	0.2
VC	3.08	0.2
ETH	0.03	0.2

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	0.0	0.0000									
TCE Conc. (mg/L)	0.0	0.0007									
DCE Conc. (mg/L)	0.0005	0.0050									
VC Conc. (mg/L)	0.0	0.0022									
ETH Conc. (mg/L)											
Distance from Source (ft)	160	280									
Date Data Collected	2013										

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore | RESET | SEE | Paste

Start Here → ◉ PCE
○ TCE
○ DCE
○ VC
○ ETH

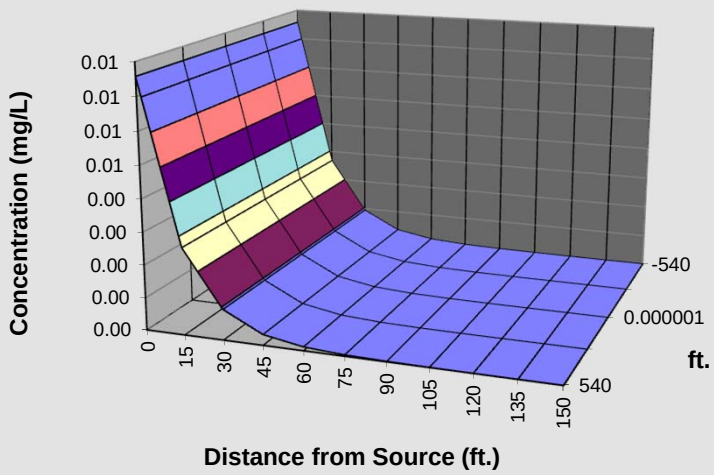
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	0.008	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
270	0.008	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.008	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-270	0.008	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-540	0.008	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	2.6E+2	9.3E+1	3.3E+1	1.2E+1	4.0E+0	1.4E+0	5.0E-1	1.8E-1	6.2E-2	2.2E-2	7.7E-3

Show No

Show

Time: 10 yr Target Level: 0.005 mg/L Displayed Model: Biotransformation Displayed Compound: PCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	0.8	(Kg)
- Plume Mass If Biotransformation/Production	0.0	(Kg)
Mass Removed	0.8	(Kg)
% Biotransformed =	+94.2%	
% Change in Mass Rate =	100.0 %	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	0.76	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.	0.00	
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE ◉ TCE ○ DCE ○ VC ○ ETH

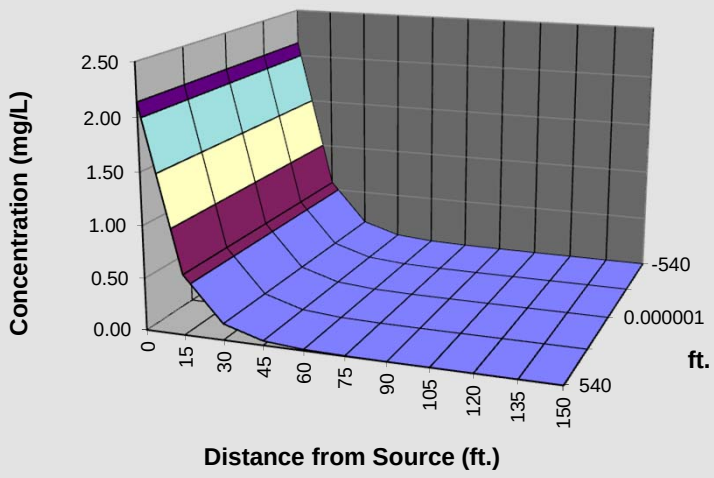
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	2.138	0.578	0.156	0.042	0.011	0.003	0.001	0.000	0.000	0.000	0.000
270	2.138	0.578	0.156	0.042	0.011	0.003	0.001	0.000	0.000	0.000	0.000
0	2.138	0.578	0.156	0.042	0.011	0.003	0.001	0.000	0.000	0.000	0.000
-270	2.138	0.578	0.156	0.042	0.011	0.003	0.001	0.000	0.000	0.000	0.000
-540	2.138	0.578	0.156	0.042	0.011	0.003	0.001	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	7.5E+4	2.0E+4	5.4E+3	1.5E+3	4.0E+2	1.1E+2	2.9E+1	8.0E+0	2.2E+0	6.0E-1	1.7E-1

Show No

Show

Time: 10 yr Target Level: 0.005 mg/L Displayed Model: Biotransformation Displayed Compound: TCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	238.7	(Kg)
- Plume Mass If Biotransformation/Production	11.2	(Kg)
Mass Removed	227.5	(Kg)
% Biotransformed =	**+95.3%**	
% Change in Mass Rate =	**100.0 %**	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	3.79	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.	0.00	
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE ○ TCE ◉ DCE ○ VC ○ ETH

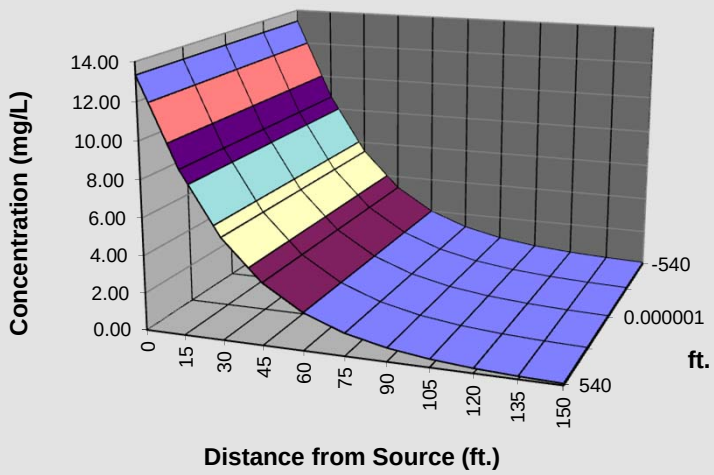
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	13.331	8.717	5.423	3.305	1.997	1.201	0.722	0.433	0.260	0.156	0.093
270	13.331	8.717	5.423	3.305	1.997	1.201	0.722	0.433	0.260	0.156	0.093
0	13.331	8.717	5.423	3.305	1.997	1.201	0.722	0.433	0.260	0.156	0.093
-270	13.331	8.717	5.423	3.305	1.997	1.201	0.722	0.433	0.260	0.156	0.093
-540	13.331	8.717	5.423	3.305	1.997	1.201	0.722	0.433	0.260	0.156	0.093
MASS RATE (mg/day)	4.6E+5	3.0E+5	1.9E+5	1.2E+5	7.0E+4	4.2E+4	2.5E+4	1.5E+4	9.1E+3	5.4E+3	3.3E+3

Show No

Show

Time: 10 yr Target Level: 0.070 mg/L Displayed Model: Biotransformation Displayed Compound: DCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	1488.3	(Kg)
- Plume Mass If Biotransformation/Production	174.8	(Kg)
Mass Removed	1313.5	(Kg)
% Biotransformed =	**+88.3%**	
% Change in Mass Rate =	**99.3 %**	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE
○ TCE
○ DCE
◉ VC
○ ETH

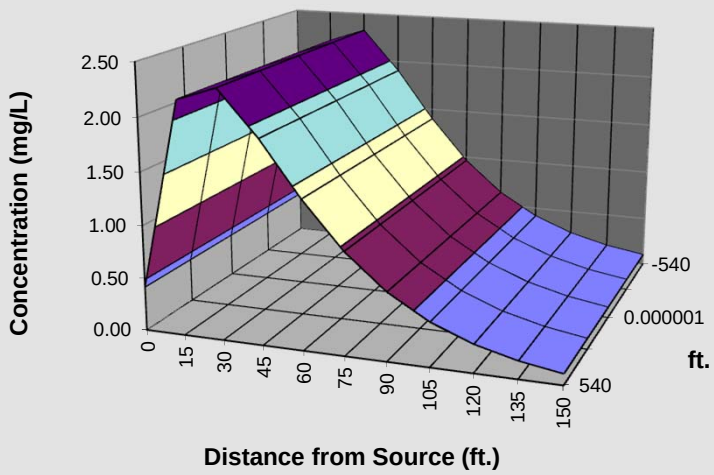
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	0.417	2.188	2.318	1.899	1.394	0.963	0.640	0.415	0.264	0.166	0.103
270	0.417	2.188	2.318	1.899	1.394	0.963	0.640	0.415	0.264	0.166	0.103
0	0.417	2.188	2.318	1.899	1.394	0.963	0.640	0.415	0.264	0.166	0.103
-270	0.417	2.188	2.318	1.899	1.394	0.963	0.640	0.415	0.264	0.166	0.103
-540	0.417	2.188	2.318	1.899	1.394	0.963	0.640	0.415	0.264	0.166	0.103
MASS RATE (mg/day)	1.5E+4	7.6E+4	8.1E+4	6.6E+4	4.9E+4	3.4E+4	2.2E+4	1.4E+4	9.2E+3	5.8E+3	3.6E+3

Show No

Show

Time: 10 yr Target Level: 0.002 mg/L Displayed Model: Biotransformation Displayed Compound: VC



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	46.5	(Kg)
- Plume Mass If Biotransformation/Production	63.7	(Kg)
Mass Removed	-17.1	(Kg)
% Biotransformed =	**-36.9 %**	
% Change in Mass Rate =	**75.2 %**	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE ○ TCE ○ DCE ○ VC ◉ ETH

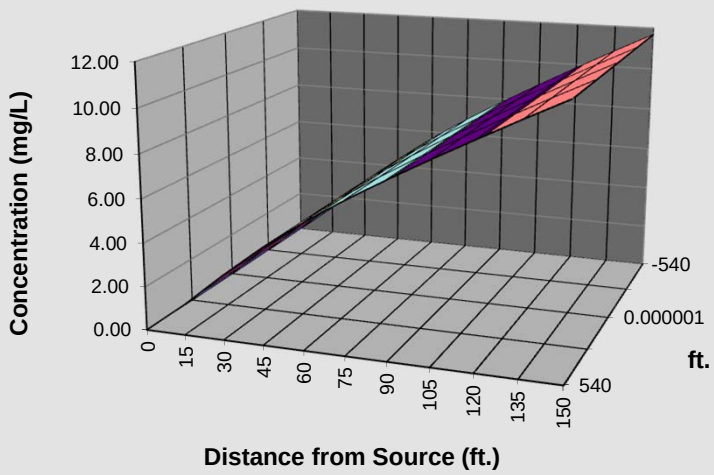
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	0.004	1.382	2.923	4.358	5.637	6.784	7.842	8.846	9.819	10.765	11.679
270	0.004	1.382	2.923	4.358	5.637	6.784	7.842	8.846	9.819	10.765	11.679
0	0.004	1.382	2.923	4.358	5.637	6.784	7.842	8.846	9.819	10.765	11.679
-270	0.004	1.382	2.923	4.358	5.637	6.784	7.842	8.846	9.819	10.765	11.679
-540	0.004	1.382	2.923	4.358	5.637	6.784	7.842	8.846	9.819	10.765	11.679
MASS RATE (mg/day)	1.4E+2	4.8E+4	1.0E+5	1.5E+5	2.0E+5	2.4E+5	2.7E+5	3.1E+5	3.4E+5	3.8E+5	4.1E+5

Show No

Show

Time: 10 yr Target Level: mg/L Displayed Model: **Biotransformation** Displayed Compound: **ETH**



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	0.5	(Kg)
- Plume Mass If Biotransformation/Production	422.4	(Kg)
Mass Removed	-422.0	(Kg)

If "Can't Calc.", make model area longer

% Biotransformed = -93095.4 %

% Change in Mass Rate = -287514.3 % (source to edge)

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ◉ PCE
○ TCE
○ DCE
○ VC
○ ETH

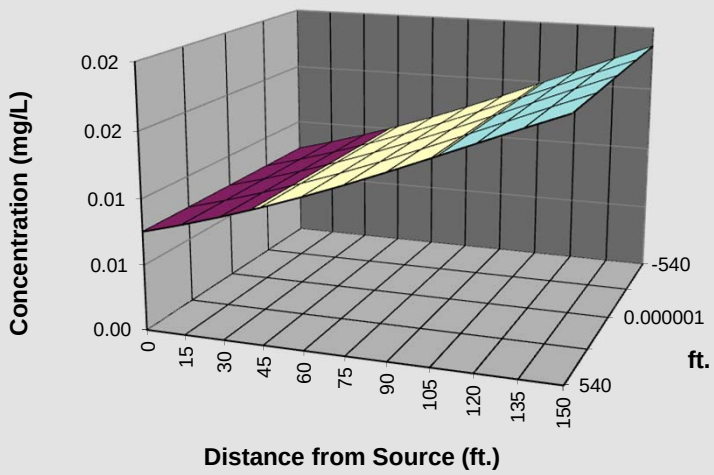
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	0.008	0.008	0.009	0.010	0.011	0.012	0.014	0.015	0.016	0.017	0.019
270	0.008	0.008	0.009	0.010	0.011	0.012	0.014	0.015	0.016	0.017	0.019
0	0.008	0.008	0.009	0.010	0.011	0.012	0.014	0.015	0.016	0.017	0.019
-270	0.008	0.008	0.009	0.010	0.011	0.012	0.014	0.015	0.016	0.017	0.019
-540	0.008	0.008	0.009	0.010	0.011	0.012	0.014	0.015	0.016	0.017	0.019
MASS RATE (mg/day)	2.6E+2	2.9E+2	3.2E+2	3.6E+2	3.9E+2	4.3E+2	4.7E+2	5.2E+2	5.6E+2	6.0E+2	6.5E+2

Show No

Show

Time: 10 yr Target Level: **0.005** mg/L Displayed Model: **No Degradation** Displayed Compound: **PCE**



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	0.8	(Kg)
- Plume Mass If Biotransformation/Production	0.0	(Kg)
Mass Removed	0.8	(Kg)
% Biotransformed =	**+94.2%**	
% Change in Mass Rate =	**-145.7 %**	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE ◉ TCE ○ DCE ○ VC ○ ETH

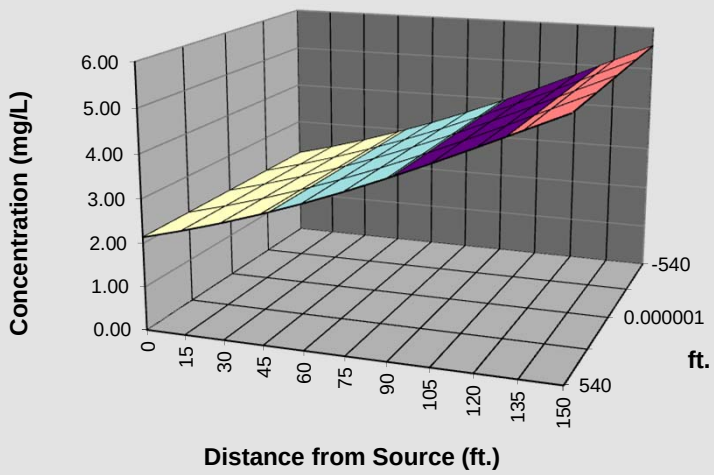
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓	*Distance from Source (ft)* 0	15	30	45	60	75	90	105	120	135	150
540	2.138	2.376	2.638	2.926	3.241	3.583	3.949	4.337	4.741	5.154	5.565
270	2.138	2.376	2.638	2.926	3.241	3.583	3.949	4.337	4.741	5.154	5.565
0	2.138	2.376	2.638	2.926	3.241	3.583	3.949	4.337	4.741	5.154	5.565
-270	2.138	2.376	2.638	2.926	3.241	3.583	3.949	4.337	4.741	5.154	5.565
-540	2.138	2.376	2.638	2.926	3.241	3.583	3.949	4.337	4.741	5.154	5.565
MASS RATE (mg/day)	7.5E+4	8.3E+4	9.2E+4	1.0E+5	1.1E+5	1.2E+5	1.4E+5	1.5E+5	1.7E+5	1.8E+5	1.9E+5

Show No

Show

Time: 10 yr Target Level: **0.005** mg/L Displayed Model: **No Degradation** Displayed Compound: **TCE**



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	238.7	*(Kg)*
- Plume Mass If Biotransformation/Production	11.2	*(Kg)*
Mass Removed	227.5	*(Kg)*
% Biotransformed =	**+95.3%**	
% Change in Mass Rate =	**-160.3 %**	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	*MGal*
Flow Rate of Water Through Source Area	0.009	*MGD*

Compare to Pump and Treat

Pumping Rate		*(gpm)*
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		*(yr)*

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE ○ TCE ◉ DCE ○ VC ○ ETH

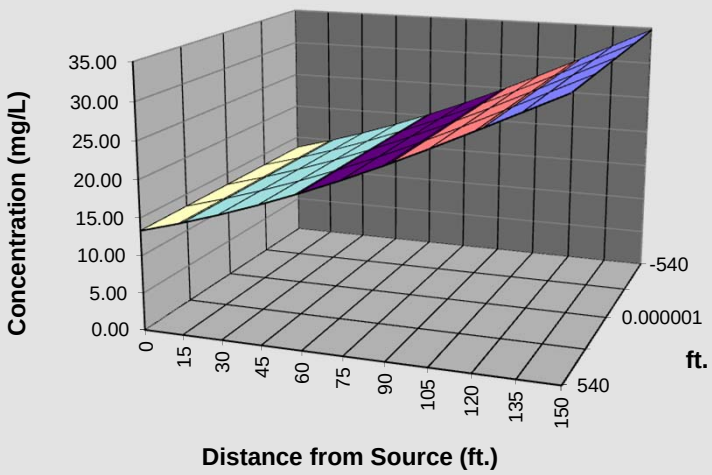
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	13.331	14.812	16.446	18.243	20.206	22.334	24.618	27.037	29.557	32.132	34.695
270	13.331	14.812	16.446	18.243	20.206	22.334	24.618	27.037	29.557	32.132	34.695
0	13.331	14.812	16.446	18.243	20.206	22.334	24.618	27.037	29.557	32.132	34.695
-270	13.331	14.812	16.446	18.243	20.206	22.334	24.618	27.037	29.557	32.132	34.695
-540	13.331	14.812	16.446	18.243	20.206	22.334	24.618	27.037	29.557	32.132	34.695
MASS RATE (mg/day)	4.6E+5	5.2E+5	5.7E+5	6.4E+5	7.0E+5	7.8E+5	8.6E+5	9.4E+5	1.0E+6	1.1E+6	1.2E+6

Show No

Show

Time: 10 yr Target Level: 0.070 mg/L Displayed Model: No Degradation Displayed Compound: DCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	1488.3	(Kg)
- Plume Mass If Biotransformation/Production	174.8	(Kg)
Mass Removed	1313.5	(Kg)
% Biotransformed =	**+88.3%**	
% Change in Mass Rate =	**-160.3 %**	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE
○ TCE
○ DCE
◉ VC
○ ETH

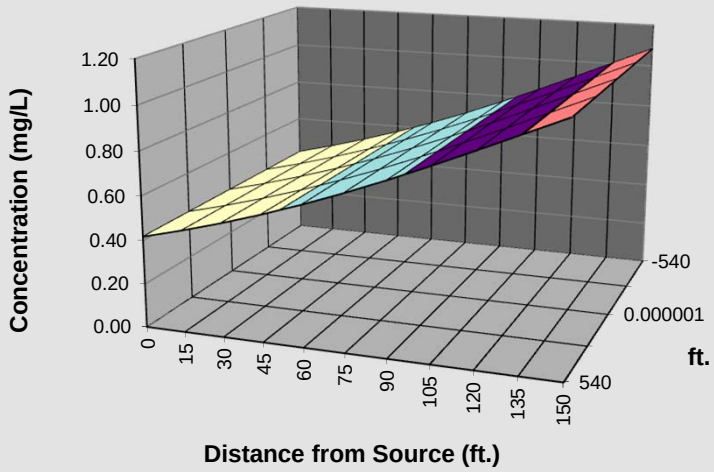
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	0.417	0.463	0.514	0.570	0.632	0.698	0.770	0.845	0.924	1.005	1.085
270	0.417	0.463	0.514	0.570	0.632	0.698	0.770	0.845	0.924	1.005	1.085
0	0.417	0.463	0.514	0.570	0.632	0.698	0.770	0.845	0.924	1.005	1.085
-270	0.417	0.463	0.514	0.570	0.632	0.698	0.770	0.845	0.924	1.005	1.085
-540	0.417	0.463	0.514	0.570	0.632	0.698	0.770	0.845	0.924	1.005	1.085
MASS RATE (mg/day)	1.5E+4	1.6E+4	1.8E+4	2.0E+4	2.2E+4	2.4E+4	2.7E+4	2.9E+4	3.2E+4	3.5E+4	3.8E+4

Show No

Show

Time: 10 yr Target Level: 0.002 mg/L Displayed Model: No Degradation Displayed Compound: VC



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	46.5	(Kg)
- Plume Mass If Biotransformation/Production	63.7	(Kg)
Mass Removed	-17.1	(Kg)
% Biotransformed =	-36.9 %	
% Change in Mass Rate =	-160.3 %	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE
○ TCE
○ DCE
○ VC
◉ ETH

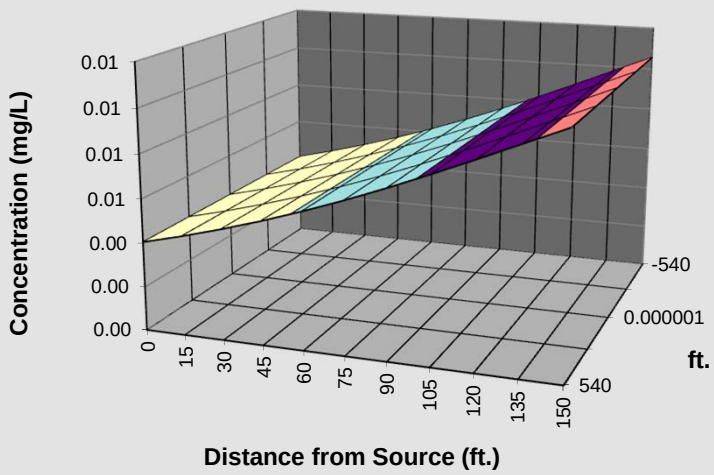
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	0.004	0.005	0.005	0.006	0.006	0.007	0.007	0.008	0.009	0.010	0.011
270	0.004	0.005	0.005	0.006	0.006	0.007	0.007	0.008	0.009	0.010	0.011
0	0.004	0.005	0.005	0.006	0.006	0.007	0.007	0.008	0.009	0.010	0.011
-270	0.004	0.005	0.005	0.006	0.006	0.007	0.007	0.008	0.009	0.010	0.011
-540	0.004	0.005	0.005	0.006	0.006	0.007	0.007	0.008	0.009	0.010	0.011
MASS RATE (mg/day)	1.4E+2	1.6E+2	1.7E+2	1.9E+2	2.1E+2	2.4E+2	2.6E+2	2.9E+2	3.1E+2	3.4E+2	3.7E+2

Show No

Show

Time: 10 yr Target Level: mg/L Displayed Model: No Degradation Displayed Compound: ETH



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	0.5	(Kg)
- Plume Mass If Biotransformation/Production	422.4	(Kg)
Mass Removed	-422.0	(Kg)
% Biotransformed =	-93095.4 %	
% Change in Mass Rate =	-160.3 %	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Halifax County
Downgradient Plume
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or* 2. Calculate by filling in gray
0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	66.6	(ft/yr)
or			
Hydraulic Conductivity	K	3.785E-04	(cm/sec)
Hydraulic Gradient	i	0.034	(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	15	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc.

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.7	(kg/L)		
FractionOrganicCarbon, foc	1.0E-3	(-)		
Partition Coefficient	Koc			
PCE	426	(L/kg)	4.62	(-)
TCE	130	(L/kg)	2.11	(-)
DCE	125	(L/kg)	2.06	(-)
VC	30	(L/kg)	1.25	(-)
ETH	302	(L/kg)	3.57	(-)
Common R (used in model)* =			**2.11**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

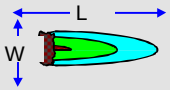
Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.578	1.20	0.79
TCE → DCE	0.770	0.90	0.74
DCE → VC	0.210	3.30	0.64
VC → ETH	0.267	2.60	0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	10	(yr)
Modeled Area Width*	1350	(ft)
Modeled Area Length*	150	(ft)
Zone 1 Length*	150	(ft)
Zone 2 Length*	0	(ft)



Zone 2=

6. SOURCE DATA

TYPE: Decaying
Single Planar

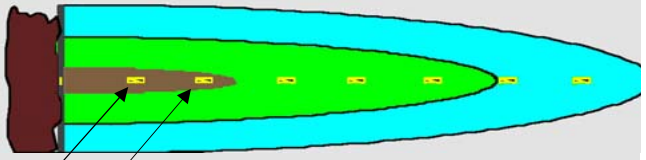
Source Options

Source Thickness in Sat. Zone* 25 (ft)

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations

	Y1
Width* (ft)	1350

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	.056	0.2
TCE	15.8	0.2
DCE	98.5	0.2
VC	3.08	0.2
ETH	0.03	0.2



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	0.0000	0.0000									
TCE Conc. (mg/L)	0.0000	0.0007									
DCE Conc. (mg/L)	0.0005	0.0050									
VC Conc. (mg/L)	0.0000	0.0022									
ETH Conc. (mg/L)											
Distance from Source (ft)	160	280									
Date Data Collected	2013										

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore | RESET | SEE | Paste

Start Here → ◉ PCE
○ TCE
○ DCE
○ VC
○ ETH

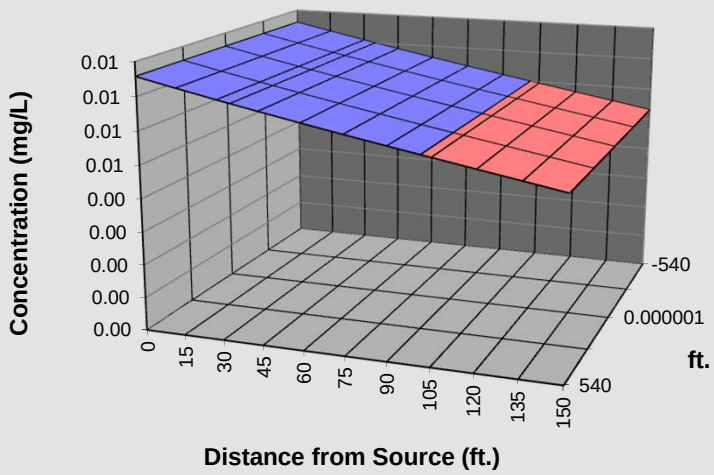
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.005
270	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.005
0	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.005
-270	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.005
-540	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.005
MASS RATE (mg/day)	2.6E+2	2.6E+2	2.5E+2	2.4E+2	2.3E+2	2.2E+2	2.1E+2	2.1E+2	2.0E+2	1.9E+2	1.8E+2

Show No

Show

Time: 10 yr Target Level: **0.005** mg/L Displayed Model: **Biotransformation** Displayed Compound: **PCE**



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	0.8	*(Kg)*
- Plume Mass If Biotransformation/Production	0.4	*(Kg)*
Mass Removed	0.4	*(Kg)*
% Biotransformed =	**+52.5%**	
% Change in Mass Rate =	**30.0 %**	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	*MGal*
Flow Rate of Water Through Source Area	0.009	*MGD*

Compare to Pump and Treat

Pumping Rate		*(gpm)*
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		*(yr)*

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE ◉ TCE ○ DCE ○ VC ○ ETH

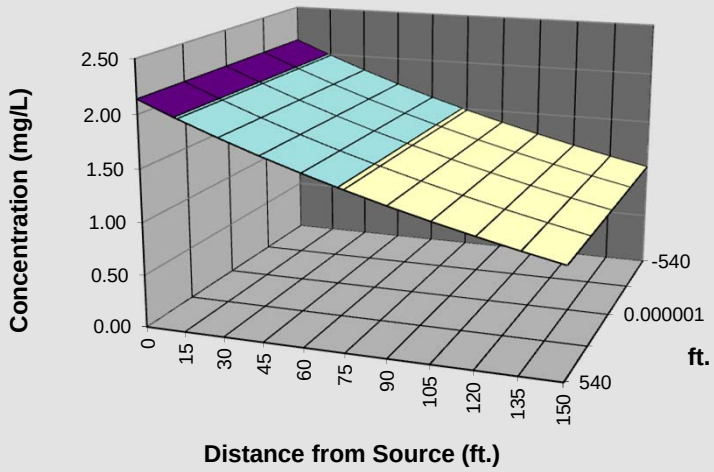
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	2.138	1.988	1.848	1.718	1.597	1.484	1.379	1.282	1.190	1.104	1.024
270	2.138	1.988	1.848	1.718	1.597	1.484	1.379	1.282	1.190	1.104	1.024
0	2.138	1.988	1.848	1.718	1.597	1.484	1.379	1.282	1.190	1.104	1.024
-270	2.138	1.988	1.848	1.718	1.597	1.484	1.379	1.282	1.190	1.104	1.024
-540	2.138	1.988	1.848	1.718	1.597	1.484	1.379	1.282	1.190	1.104	1.024
MASS RATE (mg/day)	7.5E+4	6.9E+4	6.4E+4	6.0E+4	5.6E+4	5.2E+4	4.8E+4	4.5E+4	4.1E+4	3.8E+4	3.6E+4

Show No

Show

Time: 10 yr Target Level: 0.005 mg/L Displayed Model: Biotransformation Displayed Compound: TCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	238.7	(Kg)
- Plume Mass If Biotransformation/Production	94.6	(Kg)
Mass Removed	144.1	(Kg)
% Biotransformed =	+60.4%	
% Change in Mass Rate =	52.1 %	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE ○ TCE ◉ DCE ○ VC ○ ETH

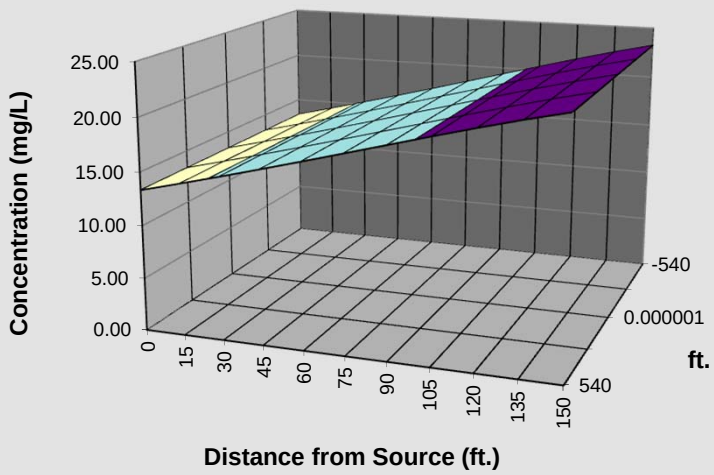
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	13.331	14.275	15.246	16.240	17.257	18.291	19.333	20.369	21.383	22.350	23.241
270	13.331	14.275	15.246	16.240	17.257	18.291	19.333	20.369	21.383	22.350	23.241
0	13.331	14.275	15.246	16.240	17.257	18.291	19.333	20.369	21.383	22.350	23.241
-270	13.331	14.275	15.246	16.240	17.257	18.291	19.333	20.369	21.383	22.350	23.241
-540	13.331	14.275	15.246	16.240	17.257	18.291	19.333	20.369	21.383	22.350	23.241
MASS RATE (mg/day)	4.6E+5	5.0E+5	5.3E+5	5.7E+5	6.0E+5	6.4E+5	6.7E+5	7.1E+5	7.5E+5	7.8E+5	8.1E+5

Show No

Show

Time: 10 yr Target Level: 0.070 mg/L Displayed Model: Biotransformation Displayed Compound: DCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	1488.3	(Kg)
- Plume Mass If Biotransformation/Production	1174.1	(Kg)
Mass Removed	314.2	(Kg)
% Biotransformed =	**+21.1%**	
% Change in Mass Rate =	**-74.3 %**	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE
○ TCE
○ DCE
◉ VC
○ ETH

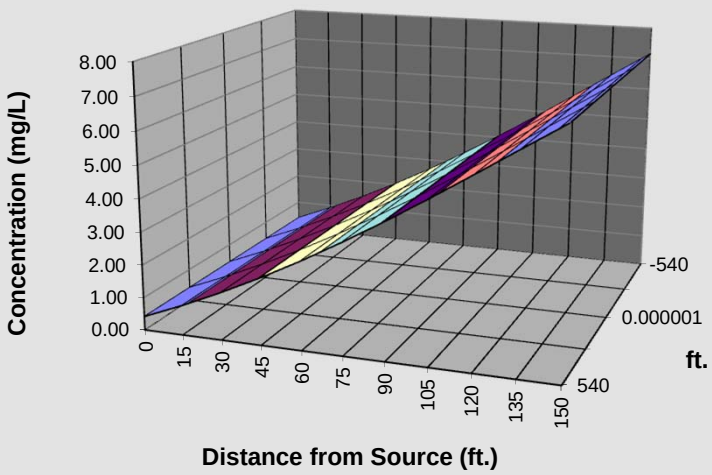
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	0.417	0.907	1.445	2.031	2.664	3.342	4.062	4.816	5.593	6.381	7.161
270	0.417	0.907	1.445	2.031	2.664	3.342	4.062	4.816	5.593	6.381	7.161
0	0.417	0.907	1.445	2.031	2.664	3.342	4.062	4.816	5.593	6.381	7.161
-270	0.417	0.907	1.445	2.031	2.664	3.342	4.062	4.816	5.593	6.381	7.161
-540	0.417	0.907	1.445	2.031	2.664	3.342	4.062	4.816	5.593	6.381	7.161
MASS RATE (mg/day)	1.5E+4	3.2E+4	5.0E+4	7.1E+4	9.3E+4	1.2E+5	1.4E+5	1.7E+5	1.9E+5	2.2E+5	2.5E+5

Show No

Show

Time: 10 yr Target Level: 0.002 mg/L Displayed Model: Biotransformation Displayed Compound: VC



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	46.5	(Kg)
- Plume Mass If Biotransformation/Production	232.9	(Kg)
Mass Removed	-186.4	(Kg)
% Biotransformed =	-400.4 %	
% Change in Mass Rate =	-1618.0 %	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE
○ TCE
○ DCE
○ VC
◉ ETH

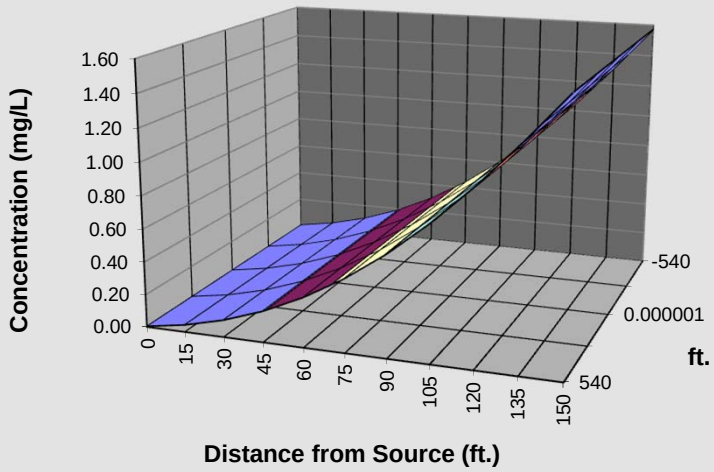
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	0.004	0.043	0.104	0.189	0.300	0.440	0.611	0.812	1.042	1.297	1.574
270	0.004	0.043	0.104	0.189	0.300	0.440	0.611	0.812	1.042	1.297	1.574
0	0.004	0.043	0.104	0.189	0.300	0.440	0.611	0.812	1.042	1.297	1.574
-270	0.004	0.043	0.104	0.189	0.300	0.440	0.611	0.812	1.042	1.297	1.574
-540	0.004	0.043	0.104	0.189	0.300	0.440	0.611	0.812	1.042	1.297	1.574
MASS RATE (mg/day)	1.4E+2	1.5E+3	3.6E+3	6.6E+3	1.0E+4	1.5E+4	2.1E+4	2.8E+4	3.6E+4	4.5E+4	5.5E+4

Show No

Show

Time: 10 yr Target Level: mg/L Displayed Model: Biotransformation Displayed Compound: ETH



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	0.5	(Kg)
- Plume Mass If Biotransformation/Production	38.7	(Kg)
Mass Removed	-38.2	(Kg)
% Biotransformed =	-8434.4 %	
% Change in Mass Rate =	-38659.1 %	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ◉ PCE
○ TCE
○ DCE
○ VC
○ ETH

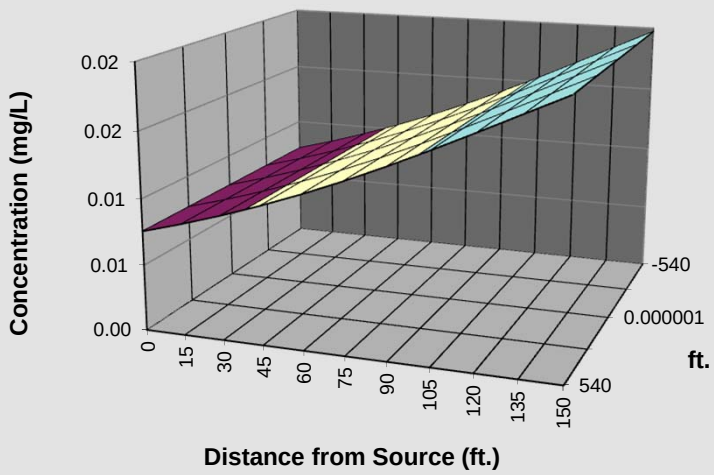
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	0.008	0.008	0.009	0.010	0.011	0.013	0.014	0.015	0.017	0.018	0.020
270	0.008	0.008	0.009	0.010	0.011	0.013	0.014	0.015	0.017	0.018	0.020
0	0.008	0.008	0.009	0.010	0.011	0.013	0.014	0.015	0.017	0.018	0.020
-270	0.008	0.008	0.009	0.010	0.011	0.013	0.014	0.015	0.017	0.018	0.020
-540	0.008	0.008	0.009	0.010	0.011	0.013	0.014	0.015	0.017	0.018	0.020
MASS RATE (mg/day)	2.6E+2	2.9E+2	3.3E+2	3.6E+2	4.0E+2	4.4E+2	4.9E+2	5.4E+2	5.9E+2	6.4E+2	6.9E+2

Show No

Show

Time: 10 yr Target Level: 0.005 mg/L Displayed Model: No Degradation Displayed Compound: PCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	0.8	(Kg)
- Plume Mass If Biotransformation/Production	0.4	(Kg)
Mass Removed	0.4	(Kg)
% Biotransformed =	+52.5%	
% Change in Mass Rate =	-160.3 %	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE ◉ TCE ○ DCE ○ VC ○ ETH

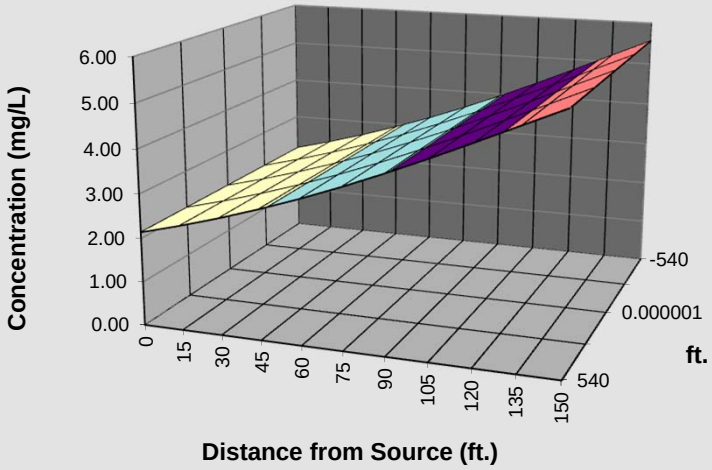
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	2.138	2.376	2.638	2.926	3.241	3.583	3.949	4.337	4.741	5.154	5.565
270	2.138	2.376	2.638	2.926	3.241	3.583	3.949	4.337	4.741	5.154	5.565
0	2.138	2.376	2.638	2.926	3.241	3.583	3.949	4.337	4.741	5.154	5.565
-270	2.138	2.376	2.638	2.926	3.241	3.583	3.949	4.337	4.741	5.154	5.565
-540	2.138	2.376	2.638	2.926	3.241	3.583	3.949	4.337	4.741	5.154	5.565
MASS RATE (mg/day)	7.5E+4	8.3E+4	9.2E+4	1.0E+5	1.1E+5	1.2E+5	1.4E+5	1.5E+5	1.7E+5	1.8E+5	1.9E+5

Show No

Show

Time: 10 yr Target Level: 0.005 mg/L Displayed Model: No Degradation Displayed Compound: TCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	238.7	(Kg)
- Plume Mass If Biotransformation/Production	94.6	(Kg)
Mass Removed	144.1	(Kg)
% Biotransformed =	+60.4%	
% Change in Mass Rate =	-160.3 %	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE ○ TCE ◉ DCE ○ VC ○ ETH

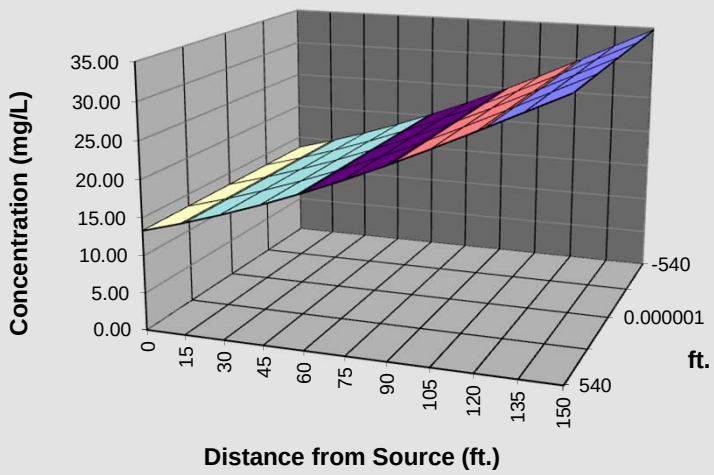
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	13.331	14.812	16.446	18.243	20.206	22.334	24.618	27.037	29.557	32.132	34.695
270	13.331	14.812	16.446	18.243	20.206	22.334	24.618	27.037	29.557	32.132	34.695
0	13.331	14.812	16.446	18.243	20.206	22.334	24.618	27.037	29.557	32.132	34.695
-270	13.331	14.812	16.446	18.243	20.206	22.334	24.618	27.037	29.557	32.132	34.695
-540	13.331	14.812	16.446	18.243	20.206	22.334	24.618	27.037	29.557	32.132	34.695
MASS RATE (mg/day)	4.6E+5	5.2E+5	5.7E+5	6.4E+5	7.0E+5	7.8E+5	8.6E+5	9.4E+5	1.0E+6	1.1E+6	1.2E+6

Show No

Show

Time: 10 yr Target Level: **0.070** mg/L Displayed Model: **No Degradation** Displayed Compound: **DCE**



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	1488.3	(Kg)
- Plume Mass If Biotransformation/Production	1174.1	(Kg)
Mass Removed	314.2	(Kg)
% Biotransformed =	**+21.1%**	
% Change in Mass Rate =	**-160.3 %**	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE ○ TCE ○ DCE ◉ VC ○ ETH

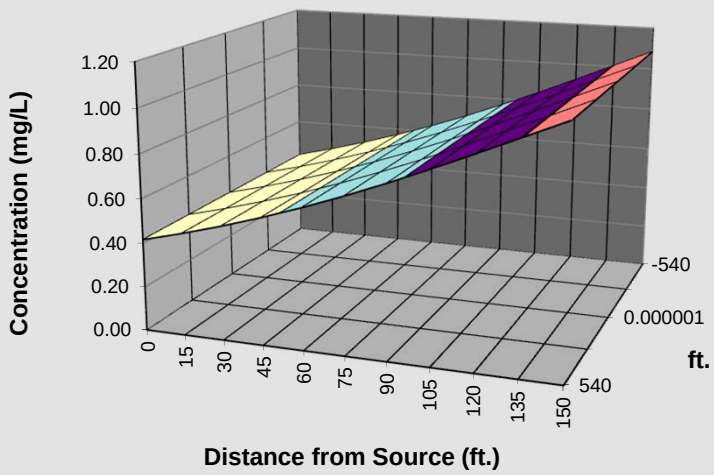
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	0.417	0.463	0.514	0.570	0.632	0.698	0.770	0.845	0.924	1.005	1.085
270	0.417	0.463	0.514	0.570	0.632	0.698	0.770	0.845	0.924	1.005	1.085
0	0.417	0.463	0.514	0.570	0.632	0.698	0.770	0.845	0.924	1.005	1.085
-270	0.417	0.463	0.514	0.570	0.632	0.698	0.770	0.845	0.924	1.005	1.085
-540	0.417	0.463	0.514	0.570	0.632	0.698	0.770	0.845	0.924	1.005	1.085
MASS RATE (mg/day)	1.5E+4	1.6E+4	1.8E+4	2.0E+4	2.2E+4	2.4E+4	2.7E+4	2.9E+4	3.2E+4	3.5E+4	3.8E+4

Show No

Show

Time: 10 yr Target Level: 0.002 mg/L Displayed Model: No Degradation Displayed Compound: VC



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	46.5	(Kg)
- Plume Mass If Biotransformation/Production	232.9	(Kg)
Mass Removed	-186.4	(Kg)
% Biotransformed =	-400.4 %	
% Change in Mass Rate =	-160.3 %	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE
○ TCE
○ DCE
○ VC
◉ ETH

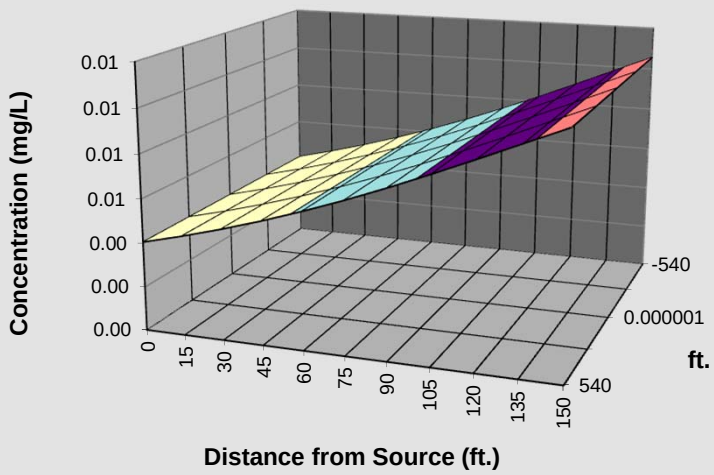
DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	15	30	45	60	75	90	105	120	135	150
540	0.004	0.005	0.005	0.006	0.006	0.007	0.007	0.008	0.009	0.010	0.011
270	0.004	0.005	0.005	0.006	0.006	0.007	0.007	0.008	0.009	0.010	0.011
0	0.004	0.005	0.005	0.006	0.006	0.007	0.007	0.008	0.009	0.010	0.011
-270	0.004	0.005	0.005	0.006	0.006	0.007	0.007	0.008	0.009	0.010	0.011
-540	0.004	0.005	0.005	0.006	0.006	0.007	0.007	0.008	0.009	0.010	0.011
MASS RATE (mg/day)	1.4E+2	1.6E+2	1.7E+2	1.9E+2	2.1E+2	2.4E+2	2.6E+2	2.9E+2	3.1E+2	3.4E+2	3.7E+2

Show No

Show

Time: 10 yr Target Level: mg/L Displayed Model: No Degradation Displayed Compound: ETH



Plume Mass (Order-of-Magnitude Accuracy)

See Gallon

Plume Mass If No Degradation	0.5	(Kg)
- Plume Mass If Biotransformation/Production	38.7	(Kg)
Mass Removed	-38.2	(Kg)
% Biotransformed =	-8434.4 %	
% Change in Mass Rate =	-160.3 %	(source to edge)

If "Can't Calc.", make model area longer

See acre-ft

Current Volume of Ground Water in Plume	Can't Calc.	MGal
Flow Rate of Water Through Source Area	0.009	MGD

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Appendix D

Time vs. Concentration Graphs

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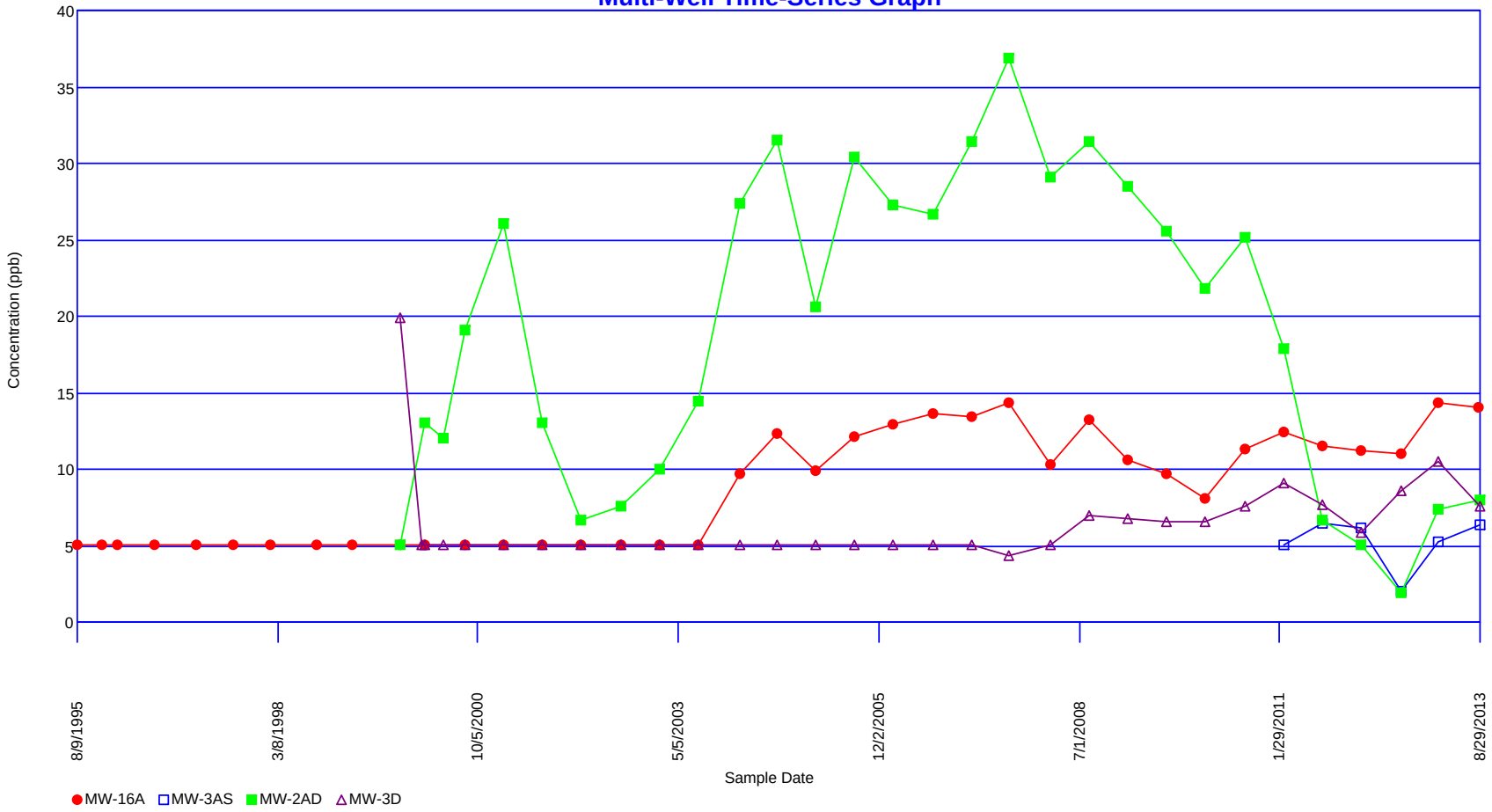
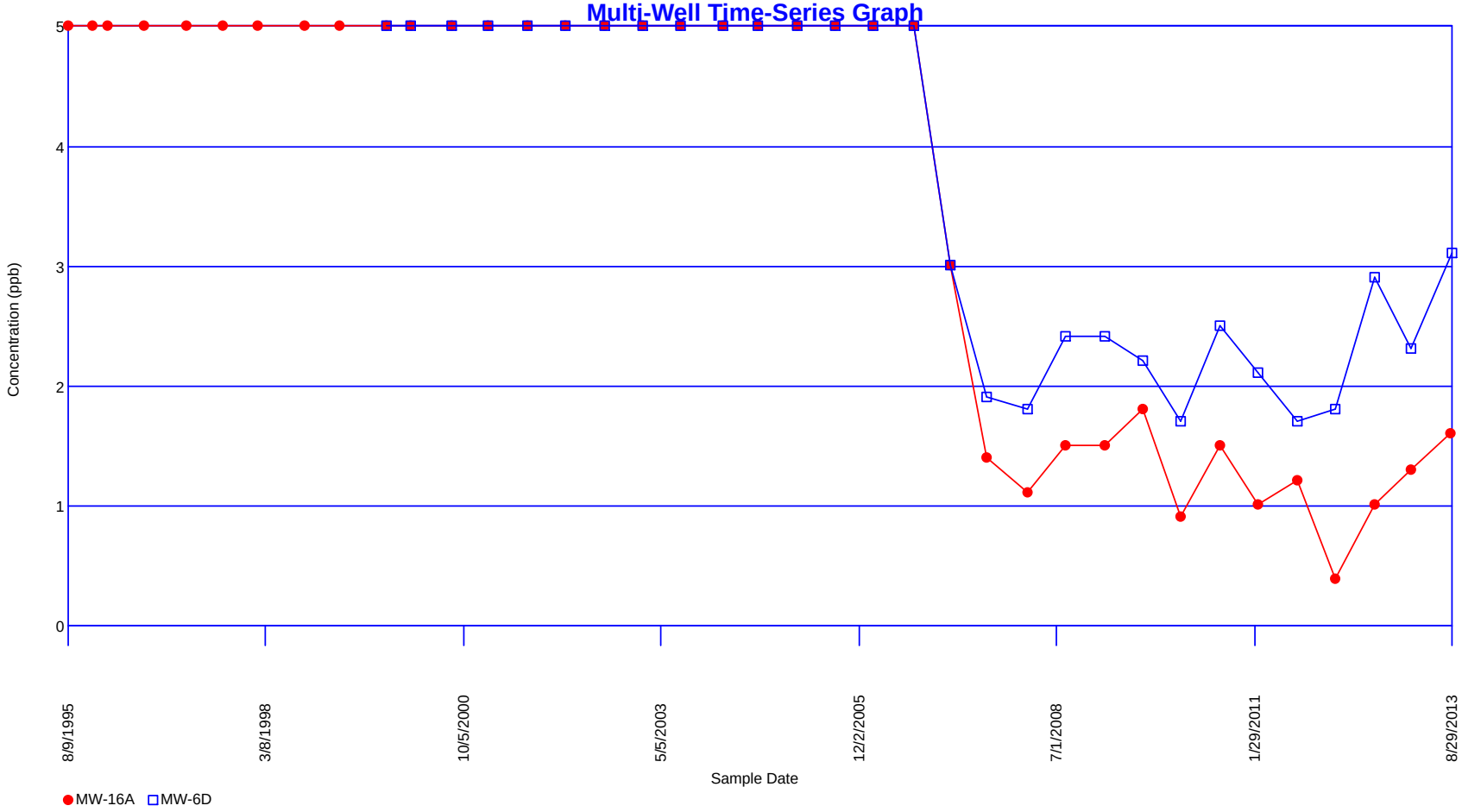
1,1-Dichloroethane

Multi-Well Time-Series Graph



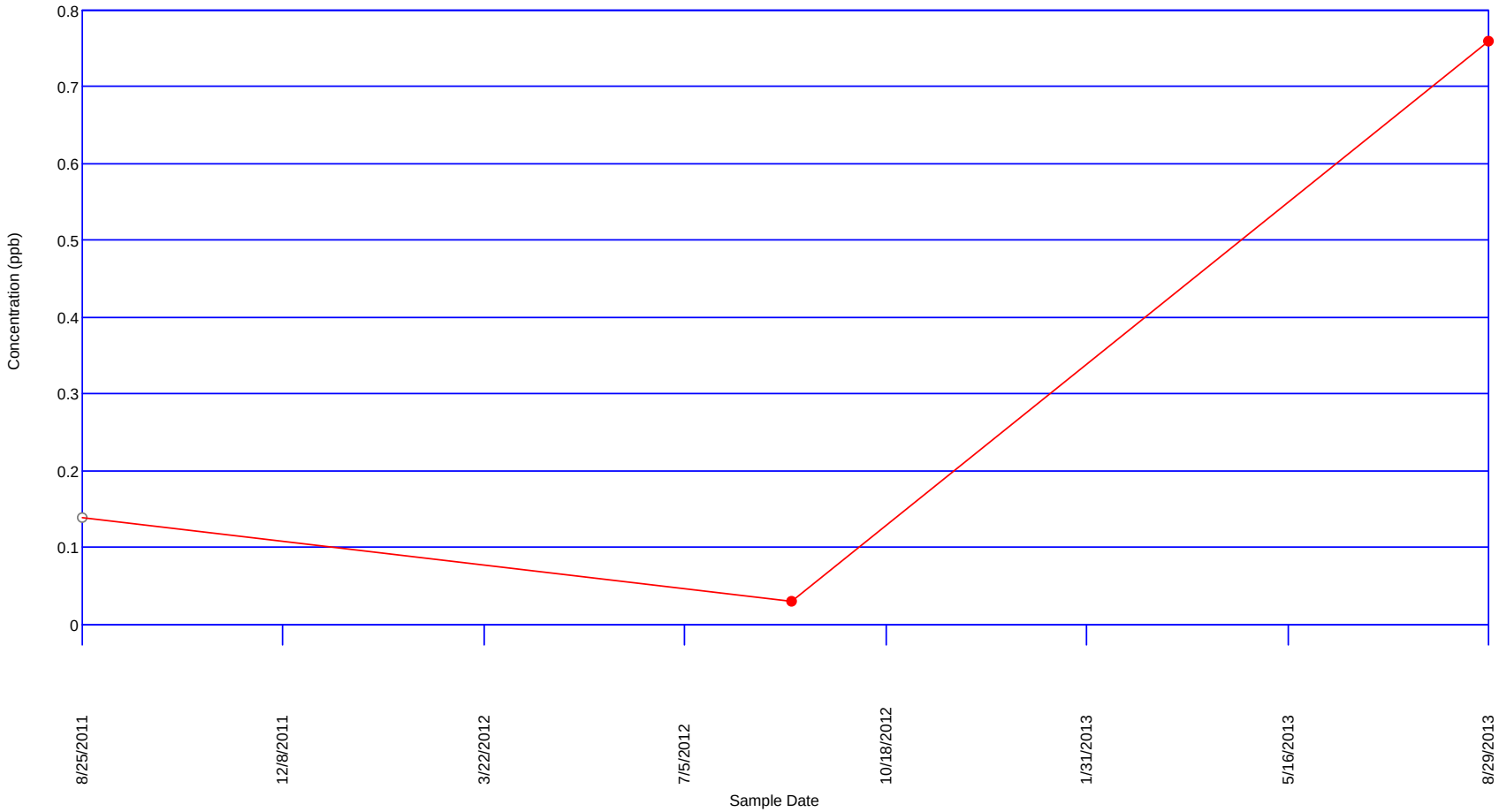
1,4-Dichlorobenzene

Multi-Well Time-Series Graph



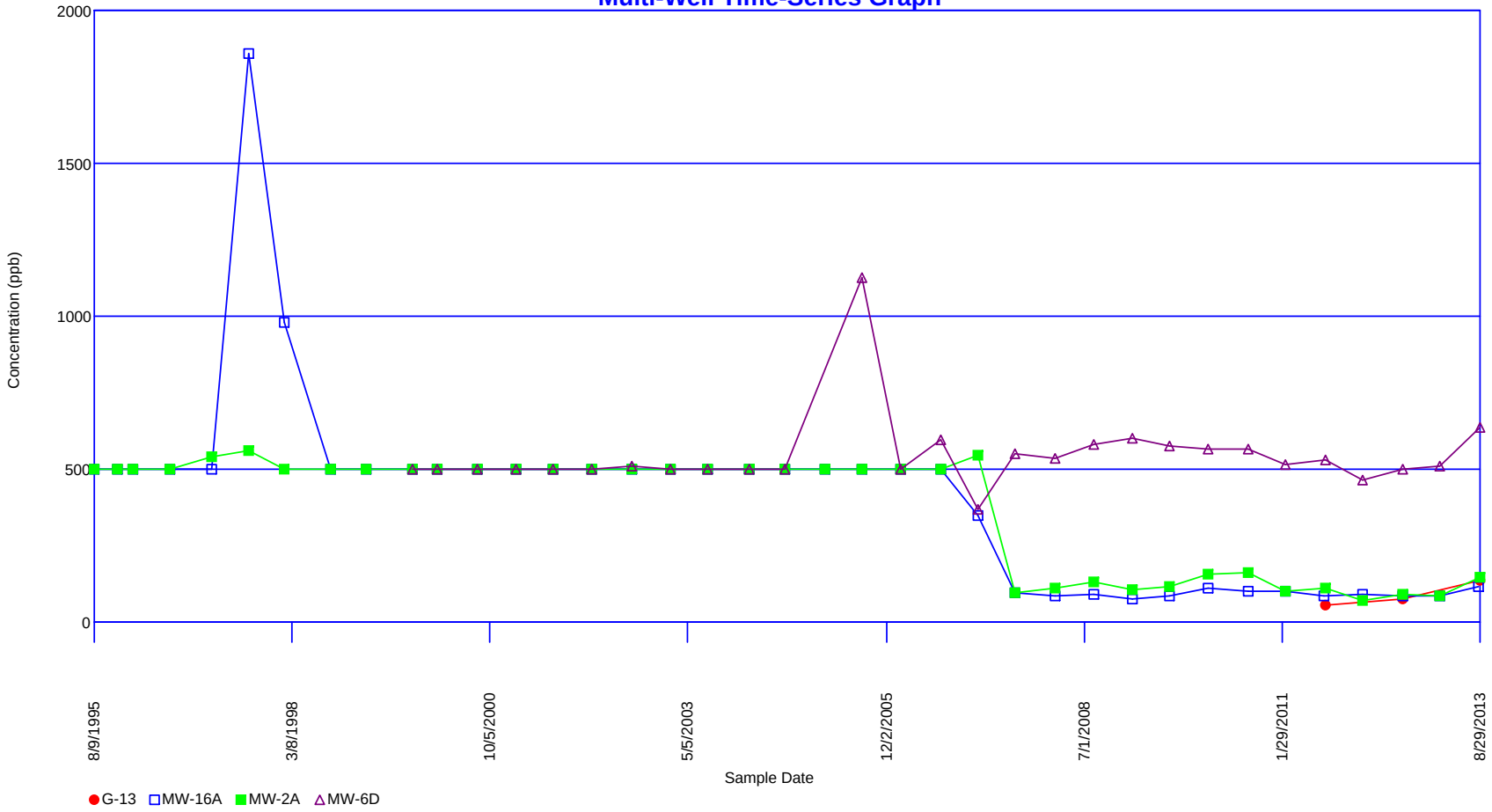
Antimony, total

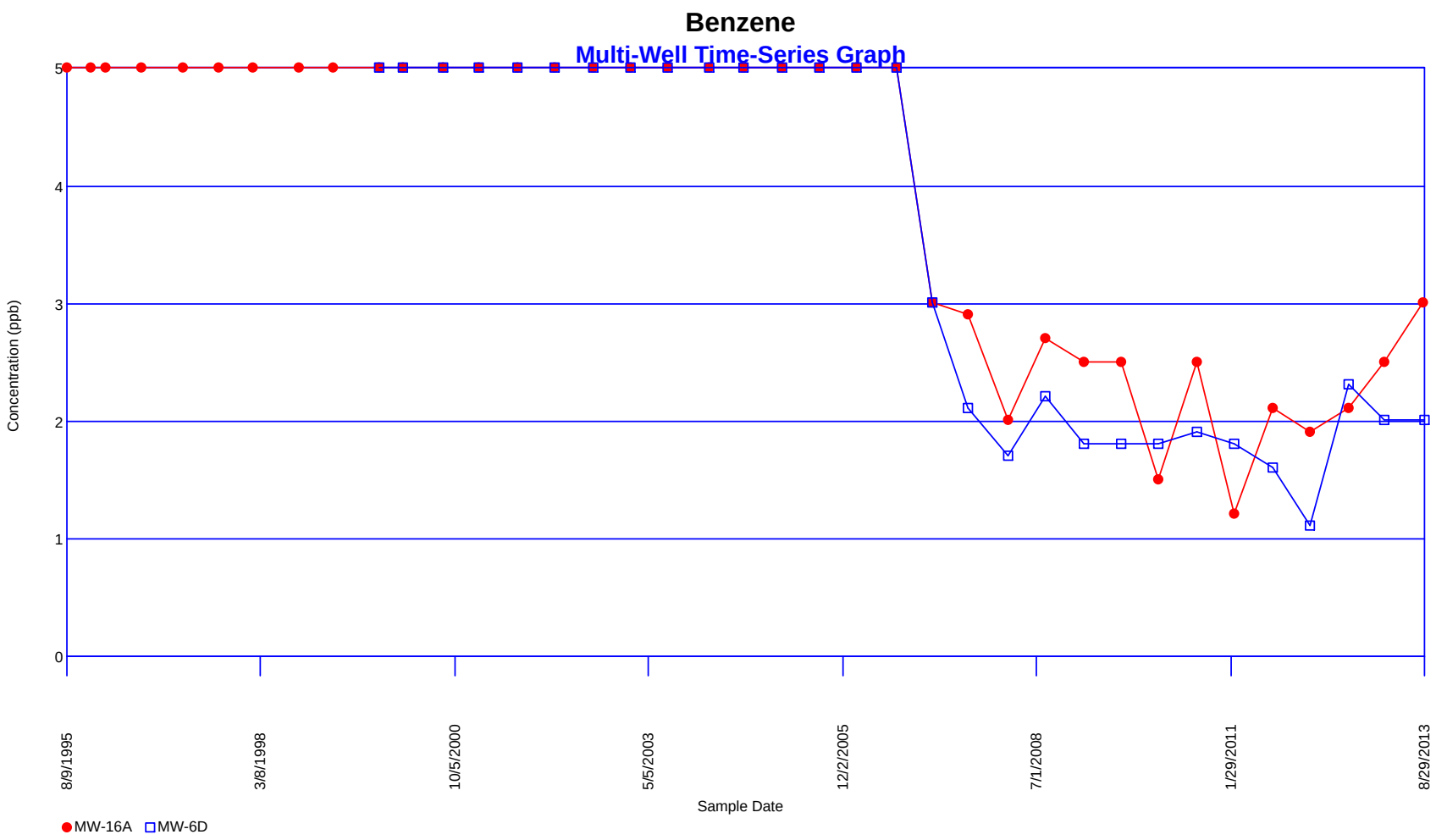
Time-Series Graph of G-13D



Barium, total

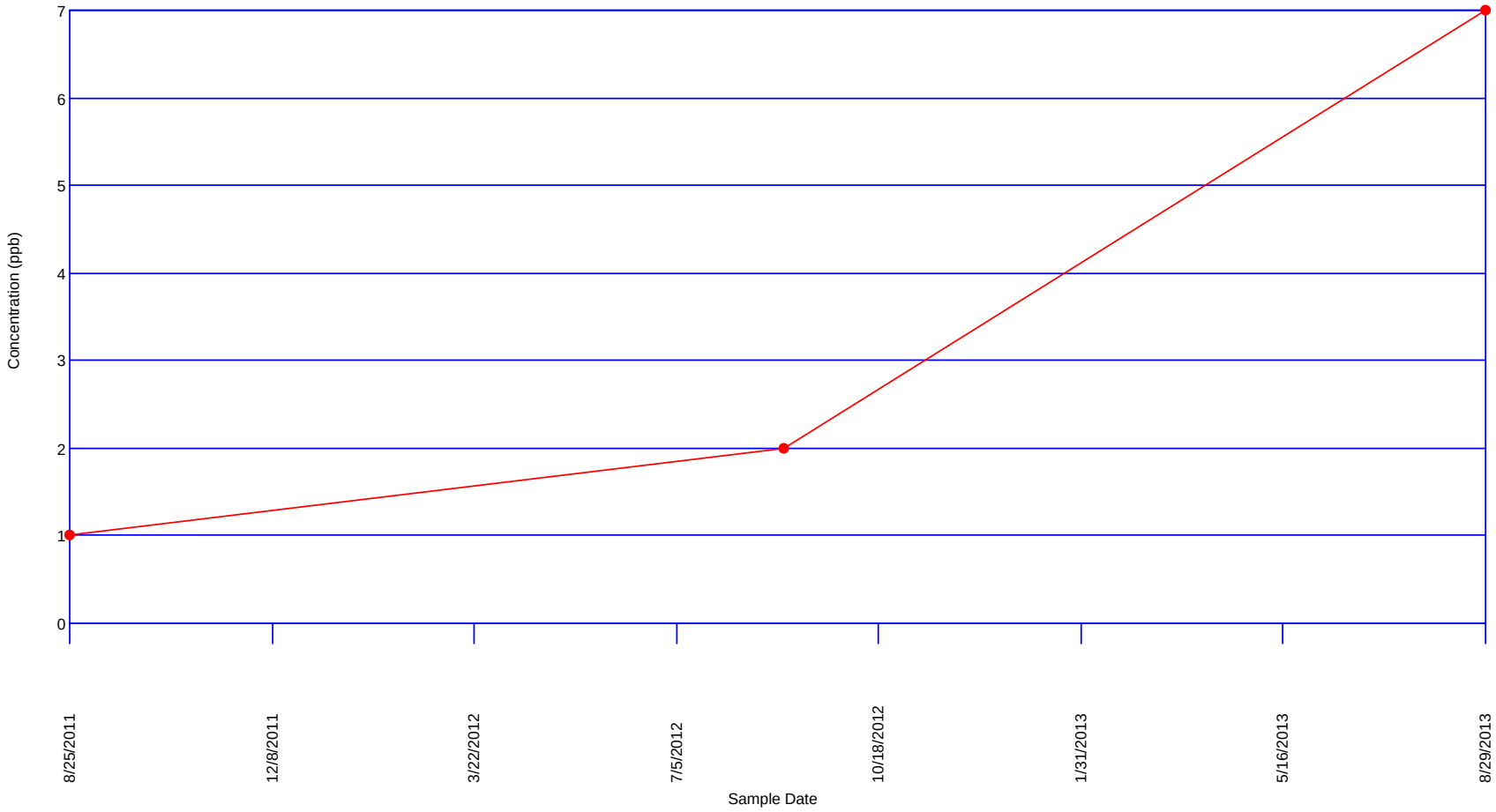
Multi-Well Time-Series Graph




Benzene
Multi-Well Time-Series Graph
Concentration (ppb)
5
4
3
2
1
0
8/9/1995
3/8/1998
10/5/2000
5/5/2003
12/2/2005
7/1/2008
1/29/2011
8/29/2013
Sample Date
MW-16A
MW-6D

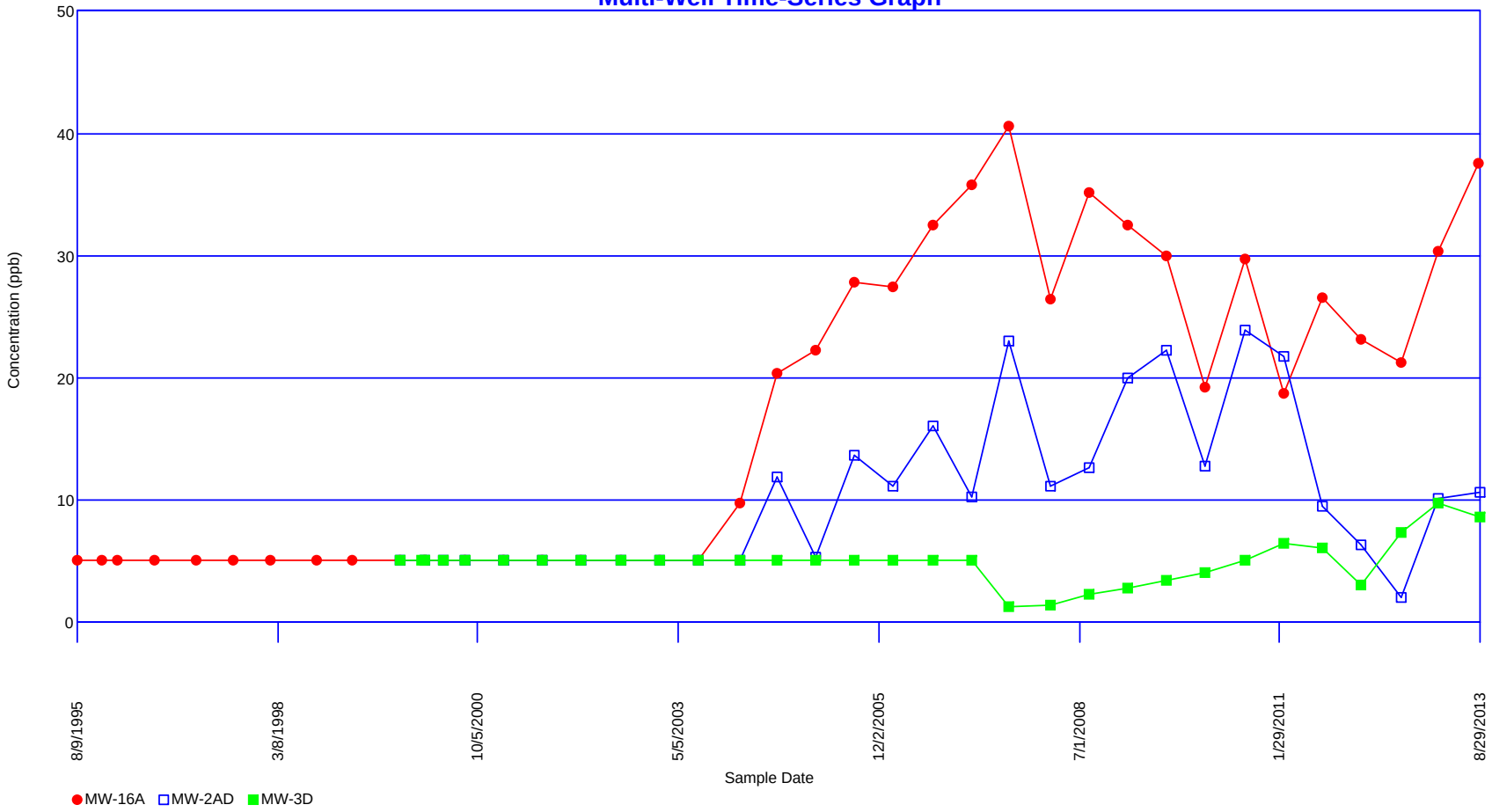
Beryllium, total

Time-Series Graph of G-13



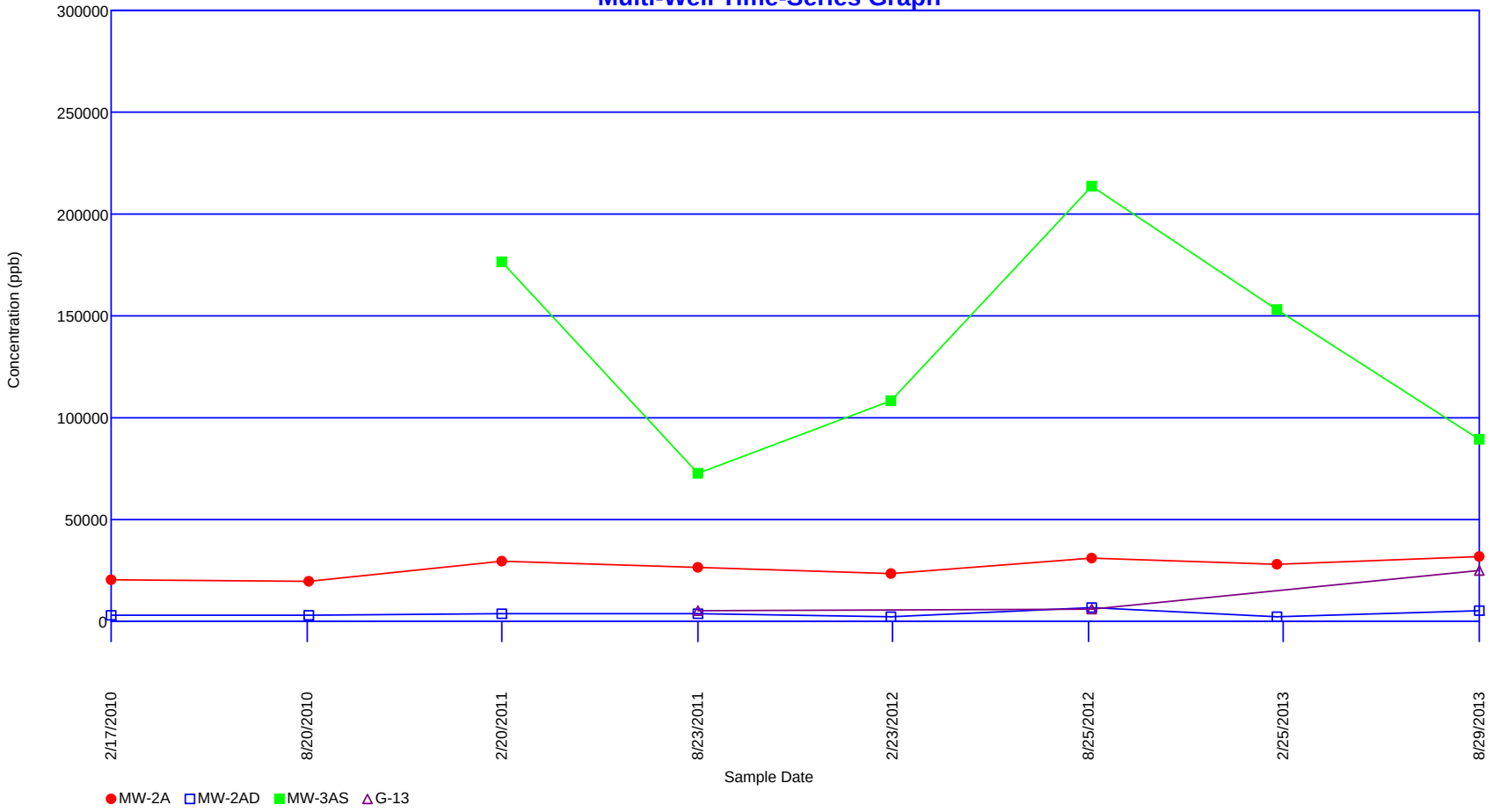
Cis-1,2-Dichloroethene

Multi-Well Time-Series Graph



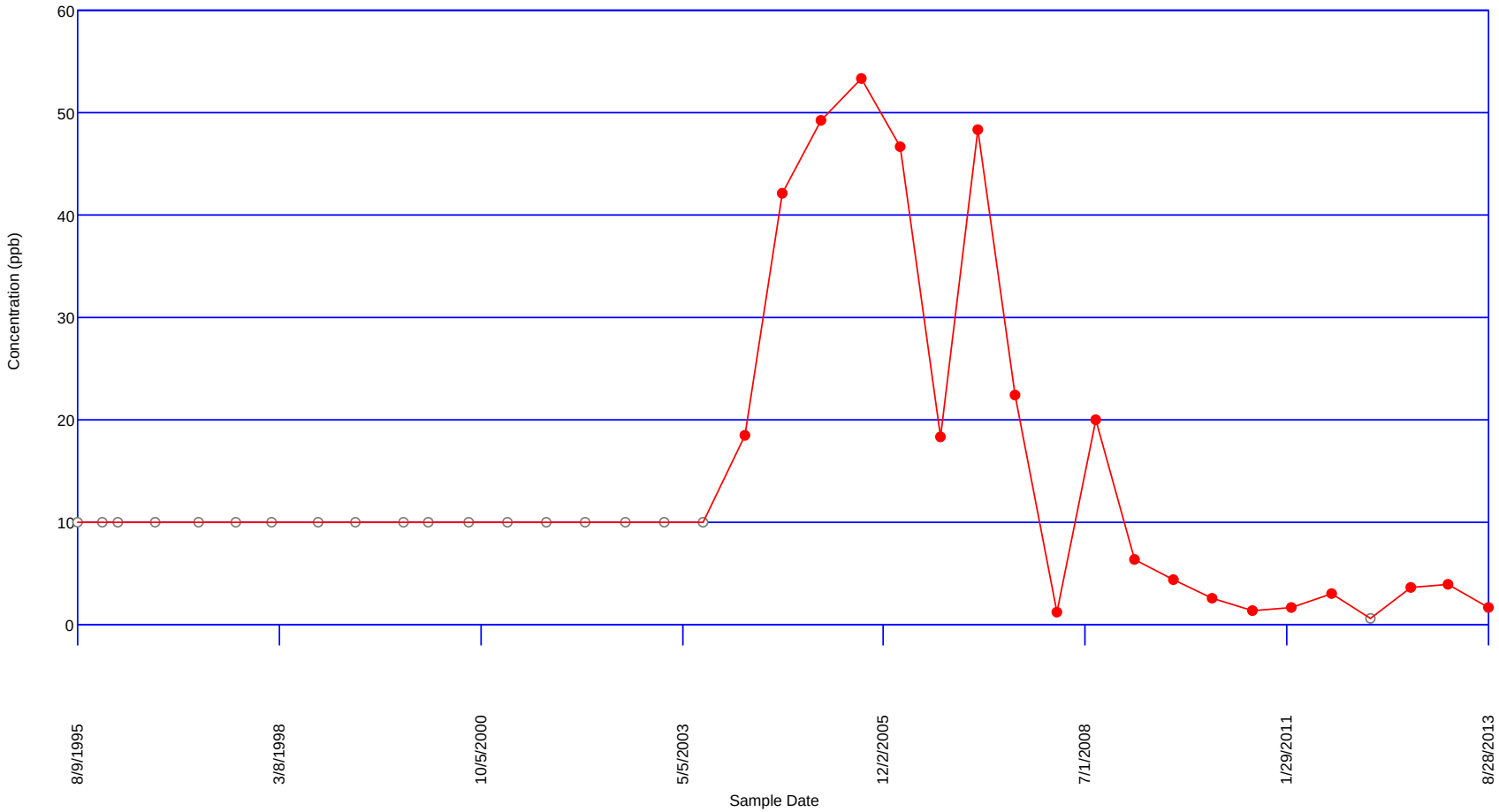
Iron, total

Multi-Well Time-Series Graph



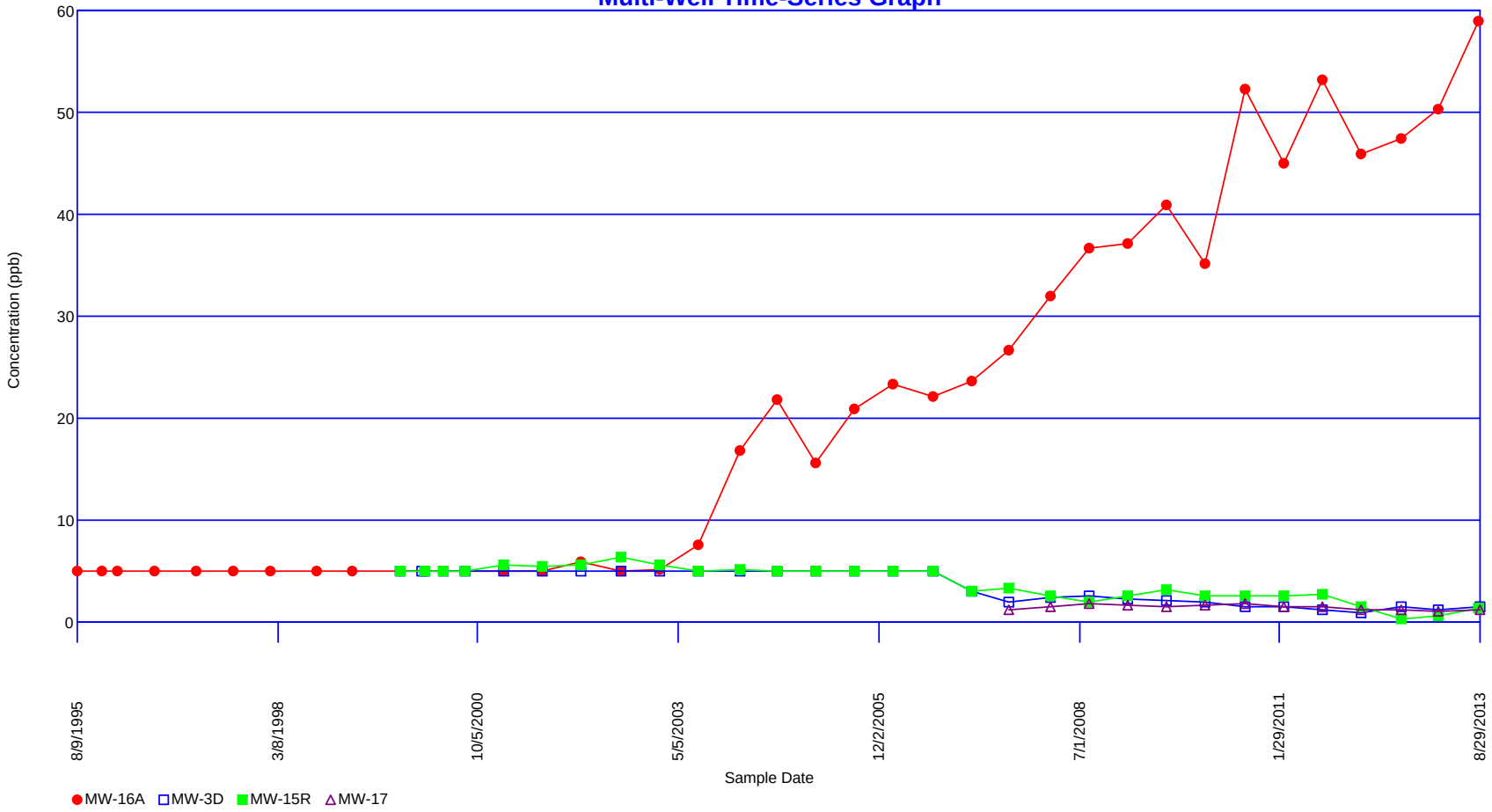
Dichloromethane (Methylene chloride)

Time-Series Graph of MW-16A



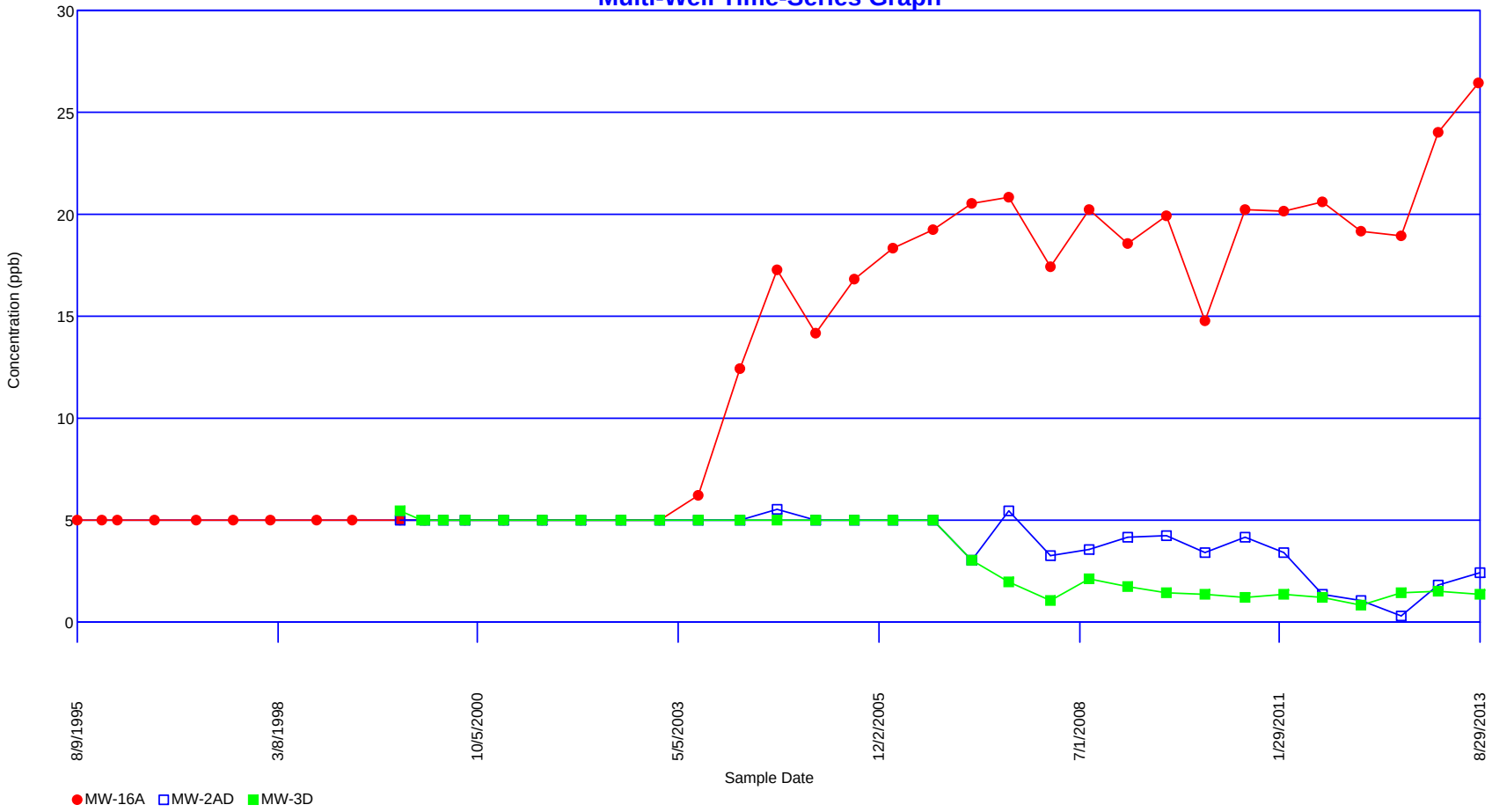
Tetrachloroethene

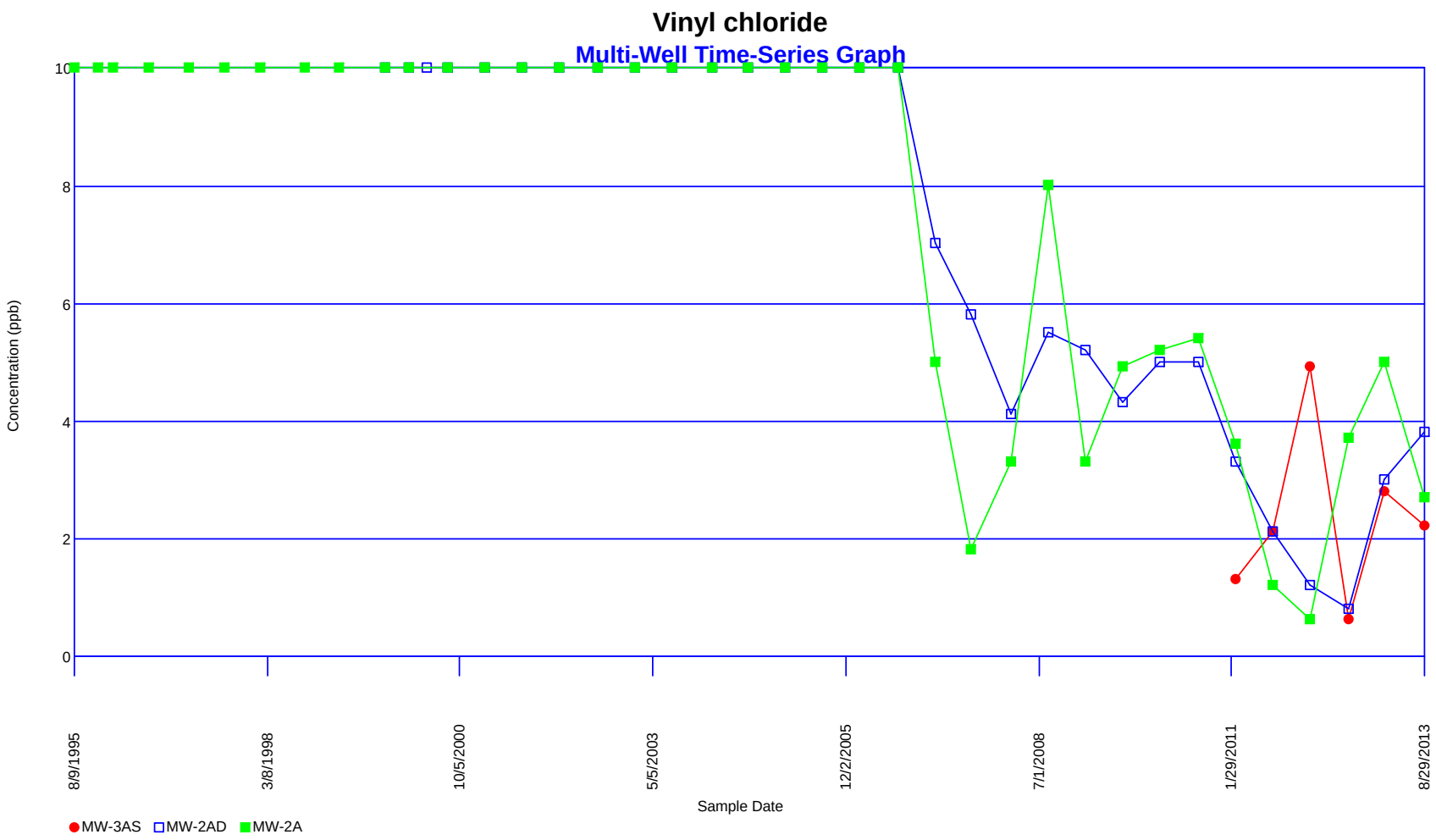
Multi-Well Time-Series Graph

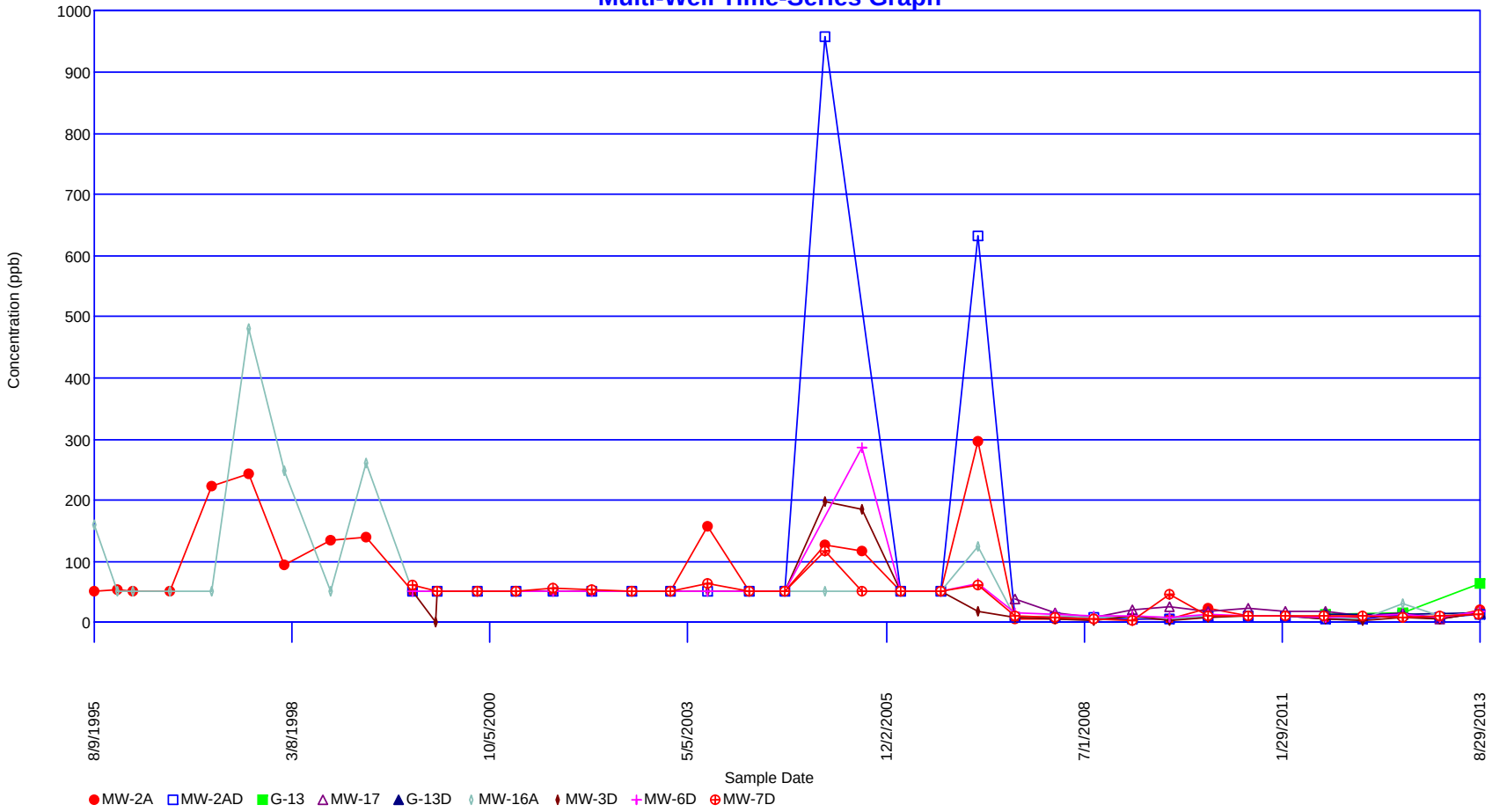


Trichloroethene

Multi-Well Time-Series Graph




Vinyl chloride
Multi-Well Time-Series Graph
Concentration (ppb)
10
8
6
4
2
0
8/9/1995
3/8/1998
10/5/2000
5/5/2003
12/2/2005
7/1/2008
1/29/2011
8/29/2013
Sample Date
MW-3AS
MW-2AD
MW-2A

Zinc

Multi-Well Time-Series Graph