

Carmen Johnson
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VOLUME I OF II

**Groundwater and Surface Water
Assessment Monitoring Results Report
Initial Background Data Set
Third Quarter 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

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DAA Job No. 6520-20

August 3, 1995

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August 4, 1995

Mr. Mark Poindexter
Hydrogeologist
Solid Waste Section
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P.O. Box 27687
Raleigh, N.C. 27611-7687

Re: Watauga County Landfill, Third Quarter Assessment Monitoring Background Report,
DAA JN 6520-20

Dear Mr. Poindexter:

Please find enclosed a copy of the third quarter background data set report for Assessment Monitoring at the Watauga County Landfill, for your review. The enclosed report presents the findings of the third background Assessment Monitoring groundwater and surface water sampling event conducted on February 6-10, 1995 by Draper Aden Associates.

Volume I of the report discusses sampling procedures, analytical results, and overall conclusions of the first and second quarter event. Volume II, comprised of two separately bound sections contains copies of all associated laboratory data. Volume II also contains Data Validation Forms summarizing the guidelines and results of data validation procedures utilized for evaluating the data discussed in this report.

The enclosed third Quarter Assessment Monitoring Background Report will be available to the public on August 11, 1995.

The fourth quarter Assessment Monitoring sampling event was conducted on April 11-13, 1995 and the first Semi-annual Assessment (5th Assessment event) was conducted on July 10-13, 1995. Draper Aden Associates will prepare and submit a Quarterly Assessment Report for the fourth and fifth event upon receipt and review of the analytical data.

Mr. Mark Poindexter
August 4, 1995
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If you should have any questions concerning the enclosed report or the third assessment groundwater and surface water sampling event, please do not hesitate to contact me.

Sincerely,
Draper Aden Associates

A handwritten signature in cursive script, appearing to read "J. E. Smith for".

Jeffrey E. Smith
Project Geologist

JSP/mf

cc: Mr. James S. Ratchford, Watauga County Manager
Mr. Richard M. DiSalvo, Jr., P.E., Director of Engineering Services, DAA
Mr. Justin E. Babendreier, Environmental Project Manager, DAA
Mr. Matt H. Stolte, Watauga County Project Coordinator, DAA

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I. Introduction

This report presents the results of the third quarter background 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 February 6-10, 1995 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. 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 third Assessment background 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 preliminary data validation procedures utilized for evaluating the data discussed in this report.

A. 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.

The decision criteria utilized for the selection of core assessment wells is the exceedance of the groundwater protection standard for an individual parameter. The groundwater protection standard is based on an individual parameter's North Carolina Groundwater Quality Standard (NCS) or EPA Maximum Contaminant Level (MCL).

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 wells. The presence of target parameters above the analytical method limit of detection shall be evaluated with respect to repeated sampling events prior to confirmation.

Eleven (11) of the eighteen (18) groundwater monitoring wells were recently 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 on the decision criteria and 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 decision criteria and the analytical data obtained from the first quarter background event, the assessment monitoring well network was restratified for the second quarter background monitoring event. Revisions to the network of core and boundary assessment wells resulted in the upgrading of six of the eleven recently installed monitoring wells to "core" status (MW-8, MW-9, MW-10, MW-11, MW-12, and MW-17). The analytical data obtained from the second quarter background event did not result in any further restratification of the monitoring well network.

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

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

As outlined in the Assessment Monitoring schedule (Table 1, Appendix 1), core assessment wells were analyzed using EPA Contract Laboratory Program (CLP) statements of work and boundary assessment wells were analyzed using Low Level Risk Assessment (LLRA) screening methods (ie: EPA SW-846 Method 8021) for the third quarter assessment background monitoring event.

In addition to the eighteen (18) groundwater monitoring wells comprising the Watauga County Landfill's assessment monitoring well network, three monitoring wells installed in October, 1988 to monitor to Boone Nissan-Mazda dealership's septic field (ie: SFW-1, SFW-2 and SFW-3) were also sampled during the third quarter background monitoring event. The septic system monitoring wells were analyzed using CLP statements of work.

B. 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. Four (4) 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 and 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.

In addition to the five 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 third quarter background event to verify the presence or absence of leachate production. Observations resulting from the inspection is documented in the field notes (Appendix II).

A leachate sample (L1) was collected from surface flow observed approximately 15 feet west of MW-10, located downgradient and below all the sanitary and debris waste disposal areas. Leachate was also observed and sampled at this location during the second sampling event. The leachate was observed to be flowing very slowly and described as odorless, with an oily sheen.

No other leachate production was observed during the third quarter background sampling event.

C. Sampling and Analysis Schedule

Groundwater

During the first year of Assessment groundwater monitoring, four (4) quarterly background sampling events will be conducted on each groundwater monitoring well. Semi-annual sampling events will be conducted after the first year. The groundwater assessment monitoring schedule is outlined in Table 1.

The analytical scans performed on each monitoring well during the first year of assessment groundwater monitoring are designed to analyze for all the target parameters detected and tentatively confirmed as a result of the first 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 NCAC 13B Section .1600). A summary and evaluation of the results 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).

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Sub 'D' unit.*

After completion of the four (4) quarterly Assessment background groundwater monitoring events and on an annual basis thereafter, the complete EPA Appendix II analysis will be repeated on the network of core assessment wells. If any additional parameters are detected, and verified through QA/QC validation as being present, that were not identified in prior Assessment monitoring events, amendments to the existing target parameter list will be evaluated and reviewed with the NCDEHNR. 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 and boundary assessment wells to establish background.

Groundwater monitoring events will also continue to be conducted on all 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 preliminarily identify low levels of parameters that may be present. The groundwater analysis schedule, indicating methods designated for the core and boundary wells, is outlined in Table 1.

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

After the first year of quarterly sampling events, the core assessment monitoring wells will be monitored on a semi-annual basis. The first semi-annual core sampling event will analyze 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. The second semi-annual core sampling event will analyze for the target assessment monitoring parameters using CLP-SOWs.

After the first year of quarterly sampling events, boundary assessment wells will also be monitored on a semi-annual basis for the target assessment monitoring parameters. Analysis of semi-annual boundary well monitoring events will continue to alternate between CLP and LLRA methods for each semi-annual event.

Surface Water

Surface water and leachate monitoring is 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 annual comprehensive Appendix II analysis. The surface water assessment monitoring schedule 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.

A. 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 from the February 6-10, 1995 sampling event. All non-dedicated equipment was decontaminated between sampling of each monitoring well.

Due to slow recharge and/or the absence of dedicated pumps, individual, disposable bailers were used to purge and collect groundwater samples from two of the assessment monitoring wells (ie: MW-5 and MW-7) and the three septic system monitoring wells (ie: SFW-1, SFW-2, and SFW-3) located around the Boone Nissan-Mazda dealership's septic field.

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 was 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 nearby wells during the recent February sampling event is presented on the enclosed Groundwater and Surface Water Monitoring Program Site Map (Figure 1, Appendix I).

B. Field Meter Calibration

Measurements of pH and Specific Conductivity were analyzed at each well by completing multiple measurements in the field during groundwater purging. 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.

C. Quality Control Blank Samples

Due to the use of dedicated purging and sampling equipment, 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.

D. 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.

E. Chain of Custody Documentation

Chain of Custody documentation and analysis requests are contained within each laboratory report for each event. 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 were also attached along with the COC forms. Analysis request forms included lists of parameters and respective required analytical methods. 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

A. List of Laboratories

Volatile analysis and Total Metal analysis by EPA Contract Laboratory Program (CLP) statements of work (SOW) were performed by Compuchem Environmental Corporation of Research Triangle Park, North Carolina. Volatile analysis by EPA SW-846 Method 8021 was performed by CT&E Environmental Services Inc., located in Charleston, West Virginia.

B. 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.

All LLRA analytical techniques (SW-846) used were in accordance with the procedures listed in the US EPA document Test Methods for Evaluating Solid Waste - Physical/Chemical Methods, SW-846 (latest edition).

C. 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 - 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 - 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 - The degree to which a sample represents the character of the population being measured. Representativeness is controlled by defining sample collection protocols and adhering to them throughout the evaluation.
- Completeness - The ratio of validated data points to the total samples collected. Completeness is achieved through duplicate sampling and resampling, when necessary.

- Comparability - 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. The SW-846 methods are utilized to generate organic data for risk assessment to preliminarily identify low levels of analytes that may be present. Estimated results less the Contract Required Detection Limit (CRDL) for organics, are similarly 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 third quarter background assessment monitoring event are provided in Tables 2 and 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. Analytical Quality Control procedures for LLRA analytical techniques are detailed in the SW-846 Method description. 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
- blanks
- duplicates
- surrogate parameters
- instrument adjustment
- calibration
- additional QC requirements (organic and inorganic)
- quantification
- raw data
- chromatograms

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). LLRA analyses for organic parameters were performed in adherence to relevant SW-846 method requirements and guidance. 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.

A. 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.

B. 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.

C. Inorganic Data Review

Inorganic analyses for this Assessment monitoring event involved analyses for Barium, Cadmium, Iron and Mercury. All inorganic analyses for this monitoring event was performed by Compuchem Environmental Corporation, RTP, North Carolina. Analysis was performed on groundwater samples from monitoring wells MW1 through MW18. In addition, analyses were also performed on a leachate sample labelled L1, five surface water samples labelled S1, S2, S3, S4 and S5 and three Septic Field samples labelled SFW1, SFW2 and SFW3, which brings the total number of samples to twenty seven. Due to the large number of field samples involved, samples were initially divided into three sample delivery groups, as indicated below.

- DAASDG#1 (Compuchem SDG#0731M) - MW1 MW2, MW3, MW4, MW6, MW8, MW10, MW11 and MW17
- DAASDG#2 (Compuchem SDG#0732M) - MW5, MW7, MW9, MW12, MW13, MW14, MW15, MW16 and MW18
- DAASDG#3 (Compuchem SDG#0733) - L1, S1, S2, S3, S4, S5, SFW1, SFW2 and SFW3

Due to a sample handling discrepancy upon receipt of samples at the laboratory, samples labelled MW5D, MW9D and MW1 were analyzed in separate batches. Samples MW5D and MW9D (designated duplicates for DAASDG#2) were analyzed under Compuchem SDG#0732MA. Sample MW1 was also analyzed separately, under Compuchem SDG#0731MA. Furthermore, certain reporting discrepancies associated with the data package for some of the Compuchem SDG groups were noted during review of the data packages, which are further detailed in Section 3.2 (Revisions to Data Package), Volume II of this report.

Inductively Coupled Plasma (ICP) and Cold Vapor Atomic Absorption analysis were the major techniques on which the individual analytical methods for each of the metals were based. All the above target metals were analyzed for their total concentrations.

The results of this data validation presented here are based upon a review of numerous QA/QC information as well as method performance criteria information including but not limited to, holding times, preservation procedures and standards, spike analysis on sample matrix (including pre- and post-digestion spikes), laboratory control samples, blank samples analyses (method, trip, equipment, calibration and other blanks), duplicate sample analyses,

duplicate spike analyses, replicate results information, dilution losses verification results, interference check sample results, and other relevant information.

ICP - Method 6010A Inorganics Data Review

ICP analyses (SW846 method 6010A) was performed on all samples, for Barium, Iron and Cadmium. A brief discussion of the results of validation of ICP data is presented in the following paragraphs. Trip Blank 1 was received at the laboratory with a pH of 7, so additional acid was added to bring the pH to <2. Qualification of sample results based on this discrepancy was deemed unnecessary.

All holding times, instrument calibration criteria and matrix spike recoveries met the required criteria. Barium and Cadmium were detected in some of the blanks. Barium was detected in calibration Blanks and Trip blanks but at very low concentrations (0.33 $\mu\text{g/L}$ to 2.6 $\mu\text{g/L}$). Sample concentrations of Barium were sufficiently high and were deemed unaffected by these blank concentrations, and hence, no validation of results based on observed blank concentrations was required. Cadmium was also reported in the Calibration blanks at low concentrations. However, the concentration of Cadmium in all samples was below the sample LOD, such that no qualification was necessary based on the concentrations detected in calibration blanks.

Several problems, attributed to certain reporting or sample preparation errors, were associated with the duplicate analysis. Duplicate samples associated with Compuchem SDG#0733 for Iron and Barium were outside the control range. Hence, all results from this sample analysis batch were validated as estimated "J". Compuchem SDG#0731M and SDG#0731MA were within control limits for duplicate analysis. For Compuchem SDG#0732M, the results for duplicate analysis performed within this batch were outside the control range limits. However, the original designated duplicate samples, MW-5D and MW-9D, which were analyzed separately under SDG #0732MA, had excellent agreement with the results of MW5 and MW9 from SDG#0732M. This is a clear indication that the observed RPD of $\approx 25\%$ for duplicate analysis of Iron and Barium (analyzed in Compuchem SDG#0732M) is associated with error in the prepared sample duplicate, MW-5D, instead of being associated with any inconsistencies in the batch analysis process. Therefore, the sample results from SDG#0732M were accepted without qualification. Documentation to this effect from Compuchem was provided following DAA's inquiry into this issue and is contained in Section 3.2, Volume II of this report.

Results for the serial dilution analysis for samples from Compuchem SDG#0731M, 0731MA and 0732MA were within the control limits. Serial dilution results for Barium and Iron for Compuchem SDG#0733 and for Iron for Compuchem#0732M were outside the control limits. Therefore, results for these analytes for these two data packages will be validated as estimated "J".

All other analysis criteria were met. All sample results were recorded as reported by the laboratory or, if the detected value was less than the detection limit, validated and reported as "U".

Atomic Absorption - Cold Vapor - Mercury analysis

Cold Vapor Atomic Absorption was used to measure Mercury in all samples. A brief discussion of the results of validation of the Atomic Absorption data is presented in the following paragraph. Trip Blank 1 was received at the laboratory with a pH of 7, so additional acid was added to bring the pH to <2. Qualification of sample results based on this discrepancy was deemed unnecessary.

All holding times, instrument calibration criteria, duplicate analyses, serial dilution results and blank sample analyses met the required criteria. All blanks were free of interferences. All matrix spike analyses met the required criteria for SDG#00731M, 0731MA, 0732MA and 0733. The matrix spike recovery for Mercury for SDG#0732M was just slightly below the control limits (74%). However, a comprehensive view of all relevant QC data indicates sample results to be acceptable as "U".

All other analysis criteria were met. All sample results were recorded as reported by the laboratory or, if the detected value was less than the detection limit, validated and reported as "U".

ii. **Organic Data Review (CLP and LLRA)**

Organic data review was conducted for the following 12 target organic parameters:

- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- 1,1-Dichloroethene (1,1-DCE)
- Methylene Chloride
- Dichlorodifluoromethane
- 1,1,1-Trichloroethane (1,1,1-TCA)
- cis-1,1-Dichloroethene (cis-1,2-DCE) (analyzed as total 1,2-DCE)
- Benzene
- 1,1-Dichloroethane (1,1-DCA)
- Chloroethane
- trans-1,3-Dichloropropane^e
- Vinyl Chloride

Additional non-target analytes were analyzed by the CLP-SOW for organic analysis and method 8021 and were preliminarily validated. Detected non-target analytes are presented in Tables 3A and 3B.

Organic target analytes were analyzed in accordance with USEPA CLP-SOW OLM01.9 (3/90) for samples collected from the landfill core monitoring wells, MW-1, MW-2, MW-3, MW-4, MW-6, MW-8, MW-9, MW-10, MW-11, MW-12, and MW-17, the Boone Nissan-Mazda septic field wells, SF1, SF2, and SF3, leachate, L1, and surface water sampling locations S1 through S5. Organic target analytes for risk assessment purposes were analyzed using USEPA SW-846 method 8021 and are associated with samples collected from boundary monitoring wells MW-5, MW-7, MW-13, MW-14, MW-15, MW-16, and MW-18.

CLP-SOW analytical data for the target analytes was accompanied by an Quality Assurance/Quality Control package compiled and produced by CompuChem Environmental Corporation, RTP, North Carolina. USEPA SW-846 method 8021 analytical data for the target analytes was accompanied by a Quality Assurance/Quality Control package compiled and produced by CT&E Environmental Services, Inc. of Charleston, WV. The packages contained instrument calibration internal standard results, raw data from all analyses and accompanying chromatographic and spectral results. Draper Aden Associates reviewed the volatile organic packages presented by CompuChem Environmental Corporation and CT&E Environmental Services, Inc. by reviewing technical holding times, preservation requirements, performance checks, initial calibrations, continuing calibrations, blank analyses, surrogate spike results, matrix spike and duplicate analyses, and internal standard criteria.

USEPA CLP SOW OLM01.9 (3/90)

Organic data review was conducted on a total of 34 volatile organic analytes (CLP SOW VOA list and Dichlorodifluoromethane) analyzed using CLP Statement of Work (3/90) OLM01.9. The data package submitted by CompuChem Environmental Corporation contained three separate data sets, as detailed previously for the inorganic data validation review.

The analytical data set prepared by CompuChem was accompanied by a CLP Quality Assurance/Quality Control (QA/QC) package containing instrument calibration and internal standard results, raw data from all analyses and accompanying chromatographic and spectral results. Draper Aden Associates reviewed the volatile organic packages presented by CompuChem by reviewing technical holding times, preservation requirements, performance checks, initial calibrations, continuing calibrations, blank analyses, surrogate spike results, matrix spike and duplicate analyses, and internal standard criteria. The review of this data package is considered preliminary, and does not account for data transcription errors, calculation errors.

Analytical data was qualified by DAA using the known national data qualification symbols presented in Section IV.

A brief summary of data validation results is presented below. Detailed data validation notes are presented in Section 2, Volume II of this report.

SDG #0731M

Samples for data set SDG #0731M were analyzed by CompuChem Environmental Corporation according to 3/90 Statement of Work (SOW) (document OLM01.9) protocol on February 15, 1995 for volatile contaminants. Dilutions were required for samples MW-2 (1/15), MW-6 (1/2.5 dil) and MW-10 (1/5 dil) in order to quantitate target parameters within the linear range of the calibration curve. Samples which were diluted have elevated levels of quantitation correlating with the required dilution factor.

The overall degree of adherence to technical and reporting protocol was excellent. Analytical data prepared by CompuChem for these samples displayed a few minor concerns and required minimal qualification. The %Deviation of Acetone, 2-Butanone and 2-Hexanone exceeded CLP performance criteria in continuing calibrations CS-A56 and CS B56. Results for these compounds in MW-2, MW-6, MW-7 and MW-10 are validated as estimated and flagged (J). Neither, Acetone, 2-Butanone, or 2-Hexanone were detected in any of the analyses associated with this Sample Delivery Group, therefore sample results were not negatively affected.

There was minimal Methylene chloride contamination in Trip Blank 1, at 2 ug/L, and also in the Method Blank (VBLKVN), at 2 ug/L, analyzed on February 15, 1995. CompuChem reported Methylene chloride at low levels in several samples which is considered laboratory contamination and was validated accordingly.

All holding times, sample preservation, instrument tuning, surrogate spike recoveries, matrix spike/matrix spike duplicate, and calibration requirements were met.

SDG #0733

Samples for data set SDG #0733 were analyzed by CompuChem Environmental Corporation according to 3/90 Statement of Work (SOW) (document OLM01.9) protocol on February 15th and 16th, 1995.

The overall degree of adherence to technical and report protocol was excellent. Analytical data prepared by CompuChem for these samples displayed a few minor concerns and required minimal qualification. The %Relative Standard Deviation (%RSD) for Acetone in the initial calibration, associated with all samples, was 38.6%. If the RRF from the 10 ug/L standard is eliminated the %RSD drops to 12.6%. Any positive Acetone results less than 20 ug/L would have been estimated and flagged with (J). Acetone was not detected in this sample delivery group.

Samples were analyzed against continuing calibration standards on 2/15/95 and 2/16/95. On 2/15/95 CCAL CS950215B56.D was acquired and used to quantitate VBLKJD, TRIPBLK3, S1, S2, S3, S4, S5, SFW1, SFW2, SFW3, SFW1 MS, and SFW1 MSD. On 2/16/95 CCAL CS950216A56.D was acquired and used to quantitate VBLKML and L1. All CCAL contractual requirements were fulfilled on 2/15/95 and also on 2/16/95. Several compounds exceeded data validation criteria, %Deviation (%D) \pm 25%, as listed below.

2/15/95 CCAL

Acetone %D 40.7
2-Butanone %D 39.9
2-Hexanone %D 29.9

2/16/95 CCAL

2-Butanone %D 36.6

None of these compounds were detected in any of the associated samples, therefore there is no negative effect to, or required qualification of the data.

All blank analyses were free from contamination except VBLKML analyzed on 2/16/95 and associated with sample L1. VBLKML contained 1 ug/L of Methylene Chloride, this is a very low level of a common laboratory contaminant.

The %Recovery (%R) of 1,1 Dichloroethene was high in both the MS and MSD at 156% and 157%. An investigation into these outlier values is described in the Validation Data Review forms-Section G comments. No qualification was required as a result of these outlier %R values and since this compound was not present in any of the samples there is no negative affect to the data.

SDG #0732M

Samples for data set SDG #0732M were analyzed by CompuChem Environmental Corporation according to 3/90 Statement of Work (SOW) (document 0LM01.9) protocol on February 16, 1995.

The overall degree of adherence to technical and reporting protocol was excellent. Analytical data prepared by CompuChem for these samples displayed a few minor concerns and required minimal qualification. The %Relative Standard Deviation (%RSD) for Acetone in the initial calibration was 38.6%. When the low point (10 ug/L) in the calibration curve is eliminated the %RSD drops to 12.6%. The percent deviation for 2-Butanone in the continuing calibration was 36.6%. Neither Acetone or 2-Butanone were detected in any of the analyses associated with this Sample Delivery Group, therefore sample results were not negatively affected. If Acetone or 2-Butanone had been detected in these samples, those values may have required qualification as estimated depending on the concentration detected.

There was minimal Methylene chloride contamination in Trip Blank 2, at 2 ug/L, and also in the Method Blank (VBLKML), at 1 ug/L, analyzed on February 16, 1995. CompuChem reported Methylene chloride at 3 ug/L in MW-12 which is probably laboratory contamination. Methylene chloride was also reported in MW-9 at 93 ug/L, and although this value is flagged with B (also detected in the method blank) on the Form 1, it is highly unlikely that this value is a result of laboratory contamination, since it is substantially greater than five times the level detected in the blank.

USEPA SW-846 Method #8021

Data validation was done on laboratory analytical results generated from method 8021, for the February 6-10, 1995, third Assessment Monitoring event at the Watauga County Landfill. USEPA SW-846 method 8021 was prescribed to analyze for twelve specified parameters; benzene, chloroethane, 1,1,-dichloroethane, 1,1,-dichloroethene, cis-1,2-dichloroethene, trans-1,3-dichloropropene, dichlorodifluoromethane, methylene chloride, tetrachloroethene, 1,1,1-trichloroethane, trichloroethene, and vinyl chloride.. Ground water samples were collected from monitoring wells MW-5, MW-7, MW-13, MW-14, MW-15, MW-16, and MW-18.

GC analyses were performed by CT&E Environmental Services Inc. of Charleston, WV. CT&E analyzed for the aforementioned parameters following the prescribed GC method. The certificate of analysis prepared by CT&E laboratory included: extraction notes, instrument calibration data, raw chromatographic data printouts, Quality Assurance/Quality Control documentation, and tabulated results.

Validation of the laboratory's compliance with GC method 8021 encompassed review of the following items: sample holding times, sample preservation requirements, sample extraction procedures, laboratory QA/QC performance checks, instrument calibrations, blank analyses, surrogate spike analyses, and matrix spike analyses. Review of transcriptions from raw data to summary sheets and specific calculations were performed on random data points.

Overall the data set for method 8021 was complete in its presentation and data was of acceptable quality. The data set exhibited the analyst's ability to achieve the reported LOQ of 1.0 $\mu\text{g/l}$ for the target parameters, with the first nonzero calibration standard at a concentration of 2.0 $\mu\text{g/l}$. Criteria for sample preservation, storage temperature, and holding times were met. Method retention time criteria were met. Surrogate recoveries for all samples were within laboratory control limits of $100 \pm 20\%$. Blank analysis criteria were met and no target parameters were identified above the LOQs in the trip or laboratory control blanks. Trichloroethene and tetrachloroethene were detected in the laboratory control blanks and the trip blank. The sample LOQs for the aforementioned target parameters were raised to 2.0 $\mu\text{g/l}$ and 2.5 $\mu\text{g/l}$, respectively in accordance with standard CLP validation protocol. This documentation procedure was followed to denote the possibility that concentrations of trichloroethene and tetrachloroethene detected in the monitoring wells were due to an exterior source and not representative of groundwater quality. Matrix spikes were performed and no

indication of matrix interference was observed for the target parameters. The matrix spike and spike duplicate analyses exhibited acceptable recoveries of $100 \pm 20\%$. Target parameters were detected in MW-7 and MW-15, above the respective LOQs, and required no additional validation qualifiers. No target parameters were identified above the LOQs in the remaining wells, (MW-5, MW-13, MW-16, and MW-18). Results for target parameters not detected above the LOQs in the samples were validated as "U".

V. DISCUSSION OF ANALYTICAL RESULTS

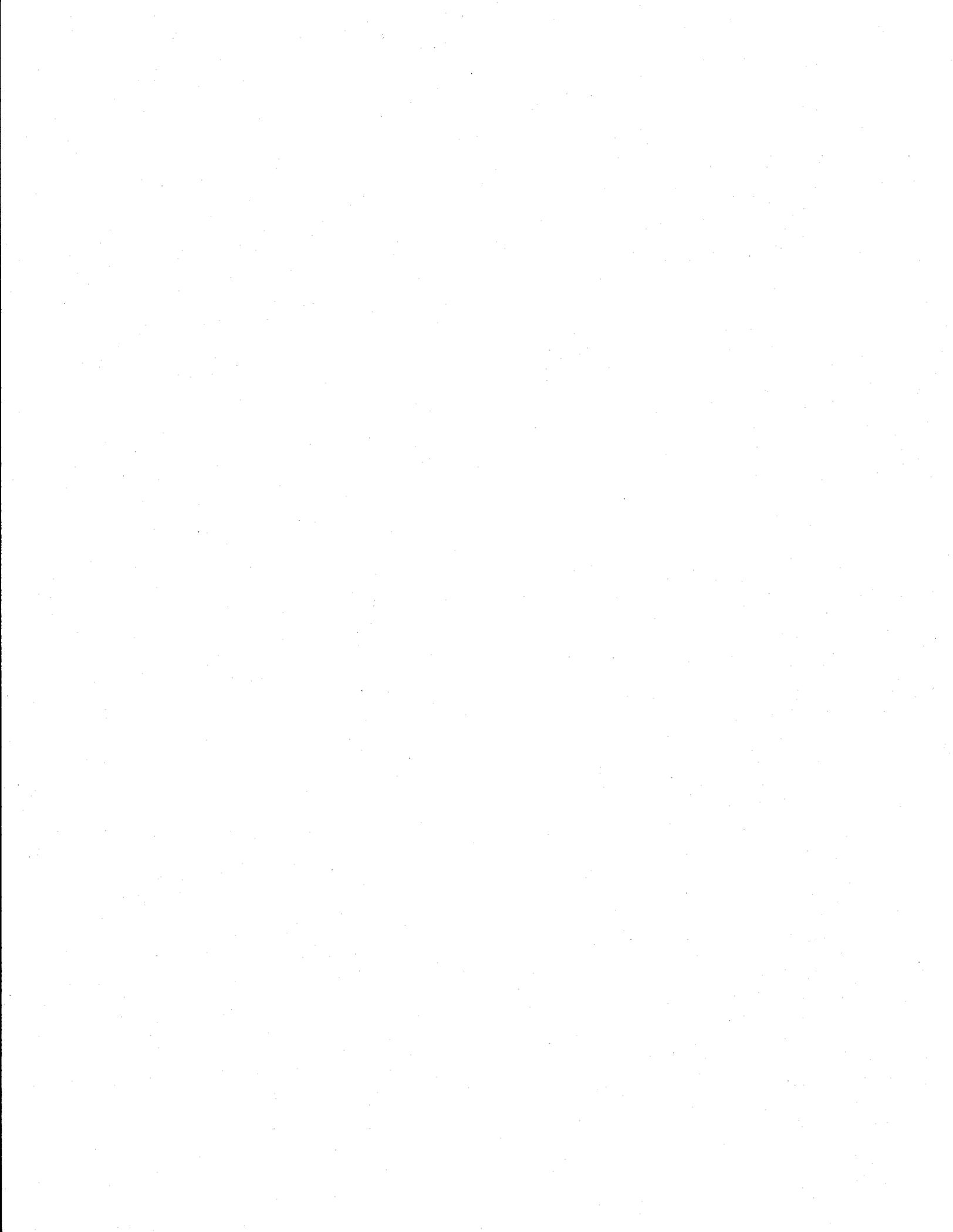
Tables 2A, 2B, and 2C (Assessment Target Parameter Analytical Results; Appendix I) provide a summary of the target parameter analytical results obtained from the third quarter background sampling event for the core monitoring wells, boundary monitoring wells, and surface water sampling locations and septic field wells respectively. These results were validated in-house by Draper Aden Associates according to the discussion provided in Section IV of this report. Tables 2A, 2B, and 2C 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 Detection Limit (CRQL) for CLP-Organic results, the Limit of Quantitation (LOQ) for LLRA-Organic results, and the analytical method.

Estimated analytical results for the target parameters are provided in Tables 2A, 2B, and 2C 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 third quarter background sampling event is provided in tables 3A and 3B, respectively. Due to the absence of associated quality control information necessary for proper data validation, non-target parameter data is provided for preliminary assessment purpose only and is not intended for use in determining regulatory compliance issues.

A. 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.





Draper Aden Associates

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February 9, 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,
revised pages to Third Quarter Assessment Monitoring Background Report,
DAA Job No. 6520-20

Dear Mr. Poindexter:

Please find enclosed two revised pages to the Third Quarter Assessment Monitoring Background Report for the Watauga County Landfill (original dated August 3, 1995), for your review. The necessary revisions were noted in recent review comments, prepared by Mr. Lou Zeller of the Blue Ridge Environmental Defense League (BREDL), dated January 26, 1996.

The review comments provided by BREDL discuss the Assessment Monitoring results obtained for monitoring well MW-15, as presented in the third Background Assessment Monitoring Results Report. Draper Aden Associates review of the analytical results tables provided in Appendix I of the report, as well as review of the data validation notes and raw analytical data, reveal that the statements included on pages 22 and 29 of the August 3, 1995 report, regarding Tetrachloroethene (PCE) and Trichloroethene (TCE), are incorrect. PCE and TCE were not detected in MW-15. Enclosed are the revised pages of the report as appropriate.

Mr. Mark Poindexter
February 9, 1996
Page 2

If you should have any questions concerning the enclosed revised pages to the Third Quarter Assessment Monitoring Background Report, please do not hesitate to contact me.

Sincerely,
DRAPER ADEN ASSOCIATES

A handwritten signature in black ink, appearing to read 'JES', with a long horizontal stroke extending to the right.

Jeffrey E. Smith
Project Geologist

JES/rc

cc: Mr. James S. Ratchford, Watauga County Manager, w/enclosure
Mr. William G. Ross Jr., Attorney,
Brooks, Pierce, McLandin, Humphrey, and Leonard, L.L.P, w/enclosure
Mr. Richard M. DiSalvo, Jr., P.E., Principal, DAA, w/enclosure
Mr. William D. Newcomb, P.G., Groundwater Project Manager, DAA, w/enclosure

monitoring wells (MW-3, MW-6, MW-8, MW-12, and MW-17), ~~one boundary monitoring well (MW-15)~~, and at one surface water sampling location (S-4). Estimated concentrations for PCE (detected below the method CRQL) were also observed at or above the EPA MCL and above the NCS in four additional core groundwater monitoring wells (MW-2, MW-9, MW-10, and MW-11) and two Boone Nissan-Mazda septic field wells (SFW-2 and SFW-3). PCE was not detected in any of the boundary monitoring wells or the leachate sample.

Trichloroethene (TCE)

Trichloroethene (TCE) was detected above the method CRQL at concentrations above the EPA MCL of 5 µg/l and above the NCS of 2.8 µg/l in five core groundwater monitoring wells (MW-3, MW-6, MW-8, MW-12, and MW-17). An estimated concentration for TCE (detected below the method CRQL) was also observed above the EPA MCL and NCS in one additional core groundwater monitoring well (MW-9) and one surface water sampling location (S-4). TCE was estimated (detected below the method CRQL) at concentrations below the EPA MCL but above the NCS in one additional core groundwater monitoring well (MW-11) ~~and one boundary monitoring well (MW-15)~~. TCE was also estimated at concentrations below both the EPA MCL and the NCS in two Boone Nissan-Mazda septic field wells (SFW-2 and SFW-3). TCE was not detected in any of the boundary monitoring wells or the leachate sample.

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

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

Methylene Chloride

Methylene Chloride were observed above the EPA MCL and NCS of 5 µg/l in one core groundwater monitoring well (MW-9) and below the EPA MCL and NCS in one boundary monitoring well (MW-7). Estimated concentrations for Methylene Chloride (detected below the CRQL) were observed below the EPA MCL and NCS in three surface water sampling locations (S-2, S-3, and S-4) and two septic field walls (SFW-1 and SFW-3).

Dichlorodifluoromethane

Dichlorodifluoromethane was observed at concentrations above the North Carolina groundwater standard (NCS) of 0.19 µg/l in three core groundwater monitoring wells (MW-8,

The analytical results for the four target metal parameters obtained from the third quarter assessment sampling event are summarized in Tables 2A, 2B, and 2C and discussed below. A discussion of parameter distribution trends for each target parameter is presented in the following Section VI.

Barium and Iron, both common naturally occurring parameters, were detected in all monitoring wells, surface water sampling locations, and the leachate samples. Although observed in all of the sampling points, Barium was detected at levels below the EPA MCL and North Carolina groundwater standard of 2,000 $\mu\text{g}/\text{l}$ in all samples except the leachate samples. Iron was also detected above the IDL in all the sampling points, and often at levels significantly above associated water quality criteria. No Federal Primary Drinking Water Standard (EPA MCL) exists for Iron.

Review of Tables 2A, 2B, and 2C indicates the third quarter total Mercury and total Cadmium CLP analysis resulted in the non-detection of Mercury and Cadmium in all eighteen (18) monitoring wells sampled, as well as the surface water sampling locations and the leachate sample.

The detection of Cadmium as a result of the first quarter sampling event, although estimated at levels above water quality standards, was observed in only two monitoring wells, MW-1 (the upgradient well) and MW-3 (an original downgradient well), and at no surface water sampling locations. The apparent discrepancy in the first quarter background Cadmium detections may be a result of sample matrix interference problems experienced by the laboratory during analysis of the first quarter samples.

B. 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 analytical results for the target organic parameters obtained from the third quarter assessment background sampling event are summarized in Tables 2A and 2B. 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.

Tetrachloroethene (PCE)

Tetrachloroethene (PCE) was detected at concentrations above the EPA MCL of 5 $\mu\text{g}/\text{l}$ and above the North Carolina groundwater standard (NCS) of 0.7 $\mu\text{g}/\text{l}$ in five core groundwater monitoring wells (MW-3, MW-6, MW-8, MW-12, and MW-17), ~~one boundary monitoring well (MW-15)~~; and at one surface water sampling location (S-4). Estimated

concentrations for PCE (detected below the method CRQL) were also observed at or above the EPA MCL and above the NCS in four additional core groundwater monitoring wells (MW-2, MW-9, MW-10, and MW-11) and two Boone Nissan-Mazda septic field wells (SFW-2 and SFW-3). PCE was not detected in any of the boundary monitoring wells or the leachate sample.

Trichloroethene (TCE)

Trichloroethene (TCE) was detected above the method CRQL at concentrations above the EPA MCL of 5 $\mu\text{g/l}$ and above the NCS of 2.8 $\mu\text{g/l}$ in five core groundwater monitoring wells (MW-3, MW-6, MW-8, MW-12, and MW-17). An estimated concentration for TCE (detected below the method CRQL) was also observed above the EPA MCL and NCS in one additional core groundwater monitoring well (MW-9) and one surface water sampling location (S-4). TCE was estimated (detected below the method CRQL) at concentrations below the EPA MCL but above the NCS in one additional core groundwater monitoring well (MW-11) and one boundary monitoring well (MW-15). TCE was also estimated at concentrations below both the EPA MCL and the NCS in two Boone Nissan-Mazda septic field wells (SFW-2 and SFW-3). TCE was not detected in the leachate sample.

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

1,1-Dichloroethene (1,1-DCE) was detected above the method CRQL at concentrations above the EPA MCL and NCS of 7 $\mu\text{g/l}$ in two core groundwater monitoring wells (MW-2 and MW-10). 1,1-DCE was also estimated (observed below the method CRQL) at concentrations below applicable water quality standards in four additional core wells (MW-3, MW-8, MW-12, and MW-17). 1,1-DCE was not detected in any of the boundary monitoring wells, septic field wells or the leachate sample.

Methylene Chloride

Methylene Chloride were observed above the EPA MCL and NCS of 5 $\mu\text{g/l}$ in one core groundwater monitoring well (MW-9) and below the EPA MCL and NCS in one boundary monitoring well (MW-7). Estimated concentrations for Methylene Chloride (detected below the CRQL) were observed below the EPA MCL and NCS in three surface water sampling locations (S-2, S-3, and S-4) and two septic field walls (SFW-1 and SFW-3).

Dichlorodifluoromethane

Dichlorodifluoromethane was observed at concentrations above the North Carolina groundwater standard (NCS) of 0.19 $\mu\text{g/l}$ in three core groundwater monitoring wells (MW-8, MW-9, and MW-17). An estimated concentration for Dichlorodifluoromethane (detected below the method CRQL) was observed at concentrations above the NCS in one additional core groundwater monitoring well (MW-11). No EPA MCL exists for Dichlorodifluoromethane.

Dichlorodifluoromethane was not detected in any of the boundary monitoring wells, septic field wells, or the leachate sample.

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

1,1,1-Trichloroethane (1,1,1-TCA) was detected above the method CRQL at concentrations above the EPA MCL and North Carolina groundwater standard (NCS) of 200 $\mu\text{g}/\text{l}$ in two core monitoring wells (MW-2 and MW-10). 1,1,1-TCA was also detected above the method CRQL, but below the EPA MCL and below the NCS, in four core monitoring wells (MW-3, MW-9, MW-12, and MW-17). Estimated concentrations of 1,1,1-TCA (below the CRQL) were also observed below the EPA MCL and NCS in two additional core groundwater monitoring wells (MW-8 and MW-11), one surface water sampling location (S-4), two septic field wells (SFW-2 and SFW-3), and one boundary groundwater monitoring well (MW-15).

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

As previously discussed in Section IV, 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 above the method CRQL at concentrations above the EPA MCL and North Carolina groundwater standard (NCS) of 70 $\mu\text{g}/\text{l}$ in three core groundwater monitoring wells (MW-6, MW-8, and MW-17). Total 1,2-DCE was also detected above the method CRQL, but below the EPA MCL and below the NCS, in two additional core groundwater monitoring wells (MW-3 and MW-12), and one surface water sampling location (S-4). Estimated concentrations for total 1,2-DCE were observed below the EPA MCL and NCS in two core groundwater monitoring wells (MW-9 and MW-11) and two septic field wells (SFW-2 and SFW-3).

Cis-1,2-Dichloroethene (cis-1,2-DCE) was detected at concentrations above the method LOQ but below the EPA MCL and NCS in one boundary monitoring well (MW-7).

Benzene

No concentrations of Benzene above the method CRQL were observed in any monitoring wells or surface water sampling locations. Estimated concentrations of Benzene (detected below the method CRQL) were observed between the EPA MCL of 5 $\mu\text{g}/\text{l}$ and the NCS of 1 $\mu\text{g}/\text{l}$ in four core groundwater monitoring wells (MW-3, MW-6, MW-8 and MW-9). Benzene was also detected below the method CRQL (estimated) below the EPA MCL but above the NCS in two additional core groundwater monitoring wells (MW-3 and MW-9) and one boundary monitoring well (MW-7).

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 eight core groundwater monitoring wells (MW-2, MW-3, MW-6, MW-8, MW-9, MW-11, MW-12 and MW-17), one additional boundary monitoring well (MW-7), and one surface water sampling location (S-4). No EPA MCL exists for 1,1-DCA. Estimated concentrations of 1,1-DCA were also observed below the NCS in one additional core well (MW-10) and two septic field wells (SFW-2 and SFW-3).

Chloroethane

Chloroethane was detected at concentrations above the method CRQL in one core groundwater monitoring well (MW-9), one surface water sampling location (S-2), and the leachate sample (L1) and above the method LOQ in one boundary monitoring well (MW-7). Estimated concentrations of Chloroethane (detected below the method CRQL) were also observed in five additional core wells (MW-3, MW-6, MW-8, MW-12 and MW-17) and two surface water sampling locations (S-4 and S-5). No EPA MCL or North Carolina groundwater standard (NCS) exists for Chloroethane.

trans-1,3-Dichloropropene

Trans-1,3-Dichloropropene was not detected above or estimated below the method CRQL in any monitoring wells or surface water sampling locations.

Vinyl Chloride

Vinyl Chloride was detected above the Method LOQ at a concentration above the EPA MCL and NCS in one boundary monitoring well (MW-7).

Vinyl Chloride was not detected above the method CRQL in any core monitoring well or surface water sampling location, but was estimated (detected below the CRQL) at a concentration at or above the EPA MCL of 2 $\mu\text{g/l}$ and above the North Carolina groundwater standard (NCS) of 0.015 $\mu\text{g/l}$ in three core groundwater monitoring wells (MW-3, MW-6 and MW-8) and one surface water sampling location (S-4).

ii. Non-Target Organic Compounds

The analytical results of additional non-target organic parameters detected as a result of utilizing USEPA CLP SOW OLMO1.9 (3/90) are summarized in Table 3. The analytical results obtained for non-target parameters, are provided to preliminarily identify those parameters which may need to be continually monitored. If upon completion of background 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 in three core monitoring wells and two boundary monitoring wells. The CLP analysis (core wells) identified one additional non-target parameter (1,2-Dichloropropane) and the LLRA analysis (boundary wells) identified five additional non-target parameters (trans-1,2-Dichloroethene, Bromomethane, 1,2-Dichloropropane, Toluene, O-Xylene, and Dibromochloromethane). Four of the five total non-target parameters were observed in the same monitoring well, MW-7.

As indicated in Table 6A (Cumulative Detected Non-target Parameter Analytical Results), the presence of most of the non-target compounds detected in the second background sampling event are not confirmed by the non-target analytical results obtained from the first, as well as the recent third background sampling event. Confirmation of the presence or absence of these non-target parameters and tentatively identified compounds detected in the background sampling events will continue be evaluated on following monitoring events.

VI. PARAMETER DISTRIBUTION TRENDS

A. Inorganic Analytical Results

Mercury (total)

The presence of Mercury in the groundwater and surface waters at the site is not supported by the analytical results of the first, second, or third quarter assessment background monitoring event. No concentrations of Mercury were observed above the IDL of 0.20 $\mu\text{g/l}$. If Mercury is confirmed to be absent upon completion of background data collection and the first complete annual EPA Appendix II List sampling event (utilizing LLRA analytical methods), it will be removed from the Target Parameter List.

Cadmium (total)

The presence of Cadmium in the groundwater and surface waters at the site is not supported by the analytical results of the second or third quarter assessment background monitoring event. No concentrations of Cadmium were observed above the IDL of 4.3 $\mu\text{g/l}$. If Cadmium is confirmed to be absent upon completion of background data collection and the first complete annual EPA Appendix II List sampling event (utilizing LLRA analytical methods), it will be removed from the Target Parameter List.

Barium (total)

Barium distribution trends, indicated by the analytical results of the third quarter assessment monitoring event, suggest a relationship between Barium distribution and proximity to the waste disposal areas. Although Barium was detected at every point sampled, a majority of the Barium detected at the site was reported at concentrations less than 120 $\mu\text{g/l}$. All concentrations for Barium detected at the site except for the leachate sample were below the EPA MCL and the NCS for Barium of 2000 $\mu\text{g/l}$.

Barium was observed above 120 $\mu\text{g/l}$ in seven monitoring wells. In three of the seven monitoring wells located near the waste disposal area (MW-5, MW-7, and MW-9), Barium was observed at concentrations above 500 $\mu\text{g/l}$. Barium was also observed at elevated levels above 120 $\mu\text{g/l}$ for MW-6 (418 $\mu\text{g/l}$), located within the Bolick site, adjacent to the waste disposal area; MW-11 (176 $\mu\text{g/l}$), located below the Boone-Nissan septic field; for MW-2 (192 $\mu\text{g/l}$), located below the waste disposal area; and for MW-1 (157 $\mu\text{g/l}$), located adjacent and upgradient of the waste disposal area. Notably absent from this group of wells is MW-10, located directly downgradient and adjacent to the waste disposal area. A concentration for Barium was observed for MW-10 at 94.8 $\mu\text{g/l}$.

Iron (total)

Iron distribution trends, indicated by the analytical results of the third quarter assessment monitoring event, also indicate a relationship between Iron distribution and proximity to the waste disposal area. The highest Iron concentration was observed in the leachate sample, L1 (255,000 $\mu\text{g/l}$). The monitoring well for which Iron was observed at the highest concentration, MW-7 (26,400 $\mu\text{g/l}$), is located adjacent and west of the waste disposal area. The following two most elevated Iron concentrations were detected in two other monitoring wells, MW-6 (5930 $\mu\text{g/l}$) and MW-3 (6610 $\mu\text{g/l}$), also located adjacent and west, respectively, of the waste disposal area.

Elevated concentrations of Iron above 1000 $\mu\text{g/l}$ were also detected in MW-10 (2240 $\mu\text{g/l}$), located directly downgradient of the waste disposal area and in MW-1 (2530 $\mu\text{g/l}$), directly adjacent yet upgradient of the waste disposal area. Concentrations of Iron above the secondary EPA MCL of 300 $\mu\text{g/l}$ were also observed in four boundary monitoring wells, MW-5 (475 $\mu\text{g/l}$), MW-13 (2370 $\mu\text{g/l}$), MW-15 (975 $\mu\text{g/l}$), and MW-16 (490 $\mu\text{g/l}$). These boundary monitoring wells have not exhibited the presence of significant concentrations of other inorganic or organic compounds to date.

B. Organic Analytical Results

i. Target Organic Parameters

Tetrachloroethene (PCE)

Tetrachloroethene (PCE) distribution trends, indicated by the analytical results of the third quarter assessment monitoring event, reveal the highest concentrations of PCE were detected along the west drainage basin adjacent to the landfill, located within and below the "Bolick" site.

PCE was detected at the highest concentrations in the nested well pair located at the downgradient property boundary of the Bolick site; ie:shallow well MW-3 (46 $\mu\text{g/l}$) and deep well MW-17 (48 $\mu\text{g/l}$). PCE was also detected downgradient of the Bolick site in the nested well pair located below the Boone-Nissan septic field; ie:shallow well MW-11 (estimated at 8 J $\mu\text{g/l}$) and the deep well MW-12 (32 $\mu\text{g/l}$). PCE was similarly detected above the EPA MCL (5 $\mu\text{g/l}$) in MW-8 (31 $\mu\text{g/l}$), located within the Bolick site, and in MW-6 (33 $\mu\text{g/l}$), located between the landfill and the Bolick site.

The detection of PCE was also observed downgradient of the Bolick site in the surface water monitoring point, S-4 (12 $\mu\text{g/l}$) and observed at low estimated levels in two Boone Nissan-Mazda septic field wells, SFW-2 (8 J $\mu\text{g/l}$) and SFW-3 (7 J $\mu\text{g/l}$).

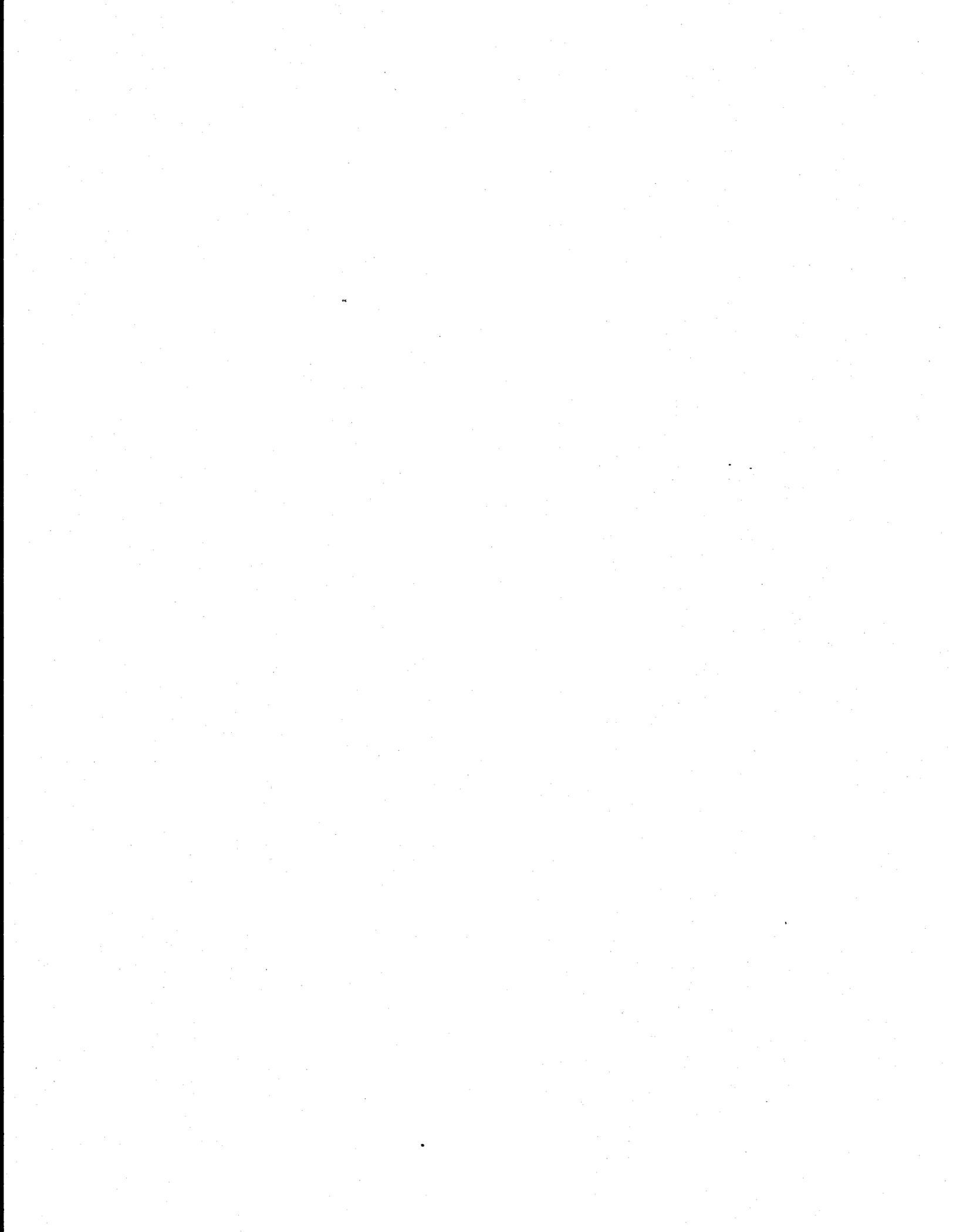
Other PCE detections were observed outside of the west drainage and concentrations estimated in MW-2 (18 J $\mu\text{g/l}$), MW-9 (4 J $\mu\text{g/l}$) and MW-10 (6 J $\mu\text{g/l}$).

PCE was not detected in any boundary monitoring wells.

Trichloroethene (TCE)

Trichloroethene (TCE) distribution trends, indicated by the analytical results of the third quarter assessment monitoring 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 (88 $\mu\text{g/l}$), located adjacent to the landfill, within the Bolick site. The following two highest concentrations for TCE were observed in the nested well pair located at the downgradient property boundary of the Bolick site; ie:shallow well MW-3 (19 $\mu\text{g/l}$) and deep well MW-17 (24 $\mu\text{g/l}$). TCE was also detected downgradient of the Bolick site in the nested well pair located below the Boone-Nissan septic field; ie:deep well MW-12 (13 $\mu\text{g/l}$) and shallow well MW-11 (estimated at 3 J $\mu\text{g/l}$). The detection of TCE was also observed downgradient of the





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February 9, 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,
revised pages to Third Quarter Assessment Monitoring Background Report,
DAA Job No. 6520-20

Dear Mr. Poindexter:

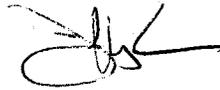
Please find enclosed two revised pages to the Third Quarter Assessment Monitoring Background Report for the Watauga County Landfill (original dated August 3, 1995), for your review. The necessary revisions were noted in recent review comments, prepared by Mr. Lou Zeller of the Blue Ridge Environmental Defense League (BREDL), dated January 26, 1996.

The review comments provided by BREDL discuss the Assessment Monitoring results obtained for monitoring well MW-15, as presented in the third Background Assessment Monitoring Results Report. Draper Aden Associates review of the analytical results tables provided in Appendix I of the report, as well as review of the data validation notes and raw analytical data, reveal that the statements included on pages 22 and 29 of the August 3, 1995 report, regarding Tetrachloroethene (PCE) and Trichloroethene (TCE), are incorrect. PCE and TCE were not detected in MW-15. Enclosed are the revised pages of the report as appropriate.

Mr. Mark Poindexter
February 9, 1996
Page 2

If you should have any questions concerning the enclosed revised pages to the Third Quarter Assessment Monitoring Background Report, please do not hesitate to contact me.

Sincerely,
DRAPER ADEN ASSOCIATES



Jeffrey E. Smith
Project Geologist

JES/rc

cc: Mr. James S. Ratchford, Watauga County Manager, w/enclosure
Mr. William G. Ross Jr., Attorney,
Brooks, Pierce, McLandin, Humphrey, and Leonard, L.L.P, w/enclosure
Mr. Richard M. DiSalvo, Jr., P.E., Principal, DAA, w/enclosure
Mr. William D. Newcomb, P.G., Groundwater Project Manager, DAA, w/enclosure

(estimated at 8 J $\mu\text{g/l}$) and two Boone Nissan-Mazda septic field wells, SFW-2 (2 J $\mu\text{g/l}$) and SFW-3 (2 J $\mu\text{g/l}$).

The only TCE observed outside of the west drainage basin was detected below the method CRQL (estimated) in MW-9 (6 J $\mu\text{g/l}$), located between the landfill and the Rocky Mountain Heights Subdivision ~~and above the method LOQ in MW-15 (2.5 $\mu\text{g/l}$), located adjacent to Rocky Branch.~~

TCE was not detected in any boundary monitoring wells.

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

1,1-Dichloroethene (1,1-DCE) distribution trends, indicated by the analytical results of the third quarter assessment monitoring 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 (360 $\mu\text{g/l}$), located in northern drainage basin below the landfill, and in the bedrock well MW-10 (100 $\mu\text{g/l}$), located in the northern drainage directly below the fill areas. 1,1-DCE was not detected in the shallow soil wells, MW-4 and MW-16, located in the northern drainage basin below the landfill.

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; i.e: MW-3 (6 J $\mu\text{g/l}$), MW-8 (6 J $\mu\text{g/l}$), MW-12 (4 J $\mu\text{g/l}$), and MW-17 (3 J $\mu\text{g/l}$). 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.

1,1-DCE was not detected in any boundary monitoring wells, surface water sampling points, or any of the Boone Nissan-Mazda septic field monitoring wells.

Methylene Chloride

The analytical results of the third quarter assessment monitoring event indicate Methylene Chloride was only observed in one core monitoring well, MW-9 (93 $\mu\text{g/l}$) located adjacent to the Carroll Residence. This Methylene Chloride concentration is well above the EPA MCL and North Carolina groundwater standard (NCS) of 5 $\mu\text{g/l}$.

A lower concentration of Methylene Chloride was also observed in the boundary monitoring well MW-7 (1.5 $\mu\text{g/l}$).

Bolick site in the surface water sampling point, S-4 (estimated at 8 J $\mu\text{g/l}$) and two Boone Nissan-Mazda septic field wells, SFW-2 (2 J $\mu\text{g/l}$) and SFW-3 (2 J $\mu\text{g/l}$).

The only TCE observed outside of the west drainage basin was detected below the method CRQL (estimated) in MW-9 (6 J $\mu\text{g/l}$), located between the landfill and the Rocky Mountain Heights Subdivision and ~~above the method LOQ in MW-15 (2.5 $\mu\text{g/l}$), located adjacent to Rocky Branch.~~

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

1,1-Dichloroethene (1,1-DCE) distribution trends, indicated by the analytical results of the third quarter assessment monitoring 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 (360 $\mu\text{g/l}$), located in northern drainage basin below the landfill, and in the bedrock well MW-10 (100 $\mu\text{g/l}$), located in the northern drainage directly below the fill areas. 1,1-DCE was not detected in the shallow soil wells, MW-4 and MW-16, located in the northern drainage basin below the landfill.

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; i.e: MW-3 (6 J $\mu\text{g/l}$), MW-8 (6 J $\mu\text{g/l}$), MW-12 (4 J $\mu\text{g/l}$), and MW-17 (3 J $\mu\text{g/l}$). 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.

1,1-DCE was not detected in any boundary monitoring wells, surface water sampling points, or any of the Boone Nissan-Mazda septic field monitoring wells.

Methylene Chloride

The analytical results of the third quarter assessment monitoring event indicate Methylene Chloride was only observed in one core monitoring well, MW-9 (93 $\mu\text{g/l}$) located adjacent to the Carroll Residence. This Methylene Chloride concentration is well above the EPA MCL and North Carolina groundwater standard (NCS) of 5 $\mu\text{g/l}$.

A lower concentration of Methylene Chloride was also observed in the boundary monitoring well MW-7 (1.5 $\mu\text{g/l}$).

Low estimated Concentrations of Methylene Chloride were observed in three surface water sampling points, S-2 (2 J $\mu\text{g/l}$), S-3 (3 J $\mu\text{g/l}$), and S-4 (1 J $\mu\text{g/l}$), and two of the three Nissan-Mazda Dealership's septic field wells, SFW-1 (2 J $\mu\text{g/l}$) and SFW-3 (2 J $\mu\text{g/L}$).

Dichlorodifluoromethane

Dichlorodifluoromethane distribution trends, indicated by the analytical results of the third quarter assessment monitoring event, are fairly random. Elevated concentrations of Dichlorodifluoromethane were observed in MW-8 at 14 $\mu\text{g/l}$, MW-9 at 27 $\mu\text{g/l}$, and MW-17 of 12 $\mu\text{g/l}$. All of these Dichlorodifluoromethane concentrations are above the North Carolina groundwater standard (NCS) of 0.19 $\mu\text{g/l}$. No EPA MCL exists for Dichlorodifluoromethane.

A lower estimated concentration (below the method CRQL) of Dichlorodifluoromethane were also observed in monitoring well MW-11 (2 J $\mu\text{g/l}$). Dichlorodifluoromethane was detected in no other monitoring wells at the site.

Dichlorodifluoromethane was not detected in any surface water sampling points, leachate sample, or any of the Boone Nissan-Mazda septic field monitoring wells.

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

1,1,1-Trichloroethane (1,1,1-TCA) distribution trends, indicated by the analytical results of the third quarter assessment monitoring event, show that 1,1,1-TCA, although occurring pervasive 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 $\mu\text{g/l}$ in the bedrock wells, MW-2 (2700 $\mu\text{g/l}$) and MW-10 (650 $\mu\text{g/l}$), located in the northern drainage below the landfill. 1,1,1-TCA was notably absent from the shallow soil wells, MW-4 and MW-16, located within the same drainage, adjacent to and downgradient, respectively, of MW-2.

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 (31 $\mu\text{g/l}$) and deep MW-17 (14 $\mu\text{g/l}$), and shallow MW-11 (estimated at 5 J $\mu\text{g/l}$) and deep MW-12 (18 $\mu\text{g/l}$), at and downgradient of the Bolick Site property boundary, respectively. An estimated concentration (below the CRQL) of 1,1,1-TCA was also observed in MW-8 (6 J $\mu\text{g/l}$), located upgradient of these two nested pairs of wells in the west drainage basin.

The detection of 1,1,1-TCA was also observed at low estimated levels downgradient of the Bolick site in the surface water monitoring point, S-4 (2 J $\mu\text{g/l}$) and in two Boone Nissan-Mazda septic field wells, SFW-2 (6 J $\mu\text{g/l}$) and SFW-3 (3 J $\mu\text{g/l}$).

1,1,1-TCA was additionally detected in MW-9 (14 $\mu\text{g/l}$), located adjacent to the Carroll property and in the boundary monitoring well MW-15 (2.5 $\mu\text{g/l}$), located adjacent to Rocky Branch.

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

As previously discussed in Section III, CLP-SOW analytical results for cis-1,2-Dichloroethene were reported as part of a total concentration of cis- and trans- isomers of the parameter. Total 1,2-Dichloroethene (1,2-DCE) distribution trends, indicated by the analytical results of the third quarter assessment monitoring event, are similar to PCE and TCE distribution trends. With one exception (MW-9), total 1,2-DCE was only detected along the west drainage basin adjacent to the landfill, located within and below the Bolick site.

Total 1,2-DCE was observed at the highest concentrations (above the EPA MCL and NCS of 70 $\mu\text{g/l}$) in MW-6 (370 $\mu\text{g/l}$) and MW-8 (91 $\mu\text{g/l}$), located adjacent to the landfill and the Bolick site, and at the deep well MW-17 (80 $\mu\text{g/l}$), located at the property boundary of the Bolick site. Elevated concentrations of 1,2-DCE (below the EPA MCL and NCS) were also observed at the downgradient property boundary of the Bolick site at the shallow well MW-3 (54 $\mu\text{g/l}$) and downgradient of the Bolick site at the nested well pair, shallow well MW-11 (estimated at 8 J $\mu\text{g/l}$) and deep well MW-12 (37 $\mu\text{g/l}$).

The detection of cis-1,2-DCE was also observed at elevated concentrations downgradient of the Bolick site in the surface water sampling point S-4 (42 $\mu\text{g/L}$) and observed at low estimated concentrations in two Boone Nissan-Mazda septic field wells, SFW-2 (6 J $\mu\text{g/L}$) and SFW-3 (3 J $\mu\text{g/l}$).

The detection of cis-1,2-DCE was also observed at elevated concentrations downgradient of the Bolick site in the surface water sampling point S-4 (42 $\mu\text{g/L}$) and SFW-3 (3 J $\mu\text{g/L}$).

Detections of cis-1,2-DCE were also observed in the two monitoring wells, MW-7 (7.2 $\mu\text{g/l}$), located south of the Bolick site, and MW-9 (estimated at 2 J $\mu\text{g/l}$), located along the southern saddle above the landfill.

Benzene

Benzene distribution trends, indicated by the analytical results of the third quarter assessment monitoring event, are inconclusive since no concentrations of Benzene were observed above the Method CRQL in any monitoring wells or surface water sampling locations.

Estimated Benzene results (below the Method CRQL) indicate parameter levels in MW-6 (12 J $\mu\text{g/l}$) at concentrations above the EPA MCL (5 $\mu\text{g/l}$) and NCS (1 $\mu\text{g/l}$) similar to levels previously observed at this location. Estimated Benzene results were also observed between the EPA MCL (5 $\mu\text{g/l}$) and NCS (1 $\mu\text{g/l}$) in MW-8 (2 J $\mu\text{g/l}$), the deeper well located adjacent to MW-6. Benzene concentrations between the lower North Carolina groundwater quality standard (NCS) and the higher EPA MCL were also observed in two other core wells and one

boundary well randomly distributed about the site; MW-3 (estimated at 2 J $\mu\text{g/l}$), MW-9 (estimated at 2 J $\mu\text{g/l}$), and MW-7 (3.6 $\mu\text{g/l}$) respectively.

Benzene was not detected in any surface water sampling points or any of the Boone Nissan-Mazda septic field monitoring wells.

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

1,1-Dichloroethane (1,1-DCA) distribution trends, indicated by the analytical results of the third quarter assessment monitoring event, reveal 1,1-DCA was observed 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 (below the proposed North Carolina groundwater quality standard of 700 $\mu\text{g/l}$) in the nested well pair, shallow MW-3 (180 $\mu\text{g/l}$) and deep well MW-17 (170 $\mu\text{g/l}$), located at the downgradient property boundary of the Bolick site. Elevated concentrations of 1,1-DCA were also observed between the landfill and the Bolick site at MW-6 (140 $\mu\text{g/l}$) and within the Bolick site at MW-8 (74 $\mu\text{g/l}$), and downgradient of the Bolick site at the nested well pair, shallow well MW-11 (28 $\mu\text{g/l}$) and deep well MW-12 (120 $\mu\text{g/l}$).

The detection of 1,1-DCA was also observed downgradient of the Bolick site in the surface water monitoring point S-4 (45 $\mu\text{g/l}$), and the Boone Nissan-Mazda septic field wells, SFW-2 (18 $\mu\text{g/l}$) and SFW-3 (11 $\mu\text{g/l}$).

Elevated concentrations of 1,1-DCA were also observed in the deep well MW-2 (160 $\mu\text{g/l}$), located in the drainage below the waste disposal area and elevated estimated concentrations (below CRQL) of 1,1-DCA were observed at the deep well MW-10 (37 J $\mu\text{g/l}$) located immediately below the waste disposal area. 1,1-DCA was not detected in the shallow wells MW-4 and MW-16, located in the northern drainage basin below the landfill.

Lower level concentrations of 1,1-DCA were observed at MW-9 (30 $\mu\text{g/l}$), located along the southern saddle above the landfill, and MW-7 (2.9 $\mu\text{g/l}$), located south of the Bolick site.

Chloroethane

Chloroethane distribution trends, indicated by the analytical results of the third quarter assessment monitoring event, show that Chloroethane was observed at the highest concentration in the groundwater in MW-9 (17 $\mu\text{g/l}$), located adjacent to the Carroll property. The highest concentration of Chloroethane was observed in the landfill spring capture outfall S-2 (26 $\mu\text{g/l}$), collected below the waste disposal area. A concentration of Chloroethane was also observed at the boundary well MW-7 (28 $\mu\text{g/l}$), located south of the Bolick site.

Estimated concentrations of Chloroethane (below the Method CRQL) were observed in five core monitoring wells located in the west drainage; shallow well MW-3 (8 J $\mu\text{g/l}$), located adjacent to deep well MW-17 (5 J $\mu\text{g/l}$), deep well MW-12 (4 J $\mu\text{g/l}$), located adjacent to shallow well MW-11 (not detected), MW-6 (11 J $\mu\text{g/l}$), located between the landfill and the Bolick site, and in MW-8 (7 J $\mu\text{g/l}$), located within the Bolick site.

Estimated concentrations of Chloroethane (below the Method CRQL) were also observed in the stream located below the Bolick site, S-4 (2 J $\mu\text{g/l}$); the seep located below the waste disposal area, S-5 (7 J $\mu\text{g/l}$); and the leachate sample collected below the waste disposal area, L-1 (6 J $\mu\text{g/l}$).

trans-1,3-Dichloropropene

The presence of trans-1,3-Dichloropropene in the groundwater and surface waters at the site is not supported by the analytical results of the first, second, or third quarter assessment monitoring events. Previous organic analysis results indicated the presence of trans-1,3-Dichloropropene in the west drainage adjacent to the landfill. The recent sampling and analysis, did not confirm the presence of trans-1,3-Dichloropropene.

If upon completion of background data collection and the first annual EPA Appendix II list sampling event (utilizing LLRA analytical methods), the absence of trans-1,3-Dichloropropene in the groundwater and surface waters at the site is confirmed, trans-1,3-Dichloropropene will be removed from the Target Parameter List.

Vinyl Chloride

Vinyl Chloride distribution trends, indicated by the analytical results of the third quarter assessment monitoring event, are inconclusive since no concentrations of Vinyl Chloride were observed above the Method CRQL in any monitoring wells or surface water sampling locations.

The recent analysis results indicate estimated levels of Vinyl Chloride in the west drainage adjacent to the landfill above the EPA MCL (2 $\mu\text{g/l}$) and NCS (0.015 $\mu\text{g/l}$) in MW-6 (20 J $\mu\text{g/l}$) located between the landfill and the Bolick site, MW-8 (6 J $\mu\text{g/l}$) located within the Bolick site, and MW-3 (2 J $\mu\text{g/l}$) located at the property boundary of the Bolick site. These estimated concentrations of Vinyl Chloride in these three monitoring wells are supported by the analytical results of the second quarter assessment monitoring event. As a result of the second background analyses, Vinyl Chloride was estimated at similar concentrations in these same three monitoring wells.

Vinyl Chloride was detected above the method LOQ at a concentration above the EPA MCL and NCS in one boundary monitoring well, MW-7 (3.6 $\mu\text{g/l}$).

The detection of Vinyl Chloride was also observed at an estimated concentration in the stream located below the Bolick site (2 J $\mu\text{g/l}$).

ii. Non-target Organic Parameters

As previously discussed in Section V.B.ii, four of the five total non-target parameters were observed in the same monitoring well, MW-7. MW-7 is located south of the Bolick site adjacent to the waste disposal area. This well is currently denoted a boundary monitoring well. The recent third sampling event also detected six of the twelve target organic parameters in MW-7, therefore, this well will be elevated to a core monitoring well for the next sampling event.

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). The 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 indicates potential impacts resulting from activities in the vicinity of 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 Section 2.10 of the Assessment Plan (dated Sept. 3, 1993) and Section III of the Activity Report (dated June 29, 1994).

A. November 16, 1994 Sampling Event

Isaacs Residence (well reference no. 39)

The Isaacs residence well was sampled in response to NCDEHNR Solid Waste Section recommendations to confirm the groundwater quality of receptors along the main tributary below the Carroll property. The Isaacs residence is located adjacent to the main tributary within the Rocky Mountain Heights subdivision, downgradient and south of the Carroll property and Southern Saddle. The water analysis of the Isaacs residence well resulted in no detected volatile organic compounds.

B. December 7, 1994 Sampling Event

Three potable wells that have previously shown trace and/or low level detections were resampled on December 7, 1994. The three potable wells resampled included one residence located in the Rocky Mountain Heights Subdivision, immediately downgradient and strike from the Carroll residence and Southern Saddle (well reference no. 24), the BREMCO potable well (well reference no. 5), and one residence located approximately 1,200 feet northeast of the BREMCO business (well reference no. 15).

Ward Residence (well reference no. 24)

The recent resampling and analysis of the Ward residence potable well detected trace levels of Trichloroethene and Tetrachloroethene, and unquantifiable levels below 1 ppb of 1,1-Dichloroethane.

Three previous sampling events conducted on the Ward residence potable well have detected trace and/or unquantifiable levels below 1 ppb of a total 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 four 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 four sampling events conducted at the Ward residence have resulted in the nondetection of chloroform. Chloroform is a common transformation product result from the chlorination of well systems. *as well as a "break down product".*

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

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

Six (6) chlorinated volatile organic solvent compounds were detected in the recent 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 compound detected at quantifiable levels was 1,1-dichloroethane (1,1-DCA), which was found at the detection limit of 1 ppb. No EPA Maximum Contaminant Level exists for 1,1-DCA. 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. Three of these compounds (1,1-Dichloroethane, 1,1,1-Trichloroethane, and Trichloroethene) have been detected in all four sampling events conducted to date on the BREMCO potable.

Greer Residence Well (well reference no. 15)

The Greer residence was recently resampled in response to NCDEHNR Solid Waste Section recommendations to investigate the persistence of compounds detected as a result of the previous sampling event conducted on the Greer residence potable well on April 6, 1994.

The Greer residence had installed a new pump approximately a week before the previous sampling event. Low levels of six (6) organic compounds were detected from this previous sampling event. Four (4) of these previously detected compounds are BTEX compounds typically associated with petroleum products (Benzene, Toluene, Ethylbenzene, and p and m-Xylene) and one compound (Styrene) is a component of plastics. These five (5) compounds (with the exception of the common compound Benzene) have not been detected in the landfill monitoring network. One common chlorinated organic solvent compound (Tetrachloroethene) was also detected in the previous sampling of the Greer residence potable well. The nondetection of these compounds in the initial sampling event, suggested their presence may be related to the new pump system recently installed at the Greer residence.

The recent resampling of the Greer residence well also resulted in no detected volatile organic compounds.

C. January 12, 1995 Sampling Event

Three potable wells were sampled on January 12, 1995. Two of these potable wells (well reference nos. 40 and 41) were sampled in response to NCDEHNR Solid Waste Section recommendations to confirm the groundwater quality of receptors along the main tributary within the Rocky Mountain Heights subdivision below the Carroll property. The other potable well (well reference no. 14) was resampled to further investigate trace and/or low level detections previously detected within the Rocky Mountain Heights subdivision in the area located immediately downgradient and strike from the Carroll residence and Southern Saddle.

Austin Residence (well reference no. 40)

The water analyses of the Austin residence well, located adjacent to the main Rocky Mountain Heights subdivision tributary, detected only Chloroform at unquantifiable levels below 1 ppb. Chloroform has been detected in ten of the forty-one potable wells sampled to date. The distribution trends of the detected Chloroform do not exhibit predictable patterns, suggesting these detections of chloroform may be a result of the chlorination of the well systems.

Norris Residence (well reference no. 41)

The water analysis of the Norris residence well, located adjacent to the main Rocky Mountain Heights subdivision tributary, resulted in no detected volatile compounds.

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. Resampling of shared well #2 was conducted March 30, 1994 from the adjacent Edwards residence. Recent resampling of shared well #2, conducted on January 12, 1995, 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 recent resampling of shared well #2 only detected 1,1-Dichloroethane at unquantifiable levels below 1 ppb.

VIII. CONCLUSIONS

A. Parameter Distribution

The analytical results obtained from the third quarter assessment background monitoring event are similar to the results obtained from the first and second quarter background events. The analytical results continue to indicate that the detection of target parameters in the Watauga County Landfill monitoring network is primarily confined to those monitoring stations which like the landfill are located south of the proposed U.S. Route 421 Bypass (Figure 2; Appendix I).

The relocation of five (5) of the assessment monitoring wells (MW-12, MW-13, MW-14, MW-15, and MW-18), as originally proposed in the Assessment Plan (DAA, September 3, 1993), was necessary due to the proposed rerouting of U.S. Route 421. The construction right-of-way for the proposed bypass would have directly impacted the original locations for these five wells, likely requiring their premature abandonment. Four of these wells were relocated north of the proposed bypass (MW-13, MW-14, MW-15, and MW-18) and one well was relocated south of the proposed bypass (MW-12).

The second quarter analytical results indicate no significant detections in the four monitoring wells relocated north of the proposed bypass, except for the detection of 1,1,1-TCE in MW-15. Conversely, the recent analytical results reveal five target parameters detected above the method CRQL in MW-12, relocated south of the proposed bypass. The analytical results indicate the northern edge of the occurrence of assessment target parameters in the groundwater exists primarily within the construction right-of-way for the proposed Route 421 bypass.

South of the proposed bypass, the detection of assessment target parameters was reported only for the saddle between the landfill and the Rocky Mountain Heights Subdivision and the west and north drainages below the landfill.

In the west drainage, the detection of target parameters above groundwater standards is observed in both the soil and bedrock aquifer media, extending from the landfill to the proposed bypass. Additionally, organic analyses performed on the piezometer network on November 16-18, 1992, indicate the target parameters are confined to the trough of the west drainage.

In the north drainage, the detection of target parameters above groundwater standards is primarily observed in the bedrock aquifer medium. No target parameters were detected above the EPA MCL in the two monitoring wells accessing the soil aquifer medium in the north drainage. The levels of the target parameters detected in the two monitoring wells accessing the bedrock aquifer medium indicate the detected target parameters have preferentially migrated to deeper fracture zones within the bedrock.

The third quarter analytical results obtained from the leachate sample (L1) indicate the presence of one organic target parameter, Chloroethane.

B. Target Parameter Summary

The detection of PCE, TCE, and cis-1,2-DCE was primarily 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 as well as the southern saddle, 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-DCA was observed in more monitoring wells throughout the site than any other target parameter. 1,1-DCA was observed at the highest concentrations in the nested well pair located at the property boundary of the Bolick site.

Dichlorodifluoromethane, and Methylene Chloride were both detected at the highest concentration in MW-9, located along the southern saddle between the landfill and the Rocky Mountain Heights subdivision.

Benzene was not detected above the method CRQL in any monitoring well or surface water sampling location. Estimated concentrations (but below the CRQL) of Benzene are preferentially distributed adjacent to the disposal area.

Trans-1,3-Dichloropropene was not detected above or estimated below the method LOQ in any second event sampling locations in the monitoring network.

Vinyl Chloride was only estimated (detected below the CRQL) in three monitoring wells, centrally located in the west drainage and nearest to the waste disposal area.

Chloroethane was the only organic target parameter to be detected in the leachate sample. Chloroethane was also observed at the highest concentration in the landfill spring capture outfall and was additionally detected in the seep located below the waste disposal area and the stream below the Bolick site. The detection of Chloroethane in groundwater, although common throughout the core of the site, was not observed at significantly elevated levels or observed to indicate a defined distribution.

C. Continuing Investigations

As a result of the first and second background sampling event, three areas were identified as not fully characterized by the existing monitoring network. The results obtained from the background monitoring event are similar to the first and second event and do not significantly alter the current assessment of these three areas. As described below, these three areas will continue to be evaluated during ongoing groundwater investigations.

West Drainage

As detailed in the Assessment Plan Activity Report (DAA, July 29, 1994), the west drainage adjacent to the landfill trends parallel to the orientation of two lineament sets observed at the site. Upper reaches of the west drainage trend parallel to mineral layering, lineation, and foliation in the host bedrock as well as parallel to the general northwest trending contact between the amphibolite/hornblende gneiss-mica schist and gneiss assemblages and the "mixed rocks" assemblage (N55°W). Upon reaching an area where the amphibolite/hornblende gneiss is not stratigraphically overlain by the mica schist and gneiss (inferred from drilling of MW-18 as well as the distribution of residual soil distributions depicted on the Watauga County Soil Survey), the drainage trends N10°E, parallel to bedrock fracture and joint lineations.

The original proposed locations for MW-13 and MW-18 were at the junction of the N55°W and N10°E lineament sets. MW-13 and MW-18 were relocated along the N10°E lineament set to account for the flow direction of the surface water drainage. Trace level detections observed in the BREMCO potable well (Potable Well Analysis Summary Table, Appendix IV) indicate the possibility that deeper groundwater flow within the bedrock may follow the N55°W lineament set. Therefore, the area between the proposed bypass and the BREMCO potable well is one area that will continue to be evaluated during ongoing groundwater investigations. *more wells?*

North Drainage

The recent analytical results indicate elevated levels above groundwater standards for the target parameters in the northern drainage below the landfill at the deep bedrock monitoring well, MW-2. Downgradient of this point, 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 also be exhibiting lateral

stratification. Rather than continuing to follow the northern drainage orientation, groundwater may flow N55°W, parallel to Rocky Branch, before reaching the apex of the watershed. Therefore, the area between the nested well pair, MW-14 and MW-15, and the Chevrolet Dealership will continue to be evaluated during ongoing groundwater investigations. The absence of volatile organic parameters detected at the Chevrolet Dealership's potable well suggests that there is no impact at the dealership's well location.

Southern Saddle

The analytical results obtained from the monitoring well installed along the saddle between the landfill and the Rocky Mountain Heights Subdivision (MW-9) indicate that the organic parameters observed in the Carroll residence potable well have also been found in MW-9. To examine potential flow pathways not currently investigated by the Residential and Business potable well sampling program (described in the Assessment Plan and Activity Report and summarized herein in Appendix IV), the area directly downgradient and south of the Carroll property will be evaluated for additional groundwater investigations. A residential well does not currently exist immediately downgradient of the Carroll property. To further investigate the parameter distributions across the saddle from the Carroll property, the area between the landfill and MW-9 will also be evaluated for additional groundwater investigations.

D. Closing

Fourth Quarterly Assessment Background Monitoring Event

The fourth quarterly assessment background monitoring event was performed by Draper Aden Associates in April, 1995. Revisions to the network of core and boundary assessment wells for the fourth background monitoring event resulted in the upgrading monitoring well MW-7 to "core" status. As indicated in the Assessment Monitoring schedule (Table 1, Appendix I), all core assessment wells, boundary assessment wells, and surface water monitoring points will be analyzed using CLP analytical methods for the fourth assessment background monitoring event.

Residential and Business Potable Well Sampling Program

breakdown products

The ongoing potable well 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 network. Duplicate sampling will indicate whether the organics detected are a persistent occurrence. The two potable wells with parameter levels previously detected above the EPA MCL, the Nissan-Mazda dealership well (well reference no. 4) and the Carroll residence well (well reference no. 12), will also be periodically sampled.

The results of the potable well sampling program will assist ongoing groundwater investigations within areas not fully characterized by the existing monitoring well network. Appropriate additional groundwater investigations will be conducted upon consultation and approval from the NCDEHNR Solid Waste Section.

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						
Assessment Monitoring Parameters (ie: 40 CFR Part 258 Appendix II List)	-	-	-	-	Low Level Risk Assessment Screening Methods	-
Target Parameter Monitoring Parameters	CLP Methods	CLP Methods	CLP Methods	CLP Methods	-	CLP Methods
"BOUNDARY" ASSESSMENT WELLS						
Target Parameter Monitoring Parameters	LLRA Methods	CLP Methods	LLRA Methods	CLP Methods	LLRA Methods	CLP 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)

Table 2A
Third Quarter Background
Assessment Target Parameter Analytical Results
Core Groundwater Monitoring Wells - Inorganic and Organic Analysis
Contract Laboratory Program (CLP) Statement of Work (SOW)

Parameter	Event	Results ug/L(ppb)											MW-17	MW-12	MW-11	MW-10	MW-9	MW-8	MW-6	MW-4	MW-3	MW-2	MW-1	Trip Blank(9)	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																				
METALS, TOTAL																																
Barium, Total	02/06/95	157	192	109	27.2	418	70.4	615	94.8	176	104	87.2	0.6	U	2000	2000																
Iron, Total	02/06/95	2830	46	6610	552	5930	368	735	2240	296	61.3	260	20.8	U	300	300*																
Cadmium, Total	02/06/95	0.5	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	U	5	5																
Mercury, Total	02/06/95	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	U	1.1	1.1																
ORGANICS																																
Benzene	02/06/95	10	150	2	10	12	J	5	50	10	10	10	10	U	1	1																
Chloroethane	02/06/95	10	150	7	10	11	J	7	50	10	4	J	10	U	-	-																
Dichlorodifluoromethane	02/06/95	10	150	10	10	25	U	14	50	2	10	U	10	U	0.19	0.19																
1,1-Dichloroethane	02/06/95	10	160	180	10	140	74	30	37	28	120	170	10	U	700**	700**																
1,1-Dichloroethene	02/06/95	10	360	6	10	25	U	6	100	10	4	J	10	U	7	7																
cis 1,2-Dichloroethene	02/06/95	10	150	54	10	370	91	2	50	8	37	80	10	U	70	70																
trans-1,3-Dichloropropene	02/06/95	10	150	10	10	25	U	10	50	10	10	10	10	U	70	70																
Methylene Chloride	02/06/95	10	150	10	10	25	U	10	50	10	10	10	10	U	5	5																
Tetrachloroethene	02/06/95	10	18	46	10	33	31	4	6	J	J	48	10	U	5	5																
Trichloroethene	02/06/95	10	150	19	10	88	14	6	50	3	J	24	10	U	0.7	0.7																
1,1,1-Trichloroethane	02/06/95	10	2700	31	10	25	U	6	650	5	J	14	10	U	2.8	2.8																
Vinyl Chloride	02/06/95	10	150	2	J	20	J	6	50	10	10	10	10	U	200	200																

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
Shading denotes parameter results that exceed U.S. EPA Maximum Contaminant Levels.
NOTES: 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.
2) Organic parameters were analyzed in accordance with USEPA CLP SOW OLMO1.9 (3/90).
3) Trip Blank for Samples MW-1, MW-2, MW-3, MW-4, MW-6, MW-8, MW-10, MW-11, S-1, S-2, S-3, S-4, S-5, and L1

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

Table 2B
Third Quarter Background
Assessment Target Parameter Analytical Results
Boundary Groundwater Monitoring Wells - Inorganic and Organic Analytels
Contract Laboratory Program (CLP) Statement of Work (SOW) - metals (1)
Low Level Risk Assessment (LLRA) SW-846 Methods - organics (2)

05/23/95

Parameter	Event	Results ug/L(ppb)										MCL (ug/L)
		MW-5	MW-7	MW-13	MW-14	MW-15	MW-16	MW-18	Trip Blank(3)	NCS (ug/L)		
METALS, TOTAL												
Barium, Total	02/06/95	710	743	79.4	16.3	82.3	72.5	87.9	0.71	2000	2000	
Iron, Total	02/06/95	475	26400	2370	61.3	975	490	61.3	20.8	300	300*	
Cadmium, Total	02/06/95	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	5	5	
Mercury, Total	02/06/95	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1.1	2	
ORGANICS												
Benzene	02/06/95	1.0	3.6	1.0	1.0	1.0	1.0	1.0	1.0	1	5	
Chloroethane	02/06/95	1.0	28	1.0	1.0	1.0	1.0	1.0	1.0	-	-	
Dichlorodifluoromethane	02/06/95	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.19	-	
1,1-Dichloroethane	02/06/95	1.0	2.9	1.0	1.0	1.0	1.0	1.0	1.0	700**	-	
1,1-Dichloroethene	02/06/95	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7	7	
cis 1,2-Dichloroethene	02/06/95	1.0	7.2	1.0	1.0	1.0	1.0	1.0	1.0	70	70	
trans-1,3-Dichloropropene	02/06/95	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-	-	
Methylene Chloride	02/06/95	1.0	1.5	1.0	1.0	1.0	1.0	1.0	1.0	5	5	
Tetrachloroethene	02/06/95	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.7	5	
Trichloroethene	02/06/95	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.8	5	
1,1,1-Trichloroethane	02/06/95	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	200	200	
Vinyl Chloride	02/06/95	1.0	3.6	1.0	1.0	1.0	1.0	1.0	1.0	0.015	2	

Notes:
NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)
MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)
LOQ Limit of Quantitation
U Denotes not detected above Instrument Detection Limit(IDL) for Inorganics and not detected above LOQ 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.
NOTES: 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.
2) Organic parameters were analyzed in accordance with USEPA SW-846 Method 8021.
3) Trip Blank for samples MW-5, MW-7, MW-13, MW-14, MW-15, MW-16, and MW-18 (for metals only).
Trip Blank for samples MW-9, MW-12, and MW-17 (for organics only).

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

05/23/95

Table 2C
Third Quarter Background
Assessment Target Parameter Analytical Results
Surface Water Sampling Locations and Septic Field Wells - Inorganic and Organic Analyses
Contract Laboratory Program (CLP) Statement of Work (SOW)

Parameter	Event	Results ug/L(ppb)										L1	TRIP BLANK (3)	NCS (ug/L)	MCL (ug/L)								
		S-1	S-2	S-3	S-4	S-5	SF-W-1	SF-W-2	SF-W-3	SF-W-3	SF-W-3												
METALS, TOTAL																							
Barium, Total	02/06/95	86.8	J	350	J	235	J	82.5	J	472	J	69.7	J	1050	J	143	J	2240	J	0.72	J	2000	2000
Iron, Total	02/06/95	13200	J	42000	J	8790	J	3110	J	90300	J	123	J	56600	J	7240	J	255000	J	20.8	J	300	300*
Cadmium, Total	02/06/95	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	4.4	U	5	5
Mercury, Total	02/06/95	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.1	2
ORGANICS																							
Benzene	02/06/95	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	1	5
Chloroethane	02/06/95	10	U	28	U	10	U	2	J	7	J	10	U	10	U	10	U	6	J	10	U	-	-
Dichlorodifluoromethane	02/06/95	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	0.19	-
1,1-Dichloroethane	02/06/95	10	U	10	U	10	U	45	U	10	U	10	U	18	U	11	U	10	U	10	U	700**	-
1,1-Dichloroethene	02/06/95	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	7	7
cis-1,2-Dichloroethene	02/06/95	10	U	10	U	10	U	42	U	10	U	10	U	6	J	3	J	10	U	10	U	70	70
trans-1,3-Dichloropropene	02/06/95	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	-	-
Methylene Chloride	02/06/95	10	U	2	J	3	J	1	J	10	U	2	J	10	U	2	J	10	U	10	U	5	5
Tetrachloroethene	02/06/95	10	U	10	U	10	U	12	J	10	U	10	U	8	J	7	J	10	U	10	U	0.7	5
Trichloroethene	02/06/95	10	U	10	U	10	U	8	J	10	U	10	U	2	J	2	J	10	U	10	U	2.8	5
1,1,1-Trichloroethane	02/06/95	10	U	10	U	10	U	2	J	10	U	10	U	6	J	3	J	10	U	10	U	200	200
Vinyl Chloride	02/06/95	10	U	10	U	10	U	2	J	10	U	10	U	10	U	10	U	10	U	10	U	0.015	2

Notes:

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

J Denotes not detected above Instrument Detection Limit (IDL) for Inorganics and not detected above CRQL for Organics
* Denotes an estimated value
** 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.

NOTES: 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.

2) Organic parameters were analyzed in accordance with USEPA CLP SOW OLMO1.9 (9/90).

3) Trip Blank for samples SFW-1, SFW-2, and SFW-3.

Watauga County Landfill
Watauga County, North Carolina
Upgradient Well: MW-1
05/15/95

Table 3
Third Quarter Background
Detected Non-Target Organic Parameter Analytical Results

Parameter	Event	Results ug/L(ppb)										MCL (ug/L)	
		MW-3	MW-7	MW-8	MW-14	MW-17	TRIP BLANK (g)	NCS (ug/L)	MCL (ug/L)				
CRQL/LOQ		10	1.0	10	1.0	10	1.0				1.0		
trans-1,2-Dichloroethene	02/06/95	~	2.6	~	~	~	~	~	~	~	~	70	100
Bromomethane	02/06/95	~	5.8	~	~	~	~	~	~	~	~	-	-
1,2-Dichloropropane	02/06/95	1	J	1	J	1	J	~	~	1	J	0.56	5
Toluene	02/06/95	~	~	~	~	~	~	~	~	~	~	1000	1000
o-Xylene	02/06/95	~	0.6	~	~	~	~	~	~	~	~	530(4)	10000(4)
Dibromochloromethane	02/06/95	~	~	~	0.6	J	~	~	~	~	~	-	100

Notes:

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 (CLP SOW) - for MW-3, MW-8, and MW-17.
LOD Limit of Detection (LLRA Methods for MW-7 and MW-14)
~ Denotes Not Detected above CRQL/LOQ
- Denotes no applicable standard
N Tentatively identified
J Denotes an estimated value
Shaded denotes parameter results that exceed U.S. EPA Maximum Contaminant Levels.
NOTE: 1) Organic parameters were analyzed in accordance with USEPA CLP SOW OLM01.9 (3/90).
2) No tentatively identified compounds detected
3) Trip Blanks for Samples MW-5, MW-7, MW-13, MW-14, MW-15, MW-16, and MW-18
4) MCL and NCS for Total Xylene

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

03-Mar-95

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	3339.03	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	3273.53	3239.77	3359.23

STATIC WATER LEVEL			
DATE			
6/20/94	38.00	7.88	18.43
9/27/94	39.69	7.51	17.42
2/6/95	37.57	5.58	16.20
			50.39
			42.85
			45.88
			15.41
			17.38
			30.73
			23.03
			17.68
			59.35

GROUNDWATER ELEVATION			
DATE			
6/20/94	3303.80	3145.06	3164.69
9/27/94	3302.11	3145.43	3165.70
2/6/95	3304.23	3147.36	3166.92
			3217.30
			3223.19
			3227.65
			3224.36
			3222.39
			3301.44
			3222.09
			3250.50
			3222.05
			3242.80
			3299.69

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
9/27/94	8.09	13.22	10.78
2/6/95	7.73	13.22	10.61
			7.52
			11.55
			4.61
			17.05
			17.83
			5.68
			17.93
			5.32
			17.86
			17.58

GROUNDWATER ELEVATION			
DATE			
6/20/94	3195.69	3148.25	3148.11
9/27/94	3195.78	3148.38	3148.37
2/6/95	3196.14	3148.38	3148.54
			3112.48
			3109.10
			3138.11
			3165.57
			3165.79
			3101.77
			3108.83
			3137.04
			3165.69
			3101.70
			3100.65
			3100.33
			3100.06
			3112.06
			3137.40
			3166.59

1) ALL MEASUREMENTS IN FEET.
 2) ALL ELEVATIONS REFERENCE MEAN SEA LEVEL.
 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

03-Mar-95

TABLE 4B
 GROUNDWATER LEVEL DATA

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

STATIC WATER LEVEL			
DATE			
6/20/94	12.75	17.26	14.47
9/27/94	12.29	16.64	14.06
2/6/95	10.71	13.66	12.88
			13.66
			17.30
			14.29
			13.99
			23.50
			12.86
			22.44

GROUNDWATER ELEVATION			
DATE			
6/20/94	3185.58	3200.54	3206.32
9/27/94	3186.04	3201.16	3206.73
2/6/95	3187.62	3204.14	3207.91
			3222.36
			3219.56
			3194.55
			3219.09
			3194.85
			3195.98
			3202.83

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

Parameter	Event	Results ug/L (ppb)													MCL (ug/L)		
		MW-1	MW-3	MW-4	MW-6	MW-7	MW-8	MW-9	MW-10	MW-12	MW-17	S2	NCS (ug/L)				
Acetone	6/20/94	61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	700
	9/27/94	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	700
2-Butanone	9/27/94	~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/27/94	~	-	-	-	19	-	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride	9/27/94	~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/27/94	~	-	2	~	~	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	9/27/94	~	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2/6/95	~	1	~	~	~	-	-	-	-	-	-	-	-	-	-	-
2-methyl-2-pentanone	6/20/94	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	6/20/94	2	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	6/20/94	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6/20/94	2	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	9/27/94	~	-	2	~	~	-	-	-	-	-	-	-	-	-	-	-
	9/27/94	~	-	~	~	~	-	-	-	-	-	-	-	-	-	-	-
Xylene (total)	6/20/94	64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/27/94	~	-	~	~	~	-	-	-	-	-	-	-	-	-	-	-

Tentatively Identified Compounds

Parameter	Event	Results ug/L (ppb)										
		MW-6	MW-9	MW-11	MW-16	MW-17	MW-18					
Hexane	9/27/94	*	*	*	7	NJ	*					
	9/27/94	*	200	NJ	*	*	*					
Dichlorofluoromethane	9/27/94	*	*	6	NJ	*	*					
	9/27/94	*	*	9	NJ	*	*					
Unknown Alkane	9/27/94	*	*	6	NJ	*	*					
	9/27/94	*	*	12	NJ	*	*					
Unknown Cycloalkane	9/27/94	*	*	28	NJ	*	*					
	9/27/94	*	*	10	NJ	10	NJ					
Unknown Hydrocarbon	9/27/94	*	*	5	NJ	7	NJ					
	9/27/94	*	*	13	NJ	18	NJ					
Unknown Unsaturated Hydrocarbon	9/27/94	*	*	*	9	NJ	*					
	9/27/94	*	*	7	NJ	*	*					
Unknown Ketone	9/27/94	50	NJ	*	8	NJ	*					
	9/27/94	*	*	*	*	*	*					

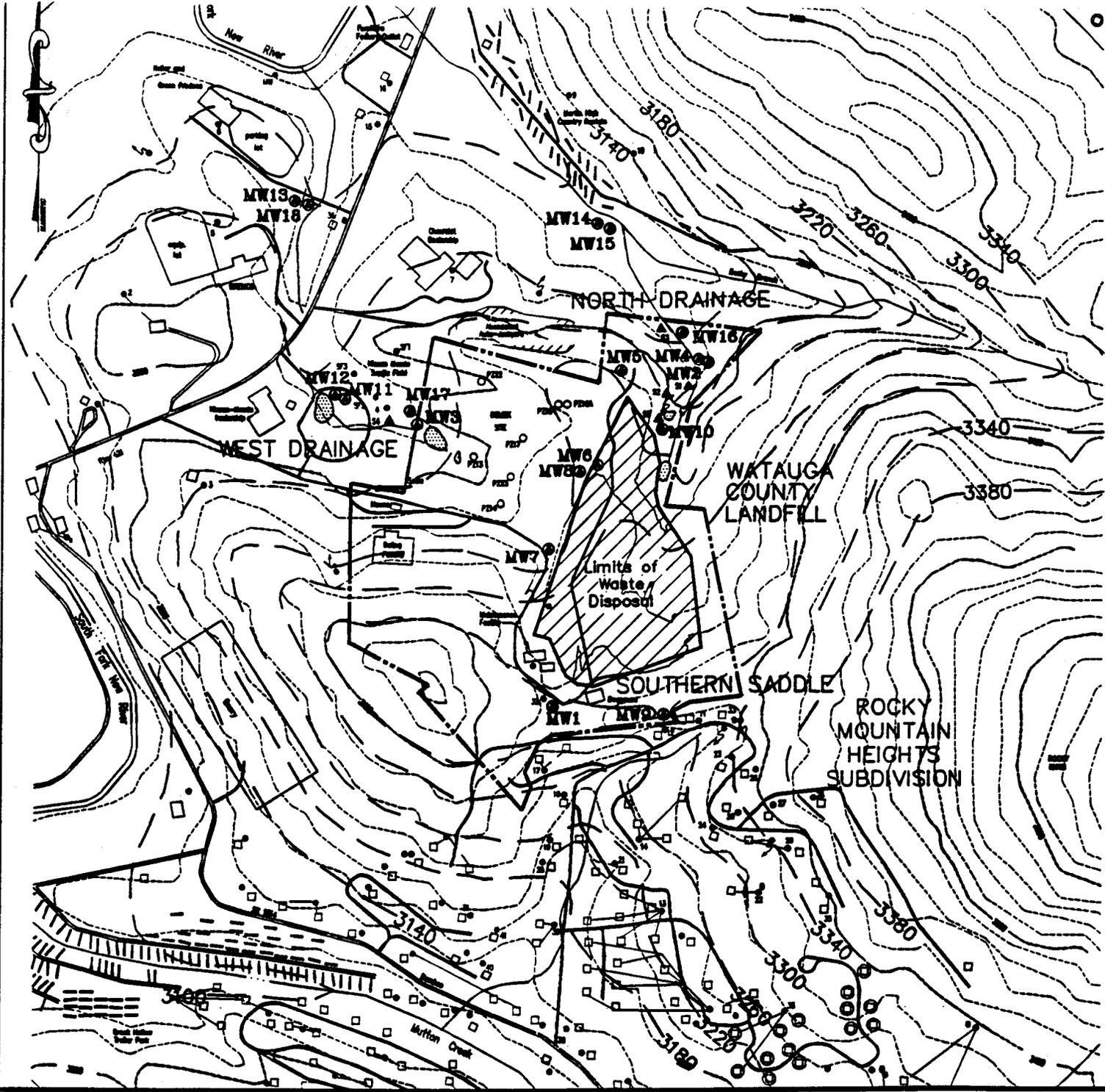
Notes:
NCS Denotes North Carolina Groundwater Quality Standard (T15A: 02L .0200)
MCL Denotes EPA Maximum Contaminant Level (EPA 822-R-94-001)
CRQL Contract Required Quantification Limit (Excludes Tentatively Identified Compounds).
~ Denotes Not Detected above the CRQL
* Denotes Not Detected
- Denotes Not Available
N Tentatively Identified
J Denotes an estimated value
Shading denotes parameter results that meet or exceed U.S. EPA Maximum Contaminant Levels.
NOTE: 1) 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
05/23/95

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

Parameter	Event	Results ug/L (ppb)													MCL (ug/L)		
		MW-7	MW-8	MW-9	MW-12	MW-13	MW-14	MW-16	MW-17	MW-18	Trip	NCS (ug/L)					
1,2,3-Trichlorobenzene	6/20/94	~	J	~	J	0.32	J	0.47	J	~	~	J	~	~	J	~	-
1,3,5-Trimethylbenzene	6/20/94	~	J	~	J	~	J	~	J	~	~	J	~	~	J	~	-
Isopropylbenzene	6/20/94	~	JB	~	JB	1.06	JB	~	JB	~	~	JB	0.50	JB	0.36	~	-
n-Propylbenzene	6/20/94	~	J	~	J	0.33	J	~	J	~	~	J	~	~	J	~	-
Trichlorofluoromethane	6/20/94	~	J	~	J	20.50	J	~	J	~	~	J	~	~	J	~	-
Styrene	6/20/94	~	J	~	J	0.94	J	~	J	~	~	J	~	~	J	2,100	-
Napthylene	6/20/94	0.33	J	~	J	0.69	J	0.74	J	7.07	J	~	~	~	J	100	100
o-Xylene	6/20/94	0.83	J	~	J	~	J	~	J	~	~	~	~	~	J	~	-
t-bb + tmb + s-bb	2/6/95	0.6	~	~	~	~	~	~	~	~	~	~	~	~	~	~	530
trans-1,2-Dichloroethene	6/20/94	44.97	J	~	J	0.83	J	~	J	~	~	~	~	~	J	~	10,000
~	6/20/94	1.53	J	~	J	1.47	J	~	J	~	~	~	~	~	J	~	10,000
~	2/6/95	2.6	~	~	~	~	~	~	~	~	~	~	~	~	~	~	-
Bromomethane	2/6/95	5.8	~	~	~	~	~	~	~	~	~	~	~	~	~	~	70
1,2-Dichloropropane	2/6/95	1.6	~	~	~	~	~	~	~	~	~	~	~	~	~	~	70
Dibromochloromethane	2/6/95	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	0.56
																	5
																	100

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 above LOD (LLRA Organic Methods Only)
- Denotes Not Available
J Denotes an estimated value
B Denotes present in blank
Shading Denotes Parameter results that meet or exceed U.S. EPA Maximum Contaminant Levels
t-bb+tmb+s-bb: tert-Butylbenzene + 1,2,4-Trimethylbenzene + sec-Butylbenzene



LEGEND

- | | | | |
|--|---|--|---|
| | Existing Ground | | SF1 Septic Field Monitoring Wells |
| | Overhead Power Line | | Spring |
| | Stream | | S Spring Used as Potable Water Source |
| | Pond | | 2 Existing Potable Well/
Sampled Well Ref. No. |
| | Existing Residence/Multi-unit Residence | | |
| | Existing Mobile Home | | |
| | Assessment Monitoring Wells | | |
| | Surface Water Sampling Locations | | |
| | Piezometer | | |
| | Groundwater Potentiometric Elevation | | |

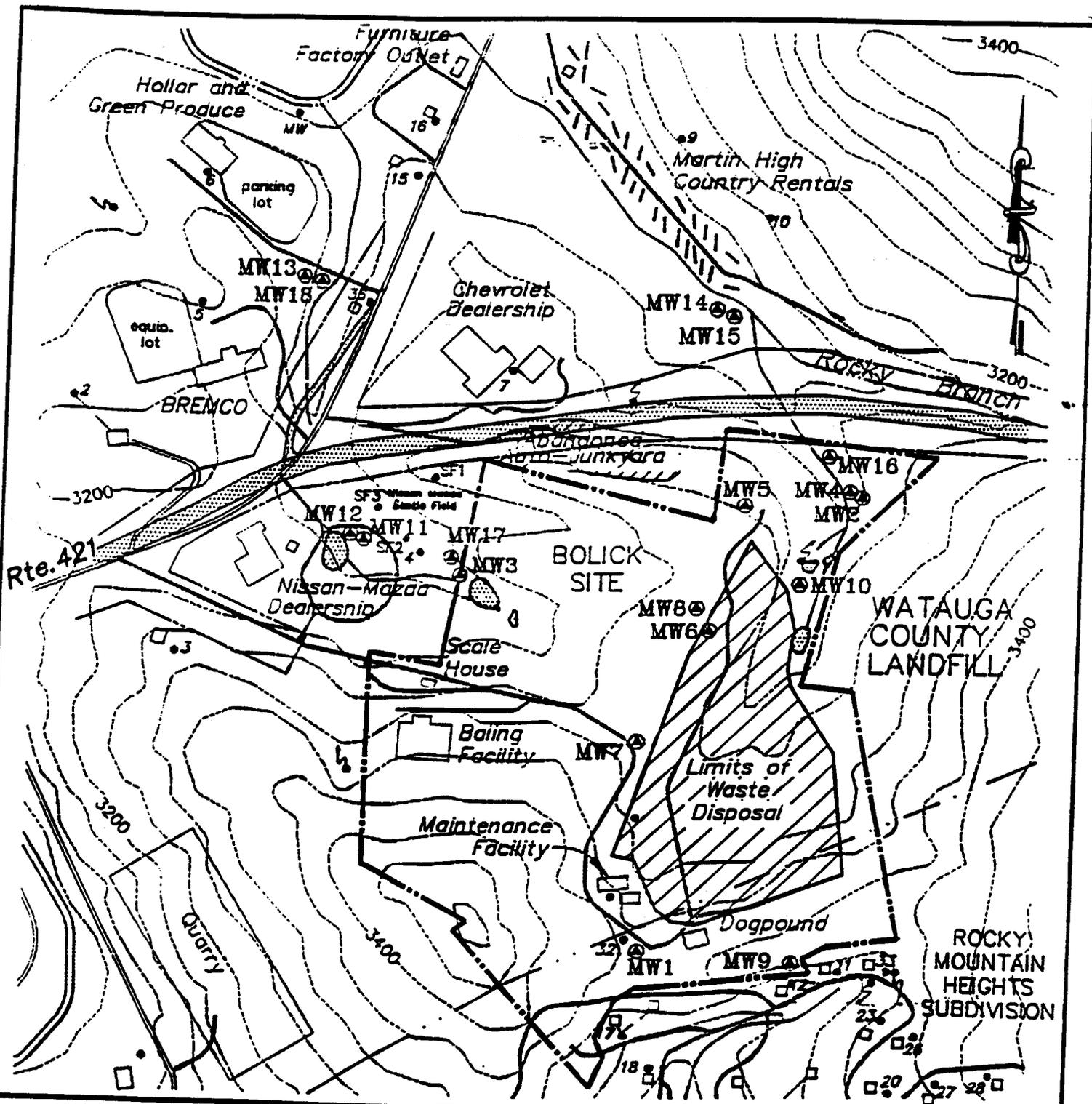
GROUNDWATER AND SURFACE WATER
MONITORING PROGRAM MAP
WATAUGA COUNTY LANDFILL
WATAUGA COUNTY, NORTH CAROLINA

Job No.: 6520-20
Scale: 1" = 300'±
Date: 02 MAR 95

Draper Aden Associates
CONSULTING ENGINEERS

FIGURE 1

(Inferred from static water level data obtained on Feb. 6-10, 1995)



PROPOSED ROUTE 421 BYPASS MAP

 <p>Draper Aden Associates CONSULTING ENGINEERS Blacksburg, Va. - Richmond, Va. - Nashville, Tenn.</p>	<p>JOB No. 6520-143</p>	<p>DATE: 10 JUN 94</p>	<p>SCALE: 1"=600'±.</p>	<p>FIGURE 2</p>
---	-------------------------	------------------------	-------------------------	-----------------

STANDARD FIELD PROTOCOL - INITIAL ACTIVITIES

Project Watauga County Landfill Permit #95-02 Date 2-5-95
 Sampling Sequence see below Weather/Temperature see notes - recorded by
 Samplers TEC 9022 P212 P211 < 0°F
 Static Water Level measurement equipment Solinst # 13246 24 Environmental
 procedure Immersion crowny

Well evacuation equipment Dedicated Pumps
 procedure Accuracy of pump rates based on groundwater recharge rates

Sample withdrawal equipment Dedicated Pumps
 procedure Sample into 1/2 gallon cans for GMP

Sample filtration equipment None
 procedure _____

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

- CLP VOA - 40ml amber glass - HCl preserved - CompuChem
- CLP Metals - 1L white plastic - HNO₃ preserved in field
- 9021 VOA - 40ml clear glass - HCl preserved - CTE

Internal temperature of shipping containers at outset of sampling

Room Temperature

Temperature equipment Corning Checkmate 90 - DAA - 02
 calibration procedure external
 measurement procedure immersion

pH equipment Corning Checkmate 90 - DAA - 02
 calibration procedure Tank (no buffers - pH meter recalibrated working on 2nd day)
 measurement procedure immersion

Conductivity equipment Corning Checkmate 90 (DAA - 02)
 calibration procedure air @ 1408.2 µS/cm
 measurement procedure immersion

Conductivity calibration measurements/time air 0.0 / 1413 µS - recalibrated each day

Sampler signatures (date/time) J. M. [Signature] 2-5-95 - 1700
[Signature] 2-5-95 - 1700

Sampling Sequence

- 10-6-95 MW1, MW6, MW3
- 10-7-95 MW11, MW10, MW8, S3, S1, S2, S5, L1, S4, MW17, MW4
- 10-8-95 MW2, MW7, MW5, MW9, MW13, MW12
- 10-9-95 MW14, MW16, MW18, SFW2, SFW3
- 10-10-95 SFW1, MW15

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-1 date 2-6-95 time 1345

Condition of well Good

Reference Point - Top of Well Casing:

Total Depth to water = DTW = 37.57 (in feet)
 Total depth of well = TD = 76.65 (in feet)
 Water column length = $L_{c(ft.)} = (TD-DTW) =$ 39.08 (in feet)

Volume of water in well casing = $V_{c(gal.)} = L_{c(ft.)} * 0.653 \text{ gal/ft.}$
 = 25.5 gal.

Volume of water in filter pack = $V_{f(gal.)} =$
 = $[L_{c(ft.)}, \text{ Not to exceed 37 feet}] * 0.522 \text{ gal/ft.}$
 = 19.3 gal

Unit Well Volume = V_w (Gallons) = $(V_c + V_f)$ = 44.8 gal
 Minimum Purge Volume (Gallons) = $3 * V_w$ = 134.4 gal

Description of water before purging clear

Measurements collected during purging:

*1402 began
pumping

+19 min.
from 1402
pumping*

	<u>Time</u>	<u>Temperature</u>	<u>pH</u>	<u>mV</u>	<u>Conductivity</u>	<u>Pumping Rate</u>	<u>gallons</u>
1.	<u>1404</u>	<u>9.4°C</u>	<u>7.59</u>	<u>-22</u>	<u>114.8 mS</u>	<u>3 gpm</u>	<u>6 gal</u>
2.	<u>1412</u>	<u>9.4°C</u>	<u>7.23</u>	<u>-10</u>	<u>104.1 mS</u>	<u>4 gpm</u>	<u>38 gal</u>
3.	<u>1420</u>	<u>9.2°C</u>	<u>7.20</u>	<u>-3</u>	<u>99.3 mS</u>	<u>4 gpm</u>	<u>70 gal</u>
4.	<u>1428</u>	<u>8.8°C</u>	<u>7.31</u>	<u>-12</u>	<u>98.5 mS</u>	<u>4 gpm</u>	<u>102 gal</u>
5.	<u>1436</u>	<u>9.0°C</u>	<u>7.12</u>	<u>-4</u>	<u>110.1 mS</u>	<u>4 gpm</u>	<u>134 gal</u>

Total volume of water purged 136 gallons
 Description of water after purging clear

Measurements collected after purging:

pH Calibration: 7.16 and 10.28
Sampled at 1500 hours

Final four (4) replicate measurements of:

	<u>Temperature</u>	<u>pH</u>	<u>mV</u>	<u>Conductivity</u>	<u>Time</u>
1.	<u>7.9°C</u>	<u>7.16</u>	<u>-6</u>	<u>108.6 mS</u>	<u>1452</u>
2.	<u>8.6°C</u>	<u>7.05</u>	<u>-1</u>	<u>99.2 mS</u>	<u>1455</u>
3.	<u>8.4°C</u>	<u>7.00</u>	<u>1</u>	<u>98.7 mS</u>	<u>1459</u>
4.	<u>8.5°C</u>	<u>7.01</u>	<u>1</u>	<u>101.5 mS</u>	<u>1503</u>

Misc. Field Observations _____

Sampler signatures (date/time) J.M. [Signature] 1510 2-6-95
[Signature] 1510 2-6-95

Y

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-2 date 2-8-95 time 0930

Condition of well Good

Reference Point - Top of Well Casing:
 Total Depth to water = DTW = 5.58 (in feet)
 Total depth of well = TD = 177.50 (in feet)
 Water column length = $L_c(\text{ft.}) = (TD-DTW) =$ 171.92 (in feet)

Volume of water in well casing = $V_c(\text{gal.}) = L_c(\text{ft.}) * 0.163 \text{ gal/ft.}$
 = 28.02 gal

Volume of water in filter pack = $V_f(\text{gal.}) = [L_c(\text{ft.}), \text{ Not to exceed } 17.0 \text{ ft.}] * 0.522 \text{ gal/ft.}$
 = 8.87 gal

Unit Well Volume = $V_w \text{ (Gallons)} = (V_c + V_f)$ = 36.39
 Minimum Purge Volume (Gallons) = $3 * V_w$ = 110.7 gal

Description of water before purging clear

Measurements collected during purging:

Begin Purging 0852 @ 4 GPM

*- need How
late at 0923
+ 43
minutes*

Time	Temperature	pH	Conductivity	Pumping Rate	Gal
1. 0855	7.9°C	11.4	292 μS	4 GPM	128 gals
2. 0902	6.2°C	11.4	305 μS	4 GPM	40 gals
3. 0910	5.0°C	11.4	348 μS	4 GPM	72 gals
4. 0917	6.2°C	11.4	316 μS	4 GPM	100 gals
5. 0922	7.4°C	11.4	348 μS	4 GPM	120 gals

Total volume of water purged 121 gallons

Description of water after purging clear

Measurements collected after purging:

pH Calibration: meter wouldn't calibrate

Final four (4) replicate measurements of:

sampled at 0945

Temperature	pH	Conductivity	Time
1. 6.5°C	11.4	312 μS	0937
2. 7.8°C	11.4	301 μS	0939
3. 6.8°C	11.4	305 μS	0941
4. 7.6°C	11.4	300 μS	0943

Misc. Field Observations _____

Sampler signatures (date/time) [Signature] 2-8-95 0950
[Signature] 2-8-95 0950

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

MW-3

date 2-6-95

time 1700

Condition of well Good

Reference Point - Top of Well Casing:

Vertical Depth to water = DTW = 10.20' (in feet)
 Vertical depth of well = TD = 39.60 (in feet)
 Filter column length = $L_c(\text{ft.}) = (TD - DTW) =$ 23.40' (in feet)

Volume of water in well casing = $V_c(\text{gal.}) = L_c(\text{ft.}) * 0.163 \text{ gal/ft.}$
 = 3.81 gal

Volume of water in filter pack = $V_f(\text{gal.}) =$
 = $[L_c(\text{ft.}), \text{ Not to exceed } 12.0 \text{ ft.}] * 0.522 \text{ gal/ft.}$
 = 6.26 gal

Well Volume = V_w (Gallons) = $(V_c + V_f)$ = 10.07 gal
 Minimum Purge Volume (Gallons) = $3 * V_w$ = 30.21 gal

Description of water before purging Silty, smells of landfill gas

Measurements collected during purging:

Stand Pump 1707

Time	Temperature	pH	Conductivity	Pumping Rate	Gal Purged
1710	9.6°C	7.20	200 μS	1.2 gal/min	2.5 Gal
1715	9.9°C	7.00	190.6 μS	1.5 gal/min	9.0 Gal
1721	9.7°C	6.81	200 μS	1.5 gal/min	18.0 Gal
1728	9.9°C	6.68	202 μS	1.5 gal/min	27.0 Gal
1733	10.0°C	6.62	195 μS	1.5 gal/min	32.0 Gal

Total volume of water purged ~ 36 Gal
 Description of water after purging lightly silty

Measurements collected after purging:

Calibration: 7.10 + 10.28

Final four (4) replicate measurements of:

Sampled at 1745

	Temperature	pH	Conductivity	Time
1.	10.4°C	6.54	195 μS	1740
2.	9.8°C	6.56	194 μS	1742
3.	10.1°C	6.56	192 μS	1745
4.	9.9°C	6.57	194 μS	1747

Disc. Field Observations Sampled @ 1745

Sampler signatures (date/time)
[Signature] 2-6-95 1750
[Signature] 2-6-95 1750

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-5 date 2-7-95 time 1102

Condition of well Good

Reference Point - Top of Well Casing:

Total Depth to water = DTW = 50.39 (in feet)
 Total depth of well = TD = 73.00 (in feet)
 Water column length = $L_c(\text{ft.}) = (TD-DTW) =$ 22.61 (in feet)

Volume of water in well casing = $V_c(\text{gal.}) = L_c(\text{ft.}) * 0.163 \text{ gal/ft.}$
 = 3.68 gal

Volume of water in filter pack = $V_f(\text{gal.}) =$
 = $[L_c(\text{ft.}), \text{ Not to exceed } 12.0 \text{ ft.}] * 0.624 \text{ gal/ft.}$
 = _____

Unit Well Volume = V_w (Gallons) = $(V_c + V_f)$ = 3.68 gallons

Minimum Purge Volume (Gallons) = $3 * V_w$ = 11.04 gallons
 (44 ba's)

Description of water before purging clear

Measurements collected during purging:

Time	Temperature	pH	Conductivity	Pumping Rate	gallons purged
1. 1138	7.9°C	not taken	428 μS	4	1 gal
2. 1146	7.2°C	not taken	433 μS	12	3 gal
3. 1157	7.0°C	not taken	423 μS	24	6 gal
4. 1208	7.2°C	not taken	424 μS	36	2 gal
5. 1219	7.2°C	not taken	410 μS	46 (2-7-95)	1.5 gal

Total volume of water purged +16 gallons (2-8-95)

Description of water after purging clear

Measurements collected after purging:

pH Calibration: _____

Final four (4) replicate measurements of:

Sample # 1045

Temperature	pH	Conductivity	Time
1. 7.9°C	not taken	444 μS	1043 2-8-95
2. 7.9°C	not taken	439 μS	1048 2-8-95
3. 7.0°C	not taken	431 μS	1052 2-8-95
4. 7.6°C	not taken	427 μS	1059 2-8-95

Misc. Field Observations _____

Sampler signatures (date/time) [Signature] 2-8-95 1115
[Signature] 2-8-95 1105

Y

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-6 date 2-6-95 time 1535

Condition of well Good

Reference Point - Top of Well Casing:

Total Depth to water = DTW = 42.85' (in feet)
 Total depth of well = TD = 58.00 (in feet)
 Water column length = $L_c(\text{ft.}) = (TD-DTW) =$ 15.15' (in feet)

Volume of water in well casing = $V_c(\text{gal.}) = L_c(\text{ft.}) * 0.163 \text{ gal/ft.}$
 = 2.47 gal

Volume of water in filter pack = $V_f(\text{gal.}) =$
 = $[L_c(\text{ft.}), \text{Not to exceed } 12.0 \text{ ft.}] * 0.624 \text{ gal/ft.}$
 = 7.488 gal

Unit Well Volume = V_w (Gallons) = $(V_c + V_f)$ = 9.96 gal
 Minimum Purge Volume (Gallons) = $3 * V_w$ = 29.87 gal

Description of water before purging clear

Measurements collected during purging:

Start Purging 1550

Time	Temperature	pH	EV	Conductivity	Pumping Rate	# Gal
1. 1552	9.1°C	6.20	47mV	528 μ S	.5 gal/min	1.0 Gal
2. 1600	7.7°C	6.40	36	445 μ S	dry	2.5 Gal
3. 1606	8.9°C	6.25	44	450 μ S	.3 gal/min	3.5 Gal
4. 1613	9.4°C	6.32	42	424 μ S	.3 gal/min	5.0 Gal
5. 1627	9.0°C	6.31	43	423 μ S	.3 gal/min	8.0 Gal

1618
Dry at 6.8 gal

Total volume of water purged ~9.0 gal

Description of water after purging clear

Measurements collected after purging:

pH Calibration: 7.10 + 10.28

Final four (4) replicate measurements of:

Sampled at 1630

	Temperature	pH	Conductivity	Time
1.	9.1°C	6.28	419 μ S	1631
2.	9.4°C	6.29	419 μ S	1634
3.	9.8°C	6.32	424 μ S	1636
4.	10.2°C	6.28	429 μ S	1638

Misc. Field Observations _____

Sampler signatures (date/time) [Signature] 2-6-95 1640
[Signature] 2-6-95 1640

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-7 date 2-7-95 time 1230

Condition of well Good

Reference Point - Top of Well Casing:

Total Depth to water = DTW = 45.88 (in feet)
 Total depth of well = TD = 50.00 51.95 (in feet)
 Water column length = $L_c(\text{ft.}) = (TD-DTW) =$ 6.07 (in feet)

Volume of water in well casing = $V_c(\text{gal.}) = L_c(\text{ft.}) * 0.163 \text{ gal/ft.}$
 = .99 gallons

Volume of water in filter pack = $V_f(\text{gal.}) =$
 = [$L_c(\text{ft.})$, Not to exceed 12.0 ft.] * 0.624 gal/ft.
 = _____

Unit Well Volume = V_w (Gallons) = $(V_c + V_f)$ = 1.0 gallon
 Minimum Purge Volume (Gallons) = $3 * V_w$ = 3.0 gallons
 (126.6 is)

Description of water before purging clear

Measurements collected during purging:

Time	Temperature	pH	Conductivity	#baits Pumping Rate	gallons
1. <u>1242</u>	<u>8.2°C</u>	_____	<u>806 uS</u>	<u>2</u>	<u>0.5</u>
2. <u>1245</u>	<u>8.0°C</u>	_____	<u>945 uS</u>	<u>3</u>	<u>1.25</u>
3. <u>1248</u>	<u>8.1°C</u>	_____	<u>929 uS</u>	<u>8</u>	<u>2.0</u>
4. <u>1250</u>	<u>8.2°C</u>	_____	<u>867 uS</u>	<u>10</u>	<u>2.5</u>

dry *2.5 = 2.5* *dry at 2.5*

Total volume of water purged 10.25
 Description of water after purging clear

Measurements collected after purging:

pH Calibration: _____

Final four (4) replicate measurements of:
 sampled at 1010

Temperature	pH	Conductivity	Time
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____

enough H₂O

Misc. Field Observations _____

Sampler signatures (date/time) J. [Signature] 2-8-95 1020
[Signature] 2-9-95 1020

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-8

date 2-6-95

time 1145

Condition of well Good

Reference Point - Top of Well Casing:

Total Depth to water = DTW = 15.41' (in feet)

Total depth of well = TD = 67.00 (in feet)

Water column length = $L_{c(ft.)} = (TD-DTW) = \underline{51.59'}$ (in feet)

Volume of water in well casing = $V_{c(gal.)} = L_{c(ft.)} * 0.163 \text{ gal/ft.}$
 = 8.41 gallon

Volume of water in filter pack = $V_{f(gal.)} = [L_{c(ft.)}, \text{ Not to exceed } 12.0 \text{ ft.}] * 0.522 \text{ gal/ft.}$
 = 6.26 gallon

Unit Well Volume = $V_w \text{ (Gallons)} = (V_c + V_f) = \underline{14.67 \text{ gallons}}$

Minimum Purge Volume (Gallons) = $3 * V_w = \underline{44.0 \text{ gallons}}$

Description of water before purging clear

Measurements collected during purging:

12:10 began purging

	Time	Temperature	pH	mV	Conductivity	Pumping Rate	<i>gallons</i>	
1.	<u>1213</u>	<u>9.0°C</u>	<u>7.28</u>	<u>-11</u>	<u>656 μS</u>	<u>.75 gpm</u>	<u>$\approx 2.5 \text{ gal}$</u>	
2.	<u>1219</u>	<u>9.9°C</u>	<u>7.17</u>	<u>-6</u>	<u>637 μS</u>	<u>.50 gpm</u>	<u>$\approx 4.0 \text{ gal}$</u>	
3.	<u>1225</u>	<u>9.5°C</u>	<u>7.09</u>	<u>-3</u>	<u>667 μS</u>	<u>.50 gpm</u>	<u>$\approx 7.0 \text{ gal}$</u>	
4.		<u>Will sample 2-7-95 by 1200 hours</u>						<u>dry at 12:00 (1225)</u>

+ 13 minutes prior to sampling

Total volume of water purged $\approx 13.0 \text{ gallons}$

Description of water after purging clear

Measurements collected after purging:

pH Calibration: 7.10 and 10.23 @ 20°C (temp. of buffer)

Final four (4) replicate measurements of:

samples at 1055 2-7-95

	Temperature	pH	Conductivity	Time	
1.	<u>8.5°C</u>	<u>7.10</u>	<u>687 μS</u>	<u>1031</u>	<u>2-7-95</u>
2.	<u>8.9°C</u>	<u>7.05</u>	<u>679 μS</u>	<u>1034</u>	<u>2-7-95</u>
3.	<u>9.5°C</u>	<u>7.00</u>	<u>660 μS</u>	<u>1036</u>	<u>2-7-95</u>
4.	<u>9.6°C</u>	<u>7.00</u>	<u>664 μS</u>	<u>1039</u>	<u>2-7-95</u>

Misc. Field Observations _____

Sampler signatures (date/time) *[Signature]* 2-7-95 1100
[Signature] 2-7-95 1100

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-9 date 2-8-95 time 1318

Condition of well Good

Reference Point - Top of Well Casing:

Total Depth to water = DTW = 59.54' (in feet)
 Total depth of well = TD = 86.40 (in feet)
 Water column length = $L_c(\text{ft.}) = (TD-DTW) = \underline{26.86}$ (in feet)

Volume of water in well casing = $V_c(\text{gal.}) = L_c(\text{ft.}) * 0.163 \text{ gal/ft.}$
 = 4.38 gal

Volume of water in filter pack = $V_f(\text{gal.}) = [L_c(\text{ft.}), \text{Not to exceed } 12.0 \text{ ft.}] * 0.522 \text{ gal/ft.}$
 = 6.26 gal

Unit Well Volume = $V_w \text{ (Gallons)} = (V_c + V_f) = \underline{10.64 \text{ gal}}$
 Minimum Purge Volume (Gallons) = $3 * V_w = \underline{31.92 \text{ gal}}$

Description of water before purging clear

Measurements collected during purging:

Started Purging at 1428

8 min sample purged.

Time	Temperature	pH	Conductivity	Pumping Rate	Volume
1. <u>1430</u>	<u>8.1°C</u>	meter not calibrating	<u>437 μS</u>	<u>1 GPM</u>	<u>3 gal</u>
2. <u>1437</u>	<u>6.9°C</u>	meter not calibrating	<u>450 μS</u>	<u>1 GPM</u>	<u>10 gal</u>
3. <u>1444</u>	<u>7.8°C</u>	meter not calibrating	<u>450 μS</u>	<u>1 GPM</u>	<u>17 gal</u>
4. <u>1451</u> <u>1455</u>	<u>7.7°C</u>	meter not calibrating	<u>396 μS</u>	<u>1 GPM</u> <u>dry</u>	<u>24 gal</u> <u>28 gal</u>

Total volume of water purged clear 731 gals

Description of water after purging clear

Sampled at 1515

Measurements collected after purging:

pH Calibration: Meter Not Calibrating

Final four (4) replicate measurements of:

	Temperature	pH	Conductivity	Time
1.	<u>6.4°C</u>	meter not calibrating	<u>397 μS</u>	<u>1510</u>
2.	<u>7.4°C</u>	meter not calibrating	<u>401 μS</u>	<u>1512</u>
3.	<u>10.3°C</u>	meter not calibrating	<u>385 μS</u>	<u>1515</u>
4.	<u>10.1°C</u>	meter not calibrating	<u>385 μS</u>	<u>1517</u>

Misc. Field Observations _____

Sampler signatures (date/time) EL/Plati 2-8-95 1520

[Signature] 2-8-95 520

Y

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-10 date 2-6-95 time 1241

Condition of well Good

Reference Point - Top of Well Casing:

Total Depth to water = DTW = 7.73' (in feet)
 Total depth of well = TD = 70.03 (in feet)
 Water column length = $L_c(\text{ft.}) = (TD-DTW) =$ 62.30 (in feet)

Volume of water in well casing = $V_c(\text{gal.}) = L_c(\text{ft.}) * 0.163 \text{ gal/ft.}$
 = 10.15 gal

Volume of water in filter pack = $V_f(\text{gal.}) =$
 = $[L_c(\text{ft.}), \text{ Not to exceed } 12.0 \text{ ft.}] * 0.522 \text{ gal/ft.}$
 = 6.26 gal

Unit Well Volume = V_w (Gallons) = $(V_c + V_f) =$ 16.41 gal
 Minimum Purge Volume (Gallons) = $3 * V_w =$ 49.23 gal

Description of water before purging clear - strong odor

Measurements collected during purging:

*1310 began purging
 + 17.5 minutes
 prior to sampling*

Time	Temperature	pH	Conductivity	Pumping Rate	gallon
1. 1312	8.3°C	8.43 - 73	158.3 μS	-75 gpm	1.50
2. 1318	9.6°C	8.22 - 66	152.1 μS	-75 gpm	6 gal
3. 1325	9.3°C	8.04 - 54	160.7 μS	-50 gpm	dry at 8.5
4. 1330	9.4°C	7.92 - 43	161.1 μS	-5 gpm	dry at 10.0

Total volume of water purged 11.5 gallons
 Description of water after purging clear

Measurements collected after purging:

pH Calibration: 7.10 and 10.28 @ 6.2°C

Final four (4) replicate measurements of:

sampled at 1005 on 2-7-95

Temperature	pH	Conductivity	Time
1. 8.8°C	8.22	165.0 μS	0948 2-7-95
2. 8.6°C	8.04	172.0 μS	0951 2-7-95
3. 8.6°C	7.92	166.8 μS	0953 2-7-95
4. 8.3°C	7.92	161.1 μS	0956 2-7-95

Misc. Field Observations _____

Sampler signatures (date/time) [Signature] 2-7-95

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-11 date 2-7-95 time 0805

Condition of well Good

Reference Point - Top of Well Casing:

Total Depth to water = DTW = 13.22 (in feet)

Total depth of well = TD = 25.80 (in feet)

Water column length = $L_c(\text{ft.}) = (TD-DTW) = \underline{12.58}$ (in feet)

Volume of water in well casing = $V_c(\text{gal.}) = L_c(\text{ft.}) * 0.163 \text{ gal/ft.}$
 = 2.05 gal.

Volume of water in filter pack = $V_f(\text{gal.}) = [L_c(\text{ft.}), \text{ Not to exceed } 12.0 \text{ ft.}] * 1.045 \text{ gal/ft.}$
 = 12.54

Unit Well Volume = V_w (Gallons) = $(V_c + V_f) = \underline{14.59}$

Minimum Purge Volume (Gallons) = $3 * V_w = \underline{43.77 \text{ gallons}}$

Description of water before purging clear

Measurements collected during purging:

0833 Began purging at 2.5 gpm

Time	Temperature	pH	Conductivity	Pumping Rate
1. _____	_____	_____	_____	_____
2. _____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____

+6.5 minutes prior to sampling

Total volume of water purged 59 gallons

Description of water after purging clear

Measurements collected after purging:

pH Calibration: 7.04 and pH meter won't calibrate

Final four (4) replicate measurements of:

sampled at 0925

Temperature	pH	Conductivity	Time
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____

Misc. Field Observations _____

Sampler signatures (date/time) J.H. [Signature] 2-7-95 0830

[Signature] 7-7-95 0830

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-12 date 2-8-95 time 1730

Condition of well Good

Reference Point - Top of Well Casing:

Total Depth to water = DTW = 10.61 (in feet)
 Total depth of well = TD = 72.75 (in feet)
 Water column length = $L_c(\text{ft.}) = (TD-DTW) = \underline{62.14}$ (in feet)

Volume of water in well casing = $V_c(\text{gal.}) = L_c(\text{ft.}) * 0.163 \text{ gal/ft.}$
 = 10.13 gal

Volume of water in filter pack = $V_f(\text{gal.}) = [L_c(\text{ft.}), \text{ Not to exceed } 12.0 \text{ ft.}] * 0.522 \text{ gal/ft.}$
 = 6.26 gal

Unit Well Volume = V_w (Gallons) = $(V_c + V_f) = \underline{16.39 \text{ gal}}$
 Minimum Purge Volume (Gallons) = $3 * V_w = \underline{49.2 \text{ gal}}$

Description of water before purging clear

Measurements collected during purging:

1750 began purging at 2.5 gpm

Time	Temperature	pH	Conductivity	Pumping Rate	gallons
1. <u>1752</u>	<u>8.2°C</u>	_____	<u>203 μS</u>	<u>2.5 gpm</u>	<u>5.0</u>
2. <u>1757</u>	<u>7.1°C</u>	_____	<u>201 μS</u>	<u>2.5 gpm</u>	<u>18.0</u>
3. <u>1804</u>	<u>8.7°C</u>	_____	<u>189.1 μS</u>	<u>2.5 gpm</u>	<u>33.0</u>
4. <u>1809</u>	<u>8.2°C</u>	_____	<u>208 μS</u>	<u>2.5 gpm</u>	<u>49.0</u>

+ (8 minutes)

Total volume of water purged + 50 gallons
 Description of water after purging clear

Measurements collected after purging:

pH Calibration: _____

Final four (4) replicate measurements of:

sampled at 1820

Temperature	pH	Conductivity	Time
1. <u>8.4°C</u>	_____	<u>182.4 μS</u>	<u>1811</u>
2. <u>8.6°C</u>	_____	<u>180.6 μS</u>	<u>1813</u>
3. <u>8.6°C</u>	_____	<u>180.0 μS</u>	<u>1815</u>
4. <u>8.5°C</u>	_____	<u>180.8 μS</u>	<u>1818</u>

Misc. Field Observations _____

Sampler signatures (date/time) *[Signature]* 2-8-95 1830
[Signature] 2-8-95 1830

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-13 date 2-8-95 time 1600

Condition of well Good

Reference Point - Top of Well Casing:

Total Depth to water = DTW = 19.39 (in feet)
 Total depth of well = TD = 31.65 (in feet)
 Water column length = $L_c(\text{ft.}) = (TD-DTW) =$ 12.26 (in feet)

Volume of water in well casing = $V_c(\text{gal.}) = L_c(\text{ft.}) * 0.163 \text{ gal/ft.}$
 = 2.0 gal.

Volume of water in filter pack = $V_f(\text{gal.}) =$
 $= [L_c(\text{ft.}), \text{ Not to exceed } 12.0 \text{ ft.}] * 1.045 \text{ gal/ft.}$
 = 12.54 gal

Unit Well Volume = V_w (Gallons) = $(V_c + V_f) =$ 14.54
 Minimum Purge Volume (Gallons) = $3 * V_w =$ 43.62 gal.

Description of water before purging slightly silty

Measurements collected during purging:

(638 began purging at 0.5 gpm)

Time	Temperature	pH	Conductivity	Pumping Rate	gallons
1. <u>1640</u>	<u>8.6°C</u>	_____	<u>99.8 uS</u>	<u>0.5 gpm</u>	<u>1.0</u>
2. <u>1646</u>	<u>7.3°C</u>	_____	<u>37.4 uS</u>	<u>0.5 gpm</u>	<u>4.0</u>
3. <u>1654</u>	<u>7.0°C</u>	_____	<u>31.9 uS</u>	<u>0.5-0.75 gpm</u>	<u>8.0</u>
4. <u>1702</u>	<u>8.0°C</u>	_____	<u>29.8 uS</u>	<u>0.5-0.75 gpm</u>	<u>12.0</u>

+ 8 minutes

notes work

well d

Total volume of water purged + 13.0 gallons

Description of water after purging slightly silty

Measurements collected after purging:

pH Calibration: _____

Final four (4) replicate measurements of:

Sampled at 1730

Temperature	pH	Conductivity	Time
1. <u>8.1°C</u>	_____	<u>34.5 uS</u>	<u>1712</u>
2. <u>8.1°C</u>	_____	<u>34.1 uS</u>	<u>1714</u>
3. <u>7.6°C</u>	_____	<u>29.0 uS</u>	<u>1717</u>
4. <u>7.4°C</u>	_____	<u>31.1 uS</u>	<u>1720</u>

Misc. Field Observations _____

Sampler signatures (date/time) [Signature] 2-8-95 1730
[Signature] 2-8-95 1730

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-14

date 2-9-95

time 0845

Condition of well GOOD

Reference Point - Top of Well Casing:

Total Depth to water = DTW = 7.52 (in feet)

Total depth of well = TD = 71.00 (in feet)

Water column length = $L_c(\text{ft.}) = (TD - DTW) = \underline{63.48}$ (in feet)

Volume of water in well casing = $V_c(\text{gal.}) = L_c(\text{ft.}) * 0.163 \text{ gal/ft.}$
 = 10.35 gal

Volume of water in filter pack = $V_f(\text{gal.}) =$
 $= [L_c(\text{ft.}), \text{ Not to exceed } 12.0 \text{ ft.}] * 1.567 \text{ gal/ft.}$
 = 13.5 gal

Unit Well Volume = V_w (Gallons) = $(V_c + V_f) = \underline{23.85 \text{ gal}}$

Minimum Purge Volume (Gallons) = $3 * V_w = \underline{71.55 \text{ gal}}$

Description of water before purging clear

Measurements collected during purging:

0900 began purging at 3.0 gpm

+18 minutes

Time	Temperature	pH	Conductivity	Pumping Rate	gallons
1. 0902	7.5°C	X	101.1 μS	3 gpm	2.0
2. 0908	6.5°C	X	87.5 μS	3 gpm	24.0
3. 0915	6.3°C	X	81.6 μS	3 gpm	45.0
4. 0922	6.9°C	X	83.5 μS	3 gpm	66.0
5. 0929	6.2°C	X	82.6 μS	3 gpm	87.0

Total volume of water purged + 90 gallons

Description of water after purging clear

Measurements collected after purging:

pH Calibration: _____

0945 sampled

Final four (4) replicate measurements of:

	Temperature	pH	Conductivity	Time
1.	6.7°C	/	79.2 μS	0934
2.	7.1°C	/	81.0 μS	0936
3.	7.6°C	/	82.0 μS	0939
4.	7.6°C	/	82.5 μS	0941

Misc. Field Observations _____

Sampler signatures (date/time)

J. M. Paul 2-9-95 0950
J. S. [unclear] 2-9-95 0950

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-15

date 2-10-95

time 1025
1230

Condition of well Good

Reference Point - Top of Well Casing:

Total Depth to water = DTW = 11.55 (in feet)

Total depth of well = TD = 178.00 (in feet)

Water column length = $L_c(\text{ft.}) = (TD-DTW) = \underline{166.45}$ (in feet)

Volume of water in well casing = $V_c(\text{gal.}) = L_c(\text{ft.}) * 0.163 \text{ gal/ft.}$
= 27.13 gal

Volume of water in filter pack = $V_f(\text{gal.}) =$
= [$L_c(\text{ft.})$, Not to exceed 13.0 ft.] * 1.522 gal/ft.
= 19.79 gal

Unit Well Volume = V_w (Gallons) = ($V_c + V_f$) = 46.92 gal

Minimum Purge Volume (Gallons) = $3 * V_w = \underline{140.8 gal.}$

Description of water before purging clear

Measurements collected during purging:

(Obs) began purging at 1.75 gpm

Time	Temperature	pH	Conductivity	Pumping Rate	gallons
1. <u>1035</u>	<u>9.2°C</u>	will	<u>159.5 μS</u>	<u>1.75 gpm</u>	<u>3.50</u>
2. <u>1048</u>	<u>9.7°C</u>	will	<u>161.5 μS</u>	<u>1.00 gpm</u>	<u>15</u>
3. <u>1053</u>	<u>9.5°C</u>	will	<u>150.3 μS</u>	<u>1.00 gpm</u>	<u>21</u>
4. <u>1121</u>	<u>9.5°C</u>	will	<u>157.9 μS</u>	<u>0.5 gpm</u>	<u>32</u>

+15 minutes

(1124 dry @ 34 gal)

Total volume of water purged +36 gallons

Description of water after purging clear

Measurements collected after purging:

pH Calibration: _____

Final four (4) replicate measurements of:

1150 sampled

Temperature	pH	Conductivity	Time
1. <u>9.1°C</u>	will	<u>162.6 μS</u>	<u>1138</u>
2. <u>9.1°C</u>	will	<u>161.9 μS</u>	<u>1140</u>
3. <u>9.3°C</u>	will	<u>162.5 μS</u>	<u>1142</u>
4. <u>9.3°C</u>	will	<u>162.1 μS</u>	<u>1144</u>

Misc. Field Observations _____

Sampler signatures (date/time)

Jan [Signature] 2-10-95 1200
[Signature] 2-10-95 1240

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-16 date 2-9-95 time 0955

Condition of well Good

Reference Point - Top of Well Casing:
 Total Depth to water = DTW = 4.61 (in feet)
 Total depth of well = TD = 26.80 (in feet)
 Water column length = $L_{c(ft.)} = (TD-DTW) =$ 22.19 (in feet)

Volume of water in well casing = $V_{c(gal.)} = L_{c(ft.)} * 0.163 \text{ gal/ft.}$
 = 3.62 gal

Volume of water in filter pack = $V_{f(gal.)} =$
 $= [L_{c(ft.)}, \text{ Not to exceed } 12.0 \text{ ft.}] * 0.522 \text{ gal/ft.}$
 = 6.26 gal

Unit Well Volume = $V_w \text{ (Gallons)} = (V_c + V_f) =$ 9.88 gal
 Minimum Purge Volume (Gallons) = $3 * V_w =$ 29.64 gal

Description of water before purging clear

Measurements collected during purging:

1020 began purging @ 2gpm

Time	Temperature	pH	Conductivity	Pumping Rate	gall
1. <u>1022</u>	<u>5.6°C</u>	_____	<u>182 uS</u>	<u>2 gpm</u>	<u>4.0</u>
2. <u>1026</u>	<u>7.1°C</u>	_____	<u>192.2 uS</u>	<u>2 gpm</u>	<u>12.0</u>
3. <u>1031</u>	<u>7.8°C</u>	_____	<u>210 uS</u>	<u>1.75 gpm</u>	<u>22.0</u>
4. <u>1038</u>	<u>7.7°C</u>	_____	<u>206 uS</u>	<u>1.75 gpm</u>	<u>30.0</u>

+7 minutes

Total volume of water purged + 30 gallons
 Description of water after purging clear

Measurements collected after purging:

pH Calibration: _____

Sampled at 1050

Final four (4) replicate measurements of:

	Temperature	pH	Conductivity	Time
1.	<u>7.2°C</u>	_____	<u>213 uS</u>	<u>1042</u>
2.	<u>7.7°C</u>	_____	<u>210 uS</u>	<u>1044</u>
3.	<u>7.6°C</u>	_____	<u>215 uS</u>	<u>1046</u>
4.	<u>7.7°C</u>	_____	<u>213 uS</u>	<u>1049</u>

Misc. Field Observations _____

Sampler signatures (date/time) J. [Signature] 2-9-95 1100
[Signature] 2-9-95 1100

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-17 date 2-7-95 time 1555

Condition of well GOOD

Reference Point - Top of Well Casing:
 Total Depth to water = DTW = 17.03 (in feet)
 Total depth of well = TD = 94.54 (in feet)
 Water column length = $L_c(\text{ft.}) = (TD-DTW) =$ 77.49 (in feet)

Volume of water in well casing = $V_c(\text{gal.}) = L_c(\text{ft.}) * 0.163 \text{ gal/ft.}$
 = 12.63

Volume of water in filter pack = $V_f(\text{gal.}) =$
 $= [L_c(\text{ft.}), \text{ Not to exceed } 12.0 \text{ ft.}] * 0.522 \text{ gal/ft.}$
 = 6.26

Unit Well Volume = V_w (Gallons) = $(V_c + V_f) =$ 18.89
 Minimum Purge Volume (Gallons) = $3 * V_w =$ 56.7 gallon

Description of water before purging clear

Measurements collected during purging:

1605 began purging

Time	Temperature	pH	Conductivity	Pumping Rate	gallon
1. <u>1609</u>	<u>7.1°C</u>	_____	<u>356 uS</u>	<u>1 gpm</u>	<u>4</u>
2. <u>1615</u>	<u>7.1°C</u>	_____	<u>405 uS</u>	<u>1 gpm</u>	<u>10</u>
3. <u>1622</u>	<u>7.6°C</u>	_____	<u>409 uS</u>	<u>1 gpm</u>	<u>17</u>
4. <u>1638</u>	<u>7.5°C</u>	_____	<u>290 uS</u>	<u>.5 gpm</u>	<u>24</u>
5. <u>1648</u>	<u>7.0°C</u>	_____	<u>263 uS</u>	<u>.35 gpm</u>	<u>30</u>

+23 minutes

Total volume of water purged 33 gallon
 Description of water after purging clear

Measurements collected after purging:

pH Calibration: _____

Final four (4) replicate measurements of:

sampled at 1710

Temperature	pH	Conductivity	Time
1. <u>7.6°C</u>	_____	<u>357 uS</u>	<u>1706</u>
2. <u>7.4°C</u>	_____	<u>319 uS</u>	<u>1708</u>
3. <u>7.5°C</u>	_____	<u>309 uS</u>	<u>1710</u>
4. <u>7.2°C</u>	_____	<u>314 uS</u>	<u>1713</u>

Misc. Field Observations _____

Sampler signatures (date/time) J.M. [Signature] 2-7-95 1720
S.P. [Signature] 2-7-95 1720

Well
at 3:
1655

ASSESSMENT MONITORING WELL SAMPLE COLLECTION FORM

Project: Watauga County Landfill Permit #95-02

Well # MW-18 date 2-9-95 time 1112

Condition of well Good

Reference Point - Top of Well Casing:

Total Depth to water = DTW = 17.58' (in feet)
 Total depth of well = TD = 73.20 (in feet)
 Water column length = $L_c(\text{ft.}) = (TD-DTW) = \underline{55.62}$ (in feet)

Volume of water in well casing = $V_c(\text{gal.}) = L_c(\text{ft.}) * 0.163 \text{ gal/ft.}$
 = 9.07 gal.

Volume of water in filter pack = $V_f(\text{gal.}) = [L_c(\text{ft.}), \text{ Not to exceed } 12.0 \text{ ft.}] * 0.522 \text{ gal/ft.}$
 = 6.26 gal

Unit Well Volume = V_w (Gallons) = $(V_c + V_f) = \underline{15.33 \text{ gal}}$
 Minimum Purge Volume (Gallons) = $3 * V_w = \underline{46.0 \text{ gal.}}$

Description of water before purging clear

Measurements collected during purging:

1134 began purging at 2gpm

Time	Temperature	pH	Conductivity	Pumping Rate	gallons
1. <u>1136</u>	<u>7.4°C</u>	4.0	<u>109.9 μS</u>	<u>2gpm</u>	<u>4.0</u>
2. <u>1142</u>	<u>9.0°C</u>	4.0	<u>102.0 μS</u>	<u>2gpm</u>	<u>15.0</u>
3. <u>1149</u>	<u>7.3°C</u>	4.0	<u>94.6 μS</u>	<u>2gpm</u>	<u>30.0</u>
4. <u>1157</u>	<u>7.8°C</u>	4.0	<u>92.5 μS</u>	<u>2gpm</u>	<u>46.0</u>

+18 minutes

Total volume of water purged + 48 gallons
 Description of water after purging clear

Measurements collected after purging:

pH Calibration: _____

Final four (4) replicate measurements of:

Sampled at 1215

Temperature	pH	Conductivity	Time
1. <u>7.2°C</u>	4.0	<u>90.8 μS</u>	<u>1201</u>
2. <u>8.5°C</u>	4.0	<u>90.7 μS</u>	<u>1203</u>
3. <u>8.5°C</u>	4.0	<u>94.6 μS</u>	<u>1205</u>
4. <u>8.4°C</u>	4.0	<u>93.1 μS</u>	<u>1207</u>

Misc. Field Observations _____

Sampler signatures (date/time) [Signature] 2-9-95 1230
[Signature] 2-9-95 1230

STANDARD FIELD PROTOCOL - FINAL ACTIVITIES

Project: Watauga County Landfill Permit #95-02 Date: 7-10-95

Internal temperature of shipping containers at completion of sampling:
< 40°C in shipment

Sample destination 2 shipments - Comstock - 1 - Forest - CTEF

Method of transportation Federal Express - Special Service

Sampler signatures (date/time) [Signature] 2-10-95 1700
[Signature] 7-10-95 1700

BOOK 2

JN

DATE

JSP 10-98

6520-20

2-6-95

Location: Country U.F. = 3rd Assessment Events

Facilities: JSP/GR

Weather: DF 20 mph winds from SW. Wind chill factor -25 - 30°F, sunny

BBIS: Arrived on site, met w/ Mark Combs

General Notes:

① Due to extreme weather conditions, will not conduct any PDD or UGA air monitoring for the duration of the project.

② Project consists of CRP activities and CRP total methods by computer environmental cell. BRZL activities by CTEE environmental services.

③ Sampling points: MW's 1-10, S1, S2, S3, S4, S5, U1, U2, S100, S101, S102, S103, Bermano Spring

④ PPE for entire project. Level D - hard work clothes, safety glasses, steel-toed boots + insulated gear

Basal Z	JUN	DATE
0230	6520-70	7-55
0300		Asst. Mott & Mott
0302		Temp 200°F, light breeze
		Snow showers
		Will
		Calibration on 7/22
		700 and
		7 KC
		Will
		glass probe on pH sensor was broken
		will call Jett Smith that
		Deft Smith started measuring with a K not (with) - will purge sufficiently but was 11:20 to assist with calibration
		Assumption on 11:20 3 estimates
0842		paper at MW11
0853		begin purging at 2.5 gpm
		Volatiles
		4525150
		4315150

1700	MW3	SWT 16.20	TL	37.60
		need to		37.60
		calibrated	7.10	10.23
		begin purging	1.2 gpm	
		water	and 1.5 gpm	
		increased flow	to 1.5 gpm	
1723		red water flow	to 1.5 gpm	
1745		sampled MW3	(by Jett)	
		volatiles	lot #	
		MW3	4325050	115670
			4325050	115695
		MW3	C4318020	+ 839551
1755		pH 2	- metal - field adjust	
		10 ft	site	

Jett Smith
26-75

1015	MW15	15 Jul	15	15
1025	MW15	15 Jul	15	15
1025	MW15	15 Jul	15	15
1030	MW15	15 Jul	15	15
	Variables	15	15	15
	MWB	430500	115721	
	MWB	432050	115687	
095	MWB	C1318020	1151348	
	MWB	C1318020	1151348	
1122	MWB	5003112	7340	
1130	MWB	5003112	7340	
1230	MWB	5003112	7340	
1240	MWB	5003112	7340	

0915	MWB	lot #	IN
	MWB	438520	H 82151
	MWB	432500	115712
	MWB	432500	115724
	MWB	C 4318020	H 81954
	MWB	field adjusted for re-bals	

1255 MW4 SWL 818 TD 2:40
 1320 IP left for LF 8:00
 key to MW2 - MW2 11:00
 give us call I key
 EK stages 11:14
~~8:00~~ MW4 codes

1330
 give us call not
 record to let generator
 and sample S3, S5 sample
 Sample S3 (big EK)
 splinters lot# 2M

1425 Sample S1 (big EK)
 metals S1
 metals S2
 metals S3
 metals S4
 metals S5

1440 Sample S2 (big EK)
 Volatiles lot# SC
 S2 4325050 115614
 4325050 115614
 lot# S2
 metals S2
 metals S3
 metals S4
 metals S5

1555 Dump 154 25
 volatiles
 Make
 4325050 115614
 4325050 115614
 4325050 115614

1505 LI - near MW10
 Sampled LI
 Volatiles
 LI
 metals
 LI
 4325050 115614
 4325050 115614

1515
 4325050 115614
 4325050 115614
 4325050 115614
 4325050 115614

1522
 4325050 115614
 4325050 115614
 4325050 115614
 4325050 115614

1530
 4325050 115614
 4325050 115614
 4325050 115614
 4325050 115614

1555
 4325050 115614
 4325050 115614
 4325050 115614

1505
 4325050 115614
 4325050 115614
 4325050 115614

1515
 4325050 115614
 4325050 115614
 4325050 115614

1522
 4325050 115614
 4325050 115614
 4325050 115614

1530
 4325050 115614
 4325050 115614
 4325050 115614

Weather now is $\approx -15^{\circ}\text{F}$
 Strong winds N 15-20 mph
 blowing heavily

1025 MWS SWL 50.51
 1045 sampled MWS (by JST)
 Comp. loc. metal

MWS at CA318020 SWL H 1858
 MWS MWS 1st CA318020 SWL H 1858
 9 CITE V = 3 at 10:10
 pH < 2 for metal

1115 stopped work to begin prep
 Sample Bldg. C

1300 Relinquished samples to Barbara
 at 11:00

1318 MWS SWL 89.54' TD 86.40'
 1325 left site to go in generator

1345 generator will not start
 1425 generator started - back to MWS
 1428 began pumping at 1 gpm
 1455 well stop at 28 gpm

1515 Still
 Volatile # MW9
 MW9 42250510
 MW9 4225050
 MW9 4225052
 MW9 4225053
 MW9 4225054
 MW9 4225055
 MW9 4225056
 MW9 4225057
 MW9 4225058
 MW9 4225059
 MW9 4225060
 MW9 4225061
 MW9 4225062
 MW9 4225063
 MW9 4225064
 MW9 4225065
 MW9 4225066
 MW9 4225067
 MW9 4225068
 MW9 4225069
 MW9 4225070
 MW9 4225071
 MW9 4225072
 MW9 4225073
 MW9 4225074
 MW9 4225075
 MW9 4225076
 MW9 4225077
 MW9 4225078
 MW9 4225079
 MW9 4225080
 MW9 4225081
 MW9 4225082
 MW9 4225083
 MW9 4225084
 MW9 4225085
 MW9 4225086
 MW9 4225087
 MW9 4225088
 MW9 4225089
 MW9 4225090
 MW9 4225091
 MW9 4225092
 MW9 4225093
 MW9 4225094
 MW9 4225095
 MW9 4225096
 MW9 4225097
 MW9 4225098
 MW9 4225099
 MW9 4225100

J	IN	DATE
WB	LF	2-1-75
JSLIPPER		4th Day
Wh. Metal	Temp	#45, bars: 2, 8
0335	air	site + LT 760
	to talk to	Barb
0345	MW 1A	at 7:52 TD
	at 100 yds	Cond. meter w/ 1480 x 15
0400	Sto. med	at 3:00 pm
0430	begin pump	to 100 yds
	reduced rate	90 up 20 min
0445	sampled	16114 (by ER)
	val	11.55
	Comp. Chem	lot # C 4318020
	pH 2	H 839568
0755	MW 1B	461 TD 76.80
	pump pull	to 100 yds
0820	at 100 yds	at 2 pm
1031	reduced rate	to 1.75 gpm
1038	reduced flow	to 100 yds/min
1050	sampled	MW 1B (by ER)
	Cond. Chem	lot # C 4318020
	pH 2	H 839568
	Comp. Chem	lot # C 4318020
	pH 2	H 839568
		metals

1750	MW 12	at 10:01 TD 76.15
	for water	at 20 ft
1712	generator	sl. ed - 200 ft
	outlet	is 15 ft
	dr. We	at 10 ft
	the tube	
1750	be Jan	at 2.5 gpm
	need to pump	49 gallons
1820	sampled	MW 12 (by ER)
	val	lot # 52
	MW 12	4325050 115672
		4325050 115395
	metals	C 4318020 H 839568
	pH 2	for metals - 10 yds
1830	reduced rate	to 1 m ² /min
	15H	site

Handwritten signature or initials, possibly "J. J. 2/1/75".

1112 MW 10 SWL 17:50 TD 73.20
 am part of ... in the 20's
 one sunny w/ light breeze.
 (a much needed breeze)

generator will not start
 began pouring at 2:00pm
 reduced rate 15 min
 1157 sampled MW 1E (by E.I.)
 vol files - ITI - X lot #'s
 metal - lot # C4918020
 SW 1329555

1245 left site for lunch
 1330 arrived back on site
 1332 MW 15 SWL 11:55 TD 178.00
 H₂O level not significant
 purging MW 14 - 1 hour 15 min
 after purge (14)
 generator will not start
 need 140 gallons

1442 left MW 15 - generator won't start
 decided to go to SFWD!
 1445 SFW 2 - SWL 11:02 TD 30'
 metal label states 30' deep on
 installed in 1988 yield 3 gpc
 2 well (rec. pt. for SWL - two)

30' - 18.18' x 163 gal / ft (2 well) = 2.9 gpc
 will purge 3 gallons
 before sampling. Use 12 barrels (minimum)
 generator will not start

1455 - 8:00 - 4:10 - SFW 2 - ITI
 water conductivity - No order
 14 Spks

TIME	TEMP	COND	# Spks
1458	87.4	122.745	3
1502	90.0	112.505	6
1505	98.0	116.705	2
1509	104.0	121.905	20
1512	112.0	111.205	28
1515	107.0	115.505	30
1519	98.2	113.5	40
TOTAL	860	22.00	110.0

1520 - Supplied SF 12
 Volat %: Lot # 4325150
 SW E 115.705
 SW F 115.705
 Met is: Lot # C 433820
 SW # 4 859475

NOTE: Swells taken deep from well were silt
 and silted off

1535 SFW 2 - SWL 14:25 TD 30'
 metal label states 30' deep and
 installed in 1988 yield 3 gpc
 2 well (rec. pt. for SWL - two)

30' - 14.23' = 15.77' ^{not}
 15.77' x .163 gal. ft. = 2.57 gal.
 will purge water 3 gal.
 take cond. by 10.15.

1545 Deegan building SFWS - IP
 Initial H₂O clear + 100 QUA

TIME	TEMP	CONC.	# GALLS
1551	8.9°C	123.7 μS	3
1555	9.4°C	92.7 μS	11 - 4.15 S. Slight odor
1600	9.1°C	94.0 μS	19
1604	9.7°C	92.0 μS	28
1608	8.3°C	93.3 μS	35
1612	lot # C438020	SN 4837432	
	wholes lot 9328550, S	S 115728	115691

1610 - Sampled SFWS - ~~IP~~
 will not start

1645 Brenco Springs (b. ER)
 Brenco Springs is dry - no flow from Brenco Springs
 though area down will flow
 Heller and Green Palace.

1655 MW15 generator fuel will not start
 fuse + bad spark plug + flexing
 1715 (re-site) get spark plug
 2-9-75

Watanga Co. UT - Day 5

1755
 1825 arrive site and MW15 generator will not start again
 took it to maintenance shop to see if mechanics can get it to run

1825 SFWS - label states 65' deep installed 83' deep
 field 4 (300)
 SWL 31.90' ref. pt. top
 65.00 - 31.90 = 33.10' under column
 33.10 x .163 gal/ft = 5.39 gal minimum
 5.39 gal x 4.15 / gal = 22.46 gal min

APPENDIX III

**Previous Landfill Groundwater Organic Analysis
Summary Table and Data Evaluation**

WATKINS 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	
	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	
1,1,1-Trichloroethane (1,1,1-TCA)	December 11, 1990	SW846 Method 8240	5		394	102			200	200	
	November 16-18, 1992	SW846 Method 8010	1		980	68	6		200	200	
	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	
Tetrachloroethene (PCE)	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	
	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	
1,1-Dichloroethane (1,1-DCA)	December 11, 1990	SW846 Method 8240	5		52	178			700'	---	
	November 16-18, 1992	SW846 Method 8010	1		41	250		81	700'	---	
	March 5, 1993	EPA Method 502.2	0.7		96	173.3	1.2	77	700'	---	
	March 5, 1993	SW846 Method 8021	0.7		82	161	1.1	43.7	700'	---	
1,1-Dichloroethene (1,1-DCE)	December 11, 1990	SW846 Method 8240	5		80	7			7	7	
	November 16-18, 1992	SW846 Method 8010	1		110	14			7	7	
	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	
cis-1,2-Dichloroethene (cis-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	
Vinyl Chloride	March 5, 1993	SW846 Method 8021	0.6						5	5	
	December 11, 1990	SW846 Method 8240	10					---	.015	2	
	November 16-18, 1992	SW846 Method 8010	1			3		12	.015	2	
Dichlorodifluoromethane	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	
	December 11, 1990	SW846 8240	5			21		---	0.19	---	
Chloroethane	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	---	
Trans-1,3-Dichloropropene	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				---	---	
Chloroethane	March 5, 1993	SW846 method 8021 and *(8240)	1.4 *(10)			*		*	---	---	
	December 11, 1990	SW846 Method 8240	5			9-J		---	70	100	
	November 16-18, 1992	SW846 Method 8010	1					3	70	100	
Chloroethane	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)

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
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	
Chloroform	March 5, 1993	SW846 Method 8021	0.5						1.8	75	
	December 11, 1990	SW846 Method 8240	5					---	0.19	100	
	November 16-18, 1992	SW846 Method 8010	1				2	1	0.19	100	3
1,2-Dichloropropane	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	
	December 11, 1990	SW846 Method 8240	5					---	0.56	5	
2,2-Dichloropropane	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	
1,1-Dichloropropene	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)		*	*	*	*	---	---	
Bis(2-ethylhexyl)phthalate	March 5, 1993	SW846 Method 8240	0.5	3.8					---	---	
	March 5, 1993	SW846 Method 8270	2		20				---	---	
Xylenes, Total	March 5, 1993	SW846 Method 8021	0.4						---	---	
	March 5, 1993	SW846 Method 8080	0.1					1	0.4	10	
4,4'-DDE	March 5, 1993	SW846 Method 8080	0.1					0.1	---	---	

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						---	5	
	November 16-18, 1992	SW846 Method 8010	1					---	0.3	5	
	March 5, 1993	EPA Method 502.2	0.1			0.2	0.2	0.3	0.3	5	
1,2-Dichloroethane	March 5, 1993	SW846 Method 8021	0.1						0.3	5	
	March 5, 1993	SW846 Method 8021	0.3						0.38	5	
	December 11, 1990	SW846 Method 8240	5						0.38	5	
	November 16-18, 1992	SW846 Method 8010	1			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	

EPA 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.

MDL Analytical Method Detection Limit
 NCS North Carolina Water Quality Standard (DEHNR: 15A NCAC 2L .0202)
 MCL EPA Primary Drinking Water Standard Maximum Contaminant Level

December 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.
 November 16-18, 1993 and March 5, 1993 Sampling Event - Conducted by Draper Aden Associates - Analysis performed by Central Virginia Laboratories and Consultants, Inc. (CVLC).
 EPA Metho 502.2 Co-elutes compounds cis-1,2-Dichloroethene and 2,2-Dichloropropane

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

Data Evaluation

The organic compounds detected in the groundwater at Watauga County Landfill are primarily dense Chlorinated solvents. The solvents have little affinity for soils and are seldom a problem in surface water because of their volatility. (EPA/600/8-83/019, May 1983). Metals concentrations detected in the groundwater are generally low or are below the analytical method detection limit, although several metals, Cadmium and Iron in particular, have been observed at levels above those established by the EPA MCL and the Secondary MCL, respectively.

Metal concentrations observed during the Assessment monitoring program will be evaluated to determine if groundwater resources are being adversely impacted by sources not directly related to the aquifer medium. The Groundwater and Surface Water Monitoring Program (SAP - Appendix I) included as an attachment to the Watauga County Assessment Plan describes the metal analysis to be conducted as part of the Assessment Plan. Cadmium, Iron, Barium, and Mercury will comprise the initial metal target analyte list for the first year of Assessment monitoring. Subsequent to complete annual Appendix II analyses conducted on the 'core' assessment monitoring well network, appropriate revisions to the target analyte list will be made.

The Groundwater and Surface Water Monitoring Program, Appendix I of the Assessment Plan, also describes the organic analysis to be conducted as part of the Assessment Plan. The following twelve "primary detected organic compounds" will initially be included in the target analyte list for the first year of Assessment monitoring. Analytical results of additional organic analytes provided by the necessary methods will also be provided. Subsequent to the complete annual Appendix II analyses conducted on the 'core' assessment monitoring well network, appropriate revisions to the target analyte list will be made.

A descriptive summary of constituents detected as a result of prior sampling and analysis is contained in the Evaluation of Existing Data contained in Section II of the Assessment Plan. Tables presenting data summaries of landfill well groundwater, potable well water, stream, and leachate analyses are also contained within Section II of the Assessment Plan. The following data evaluation explores in greater detail the organic constituents detected at the site.

Primary Detected Organic Compounds

The organic compounds detected at significant levels in three (3) previously existing downgradient groundwater monitoring wells (i.e. MW-2, MW-3, and MW-6), listed by order of decreasing occurrence and concentration are:

<i>Parameters detected at significant levels in virtually all downgradient monitoring wells</i>	Highest concentration reported (ppb)	NCS/MCL (ppb, ug/L)	Location of highest concentration
1,1,1-Trichloroethane (1,1,1-TCA)	1646	200/200	MW-2
1,1-Dichloroethene. <i>1,1-Dichloroethylene</i> (1,1-DCE)	232	7/7	MW-2
1,1-Dichloroethane (1,1-DCA)	250	700 (proposed)/--	MW-3
cis-1,2-Dichloroethene. <i>cis-1,2-Dichloroethylene</i> (cis-1,2-DCE)	225	70/70	MW-6
Tetrachloroethene. <i>tetrachloroethylene</i> . <i>perchloroethylene</i> (PCE)	39	0.7/5	MW-3
Trichloroethene. <i>trichloroethylene</i> (TCE)	110	2.8/5	MW-6

All of the constituents listed above were detected above associated EPA Maximum Contaminant Levels (MCL) and the North Carolina Groundwater Quality Standards (NCS) in one or more site groundwater monitoring wells (except for 1,1-DCA which does not have an established MCL or NCS).

All of the compounds listed above were also detected in three (3) of the potable water wells neighboring the site (i.e.: Nissan-Mazda, BREMCO and Carroil residence wells). PCE and TCE were detected above associated MCLs and NCSs in the Nissan-Mazda and Carroil residence wells. In the BREMCO potable well, all (6) compounds were observed only at unquantifiable levels below 1 ppb or at the detection limit of 1 ppb (1,1-DCE).

Five (5) of these compounds (i.e. 1,1,1-TCA, 1,1-DCE, 1,1-DCA, PCE, and TCE) were additionally detected at lower concentrations in five (5) other potable water wells neighboring the site (i.e.: Bolick rental, Greer, Shared Well #2, Ward, and Simko residences). All five (5) of these compounds were not detected in each potable water well and were mostly detected close to the method detection limit for each compound. The presence or source of these trace level compounds in these five (5) potable water wells can not be confirmed at this time.

A summary of the landfill groundwater analysis results for organic compounds listed above can be found on page 1 of the attached detected organic constituent summary table. Page 1 of the summary table presents all the groundwater analysis results for these six chlorinated volatile organics collected to date for the Watauga County Landfill monitoring wells, MW-1, MW-2, MW-3, MW-4, and MW-6. A summary of residential and business potable well analysis results can be found on Table 2.

The organic compounds detected at significant levels primarily in previously existing downgradient groundwater monitoring points located along the Bolick site (i.e.: MW-3 and MW-6), listed by order of decreasing occurrence and concentration are:

<i>Parameters detected at significant levels primarily in downgradient monitoring points located along the Bolick Site</i>	Highest concentrations reported (ppb)	NCS/MCL (ppb; ug/L)	Location of highest concentration
Methylene Chloride, dichloromethane (DCM)	23	5/5	MW-3
Dichlorodifluoromethane	21	0.19/---	MW3
Vinyl Chloride	18	0.015/2	MW-6
Benzene	6	1/5	MW-6
Trans-1,3-Dichloropropene	9	70/100	MW-3
Chloroethane	8	---/---	MW-6

Methylene Chloride and Vinyl Chloride were detected above associated MCLs and NCSs in both groundwater wells, MW-3 and MW-6. Methylene chloride was found just below the MCL at MW-2. It was found recently at the Carroll's residence at 138.2 ppb, well above the MCL of 5 ppb.

Dichlorodifluoromethane was also detected above the NCS in both MW-3 and MW-6 but does not have an established MCL.

Benzene was also detected above the MCL and NCS in MW-6 but only above the NCS in MW-3.

Trans-1,3-Dichloropropene was detected twice in MW-3 and MW-6, although well below the established NCS and MCL.

Chloroethane, although analyzed in four (4) sampling events, was only detected in MW-3 and MW-6 on one (1) event and additionally detected in MW-2 on a different sampling event. Chloroethane does not have an established MCL or NCS.

Methylene Chloride was detected in the Carroll residence well water in two out of three sampling events and Vinyl Chloride was detected in the Carroll residence well water in only one out of three sampling events. Although detected on different sampling events the two compounds have also been detected in the accompanying trip blank. The concentrations of Methylene Chloride and Vinyl Chloride detected in the Carroll residence well were above the established NCS and MCL for Methylene Chloride, and above and approaching, respectively, the established NCS and MCL for Vinyl Chloride. Methylene Chloride was detected at 138.2 ppb in the June 23, 1993 sampling of the Carroll residence well water, well above the MCL of 5 ppb.

Methylene Chloride has also been detected at various levels in three (3) other domestic wells within the Rocky Mountain Heights Subdivision. Methylene Chloride was possibly detected in the Perry residence well water although the analytical result was an estimated result denoted by the analytical lab only as <0.06. Methylene Chloride was detected at significant levels in the initial sampling of two other residential wells (Shared well # 1 and the Ward well). Resampling of the Perry residence well, the Shared Well #1 and the Ward residence well resulted in the absence (non-detection) of Methylene Chloride, suggesting a laboratory contaminant source.

Dichlorodifluoromethane was detected above the established NCS in three of the potable water wells neighboring the site (i.e.: Nissan-Mazda, Carroll, and Perry residences). Again, Dichlorodifluoromethane does not have an associated MCL.

Benzene was detected above the established NCS on all three sampling events of the Carroll residence well but below the established MCL. Benzene was not detected in any other potable water well neighboring the site.

Trans-1,3-Dichloropropene was not detected in any of the sampled potable water wells neighboring the site.

Chloroethane was detected in the Carroll residence well water at concentrations greater than twenty (20) times the concentrations observed in any of the groundwater monitoring wells at the landfill. Chloroethane was also detected in the Nissan-Mazda well water greater than twice the concentrations observed in any of the groundwater monitoring wells at the landfill. Chloroethane does not have an established MCL or NCS.

In summary, parameters detected in the landfill wells and also detected in potable wells above applicable MCLs are Methylene Chloride (Carroll), TCE (Carroll/Nissan) and PCE (Carroll/Nissan).

A summary of analysis results for the organic compounds discussed above can be found in pages 2 and 3 of the attached detected organic constituent summary table. Page 2 of the summary table lists Chlorinated volatile organics detected primarily in groundwater monitoring points located along the Bolick site and page 3 lists detected Benzene and Propane derivatives.

Questionable Detected Organic Compounds

Other organic compounds identified by landfill groundwater sampling and analysis were:

- 1) Detected at trace levels approaching or at analytical minimum detection limits.
- 2) Previously known as common laboratory contaminants.
- 3) Detected only once and at only one monitoring point. and/or
- 4) Also detected in the Trip Blank.

These compounds are listed with appropriate detection addendums as referenced above are:

Chloroform	1,3,4
Bromodichloromethane	1,2
Carbon Tetrachloride	1
1,2-Dichloroethane	1
1,4-Dichlorobenzene	1
1,2-Dichloropropane	1
2,2-Dichloropropene	1
1,1-Dichloropropene	2
Bis(2-ethylhexyl)phthalate	2,4
Xylenes. Total	1,2
4,4'-DDD	1,2

2,2-Dichloropropane additionally co-elutes with cis-1,2-Dichloroethene when utilizing EPA Method 502.2. Related data sets utilizing different analytical methods suggests 2,2-Dichloropropane detection was likely the result of the presence of cis-1,2-Dichloroethane.

A summary of analysis results for the organic compounds discussed above can be found on pages 3 and 4 of the attached detected organic constituent summary table. These compounds will continue to be analyzed in Full Appendix II monitoring scheduled for "core" assessment wells.

Organic Compounds Only Detected in Potable Water Wells

Organic compounds detected in the residential and business potable water wells neighboring the site but not detected in the monitoring well network at the landfill, listed by order of decreasing occurrence and concentration are:

Parameters detected only at potable water wells	Highest concentration (ppb)	NCS/MCL (ppb; ug/L)	Location Detected
Chloromethane	1.48/<0.9	---/---	Carroll/Perry
Trichlorofluoromethane	37.1/0.4	2100/---	Carroll/Nissan
Styrene	2.8	0.014/100	Carroll/Greer
tert-Butylbenzene	1.1	---/---	Carroll/Bolick
Ethylbenzene	trace	29/700	Greer
Isopropylbenzene	0.7/0.6	---/---	Bolick rental
1,3,5-Trimethylbenzene	0.7	---/---	Bolick rental
Napthalene	0.7	---/---	BREMCO/Perry
Toluene	0.6 ^T /0.8 ^T	1000/1000	Carroll/Nissan/Greer
4-Isopropyltoluene	0.2	---/---	Carroll
alpha-Chlordane	0.4	0.027/2	Shared Well #1
gamma-Chlordane	0.3	0.027/2	Shared Well #1
sec-Butylbenzene	0.2	---/---	Shared Well #1
Tert-Butyl Methyl Ether	2.4	200/---	Carroll
Methyl Ethyl Ketone	trace	170/---	Bolick rental

The fifteen (15) organic compounds listed above are contaminants that have previously been associated with private water well systems (Sorg, Thomas, 1986). Eight (8) of the compounds only detected in the residential and business potable water wells are BTEX components and are often found as the result of activities immediately around the private well heads and/or components of the well systems. Eight (8) of the compounds were detected in the Carroll residence well with three (3) of these same compounds were also detected in the Nissan-Mazda well.

The two (2) Chlordane compounds are commonly used in Termite extermination. The chlordane compounds were detected in only one (1) well, and their occurrence is likely a result of improper application. A resampling of the chlordane contaminated well resulted in no detection of any organic compounds.

A presentation of analytical results for the fifteen (15) organic compounds discussed above can be found in the summary table for the volatile and semi-volatile constituents detected in the residential and business potable water well testing.

APPENDIX IV

Potable Well Organic Analysis Summary Table

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May 30, 1995

Mr. John M. Alley
Environmental Health Section
Appalachian District Health Department
Route 5, Box 199
Boone, NC 28607

Re: Watauga County Landfill
Potable Well Sampling Program
DAA JN: 6520-20

Dear John:

Thank you for the analytical results of the recent sampling performed on three (3) potable wells located near the Watauga County Landfill conducted by the Appalachian District Health Department. Enclosed is an updated summary table presenting the results of the potable well testing program compiled to date. Recent potable well analytical data from samples collected on April 26, 1995 from the Sandra Ward residence, the Mack Brown Chevrolet dealership and Blue Ridge Electric Membership Company (BREMCO) have been added to the update summary table.

It is our understanding the potable well testing results continue to be reviewed by the N.C. Division of Epidemiology and that the analytical results from the recent potable well sampling indicate the sampled well waters are acceptable for all uses due to either non-detection or only trace detection of organic analytes.

If you have any questions or comments, please do not hesitate to call.

Sincerely,
DRAPER ADEN ASSOCIATES

Jeffrey E. Smith
Project Geologist

JES/rc

cc: Mr. Mark Combs, Operations Services Director, Watauga County (with enclosure)
Mr. James S. Ratchford, Watauga County Manager (with enclosure)
Mr. Richard M. DiSalvo, Jr., P.E., Director of Engineering Services, DAA

POTABLE WELL TESTING - WATAUGA COUNTY, NC
RESULTS OF VOLATILE AND SEMI-VOLATILE ANALYSIS

CONSTITUENT	MARCH 5, 1993*	MARCH 18, 1993*	MARCH 24, 1993*	JUNE 23, 1993**	JULY 13, 1994**	NCS	MCL
Carroll Residence (12)							
Benzene	2.1	1.7		1.9		1.0	5
Chloroethane	173.4	74.5		ND			
Chloromethane	ND	14.8		ND			
Dichlorodifluoromethane	30.6	ND		ND		0.19	
1,1-Dichloroethane	20.9	17.4		ND		700	
1,1-Dichloroethene	4.1	1.5		ND		7	7
cis-1,2-Dichloroethene#	1.2	0.9		<1.0		70	70
2,2-Dichloropropane#	1.2	0.9		ND			
4-Isopropyltoluene	ND	0.2	NS	ND	NS		
Isopropylbenzene	0.6	ND		ND			
Methylene Chloride	ND	43.0(XT)		136.2			
Styrene	2.8	0.5		ND		5	5
Tert-Butyl Methyl Ether	ND	ND		ND		0.014	100
Tetrachloroethene	5.4(X)	4.7		2.4		200	
Toluene	ND	0.6(T)		4.2		0.7	5
1,1,1-Trichloroethane	19.7	15.7		ND		1000	1000
Trichloroethene	7.0(X)	5.5(X)		29.4		200	200
Trichlorofluoromethane	37.1	20.2		7.0		2.8	5
Vinyl Chloride	1.7(T)	ND		ND		2100	
p and m-Xylene	ND	ND		ND		0.015	2
o-Xylene	ND	3.4		<1.0		400	10,000
Nissan-Mazda Dealership (4)				2.9		400	10,000
Carbon Tetrachloride	0.2						
Chloroethane	19.1		ND		ND	0.3	5
Dichlorodifluoromethane	8.2		ND		ND		
1,1-Dichloroethane	98.5	8.7			ND	0.19	
1,2-Dichloroethane	ND	63.1			104.3	700	
1,1-Dichloroethene	5.4	0.5			ND	0.38	
cis-1,2-Dichloroethene#	22.2	3.7			4.7	7	7
1,2-Dichloropropane	0.5	13.0			23.7	70	70
2,2-Dichloropropane#	22.2	0.3			ND	0.56	5
Tetrachloroethene	21.8(X)	13.0		NS	ND		
Toluene	ND	28.1(X)			30.9	0.7	5
1,1,1-Trichloroethane	14.7	0.8(T)			ND	1000	1000
Trichloroethene	11.2(X)	19.3			22.9	200	200
Trichlorofluoromethane	0.4	9.1(X)			12.6	2.8	5
o-Xylene	0.4	ND			ND	2100	
		0.5(T)			ND	400	10,000

(Other footnotes located on page 4)

NOTE: All Concentrations are in ppb (ug/L).

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POTABLE WELL TESTING - WATAUGA COUNTY, NC
RESULTS OF VOLATILE AND SEMI-VOLATILE ANALYSIS

CONSTITUENT	3/5/93*	3/10/93*	5/11/93**	6/23/93**	3/30/94**	4/6/94**	8/2/94**	12/7/94**	4/26/95	NCS	MCL
Blue Ridge Electric Membership Company - (BREMCO) (5)											
1,1-Dichloroethane	0.7					<1.0	1.4	1.0	1.2	700	---
Naphthalene	0.6					NA	NA	NA	NA	---	---
1,1,1-Trichloroethane	0.2	NS				<1.0	<1.0	<1.0	<1.0	200	200
Trichloroethene	0.5		NS	NS		<1.0	<1.0	<1.0	<1.0	2.8	5
1,1-Dichloroethene	ND					1.0	1.9	<1.0	1.1	7	7
cis-1,2-Trichloroethene	ND					<1.0	ND	<1.0	<1.0	70	70
Tetrachloroethene	ND					<1.0	<1.0	trace	<1.0	0.7	5
Bolick rental resident (2)											
tert-Butylbenzene	1.1					ND				---	---
Isopropylbenzene	0.7					ND				---	---
Trichloroethene	0.5					ND				2.8	5
1,3,5-Trimethylbenzene	0.7	NS	NS	NS	NS	ND	NS	NS	NS	---	---
1,1-Dichloroethane	ND					trace				700	---
1,1-Dichloroethene	ND					trace				7	7
Methyl Ethyl Ketone	ND					trace				170	---
Perry Residence (11)											
Dichlorodifluoromethane	2.5					ND				0.19	---
Naphthalene	0.7					ND				---	---
Chloroform	<9	NS	NS	NS		NS			NS	---	---
Methylene Chloride	<0.6					NS				5	5
Chloroform						<1.0				0.19	5
Greer residence (15)											
Benzene						<1.0				1.0	5
Toluene	NS	ND	NS	NS	NS	6.4				1000	1000
Tetrachloroethene						trace			ND	0.7	5
Ethylbenzene						trace				29	700
p and m - Xylene						<1.0				400	10,000
Styrene						trace				0.14	100
Ward residence (24)											
Methylene Chloride			3.2	ND	ND					5	5
1,1,1-Trichloroethane			<1.0	<1.0	<1.0				ND	200	200
Trichloroethene			trace	trace	<1.0			trace	ND	2.8	5
Tetrachloroethene			ND	trace	<1.0		ND	trace	trace	0.7	5
Carbon Tetrachloride		NS	ND	trace	<1.0			ND	ND	0.3	5
1,1-Dichloroethane			ND	ND	<1.0			<1.0	<1.0	700	---
Chloroform			ND	trace	<1.0			ND	trace	0.19	5

(Other footnotes located on page 4)

NOTE: All Concentrations are in ppb (ug/L).

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POTABLE WELL TESTING - WATAUGA COUNTY, NC
RESULTS OF VOLATILE AND SEMI-VOLATILE ANALYSIS

CONSTITUENT	3/18/93*	5/11/93**	9/21/93	3/30/94**	1/12/95	NCS	MCL
Shared Well #1 (8 Houses) (13)							
sec-Butylbenzene	0.2					---	---
Carbon Tetrachloride	0.1					0.3	5
Methylene Chloride	1.5	ND	ND	NS	NS	5	5
alpha-Chlordane	0.4					0.27	2
gamma-Chlordane	0.3					0.27	2
Shared Well #2 (4 Houses) (14)							
1,4-Dichlorobenzene	0.5			ND	ND	---	---
1,1-Dichloroethene	ND			<1.0	<1.0	7	7
1,1,1-Trichloroethane	ND	NS	NS	<1.0	ND	200	200
Chloroform	ND			trace	ND	0.19	5

CONSTITUENT	3/5/93	4/26/93
Chevrolet dealership (7)		
t-butyl methyl ether	ND	24.4

CONSTITUENT	3/23/93**	5/11/93**	6/23/93**	8/3/93**	8/9/93**	10/20/93	3/30/94	9/21/94**	1/12/95	NCS	MCL
Simko residence (20)											
1,1,1-Trichloroethane	trace										200
Chloroform	<1.0	NS	NS	NS	NS	NS	NS	NS	NS	---	5
Johnson residence (32)											
Chloroform	NS	trace	NS	NS	NS	NS	NS	NS	NS	0.19	5
McLean residence (26)											
Chloroform	NS	NS	<1.0	NS	NS	NS	NS	NS	NS	1.0	5
Yates residence (30)											
Chloroform	NS	NS	NS	<1.0	NS	NS	NS	NS	NS	0.19	5
McClintock residence (33)											
1,2-Dichloroethane	NS	NS	NS	NS	<1.0	NS	NS	NS	NS	700	---
Chloroform	NS	NS	NS	NS	<1.0	ND	NS	NS	NS	0.19	5
Welch residence; Meadowview condominiums (38)											
Chloroform	NS	NS	NS	NS	NS	<1.0	NS	NS	NS	0.19	5
Austin residence (40)											
Chloroform	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.19	5

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

**POTABLE WELL TESTING - WATAUGA COUNTY, NC
WELLS SHOWING NO DETECTED ORGANIC COMPOUNDS**

SAMPLING LOCATION	SAMPLING DATES
Colene Bolick residence (1)	March 5, 1993*
Roten residence (3)	March 5, 1993* and July 3, 1994**
Hollar and Green Produce (6)	March 5, 1993*
Vannoy residence (8)	March 5, 1993*
Martin High County Rentals #1 (9)	March 5, 1993*
Martin High County Rentals #2 (10)	March 5, 1993*
Williamson residence (16)	March 18, 1993*
Suddreth residence (17)	March 18, 1993*, September 21, 1993**, and July 3, 1994**
Taylor residence (18)	March 18, 1993*
Hodges residence (19)	March 18, 1993*
Findt residence (21)	March 18, 1993*
Rusher residence (22)	March 23, 1993**
Younce residence (25)	May 11, 1993**
Medlin residence (27)	June 23, 1993**
Rector residence (28)	June 23, 1993**
Robinson residence (29)	June 23, 1993**
Cook residence (31)	August 3, 1993**
Animal Control Office (32)	August 3, 1993**
Brook Hollow Trailer Park (37)	October 11, 1993**
Green residence (34)	October 20, 1993**
Shared well #3 (35)	October 20, 1993**
BREMCO residence (36)	September 21, 1993**
saacs residence (39)	November 16, 1994**
Norris residence (41)	January 12, 1995**

TABLE 5A AND 5B NOTES:

The sampled well reference number as presented on the Vicinity Map (Figure 3) is denoted in parentheses following the sampling locations name

* Laboratory analysis performed by Central Virginia Laboratories and Consultants (CVLC) utilizing EPA Methods 502.2 (Volatiles) and 525.1 (Semi-Volatiles)

**Laboratory Analysis performed by NCDEHNR Division of Laboratory Services utilizing EPA Method 502.2 (Volatiles)

denotes compound co-elutes

ND denotes no compounds detected for entire analytical scan

NS denotes not sampled on that date

NA denotes compound not analyzed on that date

(T) denotes found in Trip Blank

(E) denotes estimated result

(X) denotes above MCL

NSC-North Carolina Water Quality Standard (DEHNR-15A NCAC 2L.0202)

MCL-EPA Primary Drinking Water Standard Maximum Contaminant Level

January 23, 1995

Mr. John M. Alley
Environmental Health Section
Appalachian District Health Department
Route 5, Box 199
Boone, NC 28607

RE: Watauga County Landfill
Potable Well Sampling Program
DAA JN: 6520-20

Dear John:

Thank you for the analytical results of the recent sampling performed on three (3) potable wells near the Watauga County Landfill conducted by the Appalachian District Health Department. Enclosed is an updated summary table presenting the results of the potable well testing program compiled to date. Recent potable well analytical data from samples collected on January 12, 1995 from the Jean Edwards residence (shared well #2) and from the Jan Austin and Van Norris residences have been added to the update summary table.

It is our understanding the potable well testing results continue to be reviewed by the N.C. Division of Epidemiology and that the analytical results from the recent potable well sampling indicate the sampled well waters are acceptable for all uses due to either non-detection or only trace detection of organic analytes.

If you have any questions or comments, please do not hesitate to call.

Sincerely,
DRAPER ADEN ASSOCIATES

Jeffrey E. Smith
Project Geologist

JES:kr

cc: Mr. Mark Combs, Operations Services Director, Watauga County (with enclosure)
Mr. James S. Ratchford, Watauga County Manager (with enclosure)
Mr. Richard M. DiSalvo, Jr., P.E., Director of Engineering Services, DAA

POTABLE WELL TESTING - WATAUGA COUNTY, NC
RESULTS OF VOLATILE AND SEMI-VOLATILE ANALYSIS

CONSTITUENT	MARCH 5, 1993*	MARCH 18, 1993*	MARCH 24, 1993*	JUNE 23, 1993**	JULY 13, 1994**	NCS	MCL
Carroll Residence (12)							
Benzene	2.1	1.7		1.9		1.0	5
Chloroethane	173.4	74.5		ND			
Chloromethane	ND	14.8		ND			
Dichlorodifluoromethane	30.6	ND		ND			
1,1-Dichloroethane	20.9	17.4		ND		0.19	
1,1-Dichloroethene	4.1	1.5		ND		700	
cis-1,2-Dichloroethene#	1.2	0.9		<1.0		7	7
2,2-Dichloropropane#	1.2	0.9		ND		70	70
4-Isopropyltoluene	ND	0.2	NS	ND	NS		
Isopropylbenzene	0.6	ND		ND			
Methylene Chloride	ND	ND		ND			
Styrene	2.8	43.0(XT)		138.2			
Tert-Butyl Methyl Ether	ND	0.5		ND		5	5
Tetrachloroethene	5.4(X)	ND		0.014		0.014	100
Toluene	ND	4.7		2.4		200	
1,1,1-Trichloroethane	ND	0.6(T)		4.2		0.7	5
Trichloroethene	19.7	15.7		29.4		1000	1000
Trichlorofluoromethane	7.0(X)	5.5(X)		7.0		200	200
Vinyl Chloride	37.1	20.2		ND		2.8	5
p and m-Xylene	1.7(T)	ND		ND		2100	
o-Xylene	ND	ND		ND		0.015	2
Nissan-Mazda Dealership (4)							
Benzene	ND	3.4		2.9		400	10,000
Carbon Tetrachloride	0.2		ND		trace	1.0	5
Chloroethane	19.1		ND		ND	0.3	5
Dichlorodifluoromethane	8.2		ND		ND		
1,1-Dichloroethane	98.5		8.7		ND		
1,2-Dichloroethane	ND		63.1		104.3	0.19	
1,1-Dichloroethene	5.4		0.5		ND	700	
cis-1,2-Dichloroethene#	22.2		3.7		ND	0.38	
1,2-Dichloropropane	0.5		13.0		4.7	7	7
2,2-Dichloropropane#	22.2		0.3		23.7	70	70
Methylene Chloride	ND	NS	13.0		ND	0.56	5
Tetrachloroethene	21.8(X)		ND	NS	ND		
Toluene	ND		28.1(X)		4.5	5	5
1,1,1-Trichloroethane	14.7		0.8(T)		30.9	0.7	5
Trichloroethene	11.2(X)		19.3		ND	1000	1000
Trichlorofluoromethane	0.4		9.1(X)		22.9	200	200
p-Xylene	0.4		ND		12.6	2.8	5
			0.5(T)		ND	2100	

(Other footnotes located on page 4)

NOTE: All Concentrations are in ppb (ug/L).

POTABLE WELL TESTING - WATAUGA COUNTY, NC
RESULTS OF VOLATILE AND SEMI-VOLATILE ANALYSIS

CONSTITUENT	3/5/93*	3/18/93*	5/11/93**	6/23/93**	3/30/94**	4/6/94**	8/2/94**	NCS	MCL
Blue Ridge Electric Membership Company - (BREMCO) (5)									
1,1-Dichloroethane	0.7					<1.0	1.4	700	
Naphthalene	0.6					NA	NA		
1,1,1-Trichloroethane	0.2					<1.0	<1.0	200	200
Trichloroethene	0.5	NS	NS	NS	NS	<1.0	<1.0	2.8	5
1,1-Dichloroethene	ND					1.0	1.9	7	7
cis-1,2-Trichloroethene	ND					<1.0	ND	70	70
Tetrachloroethene	ND					<1.0	<1.0	0.7	5
Bolick rental resident (2)									
tert-Butylbenzene	1.1					ND			
isopropylbenzene	0.7					ND			
Trichloroethene	0.5					ND			
1,3,5-Trimethylbenzene	0.7	NS	NS	NS	NS	ND		2.8	5
1,1-Dichloroethane	ND					ND			
1,1-Dichloroethene	ND					trace	NS	700	
Methyl Ethyl Ketone	ND					trace	trace	7	7
Perry Residence (11)									
Dichlorodifluoromethane	2.5					ND		0.19	
Naphthalene	0.7					ND			
Chloromethane	<9	NS	NS	NS	NS	NS	NS		
Methylene Chloride	<0.6					NS			
Chloroform						ND		5	5
Greer residence (15)									
Benzene						<1.0		0.19	5
Toluene						<1.0			
Tetrachloroethene	NS	ND	NS	NS	NS	6.4	1000	1.0	5
Ethylbenzene						trace	0.7		1000
p and m - Xylene						trace	NS	29	5
Styrene						<1.0		400	700
Ward residence (24)									
Methylene Chloride						trace		0.14	100
1,1,1-Trichloroethane			3.2	ND	ND	ND		5	5
Trichloroethene			<1.0	<1.0	<1.0	<1.0		200	200
Tetrachloroethene			trace	trace	trace	NS		2.8	5
Carbon Tetrachloride		NS	ND	ND	ND	NS	ND	0.7	5
1,1-Dichloroethane			ND	ND	ND	<1.0		0.3	5
Chloroform			ND	ND	trace	<1.0		700	
								0.19	5

NOTE: All Concentrations are in ppb (ub/L). (Other footnotes located on page 4)

POTABLE WELL TESTING - WATAUGA COUNTY, NC
RESULTS OF VOLATILE AND SEMI-VOLATILE ANALYSIS

CONSTITUENT	3/18/93*	3/23/93**	5/11/93**	6/23/93**	8/3/93**	8/9/93**	9/21/93	10/20/93**	3/30/94**	9/21/94**	NCS	MCL
Shared Well #1 (8 Houses) (13)												
sec-Butylbenzene	0.2											
Carbon Tetrachloride	0.1											
Methylene Chloride	1.5	NS	ND	NS	NS	NS	ND	NS	NS		0.3	5
alpha-Chlordane	0.4										5	5
gamma-Chlordane	0.3										0.27	2
Shared Well #2 (4 Houses) (14)												
1,4-Dichlorobenzene	0.5										0.27	2
1,1-Dichloroethene	ND											
1,1,1-Trichloroethane	ND	NS	NS	NS	NS	NS	NS	NS	ND		7	7
Chloroform	ND	NS	NS	NS	NS	NS	NS	NS	<1.0		200	200
Simko residence (20)												
Chloroform	NS	<1.0	NS	NS	NS	NS	NS	NS	trace		0.19	5
1,1,1-Trichloroethane		trace										
Johnson residence (32)												
Chloroform	NS	NS	trace	NS	NS	NS	NS	NS	NS		0.19	5
McLean residence (26)												
Chloroform	NS	NS	NS	<1.0	NS	NS	NS	NS	NS		0.19	5
Yates residence (30)												
Chloroform	NS	NS	NS	NS	NS	NS	NS	NS	NS		1.0	5
McCillock residence (33)												
1,2-Dichloroethane	NS	NS	NS	NS	<1.0	NS	NS	NS	NS		0.19	5
Chloroform	NS	NS	NS	NS	NS	NS	NS	NS	NS			
Welch residence; Meadowview condominiums (38)												
Chloroform	NS	NS	NS	NS	<1.0	NS	NS	<1.0	NS	ND	700	---
					<1.0			ND		<1.0	0.19	5

NOTE: All Concentrations are in ppb (ub/L)

(Other footnotes located on page 4)

**POTABLE WELL TESTING - WATAUGA COUNTY, NC
WELLS SHOWING NO DETECTED ORGANIC COMPOUNDS**

SAMPLING LOCATION	SAMPLING DATES
Colene Bolick residence (1)	March 5, 1993*
Roten residence (3)	March 5, 1993* and July 3, 1994**
Hollar and Green Produce (6)	March 5, 1993*
Chevrolet Dealership (7)	March 5, 1993*
Vannoy residence (8)	March 5, 1993*
Martin High County Rentals #1 (9)	March 5, 1993*
Martin High County Rentals #2 (10)	March 5, 1993*
Williamson residence (16)	March 18, 1993*
Suddreth residence (17)	March 18, 1993*, September 21, 1993**, and July 3, 1994**
Taylor residence (18)	March 18, 1993*
Hodges residence (19)	March 18, 1993*
Findt residence (21)	March 18, 1993*
Rusher residence (22)	March 23, 1993**
Younce residence (25)	May 11, 1993**
Medlin residence (27)	June 23, 1993**
Rector residence (28)	June 23, 1993**
Robinson residence (29)	June 23, 1993**
Cook residence (31)	August 3, 1993**
Animal Control Office (32)	August 3, 1993**
Green residence (34)	October 20, 1993**
Shared well #3 (35)	October 20, 1993**
BREMCO residence (36)	September 21, 1993**
Brook Hollow Trailer Park (37)	October 11, 1993**

TABLE 5A AND 5B NOTES:

The sampled well reference number as presented on the Vicinity Map (Figure 3) is denoted in parentheses following the sampling locations name

* Laboratory analysis performed by Central Virginia Laboratories and Consultants (CVLC) utilizing EPA Methods 502.2 (Volatiles) and 525.1 (Semi-Volatiles)

**Laboratory Analysis performed by NCDEHNR Division of Laboratory Services utilizing EPA Method 502.2 (Volatiles)

denotes compound co-elutes

ND denotes no compounds detected for entire analytical scan

NS denotes not sampled on that date

NA denotes compound not analyzed on that date

(T) denotes found in Trip Blank

(E) denotes estimated result

(X) denotes above MCL

NSC-North Carolina Water Quality Standard (DEHNR-15A NCAC 2L.0202)

MCL-EPA Primary Drinking Water Standard Maximum Contaminant Level



Draper Aden Associates
CONSULTING ENGINEERS

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

November 14, 1995

Mr. John M. Alley
Environmental Health Section
Appalachian District Health Department
Route 5, Box 199
Boone, NC 28607

RE: Watauga County Landfill
Potable Well Sampling Program
DAA JN: 6520-21

Dear John:

Thank you for the analytical results of the recent sampling conducted by the Appalachian District Health Department on four (4) potable wells located near the Watauga County Landfill. Enclosed is an updated summary table presenting the results of the potable well testing program compiled to date. Recent potable well analytical data, from samples collected on October 24, 1995 from the Ward residence, Shared Well #2 (recently drilled deeper), the Bolick rental residence, and BREMCO, have been added to the update summary table.

It is our understanding the potable well testing results continue to be reviewed by the N.C. Division of Epidemiology, and that the analytical results from the recent potable well sampling indicate the sampled well waters are acceptable for all uses due to either nondetection of only trace detection of organic analytes.

If you have any questions or comments, please do not hesitate to call.

Sincerely,
DRAPER ADEN ASSOCIATES

Jeffrey E. Smith
Project Geologist

JES/rc

cc: Mr. Mark Poindexter, Hydrogeologist, NCDEHNR Solid Waste Section
Mr. Brent Rocket, Operations Services Director, Watauga County (with enclosure)
Mr. James S. Ratchford, Watauga County Manager (with enclosure)
Mr. Richard M. DiSalvo, Jr., P.E., Director of Engineering Services, DAA





Draper Aden Associates

CONSULTING ENGINEERS

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

November 14, 1995

Mr. John M. Alley
Environmental Health Section
Appalachian District Health Department
Route 5, Box 199
Boone, NC 28607

RE: Watauga County Landfill
Potable Well Sampling Program
DAA JN: 6520-21

Dear John:

Thank you for the analytical results of the recent sampling conducted by the Appalachian District Health Department on four (4) potable wells located near the Watauga County Landfill. Enclosed is an updated summary table presenting the results of the potable well testing program compiled to date. Recent potable well analytical data, from samples collected on October 24, 1995 from the Ward residence, Shared Well #2 (recently drilled deeper), the Bolick rental residence, and BREMCO, have been added to the update summary table.

It is our understanding the potable well testing results continue to be reviewed by the N.C. Division of Epidemiology, and that the analytical results from the recent potable well sampling indicate the sampled well waters are acceptable for all uses due to either nondetection of only trace detection of organic analytes.

If you have any questions or comments, please do not hesitate to call.

Sincerely,
DRAPER ADEN ASSOCIATES

Jeffrey E. Smith
Project Geologist

JES/rc

cc: Mr. Mark Poindexter, Hydrogeologist, NCDEHNR Solid Waste Section
Mr. Brent Rocket, Operations Services Director, Watauga County (with enclosure)
Mr. James S. Ratchford, Watauga County Manager (with enclosure)
Mr. Richard M. DiSalvo, Jr., P.E., Director of Engineering Services, DAA

POTABLE WELL TESTING - WATAUGA COUNTY, NC
RESULTS OF VOLATILE AND SEMI-VOLATILE ANALYSIS

CONSTITUENT	MARCH 5, 1993*	MARCH 18, 1993*	MARCH 24, 1993*	JUNE 29, 1993**	JULY 13, 1994*	NCS	MCL
Carroll Residence (12)							
Benzene	2.1	1.7		1.9		1.0	5
Chloroethane	173.4	74.5		ND		---	---
Chloromethane	ND	14.8		ND		---	---
Dichlorodifluoromethane	30.6	ND		ND		0.19	---
1,1-Dichloroethane	20.9	17.4		ND		700	---
1,1-Dichloroethene	4.1	1.5		ND		7	7
cis-1,2-Dichloroethene	1.2	0.9		<1.0		70	70
2,2-Dichloropropane#	1.2	0.9		ND		---	---
4-Isopropyltoluene	ND	0.2		ND		---	---
Isopropylbenzene	0.6	ND		ND		NS	---
Methylene Chloride	ND	43.0(XT)		138.2		5	5
Styrene	2.8	0.5		ND		0.014	100
Tert-Butyl Methyl Ether	ND	ND		2.4		200	---
Tetrachloroethene	5.4(X)	4.7		4.2		0.7	5
Toluene	ND	0.6(T)		ND		1000	1000
1,1,1-Trichloroethane	19.7	15.7		29.4		200	200
Trichloroethene	7.0(X)	5.5(X)		7.0		2.8	5
Trichlorofluoromethane	37.1	20.2		ND		2100	---
Vinyl Chloride	1.7(T)	ND		ND		0.015	2
p and m-Xylene	ND	ND		<1.0		400	10,000
o-Xylene	ND	3.4		2.9		400	10,000
Nissan-Mazda Dealership (4)							
Carbon Tetrachloride	0.2			ND		0.3	5
Chloroethane	19.1			ND		ND	---
Dichlorodifluoromethane	8.2			8.7		ND	---
1,1-Dichloroethane	98.5			63.1		ND	---
1,2-Dichloroethane	ND			0.5		104.3	---
1,1-Dichloroethene	5.4			3.7		ND	---
cis-1,2-Dichloroethene#	22.2			13.0		4.7	7
1,2-Dichloropropane	0.5			0.3		23.7	70
2,2-Dichloropropane#	22.2			13.0		ND	5
Tetrachloroethene	21.8(X)	NS		28.1(X)		ND	---
Toluene	ND			0.8(T)		0.7	5
1,1,1-Trichloroethane	14.7			19.3		ND	1000
Trichloroethene	11.2(X)			9.1(X)		22.9	200
Trichlorofluoromethane	0.4			ND		12.6	5
p-Xylene	0.4			0.5(T)		ND	---
						2100	---
						400	10,000

NOTE: All Concentrations are in ppb (ug/L).

(Other footnotes located on page 4)

POTABLE WELL TESTING - WATAUGA COUNTY, NC
RESULTS OF VOLATILE AND SEMI-VOLATILE ANALYSIS

CONSTITUENT	3/5/93*	3/18/93*	5/11/93**	6/23/93**	3/30/94**	4/6/94**	8/2/94**	12/7/94**	10/24/95	NCS	MCL
Blue Ridge Electric Membership Company - (BREEMCO) (5)											
1,1-Dichloroethane	0.7					<1.0	1.4	1.0	1.8	700	---
Naphthalene	0.6					ND	ND	ND	ND	---	---
1,1,1-Trichloroethane	0.2					<1.0	<1.0	<1.0	<1.0	200	200
Trichloroethene	0.5	NS		NS		<1.0	<1.0	<1.0	<1.0	2.8	5
1,1-Dichloroethene	ND					1.0	1.9	<1.0	1.7	7	7
cis-1,2-Trichloroethene	ND					<1.0	ND	<1.0	<1.0	70	70
Tetrachloroethene	ND					<1.0	<1.0	trace	<1.0	0.7	5
Bolick rental resident (2)											
tert-Butylbenzene	1.1					ND			ND	---	---
isopropylbenzene	0.7					ND			ND	---	---
Trichloroethene	0.5					ND			ND	2.8	5
1,3,5-Trimethylbenzene	0.7	NS				ND	NS	NS	ND	---	---
1,1-Dichloroethane	ND					trace		NS	<1.0	700	---
1,1-Dichloroethene	ND					trace		trace	trace	7	7
Methyl Ethyl Ketone	ND					trace		trace	35.3	170	---
Tetrahydrofuran	ND					ND			42.3	---	---
Perry Residence (11)											
Dichlorodifluoromethane	2.5					ND			ND	0.19	---
Naphthalene	0.7					ND			ND	---	---
Chloromethane	<9	NS				NS			NS	---	---
Methylene Chloride	<0.6					ND			NS	5	5
Chloroform						<1.0				0.19	100
Greer residence (15)											
Benzene						<1.0				1.0	5
Toluene						6.4				1000	1000
Tetrachloroethene	NS	ND				trace	NS		NS	0.7	5
Ethylbenzene						trace				29	700
p and m - Xylene						<1.0				400	10,000
Styrene						trace				0.14	100
Ward residence (24)											
Methylene Chloride						3.2				5	5
1,1,1-Trichloroethane						<1.0			ND	200	200
Trichloroethene						trace			ND	2.8	5
Tetrachloroethene	NS	NS				trace			ND	0.7	5
Carbon Tetrachloride						ND			ND	0.3	5
1,1-Dichloroethane						ND			ND	700	---
Chloroform						ND			ND	0.19	100
1,2-Dibromoethane (EDB)						ND			ND	0.0004	0.05

NOTE: All Concentrations are in ppb (ug/L).

(Other footnotes located on page 4)



POTABLE WELL TESTING - WATAUGA COUNTY, NC
RESULTS OF VOLATILE AND SEMI-VOLATILE ANALYSIS

CONSTITUENT	3/18/93*	5/11/93**	9/21/93**	3/30/94**	1/12/95**	10/24/95**	NCS	MCL
Shared Well #1 (8 Houses) (13)								
sec-Butylbenzene	0.2						---	---
Carbon Tetrachloride	0.1						0.3	5
Methylene Chloride	1.5	ND	ND	NS	NS	NS	5	5
alpha-Chlordane	0.4						0.27	2
gamma-Chlordane	0.3						0.27	2
Shared Well #2 (4 Houses) (14)								
1,4-Dichlorobenzene	0.5			ND	ND	ND	---	---
1,1-Dichloroethane	ND			ND	ND	<1.0	700	---
1,1-Dichloroethene	ND			<1.0	<1.0	ND	7	7
Tetrachloroethene	ND			ND	ND	trace	0.7	5
1,1,1-Trichloroethane	ND	NS	NS	<1.0	ND	trace	200	200
Chloroform	ND			trace	ND	9.0	0.19	100
Bromodichloromethane	ND			ND	ND	1.4	---	100
Dibromochloromethane	ND			ND	ND	<1.0	---	---
2-Chlorotoluene	ND			ND	ND	1.2	---	---
4-Chlorotoluene	ND			ND	ND	1.0	---	---
Methyl Ethyl Ketone	ND			ND	ND	24.6	170	---
Tetrahydrofuran	ND			ND	ND	13.4	---	---

CONSTITUENT	3/23/93**	5/11/93**	6/23/93**	8/3/93**	8/9/93**	10/20/93**	3/30/94**	9/21/94**	1/12/95**	NCS	MCL
Simko residence (20)											
1,1,1-Trichloroethane	trace									---	200
Chloroform	<1.0	NS	NS	NS	NS	NS	NS	NS	NS	0.19	100
Johnson residence (32)											
Chloroform	NS	trace	NS	NS	NS	NS	NS	NS	NS	0.19	100
McLean residence (26)											
Chloroform	NS	NS	<1.0	NS	NS	NS	NS	NS	NS	1.0	100
Yates residence (30)											
Chloroform	NS	NS	NS	<1.0	NS	NS	NS	NS	NS	0.19	100
McClintock residence (33)											
1,2-Dichloroethane	NS	NS	NS	NS	<1.0	<1.0	NS	ND	NS	700	---
Chloroform	NS	NS	NS	NS	<1.0	ND	NS	<1.0	NS	0.19	100
Welch residence; Meadowview condominiums (36)											
Chloroform	NS	NS	NS	NS	NS	<1.0	NS	NS	NS	0.19	100
Austin residence (40)											
Chloroform	NS	NS	NS	NS	NS	NS	NS	NS	trace	0.19	100

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

POTABLE WELL TESTING - WATAUGA COUNTY, NC
WELLS SHOWING NO DETECTED ORGANIC COMPOUNDS

SAMPLING LOCATION	SAMPLING DATES
Colene Bolick residence (1)	March 5, 1993*
Roten residence (3)	March 5, 1993* and July 3, 1994**
Hollar and Green Produce (6)	March 5, 1993*
Vannoy residence (8)	March 5, 1993*
Martin High County Rentals #1 (9)	March 5, 1993*
Martin High County Rentals #2 (10)	March 5, 1993*
Williamson residence (16)	March 18, 1993*
Suddreth residence (17)	March 18, 1993*, September 21, 1993**, and July 3, 1994**
Taylor residence (18)	March 18, 1993*
Hodges residence (19)	March 18, 1993*
Findt residence (21)	March 18, 1993*
Rusher residence (22)	March 23, 1993**
Younce residence (25)	May 11, 1993**
Medlin residence (27)	June 23, 1993**
Rector residence (28)	June 23, 1993**
Robinson residence (29)	June 23, 1993**
Cook residence (31)	August 3, 1993**
Animal Control Office (32)	August 3, 1993**
Brook Hollow Trailer Park (37)	October 11, 1993**
Green residence (34)	October 20, 1993**
Shared well #3 (35)	October 20, 1993**
BREMCO residence (36)	September 21, 1993**
Isaacs residence (39)	November 16, 1994**
Norris residence (41)	January 12, 1995**

TABLE 5A AND 5B NOTES:

The sampled well reference number as presented on the Vicinity Map (Figure 3) is denoted in parentheses following the sampling locations name

* Laboratory analysis performed by Central Virginia Laboratories and Consultants (CVLC) utilizing EPA Methods 502.2 (Volatiles) and 525.1 (Semi-Volatiles)

**Laboratory Analysis performed by NCDEHNR Division of Laboratory Services utilizing EPA Method 502.2 (Volatiles)

denotes compound co-elutes

ND denotes no compounds detected for entire analytical scan

NS denotes not sampled on that date

NA denotes compound not analyzed on that date

(T) denotes found in Trip Blank

(E) denotes estimated result

(X) denotes above MCL

NSC-North Carolina Water Quality Standard (DEHNR-15A NCAC 2L.0202)

MCL-EPA Primary Drinking Water Standard Maximum Contaminant Level

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Solid Waste
Section
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