

Carmen Johnson (CJ)

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95-02 6/5/12 (CJ)

~~Revised Date: 05/1/96~~

VOLUME I OF II

**Groundwater and Surface Water
Assessment Monitoring Results Report
Second Semi-Annual Event**

**Watauga County Landfill
Watauga County, North Carolina
NCDEHNR Permit No. 95-02**

Prepared for:

Watauga County Board of Commissioners

and

North Carolina Department of Environment, Health and Natural Resources
Division of Solid Waste Management
Solid Waste Section

Prepared by:

Draper Aden Associates
Consulting Engineers
2206 S. Main Street
Blacksburg, Virginia 24060
(703) 552-0444

DAA Job No. 6520-21

June 3, 1996



Draper Aden Associates

CONSULTING ENGINEERS

2206 South Main Street
Blacksburg, Virginia 24060
Phone: (703) 552-0444
Fax: (703) 552-0291

July 5, 1996

Mr. Mark Poindexter
Hydrogeologist
Solid Waste Section
North Carolina Department of Environment, Health and Natural Resources
P.O. Box 27687
Raleigh, N.D. 27611-7687

RE: Watauga County Landfill,
Second Semi-annual Assessment Monitoring Background Report,
DAA Job No. 6520-21

Dear Mr. Poindexter:

Please find enclosed a copy of the 2nd Semi-annual Assessment Monitoring Event Report (6th Assessment event) for the Watauga County Landfill for your review and comment. The enclosed report presents the validated results of the 2nd semi-annual Assessment Monitoring event, conducted on April 9-10, 1996 by Draper Aden Associates. Preliminary summary analytical data tables for this event were sent to you on May 10, 1996.

Volume I of the report discusses sampling procedures, analytical results, and overall conclusions of the 2nd semi-annual event. Volume II, in the CD-ROM format, contains of all associated laboratory data. Although Watauga County will continue to keep an original paper notebook copy of Volume II, copies of Volume II will only be distributed in the CD-ROM format. Use of the CD-ROM format will eliminate the high costs associated with copying and shipping the extensive paper volumes of raw analytical data comprising Volume II.

The 3rd semi-annual Assessment Monitoring Event is tentatively scheduled to be performed by Draper Aden Associates in October, 1996.



Draper Aden Associates

CONSULTING ENGINEERS

2206 South Main Street
Blacksburg, Virginia 24060
Phone: (703) 552-0444
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May 10, 1995

Mr. Mark Poindexter
Hydrogeologist
Solid Waste Section
North Carolina Department of Environment, Health and Natural Resources
P.O. Box 27687
Raleigh, N.C. 27611-7687

RE: Watauga County Landfill, Assessment Monitoring Program,
DAA Job No. 6520-21

Dear Mr. Poindexter:

Enclosed you will also find preliminary, unvalidated analytical result summary tables for the second semi-annual Assessment Monitoring sampling event, conducted at the Watauga County Landfill (Permit #95-02) on April 9-10, 1996 by Draper Aden Associates. Assessment monitoring was performed in accordance with monitoring program revisions detailed in the Remedial Investigation and Alternatives Report (DAA, January 12, 1996), conditionally approved by the NCDEHNR on March 27, 1996.

The analytical data obtained from this sampling event is currently being validated and evaluated. A formal, comprehensive report presenting the validated results of the second semi-annual assessment event is anticipated to be available in late May, 1996.

If you should have any questions or comments concerning the enclosed summary table or upcoming Assessment activities, please do not hesitate to contact me.

Sincerely,
DRAPER ADEN ASSOCIATES


Jeffrey E. Smith
Project Geologist

JES/rc
Attachments

cc: Mr. James S. Ratchford, Watauga County Manager
Mr. Bob Frye, Assistant Watauga County Manager
Mr. Richard M. DiSalvo, Jr., P.E., Principal, DAA
Mr. William D. Newcomb, P.G., Groundwater Project Manager, DAA

PRELIMINARY

Watauga County Landfill
 Watauga County, North Carolina
 Upgradient Well: MW-1
 05/10/96

Table 2A
 Second Semi-Annual Monitoring Event
 Assessment Target Parameter Analytical Results
Core Groundwater Monitoring Wells - Inorganic and Organic Analyses
 Contract Laboratory Program (CLP) Statements of Work (SOW)

Parameters	Event	Results ug/L (ppb)											NCS (ug/L)	MCL (ug/L)											
		MW-1	MW-2	MW-3	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12	MW-15			MW-17										
METALS, TOTAL																									
Barium, Total	4/10/9	144	J	178	J	142	J	570		612	J	507	J	105	J	268		119	J	56.3	J	75.7	J	2000	2000
Chromium, Total	4/10/9	0.90	U	0.90	U	4.8	J	26.3		2.5	J	0.90	U	42.8	U	0.90	U	0.90	U	0.90	U	0.90	U	50	100
Cobalt, Total	4/10/9	1.4	J	1.0	U	3.6	J	24.7		4.2	J	9.6	J	2.5	J	9.0	J	1.0	U	1.0	U	2.6	J	-	-
Iron, Total	4/10/9	1660		257		8550		9760		12000		348		3340		13.3	U	13.3	U	194		53.5	J	300*	300*
Nickel, Total	4/10/9	1.4	U	1.4	U	7.1	J	25.4		7.3	J	1.4	U	35.9	J	1.4	U	1.4	U	1.4	U	1.4	U	100	100
Vanadium, Total	4/10/9	3.8	J	1.6	J	17.9	J	3.8		10.6	J	0.72	J	7.5	J	0.50	U	0.92	J	2.9	J	0.75	J	-	-
ORGANICS																									
Benzene	4/10/9	1	J	91	U	2	J	11		5	J	4	J	23	U	10	U	1	U	10	U	10	U	1	5
Chloroethane	4/10/9	10	U	91	U	8	J	14		41	J	16	J	23	U	10	U	5	J	10	U	5	J	-	-
Dichlorodifluoromethane	4/10/9	10	U	91	U	10	U	25		10	U	10	U	23	U	10	U	10	U	10	U	10	U	0.19	-
1,1-Dichloroethane	4/10/9	10	U	130		150		120		5	J	36		22	J	26		120		10	U	130		700**	-
1,1,1-Dichloroethene	4/10/9	10	U	210		3	J	25		10	U	10	U	51		10	U	3	J	10	U	2	J	7	7
1,2-Dichloroethene(total)	4/10/9	10	U	91	U	64		420		6	J	11		23	U	11		54		10	U	87		70	70
Methylene Chloride	4/10/9	10	U	91	U	1	J	8		1	J	120	J	23	U	2	J	5	J	10	U	2	J	5	5
Tetrachloroethene	4/10/9	10	U	20	J	46		10		10	U	4	J	4	J	12		37		10	U	41		0.7	5
Trichloroethene	4/10/9	10	U	91	U	30		38		10	U	6	J	23	U	4	J	15		10	U	19		2.8	5
1,1,1-Trichloroethane	4/10/9	10	U	1300		21		25		10	U	8	J	280		6	J	15		4	J	7	J	200	200
Vinyl Chloride	4/10/9	10	U	91	U	2	J	14		10	U	10	U	23	U	10	U	10	U	10	U	10	U	0.02	2

Notes: NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)
 MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)
 U Denotes not detected above Instrument Detection Level (IDL) for Inorganics and not detected above CRQL for Organics
 J Denotes an estimated value
 CRQL Contract Required Quantification Limit
 * Denotes a Secondary Maximum Contaminant Level (SMCL) for Total Iron
 ** Denotes Not Available or Not Sampled
 Shading denotes parameter results that exceed U.S. EPA Maximum Contaminant Levels.
 (1) Metal parameters were analyzed in accordance with EPA Contract Laboratory Program (CLP) Statement of Work ILMO 3.0.
 CLP analytical methods utilize relevant Atomic Adsorption technique and Inductively Coupled Plasma (ICP) method for metal analysis
 (2) Organic parameters were analyzed in accordance with EPA Contract Laboratory Program Statement of Work OLMO3.2.

PRELIMINARY

05/10/96

Parameters	Sampling Date	Results ug/L(ppb)						NCS (ug/L)	MCL (ug/L)
		S-1	S-2	S-3	S-4	S-5	S-6		
METALS, TOTAL									
Barium, Total	4/10/96	345	427	182	J 68.5	J 113	J 70.9	J 2000	2000
Chromium, Total	4/10/96	0.90	U 0.90	U 0.90	U 0.90	U 0.90	U 0.90	U 50	100
Cobalt, Total	4/10/96	8.0	J 3.9	J 5.3	J 2.3	J 1.0	U 1.5	J -	-
Iron, Total	4/10/96	503	4390	1260	285	688	429	300*	300*
Nickle, Total	4/10/96	1.4	U 1.4	U 1.4	U 1.4	U 1.4	U 1.4	U 100	100
Vanadium, Total	4/10/96	0.50	U 0.50	U 0.50	U 0.63	J 0.50	U 0.50	U -	-
ORGANICS									
Benzene	4/10/96	10	U 2	J 10	U 10	U 10	U 10	U 1	5
Chloroethane	4/10/96	8	J 46	U 10	U 3	J 5	J 10	U -	-
Dichlorodifluoromethane	4/10/96	10	U 10	U 10	U 10	U 10	U 10	U 0.19	-
1,1-Dichloroethane	4/10/96	3	J 15	U 10	U 30	U 2	J 14	U 700**	-
1,1-Dichloroethene	4/10/96	10	U 10	U 10	U 10	U 10	U 10	U 7	7
1,2-Dichloroethene (Total)	4/10/96	10	U 5	J 10	U 35	U 10	U 16	U 70	70
Methylene Chloride	4/10/96	10	UJ 10	UJ 10	UJ 10	UJ 10	UJ 10	UJ 5	5
Tetrachloroethene	4/10/96	10	U 10	U 10	U 9	J 1	J 4	J 0.7	5
Trichloroethene	4/10/96	10	U 1	J 10	U 6	J 1	J 3	J 2.8	5
1,1,1-Trichloroethane	4/10/96	10	U 10	U 10	U 2	J 2	J 1	J 200	200
Vinyl Chloride	4/10/96	10	U 10	U 10	U 10	U 10	U 10	U 0.015	2

Note NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)

MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)

CRQL Contract Required Quantification Limit

U Denotes not detected above Detection Limit(IDL) for Inorganics and not detected above CRQL for Organics

J Denotes an estimated value

* Denotes a Secondary Maximum Contaminant Level (SMCL) for Total Iron

** Denotes a proposed NCS

- Denotes Not Available or Not Sampled

Shading denotes parameter results that exceed U.S. EPA Maximum Contaminant Levels.

Note: 1) CLP analytical methods utilize relevant Atomic Adsorption technique and Inductively Coupled Plasma (ICP) method,

in accordance with EPA Contract Laboratory Program (CLP) Statement of Work ILMO 3.0 for metal analysis.

Organic parameters were analyzed in accordance with USEPA CLP SOW OLM03.2.

TABLE 4A
GROUNDWATER LEVEL DATA
MONITORING WELLS

REFERENCE ELEVATION									
	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9
GROUND	3399.03	3151.24	3182.25	3150.06	3263.81	3262.55	3270.56	3235.39	3356.65
MEASURING POINT	3341.80	3152.94	3183.12	3152.52	3267.69	3266.04	3273.33	3239.77	3359.23

STATIC WATER LEVEL									
DATE									
6/20/94	38.00	7.88	18.43	13.48	NM	44.12	23.03	17.68	59.35
9/27/94	39.69	7.51	17.42	10.45	NM	43.99	30.73	17.38	57.79
2/16/95	37.57	5.58	16.20	8.18	50.39	42.85	45.88	15.41	59.54
4/11/95	37.94	6.46	16.85	9.22	48.95	42.81	49.11	16.05	59.30
7/10/95	41.20	6.60	17.43	8.94	50.29	43.73	48.98	17.42	80.17
4/9/96	38.71	5.85	7.01	8.40	49.87	42.87	44.32	16.80	61.28

GROUNDWATER ELEVATION									
DATE									
6/20/94	3303.80	3145.06	3164.69	3139.04	NM	3221.92	3250.50	3222.09	3299.88
9/27/94	3302.11	3145.43	3165.70	3142.07	NM	3222.05	3242.80	3222.39	3301.44
2/16/95	3304.23	3147.36	3166.92	3144.34	3217.30	3223.19	3227.65	3224.36	3299.69
4/11/95	3303.86	3146.48	3166.27	3143.30	3218.74	3223.23	3224.42	3223.72	3299.93
7/10/95	3300.60	3146.34	3165.69	3143.58	3217.40	3222.31	3224.55	3222.35	3279.06
4/9/96	3303.09	3147.09	3176.11	3144.12	3217.82	3223.17	3229.21	3222.97	3297.95

REFERENCE ELEVATION									
	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18
GROUND	3202.18	3156.44	3156.82	3117.39	3117	3117.15	3141.42	3181.14	3117.12
MEASURING POINT	3203.87	3159.6	3159.15	3119.72	3120	3120.65	3142.72	3183.62	3119.63

STATIC WATER LEVEL									
DATE									
6/20/94	8.18	13.35	11.04	19.66	7.94	11.92	5.32	17.93	17.93
9/27/94	8.09	13.22	10.78	19.57	7.89	11.82	5.68	17.83	17.86
2/16/95	7.73	13.22	10.61	19.39	7.52	11.55	4.61	17.05	17.58
4/11/95	7.90	13.00	10.58	19.53	7.75	11.87	5.11	17.48	17.65
7/10/95	7.91	12.53	10.48	19.62	7.74	11.96	4.54	18.11	17.94
4/9/96	7.67	12.73	10.38	19.56	7.59	11.85	4.67	17.78	17.81

GROUNDWATER ELEVATION									
DATE									
6/20/94	3195.69	3146.25	3148.11	3100.06	3112.06	3108.73	3137.40	3165.69	3101.70
9/27/94	3195.78	3146.38	3148.37	3100.15	3112.11	3108.83	3137.04	3165.79	3101.77
2/16/95	3196.14	3146.38	3148.54	3100.33	3112.48	3109.10	3138.11	3166.57	3102.05
4/11/95	3195.97	3146.60	3148.57	3100.19	3112.25	3108.78	3137.61	3166.14	3101.98
7/10/95	3195.96	3147.07	3148.67	3100.10	3112.26	3108.69	3138.18	3165.51	3101.69
4/9/96	3196.20	3146.87	3148.77	3100.16	3112.41	3108.80	3138.05	3165.84	3101.82

1) ALL MEASUREMENTS IN FEET.
 2) ALL ELEVATIONS REFERENCE MEAN SEA LEVEL. H:\TEAM\6520-21\TABLE4A.xls
 3) MEASURING POINT (M.P.) IS FROM THE TOP OF WELL CASING.
 4) NM - NOT MEASURED

TABLE 4B
 GROUNDWATER LEVEL DATA

REFERENCE ELEVATION							
	PZ-13	PZ-14	PZ-17	PZ-18	PZ-18A	PZ-22	PZ-23
GROUND	3195.05	3214.80	3217.62	3233.60	3233.95	3205.6	3221.74
MEASURING POINT	3198.33	3217.80	3220.79	3236.02	3236.86	3208.84	3225.27

STATIC WATER LEVEL							
DATE	12.75	17.26	14.47	16.80	17.30	14.29	24.68
6/20/94	12.29	16.64	14.06	16.47	17.77	13.99	23.50
9/27/94	10.71	13.66	12.88	13.66	13.60	12.86	22.44
2/6/95	12.39	15.82	13.79	15.39	15.92	13.25	23.26
4/11/95	13.07	18.47	15.24	16.41	16.49	14.15	23.71
7/10/95	11.70	15.45	15.00	15.59	15.71	13.57	23.33
4/9/96							

GROUNDWATER ELEVATION							
DATE	3185.58	3200.54	3206.32	3219.22	3219.56	3194.55	3200.59
6/20/94	3186.04	3201.16	3206.73	3219.55	3219.09	3194.85	3201.77
9/27/94	3187.62	3204.14	3207.91	3222.36	3223.26	3195.98	3202.83
2/6/95	3185.94	3201.98	3207.00	3220.63	3220.94	3195.59	3202.01
4/11/95	3185.26	3199.33	3205.55	3219.61	3220.37	3194.69	3201.56
7/10/95	3186.63	3202.35	3205.79	3220.43	3221.15	3195.27	3201.94
4/9/96							

- 1) ALL MEASUREMENTS IN FEET.
- 2) ALL ELEVATIONS REFERENCE MEAN SEA LEVEL.
- 3) MEASURING POINT (M.P.) IS FROM THE TOP OF WELL CASING.

THESE DOCUMENTS, INCLUDING DRAWINGS, SPECIFICATIONS, REPORTS, AND STUDIES WERE PREPARED BY DRAPER ADEN ASSOCIATES, CONSULTING ENGINEERS, PURSUANT TO A CONTRACT BY AND BETWEEN DRAPER ADEN ASSOCIATES AND WATAUGA COUNTY BOARD OF COMMISSIONERS, WITH RESPECT TO THE PROJECT DESCRIBED IN SAID CONTRACT. ANY REUSE OF SAID DOCUMENTS WITHOUT WRITTEN VERIFICATION OR ADAPTATION BY DRAPER ADEN ASSOCIATES FOR THE SPECIFIC PURPOSE INTENDED WILL BE AT THE SOLE RISK OF THE INDIVIDUAL OR ENTITY UTILIZING SAID DOCUMENTS, DRAWINGS, SPECIFICATIONS, REPORTS, AND STUDIES AND SUCH USE IS WITHOUT THE AUTHORIZATION OF DRAPER ADEN ASSOCIATES. DRAPER ADEN ASSOCIATES, CONSULTING ENGINEERS, SHALL HAVE NO LEGAL LIABILITY RESULTING FROM ANY AND ALL CLAIMS, DAMAGES, LOSSES, AND EXPENSES, INCLUDING ATTORNEY'S FEES ARISING OUT OF THE UNAUTHORIZED USE OF THESE DOCUMENTS, DRAWINGS, SPECIFICATIONS, REPORTS, AND STUDIES PREPARED AS A RESULT OF THE AFORESAID CONTRACT.

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Mr. Mark Poindexter
July 5, 1996
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If you should have any questions or comments concerning the enclosed report, or the pending 3rd semi-annual Assessment Monitoring Event, please do not hesitate to contact me.

Sincerely,
DRAPER ADEN ASSOCIATES

A handwritten signature in black ink, appearing to read "Jeffrey E. Smith". The signature is stylized with a large loop and a horizontal line extending to the right.

Jeffrey E. Smith
Project Geologist

JES/rc

cc: Mr. Bob Frye, Assistant Watauga County Manager
Mr. James S. Ratchford, Watauga County Manager
Mr. Richard M. DiSalvo, Jr., P.E., Principal, DAA
Mr. William D. Newcomb, P.G., Groundwater Project Manager, DAA

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CLP METALS (BOOK 3)

- Section 2.1 - DAA Metals Validation Forms
- Section 2.2 - Revisions to Original Data Set
- Section 2.3 - CLP Metals Analytical Data

I. INTRODUCTION

This report presents the results of the second semi-annual sampling event for Assessment Groundwater and Surface Water Monitoring at the Watauga County Landfill, NCDEHNR Permit No. 95-02, Watauga County, North Carolina, performed on April 9-10, 1996 by Draper Aden Associates. Assessment monitoring was performed in accordance with the Watauga County Landfill Assessment Plan (DAA, September 3, 1993), approved by the NCDEHNR on September 30, 1993, and monitoring program revisions detailed in the Remedial Investigation and Alternatives Report (DAA, January 12, 1996), conditionally approved by the NCDEHNR on March 27, 1996. Appendix I of the Assessment Plan, The Groundwater and Surface Water Monitoring Program, details the schedule and procedures to be implemented for collecting groundwater and surface water samples, analyzing the samples for specified parameters, and evaluating and reporting the resultant water quality data.

Volume I of this report (herein) discusses sampling procedures, analytical results, and overall conclusions of the second semi-annual Assessment sampling event. Volume II of the report (separate cover) contains copies of all associated laboratory data. Volume II of this report also contains Data Validation Forms summarizing the guidelines and results of the data validation procedures utilized for evaluating the data discussed in this report.

1.1. Groundwater Monitoring Well Network

Eighteen (18) groundwater monitoring wells comprise the assessment groundwater monitoring well network at the Watauga County Landfill. Monitoring well locations are shown on the Groundwater and Surface Water Monitoring Program site map (Figure 1).

In order to maximize the effectiveness and efficiency of the Groundwater Monitoring Program, the assessment well network is stratified into two groups of "core" and "boundary" wells. Core assessment wells are selected based on the well's ability to monitor and characterize migration of potential slugs of contaminants. Boundary assessment wells are selected based on the well's ability to monitor and characterize the limits of the horizontal and vertical extent of the contaminants.

Eleven (11) of the eighteen (18) groundwater monitoring wells were installed in January and February of 1994. For the first quarter background event, four (4) of the previous seven (7) monitoring wells, MW-2, MW-3, MW-4, and MW-6, were denoted as core assessment wells based available data. The upgradient well MW-1 was also evaluated similarly for purposes of comparison. All other assessment monitoring wells were initially denoted as boundary assessment wells for this initial assessment background sampling event.

Based on the analytical data obtained from the first quarter background event, the assessment monitoring well network was restratified for the following background monitoring events. Revisions to the network of core and boundary assessment wells resulted in the upgrading of six of the eleven additional monitoring wells to "core" status (MW-8, MW-9, MW-10, MW-11, MW-12, and MW-17).

Upon review of the analytical data obtained from all four (4) background events, two additional monitoring wells, MW-4 and MW-7, were also restratified for the following semi-annual monitoring events. MW-7 was upgraded to "core" status and MW-4 was downgraded to "boundary" status. Due to the repeated detection of low levels of 1,1,1-TCA observed in the boundary well MW-15 during the past five assessment monitoring events, MW-15 was also upgraded to core status for the second semi-annual assessment monitoring event.

The current stratification of the assessment monitoring well network is as follows:

<u>CORE WELLS</u>	<u>BOUNDARY WELLS</u>
MW-1	MW-4
MW-2	MW-5
MW-3	MW-13
MW-6	MW-14
MW-7	MW-16
MW-8	MW-18
MW-9	
MW-10	
MW-11	
MW-12	
MW-15	
MW-17	

The decision criteria utilized for the classification of boundary wells in the assessment monitoring well network is the exceedance of the analytical method limit of detection as determined by the laboratory for parameters identified as target parameters in the core assessment monitoring wells. The presence of target parameters above the analytical method limit of detection are evaluated with respect to repeated sampling events prior to confirmation.

After the first semi-annual assessment monitoring event (the fifth assessment event), the non-impacted boundary wells (i.e.: MW-4, MW-5, MW-13, MW-14, MW-16, and MW-18) were withdrawn from the routine compliance monitoring program. The current twelve core assessment monitoring wells will continue to be monitored on a semi-annual basis. The six non-impacted boundary wells will remain operational to allow for future monitoring based on temporal contaminant distribution trends observed after each semi-annual event .

The conditional NCDEHNR approval of monitoring program revisions detailed in the Remedial Investigation and Alternatives Report (DAA, January 12, 1996), requested that the boundary wells be rotated in and out of routine monitoring on a regular basis. The monitoring results obtained from the network of core assessment monitoring wells as a result of the recent second semi-annual monitoring event, described herein, do not indicate any significant changes in

contaminant concentrations. Therefore, it is suggested that additional sampling of the non-impacted boundary wells is not warranted at this time (i.e. third semi-annual sampling event, tentatively scheduled to occur October, 1996). As requested, it is proposed that the boundary wells be rotated in and out of routine monitoring on a bi-annual basis. If temporal contaminant distribution trends observed after future semi-annual events indicate significant changes in contaminant concentrations have occurred, the proposed schedule incorporating bi-annual sampling of non-impacted boundary wells will be reevaluated.

As indicated in the Assessment Monitoring schedule (Table 1, Appendix I), all assessment monitoring wells were analyzed utilizing CLP analytical methods for the second semi-annual assessment monitoring event.

1.2 Surface Water Sampling

The goal of the surface water monitoring system at Watauga County Landfill is to provide representative surface water samples for assessing the potential impact of landfill runoff and leachate on the streams located downgradient of the waste disposal area. Five (5) surface water monitoring points, combined with the sampling of any observed leachate production, serve to provide this objective.

- (S-1) The last of the series of sediment ponds is sampled to provide a representative sample for assessing the quality of the surface water originating from the landfill before the water discharges into the stream.
- (S-2) The spring capture outfall located adjacent to the last of the series of sediment ponds is sampled to provide a representative sample for assessing the quality of the water originating from the spring capture system located beneath the fill area.
- (S-3) The stream is sampled at the landfill property boundary (approximately 600 feet below the last sediment pond) to provide a representative sample for assessing the water quality of the stream below the waste disposal area. No sampling location is available upstream of the waste disposal area since the stream originates immediately below the adjacent to the disposal area.
- (S-4) The stream located below the Bolick site is sampled approximately thirty (30) feet below the landfill property boundary to provide a representative sample for assessing the water quality of the surface water below the Bolick site. This sampling location is chosen instead of the sediment pond located on the Bolick site to provide a sample that is more representative of the potential influence of groundwater from the soil aquifer.
- (S-5) A seep, located below the waste disposal area and directly above the sediment pond, was observed flowing during the first quarter background event. This seep is sampled in addition to

the four (4) originally proposed surface water sampling locations when observed flowing during routine surface water sampling events.

- (S-6) An additional surface water monitoring point, located below the existing surface water monitoring point S-4, was proposed subsequent to the first semi-annual sampling event. This monitoring point will provide information to assess the persistence of surface water impacts observed at S-4 further downgradient along this west drainage.

As outlined in the Assessment Monitoring schedule (Table 1, Appendix 1), surface water samples were analyzed using CLP statements of work.

In addition to these six surface water sampling locations, any leachate production observed during surface water sampling events is also sampled. A grid field screening inspection of the landfill was conducted concurrent with the second semi-annual event to verify the presence or absence of leachate production. No leachate production was observed. Observations resulting from the inspection is documented in the field notes (Appendix II).

1.3 Sampling and Analysis Schedule

Groundwater

During the first year of Assessment groundwater monitoring, four (4) quarterly background sampling events were conducted on each groundwater monitoring well. Semi-annual sampling is currently conducted. The first semi-annual Assessment monitoring event was conducted on July 10-13, 1995. The second semi-annual Assessment monitoring event was recently conducted on April 9-10, 1996, upon notification of NCDEHNR conditional approval of proposed assessment monitoring program revisions, and is described herein. The groundwater Assessment monitoring schedule proposed for subsequent monitoring events is outlined in Table 1.

The analytical scans performed on each monitoring well during the first year of assessment background groundwater monitoring were designed to analyze for all the target parameters detected and tentatively confirmed as a result of the initial comprehensive sampling event performed on the previously existing monitoring well network MW-1 through MW-7 on March 5, 1993. The initial March 5, 1993 sampling event was comprised of the complete EPA Appendix II List of Hazardous Inorganic and Organic Parameters (40 CFR, Part 258) currently required for Assessment Monitoring under the North Carolina Department of Environment, Health, and Natural Resources (NCDEHNR) requirements for Municipal Solid Waste Landfills (15A NAACO 13B Section .1600). A summary results table of the initial March 5, 1993 sampling event are contained in Appendix III of this report and detailed in Sections II and III of the Assessment Plan (DAA, September 3, 1993).

The complete EPA Appendix II analysis was repeated on the revised network of core plume assessment wells during the first semi-annual event, performed on July 10-13, 1995. Additional parameters detected, and verified through QA/QC validation as being present, that were not identified in prior Assessment monitoring events, were added to the assessment target parameter list. Target parameters not detected during all five previous assessment monitoring program events, and verified through QA/QC validation as not being present, were deleted from the assessment target parameter list. As required, amendments to the existing target parameter list were evaluated and approved by the NCDEHNR, prior to implementation. For amended target parameters, four (4) independent samples will be collected and analyzed for those additional parameters during the following four (4) semi-annual sampling events at all core assessment wells to establish background.

Revisions to the target inorganic parameter list involve adding four metal parameters; i.e.: Chromium, Cobalt, Nickel, and Vanadium, and deleting two other metal parameters; i.e.: Cadmium and Mercury. The presence of Cadmium and Mercury in the groundwater at the site is not supported by the analytical results of all four assessment background or the first semi-annual monitoring events. Chromium, Cobalt, Nickel, and Vanadium were observed in three (3) or more core monitoring wells, although also at levels far below EPA MCL and North Carolina groundwater standards, as a result of the comprehensive EPA Appendix II analytical scan performed during the first semi-annual assessment sampling event.

Revisions to the target organic parameter list involve deleting trans-1,3-Dichloropropene. The analytical results of the four background monitoring events and the first semi-annual assessment sampling event confirmed the absence of trans-1,3-Dichloropropene in the groundwater and surface waters at the site. Thus, per the decision criteria outlined in the Assessment Plan, trans-1,3-Dichloropropene was removed from the Target Parameter List. No additions to the organic target parameter list were warranted.

Groundwater monitoring events will continue to be conducted on all core wells on a semi-annual basis for the target parameters detected as a result of the complete EPA Appendix II analysis. Reevaluation of the site network and monitoring scheme will be conducted after review of the results of each sampling event. The groundwater monitoring program follows a two-tiered analytical approach utilizing both EPA Contract Laboratory Program Statement of Work (CLP SOW) - Organic and Inorganic analytical methods, and Low Level Risk Assessment (LLRA) screening by EPA-SW846 analytical methods. The CLP SOWs are utilized to generate high-level quality data with documented QA/QC protocols. The LLRA methods (EPA-SW-846) are utilized for risk assessment screening to preliminary identify low levels of parameters that may be present. The groundwater analysis schedule proposed for subsequent assessment monitoring events, indicating analytical methods designated for each event, is outlined in Table 1.

During the first year of background Assessment Monitoring, analyses of the core assessment monitoring wells utilized CLP SOWs for all four (4) quarterly events. Organic analyses of the boundary assessment monitoring wells alternated between CLP and LLRA analytical methods for each quarterly event. Metal analyses of all assessment monitoring wells utilized CLP analytical methods for all events.

After completed the first year of quarterly background sampling, the core assessment monitoring wells are currently monitored on a semi-annual basis. The first semi-annual assessment monitoring event analyzed for all the assessment monitoring parameters included in the EPA Appendix II List of Hazardous Inorganic and Organic Parameters (40 CFR Part 258), utilizing LLRA analytical methods for organic parameters and CLP analytical methods for metal parameters. The second semi-annual assessment monitoring event analyzed for all target assessment monitoring parameters (both organic and metal) using CLP-SOWs.

The proposed assessment monitoring schedule for following sampling events will alternate between CLP and LLRA analytical methods for groundwater organic analyses each semi-annual event. Metal analyses of all assessment monitoring wells will utilize CLP analytical methods for all events.

Surface Water

Surface water and leachate monitoring was conducted on a semi-annual basis during the first year of the Assessment Plan groundwater monitoring program and will continue semi-annually thereafter. The analytical scans that are performed on the surface water and leachate samples utilize CLP SOW and are designed to analyze for all the target parameters detected as a result of the comprehensive Appendix II analysis. The surface water assessment monitoring schedule proposed for subsequent assessment monitoring events is outlined in Table 1.

II. GROUNDWATER AND SURFACE WATER SAMPLING FIELD PROCEDURES

Groundwater and surface water samples were collected according to the Watauga County Landfill Groundwater and Surface Water Monitoring Plan (DAA, September 3, 1993), to insure representative samples were collected, received by the laboratory and subject to analysis. Field notes, contained in Appendix II, document groundwater sample collection procedures.

2.1 Well Purging and Sample Collection

Dedicated stainless steel and TEFLON electrical submersible pumps were permanently installed in the new well network subsequent to the first event. Environmental Technicians from Draper Aden Associates used the dedicated pumps to purge and collect groundwater samples from the monitoring well network during the April 9-10, 1996 sampling event. All non-dedicated equipment was decontaminated between sampling of each monitoring well.

A minimum of three well volumes of groundwater, inclusive of water residing in the well casing and filter pack, were removed from each monitoring well prior to sample collection. A well volume was calculated from measurements of depth to water, and total well depth taken prior to purging. Stabilization of field analyses for pH and Specific Conductivity were used to verify that stagnant water within the well was removed during purging, and that groundwater representative of the near-aquifer was being sampled. Field notes recorded during each sampling event, contained in Appendix II, summarize and document well purging calculations and results.

The potentiometric surface, inferred from static water level elevations obtained from the eighteen (18) well and seven (7) piezometer network during the recent April sampling event (presented in Table 4A and 4B), is presented on the enclosed Groundwater and Surface Water Monitoring Program Site Map (Figure 1, Appendix I).

2.2 Field Meter Calibration

Measurements of pH and Specific Conductivity were analyzed at each well by completing multiple measurements in the field, at the time of groundwater purging. Although pH and Specific Conductivity are not assessment monitoring parameters, the measurements were used to ensure groundwater quality and stabilization.

A Corning Checkmate 90 pH/Conductivity/Temperature meter was used for the field measurement of pH, and conductivity. The meter was calibrated in the field using laboratory-grade buffers for pH, and KCl solution for Specific Conductivity. Field notes in Appendix II document field meter calibration methods for each sampling event.

2.3 Quality Control Blank Samples

Due to the use of dedicated purging and sampling equipment for each monitoring well, field blanks were not collected.

Trip Blanks were utilized as part of the assessment monitoring program. Trip Blanks were prepared by the analyzing laboratory to accompany the sample kits at all times. The Trip Blanks employed sample containers and volumes identical in physical and chemical integrity to the samples used for actual sample collection. The Trip Blank was analyzed for all parameters included in the sampling event. The Trip Blank served as a control on sample kit preparation, analysis in the laboratory, and sample kit transportation.

2.4 Sample Containers and Shipment

Groundwater samples were collected in U.S. EPA approved containers prepared and supplied by the analyzing laboratory. Where applicable, the analyzing laboratory prepared organic sample containers with hydrochloric acid (HCl) prior to sample collection. Total metal samples were preserved in the field using nitric acid supplied by the analyzing laboratory. All samples were placed on ice in a cooler at approximately 4°C immediately after collection. A chain of custody seal was placed on each sample and each cooler to verify samples were not disturbed during transport. The coolers were shipped to the analyzing laboratory by overnight courier service.

2.5 Chain of Custody Documentation

Chain of Custody documentation and analysis requests are contained the laboratory report. Laboratory analytical data sheets are found in Volume II.

Chain of Custody (COC) forms provided by the analyzing laboratory or developed by Draper Aden Associates were used to document the custody of the samples from the time they were collected in the field to the time the custody of the samples was relinquished by Draper Aden personnel. Relinquishing custody of the samples was accomplished by shipping through an overnight carrier service. The information recorded in the Chain of Custody included sampling location, sampling points, number of samples, type of sampling containers, sample preservation procedures, matrix spike samples, if any, blanks accompanying the samples, date and time of sample collection, and the date and time custody was relinquished. These COC forms were sent with the samples to the analyzing laboratory. Analysis request forms which included lists of parameters required to be analyzed for the different analytical methods to be used were also attached along with the COC forms. Draper Aden Associates also requested the analyzing laboratory to attach these COC documents with the certificate analysis supplied by them after analysis of samples was complete.

III. LABORATORY ANALYSIS AND DATA VALIDATION

3.1 List of Laboratories

Volatile organic analyses and Total Metal analyses by EPA Contract Laboratory Program (CLP) statements of work (SOW) were performed by Compuchem Environmental Corporation of Research Triangle Park, North Carolina.

3.2 Analytical Methods

All CLP analytical techniques used were in accordance with the procedures listed in the Contract Laboratory Program SOW Organics OLMO1.9 (3/90), Inorganics ILMO3.0.

3.3 Data Quality Objectives

Quality Assurance Objectives for Measurements

Data quality objectives (DQO) are established to ensure that the data collected throughout is sufficient and of adequate quality for the intended use. Overall data quality objectives included the following:

- Precision - A measurement of the reproducibility of measurements compared to their average value. Precision is measured by the use of splits, replicate samples, or co-located samples and field audit samples.
- Accuracy - This measures the bias in a measurement system by comparing a measured value to a true or standard value. Accuracy is measured by the use of standards, spiked samples, and field audit samples.
- Representativeness - This is the degree to which a sample represents the characteristic of the population being measured. Representativeness is controlled by defining sample collection protocols and adhering to them throughout the evaluation.
- Completeness - This is the ratio of validated data points to the total samples collected. Completeness is achieved through duplicate sampling and resampling, when necessary.
- Comparability - This is the confidence that one data set can be compared to another. Comparability is achieved through the use of standard methods to control the precision and accuracy of the data sets to be compared by use of field audit samples.

The CLP SOWs are utilized to generate a high level quality data with documented QA/QC protocols. Estimated CLP SOW results, between the Instrument Detection Limit (IDL) and the Contract Required Detection Limit (CRDL) for Inorganics, and less than the Contract Required Quantitation Limit (CRQL) for Organics, are provided for preliminary assessment purposes only. Estimated data is not intended for use in determining regulatory compliance issues.

Analytical Procedures

Analytical methods and detected parameters for the second semi-annual assessment monitoring event, described herein, are provided in Tables 2A-B and Table 3 (Summary Tables - Assessment Monitoring Results; Appendix I).

Internal Quality Control

i. **Field Quality Control** - Field Quality Control procedures are summarized in Section II of this report.

ii. **Analytical Quality Control** - Analytical Quality Control procedures for CLP analytical techniques are guided by adherence to Contract Laboratory Program (CLP) deliverables. All quality control data and records generated by the laboratory were examined by Draper Aden Associates for adherence to method requirements. A laboratory quality control report generally consists of the following components:

- spikes
- surrogate parameters
- chromatograms
- blanks
- instrument adjustment
- additional QC requirements (organic and inorganic)
- duplicates
- calibration
- raw data
- quantification

For this project, QC reports are provided with the target parameter analytical results for all sampling events.

IV. DATA VALIDATION

The CLP analyses for organic as well as inorganic parameters were performed in adherence to the relevant Contract Laboratory Program-Statement of Work (CLP-SOW). Results of the CLP-SOW analyses were summarized and reported by the analyzing laboratory in standard CLP reporting format. Draper Aden Associates conducted data validation of each data set. The results from each sampling event were evaluated in association with corresponding QA/QC information provided by the analyzing laboratory.

4.1 Laboratory Reporting Qualifiers

Two different types of qualifiers were associated with laboratory analyses and data validation: they were **laboratory reporting qualifiers** and **data validation qualifiers**.

The laboratory used **laboratory reporting qualifiers** to flag sample results with reference to relevant QA/QC criteria. Laboratory reporting qualifiers were unique to the analyzing laboratory and are defined in the laboratory data package presented in volume II of this report. The defined **organic** laboratory reporting qualifiers are not equivalent to the defined **inorganic** laboratory reporting qualifiers and review of the definitions is recommended. In addition to the laboratory reporting qualifiers defined in volume II, project specifications required the laboratory performing the analytical services to utilize the following additional data qualifiers and definitions:

Qualifiers

- D - Denotes the sample was diluted to obtain the result.
- S - Method of Standard Additions was utilized to obtain the result.
- E - Laboratory recoveries fell outside EPA control limits. Results are approximate concentrations.
- TI - The laboratory tentatively identified the parameter.

Definitions

- CRDL. Contract Required Detection Limit (associated with CLP-inorganics only).
- IDL. Instrument Detection Limit (Associated with CLP-inorganics only).
Inorganic Data qualified with a "U" refers to IDL.
- CRQL. Contract Required Quantitation Limit (associated with CLP organics only).
Organic Data qualified with a "U", refer to CRQL.

4.2 Data Validation Qualifiers

Data validation was completed using guidance from the "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", (Document 1) USEPA, February, 1993; and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review - February 1994" (Document 2).

Data Validation was performed on the results presented in the laboratory analysis report, and the validated results were flagged, where required, using the appropriate national **data validation qualifiers** defined from the aforementioned CLP guidance documents. The data

validation qualifiers were divided into two categories; **organic** data validation qualifiers and **inorganic** data validation qualifiers. The **data validation qualifiers** (as defined in Documents 1 and 2 above) are different from the **laboratory reporting qualifiers**. Definitions of the nationally recognized data validation qualifiers used by Draper Aden Associates in the validation process and for the reported results are presented below.

Organic Data Validation Qualifiers

- U - The parameter was analyzed for, but was not detected above the reported sample limit of quantitation (LOQ).
- J - The parameter was positively identified; the associated numerical value is the approximate concentration of the parameter in the sample.
- N - The analysis indicates the presence of an parameter for which there is presumptive evidence to make a "tentative identification".
- NJ - The analysis indicates the presence of an parameter that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
- UJ - The parameter was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the parameter in the sample.
- R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the parameter cannot be verified.

Inorganic Data Validation Qualifiers

- U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is the sample detection limit.
- J - The associated value is an estimated quantity.
- R - The data are unusable. (Note: Parameter may not be present)
- UJ - The material was analyzed for, but was not detected. The associated result is an estimate and may be inaccurate or imprecise.

4.3 Inorganic Data Review

Inorganic analyses for this second semi-annual Assessment monitoring event involved analyses for six inorganic parameters *viz.* barium, iron, chromium, cobalt, nickel and vanadium. All inorganic analyses for this monitoring event was performed by Compuchem Environmental Corporation, RTP, North Carolina. Analysis was performed on a total of twelve groundwater samples collected from monitoring wells MW-1, MW-2, MW-3, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-15, MW-17, and six surface water samples, S-1 through S-6. Samples were divided into two sample delivery groups, as indicated below.

- DAASDG#1 (Compuchem SDG#32163/1M) - MW-1, MW-3, MW-6, MW-7, MW-8, MW-10, MW-11, MW-12 and MW-17
- DAASDG#2 (Compuchem SDG#32163/2M) - MW-2, MW-9, MW-15, S-1, S-2, S-3, S-4, S-5 and S-6

All samples were analyzed for the six target parameters by Inductively Coupled Plasma (ICP) method, EPA-200.7M. All analyses were performed in accordance with EPA Contract Laboratory Program (CLP) Statement of Work ILM03.0. All the above target metals were analyzed for their total concentrations. Designated Quality Control (QC) samples for duplicate analyses and matrix spike analyses for each SDG above, were collected and supplied by DAA (MW1S and MW1D for DAA SDG#1 and MW9S and MW9D for DAA SDG#2). Trip blank-1 and trip blank-2 served as blank controls to monitor for extraneous contamination during sampling and transport of samples for DAA SDG-1 and DAA SDG-2 respectively.

Draper Aden Associates performed a limited review of this inorganic analyses data. The results of this data validation presented here are based upon a review of QA/QC information as well as method performance criteria information including holding times, preservation procedures and standards, spike analysis on sample matrix, blank samples analyses, duplicate sample analyses, interference check sample results, case narrative, IDL/CRDL information and other relevant information. The completeness of the data package was verified including the presence of raw analytical data, chain of custody and preparation logs.

CLP-ICP Method Inorganic Data Review

A brief discussion of the results of validation of ICP data is presented in the following paragraphs. All samples under DAA SDG-1 were received under the required preservation conditions in the laboratory, except MW-7 and trip blank-1. These samples were received at pH=6 and had to be preserved to pH<2 upon receipt at the laboratory. All samples under DAA SDG-2 were transported unpreserved to the laboratory due to inadvertent loss of preservative in the field. The samples were preserved upon receipt at the laboratory. However, all results for these samples which were reported above the corresponding IDLs for the various parameters

were deemed as estimated and flagged with "J". All results which were reported "undetected" for these samples were accepted as reported, and pending significant variability in these results on the upcoming sampling events, no further action is deemed to be required for these results.

Review of the analytical data packages for both sample delivery groups indicated that all relevant QC and method performance criteria were met for these analyses. All initial calibration and calibration verification requirements were met. Minor quantities of barium were reported in a few calibration blanks and preparation blank. However, no validation of sample results for barium based on these blank results was deemed to be required.

Matrix spike recoveries and interference check sample recoveries and duplicate sample analysis results were verified to be met for all target parameters. All other applicable QC and method specifications were verified to be met. All sample results unaffected by the above data validation process were recorded as reported by the laboratory or, if the reported value was less than the IDL, validated and reported as "U".

4.4 Organic Data Review

CLP Volatile Organic Data Review

GC/MS organic data review was performed on volatile organic parameters analyzed using EPA CLP 3/90 Statement of Work (SOW) Document Number OLM03.2. The parameter list included dichlorodifluoromethane. Sample analysis was performed by CompuChem Environmental Corporation of Research Triangle Park, NC.

Evaluation of CompuChem's compliance with GC/MS CLP VOA protocol and validation of the results, included but was not limited to, review of the following items: sample holding times, sample preservation requirements, laboratory QA/QC performance checks, instrument calibration, blank analyses, surrogate spike recoveries, confirmation of detected parameters and matrix spike analyses results. Review of all transcriptions from raw sample data to sample summary sheets was performed. Specific representative calculations were also performed at random.

Samples were collected during the April 9-10, 1996 sampling event of Watauga County Landfill from monitoring wells MW-1, MW-2, MW-3, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-15, MW-17 and surface water locations S-1, S-2, S-3, S-4, S-5 and S-6. Samples were received by CompuChem in good condition on April 11-12, 1996.

Overall, the analytical quality of the data for Watauga County Landfill and adherence to technical and reporting protocol was excellent.

All method required initial and continuing calibration requirements were met. The percent relative standard deviation (%RSD) of acetone, 2-butanone and 2-hexanone exceeded CLP validation criteria therefore all results for these parameters were qualified as estimated (J). Additionally, all 4 methyl-2-pentanone and 1,1,2,2-tetrachloroethane results in MW-9, MW-15, S-1, S-2, S-3, S-4, S-5, MW-2 and S-6 are qualified as estimated due to exceeding validation percent deviation results in the continuing calibration.

There was minimal methylene chloride contamination in trip blank 1 at 2 µg/L and in VBLKNK at 1 ug/L. CompuChem reported methylene chloride at low levels, less than 10 µg/L, in several samples. All methylene chloride results in these samples are considered laboratory contamination and were qualified accordingly, as per validation guidelines.

MS/MSD analyses were performed on MW-1 for SDG #1 and MW-9 for SDG #2. 1,1-Dichloroethene %RPD exceeded method QC limits in MW-1 analyses. No qualification of the data is required as per validation guidelines or is considered necessary based on professional judgment.

A review of tentatively identified compound (TIC) results reveals the presence of dichlorofluoromethane and/or ether in several samples as listed in the analytical data set notes. Laboratory artifacts, such as CO₂ and siloxanes, are not listed on the analytical data set notes. In three cases, involving samples MW-11, S-2 and S-4, CompuChem labeled a TIC as unknown. However, following a review of the overall analytical results, a more precise determination of either dichlorofluoromethane or ether was assigned. Factors influencing these decisions were other samples with the same apparent TIC having a good library match, similar relative retention time and the same ions. Therefore, identification information was inferred from the other sample TIC results as per validation guidelines. Additionally, in sample S-5, the TIC with a retention time of 8.371 was re-evaluated as an unknown chlorinated fluorinated hydrocarbon instead of simply unknown. Although the validation guidelines list this as a common laboratory contaminant, a review of method blank and holding blank results did not indicate laboratory contamination.

Numerous target parameters were detected, both above and below the CRQL, in these water samples as listed on the Analytical Data Set Notes. Three samples required dilution in order to quantitate detected target parameters within the linear range of the calibration curve. Sample MW-10 required a 1/2.3 dilution (CRQL = 23 ug/L), sample MW-6 required a 1/2.5 dilution (CRQL = 25 ug/L) and MW-2 required a 1/9.1 dilution (CRQL = 91 ug/L). All reported parameters are confirmable. All sample results not previously noted as requiring qualification stand as reported by CompuChem.

All blank, holding time, tuning criteria, surrogate recoveries, internal standard area, and internal standard retention time requirements were fulfilled.

V. DISCUSSION OF ANALYTICAL RESULTS

Tables 2A-B (Assessment Target Parameter Analytical Results; Appendix I) provide a summary of the target parameter analytical results obtained from the second semi-annual sampling event. These results were validated in-house by Draper Aden Associates according to the discussion provided in Sections III and IV of this report. Tables 2A-B lists for each parameter, as applicable, a Maximum Contaminant Level (MCL) established by the USEPA and groundwater quality standards established by the state of North Carolina (NCS), the Instrument Detection Level (IDL) for CLP-Inorganic results, the Contract Required Quantitation Limit (CRQL) for CLP-Organic results, and the analytical method.

Estimated analytical results for the target parameters are provided in Tables 2A-B for preliminary assessment purpose only. Estimated analytical data is not intended for use in determining regulatory compliance issues.

A summary of additional non-target parameter analytical results obtained from the second semi-annual assessment sampling event is provided in Table 3. Non-target parameter data is provided for preliminary assessment purpose only and is not intended for use in determining regulatory compliance issues.

5.1 Inorganic Analytical Results

The evaluation of existing inorganic data on twelve (12) metal parameters, collected prior to development of the Assessment Plan, indicated the tentative presence of four (4) metals at elevated concentrations in the groundwater beneath the Watauga County Landfill. Previous metal concentrations detected in the groundwater are generally low or are below analytical method quantitation limits. However, two metals, Cadmium and Iron, were historically observed at levels above those established by the EPA MCL and Secondary MCL, respectively. Barium, a common naturally occurring parameter, was also observed at relatively elevated levels, but below water quality standards. Mercury was also detected, although only once for each well in the six or more sampling and analysis events previously conducted.

Since Cadmium and Mercury were not detected as a result of the initial four (4) background and the first semi-annual assessment monitoring analyses, Cadmium and Mercury were recently removed from the existing target parameter list.

As a result of the comprehensive EPA Appendix II analyses performed during the first semi-annual monitoring event, four (4) additional metals were observed in three (3) or more core monitoring wells, although also at levels far below EPA MCL and North Carolina groundwater standards.

- Chromium
- Cobalt
- Nickel
- Vanadium

These four (4) metals were added to the existing target parameter list. Four (4) independent samples will be collected and analyzed for these four (4) metals during the following four (4) semi-annual sampling events at all core and boundary assessment wells to establish background.

The analytical results for the current six (6) target metal parameters, Barium, Chromium, Cobalt, Iron, Nickel, and Vanadium, obtained from the second semi-annual assessment sampling event, are summarized in Tables 2A and 2B and discussed below. A discussion of parameter distribution trends for each target parameter is presented in the following Section VI.

The two original target metal parameters, Barium and Iron, both common naturally occurring parameters, have been detected in all monitoring wells and surface water sampling locations, as a result of the previous background Assessment monitoring events. Although observed in all of the monitoring wells and surface water sampling locations, Barium was detected at levels below the Federal Primary Drinking Water Standard (EPA MCL) and North Carolina groundwater standard (NCS) of 2,000 µg/l as a result of all previous Assessment background monitoring events. Concentrations of Iron were often at levels significantly above associated water quality criteria. No EPA MCL or NCS exists for Iron. Similar Barium and Iron concentrations were observed as a result of the first and second semi-annual assessment monitoring events.

The results obtained during the second semi-annual monitoring event for the four (4) metal parameters recently added to the target parameter list closely parallel the results obtained during the previous semi-annual monitoring event. Chromium and Nickel were both detected in the same 4 of 12 monitoring wells and were both not detected in the surface water samples. Most of the Chromium and Nickel concentrations were detected at trace levels, below the analytical method's Contract Required Quantification Limit (CRQL), and at levels below respective EPA MCL and North Carolina groundwater standards. Cobalt was detected in 8 of 12 monitoring wells and 5 of 6 surface water sampling locations, although all concentrations were detected at trace levels. Vanadium was detected in 11 of 12 monitoring wells, although all concentrations were detected at trace levels. No Vanadium was detected at any surface water sampling location. No EPA MCL or North Carolina groundwater standard exists for Cobalt or Vanadium.

5.2 Organic Analytical Results

i. Target Organic Parameters

The evaluation of existing organic data, compiled prior and during development of the Assessment Plan, indicated the tentative presence of twelve (12) primary target organic parameters occurring in the groundwater beneath the Watauga County Landfill. The presence of one of the original twelve target organic parameters, trans-1,3-Dichloropropene, in the groundwater at the site was not supported by the analytical results of the background and first semi-annual assessment monitoring events. Since upon completion of background data collection and the first annual EPA Appendix II list sampling event (utilizing LLRA analytical methods), the presence of trans-1,3-Dichloropropene in the groundwater and surface waters at the site was not confirmed, trans-1,3-Dichloropropene was removed from the Target Parameter List.

The analytical results for the eleven (11) current target organic parameters obtained from the second semi-annual assessment sampling event are summarized in Tables 2 A-B. The recent analytical results obtained from each target organic parameter is individually discussed below. A discussion of distribution trends for each target organic parameter is presented in the following Section VI.

1,1-Dichloroethane (1,1-DCA)

1,1-Dichloroethane (1,1-DCA) was detected at concentrations below the proposed North Carolina groundwater standard (NCS) of 700 $\mu\text{g/l}$ in ten downgradient groundwater monitoring wells (MW-2, MW-3, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, and MW-17). 1,1-DCA was not detected in the upgradient well, MW-1, or the recent addition to the core well network, MW-15. No EPA MCL exists for 1,1-DCA. Concentrations of 1,1-DCA (detected both above and estimated below the method CRQL) were also observed below the NCS at five of six surface water sampling locations (S-1, S-2, S-4, S-5 and S-6).

Tetrachloroethene (PCE)

Tetrachloroethene (PCE) was detected and/or estimated at concentrations above the EPA MCL of 5 $\mu\text{g/l}$ in seven groundwater monitoring wells (MW-2, MW-3, MW-6, MW-8, MW-11, MW-12, and MW-17) and one surface water sampling location (S-4), and estimated above the North Carolina groundwater standard (NCS) of 0.7 $\mu\text{g/l}$ in two additional monitoring wells (MW-9 and MW-10) and two additional surface water sampling locations (S-5 and S-6).

Trichloroethene (TCE)

Trichloroethene (TCE) was detected and/or estimated at concentrations above the EPA MCL of 5 µg/l in six groundwater monitoring wells (MW-3, MW-6, MW-8, MW-9, MW-12, and MW-17). and estimated above the NCS of 2.8 µg/l in one additional monitoring well (MW-11). An estimated concentration for TCE (detected below the method CRQL) was observed above the EPA MCL in one surface water sampling location (S-4) and above the NCS in one additional surface water sampling location (S-6). TCE was also estimated (detected below the method CRQL) at concentrations below the EPA MCL and NCS in two additional surface water sampling locations (S-2 and S-5).

cis-1,1-Dichloroethene (cis-1,2-DCE)

As previously discussed in Section III, CLP-SOW analytical results for cis-1,2-Dichloroethene are reported as part of a total concentration of cis- and trans- isomers of the parameter.

Total-1,2-Dichloroethene (1,2-DCE) was detected at concentrations above the EPA MCL and North Carolina groundwater standard (NCS) of 70 µg/l in three groundwater monitoring wells (MW-6, MW-8, and MW-17). 1,2-DCE was also detected and/or estimated below the EPA MCL and NCS in five additional monitoring wells (MW-3, MW-7, MW-9, MW-11, and MW-12). 1,2-DCE was detected above the method CRQL at concentrations below the EPA MCL and NCS at two surface water sampling locations (S-4 and S-6). Estimated concentrations for 1,2-DCE (detected below the method CRQL) were also observed below the EPA MCL and NCS at one additional surface water sampling location (S-2).

Dichlorodifluoromethane

Dichlorodifluoromethane was not detected in any of the monitoring wells at any surface water sampling locations.

1,1,1-Trichloroethane (1,1,1-TCA)

1,1,1-Trichloroethane (1,1,1-TCA) was detected at concentrations above the EPA MCL and North Carolina groundwater standard (NCS) of 200 µg/l in two groundwater monitoring wells (MW-2 and MW-10). 1,1,1-TCA was also detected and/or estimated below the EPA MCL and NCS in seven additional monitoring wells (MW-3, MW-8, MW-9, MW-11, MW-12, MW-15 and MW-17). Estimated concentrations of 1,1,1-TCA (below the method CRQL) were also observed below the EPA MCL and NCS at three surface water sampling locations (S-4, S-5 and S-6).

1,1-Dichloroethene (1,1-DCE)

1,1-Dichloroethene (1,1-DCE) was detected above the method LOQ at concentrations above the EPA MCL and NCS of 7 µg/l in two monitoring wells (MW-2 and MW-10). 1,1-DCE was also detected and/or estimated (observed both above and below the method CRQL) at concentrations below applicable water quality standards in four additional wells (MW-3, MW-8, MW-12, and MW-17). 1,1-DCE was not detected in any of the surface water samples.

Benzene

Concentrations of Benzene were estimated (detected below the method CRQL) above the EPA MCL of 5 µg/l and above the NCS of 1 µg/l in one monitoring well (MW-6). Benzene was also observed at estimated concentrations below the EPA MCL but above the NCS in four additional monitoring wells (MW-3, MW-7, MW-8, and MW-9) and one surface water sampling location (S-2). Benzene was observed at estimated concentrations below both the EPA MCL and the NCS in two additional monitoring wells (MW-1 and MW-12)

Vinyl Chloride

Estimated concentrations of Vinyl Chloride (detected below the CLP method CRQL) were observed at concentrations above the EPA MCL of 2 µg/l in two core groundwater monitoring wells (MW-6 and MW-8), and above both the EPA MCL and the North Carolina groundwater standard (NCS) of 0.015 µg/l in one additional well (MW-3). Vinyl Chloride was not detected in any of the surface water samples.

Methylene Chloride

Methylene Chloride was detected at concentrations above the EPA MCL and NCS of 5 µg/l in one groundwater monitoring wells (MW-9). The analysis was unable to verify lower level detections of Methylene Chloride (less than 10 µg/l), due to the presence of Methylene Chloride in the method blank. Methylene Chloride was not detected at any surface water sampling location.

Chloroethane

Chloroethane was detected above the CLP method CRQL in two groundwater monitoring wells (MW-7 and MW-9) and at one surface water sampling location (S-2). Chloroethane was detected below the CLP method CRQL in five additional groundwater monitoring wells (MW-3, MW-6, MW-8, MW-12 and MW-17) and three additional surface water sampling locations (S-1, S-4 and S-5). No EPA MCL or North Carolina groundwater standard (NCS) exists for Chloroethane.

ii. **Non-Target Organic Parameters**

The analytical results of additional detected non-target organic parameters are summarized in Table 3. The analytical results obtained for non-target parameters, are provided to preliminary identify those parameters which may need to be continually monitored. If upon continued semi-annual data collection, the presence of any non-target parameters are confirmed by repeated analysis, the parameter will be added to the Target Parameter list.

Additional non-target parameters were detected or tentatively identified in eight monitoring wells and five surface water sampling locations. Detected or tentatively identified non-target parameters and associated sampling points are presented below.

<u>Non-target Parameter(s)</u>	<u>Monitoring Point(s)</u>
Dichloroflouromethane*	MW-3, 6, 8, 9, 11, 12 and 17 & S-2 and 4
Ether*	MW-6, 7, 8 and 9 & S-2 and 4
Xylene	S-1, 2 and 5
Acetone	S-6
Toluene	S-2
Ethylbenzene	S-2
Carbon Disulfide	S-5
Unknown chlorinated- flourinated compound	S- 5

*tentatively identified (see Section 4.4)

All of the detected or tentatively identified non-target parameter concentrations were observed at levels below corresponding EPA MCLs and North Carolina groundwater quality standards.

As indicated in Table 6A (Cumulative Detected Non-target Organic Parameter Analytical Results), the presence of the non-target compounds detected in the second semi-annual sampling event are not confirmed by the non-target analytical results obtained from previous assessment sampling events. Confirmation of the presence or absence of these non-target parameters will continue to be evaluated on the following semi-annual monitoring events.

VI. PARAMETER DISTRIBUTION TRENDS

6.1 Inorganic Analytical Results

Barium (total)

Barium distribution trends, indicated by the analytical results of the second semi-annual EPA Appendix II List sampling event, are inconclusive. Although Barium was detected at every point sampled, over half of the Barium detected in the groundwater at the site was reported at concentrations less than 150 $\mu\text{g/l}$. The EPA MCL and the NCS for Barium is 2000 $\mu\text{g/l}$.

Barium was observed above 150 $\mu\text{g/l}$ in five monitoring wells. In three of the monitoring wells located near the waste disposal area (MW-6, MW-7 and MW-9), Barium was observed at concentrations above 500 $\mu\text{g/l}$. Barium was also observed at elevated levels above 150 $\mu\text{g/l}$ for MW-11 (268 $\mu\text{g/l}$), located below the Boone-Nissan septic field; and MW-2 (178 J $\mu\text{g/l}$), located within the bedrock aquifer in the drainage below the waste disposal area.

Elevated concentrations of Barium above 150 $\mu\text{g/l}$ were also estimated in three surface water monitoring locations; i.e. S-1 (345 J $\mu\text{g/l}$), S-2 (427 J $\mu\text{g/l}$), and S-3 (182 J $\mu\text{g/l}$).

Iron (total)

Iron distribution trends, indicated by the analytical results of the second semi-annual sampling event, indicate a relationship between Iron distribution and proximity to the waste disposal area and the western drainage. The monitoring wells for which Iron was observed at the highest concentrations, MW-7 (12000 $\mu\text{g/L}$), MW-6 (9760 $\mu\text{g/L}$), and MW-3 (8550 $\mu\text{g/l}$), are located adjacent and west of the waste disposal area. Iron was also observed at elevated levels above 1000 $\mu\text{g/l}$ in MW-10 (3340 $\mu\text{g/l}$), located in the drainage immediately below the waste disposal area; MW-1 (1660 $\mu\text{g/l}$), located adjacent and upgradient of the waste disposal area.

Elevated concentrations of Iron above 1000 $\mu\text{g/l}$ were also estimated in two surface water monitoring locations; i.e. S-2 (4390 J $\mu\text{g/l}$) and S-3 (1260 J $\mu\text{g/l}$).

Chromium (total)

Chromium distribution trends, indicated by the analytical results of the second semi-annual sampling event, also indicate a relationship between Chromium distribution and proximity to the waste disposal area and the western drainage. Three monitoring wells for which Chromium was detected, MW-7 (2.5 J $\mu\text{g/L}$), MW-6 (26.3 $\mu\text{g/L}$), and MW-3 (4.8 $\mu\text{g/l}$), are located adjacent and west of the waste disposal area. Chromium was also observed in MW-10 (42.8 $\mu\text{g/l}$), located in the

drainage immediately below the waste disposal area. The EPA MCL for Chromium is 100 µg/l and the NCS is 50 µg/l.

Chromium was not detected in any surface water monitoring locations.

Cobalt (total)

Cobalt distribution trends, indicated by the analytical results of the second semi-annual sampling event, are inconclusive. The monitoring wells for which concentrations of Cobalt were estimated at the highest concentrations, MW-6 (24.7 J µg/L), MW-9 (9.6 J µg/L), and MW-11 (9.0 µg/l), are situated in three dissimilar locations. The low level, trace detection of Cobalt estimated in other wells also reveal no significant distribution trends. No EPA MCL or NCS exists for Cobalt.

Estimated, low level, trace concentrations of Cobalt between 1.5 J µg/l and 8.0 J µg/l were also detected in five of six surface water monitoring locations.

Nickel (total)

Nickel distribution trends, indicated by the analytical results of the second semi-annual sampling event, also indicate a relationship between Nickel distribution and proximity to the waste disposal area and the western drainage. Three monitoring wells for which Nickel was detected, MW-7 (7.3 J µg/L), MW-6 (25.4 µg/L), and MW-3 (7.1 µg/l), are located adjacent and west of the waste disposal area. Nickel was also observed in MW-10 (35.9 µg/l), located in the drainage immediately below the waste disposal area. The EPA MCL and NCS for Nickel is 100 µg/l.

Nickel was not detected in any surface water monitoring locations.

Vanadium (total)

Vanadium distribution trends, indicated by the analytical results of the second semi-annual sampling event, indicate a relationship between Vanadium distribution and proximity to the waste disposal area and the western drainage. Although estimated concentrations for Vanadium were observed in all monitoring wells, three monitoring wells for which Vanadium was estimated at higher concentrations, MW-3 (17.9 µg/L), MW-7 (10.6 J µg/L), and MW-8 (5.5 µg/l), are located adjacent and west of the waste disposal area. Vanadium was also estimated at elevated levels above 5.0 µg/l in MW-10 (7.5 µg/l), located in the drainage immediately below the waste disposal area. No EPA MCL or NCS exists for Vanadium.

Vanadium was not detected in any surface water monitoring locations.

6.2 Organic Analytical Results

i. Target Organic Parameters

1,1-Dichloroethane (1,1-DCA)

1,1-Dichloroethane (1,1-DCA) distribution trends, as indicated by the analytical results of the second semi-annual sampling event, reveal 1,1-DCA was observed at elevated concentrations in more monitoring wells and occurs more pervasively throughout the site than any other target parameter. No established EPA MCL or NCS exists for 1,1-DCA.

1,1-DCA was observed at the highest concentrations (although below the proposed North Carolina groundwater quality standard of 700 $\mu\text{g/l}$) in the nested well pair, shallow well MW-3 (150 $\mu\text{g/l}$) and deep well MW-17 (120 $\mu\text{g/l}$), located at the downgradient property boundary of the Bolick site. Elevated concentrations of 1,1-DCA above 100 $\mu\text{g/l}$ were also observed between the landfill and the Bolick site at MW-6 (120 $\mu\text{g/l}$), downgradient of the Bolick site at well MW-12 (120 $\mu\text{g/l}$ E), and in the deep well MW-2 (130 $\mu\text{g/l}$), located in the north drainage below the waste disposal area.

Elevated 1,1-DCA concentrations were also observed within the Bolick site at well MW-8 (80 $\mu\text{g/l}$), downgradient of the Bolick site at MW-11 (26 $\mu\text{g/l}$), along the southern saddle above the landfill at MW-9 (36 $\mu\text{g/l}$), and estimated in the north drainage below the waste disposal area at MW-10 (22 J $\mu\text{g/l}$).

A lower level concentration of 1,1-DCA was estimated at MW-7 (5 J $\mu\text{g/l}$), located south of the Bolick site.

Tetrachloroethene (PCE)

Tetrachloroethene (PCE) distribution trends, as indicated by the analytical results of the second semi-annual sampling event, show that with few exceptions, PCE was detected primarily along the west drainage basin adjacent to the landfill, located within and below the "Bolick" site.

PCE was detected at concentrations above the EPA MCL (5 $\mu\text{g/l}$) in the nested well pair located at the downgradient property boundary of the Bolick site; i.e. shallow well MW-3 (46 $\mu\text{g/l}$) and deep well MW-17 (41 $\mu\text{g/l}$). PCE was also detected downgradient of the Bolick site at concentrations above the EPA MCL in the nested well pair located below the Boone-Nissan septic field; i.e. shallow well MW-11 (12 $\mu\text{g/l}$) and the deep well MW-12 (37 $\mu\text{g/l}$). PCE was similarly detected above the EPA MCL in MW-8 (36 $\mu\text{g/l}$), located with the Bolick site, and in well MW-6 (10 J $\mu\text{g/l}$), located between the landfill and the Bolick site.

PCE was estimated at lower concentrations above the EPA MCL in well MW-2 (20 J $\mu\text{g/l}$), located within the bedrock aquifer in the north drainage below the waste disposal area.

PCE was also estimated at concentrations above the EPA MCL (5 $\mu\text{g/l}$) in the surface water sampling location situated in the west drainage, S-4 (9 J $\mu\text{g/l}$).

Trichloroethene (TCE)

Trichloroethene (TCE) distribution trends, as indicated by the analytical results of the second semi-annual sampling event, are similar to PCE distribution trends. With one exception (MW-9), TCE was only detected along the west drainage basin adjacent to the landfill, located within and below the Bolick site.

TCE was detected at the highest concentration in monitoring well MW-6 (28 $\mu\text{g/l}$), located adjacent to the landfill, within the Bolick site. Elevated TCE concentrations above the EPA MCL of 5 $\mu\text{g/l}$ were also observed in the deeper well adjacent to MW-6, MW-8 (16 $\mu\text{g/L}$). Elevated concentrations above the EPA MCL for TCE were also observed in the nested well pair located at the downgradient property boundary of the Bolick site; i.e. shallow well MW-3 (20 $\mu\text{g/l}$) and deep well MW-17 (19 $\mu\text{g/l}$). TCE was also detected above the EPA MCL downgradient of the Bolick site in well MW-12 (15 $\mu\text{g/l}$), located below the Boone-Nissan septic field.

TCE was also estimated at concentrations above the EPA MCL (5 $\mu\text{g/l}$) in the surface water sampling location situated in the west drainage, S-4 (6 J $\mu\text{g/l}$).

The only TCE concentrations observed outside of the west drainage basin were estimated in MW-9 (6 J $\mu\text{g/l}$), located between the landfill and the Rocky Mountain Heights Subdivision, and the surface water sampling points, S-2 (1 J $\mu\text{g/l}$), S-5(1 J $\mu\text{g/l}$), and S-6 (3 J $\mu\text{g/l}$),.

cis-1,2-Dichloroethene (cis-1,2-DCE)

As previously discussed in Section III, CLP-SOW analytical results for cis-1,2-Dichloroethane are reported as part of a total concentration of cis- and trans- isomers of the parameter

1,2-Dichloroethene (1,2-DCE) distribution trends, as indicated by the analytical results of the second semi-annual sampling event, are similar to PCE, TCE, and Dichlorodifluoromethane distribution trends. With one exception (MW-9), 1,2-DCE was only detected along the west drainage basin adjacent to the landfill, located within and below the Bolick site.

1,2-DCE was observed at the highest concentrations (above the EPA MCL and NCS of 70 $\mu\text{g/l}$) in MW-6 (420 $\mu\text{g/l}$) and MW-8 (78 $\mu\text{g/l}$), located adjacent to the landfill and the Bolick site,

and in deep well MW-17 (87 µg/l), located at the downgradient property boundary of the Bolick site. Elevated concentrations of 1,2-DCE (below the EPA MCL and NCS) were also observed in shallow well MW-3 (64 µg/l), located at the downgradient property boundary of the Bolick site, and downgradient of the Bolick site at the nested well pair, shallow well MW-11 (11 µg/l) and deep well MW-12 (54 µg/l).

Lower level detections of cis-1,2-DCE were observed at the two monitoring wells, MW-7 (6 J µg/l), located south of the Bolick site, and MW-9 (11 µg/l), located along the southern saddle above the landfill.

1,2-DCE was detected at three surface water sampling locations; S-2 (estimated at 5 J µg/l), S-4 (35 µg/l), and S-6 (16 µg/l).

Dichlorodifluoromethane

Dichlorodifluoromethane was not detected in any of the monitoring wells at any surface water sampling locations.

1,1,1-Trichloroethane (1,1,1-TCA)

1,1,1-Trichloroethane (1,1,1-TCA) distribution trends, as indicated by the analytical results of the second semi-annual sampling event, show that 1,1,1-TCA, although occurring throughout the core of the site, was observed at the highest concentrations in the bedrock of the northern drainage basin below the landfill. 1,1,1-TCA was observed above the EPA MCL and NCS of 200 µg/l in the bedrock wells, MW-2 (1300 µg/l) and MW-10 (290 µg/l), located in the northern drainage below the landfill.

1,1,1-TCA was also observed at lower concentrations, below the EPA MCL and NCS, in both the deep and shallow wells of the two nested pairs located in the west drainage basin; shallow MW-3 (21 µg/l) and deep MW-17 (estimated at 7 J µg/l), and shallow MW-11 (estimated at 6 J µg/l) and deep MW-12 (15 µg/l), located along and downgradient of the Bolick Site property boundary, respectively. An estimated concentration (below the LOQ) of 1,1,1-TCA was also observed in MW-8 (8 J µg/l), located upgradient of these two nested pairs of wells in the west drainage basin.

Estimated 1,1,1-TCA concentrations were also observed at three surface water sampling locations; S-4 (2 J µg/l), S-5 (2 J µg/l), and S-6 (1 J µg/l).

1,1,1-TCA was additionally estimated in MW-9 (8 J µg/l), located adjacent to the Carroll property and MW-15 (4 J µg/l), located adjacent to Rocky Branch.

1,1-Dichloroethene (1,1-DCE)

1,1-Dichloroethene (1,1-DCE) distribution trends, as indicated by the analytical results of the second semi-annual sampling event, show that 1,1-DCE was observed at the highest concentrations in the bedrock of the northern drainage basin below the landfill. The highest concentrations for 1,1-DCE were observed in the deep bedrock well MW-2 (210 µg/l), located in northern drainage basin below the landfill and in the bedrock well MW-10 (51 µg/l), located in the northern drainage directly below the fill areas.

Monitoring wells located in the west drainage basin reveal either low level, estimated concentrations or the non-detection of 1,1-DCE. 1,1-DCE was observed below the method CRQL (estimated) for four monitoring wells located in the west drainage basin; MW-3 (3 J µg/l), MW-8 (6 J µg/l), MW-12 (3 J µg/l), and MW-17 (2 J µg/l). 1,1-DCE was not detected in the shallow well MW-11, located adjacent to the deep well MW-12 in this west drainage basin.

Benzene

Benzene distribution trends, as indicated by the analytical results of the second semi-annual sampling event, suggest a relationship between Benzene distribution and proximity to the waste disposal area.

Benzene was estimated at concentrations above the EPA MCL (5 µg/l) and NCS (1 µg/l) in MW-6 (13 µg/l), located adjacent and west of the disposal area. Estimated Benzene concentrations between the lower North Carolina groundwater quality standard (NCS) and the higher EPA MCL were observed distributed about the waste disposal area in four other wells; MW-3 (2 J µg/L), MW-7 (5 J µg/L), MW-8 (5 J µg/l), and MW-9 (4 J µg/L).

Benzene was also estimated at a concentration between the EPA MCL (5 µg/l) and NCS (1 µg/l) in the landfill spring capture outfall, S-2 (2 J µg/L).

Vinyl Chloride

Vinyl Chloride distribution trends, indicated by the analytical results of the second semi-annual sampling event indicate estimated levels of Vinyl Chloride above the EPA MCL (2 µg/l) and NCS (0.015 µg/l) in the west drainage adjacent to the landfill in MW-6 (14 J µg/l), located between the landfill and the Bolick site, and MW-8 (5 J µg/l), located within the Bolick site. An estimated level of Vinyl Chloride was also detected above the NCS (0.015 µg/l) in MW-3 (2 J µg/l), located in the west drainage at the downgradient property boundary of the Bolick site.

Methylene Chloride

Methylene Chloride distribution trends, as indicated by the analytical results of the second semi-annual sampling event, show that Methylene Chloride was confirmed present at only one location, MW-9 (120 µg/l), located adjacent to the Carroll Residence, between the landfill and the Rocky Mountain Heights Subdivision. This Methylene Chloride concentration is well above the EPA MCL and North Carolina groundwater standard (NCS) of 5 µg/l.

Chloroethane

Chloroethane distribution trends, as indicated by the analytical results of the second semi-annual sampling event, indicate that Chloroethane was observed at the highest concentration in MW-9 (16 µg/l), located adjacent to the Carroll property, and well MW-7 (41 µg/l), located south of the Bolick site, adjacent to the disposal area.

Elevated estimated concentrations of Chloroethane were also observed in five monitoring wells located in the west drainage; shallow well MW-3 (8 J µg/l), located adjacent to deep well MW-17 (5 J µg/l), deep well MW-12 (5 J µg/l), located adjacent to shallow well MW-11 (not detected), MW-6 (14 J µg/l), located between the landfill and the Bolick site, and in MW-8 (10 J µg/l), located within the Bolick site.

ii. Non-target Organic Parameters

As previously discussed in Section IV.B.ii, additional non-target parameters were tentatively identified in eight monitoring wells and detected at concentrations below the corresponding CLP method CRQL in five surface water sampling locations (Table 3, Appendix I). A combined total of two non-target parameters were tentatively identified in the eight monitoring wells (MW-3, MW-6, MW-7, MW-8, MW-9, MW-11, MW-12, and MW-17) These monitoring wells are preferentially located along the N55°W lineament, both adjacent to the waste disposal area and within the west drainage. A combined total of six non-target compounds were detected in five surface water monitoring locations (S-1, S-2, S-4, S-5, AND S-6). Four non-target parameters were detected in one of these surface water sampling locations, although again at concentrations below the corresponding CLP method CRQL.

Non-target parameter distribution trends will continue to be evaluated. These non-target compounds have not been repeatedly detected in these wells as a result of previous background analyses (Table 6A, Appendix I). The isolated detection of these non-target compounds in these wells is not indicative of a pervasive, persistent occurrence.

VII. POTABLE WELL SAMPLING AND ANALYSIS PROGRAM

The initial domestic and commercial use potable well sampling event was developed and conducted by Draper Aden Associates on March 5, 1993 at the direction of Watauga county and approval of State officials to protect public health and welfare. The ongoing potable water well sampling and analysis program is currently being jointly conducted by the Appalachian District Health Department (ADHD) and the North Carolina State Laboratory of Public Health.

The objective of the potable well sampling and analysis program is to investigate and evaluate the potential influence and associated risks of the landfill on neighboring groundwater resources. Potable well water samples collected by the ADHD are analyzed for volatile organic compounds by the State Laboratory utilizing EPA Method 502.2. Potable water well locations with accompanying sampled well reference number can be found on the Site Map (Figure 1). A summary of the analytical results of the potable well testing program collected to date are presented in Appendix IV.

The analytical results of the domestic and commercial use potable water well sampling and analysis program previously indicated that two (2) of the forty-one (41) sampled potable wells neighboring the landfill are significantly impacted by volatile organic compounds. These two (2) significant impacted wells are the Carroll residence (well reference no. 12) and the Nissan-Mazda Dealership well (well reference no. 4). These analytical results are from testing conducted in March 1993, and have been included in earlier reports.

At this time the cause or source of all the organics detected in the potable well sampling program cannot be determined. It should be noted that eight (8) of twenty-one (21) compounds detected in the Carroll residence potable well have not been detected in the landfill monitoring well network. The differences in parameter "fingerprints" in groundwater beneath these sites compared to "fingerprints" for landfill wells tends to indicate potential impacts resulting from activities specifically undertaken on these sites and/or immediately around the private well heads and/or components of the well systems.

Review of the analytical results from all the potable well sampling conducted recently, performed by the NC Department of Epidemiology, indicate that the sampled well waters are acceptable for all uses due to either non-detection or low level detection of organic analytes. The two (2) potable water wells previously identified as significantly impacted have been replaced by alternative water sources and have not been resampled during the past year. Individual potable well analytical results obtained recently are discussed below. Discussions of individual potable well analytical results obtained previously can be found in earlier Assessment reports

A routine potable well sampling schedule has been proposed to the NCDEHNR that involves the semi-annual sampling of a minimum of six residences.

The proposed semi-annual potable well sampling schedule will continue to concentrate on sampling those potable wells that have previously shown trace level detections of organics similar to those detected in the landfill groundwater monitoring well network. This will be accomplished by routine, semi-annual sampling of the three potable wells that have previously shown trace level detections of organics similar to those detected in the landfill groundwater monitoring well network, as discussed in the recent Remedial Investigation and Alternatives Report [e.g. BREMCO (well reference no. 5), Ward Residence (well reference no. 24), and Shared Well #2 (well reference no. 14)].

The proposed semi-annual schedule will also continue to incorporate periodic confirmational sampling on potable wells that have previously shown nondetection of target organic analytes, or have shown detections of organics dissimilar to those detected in the landfill groundwater monitoring well network. This will be accomplished by including the sampling of three (or more as appropriate) additional potable wells during each semi-annual sampling event. The decision criteria for inclusion of additional wells in the potable well sampling program should continue to be based both on previous sampling results as well as public input or requests.

The semi-annual potable well program sampling events are anticipated to be performed in the spring (e.g. April) and fall (e.g. October) months and will roughly coincide with the semi-annual monitoring of the landfill's monitoring program. The first routine, regularly scheduled semi-annual potable well sampling (e.g. April, 1996) is described herein.

7.1 February 21, 1995 Sampling Event

Two potable wells were resampled on February 21, 1995, prior to implementation of the proposed routine semi-annual potable well sampling schedule, in response to requests received subsequent to a public participation session conducted by Watauga County. Previous sampling conducted on these two potable wells have previously either not detected any organic compounds or only shown the trace and/or low level detection. These two potable wells included a Meadowview condominium residence (well reference no. 38), located south of the Rocky Mountain Heights Subdivision, and one residence (well reference no. 1), located in the northwest portion of the west drainage below the landfill.

Meadowview condominiums; Unit #2 (38)

The potable well water from Unit #2 in the Meadowview condominiums, located south of the Rocky Mountain Heights subdivision, was sampled on February 21, 1995. Previous water analysis of the potable well water, sampled from the Welch residence in the Meadowview condominiums on October 20, 1993, detected chloroform and trans-1,2-dichloroethene at unquantifiable levels below 1 ppb and trace levels of 1,1,1-trichloroethane and trichloroethene.

Chloroform is a common transformation product from the chlorination of well systems and trans-1,2-dichloroethene has not been confirmed present in the landfill monitoring well network to date. 1,1,1-trichloroethane and trichloroethene, detected at trace levels, are found in many common solvents which could be used at this site. The resampling of the Meadowview condominiums resulted in the detection of no volatile organic compounds.

Colene Bolick Residence (well reference no. 1)

The potable well from the Colene Bolick Residence, located in the northwest portion of west drainage below the landfill was also resampled on February 21, 1995. The initial sampling of the Colene Bolick residence, performed on March 5, 1993, resulted in the detection of no volatile organic compounds. The recent resampling of the Colene Bolick residence also resulted in the detection of no volatile organic compounds.

7.2 April 9, 1996 Sampling Event

For the first routine, regularly scheduled semi-annual potable well sampling event, the Health Department attempted to involve BREMCO (well reference no. 5), the Ward Residence (well reference no. 24), Shared Well #2 (well reference no. 14), the Bolick rental residence (well reference no. 2), the Simko residence (well reference no. 20), and the McClintock residence (well reference no. 33). These wells include four residences located in the Rocky Mountain Heights Subdivision (well reference nos 14, 20, 24 and 33), and the potable wells located in the west drainage below the landfill (well reference nos. 2 and 5). All these wells had been sampled previously. Attempts were made to resample these potable wells to further investigate trace and/or low level detections previously detected.

Four potable wells were sampled on April 9, 1996, marking the initiation of the routine semi-annual potable well sampling schedule. The results obtained from these potable wells [i.e.; BREMCO (well reference no. 5), Shared Well #2 (well reference no. 14), the Bolick rental residence (well reference no. 2), and a residence located behind the Cheverolet Dealership's lot (well reference no. 7)] are presented below. The residence located behind the Cheverolet Dealership's lot is connected to the Cheverolet Dealership's potable well (well reference no. 7).

Blue Ridge Electric Membership Company, BREMCO (well reference no. 5)

Six (6) chlorinated volatile organic solvent compounds were detected in the April 10, 1996 sampling of the BREMCO potable well (1,1-Dichloroethane, 1-1-Dichloroethene, Cis-1,2-Dichloroethene, 1,1,1-Trichloroethane, Trichloroethene, and Tetrachloroethene). The only compounds detected at quantifiable levels were 1,1-Dichloroethane (1,1-DCA), which was detected just above the detection limit of 1 ppb at 1.5 ppb, and 1,1-Dichloroethene (1,1-DCE), which was also detected at the detection limit of 1 ppb. No EPA Maximum Contaminant Level exists for 1,1-

DCA. The EPA MCL for 1,1-DCE is 7 ppb. The other detected organic compounds were observed at unquantifiable levels below 1 ppb.

The same six (6) chlorinated volatile organic solvent compounds detected as a result of the recent sampling event have also been detected in previous sampling events conducted on the BREMCO potable well. All six (6) compounds have been detected in the past four (4) sampling events. Three of these compounds (1,1-Dichloroethane, 1,1,1-Trichloroethane, and Trichloroethene) have been detected in all six (6) previous sampling events.

Shared Well #2 (well reference no. 14)

Shared well #2 serves four residences. Shared well #2 was originally sampled from the Cone residence on March 18, 1993. Subsequent resampling of shared well #2 was performed on the adjacent Edwards residence.

The initial March 18, 1993 sampling detected only low levels of 1,4-Dichlorobenzene, which is a compound that has not been detected in the landfill monitoring well network.

The second March 30, 1994 sampling detected trace levels of Chloroform, which again is a common transformation product resulting from the chlorination of well systems, and also detected two (2) common chlorinated organic compounds (1,1-Dichloroethene and 1,1,1-Trichloroethane) at unquantifiable levels below 1 ppb.

The third January 12, 1995 sampling only detected 1,1-Dichloroethene at unquantifiable levels below 1 ppb.

Shared well #2 was drilled deeper in the fall of 1995 in order to provide needed water production. Resampling was performed to investigate the effect of drilling the well deeper on the concentrations of organic compounds found in this potable well. The fourth resampling, performed on October 24, 1995, detected 1,1-Dichloroethane (not 1,1-Dichloroethene) at unquantifiable levels below 1 ppb, trace levels of Tetrachloroethene and 1,1,1-Trichloroethane, and Chloroform at 9 ppb. Chloroform is likely a transformation product resulting from the recent chlorination of the well system. A variety of additional compounds that do not appear related to the organic constituents found in the landfill's monitoring well network were also detected. These compounds include the following: Bromodichloromethane, Dibromochloromethane, 2-Chlorotoluene, 4-Chlorotoluene, Methyl Ethyl Ketone, and Tetrahydrofuran. The presence of these compounds are likely a byproduct resulting from the recent overdrilling of the well bore.

The recent fifth resampling only detected 1,1-Dichloroethene at unquantifiable levels below 1 ppb.

Bolick rental residence (well reference no. 2)

The Bolick rental residence potable well, located directly to the southwest of the BREMCO business, was also resampled and analyzed during this sampling event. The Bolick rental residence potable well has been sampled three previous times. Trace levels (less than 1.0 ppb) of two common chlorinated volatile organic compounds (1,1-dichloroethane and 1,1-dichloroethene) and significant levels of methyl ethyl ketone (MEK) and Tetrahydrofuran were detected as a result of the previous two sampling events. MEK and Tetrahydrofuran have not been detected in the landfill monitoring well network to date. Coincidentally, three of the four compounds detected in the initial Bolick rental residence potable well sampling event conducted on March 5, 1993 (benzene derivative compounds) were also not detected in the landfill monitoring well network.

The recent sampling and analysis of the Bolick rental residence well only resulted in the detection of trace levels of one of the previously detected compounds (1,1-dichloroethane).

Chevrolet Dealership (well reference no. 7)

The initial sampling of the Chevrolet Dealership's potable well, performed on March 5, 1993, resulted in no detected volatile organic compounds. The Chevrolet Dealership's potable well was resampled on April 26, 1995 in response to NCDEHNR Solid Waste Section recommendations. The second sampling of the Chevrolet Dealership's potable well detected tert-Butyl Metyl Ether at a concentration of 24.4 ppb. A residence located behind the Chevrolet Dealership's lot was sampled during the recent April 9, 1996 (third) sampling event. This residence is connected to the Chevrolet Dealership's potable well. The third sampling of the Chevrolet Dealership's potable well also detected tert-Butyl Metyl Ether at a concentration of 2.5 ppb. Tert-Butyl Metyl Ether has not been detected in any of the assessment monitoring wells to date. The presence of tert-Butyl Metyl Ether in the Chevrolet Dealership's potable well is likely due to activities and sources immediately surrounding the well head.

7.2 May 10-11, 1996 Sampling Event

Three potable wells, located in the Rocky Mountain Heights Subdivision, were sampled on May 10-11, 1996, to complete the first routine, regularly scheduled semi-annual potable well sampling event [i.e., the Ward Residence (well reference no. 24), the Simko residence (well reference no. 20), and the Johnson residence (well reference no. 23)]. The Health Department was unsuccessful at contacting the McClintock residence (well reference no. 33). The McClintock residence is only seasonally occupied. Attempts will be made to sample the McClintock residence during the next semi-annual sampling event, scheduled for the fall (e.g. October).

Ward Residence (well reference no. 24)

The recent May 10-11, 1996 resampling and analysis of the Ward residence potable well detected trace levels of Chloroform and Tetrachloroethene, and unquantifiable levels below 1 ppb of 1,1-Dichloroethane. The results of the previous October 24, 1995 analysis of the Ward residence potable well was identical to these recent sampling and analysis results.

Prior to these two sampling events, five sampling events had been conducted on the Ward residence potable well. The combined analyses from the previous sampling events conducted on the Ward residence potable well had detected trace and/or unquantifiable levels below 1 ppb of five (5) chlorinated organic compounds (Carbon Tetrachloride, 1,1-Dichloroethane, 1,1,1-Trichloroethane, Trichloroethene, and Tetrachloroethene).

The initial Ward residence sampling event also detected Methylene Chloride at 3.2 ppb. the next five consecutive sampling events at the Ward residence resulted in the nondetection of Methylene Chloride. Methylene Chloride is also a known laboratory contaminant.

The third Ward residence sampling event also detected trace levels of chloroform. The other five sampling events conducted at the Ward residence had resulted in the nondetection of chloroform. Chloroform is a common transformation product result from the chlorination of well systems.

The fourth Ward residence sampling event resulted in no detected volatile organic compounds.

Simko residence (well reference no. 20)

The potable well water from the Simko residence was resampled on May 10-11, 1996 to confirm the results from the initial sampling event conducted on March 23, 1993. The initial sampling event detected chloroform at unquantifiable levels below 1 ppb and 1,2-dichloroethane at trace levels. The recent resampling also resulted in the detection of chloroform at unquantifiable levels below 1 ppb and 1,2-dichloroethane at trace levels. Chloroform is a common transformation product result from the chlorination of well systems.

Johnson residence (well reference no. 32)

The potable well water from the Johnson residence was resampled on May 10-11, 1996 to confirm the results from the initial sampling event conducted on May 11, 1993. The initial sampling event detected chloroform at unquantifiable levels below 1 ppb. The recent resampling also resulted in the detection of chloroform at unquantifiable levels below 1 ppb. Chloroform is a common transformation product result from the chlorination of well systems.

7.4 Pending Potable Well Sampling

The proposed semi-annual potable well sampling schedule involves the semi-annual sampling of a minimum of six residences. As outlined in the proposed schedule, the sampling program will continue to concentrate on sampling those few wells that have previously shown trace level detections of organics similar to those detected in the landfill groundwater monitoring well network. Duplicate sampling will indicate whether the organics detected are a persistent occurrence or uncommon event.

The proposed semi-annual potable well sampling schedule will continue to concentrate on sampling those potable wells that have previously shown trace level detections of organics similar to those detected in the landfill groundwater monitoring well network. This will be accomplished by routine, semi-annual sampling of the three potable wells that have previously shown trace level detections of organics similar to those detected in the landfill groundwater monitoring well network [e.g. BREMCO (well reference no. 5), Ward Residence (well reference no. 24), and Shared Well #2 (well reference no. 14)].

The proposed semi-annual schedule will also continue to incorporate periodic confirmational sampling on potable wells that have previously shown nondetection of target organic analytes, or have shown detections of organics dissimilar to those detected in the landfill groundwater monitoring well network. This will be accomplished by including the sampling of three (or more as appropriate) additional potable wells during each semi-annual sampling event. The decision criteria for inclusion of additional wells in the potable well sampling program should continue to be based both on previous sampling results as well as public input or requests.

The Health Department will also attempt to sample the seasonally occupied McClintock residence (well reference no. 33) during the next October sampling event. The two previous sampling events performed on this well were also performed during the months of August and October.

In summary, review of the analytical results from all the potable well sampling conducted recently, performed by the NC Department of Epidemiology, indicate that the recently sampled well waters are acceptable for all uses due to either nondetection or very low level detection of the organic analytes. At this time the cause or source of all the low level detected organics can not be determined.

VIII. CONCLUSIONS

8.1 Parameter Distribution

The analytical results obtained from the second semi-annual assessment monitoring event are similar to the results obtained from the previous assessment events. The analytical results indicate the northern edge of the occurrence of assessment target parameters in the groundwater primarily exists within the construction right-of-way for the proposed Route 421 bypass. South of the proposed bypass, the detection of assessment target parameters was concentrated between the saddle, located between the landfill and the Rocky Mountain Heights Subdivision, and the west and north drainages below the landfill.

West Drainage

In the west drainage, the detection of target parameters above groundwater standards was observed in both the soil and bedrock aquifer media, extending from the landfill to the proposed bypass. The recent analytical results reveal five target parameters detected above the method CRQL and an additional four target parameters estimated below the method CRQL in MW-12, located south of the proposed bypass. Previous organic analyses performed on the piezometer network on November 16-18, 1992, indicates the target parameters are confined to the trough of the west drainage.

Six target organic parameters were detected in the surface water sampling location, S-4, located in the west drainage (two parameters at concentrations above the method CRQL and four parameters below the method CRQL). The estimated concentrations of two of these six organic compounds observed in the west drainage were above surface water standards at S-4. Sampling and analysis performed on surface water sampling location, S-6, located approximately 150 feet downstream from S-4, indicates levels observed in S-4 dissipate quickly.

The organic compounds and relative levels detected in the surface water sampling locations in the west drainage are consistent with the those detected in adjacent groundwater monitoring wells, although at lower concentrations, and indicate that organic impacts to surface water are entirely due to local groundwater discharge at this location. Directly below S-6, the west surface water drainage receives considerable surface runoff from 280 feet of topographic relief existing directly to the south of the west drainage's watershed. This portion of the west drainage was not sampled during the recent second semi-annual sampling event due to stagnant, unrepresentative sampling conditions. It is anticipated that pending sampling of the west surface water drainage directly below S-6 will result in the non-detection of all target parameters.

North Drainage

In the north drainage, the detection of target parameters is confined to the bedrock aquifer medium. The elevated levels of the target parameters detected in the two monitoring wells accessing the bedrock aquifer medium in the north drainage indicate the parameters have preferentially migrated to deeper fracture zones within the bedrock. Downgradient of the northern drainage, the bedrock aquifer system enters the central watershed of Rocky Branch and is likely significantly diluted. Groundwater entering the Rocky Branch watershed from the northern drainage may be exhibiting lateral stratification. Rather than continuing to follow the northern drainage orientation, groundwater may flow N55°W, parallel to Rocky Branch, within the area between the nested well pair, MW-14 and MW-15, and the Chevrolet Dealership, before reaching the apex of the watershed. Note, the absence of similar volatile organic parameters detected at the Chevrolet Dealership's potable well suggests non-impact at the dealership's well location.

Southern Saddle

Several organic compounds detected in the monitoring well located along the southern saddle between the landfill and the Rocky Mountain Heights subdivision, particularly Methylene Chloride, were observed at markedly different concentrations than the levels of the organic compounds detected in the remainder of the monitoring well network. The analytical results obtained from the monitoring well installed along the saddle between the landfill and the Rocky Mountain Heights Subdivision (MW-9) indicates the organic parameters observed in the Carroll residence potable well are not confined to the Carroll property.

8.2 Target Parameter Summary

The detection of three target parameters, TCE, cis-1,2-DCE, and Chloroethane, was only reported within the west drainage and southern saddle.

The detection of 1,1,1-TCA and 1,1-DCE was observed in both the west and the north drainages, although these parameters were observed at significantly higher elevated levels in the north drainage, particularly at the deep bedrock well MW-2. The detection of 1,1,1-TCA was also observed along the southern saddle.

The detection of PCE was observed in both the west and the north drainages, although PCE was observed at significantly higher elevated levels in the west drainage,

The detection of 1,1-DCA was observed at elevated concentrations in more monitoring wells throughout the site than any other target parameter, although 1,1-DCA was observed at the highest concentrations in the west drainage

Methylene Chloride was only confirmed present in MW-9, located along the southern saddle between the landfill and the Rocky Mountain Heights subdivision. Concentrations observed in MW-9 were twenty-four times the EPA MCL.

Benzene was detected in seven monitoring wells. Higher concentrations of Benzene are preferentially distributed adjacent to the disposal area. Lower estimated concentrations were found distributed further downgradient within the west drainage and in MW-9, located along the southern saddle between the landfill and the Rocky Mountain Heights subdivision

Dichlorodifluoromethane was not detected above or estimated below the method LOQ in any monitoring well or surface water sampling location.

Vinyl Chloride was detected in three monitoring wells, all centrally located in the west drainage, adjacent to the waste disposal area.

8.3 Closing

Third Semi-annual Assessment Background Monitoring Event

The third semi-annual assessment monitoring event (seventh assessment event) is tentatively scheduled to be performed in October, 1996. As indicated in the Assessment Monitoring schedule (Table 1, Appendix I), core assessment wells will be analyzed utilizing LLRA analytical methods for the third semi-annual assessment monitoring event. Surface water monitoring points will be analyzed using CLP analytical methods.

Revisions to the network of core and boundary assessment wells for the second semi-annual assessment monitoring event involved in the upgrading of monitoring well MW-15 to "core" status. As approved by the NCDEHNR, the non-impacted boundary wells (i.e. MW-4, MW-5, MW-13, MW-14, MW-16, and MW-18) were withdrawn from the routine compliance monitoring program and were not sampled during the second semi-annual assessment monitoring event. As requested by the NCDEHNR, Watauga County proposes to bi-annually rotate the non-impacted wells in and out of the routine compliance monitoring program basis. Watauga County reserves the right to propose an alternate monitoring frequency for the non-impacted wells based on temporal contaminant distribution trends observed from subsequent monitoring events.

Upon the approval of the NCDEHNR, the alternate monitoring frequency of the non-impacted wells revisions outlined above will be implemented with the second semi-annual assessment monitoring event (sixth assessment event), tentatively scheduled to be performed by Draper Aden Associates in January, 1996.

Proposed Assessment Monitoring Well Location

As presented in the Remedial Investigation and Alternatives (RIA) Report for the Watauga County Landfill, dated January 12, 1996, an additional assessment monitoring well is proposed in the west drainage. This additional assessment monitoring well is proposed in response to trace level detections observed in the Blue Ridge Electric Company's (BREMCO) potable well (Potable Well Analysis Summary Table, Appendix IV). These trace level detections suggest groundwater flow within the west drainage may follow a N55°W lineament set within the west drainage. The objective of the proposed monitoring well is to provide additional information to evaluate the transport, migration, and fate of the organic parameters, and evaluate aquifer equilibrium conditions existing within the west drainage. The County recently obtained an agreement with BREMCO for the property easement necessary for the installation of the additional well. The proposed location for the additional assessment monitoring well is approximately fifty feet north-northwest of BREMCO's potable well (well reference no. 5, see Figure 1), along the N55°W lineament set trace.

Review of the BREMCO potable well record indicates that the well was drilled to a total depth of 425 feet. The driller of the BREMCO potable well (Dewey Wright Well and Pump) has been unable to locate a detailed well record specifying groundwater production zones. Therefore, since the primary groundwater production zone observed during the drilling of BREMCO's potable well is not documented, the depth of the screened interval of the proposed monitoring well will coincide with the the portion of the aquifer most likely to be impacted (within 100-150 ft.). The actual depth of the monitoring well screen interval will be chosen in the field in response to groundwater production conditions encountered during drilling. The monitoring well screen interval will not be located in unproductive groundwater production zones.

Watauga County will install the additional assessment monitoring well, as detailed above, upon DEHNR approval. The County's objective is to have the well installed, developed, and equipped with a dedicated stainless steel and TEFLON electrical submersible pump prior to the next semi-annual assessment monitoring event (seventh assessment event) scheduled to be performed in October, 1996.

APPENDIX I
TABLES AND FIGURES

Table 1

Watauga County Landfill
Groundwater and Surface Water
Assessment Monitoring Schedule

GROUNDWATER MONITORING	1st Year Quarterly Sampling Event				2nd Year Semi-Annual Sampling Events	
"CORE" ASSESSMENT WELLS						
Target Parameter Monitoring Parameters	CLP Methods	CLP Methods	CLP Methods	CLP Methods	Low Level Risk Assessment Screening Methods	CLP Methods
"BOUNDARY" ASSESSMENT WELLS						
Target Parameter Monitoring Parameters	LLRA Methods	CLP Methods	LLRA Methods	CLP Methods	LLRA Methods*	-
SURFACE WATER MONITORING						
Target Parameter Monitoring Parameters	CLP Methods	-	CLP Methods	-	CLP Methods	CLP Methods

CLP - EPA Contract Laboratory Program Methods

LLRA - Low Level Risk Assessment Screening Methods (EPA SW-846)

* - proposed bi-annual monitoring schedule.

Watauga County Landfill
 Watauga County, North Carolina
 Upgradient Well: MW-1
 05/10/96

Table 2A
 Second Semi-Annual Monitoring Event
 Assessment Target Parameter Analytical Results
 Core Groundwater Monitoring Wells - Inorganic and Organic Analyses
 Contract Laboratory Program (CLP) Statements of Work (SOW)

Parameters	Event	Results ug/L(ppb)											NCS (ug/L)	MCL (ug/L)													
		MW-1	MW-2	MW-3	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12	MW-15			MW-17												
METALS, TOTAL																											
Barium, Total	4/10/96	144	J	178	J	142		570		612	J	63.5		507	J	105		268		119		56.3	J	75.7		2000	2000
Chromium, Total	4/10/96	0.90	U	0.90	U	4.8		26.3		2.5	J	0.90	U	0.90	U	42.8		0.90	U	0.90	U	0.90	U	0.90	U	50	100
Cobalt, Total	4/10/96	1.4	J	1.0	U	3.6	J	24.7		4.2	J	1.0	U	9.6	J	2.5		9.0		1.0	U	1.0	U	2.6		-	-
Iron, Total	4/10/96	1660		257	J	8550		9760		12000	J	334		348	J	3340		13.3	U	13.3	U	194	J	53.5		300*	300*
Nickel, Total	4/10/96	1.4	U	1.4	U	7.1		23.4		7.3	J	1.4	U	1.4	U	35.9		1.4	U	1.4	U	1.4	U	1.4	U	100	100
Vanadium, Total	4/10/96	3.8		1.6	J	17.9		3.8		10.6	J	5.5		0.72	J	7.5		0.50	U	0.92	U	2.9	J	0.75		-	-
ORGANICS																											
Benzene	4/10/96	1	J	91	U	2	J	11		5	J	5	J	4	J	23	U	10	U	1	J	10	U	10	U	1	5
Chloroethane	4/10/96	10	U	91	U	8	J	14		41	U	10	J	16	U	23	U	10	U	5	J	10	U	5	J	-	-
Dichlorodifluoromethane	4/10/96	10	U	91	U	10	U	25		10	U	10	U	10	U	23	U	10	U	10	U	10	U	10	U	0.19	-
1,1-Dichloroethane	4/10/96	10	U	130		150		120		5	J	80		36	J	22	J	26		120		10	U	130		700**	-
1,1-Dichloroethene	4/10/96	10	U	110		3	J	25		10	U	6	J	10	U	11		10	U	3	J	10	U	2	J	7	7
1,2-Dichloroethene(total)	4/10/96	10	U	91	U	64		420		6	J	23		11		23	U	11		54		10	U	10	U	70	70
Methylene Chloride	4/10/96	10	U	91	U	10	U	25		10	U	10	U	23	U	23	U	10	U	10	U	10	U	10	U	5	5
Tetrachloroethene	4/10/96	10	U	20	J	16		10		10	U	35		4	J	4	J	12		10	U	10	U	10	U	0.7	5
Trichloroethene	4/10/96	10	U	91	U	10		23		10	U	15		6	J	23	U	4	J	15		10	U	10	U	2.8	5
1,1,1-Trichloroethane	4/10/96	10	U	300		21		25		10	U	8	J	8	J	290		6	J	15		4	J	7	J	200	200
Vinyl Chloride	4/10/96	10	U	91	U	2	J	14		10	U	5		10	U	23	U	10	U	10	U	10	U	10	U	0.02	2

Notes:
 NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L: 0200)
 MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)
 U Denotes not detected above Instrument Detection Level (IDL) for Inorganics and not detected above CRQL for Organics
 J Denotes an estimated value
 CRQL Contract Required Quantification Limit
 * Denotes a Secondary Maximum Contaminant Level (SMCL) for Total Iron
 ** Denotes a proposed NCS
 - Denotes Not Available or Not Sampled
 [Pattern] denotes parameter results that exceed U.S. EPA Maximum Contaminant Levels.

(1) Metal parameters were analyzed in accordance with EPA Contract Laboratory Program (CLP) Statement of Work ILMO 3.0.
 CLP analytical methods utilize relevant Atomic Adsorption technique and Inductively Coupled Plasma (ICP) method for metal analysis
 (2) Organic parameters were analyzed in accordance with EPA Contract Program Statement of Work OLMO1.2.

Watauga County Landfill
 Watauga County, North Carolina
 Upgradient Well: MW-1

Table 2B
 Second Semi-Annual Monitoring Event
 Assessment Target Parameter Analytical Results
 Surface Water Monitoring Locations - Inorganic and Organic Analysis
 Contract Laboratory Program (CLP) Statements of Work (SOW)

05/23/96

Parameters	Sampling Date	Results ug/L(ppb)										NCS (ug/L)	MCL (ug/L)		
		S-1	S-2	S-3	S-4	S-5	S-6	S-5	S-6	S-5	S-6				
METALS, TOTAL															
Barium, Total	4/10/96	345	J	427	J	182	J	68.5	J	113	J	70.9	J	2000	2000
Chromium, Total	4/10/96	0.90	U	0.90	U	0.90	U	0.90	U	0.90	U	0.90	U	50	100
Cobalt, Total	4/10/96	8.0	J	3.9	J	5.3	J	2.3	J	1.0	U	1.5	J	-	-
Iron, Total	4/10/96	503	J	4390	J	1260	J	285	J	688	J	429	J	300*	300*
Nickel, Total	4/10/96	1.4	U	1.4	U	1.4	U	1.4	U	1.4	U	1.4	U	100	100
Vanadium, Total	4/10/96	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	0.50	U	-	-
ORGANICS															
Benzene	4/10/96	10	U	2	J	10	U	10	U	10	U	10	U	1	5
Chloroethane	4/10/96	8	J	46	-	10	U	3	J	5	J	10	U	-	-
Dichlorodifluoromethane	4/10/96	10	U	10	U	10	U	10	U	10	U	10	U	0.19	-
1,1-Dichloroethane	4/10/96	3	J	15	-	10	U	30	-	2	J	14	-	700**	-
1,1-Dichloroethene	4/10/96	10	U	10	U	10	U	10	U	10	U	10	U	7	7
1,2-Dichloroethene (Total)	4/10/96	10	U	5	J	10	U	35	-	10	U	16	-	70	70
Methylene Chloride	4/10/96	10	U	10	U	10	U	10	U	10	U	10	U	5	5
Tetrachloroethene	4/10/96	10	U	10	U	10	U	9	-	1	J	4	J	0.7	5
Trichloroethene	4/10/96	10	U	1	J	10	U	6	-	1	J	3	J	2.8	5
1,1,1-Trichloroethane	4/10/96	10	U	10	U	10	U	2	J	2	J	1	J	200	200
Vinyl Chloride	4/10/96	10	U	10	U	10	U	10	U	10	U	10	U	0.015	2

Note NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)
 MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)
 CRQL Contract Required Quantification Limit
 U Denotes not detected above Detection Limit(IDL) for Inorganics and not detected above CRQL for Organics
 J Denotes an estimated value
 * Denotes a Secondary Maximum Contaminant Level (SMCL) for Total Iron
 ** Denotes a proposed NCS
 • Denotes Not Available or Not Sampled
 Shaded denotes parameter results that exceed U.S. EPA Maximum Contaminant Levels.
 Note: 1) CLP analytical methods utilize relevant Atomic Adsorption technique and Inductively Coupled Plasma (ICP) method, in accordance with EPA Contract Laboratory Program (CLP) Statement of Work ILMO 3.0 for metal analysis.
 Organic parameters were analyzed in accordance with USEPA CLP SOW OLM03.2.

Watauga County Landfill
 Watauga County, North Carolina
 Upgradient Well: MW-1
 05/23/96

Table 3
 Second Semi-Annual Assessment Monitoring Event
 Detected Non-Target Organic Parameters

Parameter	Event	S-1	S-2	S-4	S-5	S-6	NCS (ug/L)	MCL (ug/L)
Acetone	4/10/96	~	~	~	~	2	700	-
Carbon Disulfide	4/10/96	~	~	1	~	~	-	-
Ethylbenzene	4/10/96	~	1	~	~	~	29	700
Toluene	4/10/96	~	2	~	~	~	1000	1000
Xylene (total)	4/10/96	1	6	~	2	~	530	10000

Tentatively Identified Compounds

Parameter	Event	MW-3	MW-6	MW-7	MW-8	MW-9	MW-11	MW-12	MW-17	S-2	S-4	NCS (ug/L)	MCL (ug/L)
Ether	4/10/96	~	84	NJ	10	NJ	~	~	~	34	NJ	8	NJ
Dichlorofluoromethane	4/10/96	21	NJ	50	NJ	~	~	~	~	34	NJ	8	NJ

Notes:

- NCS Denotes North Carolina Groundwater Quality Standard (TI 5A: 02L .0200)
 - MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)
 - ~ Denotes Not Detected
 - . Denotes Not Available
 - J Denotes an estimated value
 - N Denotes tentatively identified
- Organic parameters were analyzed in accordance with USEPA CLP SOW OLMO1.9 (3/90).

TABLE 4A
GROUNDWATER LEVEL DATA
MONITORING WELLS

GROUND MEASURING POINT	REFERENCE ELEVATION								
	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9
3339.03	3151.24	3182.25	3150.06	3263.81	3262.55	3270.56	3235.39	3256.65	3359.23
3341.80	3192.94	3183.12	3192.92	3267.69	3266.04	3273.33	3239.77	3259.23	

DATE	STATIC WATER LEVEL								
6/20/94	38.00	7.48	16.43	13.18	NM	44.12	23.03	17.68	59.35
9/27/94	39.69	7.51	17.42	10.45	NM	43.99	30.73	17.38	57.79
2/6/95	37.57	5.58	16.20	8.18	50.39	42.85	45.88	15.41	59.54
4/11/95	37.94	6.46	16.85	9.22	48.95	42.81	49.11	16.05	59.30
7/10/95	41.20	6.60	17.43	8.94	50.39	43.73	48.98	17.42	80.17
4/9/96	38.71	5.85	7.01	8.40	49.87	42.87	44.32	16.80	61.28

DATE	GROUNDWATER ELEVATION								
6/20/94	3383.80	3145.06	3164.69	3139.04	NM	3221.92	3250.30	3222.09	3299.88
9/27/94	3302.11	3145.43	3165.70	3142.07	NM	3222.05	3242.80	3222.39	3301.44
2/6/95	3304.23	3147.56	3166.92	3144.54	3217.90	3225.19	3227.65	3224.36	3299.69
4/11/95	3303.86	3146.48	3166.37	3143.50	3223.23	3224.42	3224.72	3223.72	3299.93
7/10/95	3300.60	3146.34	3165.69	3143.58	3217.40	3223.31	3224.55	3222.35	3279.06
4/9/96	3303.09	3147.09	3176.11	3144.12	3217.82	3223.17	3229.21	3221.97	3297.95

GROUND MEASURING POINT	REFERENCE ELEVATION								
	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18
3202.18	3156.44	3117.99	3156.82	3117.99	3117	3141.42	3181.14	3117.12	3119.63
3203.87	3159.6	3159.15	3159.72	3119.72	3120	3120.65	3142.72	3183.62	

DATE	STATIC WATER LEVEL								
6/20/94	8.18	13.35	11.04	19.66	7.94	11.92	9.32	17.93	17.93
9/27/94	8.09	13.22	10.78	19.57	7.89	11.82	5.68	17.83	17.86
2/6/95	7.73	13.22	10.61	19.39	7.52	11.55	4.61	17.05	17.58
4/11/95	7.90	13.00	10.58	19.35	7.75	11.87	5.11	17.48	17.65
7/10/95	7.91	12.53	10.48	19.62	7.74	11.96	4.54	18.11	17.94
4/9/96	7.87	12.73	10.38	19.56	7.59	11.85	4.67	17.78	17.81

DATE	GROUNDWATER ELEVATION								
6/20/94	3195.69	3146.25	3146.11	3100.06	3112.06	3108.73	3137.40	3165.69	3101.70
9/27/94	3195.78	3146.38	3146.37	3100.15	3112.11	3108.83	3137.04	3165.79	3101.77
2/6/95	3196.14	3146.38	3146.54	3100.33	3112.48	3109.10	3138.11	3166.57	3102.05
4/11/95	3195.97	3146.60	3146.57	3100.19	3112.25	3108.78	3137.61	3166.14	3101.98
7/10/95	3195.96	3147.07	3146.67	3100.10	3112.26	3108.69	3138.18	3165.51	3101.69
4/9/96	3196.20	3146.87	3146.77	3100.16	3112.41	3108.80	3138.05	3165.84	3101.82

1) ALL MEASUREMENTS IN FEET.
2) ALL ELEVATIONS REFERENCE MEAN SEA LEVEL. HETAM 6920-711 TABLSHA-016
3) MEASURING POINT (M.P.) IS FROM THE TOP OF WELL CASING.
4) NM - NOT MEASURED

Watauga County Landfill
 Watauga County, North Carolina
 Upgradient Well: MW-1

23-May-96

TABLE 4B
 GROUNDWATER LEVEL DATA

REFERENCE ELEVATION									
	PZ-13	PZ-14	PZ-17	PZ-18	PZ-18A	PZ-22	PZ-23		
GROUND	3195.05	3214.80	3217.62	3233.60	3233.95	3205.6	3221.74		
MEASURING POINT	3198.33	3217.80	3220.79	3236.02	3236.86	3208.84	3225.27		

STATIC WATER LEVEL									
DATE	12.75	17.26	14.47	16.80	17.30	14.29	24.68		
6/20/94	12.29	16.64	14.06	16.47	17.77	13.99	23.50		
9/27/94	10.71	13.66	12.88	13.66	13.60	12.86	22.44		
2/6/95	12.39	15.82	13.79	15.39	15.92	13.25	23.26		
4/11/95	13.07	18.47	15.24	16.41	16.49	14.15	23.71		
7/10/95	11.70	15.45	15.00	15.59	15.71	13.57	23.33		
4/9/96									

GROUNDWATER ELEVATION									
DATE	3185.58	3200.54	3206.32	3219.22	3219.56	3194.55	3200.59		
6/20/94	3186.04	3201.16	3206.73	3219.55	3219.09	3194.85	3201.77		
9/27/94	3187.62	3204.14	3207.91	3222.36	3223.26	3195.98	3202.83		
2/6/95	3185.94	3201.98	3207.00	3220.63	3220.94	3195.59	3202.01		
4/11/95	3185.26	3199.33	3205.55	3219.61	3220.37	3194.69	3201.56		
7/10/95	3186.63	3202.35	3205.79	3220.43	3221.15	3195.27	3201.94		
4/9/96									

- 1) ALL MEASUREMENTS IN FEET.
- 2) ALL ELEVATIONS REFERENCE MEAN SEA LEVEL.
- 3) MEASURING POINT (M.P.) IS FROM THE TOP OF WELL CASING.

Table 5B
 Background Assessment Organic Target Parameter Analytical Results
 Boundary Groundwater Monitoring Wells and
 Surface Water Sampling Locations

Parameter	Event	MW-4	MW-5	MW-13	MW-14	MW-15	MW-16	MW-18	SI	S2	S3	S4	S5	LI	Mt. Spring	Analysis Type	NCS (ug/L)	MCL (ug/L)
Benzene	6/20/94	10	U	5.20	U	5.20	U	5.20	U	3.20	U	1	10	U	U	CLP/8071	1	5
	9/27/94	2	U	10	U	10	U	10	U	1	U	1	10	U	U	CLP	1	5
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	10	U	U	U	CLP/8071	1	5
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	1	5
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	1	5
Chloroethane	6/20/94	10	U	9.72	U	9.72	U	9.72	U	9.72	U	10	U	U	U	CLP/8071	1	5
	9/27/94	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	1	5
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	10	U	U	U	CLP/8071	1	5
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	1	5
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	1	5
Dichlorodifluoromethane	6/20/94	10	U	46.64	U	46.64	U	46.64	U	46.64	U	4	10	U	U	CLP/8071	0.19	1
	9/27/94	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	0.19	1
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	10	U	U	U	CLP/8071	0.19	1
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	0.19	1
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	0.19	1
1,1-Dichloroethane	6/20/94	10	U	43.19	U	43.19	U	43.19	U	43.19	U	10	U	U	U	CLP/8071	7.00*	1
	9/27/94	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	7.00*	1
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	45	10	U	U	CLP/8071	7.00*	1
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	7.00*	1
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	7.00*	1
1,1-Dichloroethene	6/20/94	10	U	9.72	U	9.72	U	9.72	U	9.72	U	10	U	U	U	CLP/8071	7	7
	9/27/94	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	7	7
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	10	U	U	U	CLP/8071	7	7
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	7	7
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	7	7
cis-1,2-Dichloroethene(3)	6/20/94	10	U	9.49	U	9.49	U	9.49	U	9.49	U	10	U	U	U	CLP/8071	20	20
	9/27/94	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	20	20
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	10	U	U	U	CLP/8071	20	20
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	20	20
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	20	20
trans-1,2-Dichloroethene	6/20/94	10	U	24.49	U	24.49	U	24.49	U	24.49	U	10	U	U	U	CLP/8071	20	20
	9/27/94	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	20	20
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	10	U	U	U	CLP/8071	20	20
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	20	20
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	20	20
Methylene Chloride	6/20/94	10	U	26.20	U	26.20	U	26.20	U	26.20	U	1	1	U	U	CLP/8071	3	3
	9/27/94	10	U	10	U	10	U	10	U	10	U	1	1	U	U	CLP	3	3
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	1	1	U	U	CLP/8071	3	3
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP/8071	3	3
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	3	3
Tetrachloroethene	6/20/94	10	U	2.84	U	2.84	U	2.84	U	2.84	U	10	U	U	U	CLP/8071	3	3
	9/27/94	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	3	3
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	10	U	U	U	CLP/8071	3	3
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	3	3
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	3	3
Trichloroethene	6/20/94	10	U	21.20	U	21.20	U	21.20	U	21.20	U	1	1	U	U	CLP/8071	2.8	2.8
	9/27/94	10	U	10	U	10	U	10	U	10	U	1	1	U	U	CLP	2.8	2.8
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	10	U	U	U	CLP/8071	2.8	2.8
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	2.8	2.8
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	2.8	2.8
1,1,1-Trichloroethene	6/20/94	10	U	20.11	U	20.11	U	20.11	U	20.11	U	1	1	U	U	CLP/8071	2.8	2.8
	9/27/94	10	U	10	U	10	U	10	U	10	U	1	1	U	U	CLP	2.8	2.8
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	10	U	U	U	CLP/8071	2.8	2.8
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	2.8	2.8
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	2.8	2.8
Vinyl Chloride	6/20/94	10	U	6.60	U	6.60	U	6.60	U	6.60	U	1	1	U	U	CLP/8071	0.013	1
	9/27/94	10	U	10	U	10	U	10	U	10	U	1	1	U	U	CLP	0.013	1
	2/06/95	10	U	1.0	U	1.0	U	1.0	U	1.0	U	10	U	U	U	CLP/8071	0.013	1
	4/11/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	0.013	1
	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	U	U	CLP	0.013	1

TABLE 3B NOTES:

- NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)
- MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)
- U Denotes not detected above Instrument Detection Level (IDL) for Inorganics and not detected above CRQL/LOQ for Organics.
- J Denotes an estimated value
- CRQL Contract Required Quantification Limit (CLP methods)
- LOQ Limit of Quantification (SW-846 methods)
- Denotes Not Available or Not Sampled
- Denotes parameter results that exceed U.S. EPA Maximum Contaminant Levels.

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ANALYSIS TYPE NOTES:

- 1) Organic parameters were analyzed utilizing CLP Statement of Work OLMO1.9(Q/90), SW-846 Method #8260 and/or #8021, as noted.
- 2) For CLP, 1,2-Dichloroethene was reported as total concentration; for 8021/8260 concentration was reported for cis-isomer.
- 3) For the 6/20/94, 2/6/93, and 7/10/93 events, boundary monitoring well analyses were performed utilizing SW-846 Method #8021. Surface water sampling locations analyses were performed by using CLP analytical methods.

Watauga County Landfill
Watauga County, North Carolina
Upgradient Well: MW-1
05/17/96

Table 5C
Background Assessment Metal Target Parameter Analytical Results
Core Groundwater Monitoring Wells and Septic Field Monitoring Wells

Parameter	Event	Results ug/(ppb)												MCL (ug/L)				
		MW-1	MW-2	MW-3	MW-4	MW-6	MW-8	MW-9	MW-10	MW-11	MW-12	MW-17	SFW-1		SFW-2	SFW-3	Analysis Type	NCS (ug/L)
Barium, Total	6/20/94	203	199	123	24.2	652	281	710	109	117	101	117	117				CLP	2000
	9/27/94	149	204	119	23.3	302	86.9	632	113	153	101	90.4	90.4				CLP	2000
	2/06/95	157	192	109	27.2	418	70.4	615	94.8	176	104	87.2	87.2				CLP	2000
	4/11/95	143	212	82	23.2	477	65	628	93.1	295	97.7	77.3	77.3				CLP	2000
	7/10/95	123	210	94.5	23.8	499	70.6	612	103	199	110	79	79				CLP	2000
	7/20/94	409	24.4	9950	24.4	24900	16100	7060	5460	337	1800	3220	3220				CLP	300
Iron, Total	9/27/94	1390	140	9220	71.8	9170	418	42	3100	3.8	16	149	149				CLP	300
	2/06/95	2830	46	6610	552	5920	368	735	2240	296	61.3	260	260				CLP	300
	4/11/95	2490	245	3600	54.4	8300	149	81.7	234	15.7	54.4	63.7	63.7				CLP	300
	7/10/95	646	9.7	4480	9.7	7980	455	9.7	508	9.7	9.7	48.5	48.5				CLP	300
	6/20/94	6.0	4.5	5.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				CLP	3
	9/27/94	4.3	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6				CLP	3
Cadmium, Total	2/06/95	0.3	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4				CLP	3
	4/11/95	0.3	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4				CLP	3
	7/10/95	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5				CLP	3
	6/20/94	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	3
	9/27/94	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1
	2/06/95	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1
Mercury, Total	4/11/95	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1
	7/10/95	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1
	6/20/94	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1
	9/27/94	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1
	2/06/95	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1
	7/10/95	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1

Boundary Groundwater Monitoring Wells and Surface Water Sampling Locations

Parameter	Event	Results ug/(ppb)												MCL (ug/L)				
		MW-5	MW-7	MW-13	MW-14	MW-15	MW-16	MW-18	MW-18	S1	S2	S3	S4		S5	L1	Mt. Spring	Analysis Type
Barium, Total	6/20/94	-	439	54.2	18.4	94.9	66.8	73.6	133	755	266	94.1	197				CLP	2000
	9/27/94	-	698	59.7	17.4	79	70.6	78.7	-	-	-	-	-				CLP	2000
	2/06/95	710	743	79.4	16.3	82.3	72.5	67.9	86.8	350	235	82.5	472			5.3	CLP	2000
	4/11/95	591	426	54.4	16.4	78.4	70.3	83	7	-	-	-	-				CLP	2000
	7/10/95	700	-	116	19.3	73.6	67	90	502	592	277	861	310				CLP	2000
	6/20/94	-	15200	283	100	2110	78.6	24.4	11500	30800	8600	1040	26400				CLP	2000
Iron, Total	9/27/94	-	19200	430	3.8	354	117	12.2	-	-	-	-	-				CLP	300
	2/06/95	475	26400	2370	61.3	975	490	61.3	13200	42000	8790	3110	90300			31.4	CLP	300
	4/11/95	15.7	5180	131	40.8	490	331	40.8	19400	36100	3740	1290	87900				CLP	300
	7/10/95	9.7	-	3960	9.7	21.2	9.7	9.7	4.5	4.5	4.5	4.5	4.5				CLP	300
	6/20/94	-	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3				CLP	3
	9/27/94	-	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3				CLP	3
Cadmium, Total	2/06/95	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4				CLP	3
	4/11/95	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3				CLP	3
	7/10/95	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3				CLP	3
	6/20/94	-	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	3
	9/27/94	-	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1
	2/06/95	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1
Mercury, Total	4/11/95	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1
	7/10/95	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1
	6/20/94	-	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1
	9/27/94	-	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1
	2/06/95	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1
	4/11/95	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				CLP	1.1

Table 5C Notes:

- NCS Denotes North Carolina Groundwater Quality Standard (TI 5A: 02L .0200)
- MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)
- U Denotes not detected above Instrument Detection Limit (IDL) for Inorganics (CLP SOW only)
- J Denotes an estimated value
- * Denotes a Secondary Maximum Contaminant Level (SMCL) for Total Iron
- ** Denotes a proposed NCS
- Denotes Not Available or Not Sampled
- Standard parameter results that exceed U.S. EPA Maximum Contaminant Levels.
CLP analytical methods utilize relevant Atomic Adsorption technique and Inductively Coupled Plasma (ICP) method,
in accordance with EPA Contract Laboratory Program (CLP) Statement of Work ILMO 3.0 for metal analysis.

H/Eteam/6520-2/Tables2.xls

Table 6A
Cumulative Detected Non-Target Organic Parameter Analytical Results
Contract Laboratory Program (CLP) Statement of Work (SOW) - Organics

Parameter	Event	Results ug/L(ppb)																
		MW-1	MW-3	MW-4	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12	MW-17	S1	S2	NCS (ug/L)	MCL (ug/L)			
Acetone	6/20/94	61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/27/94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4/1/95	-	-	-	15	J	-	-	-	-	-	-	-	-	-	-	-	-
2-Butanone	9/27/94	-	-	-	19	-	-	-	-	-	-	-	-	-	-	-	-	-
	7/10/95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	4/1/95	-	-	2	J	-	-	-	-	-	-	-	-	-	-	-	-	-
	4/1/95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	4/1/95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2/6/95	-	-	-	-	1	J	-	-	-	-	-	-	-	-	-	-	-
2-methyl-2-pentanone	8/20/94	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8/20/94	2	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	8/20/94	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7/10/95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	8/20/94	2	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4/1/95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7/10/95	-	-	2	J	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylene (total)	8/20/94	84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/27/94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4/1/95	-	-	-	1	J	-	-	-	-	-	-	-	-	-	-	-	-
m/p Xylene	4/1/95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7/10/95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Tentatively Identified Compounds

Parameter	Event	Results ug/L(ppb)															
		MW-5	MW-9	MW-11	MW-16	MW-17	MW-18										
Hexane	4/1/95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4/1/95	-	200	NJ	7	NJ	-	-	-	-	-	-	-	-	-	-	
Dichlorodimethylmethane	4/1/95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4/1/95	-	-	6	NJ	-	-	-	-	-	-	-	-	-	-	-	
	4/1/95	-	-	9	NJ	-	-	-	-	-	-	-	-	-	-	-	
Unknown Alkane	4/1/95	-	-	6	NJ	-	-	-	-	-	-	-	-	-	-	-	
	4/1/95	-	-	12	NJ	-	-	-	-	-	-	-	-	-	-	-	
	4/1/95	-	-	28	NJ	-	-	-	-	-	-	-	-	-	-	-	
Unknown Cycloalkane	4/1/95	-	-	10	NJ	10	NJ	7	NJ	7	NJ	7	NJ	7	NJ	7	
	4/1/95	-	-	5	NJ	7	NJ	37	NJ	-	-	-	-	-	-	-	
	4/1/95	-	-	13	NJ	18	NJ	9	NJ	-	-	-	-	-	-	-	
Unknown Unsaturated Hydrocarbon	4/1/95	-	-	-	-	9	NJ	-	-	-	-	-	-	-	-	-	
	7/10/95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Unknown Ketone	4/1/95	50	NJ	-	-	6	NJ	-	-	-	-	-	-	-	-	-	

Notes:

- NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)
- MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)
- Denotes Not Detected
- J Denotes Not Available
- N Denotes an estimated value
- Organic parameters were analyzed in accordance with USEPA CLP SOW OLM01.9 (3/90).

Watauga County Landfill
 Watauga County, North Carolina
 Upgradient Well: MW-1
 11/27/95

Table 6B
 Cumulative Detected Non-Target Organic Parameter Analytical Results
 Low Level Risk Assessment (LLRA) Analytical Methods

Parameter	Event	Method	Results ug/L (ppb)															MCL (ug/L)						
			MW-3	MW-6	MW-7	MW-8	MW-9	MW-10	MW-12	MW-13	MW-14	MW-16	MW-17	MW-18	Tip	NCS (ug/L)								
1,2,3-Trichlorobenzene	6/20/94	8021	-	-	-	-	-	-	-	-	0.32	J	0.47	J	-	-	-	-	-	-	-	-	-	
1,4-Dichlorobenzene	7/10/95	8260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1,3,5-Trimethylbenzene	6/20/94	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Isopropylbenzene	6/20/94	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Propylbenzene	6/20/94	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorofluoromethane	6/20/94	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7/10/95	8260	1.1	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	6/20/94	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthylene	6/20/94	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	6/20/94	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2/6/95	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7/10/95	8260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1-trichloroethane	6/20/94	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6/20/94	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2/6/95	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7/10/95	8260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	6/20/94	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6/20/94	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2/6/95	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7/10/95	8260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloroethane	7/10/95	8260	1.8	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7/10/95	8021	1.8	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	2/6/95	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromomethane	2/6/95	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7/10/95	8260	2.4	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	2/6/95	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7/10/95	8260	1	J	1	1.6	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7/10/95	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Butanone	7/10/95	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7/10/95	8021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
 NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)
 MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)

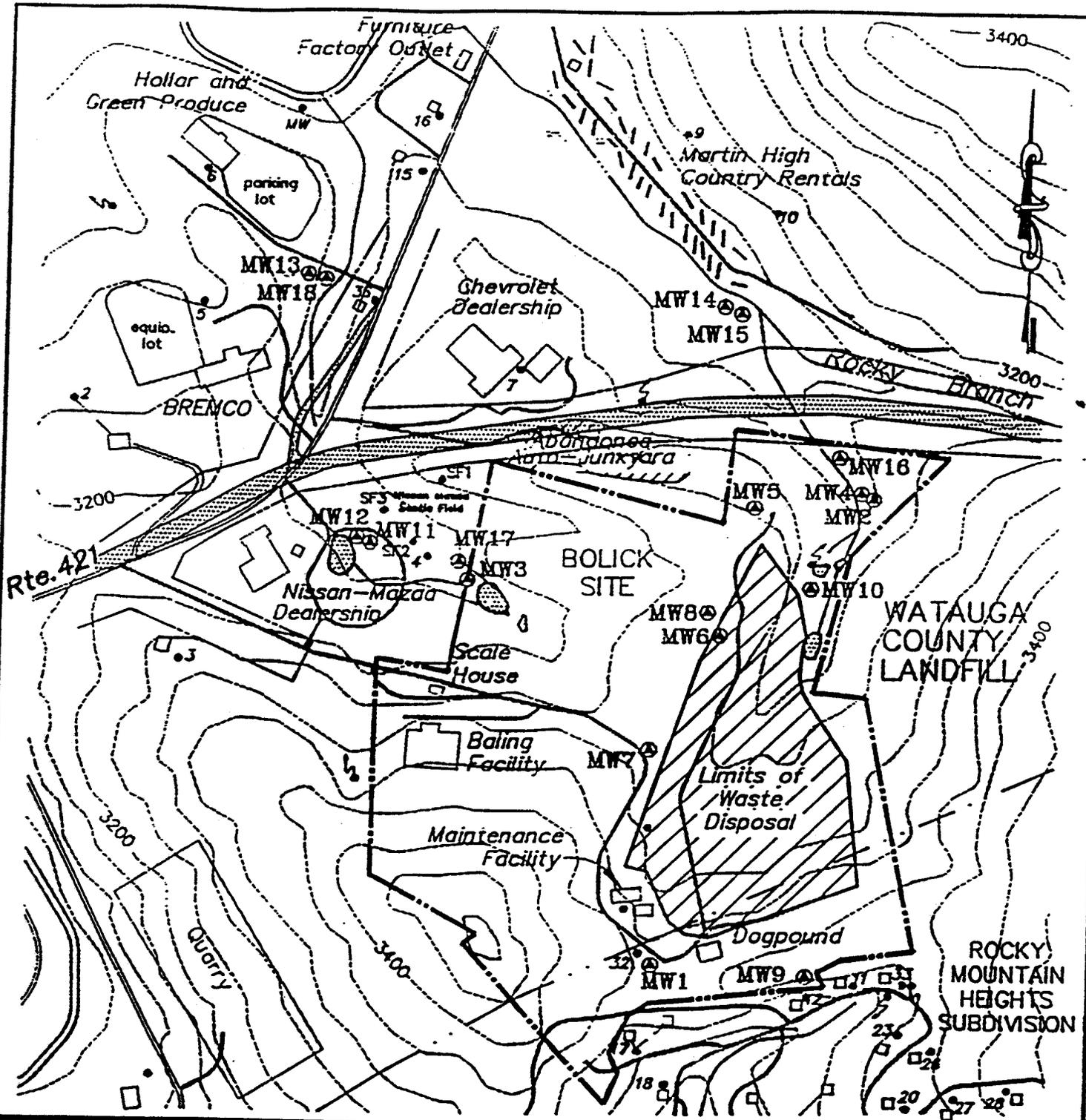
- Denotes not detected
- J Denotes an estimated value
- B Denotes present in blank
- Denotes Parameter results that meet or exceed U.S. EPA Maximum Contaminant Levels
- 1,1,1-trichloroethane + 1,1,2,2-tetrachloroethane + 1,1,2-trichloroethane + 1,2,3-trichlorobenzene + 1,2,4-trimethylbenzene + sec-butylbenzene

Watauga County Landfill
 Watauga County, North Carolina
 Upgradient Well: MW-1
 05/23/96

Table 6C
 First Semi-Annual Assessment Monitoring Event
 Non-Target Metal Parameter Analytical Results

Parameter	Event	Results ug/L(ppb)															NCS (ug/L)	MCL (ug/L)			
		MW-1	MW-2	MW-3	MW-4	MW-6	MW-8	MW-9	MW-10	MW-11	MW-12	MW-17									
Antimony	7/10/95	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	1.9	U	50	6
Arsenic	7/10/95	2.7	U	2.7	U	2.7	U	2.7	U	2.7	U	2.7	U	2.7	U	2.7	U	2.7	U	50	-
Beryllium	7/10/95	0.1	U*	0.1	U*	0.1	U*	0.1	U*	0.1	U*	0.1	U*	0.1	U*	0.1	U*	0.1	U*	50	4
Chromium	7/10/95	1.4	U	0.7	U	3.5	U	1.5	U	2.3	U	0.7	U	6.3	U	0.7	U	0.7	U	50	100
Cobalt	7/10/95	0.5	U*	0.5	U*	1.9	U	1.5	U	1.5	U	5.2	U	0.5	U	4.7	U	0.5	U	1000	-
Copper	7/10/95	0.5	U*	0.5	U*	6.1	U	0.5	U*	0.5	U	0.5	U*	0.5	U*	0.5	U*	0.5	U*	1000	1300
Cyanide	7/10/95	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	154	-
Lead	7/10/95	1.6	U	2	U	2	U	1.6	U	1.6	U	1.6	U	1.6	U	1.6	U	1.6	U	15	15
Nickel	7/10/95	2.4	U	2.4	U	2.4	U	2.4	U	2.9	U	2.4	U	5.4	U	2.4	U	2.4	U	100	100
Selenium	7/10/95	3.4	U	3.4	U	3.4	U	3.4	U	3.4	U	3.4	U	3.4	U	3.4	U	3.4	U	50	50
Silver	7/10/95	0.6	U	0.6	U	0.6	U	0.6	U	0.6	U	0.6	U	0.6	U	0.6	U	0.6	U	18	-
Tin	7/10/95	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	-	-
Thallium	7/10/95	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	-	-
Vanadium	7/10/95	1.5	U	10.6	U	1.3	U	0.74	U	3.8	U	1.9	U	2.0	U	0.6	U	0.78	U	0.88	U
Zinc	7/10/95	1.2	U*	1.2	U*	23.8	U	1.2	U*	1.2	U*	1.2	U*	1.2	U*	1.2	U*	1.2	U*	2100	-

Notes: NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)
 MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)
 U Denotes not detected above Instrument Detection Limit (IDL) for Inorganics (CLP SOW only)
 U* Denotes sample result is less than 5 times corresponding blank concentration (termed sample LOQ).
 J Denotes an estimated value
 - Denotes not available or not sampled
 UJ Denotes parameter results that exceed U.S. EPA Maximum Contaminant Levels.
 CLP analytical methods utilize relevant Atomic Adsorption technique and Inductively Coupled Plasma(ICP) method, in accordance with EPA Contract Laboratory Program (CLP) Statement of Work LMO 3.0 for metal analysis



——— 3200 ——— Existing Ground
 ——— Proposed Right-of-Way
 Proposed Road Improvements

PROPOSED ROUTE 421 BYPASS MAP

 Draper Aden Associates CONSULTING ENGINEERS <small>Shadensburg, Va. - Richmond, Va. - Nashville, Tenn.</small>	JOB No. 6520-14	DATE: 10 JUN 94	SCALE: 1"=600'±	FIGURE 2
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APPENDIX II

FIELD NOTES

STANDARD FIELD PROTOCOL - INITIAL ACTIVITIES

Project Watauga County Landfill Permit #95-02 Date 4/9/96
Sampling Sequence see below Weather/Temperature see notes
Samplers Jeff S. Pack / Curtis Farley
Static Water Level measurement equipment Solinst Water Level Probe
procedure inversion

Well evacuation equipment MW-7 - disposable bailer / all other wells: dedicated pump
procedure per GMP - based on aquifer recharge rates

Sample withdrawal equipment MW-7 (bailer) all other wells - dedicated pumps
procedure sample at rate > < 100 ml/minute

Sample filtration equipment none required
procedure

Types of sample containers and method of preservation used for
required analysis (in order of sequence of filling containers)

CLP volatiles: 40ml amber glass bottles / with HCl - pH 2
CLP metals: 1 L white plastic / with HNO₃ - pH 2

Internal temperature of shipping containers at outset of sampling
room temperature

Temperature equipment HANNA HI 9023 C meter
calibration procedure internal
measurement procedure immersion

pH equipment HANNA HI 9023 C meter
calibration procedure depending on well - 7/4 buffers or 7/10 buffers
measurement procedure immersion

Conductivity equipment Corning Checkmate meter
calibration procedure ambient air / 143 uS conductivity std.
measurement procedure immersion

Conductivity calibration measurements/time 0.00 (air) 1213 (std)

Sampler signatures (date/time) Jeff Pack 4/9/96 0945

Sampling sequence: MW-1, MW-6, MW-8, MW-3, MW-11 (4/9/96)
MW-7, MW-10, MW-17, MW-2, MW-9, MW-15, MW-2,
S-3, S-1, S-2, S-5, S-4, S-6
(did not sample MW-4, MW-5, MW-13, MW-14, MW-16, MW-18)

SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit No. 95-02

Well # MW-1

Date 4/2/96

Time 1345

Sampler's Initials JSP/CF

Condition of well/pad: good

pH Calibration: 7 and 4 Standard solutions

Meter Calibrated to pH 7.06 and 4.00

Reference Point - Top of Well Casing:

Depth To Water = DTW = 38.71 (in feet)
 Total Depth of well = TD = 76.65 (in feet)
 Water column length = $L_{(ft.)} = (TD-DTW)$ = 37.94 (in feet)
 Volume of water in well casing = $V_{(gal.)} = L_{(ft.)} * 0.163$ gal/ft. = 24.8 gal

Minimum Purge Volume (gallons) = $3 * V_c$

= 74.3 gal

Measurements collected during purging:

13:56 : Purge start time

Description of Initial Purge Water: (e.g. silty?) clear, no odor

#	Time	Temp. (C)	pH	mV	Specific Conductivity	Purge Rate(GPM) or # of bails	Estimated volume purged
1	13:58	11.6	6.42	22.5	103.0 μS	4 GPM	~ 8
2	14:02	11.6	6.22	31.5	101.1 μS	4 GPM	~ 24
3	14:08	11.5	6.24	31.5	97.5 μS	4 GPM	~ 48
4	14:15	11.4	6.22	32.1	94.3 μS	4 GPM	~ 76

14:19 : Dial down time

Reduced Flow Rate Time 19 min. for 15 sec/ft. of total well depth.

Total volume of water purged + 76 gallons

Description of final purge water (e.g. silty? NAPLs?) clear - no odor

Field pH Adjustments:

Total and Dissolved Metals: pH < 2	Acrylonitrile Adjustment: pH	Field VOA pH Blank: pH
2 ml of HNO_3 Preservative	# of drops of $NHCl$	# of drops of $NHCl$

Sample Collection Time 14:35

Misc. Field Observations None

Sampler signatures (date/time)

CGF J. Michael 4/2/96 14:35
4/2/96 14:35

SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit No. 95-02

Well # MW-2

Date 4/16/76

Time 1515

Sampler's Initials JSP/CF

Condition of well/pad: good

pH Calibration: 7 and 10 Standard solutions

Meter Calibrated to pH 7.06 and 10.12

Reference Point - Top of Well Casing:

Depth To Water = DTW

= 5.85 (in feet)

Total Depth of well = TD

= 177.50 (in feet)

Water column length = $L_{(ft.)} = (TD-DTW)$

= 171.65 (in feet)

Volume of water in well casing = $V_{(gal.)} = L_{(ft.)} * 0.163 \text{ gal/ft.}$

= 28 gal

Minimum Purge Volume (gallons) = $3 * V_c$

= 84 gallons

Measurements collected during purging:

1520 : Purge start time

Description of Initial Purge Water: (e.g. silty?) clear - no odor

#	Time	Temp. (C)	pH	mV	Specific Conductivity	Purge Rate(GPM) or # of bails	Estimated volume purged
1	1521	11.7	8.07	-49	266 μ S	4 gpm	4 gal
2	1525	12.1	8.08	-50	278 μ S	4 gpm	20 gal
3	1530	12.3	8.19	-56	267 μ S	4 gpm	40 gal
4	1535	11.8	8.19	-55	265 μ S	4 gpm	60 gal
5	1541	12.1	8.21	-57	262 μ S	4 gpm	84 gal

1541 : Dial down time

Reduced Flow Rate Time 45 min. for 15 sec/ft. of total well depth.

Total volume of water purged + 84 gallons

Description of final purge water (e.g. silty? NAPLs?) clear - no odor

Field pH Adjustments:

Total and Dissolved Metals: pH	Acrylonitrile Adjustment: pH	Field VOA pH Blank: pH
ml of Preservative	# of drops of N HCl	# of drops of N HCl

Sample Collection Time 1630

Misc. Field Observations CLP metals unpreserved - inadequate qty. of HNO₃ - will request lab to preserve

Sampler signatures (date/time) JSP 4/16/76 1630

SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit No. 95-02

Well # MW-3

Date 4/9/96

Time 1610

Sampler's Initials JSP/CF

Condition of well/pad: good

pH Calibration: 7 and 4 Standard solutions

Meter Calibrated to pH 7.04 and 4.00.

Reference Point - Top of Well Casing:

Depth To Water = DTW = 7.01 (in feet)

Total Depth of well = TD = 39.60 (in feet)

Water column length = $L_{(ft)} = (TD-DTW)$ = 32.6 (in feet)

Volume of water in well casing = $V_{(gal)} = L_{(ft)} * 0.163$ gal/ft. = 5.3 gal

Minimum Purge Volume (gallons) = $3 * V_c$ = 15.9 gal

Measurements collected during purging:

1606 : Purge start time

Description of Initial Purge Water: (e.g. silty?) slightly silty - no odor

#	Time	Temp. (C)	pH	mV	Specific Conductivity	Purge Rate(GPM) or # of bails	Estimated volume purged
1	1609	12.3	6.23	32.3	198.6 μS	2 GPM	~ 6 gal
2	1612	12.1	6.21	33.7	198.6 μS	2 GPM	~ 12 gal
3	1614	12.2	6.14	30.2	195.7 μS	2 GPM	~ 16 gal

1615 : Dial down time

Reduced Flow Rate Time 10 min. for 15 sec/ft. of total well depth.

Total volume of water purged + 16 gallons

Description of final purge water (e.g. silty? NAPLs?) slightly silty - no odor

Field pH Adjustments:

Total and Dissolved Metals: pH < 2	Acrylonitrile Adjustment: pH	Field VOA pH Blank: pH
ml of <u>HNO₃</u> Preservative	# of drops of <u>NHCl</u>	# of drops of <u>NHCl</u>

Sample Collection Time 1630

Misc. Field Observations None

Sampler signatures (date/time) JSP 4/9/96 1630

SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit No. 95-02

Well # MW-6

Date 4/9/96

Time 1445

Sampler's Initials JSP/CF

Condition of well/pad: good

pH Calibration: 7 and 4 Standard solutions

Meter Calibrated to pH 7.64 and 4.00

Reference Point - Top of Well Casing:

Depth To Water = DTW = 42.87' (in feet)
 Total Depth of well = TD = 58.00 (in feet)
 Water column length = $L_{(ft.)} = (TD-DTW)$ = 15.13 (in feet)
 Volume of water in well casing = $V_{(gal.)} = L_{(ft.)} * 0.163 \text{ gal/ft.}$ = 2.5 gal

Minimum Purge Volume (gallons) = $3 * V_c$

= 7.5 gal

Measurements collected during purging:

1452 : Purge start time

Description of Initial Purge Water: (e.g. silty?) clear - strong sulfur odor

#	Time	Temp. (C)	pH	mV	Specific Conductivity	Purge Rate(GPM) or # of bails	Estimated volume purged
1	1454	12.5	6.04	42.8	404	.56 gpm	1.0 gal
	1455						

well dry after 1.5 gallons

_____ : Dial down time

Reduced Flow Rate Time _____ min. for 15 sec/ft. of total well depth.

Total volume of water purged + 1.5 gallons

Description of final purge water (e.g. silty? NAPLs?) clear - strong sulfur odor

Field pH Adjustments:

Total and Dissolved Metals: pH < 2	Acrylonitrile Adjustment: pH	Field VOA pH Blank: pH
ml of HNO_3 Preservative	# of drops of $NHCl$	# of drops of $NHCl$

Sample Collection Time 1515

Misc. Field Observations none

Sampler signatures (date/time)

JSP/CF 4/9/96 1515

SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit No. 95-02

Well # MW-7

Date 4/9/96

Time 1130

Sampler's Initials JSP/CF

Condition of well/pad: Good

pH Calibration: 4 and 7 Standard solutions

Meter Calibrated to pH 7.06 and 4.00.

Reference Point - Top of Well Casing:

Depth To Water = DTW

= 44.32 (in feet)

Total Depth of well = TD

= 50.00 (in feet)

Water column length = $L_{(ft.)} = (TD-DTW)$

= 5.7 (in feet)

Volume of water in well casing = $V_{(gal.)} = L_{(ft.)} * 0.163 \text{ gal/ft.}$

= .93 gal

Minimum Purge Volume (gallons) = $3 * V_c$

= 3.0 gal

Measurements collected during purging:

1145 : Purge start time

Description of Initial Purge Water: (e.g. silty?) clear-no odor

#	Time	Temp. (C)	pH	mV	Specific Conductivity	Purge Rate(GPM) or # of bails	Estimated volume purged
1	1145	10.5	6.77	0.2	649 μ S	1 bail	.25 gal
2	1150	10.8	6.85	3.3	727 μ S	4 bails	1.0 gal
3	1153	11.1	6.81	1.2	818 μ S	8 bails	2.0 gal
4	1157	10.7	6.77	1.2	887 μ S	12 bails	3.0 gal
5	1201	10.9	6.78	1.1	571 μ S	12 bails	3.5 gal
			well dry			well dry	

—: Dial down time

Reduced Flow Rate Time — min. for 15 sec/ft. of total well depth.

Total volume of water purged 10 ± 3.5 gal

Description of final purge water (e.g. silty? NAPLs?) clear-no odor

Field pH Adjustments:

Total and Dissolved Metals: pH < 2	Acrylonitrile Adjustment: pH	Field VOA pH Blank: pH
2 ml of <u>4NO₂</u> Preservative	# of drops of <u>NHCl</u>	# of drops of <u>NHCl</u>

Sample Collection Time 0815 4/10/96

Misc. Field Observations none

Sampler signatures (date/time)

JSP 4/10/96 0815

SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit No. 95-02

Well # MW-8

Date 4-9-96

Time 15:20

Sampler's Initials JSP / CF

Condition of well/pad: Good

pH Calibration: 4 and 7 Standard solutions

Meter Calibrated to pH 4.00 and 7.00

Reference Point - Top of Well Casing:

Depth To Water = DTW = 16.80 (in feet)
 Total Depth of well = TD = 67.00 (in feet)
 Water column length = $L_{(ft)} = (TD-DTW)$ = 50.20 (in feet)
 Volume of water in well casing = $V_{(gal)} = L_{(ft)} * 0.163$ gal/ft. = 8.18 gal

Minimum Purge Volume (gallons) = $3 * V_c$

= 24.5

Measurements collected during purging:

15:23 : Purge start time

Description of Initial Purge Water: (e.g. silty?) clear, no odor

#	Time	Temp. (C)	pH	mV	Specific Conductivity	Purge Rate(GPM) or # of bails	Estimated volume purged
1	15:24	12.5	6.92	-6.4	684 μS	.75 GPM	.75 gal
2	15:30	12.9	6.70	5.3	546 μS	.75 GPM	~ 5 gal
3	15:36	13.3	6.72	3.8	563 μS	.75 GPM	~ 10 gal
	15:40	13.4	6.71				~ 12.75 gal

_____ : Dial down time

Reduced Flow Rate Time _____ min. for 15 sec/ft. of total well depth.

Total volume of water purged + 12.75 gal

Description of final purge water (e.g. silty? NAPLs?) clear - no odor

Field pH Adjustments:

Total and Dissolved Metals: pH < 2	Acrylonitrile Adjustment: pH	Field VOA pH Blank: pH
2 ml of <u>HNO₃</u> Preservative	# of drops of <u>NHCl</u>	# of drops of <u>NHCl</u>

Sample Collection Time _____

1600 4/9/96

Misc. Field Observations _____

Sampler signatures (date/time)

JSP 4/9/96 1600

SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit No. 95-02

Well # MW-9

Date 4/10/96 Time 1255 Sampler's Initials JSP/CF

Condition of well/pad: good

pH Calibration: 7 and 4 Standard solutions Meter Calibrated to pH 7.06 and 4.00

Reference Point - Top of Well Casing:

Depth To Water = DTW = 61.28 (in feet)
 Total Depth of well = TD = 86.40 (in feet)
 Water column length = $L_{(ft)} = (TD-DTW)$ = 25.12 (in feet)
 Volume of water in well casing = $V_{(gal.)} = L_{(ft)} * 0.163 \text{ gal/ft.}$ = 4.1 gal

Minimum Purge Volume (gallons) = $3 * V_c$ = 12.3 gal

Measurements collected during purging:

1303 : Purge start time Description of Initial Purge Water: (e.g. silty?) clear - no odor

#	Time	Temp. (C)	pH	mV	Specific Conductivity	Purge Rate(GPM) or # of bails	Estimated volume purged
1	1304	11.9	6.08	38.9	448 μS	1.0 gpm	1 gal
2	1307	12.9	6.14	36.8	431 μS	1.0 gpm	4 gal
3	1311	13.5	6.12	37.2	441 μS	1.0 gpm	8 gal
4	1316	14.0	6.09	38.8	429 μS	1.0 gpm	13 gal

1316 : Dial down time Reduced Flow Rate Time 22 min. for 15 sec/ft. of total well depth.

Total volume of water purged + 13 gallons

Description of final purge water (e.g. silty? NAPLs?) clear - no odor

Field pH Adjustments:

Total and Dissolved Metals: pH <u>< 2</u>	Acrylonitrile Adjustment: pH	Field VOA pH Blank: pH
ml of HNO_3 Preservative	# of drops of $NHCl$	# of drops of $NHCl$

Sample Collection Time 1340

Misc. Field Observations none

Sampler signatures (date/time) J. Spach 4/10/96 1340

SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit No. 95-02

Well # MW-10

Date 4/9/96

Time 12:10

Sampler's Initials JP/CF

Condition of well/pad: Good

pH Calibration: 7 and 10 Standard solutions

Meter Calibrated to pH 7.06 and 10.04.

Reference Point - Top of Well Casing:

Depth To Water = DTW

= 7.67 (in feet)

Total Depth of well = TD

= 70.03 (in feet)

Water column length = $L_{(ft.)} = (TD - DTW)$

= 62.36 (in feet)

Volume of water in well casing = $V_{(gal.)} = L_{(ft.)} * 0.163 \text{ gal/ft.}$

= 10.2 gal

Minimum Purge Volume (gallons) = $3 * V_c$

= 30.6 gal

Measurements collected during purging:

12:18 : Purge start time

Description of Initial Purge Water: (e.g. silty?) clear - strong sulfur odor

#	Time	Temp. (C)	pH	mV	Specific Conductivity	Purge Rate (GPM) or # of bails	Estimated volume purged	
1	12:19	10.3	7.32	-27	157.5 μ S	1.0 gpm	1 gal	
2	12:23	10.0	7.11	-17.9	127.3 μ S	1.0 gpm	5 gal	
3	12:28	10.8	7.11	-17.8	146.5 μ S	1.0 gpm	10 gal	
4	12:33	11.6	7.21	-23.3	213 μ S	1.0 gpm	15 gal	
	12:45	well air after 17 gallons purged						

_____ : Dial down time

Reduced Flow Rate Time _____ min. for 15 sec/ft. of total well depth.

Total volume of water purged 17 gallons

Description of final purge water (e.g. silty? NAPLs?) clear - sulfur odor

Field pH Adjustments:

Total and Dissolved Metals: pH < 2	Acrylonitrile Adjustment: pH	Field VOA pH Blank: pH
ml of HNO_3 Preservative	# of drops of N HCl	# of drops of N HCl

Sample Collection Time 0845 4/10/96

Misc. Field Observations none

Sampler signatures (date/time)

JP/CF 4/10/96 0845

SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit No. 95-02

Well # MW-11

Date 4/9/96

Time 16:35

Sampler's Initials JSP/CF

Condition of well/pad: good

pH Calibration: 4 and 7 Standard solutions

Meter Calibrated to pH 7.04 and 4.20.

Reference Point - Top of Well Casing:

Depth To Water = DTW = 12.73 (in feet)
 Total Depth of well = TD = 25.80 (in feet)
 Water column length = $L_{c(ft)} = (TD-DTW)$ = 13.07 (in feet)
 Volume of water in well casing = $V_{c(gal)} = L_{c(ft)} * 0.163$ gal/ft. = 2.1 gal

Minimum Purge Volume (gallons) = $3 * V_c$

= 6.3 gallons

Measurements collected during purging:

16:35 : Purge start time

Description of Initial Purge Water: (e.g. silty?) clear, no odor

#	Time	Temp. (C)	pH	mV	Specific Conductivity	Purge Rate(GPM) or # of bails	Estimated volume purged
1	16:36	10.2	6.96	24.6	280 μ S	2 GPM	~ 2 gal
2	16:38	10.4	6.33	26.1	291 μ S	2 GPM	~ 4 gal
3	16:39	10.5	6.30	27.5	295 μ S	2 GPM	~ 8 gal

16:40 : Dial down time

Reduced Flow Rate Time 7 min. for 15 sec/ft. of total well depth.

Total volume of water purged 7.8 gal

Description of final purge water (e.g. silty? NAPLs?) clear - no odor

Field pH Adjustments:

Total and Dissolved Metals: pH < 2	Acrylonitrile Adjustment: pH	Field VOA pH Blank: pH
ml of HNO_3 Preservative	# of drops of N HCl	# of drops of N HCl

Sample Collection Time 16:50

Misc. Field Observations none

Sampler signatures (date/time)

JSP 4/9/96 16:50

SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit No. 95-02

Well # MW-12

Date 4/10/96

Time 1025

Sampler's Initials JSP/CF

Condition of well/pad: good

pH Calibration: 7 and 4 Standard solutions

Meter Calibrated to pH 7.04 and 4.00

Reference Point - Top of Well Casing:

Depth To Water = DTW = 10.38 (in feet)

Total Depth of well = TD = 72.75 (in feet)

Water column length = $L_{(ft.)} = (TD-DTW)$ = 62.37 (in feet)

Volume of water in well casing = $V_{(gal.)} = L_{(ft.)} * 0.163 \text{ gal/ft.}$ = 10.17 gal

Minimum Purge Volume (gallons) = $3 * V_c$ = 30.51 gal

Measurements collected during purging:

10:37 : Purge start time

Description of Initial Purge Water: (e.g. silty?) clear, no odor

#	Time	Temp. (C)	pH	mV	Specific Conductivity	Purge Rate(GPM) or # of bails	Estimated volume purged
1	10:28	11.4	6.57	12.9	201 μS	2 GPM	~ 2 gal
2	10:32	11.5	6.50	15.9	208 μS	2 GPM	~ 10 gal
3	10:37	11.6	6.50	17	208 μS	2 GPM	~ 20 gal
4	10:42	11.6	6.49	16.7	206 μS	2 GPM	~ 30 gal

10:42 : Dial down time

Reduced Flow Rate Time 18 min. for 15 sec/ft. of total well depth.

Total volume of water purged + 30 gallons

Description of final purge water (e.g. silty? NAPLs?) clear - no odor

Field pH Adjustments:

Total and Dissolved Metals: pH < 2	Acrylonitrile Adjustment: pH	Field VOA pH Blank: pH
ml of HNO_3 Preservative	# of drops of $NHCl$	# of drops of $NHCl$

Sample Collection Time 1100

Misc. Field Observations none

Sampler signatures (date/time)

JSP 4/10/96 1100

SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit No. 95-02

Well # MW-15

Date 4-10-96

Time 1412

Sampler's Initials _____

Condition of well/pad: good

pH Calibration: 7 and 10 Standard solutions

Meter Calibrated to pH 7.06 and 10.25.

Reference Point - Top of Well Casing:

Depth To Water = DTW

= 11.85 (in feet)

Total Depth of well = TD

= 178.00 (in feet)

Water column length = $L_{(ft.)} = (TD - DTW)$

= 166.15 (in feet)

Volume of water in well casing = $V_{(gal.)} = L_{(ft.)} * 0.163 \text{ gal/ft.}$

= 27.08 gal

Minimum Purge Volume (gallons) = $3 * V_c$

= 81.24 gal

Measurements collected during purging:

14:21 : Purge start time

Description of Initial Purge Water: (e.g. silty?) clear, no odor

#	Time	Temp. (C)	pH	mV	Specific Conductivity	Purge Rate(GPM) or # of bails	Estimated volume purged
1	14:22	11.6	8.81	-88.6	146.9 μS	1.5 GPM	~ 1.5 gal
2	14:28	11.8	8.22	-56.4	145.2 μS	1.5 GPM	~ 10.5 gal
3	14:35	12.1	8.03	-46.8	144.2 μS	1.5 GPM	~ 21 gal
4	14:42	12.6	7.95	-42.8	136.7 μS	1.5 GPM	~ 31.5 gal
5	14:49	13.1	7.90	-40.2	144.5 μS	1.5 GPM	~ 42 gal
	14:50	well went dry					

_____ : Dial down time

Reduced Flow Rate Time _____ min. for 15 sec/ft. of total well depth.

Total volume of water purged 42 gallons

Description of final purge water (e.g. silty? NAPLs?) clear - no odor

Field pH Adjustments:

Total and Dissolved Metals: pH --	Acrylonitrile Adjustment: pH	Field VOA pH Blank: pH
ml of Preservative	# of drops of NHCl	# of drops of NHCl

Sample Collection Time 1510

Misc. Field Observations CLP metals unpreserved - out of HNO₃

Sampler signatures (date/time)

J. Mad 4/10/96 1510

SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit No. 95-02

Well # MW-17

Date 4/10/96

Time 0900

Sampler's Initials JSP/CF

Condition of well/pad: good

pH Calibration: 7 and 4 Standard solutions

Meter Calibrated to pH 7.08 and 4.00

Reference Point - Top of Well Casing:

Depth To Water = DTW = 17.78 (in feet)
 Total Depth of well = TD = 94.54 (in feet)
 Water column length = $L_{(ft)} = (TD - DTW)$ = 76.76 (in feet)
 Volume of water in well casing = $V_{(gal)} = L_{(ft)} * 0.163 \text{ gal/ft.}$ = 12.51

Minimum Purge Volume (gallons) = $3 * V_c$ = 37.53 gal

Measurements collected during purging:

0916 : Purge start time

Description of Initial Purge Water: (e.g. silty?) clear - no odor

#	Time	Temp. (C)	pH	mV	Specific Conductivity	Purge Rate(GPM) or # of bails	Estimated volume purged
1	0918	10.9	6.55	13.1	31145	1 gpm	1 gal
2	0929	12.1	6.78	3.9	29745	1 gpm	13 gal
3	0942	12.7	6.66	9.0	27945	1 gpm	26 gal
4	0954	12.9	6.40	22.2	26745	1 gpm	38 gal

0954 : Dial down time

Reduced Flow Rate Time 24 min. for 15 sec/ft. of total well depth.

Total volume of water purged +38 gallons

Description of final purge water (e.g. silty? NAPLs?) clear - no odor

Field pH Adjustments:

Total and Dissolved Metals: pH < 7	Acrylonitrile Adjustment: pH	Field VOA pH Blank: pH
ml of HNO_3 Preservative	# of drops of $NHCl$	# of drops of $NHCl$

Sample Collection Time 1020

Misc. Field Observations none

Sampler signatures (date/time)

J Mad 4/10/96 1020

STANDARD FIELD PROTOCOL - FINAL ACTIVITIES

Project: Watauga County Landfill Permit #95-02 Date: 4/11/96

Internal temperature of shipping containers at completion of sampling:
≈ 4°C

Sample destination Compu Chem Environmental Laboratory Corp.

Method of transportation Federal Express

Sampler signatures (date/time) [Signature] 4/11/96 1700

Book 3
ISP 4-15 6520-21 DATE 4/1/76

Walters Co LP
Site Semi-Annual Assessment Exhibit
RISP / CTF

Work Order Temp to 20'st. Windy
1st shift snow and snow
2045 arrived on site - met w/ JTB
will monitor minimum / O₂ levels
in replacement house (Remains
Residence)

000 Reports Residence
at 2045 - 0.07% O₂ 20.2 - 20.17% O₂
- cannot access basement - either
do not send keys to assembly
- should all accessible during
- in which the basement and
press. All readings from 100

110 417
R (P) 1 purchase 3.3
3 to 4th floor peak
3074 - 401 53
6.87% O₂ 55
Y (C) 2045 - 20.17% O₂

34 9.6 by 10. peak
2074 - 401 53
16 218 9.55
3574 - 401 53 peak
21 0.78 10.55
20.57 - 0.55

DAY 2 4/10/96

Washington Co. LF

Weather: temp. mid 20s, windy, cloudy

0800 MW-7

0815 sampled MW-7

0835 MW-10

0845 sampled MW-10

0900 MW-17 DTW 17.78

calibrated instruments (4/7 buffers)

0916 began purging at 1.0 gpm
water clear - no odor

0954 dialed down to $\leq 1.00 \text{ ml/min}$
water clear - no odor

1020 sampled MW-17

(0.070 LEL CH₄ - 20.590 O₂)

1025 MW-12 DTW 10.38

1027 began purging at 2 gpm
water clear - no odor

1042 dialed down to $\leq 1.00 \text{ ml/min}$
water clear - no odor

(0.070 LEL 20.590 O₂)

1100 sampled MW-12

1115 returned to office to ship samples

1125 MW-9 DTW 61.20

1203 began purging at 1.0 gpm
water clear - no odor

(0.1 LEL CH₄ - 20.590 O₂)

1312 MEDICAL STS to 210000 hours
300 sample lab MW-9

1345 MW-15 DTW 40.82
(not sampled)

1355 MW-15 DTW 41.56
(not sampled)

1358 MW-18 DTW 41.81
(not sampled)

1410 MW-14 DTW 42.07
(not sampled)

1412 MW-15 DTW 41.85
(not sampled)

1491 began purging at 1.0 gpm
water clear - no odor

1450 began purging at 2 gpm
water clear - no odor

1510 sample lab MW-15 (not sampled)
COP meter SW reserved - no odor
H2O3

1518 MW-12 DTW 58.55

1520 began purging at 4 gpm
water clear - no odor

1544 MW-14 DTW 59.07
(not sampled)

1536 MW-15 DTW 41.67
(not sampled)

1542 MEDICAL STS to 410000 hours

1548 sampled S-3 = methyl vinyl ether
1555 sampled S-1 = methyl vinyl ether
1610 sampled S-2 = methyl vinyl ether
1620 sampled S-5 = methyl vinyl ether

1630 sampled MW-2

metals unpreserved

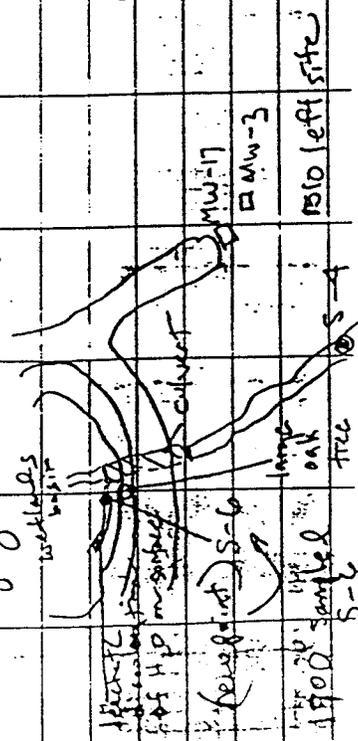
(0.070 LEL 20.5700)

Notes

Standing water near S-5, S-2, S1 show discoloration by petroleum products on the surface. Grease discoloration on rocks/organic material at drain pipes at S-2. Heavy iron discoloration on surfaces of banks/rocks through the entire course of the stream.

1640 sampled S-4

1645 investigated sampling location for S-6. No flow in wetlands basin. Will sample near culvert which empties into wetlands basin just after going under the road.



Dioxin UN 651010

Wichita Co. LP

Beatty Field (Ft. Base) Green Bay, Wis. 2002

ORAS samples at site

Use Station: 5000 - 1000 mg/L 2003

Use with the Dioxin/PCDD

Standard will require a method of retention

Separate from Spent Chlorinated Hydrocarbons

ORAS samples: Signaling basis for

TPB (Total Petroleum Hydrocarbons)

TPH (Total Petroleum Hydrocarbons)

APPENDIX III

**Previous Landfill Groundwater Organic Analysis
Summary Table**

WATAUGA COUNTY LANDFILL GROUNDWATER
ORGANIC CONSTITUENTS DETECTED

December 11, 1990, November 16-18, 1992 and March 3, 1993 SAMPLING EVENTS

Analyte	Date Sampled	Analytical Method	MDL	MW-1	MW-2	MW-3	MW-4	PZ-24	NCS	MCL	TRIP
Trichloroethene (TCE)	December 11, 1990	SW846 Method 8240	5			9		---	2.8	5	
	November 16-18, 1992	SW846 Method 8010	1			23		110	2.8	5	
1,1,1-Trichloroethane	March 5, 1993	EPA Method 502.2	0.2	0.4	2.4	18.1	0.7		2.8	5	
	March 5, 1993	SW846 Method 8021	0.2		2.1	15.7	0.8	79.5	2.8	5	
	December 11, 1990	SW846 Method 8240	5		394	102			200	200	
	November 16-18, 1992	SW846 Method 8010	1		980	68	6		200	200	
tetrachloroethene (PCE)	March 5, 1993	EPA Method 502.2	0.4		1646	19.0	10.5		200	200	
	March 5, 1993	SW846 Method 8021	0.4		1212	19.0	22.5	1.4	200	200	
	December 11, 1990	SW846 Method 8240	5		7	25			0.7	5	
	November 16-18, 1992	SW846 Method 8010	1		5	39		4	0.7	5	
1,1-Dichloroethane (1,1-DCE)	March 5, 1993	EPA Method 502.2	0.5	0.5	11.2		1.6		0.7	5	
	March 5, 1993	SW846 Method 8021	0.5		11.8	24.9	1.6	12.5	0.7	5	
	December 11, 1990	SW846 Method 8240	5		52	178			700 ¹	---	
	November 16-18, 1992	SW846 Method 8010	1		41	250		81	700 ¹	---	
1,1-Dichloroethene (1,1-DCE)	March 5, 1993	EPA Method 502.2	0.7		96	173.3	1.2	77	700 ¹	---	
	March 5, 1993	SW846 Method 8021	0.7		82	161	1.1	43.7	700 ¹	---	
	December 11, 1990	SW846 Method 8240	5		80	7			7	7	
	November 16-18, 1992	SW846 Method 8010	1		110	14			7	7	
1,1,2-Dichloroethane (1,1,2-DCE)	March 5, 1993	EPA Method 502.2	0.7		232	10.3	5.1	0.9	7	7	
	March 5, 1993	SW846 Method 8021 and *(8240)	0.7 *(0.3)		143.6	9	4.5	*	7	7	
1,1,2-Dichloroethane (1,1,2-DCE)	March 5, 1993	EPA Method 502.2	0.7	0.7	1.4	36.4		225	70	70	
	March 5, 1993	SW846 Method 8021 and *(8240)	0.7 *(0.7)		1	26.6	*	87.8	70	70	

Note: All Concentrations are in ppb (ug/L) (other footnotes located on page 4)

WATAUGA COUNTY LANDFILL GROUNDWATER
 ORGANIC CONSTITUENTS DETECTED

DECEMBER 11, 1990, NOVEMBER 16-18, 1992 AND MARCH 5, 1993 SAMPLING EVENTS

Analyte	Date Sampled	Analytical Method	MDL	MW-1	MW-2	MW-3	MW-4	PZ-24	NCS	MCL	TRIP
Methylene Chloride	December 11, 1990	SW846 Method 8240	5			23		---	5	5	
	November 16-18, 1992	SW846 Method 8010	1			16		15	5	5	
	March 5, 1993	EPA Method 502.2	0.6		4.2	9.4			5	5	
	March 5, 1993	SW846 Method 8021	0.6						5	5	
Vinyl Chloride	December 11, 1990	SW846 Method 8240	10					---	.015	2	
	November 16-18, 1992	SW846 Method 8010	1			3		12	.015	2	
	March 5, 1993	EPA Method 502.2	0.4			3.4		18.3	.015	2	2.6
	March 5, 1993	SW846 Method 8021 and *(8240)	0.4 *(1.0)			*		*	.015	2	
Dichlorodifluoromethane	December 11, 1990	SW846 8240	5			21		---	0.19	---	
	November 16-18, 1992	SW846 Method 8010	1						0.19	---	
	March 5, 1993	EPA Method 502.2	0.8			11.8		6.9	0.19	---	
	March 5, 1993	SW846 Method 8021 and *(8240)	0.8 *(0.8)			*			0.19	---	
Chloroethane	December 11, 1990	SW846 Method 8240	10					---	---	---	
	November 16-18, 1992	SW846 8010	1			5		8	---	---	
	March 5, 1993	EPA Method 502.2	1.4		2.6				---	---	
	March 5, 1993	SW846 method 8021 and *(8240)	1.4 *(10)			*		*	---	---	
trans-1,3-Dichloropropene	December 11, 1990	SW846 Method 8240	5			9-J		---	70	100	
	November 16-18, 1992	SW846 Method 8010	1					3	70	100	
	March 5, 1993	EPA Method 502.2	0.7			0.9		5.5	70	100	
	March 5, 1993	SW846 Method 8021 and *(8240)	0.7 *(0.7)			*			70	100	

Note: All Concentrations are in ppb (ug/L.) (other footnotes located on page 4)

DECEMBER 11, 1990, NOVEMBER 16-18, 1992 AND MARCH 5, 1993 SAMPLING EVENTS

Analyte	Date Sampled	Analytical Method	MDL	MW-1	MW-2	MW-3	MW-4	PZ-24	NCS	MCL	TRIP
Benzene	December 11, 1990	SW846 Method 8240	5					---	1.0	5	
	March 5, 1993	EPA Method 502.2	0.1			1.5	0.5	6.3	1.0	5	
	March 5, 1993	SW846 Method 8021	0.1			1.3		6.3	1.0	5	
1,4-Dichlorobenzene	November 15-18, 1992	SW846 Method 8010	0.3			0.5			0.19	75	
	March 5, 1993	EPA Method 502.2	0.5		0.8				1.8	75	
	March 5, 1993	SW846 Method 8021	0.5						1.8	75	
Chloroform	December 11, 1990	SW846 Method 8240	5					---	0.19	100	
	November 16-18, 1992	SW846 Method 8010	1				2	1	0.19	100	3
	March 5, 1993	EPA Method 502.2	0.3						0.19	100	
	March 5, 1993	SW846 Method 8021	0.3			0.5			0.19	100	
2-Dichloropropane	December 11, 1990	SW846 Method 8240	5					---	0.56	5	
	November 16-18, 1992	SW846 Method 8010	1						0.56	5	
	March 5, 1993	EPA Method 502.2	0.3		0.3				0.56	5	
	March 5, 1993	SW846 Method 8021 and *(8240)	0.3 *(0.3)			*	*	*	0.56	5	
2-Dichloropropane	March 5, 1993	EPA Method 502.2	0.7	0.7	1.4				---	---	
	March 5, 1993	SW846 Method 8021 and *(8240)	0.7 *(0.7)		*	*	*	*	---	---	
1-Dichloropropene	March 5, 1993	SW846 Method 8240	0.5	3.8					---	---	
is(2-ethylhexyl)phthalate	March 5, 1993	SW846 Method 8270	2		20				---	---	
Ylenes, Total	March 5, 1993	SW846 Method 8021	0.4						---	---	
4'-DDD	March 5, 1993	SW846 Method 8080	0.1					0.1	0.4	10	

Note: All Concentrations are in ppb (ug/L) (other footnotes located on page 4)

WATAUGA COUNTY LANDFILL GROUNDWATER
 ORGANIC CONSTITUENTS DETECTED

DECEMBER 11, 1990, NOVEMBER 16-18, 1992 AND MARCH 5, 1993 SAMPLING EVENTS

Analyte	Date Sampled	Analytical Method	MDL	MW-1	MW-2	MW-3	MW-4	PZ-24	NCS	MCL	TRIP
Bromodichloromethane	December 11, 1990	SW846 Method 8240	5					---	---	100	
	November 16-18, 1992	SW846 Method 8010	1						---	100	
	March 5, 1993	EPA Method 502.2	0.3		0.6				---	100	
Carbon Tetrachloride	December 11, 1990	SW846 Method 8240	5						---	100	
	November 16-18, 1992	SW846 Method 8010	1					---	0.3	5	
	March 5, 1993	EPA Method 502.2	0.1						0.3	5	
	March 5, 1993	SW846 Method 8021	0.1			0.2	0.2	0.3	0.3	5	
	March 5, 1993	SW846 Method 8021	0.3						0.3	5	
1,2-Dichloroethane	December 11, 1990	SW846 Method 8240	5						0.38	5	
	November 16-18, 1992	SW846 Method 8010	1					---	0.38	5	
	March 5, 1993	EPA Method 502.2	0.3		0.3				0.38	5	
	March 5, 1993	SW846 Method 8021 and *(8240)	0.3 *(0.3)		*	*	*	*	0.38	5	

A SW-846 Methods 8011, 8030, 8040, 8090, 8120, 8150, and 8310 were Also Performed on Samples Collected on March 5, 1993, Resulting in No Analytes Detected.

- DL Analytical Method Detection Limit
- S North Carolina Water Quality Standard (DEHNR: 15A NCAC 2L .0202)
- PL EPA Primary Drinking Water Standard Maximum Contaminant Level

ember 11, 1990 Sampling Event - Conducted by Engineering Tectonics and split-sampled with the NCDEHNR Solid Waste Section - Analysis performed by the North Carolina State Laboratory of Public Health.
 vember 16-18, 1993 and March 5, 1993 Sampling Event - Conducted by Draper Aden Associates - Analysis performed by Central Virginia Laboratories and Consultants, Inc. (CVLC).
 A Metho 502.2 Co-elutes compounds cis-1,2-Dichloroethene and 2,2-Dichloropropane

notes estimated result
 notes proposed NCS
 notes *(method) utilized and analyte not detected

2: All Concentrations are in ppb (µg/L)

APPENDIX IV

Potable Well Organic Analysis Summary Table

Drawing Under Seperate Cover