FINAL

Remedial Investigation Report

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Volume 2 - Appendices

Remedial Investigation
Burgess Brothers Superfund Site
Woodford and Bennington Vermont

Burgess Brothers Steering Committee

July 1996

O'BRIEN & GERE ENGINEERS, INC.

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Remedial Investigation
Burgess Brothers Superfund Site
Woodford and Bennington, Vermont

DRAFT - Remedial Investigation Report

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Remedial Investigation Phase 1A
Burgess Brothers Superfund Site
Woodford and Bennington, Vermont

Burgess Brothers
Superfund Site Steering
Committee

September 1993

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SECTION 1 - INTRODUCTION

1.01 Introduction

This report addresses data quality for samples collected during the Remedial Investigation (RI) performed at the Burgess Brothers Superfund Site located in Woodford and Bennington, Vermont. Sample collection activities, conducted by O'Brien & Gere Engineers of Syracuse, New York, involved twenty-one sampling and analysis programs. The quantity and types of samples collected, the dates of sample collection for these programs, and the appropriate reference to Appendix 12 are tabulated below.

Sampling Prog-ram	Collection Dates	Samples Collected	Appendix 15 Reference
Round I Sediments	9/21/92 to 9/23/92	32 sediments 2 blind duplicates 2 matrix spike/matrix spike duplicates 3 equipment blanks 6 trip blanks	Table 20 - Volatiles - 8240 Table 21 - Semi-volatiles - 8270 Table 22 - PCB/Pesticides - 8080 Table 23 - Inorganics Table 20A - TOC
Round I Surface Waters	9/21/92 to 9/23/92	13 waters 1 blind duplicate 1 matrix spike/matrix spike duplicate 2 trip blanks	Table 15A - Volatiles - 8240 Table 16 - Volatiles - 524.2 Table 17 - Semi-volatiles - 8270 Table 18 - PCB/Pesticides - 8080 Table 19 - Inorganics BOD Hardness
Surface Soils	9/29/92 to 10/5/92	62 surface soils 4 blind duplicates 4 matrix spike/matrix spike duplicates 3 equipment blanks 4 trip blanks	Table 1 - Volatiles - 8240 Table 2 - Semi-volatiles - 8270 Table 3 - PCB/Pesticides - 8080 Table 4 - Inorganics
EPA 524.2 Analysis	9/29/92 to 7/1/93	18 waters 3 blind duplicates 4 matrix spike/matrix spike duplicates 8 trip blanks	Table 11 - Volatiles - 524.2 Table 16 - Volatiles - 524.2

Sampling Prog-ram	Collection Dates	Samples Collected	Appendix 15 Reference
Bend in the Road Soils	10/1/92	10 soils 1 blind duplicate 1 matrix spike/matrix spike duplicate 1 equipment blank	Table 9 - Inorganics
Soil Borings	10/7/92 to 10/23/92	32 soils 2 blind duplicates 2 matrix spike/matrix spike duplicates 3 equipment blanks 6 trip blanks	Table 5A - Volatiles - 8240 Table 5B - Volatiles - 8240 Table 6 - Semi-volatiles - 8270 Table 7 - PCB/Pesticides - 8080 Table 8 - Inorganics
Soil Borings	12/16/92	7 soils 1 blind duplicate 1 matrix spike/matrix spike duplicate 1 equipment blank 1 trip blank	Table 5A - Volatiles - 8240 Table 5B - Volatiles - 8240
Soil Borings	1/7/93 to 1/20/93	11 soils 1 blind duplicate 1 matrix spike/matrix spike duplicate 3 equipment blanks 2 trip blanks	Table 5A - Volatiles - 8240 Table 5B - Volatiles - 8240
Soil Borings	1/27/93	5 soils 1 blind duplicate 1 matrix spike/matrix spike duplicate 1 equipment blank 1 trip blank	Table 5A - Volatiles - 8240 Table 5B - Volatiles - 8240 Table 6 - Semi-volatiles - 8270 Table 8 - Inorganics
Leachate Program	1/28/93 to 6/4/93	4 leachates 1 blind duplicate 1 matrix spike/matrix spike duplicate 1 equipment blank 3 trip blanks	Table 24 - Volatiles - 8240 Table 25 - Semi-volatiles - 8270 Table 26 - PCB/Pesticides - 8080 Table 27 - Inorganics BOD Hardness Table 24A - TOC
Soil Borings	2/2/93	1 soil 1 matrix spike/matrix spike duplicate 1 trip blank	Table 5A - Volatiles - 8240 Table 5B - Volatiles - 8240
Soil Borings	3/25/93	1 soil 1 blind duplicate 1 matrix spike/matrix spike duplicate 1 equipment blank 1 trip blank	Table 5A - Volatiles - 8240 Table 5B - Volatiles - 8240

Sampling Program	Collection Dates	Samples Collected	Appendix 15 Reference
Round II Sediments	4/13/93 to 4/15/93	32 sediments 2 blind duplicates 2 matrix spike/matrix spike duplicates 2 equipment blanks 1 trip blank	Table 20 - Volatiles - 8240 Table 21 - Semi-volatiles - 8270 Table 22 - PCB/Pesticides - 8080 Table 23 - Inorganics Table 20A - TOC
Round II Surface Waters	4/13/93 to 4/15/93	15 waters 1 blind duplicate 1 matrix spike/matrix spike duplicate 1 trip blank	Table 15A - Volatiles - 8240 Table 16 - Volatiles - 524.2 Table 17 - Semi-volatiles - 8270 Table 18 - PCB/Pesticides - 8080 Table 19 - Inorganics BOD Hardness
Round I Ground Waters	5/24/93 to 6/5/93	34 waters 34 filtered waters 5 blind duplicates 5 matrix spike/matrix spike duplicates 2 matrix spike/duplicates 8 equipment blanks 9 trip blanks	Table 10A - Volatiles - 8240 Table 10B - Volatiles - 8240 Table 11 - Volatiles - 524.2 Table 12A - Semi-volatiles - 8270 Table 12B - Semi-volatiles - 8270 Table 13 - PCB/Pesticides - 8080 Table 14A - Inorganics BOD Hardness Table 14B - Inorganics BOD Hardness Table 14C - Inorganics BOD Hardness Table 14D - Inorganics BOD Hardness
Round II Ground Waters	6/22/93 to 7/1/93	34 waters 34 filtered waters 5 blind duplicates 6 matrix spike/matrix spike duplicates 5 matrix spike/duplicates 8 equipment blanks 9 trip blanks	Table 10A - Volatiles - 8240 Table 10B - Volatiles - 8240 Table 11 - Volatiles - 524.2 Table 12A - Semi-volatiles - 8270 Table 12B - Semi-volatiles - 8270 Table 13 - PCB/Pesticides - 8080 Table 14A - Inorganics BOD Hardness Table 14B - Inorganics BOD Hardness Table 14C - Inorganics BOD Hardness Table 14D - Inorganics BOD Hardness

Sampling Program	Collection Dates	Samples Collected	Appendix 15 Reference
Air Sampling	10/14/92	6 air samples 1 blind duplicate 1 trip blank	Table 28 - Volatiles - T02 Table 29 - Semi-volatiles - T013
Hexavalent Chromium Analysis	9/29/92 to 6/29/93	61 waters 4 blind duplicates 5 equipment blanks	Table 14B - Inorganics Table 14C - Inorganics Table 19 - Inorganics
BOD Analysis	9/21/92 to 6/29/93	50 waters 5 blind duplicates 4 equipment blanks	Table 14A - Inorganics Table 14B - Inorganics Table 14C - Inorganics Table 19 - Inorganics Table 27 - Inorganics
TOC Analysis	9/21/92 to 6/29/93	50 waters 52 soil/sediments 11 blind duplicates 10 equipment blanks	Table 1A - TOC Table 5C - TOC Table 8A - TOC Table 10C - TOC Table 14E - TOC Table 20A - TOC
Hardness Analysis	9/21/92 to 6/29/93	50 waters 5 blind duplicates 4 equipment blanks	Table 14A - Inorganics Table 14B - Inorganics Table 14C - Inorganics Table 19 - Inorganics Table 27 - Inorganics

1.02 General Considerations

Validation is a process of determining the suitability of a measurement system for providing useful analytical data. Although the term is frequently used in discussing methodologies, it applies to all aspects of the system and especially to samples, their measurement, and the actual data output. Accordingly, this report outlines excursions from the applicable quality control criteria outlined in the following documents:

> *Quality Assurance Project Plan (QAPP) for the Remedial Investigation, Burgess Brothers Superfund Site*, Woodford and Bennington, Vermont, O'Brien & Gere Engineers, Inc., July 1992.

> *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988.

Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses, USEPA Region I, February 1989.

Test Methods for Evaluating Solid Wastes, SW-846 Third Edition, USEPA, November 1986.

Methods for Determination of Toxic Organic Compounds in Air - EPA Methods, Noyes Data Corporation, 1990.

The following four sections of this document address distinct aspects of the validation process. Section 2 provides the analytical methodology employed in sample analysis. Section 3 lists the data quality assurance/quality control (QA/QC) protocols used to validate the sample data. Specific QA/QC excursions and qualifications performed on the sample data are discussed in Section 4. Finally, data completeness and usability with respect to the intended purposes of the data are discussed in Section 5. Each section is subdivided with respect to the phase of the investigation and the type of analyses performed.

SECTION 2 - ANALYTICAL METHODS

2.01 Soil, Surface Soil, and Sediment Samples

Soil and sediment samples were analyzed utilizing the methods listed below. With the exception of total organic carbon (TOC) analyses, sample analyses were performed by OBG Laboratories, Inc. (OBG Labs) of Syracuse, New York. Total organic carbon analysis was provided by Hudson Environmental Services, Inc. (HES) of Queensbury, New York.

Parameter	Analytical/Extraction	Reference
Volatile Organics	8240/5030	1
Semivolatile Organics	8270/3550	1
Pesticides/PCBs	8080/3550	1
Trace Metals	6010/3050	1
Arsenic	7060/3050	1
Lead	7421/3050	1
Selenium	7740/3050	1
Thallium	7841/3050	1
Mercury	7471	1
Cyanide	9010	1
Total Organic Carbon	9060	1
Percent Solids	209F	2

Analytical Method References

1. *Test Methods for Evaluating Solid Waste*: Physical/Chemical Methods, SW-846, 3rd Edition, USEPA, September 1986.

2. *Standard Methods for the Examination of Water Wastewater*, 16th Edition, 1985.

The following qualifiers have been used in this data validation.

U Indicates that the compound was analyzed for, but was not detected. The sample quantitation limit is presented and adjusted for dilution and percent moisture (solid samples only). This qualifier is also used to signify that the detection limit of an analyte was raised due to blank contamination.

J Indicates that the result should be considered approximate. This qualifier is used when the data validation procedure identifies a deficiency in the data generation process. Additionally, for organic analyses this qualifier is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria but, the result is less than the sample quantification limit but greater than zero.

UJ Indicates that the detection limit for the analyte in this sample should be considered approximate. This qualifier is used when the data validation process identifies a deficiency in the data generation process.

R Indicates that the previously reported detection limit or sample result has been determined to be unusable due to a major deficiency in the data generation procedure. The data should not be used for any qualitative or quantitative purposes.

2.02 Ground Water and Surface Water Samples

Ground and surface water samples were analyzed utilizing the analytical methods listed below. With the exception of volatile organics by USEPA method 524.2 and hexavalent chromium analyses, sample analyses were provided by OBG Labs. Method 524.2 volatile organics analyses were performed by H2M Environmental Testing Laboratories, Inc. (H2M Labs) of Melville, New York and hexavalent chromium analyses were provided by Adirondack Environmental Services, Inc. (AES) of Albany, New York. Qualifiers utilized for these sample results are as described in Section 2.01.

Parameter	Analytical/Extraction	Reference
Volatile Organics	8240/5030	1
Semivolatile Organics	8270/3520	1
PCBs	8080/3520	1
Trace Metals	6010/3010	1
As	7060/3020	1
Se	7740/3020	1
Pb	7421/3020	1
Tl	7841/3020	1
Hg	7470	1
CN	9010	1
TOC	415.1	2
BOD	405.1	2
Hardness	130.2	
Cr^{+6}	7196	1

Analytical Method References

1. *Test Methods for Evaluating Solid Waste*: Physical/Chemical Methods, SW-846, 3rd Edition, USEPA, September 1986.

2. *Methods for Chemical Analysis of Water and Wastes*, USEPA, EPA 600/4-79-020, March 1979.

2.03 Air Analysis

Air samples were analyzed for volatile and semivolatile organics using the methods listed below. Sample analyses utilizing these methods were performed by Pace, Incorporated (Pace) of Golden, Colorado. Qualifiers used for these analyses are as described in Section 2.01.

Parameter	Analytical/Extraction	Reference
Volatile Organics	TO2 (modified)	2, modified by 1
Semivolatile Organics	TO13	2

Analytical Method References

1. *Volatile Organic Compounds in Air by TO2 - Standard Operating Procedure DN-OE-032A*, Pace, Incorporated, September 1990.

2. *Methods for Determination of Toxic Organic Compounds in Air - EPA Methods*, Noyes Data Corporation, 1990.

SECTION 3 - DATA VALIDATION PROTOCOLS

3.01 Inorganics Analysis

Target analyte list (TAL) inorganics analyses were performed using the USEPA analytical methods outlined in Section 2. The validation of TCL inorganics followed the requirements presented in the QAPP and the analytical methodology presented in *Test Methods for Evaluating Solid Wastes*, SW-846 Third Edition, USEPA, November 1986. Qualification of sample data was based on the validation guidelines presented in *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were evaluated for TCL inorganic analyses:

1. Holding Times
2. Calibration
    a. Initial Calibration Verification
    b. Continuing Calibration Verification
3. CRDL Standard Analysis
4. Blank Analysis
5. ICP Interference Check Sample Analysis (ICP only)
6. Matrix Spike Analysis
7. Laboratory Duplicate Analysis
8. Field Duplicate Analysis
9. Laboratory Control Sample Analysis
10. Furnace Atomic Absorption Analysis

11. ICP Serial Dilution Analysis (ICP only)

12. Element Quantitation and Reported Detection Limits

13. Percent Solids Quantitation and Content (Soils only)

14. Verification of Instrument Parameters

    a. Quarterly Detection Limit Verification

    b. Annual ICP Interelement Correction Factors

15. Document Completeness

16. Overall Data Assessment

Hexavalent chromium analyses were performed using the USEPA analytical methods outlined in Section 2. The validation of hexavalent chromium followed the requirements presented in the QAPP and the analytical methodology presented in *Test Methods for Evaluating Solid Wastes*, SW-846 Third Edition, USEPA, November 1986, Method 7196. Qualification of sample data was based on the validation guidelines presented in *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC criteria were evaluated and the actions performed for Cr^{+6} analyses:

1. Holding Times:
    - Criteria as listed in *Test Methods for Evaluating Solid Wastes*, SW-846 Third Edition, USEPA, November 1986, Method 7196, page 2.
    - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 18.

2. Calibration
    - Criteria - daily 3 point initial calibration, %RSD less than or equal to 10, continuing calibration every 10 samples, less than 10% difference between the actual and expected values.

- Action - initial calibration %RSD greater than 10, or continuing calibration greater than 10% difference, detected and nondetected sample results qualified J, UJ respectively; continuing calibration results greater than 90% difference, nondetected sample results qualified as unusable (R) and detected results qualified as approximate (J).

3. Blank Analysis
   - Criteria - frequency of 1 per matrix and every 10 samples.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 22.

4. Matrix Spike Analysis
   - Criteria - frequency of 1 per matrix and every 20 samples, percent recovery of 75 to 125.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 28.

5. Laboratory Duplicate Analysis
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, pages 29 and 30.

6. Field Duplicate Analysis
   - Criteria - less than or equal to 30% difference for water samples, less than or equal to 50% difference for sediment or soil samples.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 31.

7. Laboratory Control Sample Analysis
   - Criteria - frequency of every 15 samples, percent recovery of 85 to 115.
   - Action - Percent recovery of 50 to 85 or greater than 120, detected results qualified as approximate (J); recovery of 50 to 85 percent, nondetected results qualified as approximate (UJ); nondetected results were qualified as unusable

(R) and detected results were qualified as approximate when recoveries were less than 50%.

8. Documentation Completeness
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 17.

9. Overall Data Assessment
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 38.

3.02 Organics Analysis

Organics analyses were performed using USEPA analytical methods outlined in Section 2. The requirements that were employed for the validation of volatile, semivolatile, and pesticide/PCB analyses data are outlined in the QAPP and in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters evaluated are as follows:

Volatile and Semivolatile Analysis

1. Holding Times
2. GC/MS Instrument Tuning Criteria
3. Calibration
   a. Initial Calibration
   b. Continuing Calibration
4. Blank Analysis

5. Surrogate Recovery

6. Matrix Spike / Matrix Spike Duplicate Analysis

7. Reference Standard Analysis

8. Field Duplicate Analysis

9. Internal Standards Recovery

10. Compound Identification and Quantitation

11. Tentatively Identified Compounds

12. Percent Solids Determination and Content (soils only)

13. System Performance

14. Documentation Completeness

15. Overall Data Assessment

<u>Pesticide/PCB Analysis</u>

1. Holding Times

2. Instrument Performance

    a. Standards Retention Time Windows

    b. DCBP Retention Time Shift

    c. Endrin and Dieldrin Degradation

    d. Baseline Stability

    e. Chromatographic Resolution

3. Calibration

    a. Initial Calibration

    b. Analytical Sequence Verification

    c. Continuing Calibration Verification

4. Blank Analysis

5. Surrogate Recovery

6. Matrix Spike / Matrix Spike Duplicate Analysis

7. Field Duplicate Analysis

8. Reference Standard Analysis

9. Percent Solids Analysis

10. Compound Identification and Quantitation

11. Documentation Completeness

12. Overall Data Assessment

3.03 Wet Chemistry Analysis

Wet chemistry analyses were performed using the USEPA analytical methods outlined in Section 2. The validation of TOC, BOD, and hardness followed the requirements presented in the QAPP and the analytical methodology presented in *Test Methods for Evaluating Solid Wastes*, SW-846 Third Edition, USEPA, November 1986, Methods 415.1, 405.1, and 130.2 respectively. Qualification of sample data was based on the validation guidelines presented in *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were evaluated for wet chemistry analyses:

TOC Analysis

1. Holding Times
   - Criteria of 28 days from collection to analysis.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 18.

2. Calibration
   - Criteria - daily 3 point initial calibration, RSD less than or equal to 10, continuing calibration every 10 samples, less than 10% difference between the actual and expected values.
   - Action - initial calibration %RSD greater than 10, or continuing calibration between 10 and 90 percent difference, detected and nondetected sample results qualified J, UJ respectively; continuing calibration %D greater than 90%, nondetected sample results were qualified as unusable (R), and detected sample results were qualified as approximate (J).

3. Blank Analysis
   - Criteria - frequency of 1 per matrix and every 10 samples
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 22.

4. Matrix Spike Analysis
   - Criteria - frequency of 1 per matrix and every 20 samples, percent recovery of 75 to 125.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 28.

5. Laboratory Duplicate Analysis
   - Criteria - frequency of 1 per matrix and every 20 samples, less than or equal to 20 percent difference.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, pages 29 and 30.

6. Field Duplicate Analysis
   - Criteria - frequency of 1 per matrix and every 20 samples, less than or equal to 30 percent difference.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 31.

7. Laboratory Control Sample Analysis
   - Criteria - frequency of every 20 samples, percent recovery of 85 to 115.
   - Action - Percent recovery of 50 to 85 or greater than 120, detected results qualified as approximate (J); recovery of 50 to 85 percent, nondetected results qualified as approximate (UJ); nondetected sample results qualified as unusable (R) when percent recovery was less than 50, and detected sample results were qualified as approximate (J).

8. Documentation Completeness
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 17.

9. Overall Data Assessment
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 38.

BOD Analysis

1. Holding Times
   - Criteria - preserve samples at 4°C, 48 hours from collection to analysis.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 18.

2. Blank Analysis
   - Criteria - frequency of 1 per matrix and every 10 samples.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 22.

3. Laboratory Duplicate Analysis
   - Criteria - frequency of 1 per every 10 samples, RPD within 30 percent.

- Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 30.

4. Field Duplicate Analysis
   - Criteria - frequency of 1 per matrix and every 20 samples, RPD within 30 for water samples and RPD within 50 for sediment and soil samples.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 31.

5. Laboratory Control Sample Analysis
   - Criteria - frequency of every batch or 10% of samples, percent recovery of 90 to 110.
   - Action - Percent recovery of 50 to 90 or greater than 110, detected results qualified as approximate (J); recovery of 50 to 90 percent, nondetected results qualified as approximate (UJ); nondetected sample results qualified as unusable (R) and detected results as approximate (J) for recoveries less than 50%.

6. BOD Quantitation
   - Criteria - mimimum dissolved oxygen depletion of 2 mg/L.
   - Action - resubmit corrected data.

7. Documentation Completeness
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 17.

9. Overall Data Assessment
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 38.

Hardness Analysis

1. Holding Times
   - Criteria - preservation of samples with HNO3 to pH of less than 2, 6 months from collection to analysis of samples.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 18.
2. Calibration
   - Criteria - daily initial calibration, continuing calibration verification every 2 hours or 10 percent frequency, continuing calibration results within 10 percent of the true value.
   - Action - detected and nondetected sample results were qualified as approximate (J, UJ) when continuing calibration results were between 10 and 90 percent difference; sample results were qualified as unusable (R) when continuing calibration results were greater than 90 percent difference.
3. Blank Analysis
   - Criteria - calibration blank at a frequency of the beginning and end of run and 10 percent of samples, preparation blank at a frequency of 1 per batch or 5 percent of samples.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 22.
4. Matrix Spike Analysis
   - Criteria - frequency of 1 per batch and every 20 samples, within 25% recovery of true value.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 28.
5. Laboratory Duplicate Analysis
   - Criteria - within 25 percent RPD for values five times the detection limit or the value of the detection limit for sample results less than five times the detection limits.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating*

Inorganics Analyses, USEPA Region I, February 1989, pages 29 and 30.

6. Field Duplicate Analysis
   - Criteria - frequency of 1 per matrix and every 20 samples, RPD within 30 for water samples and RPD within 50 for sediment and soil samples.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 31.

7. Laboratory Control Sample Analysis
   - Criteria - frequency of 10% of samples, percent recovery within 10 percent of true value.
   - Action - Detected sample results were quallified as approximate (J) when the percent recovery was greater than 110; detected and nondetected sample results were qualified as approximate (J) or (UJ) respectively when percent recovery was 10 to 50; detected results were approximate and nondetected results were qualified as unusable (R) when recoveries were greater than 90 percent.

8. Documentation Completeness
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 17.

9. Overall Data Assessment
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 38.

SECTION 4 - DATA QUALITY EVALUATION

This section summarizes the QA/QC parameters, validation criteria, and qualifications performed on the sample data when QA/QC parameters did not meet criteria. Samples that required qualification are identified in the following sections by the description documented on the sample chain of custody records. Only one qualifier was used for an individual sample result. When the data validation process identified several quality control deficiencies, the cumulative effect of the various excursions were employed in assigning the final data qualifier. Data qualified as a result of the validation process are summarized on tables in Appendix 5 of the RI report.

4.01 Round I Sediment Program

4.01.1 Target Analyte List Inorganics Analysis

QA/QC parameters for TAL inorganic analyses were evaluated for sixteen sediment samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration verification, CRDL standard analysis, field duplicate analysis, laboratory control sample analysis, ICP serial dilution analysis, percent solids quantitation and content, quarterly detection limit verification and ICP interelement correction factors, and document completeness. Excursions from QA/QC criteria are summarized below.

Calibration Blank Analysis

Aluminum, antimony, barium, calcium, copper, iron, magnesium, manganese, potassium, sodium, vanadium, and zinc were detected at concentrations above their instrument detection limits (IDLs) in Equipment Blank #1 and Equipment Blank #2 collected on 9/22/92 and 9/23/92, respectively. Equipment blank action levels were calculated at five times the blank concentration for these analytes using a density of 1.0 g/ml for water and the percent solids of the affected samples. Qualification of sample data was not required since detected sample results were greater than the blank action levels established from the equipment blanks.

Continuing calibration blanks (CCB #3 and CCB #4) contained antimony at a concentrations of 27.7 μg/L and 22.1 μg/L, respectively. Blank action levels were calculated for the sediment samples using a density value of 1 g/mL for water and the percent solids of the associated samples. Detected antimony concentrations in the associated samples less than the blank action level were qualified with a "U". Detected antimony results were qualified with a "U" due to these excursions for the following samples; SED-5 Comp, SED-15, Sediment Equipment Blank #2, SED-09, SED-10, SED-11, and SED-12.

CCB #4 also contained potassium at a concentration greater than the IDL. Due to this excursion detected potassium concentrations were qualified with a "U" in the following samples; SED-03, SED-04, SED-07, SED-13, SED-14, SED-15, SED-02, SED-08, SED-09, SED-10, SED-12, SED-1A, and SED-1B.

Vanadium was detected in CCB #1 at a concentration of 5.5 μg/L. Due to this excursion the detected vanadium result for Equipment Blank #1 was qualified with a "U".

Aluminum was detected in CCB #2 at a concentration of 14.1 μg/L. Due to this excursion the detected aluminum result for Equipment Blank #2 was qualified with a "U".

Preparation Blank Analysis

The water preparation blank contained concentrations of copper, iron, and zinc that were greater than their IDLs. Due to these excursions the detected copper, iron, and zinc results for Equipment Blank #1 and Equipment Blank #2 were qualified with a "U".

ICP Interference Check Sample Analysis

The interference check sample (ICSA) solution A contained concentrations of barium, beryllium, cobalt, copper, manganese, vanadium, and zinc which were greater than their IDLs. Potassium was detected in solution A at a negative concentration greater than two times the absolute value of the IDL. Due to these excursions detected results for barium, beryllium, cobalt, copper, manganese, vanadium, zinc, potassium and non-detected potassium results were approximated for samples containing one or more of the interfering analytes (aluminum, calcium, iron, or magnesium) at concentrations greater than half the

ICSA concentrations. The following samples were qualified for these excursions; SED-8, SED-9, and SED-10.

Matrix Spike Analysis

Matrix spike recovery criteria of 75.0% to 125.0% were exceeded for several analytes. Analytes exceeding recovery criteria and qualifications applied to the associated samples are tabulated below.

Matrix Spike Sample ID#	Analyte	% Recovery	Qualification	Affected Samples
SED-09	antimony	57.6	UJ	SED-6 Comp
	selenium	59.2	UJ	SED-5 Comp
	silver	66.0	J, UJ	SED-3
				SED-4
				SED-7
				SED-13
				SED-14
				SED-15
				SED-02
				SED-08
				SED-09
				SED-10
				SED-11
				SED-12
				SED-1A
				SED-1B
				Blind Duplicate #1

Laboratory Duplicate Analysis

The duplicate relative percent difference (RPD) criterion of less than 35.0% for soil/sediment samples was exceeded for copper and iron with values of 44.2% and 50.0%, respectively. Detected sample results for these analytes were approximated (J) for the samples listed below.

SED-6 Comp	SED-14	SED-11
SED-5 Comp	SED-15	SED-12
SED-03	SED-02	SED-1A
SED-04	SED-08	SED-1B
SED-07	SED-09	Blind Duplicate #1
SED-13	SED-10	

Furnace Analytical Spike Analysis

Furnace analytical spike recovery criteria of 85.0% to 115.0% were exceeded for arsenic for SED-1A and SED-1B with values of 80.0% and 78.0%, respectively. Due to these excursions the detected arsenic results for these samples were approximated (J). Analytical spike recovery criteria were also exceeded for selenium but further qualification of the sample data was not required since the associated samples were previously approximated (UJ) for matrix spike recovery excursions.

Element Quantitation and Reported Detection Limits

Detected sample results that were greater than the IDLs but less than the CRDLs which were identified by the laboratory with a "B" qualifier were qualified as approximated (J).

Overall Data Assessment

Overall, the laboratory performed inorganics analyses in accordance with the requirements specified in the methods listed in Section 2.01. These data have been determined to be usable for qualitative and quantitative purposes. Detected sample results for several analytes were qualified with a "U" based on calibration and preparation blank criteria.

Sample results for analytes detected in the ICSA solution A at positive and negative concentrations were approximated for SED-8, SED-9, and SED-10. Sample results for several analytes were also approximated based on excursions from matrix spike analysis, laboratory duplicate analysis, and furnace analytical spike analysis criteria.

4.01.2 Target Compound List Volatiles Analysis

Sixteen sediment samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method USEPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, surrogate recovery, matrix spike/matrix spike duplicate analysis, reference standard analysis, internal standards recovery, tentatively identified compounds, percent solids determination and content, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

TCL compound initial calibration criteria were met for the low level soil and medium level soil/water calibrations with the exception of 2-butanone for the medium level soil/water calibration analyzed on 9/28/92. The response factor (RF) of 0.02604 was less than the minimum criterion of 0.05. Due to this excursion non-detected sample results for 2-butanone were determined to be unusable (R) for Sediment Equipment Blank (9/22/92) and Sediment Equipment Blank (9/23/92). Additional sediment samples that were qualified as ususable due to calibration excursions are presented on page 141 and 142.

Continuing Calibration

The continuing calibration minimum RF criterion was exceeded for 2-butanone in medium level soil/water calibration standards analyzed on 9/24/92 and 9/28/92. Qualification of sample data was not required for these excursions since the affected samples were previously qualified for not meeting the minimum RF criterion in the initial calibration.

The continuing calibration percent difference (%D) criterion of less than 25% was exceeded for acetone (25.89%) in the low level soil calibration analyzed on 9/29/92. Due to this excursion, detected acetone results for SED-3, SED-4, and SED-15 which have been qualified as non-detected (U) for equipment blank contamination were qualified as approximated (UJ).

Blank Analysis

Method blanks, equipment blanks and trip blanks were analyzed at the frequency required in the QAPP. Acetone was detected at a concentration of 17 $\mu g/L$ in Sediment Equipment Blank (9/22/92). A blank action level of ten times the blank concentration was calculated using a value of 1.0 g/mL for the density of water and was corrected for dry weight using the percent solids of the affected samples. Dilutions and differences between sample and blank weights or volumes were taken into account when applying blank actions. Detected acetone results in the affected samples that were less than the action level were qualified with a "U" indicating that the sample results may reflect contamination during sampling. The following samples were qualified for blank contamination: SED-3, SED-4, and SED-15.

Field Duplicate Analysis

Field duplicate analysis was performed using Blind Duplicate #1 and SED-12 for the duplicate samples. The field duplicate relative percent difference (RPD) criterion of less than 50% was exceeded for acetone (50.4%) and toluene (200.0%). Due to these excursions, the detected acetone results for SED-12 and Blind Duplicate #1 were approximated (J) and the detected and non-detected toluene result for SED-12 and Blind Duplicate #1, respectively were approximated (J, UJ).

Compound Identification and Quantitation

Mass spectral ion relative abundance criteria of +/- 20% were exceeded for the mass 43 peak for 2-butanone in sample SED-12. The 60% relative abundance for mass 43 was 40% less than the relative abundance of mass 43 in the reference spectrum. Due to this excursion the detected 2-butanone result for SED-12 was qualified as approximate (J).

Overall Data Assessment

Overall, the laboratory performed volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the volatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Non-detected 2-butanone results were determined to be unusable (R) for Sediment Equipment Blank (9/22/92) and Sediment Equipment Blank (9/23/92) based on calibration minimum RF criterion. Acetone results for SED-3, SED-4, and SED-15 were qualified with a "U" due to equipment blank criteria. Acetone and toluene results for SED-12 and Blind Duplicate #1 were approximated based on field duplicate criteria. The detected 2-butanone result for SED-12 was approximated based on mass spectral ion criteria.

4.01.3 Target Compound List Semivolatiles Analysis

Fifteen sediment samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for*

Evaluating Organic Analyses, USEPA Region I, November 1988. The following QA/QC parameters for method USEPA 8270 were found to meet validation criteria: holding times, GC/MS instrument tuning, field duplicate analysis, reference standard analysis, internal standards recovery, compound identification and quantitation, percent solids determination and content, and system performance. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration data for the instrumentation used to analyze sample Sediment Equipment Blank (9/23/92) were not included in the data package. The required initial calibration information was also included in the Surface Soil Program data package. The daily instrument tune and initial calibration data were copied from the Surface Soil data package and inserted into the Sediment Program data package. Initial calibration minimum RF and percent relative standard deviation (%RSD) criteria were met for this initial calibration.

The initial calibration for sediment samples analyzed on 10/23/92 exceeded the minimum %RSD criterion of less than 30% for 2,4-dinitrophenol (42.546%). Qualification of sample data was not required since the %RSD was less than 50% and 2,4-dinitrophenol was not detected in the affected samples.

Continuing Calibration

Continuing calibration data were not included for the instrumentation used to analyze Sediment Equipment Blank (9/23/92) or for sediment samples analyzed on 10/23/92. Continuing calibration information for the instrumentation used to analyze Sediment Equipment Blank (9/23/92) was copied from the Surface Soil Program data package and inserted into the Sediment Program data package. The continuing calibration %D criterion of less than 25% was exceeded for 4-nitroaniline (34.21%) and 3,3'-dichlorobenzidine for this calibration. Qualification of sample data was not required since the %Ds were less than 50% and these compounds were not detected in the affected samples.

Continuing calibration data for sediment samples analyzed on 10/23/92 was provided by OBG Labs on 7/15/93. Continuing calibration criteria were met for this calibration.

The continuing calibration %D criterion of less than 25% was also exceeded for the continuing calibrations and compounds listed below. Qualification of sample results was not required since these compounds were not detected in the affected samples and the %Ds were less than 50%.

Date Analyzed	Compound	%D
10/5/92	bis(2-chloroisopropyl) ether	33.03
10/6/92	benzoic acid	38.54
	bis(2-chloroisopropyl) ether	34.04
	2,4-dinitrophenol	31.22
	di-n-octylphthalate	27.48

Date Analyzed	Compound	%D
10/7/92	benzoic acid	38.59
	bis(2-chloroisopropyl) ether	32.66
	2,4-dinitrophenol	47.69
	4,6-dinitro-2-methylphenol	26.98
10/13/92	2,4-dinitrophenol	27.80

Blank Analysis

Method blank data were not included for the Sediment Equipment Blank samples extracted on 9/29/92 and 9/30/92. Method blank data for 9/29/92 were copied from the Surface Water Program data package and data for 9/30/92 were supplied by OBG Labs on 8/31/93. Di-n-butylphthalate was detected in the sediment method blanks extracted on 9/25/92 and 9/30/92 at concentrations of 58 μg/Kg and 71 μg/Kg, respectively. Di-n-butylphthalate and bis(2-ethylhexyl) phthalate were detected in the water method blank extracted on 9/29/92 at concentrations of 3 μg/L and 2 μg/L, respectively. Qualification of sample results was not required since di-n-butylphthalate was not detected in the affected samples.

Surrogate Recovery

Surrogate recovery criteria specified in the QAPP were exceeded for samples SED-2 and Sediment Equipment Blank (9/23/92). Surrogate recoveries and recovery criteria specified in the QAPP are tabulated below for these samples. Non-detected sample results for both acid and base/neutral fractions were approximated for SED-2 due to these excursions. Sediment Equipment

Blank (9/23/92) did not require qualification since only one surrogate exceeded criteria and the recovery was greater than 10%.

Sample	Surrogate	% Recovery	% Recovery Criteria
SED-2	2-fluorobiphenyl	60.0	61.2 to 112.6
	terphenyl-d14	50.0	53.5 to 119.6
	phenol-d6	46.0	47.4 to 110.1
	2-fluorophenol	49.0	56.1 to 102.0
Sediment Equipment Blank	phenol-d6	39.0	47.4 to 110.1

Matrix Spike/Matrix Spike Duplicate Analysis

The matrix spike recovery criteria of 22.9% to 117.8% were exceeded for 2,4-dinitrotoluene with recoveries of 22.0% and 20.0% for the matrix spike (MS) and matrix spike duplicate (MSD) analysis of SED-11, respectively. Qualification of sample results was not required since both the MS and MSD recoveries were greater than 10% and 2,4-dinitrotoluene was not detected in the unspiked sample.

Tentatively Identified Compounds

Several tentatively identified compounds (TICs) were detected in the method blanks. Sample TICs with relative retention times matching the retention times of the TICs in the method blanks were determined to be unusable (R). Samples requiring qualification are summarized below.

Sample ID#	TIC Retention Time (min)	
	Sample	Blank
SED-03	6.91	6.86
SED-04	6.88	6.86
SED-07	6.88	6.86
SED-13	6.88	6.86

Sample ID#	TIC Retention Time (min)	
SED-14	6.87	6.86
SED-16	6.86	6.86
SED Equipment Blank (9/23/92)	6.65	6.64
SED-08	8.66	8.66
SED-10	8.76	8.66
SED-12	8.78	8.66
SED-1A	8.76	8.66
SED-1B	26.27	26.37
SED Blind Duplicate #1	26.27	26.37

Document Completeness

Method blank data were not included for the Sediment Equipment Blank samples extracted on 9/29/92 and 9/30/92. Method blank data for 9/29/92 were copied from the Surface Water Program data package and data for 9/30/92 were supplied by OBG Labs on 8/31/93.

Overall Data Assessment

Overall, the laboratory performed semivolatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the semivolatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Minor excursions that did not result in the qualification of data were observed for continuing calibration, blank analysis, surrogate recovery, and matrix spike/matrix spike duplicate criteria. Sample TICs with retention times and mass spectral criteria matching TICs detected in the method blanks were determined to be unusable (R) for several samples. Method blank data for semivolatiles analysis that were not included in the original data package were provided by OBG Labs on 8/31/93.

4.01.4 PCB/Pesticide Analysis

Fourteen sediment samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8080 were found to meet validation criteria: holding times, instrument performance, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, field duplicate analysis, percent solids analysis, compound identification and quantitation, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

The initial calibration %RSD criterion of less than 10% was exceeded for lindane and Aroclor 1016 in the five point calibrations analyzed on 9/21/92 with values of 12.7% and 15.8%, respectively. Qualification of sample data for these compounds was not required since they were not detected in the associated samples.

Continuing Calibration

The continuing calibration %D criterion of less than 15% was exceeded for alpha-BHC, aldrin, endrin, delta-BHC, and endosulfan sulfate. Qualification of sample data for these compounds was not required since they were not detected in the affected samples.

Reference Standard Analysis

Endrin aldehyde was not recovered in the reference samples analyzed with these samples. The laboratory indicated that this compound was removed by the tetrabutylammonium-sulfite (TBA) cleanup procedure. Due to this excursion the non-detected endrin aldehyde results reported for the samples were determined to be unusable (R).

Overall Data Assessment

Overall, the laboratory performed pesticide/PCB analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the pesticide/PCB sample data have been determined to be usable for qualitative and quantitative purposes. Minor excursions that did not result in the qualification of data were observed for initial and continuing calibration criteria. Non-detected endrin aldehyde results reported for the samples were determined to be unusable since endrin aldehyde was not recovered in the reference standard analyzed with the samples.

4.02 Round I Surface Water Program

4.02.1 Target Analyte List Inorganics Analysis

QA/QC parameters for TAL inorganic analyses were evaluated for thirteen surface water samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: initial and continuing calibration, CRDL standard analysis, ICP interference check sample analysis, matrix spike analysis, laboratory duplicate analysis, field duplicate analysis, laboratory control sample analysis, ICP serial dilution analysis, quarterly detection limit verification and ICP interelement correction factors, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Holding Times

The cyanide sample holding time criterion of less than fourteen days was exceeded by three days. Due to this excursion the non-detected cyanide results reported for the Round I Surface Water samples were approximated (UJ).

Blank Analysis

Calibration and preparation blanks contained several analytes at concentrations above their IDLs. Blank concentrations were multiplied by a factor of five to generate a blank action level. Sample concentrations below the blank action level were qualified with a "U". Detected sample concentrations above the blank action level were not qualified. Analytes detected in the blanks and the samples affected are tabulated below.

Blank ID#	Analyte	Blank Concentration (µg/L)	Affected Samples	Qualifier
CCB #1	vanadium	5.5	SW-05 SW-06 SW-03 SW-07 SW-14 SW-04 SW-015 SW-1B SW-12	U
CCB #3	antimony	27.7	SW-02 Blind Duplicate #1	U
preparation	copper	6.0	SW-05 SW-06 SW-03 SW-07 SW-14 SW-04 SW-015 SW-1B SW-12 SW-11 SW-02 SW-09 SW-10 Blind Duplicate #1	U
preparation	zinc	5.1	SW-05 SW-06 SW-03 SW-07 SW-14 SW-04 SW-015 SW-1B SW-12 SW-11 SW-02 Blind Duplicate #1	U

Furnace Analysis

The furnace duplicate analysis percent relative standard deviation (%RSD) criterion of less than 20.0% was exceeded for lead for several samples. These samples, SW-06, SW-14, SW-1B, and SW-09 did not require further qualification for this excursion since the lead results for these samples were approximated (J) for being greater than the IDL but less than the CRDL.

Element Quantitation and Reported Detection Limits

Detected sample results that were greater than the IDLs but less than the CRDLs which were identified by the laboratory with a "B" qualifier were qualified as approximated (J).

Overall Data Assessment

Overall, the laboratory performed inorganics analyses in accordance with the requirements specified in the methods listed in Section 2.02. These data have been determined to be usable for qualitative and quantitative purposes. Non-detected cyanide results reported for the samples were approximated since the holding time to analysis of fourteen days was exceeded by three days. Detected sample results for vanadium, antimony, copper, and zinc were qualified with a "U" based on calibration and preparation blank criteria. Detected lead results for SW-06, SW-14, SW-1B, and SW-09 exceeded furnace duplicate %RSD criterion of less than 20.0%, but did not require qualification since the results were approximated for being less than the CRDL.

4.02.2 Target Compound List Volatiles Analysis

Eleven surface water samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method USEPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, reference standard analysis, field duplicate analysis, internal standards recovery, tentatively identified compounds, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

The average RF for 2-butanone of 0.02604 was less than the minimum RF criterion of 0.05 in the initial calibration analyzed on 9/19/92. Due to this excursion non-detected 2-butanone results were qualified as unusable (R) for the samples listed below.

SW-05	SW-04	SW-02
QC Trip Blank (9/21/92)	QC Trip Blank (9/22/92)	SW-09
SW-03	SW-1B	SW-10
SW-07	SW-12	SW Blind Duplicate #1
SW-14	SW-11	QC Trip Blank (9/23/92)

The average RF for 1,2-dibromo-3-chloropropane of 0.02624 was less than the minimum RF criterion of 0.05 in the initial calibration analyzed on

10/9/92. Due to this excursion non-detected 1,2-dibromo-3-chloropropane results were qualified as unusable (R) for the samples listed below.

SW-01B-01	SW-02-01	SW-10-01
SW-03-01	SW-06-01	SW-BLDUP-01
SW-15-01	Trip Blank (9/29/92)	

Continuing Calibration

The minimum RF criterion of greater than 0.05 was also exceeded for 2-butanone in the continuing calibration standards analyzed on 9/24/92, 9/25/92, 9/27/92, and 9/28/92. Qualification of sample data due to these excursions was not required since the affected data were previously qualified for exceeding initial calibration minimum RF criteria.

Compound Identification and Quantitation

Several samples contained compounds at concentrations above the linear range of the instrumentation. These samples required reanalysis with a dilution to properly quantitate the sample results. For samples SW-03, SW-14, SW-12, SW-11, and SW-02 the diluted and undiluted analysis data were included in the data package. For these samples the undiluted and diluted analyses were combined to report the lowest detection limits for the non-detected sample results and the properly quantitated results for concentrations that exceeded the linear range.

Overall Data Assessment

Overall, the laboratory performed volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.02. The majority of the volatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Non-detected 2-butanone and 1,2-dibromo-3-chloropropane results were determined to be unusable for several samples based on initial calibration minimum RF criterion. Results from diluted and undiluted analyses were combined for SW-02, SW-03, SW-11, SW-12, and SW-14 to properly quantitate carbon disulfide, 1,2-dichloroethene, and trichloroethene while providing the lowest level of detection for the remaining compounds.

4.02.3 Target Compound List Semivolatiles Analysis

Eleven surface water samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method USEPA 8270 were found to meet validation criteria: holding times, GC/MS instrument tuning, initial calibration, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, reference standard analysis, field duplicate analysis, internal standards recovery, compound identification and quantitation, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Continuing Calibration

Compounds that exceeded continuing calibration %D criterion of less than 25% are tabulated below. Qualification of sample data due to these excursions was not required since the affected compounds were not detected in the samples and the %Ds were less than 50%.

Date Analyzed	Compound	% Difference
10/6/92	bis(2-chloroisopropyl) ether	34.04
	benzoic acid	38.54
	2,4-dinitrophenol	31.22
	di-n-octylphthalate	27.48
10/7/92	bis(2-chloroisopropyl) ether	32.66
	benzoic acid	38.59
	2,4-dinitrophenol	47.69
	4,6-dinitro-2-methylphenol	26.98
10/14/92	benzoic acid	25.34
	hexachlorobutadiene	26.84
	3,3'-dichlorobenzidine	34.10
10/15/92	4-nitroaniline	34.21
	3,3'-dichlorobenzidine	37.61

Tentatively Identified Compounds

Several tentatively identified compounds (TICs) were detected in the method blanks. Sample TICs with relative retention times matching the retention times of the TICs in the method blanks were qualified as unusable (R). Samples requiring qualification are summarized below.

Sample ID#	TIC Retention Time (min)	
	Sample	Blank
SW-05	6.87	6.83
	31.40	31.37
	40.33	40.32
SW-03	6.84	6.82
	31.39	31.37
SW-07	6.84	6.82
	31.37	31.37
SW-14	6.85	6.82
	31.38	31.38

Sample ID#	TIC Retention Time (min)	
	Sample	Blank
SW-04	6.85	6.82
SW-1B	6.63	6.64
	7.82	7.77
	31.01	31.01
SW-12	6.64	6.64
	7.82	7.77
SW-11	6.64	6.64
	7.84	7.77
	31.01	31.01
SW-02	6.64	6.64
	7.79	7.77
SW-09	6.62	6.64
SW-10	6.64	6.64
	7.82	7.77
SW Blind Duplicate #1	6.64	6.64
	7.81	7.77

Overall Data Assessment

Overall, the laboratory performed semivolatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.02. The majority of the semivolatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Minor excursions that did not result in the qualification of data were observed for continuing calibration criteria. Sample TICs with retention times and mass spectral criteria matching TICs detected in the method blanks were determined to be unusable (R) for several samples.

4.02.4 PCB/Pesticide Analysis

Eleven water samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method USEPA 8080 were found to meet validation criteria: holding times, instrument performance, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, field duplicate analysis, compound identification and quantitation, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

The initial calibration %RSD criterion of less than 10% was exceeded for lindane and Aroclor 1016 in the five point calibrations analyzed on 9/21/92 with values of 12.7% and 15.8%, respectively. Qualification of sample data for these compounds was not required since they were not detected in the associated samples.

Continuing Calibration

The continuing calibration %D criterion of less than 15% was exceeded for alpha-BHC, aldrin, endrin, delta-BHC, and endosulfan sulfate. Qualification of sample data for these compounds was not required since they were not detected in the affected samples.

Reference Standard Analysis

Endrin aldehyde was not recovered in the reference samples analyzed with these samples. The laboratory indicated that this compound was removed by the TBA cleanup procedure. Due to this excursion the non-detected endrin aldehyde results reported for the Round I Surface Water samples were determined to be unusable (R).

Overall Data Assessment

Overall, the laboratory performed pesticide/PCB analyses in accordance with the requirements specified in the methods listed in Section 2.02. The majority of the pesticide/PCB sample data have been determined to be usable for qualitative and quantitative purposes. Minor excursions that did not result in the qualification of data were observed for initial and continuing calibration criteria. Non-detected endrin aldehyde results reported for the samples were determined to be unusable since endrin aldehyde was not recovered in the reference standard analyzed with the samples.

4.03 Surface Soil Program

4.03.1 Target Analyte List Inorganics Analysis

QA/QC parameters for TAL inorganic analyses were evaluated for thirty-one surface soil samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses,* USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration, CRDL standard analysis, ICP serial dilution analysis, percent solids quantitation and content, quarterly detection limit verification and ICP interelement correction factors, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Equipment Blank Analysis

Equipment blanks, SP-Equipment/Field Blank #1, SP-Equipment/ Field Blank #2, and SP-Equipment/Field Blank #3, contained concentrations of aluminum, antimony, barium, calcium, chromium, copper, iron, manganese, magnesium, silver, sodium, potassium, vanadium, and zinc that were above the IDLs for these analytes. Equipment blank action levels were calculated at five times the blank concentration using a value of 1 mg/L for the density of water and corrected for the percent solids of the samples for these analytes. Qualification of sample data was not required since these analytes were not detected in the samples or the detected concentrations were greater than the action level.

Calibration Blank Analysis

Initial and continuing calibration blanks were analyzed at the required frequencies as specified in the QAPP. Sample results required qualification when blank concentrations were greater than the IDLs or negative concentrations were greater than two times the absolute value of the IDLs. When positive concentrations were detected in a blank, action levels were calculated and detected results less than the action levels were qualified with a "U", indicating that the sample results may reflect internal laboratory contamination. Detected sample results below the action level were qualified with a "U". When negative concentrations greater than two times the absolute value of the IDLs were detected, the associated sample results were approximated (J, UJ). The following samples required qualification for calibration blank contamination.

Date Analyzed	Analyte	Blank Concentration	Qualification	Affected Samples
10/16/92	silver	3.1 µg/L	U	SBW-10 (0-10") SP-19 (0-12") SP-20 (0-12")
10/16/92	cadmium	2.4 µg/L	U	SP-15 (0-12") SP-21 (0-12") SP-10 (0-12") SP-12 (0-12") SP-16 (0-12") SP-07 (0-12") SP-11 (0-12") SP-08 (0-12")
10/19/92	beryllium	-1.0 µg/L	J, UJ	SP-01 (0-10") SP-02 (0-10") SP-04 (0-12") SP-03 (0-12")
10/19/92	beryllium	-1.0 µg/L	J, UJ	SBW-18 (0-12") SP-14 (0-12") SP-17 (0-12") SP-18 (0-12") SBW-13 (0-12") SBW-21 (0-12") W-08 S2 (0-12")
10/19/92	beryllium	-1.0 µg/L	J, UJ	W-25 S2 (0-12") W-04 S2 (0-12") W-12 S2 (0-12") SP-Blind Duplicate #2 (0-12")
10/20/92	iron	-6.1 µg/L	J, UJ	SP-Equipment Blank #2 SP-Equipment Blank #1
10/20/92	aluminum potassium	13.0 µg/L -1254.6 µg/L	U J, UJ	SP-Equipment Blank #3

Laboratory Control Sample Analysis

Aqueous reference standards were analyzed at the frequency specified in the QAPP. Soil reference samples were not analyzed as required by the QAPP. Qualification of sample results was not required since the matrix spike samples were used to evaluate analyte recoveries for soil matrices and the aqueous reference samples met the recovery criteria.

Matrix Spike Analysis

Matrix spike analysis was performed at the frequency specified in the QAPP using samples SP-20 (0-12") and SP-03 (0-12"). Recovery criteria of 75.0% to 125.0% were exceeded for antimony, lead, manganese, nickel, selenium, and zinc for sample SP-03 (0-12"). The recovery criteria were exceeded for antimony, manganese, and selenium for sample SP-20 (0-12"). Post digestion matrix spike analyses were analyzed for antimony, lead, nickel, and selenium as required for these analyses. Post digestion spike recoveries met recovery criteria except for selenium. The low matrix spike recoveries exhibited by these analytes may be due to sample matrix effects or laboratory error during digestion and analysis. Since the cause of the low spike recoveries cannot be fully determined, the sample results for these analytes require qualification. MS/MSD data were evaluated and qualifiers were applied to the analytical results in accordance with USEPA guidance dated February 1989 not the September 1990 guidance. This procedure was discussed and agreed upon with

USEPA in a conference call held, January 25, 1995. Spike recoveries and the samples qualified for these excursions are tabulated below.

Matrix Spike Sample ID#	Analyte	% Recovery	Qualification	Affected Samples
SP-20 (0-12")	antimony	23.9	J, R	SBW-10 (0-10") SP-19 (0-12") SP-20 (0-12") W-07 S2 (0-12") SP-22 (0-12") SP-09 (0-12") SP-Blind Duplicate #1 SP-06 (0-12") SP-12 (0-12") SP-13 (0-12") SP-05 (0-12") SP-15 (0-12") SP-21 (0-12") SP-10 (0-12") SP-16 (0-12") SP-07 (0-12") SP-11 (0-12") SP-8 (0-12")
	selenium	41.7	J, UJ	SBW-10 (0-10") SP-19 (0-12") SP-20 (0-12") W-07 S2 (0-12") SP-22 (0-12") SP-09 (0-12") SP-Blind Duplicate #1 SP-06 (0-12") SP-12 (0-12") SP-13 (0-12") SP-05 (0-12") SP-15 (0-12") SP-21 (0-12") SP-10 (0-12") SP-16 (0-12") SP-07 (0-12") SP-11 (0-12") SP-8 (0-12")

Matrix Spike Sample ID#	Analyte	% Recovery	Qualification	Affected Samples
SP-03 (0-12")	antimony	58.3	J, UJ	SP-01 (0-10") SP-02 (0-12") SP-04 (0-12") SP-03 (0-12") SBW-18 (0-12") SP-14 (0-12") SP-17 (0-12") SP-18 (0-12") SBW-13 (0-12") SBW-21 (0-12") W-08 S2 (0-12") W-25 S2 (0-12") W-04 S2 (0-12") W-12 S2 (0-12") SP-Blind Duplicate #2
	nickel	31.2	J, UJ	SP-01 (0-10") SP-02 (0-12") SP-04 (0-12") SP-03 (0-12") SBW-18 (0-12") SP-14 (0-12") SP-17 (0-12") SP-18 (0-12") SBW-13 (0-12") SBW-21 (0-12") W-08 S2 (0-12") W-25 S2 (0-12") W-04 S2 (0-12") W-12 S2 (0-12") SP-Blind Duplicate #2
	selenium	40.0	J, UJ	SP-01 (0-10") SP-02 (0-12") SP-04 (0-12") SP-03 (0-12") SBW-18 (0-12") SP-14 (0-12") SP-17 (0-12") SP-18 (0-12") SBW-13 (0-12") SBW-21 (0-12") W-08 S2 (0-12") W-25 S2 (0-12") W-04 S2 (0-12") W-12 S2 (0-12") SP-Blind Duplicate #2

Laboratory Duplicate Analysis

Duplicate RPD criterion of less than 35.0% for soil samples was exceeded for calcium, lead, and nickel with values of 57.2, 50.8, and 115.5, respectively. Detected sample results for these analytes that required qualification are tabulated below.

Analyte	Qualification	Affected Samples
calcium	J	SP-01 (0-12")
		SP-02 (0-12")
		SP-04 (0-12")
		SP-03 (0-12")
		SBW-18 (0-12")
		SP-14 (0-12")
		SP-17 (0-12")
		SP-18 (0-12")
		SBW-13 (0-12")
		SBW-21 (0-12")
		W-08 S2 (0-12")
		W-25 S2 (0-12")
		W-04 S2 (0-12")
		W-12 S2 (0-12")
		SP-Blind Duplicate #2
		SBW-12 (0-12")
		SP-20 (0-12")
		W-07 S2 (0-12")
		SP-22 (0-12")
		SP-09 (0-12")
		SP-06 (0-12")
		SP-12 (0-12")
		SP-13 (0-12")
		SP-05 (0-12")
		SP-15 (0-12")
		SP-10 (0-12")
		SP-07 (0-12")
		SP-11 (0-12")
lead	J	SP-01 (0-12")
		SP-02 (0-12")
		SP-04 (0-12")
		SBW-18 (0-12")
		SP-17 (0-12")
		SP-18 (0-12")
		SBW-13 (0-12")
		SBW-21 (0-12")
		W-08 S2 (0-12")
		W-25 S2 (0-12")
		W-12 S2 (0-12")
		SP-Blind Duplicate #2
		SBW-12 (0-12")
		SP-19 (0-12")
		SP-20 (0-12")
		W-07 S2 (0-12")
		SP-12 (0-12")
		SP-13 (0-12")
		SP-05 (0-12")
		SP-15 (0-12")
		SP-21 (0-12")
		SP-16 (0-12")

Analyte	Qualification	Affected Samples
nickel	J	SP-01 (0-12") SP-02 (0-12") SP-04 (0-12") SP-03 (0-12") SBW-18 (0-12") SP-14 (0-12") SP-17 (0-12") SP-18 (0-12") SBW-13 (0-12") SBW-21 (0-12") W-08 S2 (0-12") W-25 S2 (0-12") W-04 S2 (0-12") W-12 S2 (0-12") SP-Blind Duplicate #2 SBW-12 (0-12") SP-19 (0-12") SP-20 (0-12") W-07 S2 (0-12") SP-22 (0-12") SP-09 (0-12") SP-Blind Duplicate #1 SP-06 (0-12") SP-12 (0-12") SP-13 (0-12") SP-05 (0-12") SP-15 (0-12") SP-10 (0-12") SP-07 (0-12") SP-11 (0-12")

Field Duplicate Analysis

The duplicate analysis of SBW-13 (0-12") (SP-Blind Duplicate #2) exceeded RPD criterion of less than 50.0% for arsenic with a value of 88.2%. Due to this excursion detected arsenic results were approximated (J) for the samples listed below.

SP-03 (0-12")	SBW-18 (0-12")
SP-18 (0-12")	SBW-13 (0-12")
SBW-21 (0-12")	W-08 S2 (0-12")
W-25 S2 (0-12")	

ICP Interference Check Standard Analysis

ICP interference check standards were analyzed at the frequency required in the QAPP. Manganese was detected at concentrations above the IDL in the ICSA solution A. The following three samples contained iron in concentrations greater than half the ICSA concentration: SP-07(0-12"), SP-11(0-12"), and SP-19(0-12"). Due to this excursion, the manganese results for these samples were qualified as approximate (J).

Furnace Analytical Spike Analysis

Furnace analytical spike recovery criteria of 85.0% to 125.0% were exceeded for the arsenic analysis of W-04 S2 (0-12") with a recovery of 68.0%. Due to this excursion the detected arsenic result for this sample was approximated (J). Selenium spike recoveries were between 30.0% and 85.0% for a majority of the samples. Qualification of the selenium data for these excursions was not required since the sample results were previously qualified as approximate for matrix spike excursions.

Method of Standard Additions Analysis

The minimum correlation coefficient criterion of greater than 0.995 was exceeded for the lead analyses of SP-03 (0-12") and W-25 S2 (0-12") with values of 0.9850 and 0.9942, respectively. Qualification of sample results due to these excursions was not required since lead was analyzed by ICP for SP-03

(0-12") and lead for W-25 S2 (0-12") was previously approximated for laboratory duplicate excursions.

Element Quantitation and Reported Detection Limits

Detected sample results that were greater than the IDLs but less than the CRDLs which were identified by the laboratory with a "B" qualifier were qualified as approximated (J).

Overall Data Assessment

Overall, the laboratory performed inorganics analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the inorganics sample data have been determined to be usable for qualitative and quantitative purposes. Detected and non-detected sample results were qualified with a "U" and approximated for several analytes that were detected in the calibration blanks at positive and negative concentrations. Soil reference standards were not analyzed, but sample qualification was determined to be unnecessary since water based standards met criteria and the samples were qualified on matrix spike criteria. Detected results were approximated and non-detected results were determined to be unusable for antimony for several samples based on matrix spike criteria. Results for selenium, antimony, and nickel were also approximated due to matrix spike recovery criteria. Detected results were approximated for calcium, lead, and nickel due to laboratory duplicate criteria. Arsenic results were approximated for seven samples based on field duplicate criteria. Manganese results were approximated for three samples based on ICSA criteria. The detected arsenic results for one sample was approximated based on further analytical spike recoveries. Minor excursions were observed for ICSA solution A, furnace analytical spike, and method of standard additions that did not result in the qualification of data.

4.03.2 Target Compound List Volatiles Analysis

Thirty-one surface soil samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, surrogate recovery, matrix spike/matrix spike duplicate analysis, reference standard analysis, tentatively identified compounds, percent, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Minimum average RF criterion of greater than 0.05 was exceeded for 2-butanone with a value of 0.02175 in the medium level soil calibration analyzed on 9/28/92. Due to this excursion non-detected 2-butanone results were determined to be unusable (R) in the samples listed below.

SP Equipment/Field Blank (9/29/92)	QC Trip Blank (10/2/92)
QC Trip Blank (9/29/92)	SP Equipment/Field Blank (10/5/92)
QC Trip Blank (10/1/92)	QC Trip Blank (10/5/92)

SP Equipment/Field Blank (10/2/92)

Continuing Calibration

The average and the continuing calibration RFs for 2-butanone analyzed for low level soils on 10/5/92 were quantitated using the wrong internal standard. The correct average and continuing calibration RFs of 0.08231 and 0.08160, respectively met continuing calibration criterion with a %D of 0.84%.

The low level soil continuing calibration standard analyzed on 10/11/92 exceeded calibration %D criterion of less than 25% for bromomethane (25.61%). Qualification of sample data was not required since bromomethane was not detected in the affected samples and the %D was less than 50%.

Medium level soil continuing calibration standards analyzed on 10/5/92, 10/12/92, and 10/13/92 exceeded minimum RF criterion of greater than 0.05 for 2-butanone. Qualification of sample data was not required for these excursions since the affected samples were previously qualified for exceeding RF criterion in the initial calibration.

Medium level soil continuing calibration %D criterion of less than 25% was exceeded for vinyl acetate on 10/12/92 (26.5%) and on 10/13/92 (29.33%). Qualification of sample data for these excursions was not required since vinyl acetate was not detected in the affected samples and the %Ds were less than 50%.

Blank Analysis

Acetone was detected in the SP Equipment/Field Blank and the QC Trip Blank collected on 10/5/92 at concentrations of 6 μg/L and 170 μg/L, respectively. A blank action level of ten times the highest blank concentration was calculated using a value of 1.0 g/mL for the density of water and was corrected for dry weight using the percent solids of the affected samples. Dilutions and differences between sample and blank weights or volumes were taken into account when applying blank actions. Detected acetone results in the affected samples that were less than the action level were qualified with a "U" indicating that the sample results may reflect contamination during transportation. The following samples were qualified for blank contamination: SP-17 (5"-7"), SP-18 (5"-7"), W-08 S2 (5"-7"), W-04 S2 (5"-7"), and W-12 S2 (5"-7").

Field Duplicate Analysis

Acetone was detected at a concentration of 9 μg/Kg in SP-22 (4"-7") but was not detected in the corresponding field duplicate, SP Blind Duplicate #1. The relative percent difference (RPD) of 200% for these results exceed the duplicate RPD criterion of less than 50% for soil samples. Due to this excursion the detected result for SP-22 (4"-7") and the non-detected result for SP Blind Duplicate #1 were approximated (J, UJ).

Internal Standards Performance

The chlorobenzene internal standard area of 137636 was below the lower limit of 139226 for W12-S2 (5"-7") analyzed on 10/15/92. Non-detected sample results for the compounds listed below were approximated (UJ) in this sample due to this excursion.

4-methyl-2-pentanone	1,1,2,2-tetrachloroethane	ethylbenzene
2-hexanone	toluene	styrene
tetrachloroethene	chlorobenzene	xylene

Compound Identification and Quantitation

Several samples contained compounds at concentrations above the linear range of the instrumentation. These samples required reanalysis with a dilution to properly quantitate the sample results. For samples SP-10 (5"-7"), SP-07 (5"-7"), and SP-11 (5"-7") the diluted and undiluted analysis data were included in the data package. For these samples the undiluted and diluted analyses were combined to report the lowest detection limits for the non-detected sample results and the properly quantitated results for concentrations that exceeded the linear range.

Acetone was detected in several samples at concentrations below the contract required detection limit (CRDL). The non-detected sample results reported by the laboratory for acetone were replaced with the detected concentration and qualified with a "J" to indicate that the concentration is below the CRDL. Samples SP-16 (5"-7") and SP-01 (5"-7") contained acetone at concentrations below the CRDL.

Acetone concentrations were incorrectly reported for SP-18 (5"-7") and W12 S2 (5"-7"). The reported concentrations were 18 μg/Kg and less than 16 μg/Kg for SP-18 (5"-7") and W12 S2 (5"-7"), respectively. The correct concentrations are 28 μg/Kg and 20 μg/Kg for SP-18 (5"-7") and W12 S2 (5"-7"), respectively.

Mass spectral ion relative abundance criteria of +/- 20% was exceeded for masses 57, 58, and 100 peak for 4-methyl-2-pentanone in SP-07 (5"-7"). Due to these excursion the detected 4-methyl-2-pentanone result for SP-07 (5"-7") was qualified as approximate (J).

Percent Solids Determination and Content

Since the percent solids content of sample SP-07 was less than 30% (26%), the detected sample results were qualified with a "J".

Overall Data Assessment

Overall, the laboratory performed volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the volatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Non-detected 2-butanone results were determined to be unusable for the equipment blanks and the trip blanks based on calibration minimum RF criterion. Detected acetone results for SP-17 (5"-7"), SP-18 (5"-7"), W-08 S2 (5"-7"), W-04 S2 (5"-7"), and W-12 S2 (5"-7") were qualified with a "U" due to blank contamination, possibly due to sample handling errors. Acetone results for SP-22 (4"-7") and SP Blind Duplicate #1 were approximated based on field duplicate criteria. Internal standard recovery criteria were exceeded for chlorobenzene in the analysis of W12-S2 (5"-7").

Due to this excursion non-detected results for 4-methyl-2-pentanone, 2-hexanone, tetrachloroethene, 1,1,2,2-tetrachloroethane, toluene, chlorobenzene, ethylbenzene, styrene, and xylene were approximated. For samples SP-10 (5"-7"), SP-07 (5"-7"), and SP-11 (5"-7") the diluted and undiluted analysis data were combined to report the lowest level of detection for the non-detected sample results and the properly quantitated results for concentrations that exceeded the linear range.

Acetone was detected in SP-16 (5"-7") and SP-01 (5"-7") at concentrations below the contract required detection limit (CRDL). The non-detected sample results reported by the laboratory for acetone were replaced with the detected concentration and qualified with a "J".

Acetone concentrations were incorrectly reported for SP-18 (5"-7") and W12 S2 (5"-7"). The correct concentrations are 28 μg/Kg and 20 μg/Kg for SP-18 (5"-7") and W12 S2 (5"-7"), respectively.

Mass spectral ion relative abundance criteria of +/- 20% was exceeded for masses 57, 58, and 100 peak for 4-methyl-2-pentanone in SP-07 (5"-7"). Due to these excursion the detected 4-methyl-2-pentanone result for SP-07 (5"-7") was qualified as approximate (J).

<u>4.03.3 Target Compound List Semivolatiles Analysis</u>

Nine surface soil samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8270 were found to meet validation criteria: holding times, GC/MS instrument tuning, matrix spike/matrix spike duplicate analysis, reference standard analysis, field duplicate analysis, internal standards recovery, percent solids determination and content, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

The initial calibration performed on 10/22/92 exceeded percent relative standard deviation criterion (%RSD) of less than 30% for 2,4-dinitrophenol (42.546%). Qualification of sample data was not required since 2,4-dinitrophenol was not detected in the affected samples and the %RSD was less than 50%.

Continuing Calibration

Continuing calibration %D criterion of less than 25% was exceeded on 10/15/92 for 4-nitroaniline (34.21%) and 3,3'-dichlorobenzidine (37.61%), on 10/23/92 for 2,4,6-tribromophenol (29.31%), and on 10/24/92 for benzoic acid (32.14%) and hexachlorocyclopentadiene (28.91%). Qualification of sample data was not required since these compounds were not detected in the affected samples and the %Ds were less than 50%.

Continuing calibration %D criterion was also exceeded on 10/24/92 for 2,4-dinitrophenol (56.95%). Due to this excursion the non-detected 2,4-dinitrophenol result for SP-03 (0"-12") was approximated (UJ).

Blank Analysis

Bis(2-ethylhexyl) phthalate was detected in the method blanks extracted on 10/5/92 and 10/12/92 at concentrations of 3.3 μg/L and 550 μg/Kg, respectively. Di-n-butylphthalate was detected in the method blanks extracted on 10/7/92 and 10/12/92 at concentrations of 50 μg/Kg and 37 μg/Kg, respectively. Qualification of sample data were limited to bis(2-ethylhexyl) phthalate in sample SP-03 (0"-12") extracted on 10/12/92 since di-n-butyl-phthalate was not detected in the samples and bis(2-ethylhexyl) phthalate was only detected in this sample. A blank action level for bis(2-ethylhexyl) phthalate was calculated at ten times the blank concentration and corrected for the percent solids of the affected sample. Dilutions and differences between sample and blank weights or volumes were taken into account when applying blank actions. The detected bis(2-ethylhexyl) phthalate result for sample SP-03 (0"-12") was below the action level and was qualified with a "U". The "U" qualifier indicates that the sample concentration may be due in part or whole to laboratory contamination.

Surrogate Recovery

Surrogate recovery criteria of 47.4% to 110.1% and 56.1% to 102.2% for phenol-d6 and 2-fluorophenol, respectively were exceeded for samples listed below. Non-detected sample results for the acid extractables were approximated (UJ) in these samples since the recoveries were below the lower limit but above 10%.

Sample	Phenol-d6 %Recovery	2-Fluorophenol %Recovery
SP Equipment/Field Blank (9/29/92)	37	50
SP Equipment/Field Blank (10/2/92)	40	45

Tentatively Identified Compounds

Several tentatively identified compounds (TICs) were detected in the method blanks. Sample TICs with relative retention times matching the retention times of the TICs in the method blanks were qualified as unusable (R). Samples requiring qualification are summarized below.

Sample ID#	TIC Retention Time (min)	
	Sample	Blank
SP-22 (0"-12")	6.58 39.59	6.57 39.56
SP-09 (0"-12")	10.89	10.84
SP Blind Duplicate #2 (0"-12")	6.65	6.57
SP-06 (0"-12")	6.67	6.57
SP-13 (0"-12")	6.67	6.57
SP-10 (0"-12")	6.64 10.87	6.57 10.84
SP-07 (0"-12")	6.64	6.57
SP-01 (0"-10")	6.63 39.59	6.57 39.56
SP-02 (0"-12")	6.61	6.57

Sample ID#	TIC Retention Time (min)	
	Sample	Blank
SP-04 (0"-12")	6.63 39.62	6.57 39.56
SP Equipment/Field Blank (10/2/92)	6.59	6.64
SP-03 (0"-12")	9.78 30.15	9.77 30.16

Compound Identification and Quantitation

Sample SP-07 (0"-12") required reanalysis with a dilution to quantitate several compounds that exceeded the calibration range. The reanalysis resulted in the detection of several compounds with concentrations below the CRDL. For this sample the laboratory reported both the CRDLs for the diluted analysis and the detected concentrations. As a result of the validation the detected concentrations for the affected compounds were reported as approximated (J). The detected compounds with the reported CRDLs and the qualified sample results are listed below.

Compound	CRDL (μg/Kg)	Qualified Result (μg/Kg)
acenaphthene	7600	910 J
anthracene	7600	1500 J
benzo(a)anthracene	7600	4900 J
chrysene	7600	6100 J
benzo(b)fluoranthene	7600	6700 J
benzo(k)fluoranthene	7600	4900 J
benzo(a)pyrene	7600	4600 J
indeno(1,2,3-cd)pyrene	7600	3300 J

Bis(2-ethylhexyl) phthalate was incorrectly reported as non-detected with a CRDL of 420 μg/Kg for sample SP-03 (0"-12"). For this sample bis(2-

ethylhexyl) phthalate was detected at 750 μg/Kg, but was qualified with a "U" due to method blank contamination.

Overall Data Assessment

Overall, the laboratory performed semivolatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the semivolatile organics sample data have been determined to be usable for qualitative and quantitative purposes. The non-detected 2,4-dinitrophenol result for SP-03 (0"-12") was approximated based on continuing calibration %D criterion. The detected bis(2-ethylhexyl) phthalate result for SP-03 (0"-12") was qualified with a "U" based on method blank criteria. Non-detected results for the acid extractable compounds were approximated for SP-Equipment/Field Blank (9/29/92) and SP-Equipment/ Field Blank (10/2/92) based on surrogate recovery criteria. Sample TICs with retention times and mass spectral criteria matching TICs detected in the method blanks were determined to be unusable (R) for several samples.

Sample SP-07 (0"-12") required reanalysis with a dilution to quantitate several compounds that exceeded the calibration range. The reanalysis resulted in the detection of several compounds with concentrations below the CRDL. As a result of the validation the detected concentrations for the affected compounds were reported as approximated (J) since they were below the CRDL.

Bis(2-ethylhexyl) phthalate was incorrectly reported as non-detected with a CRDL of 420 μg/Kg for sample SP-03 (0"-12"). For this sample bis(2-

ethylhexyl) phthalate was detected at 750 $\mu g/Kg$, but was qualified with a "U" due to method blank contamination.

4.03.4 PCB/Pesticide Analysis

Ten surface soil samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8080 were found to meet validation criteria: holding times, instrument performance, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, field duplicate analysis, percent solids analysis, compound identification and quantitation, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration %RSD criterion of less than 10% was exceeded for chlordane in the five point calibration analyzed on 10/6/92 with a value of 11.0%. Qualification of sample data for this compound was not required since it was not detected in the associated samples.

Continuing Calibration

Continuing calibration %D criterion of less than 15% was exceeded for a majority of the pesticide compounds on the dates that samples were analyzed. Qualification of sample data for these compounds was not required since they were not detected in the affected samples.

Reference Standard Analysis

Endrin aldehyde was not recovered in the reference samples analyzed with these samples. The laboratory indicated that this compound was removed by the TBA cleanup procedure. Due to this excursion the non-detected endrin aldehyde results reported for all the samples were determined to be unusable (R). Methoxychlor exceeded recovery criteria with a recovery of 6.5% in the reference sample extracted on 10/9/92 and analyzed on 10/13/92. Due to this excursion the non-detected methoxychlor result for SP-Equipment/Field Blank #2 was determined to be unusable (R).

Overall Data Assessment

Overall, the laboratory performed pesticide/PCB analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the pesticide/PCB sample data have been determined to be usable for qualitative and quantitative purposes. Minor excursions that did not result in the qualification of data were observed for initial and continuing calibration criteria. Non-detected endrin aldehyde results reported for the samples were determined to be unusable since endrin aldehyde was not recovered in the reference standard analyzed with the samples. The non-detected methoxychlor result for SP-Equipment/Field Blank #2 was determined to be unusable (R) based on reference standard criteria.

4.04 EPA 524.2 Volatiles Analysis

Eighteen residential well water samples collected from 9/29/92 to 7/1/93 were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 524.2 were found to meet validation criteria: GC/MS instrument tuning, surrogate recovery, field duplicate analysis, internal standards recovery, tentatively identified compounds, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Holding Time

Samples collected from 4/14/93 to 4/15/93 were relinquished by OBG Labs on 4/16/93 and were received by H2M Labs on 4/20/93. Due to the length of time to ship these samples, sample integrity is uncertain. To evaluate the condition of the samples upon receipt, Joann Slavin of H2M Labs was contacted. Ms Slavin indicated that it was not H2M Labs' standard procedure to determine cooler temperatures unless H2M Labs chain of custody forms are used. Therefore, the integrity of these samples is uncertain due to the duration for shipping and the uncertainty of sample preservation. Due to these excursions, detected results were approximated (J) and non-detected sample results were determined to be unusable (R) for SW-02-02, SW-03-02, SW-015-02, Trip Blank (4/14/93), SW-01B-02, Trip Blank (4/15/93), and SW-Blind Duplicate #1-2.

The samples collected on 6/3/93 were relinquished by OBG Labs on 6/4/93 and were received by H2M Labs on 6/8/93. Sample integrity and preservation for the affected samples is uncertain since the samples were in transit for days for shipment and the temperature of the samples was not determined at the time of receipt by H2M Labs. Due to these excursions the non-detected sample results were determined to be unusable (R) for Ryder Spring-1, Blind Duplicate #4-1, and Trip Blank (6/3/93).

Samples collected on 7/1/93 were relinquished by OBG Labs on 7/2/93 and were received by H2M Labs on 7/8/93. These samples required six days for shipment and the cooler temperature was not measured by H2M Labs at the time of receipt. Due to these circumstances the ability of these samples to accurately represent the environmental system is in question. Therefore the non-detected sample results for compounds reported for Olin Well-2, Ryder Spring-2, Dickinson-2, Blind Duplicate-2, and Trip Blank (7/1/93) have been determined to be unusable (R).

Initial Calibration

Initial calibration minimum RF criterion of greater than 0.05 and %RPD criterion of less than 30.0% were exceeded for the compounds listed below. Qualifications due to these excursions and the affected samples are also included in the following table.

Calibration Date	Compound	Excursion RF	Excursion %RSD	Affected Samples	Qualified Result
10/9/92	acetone	0.03186	NA	SW-01B	R
				SW-02	4 J
				SW-03	2 J
				SW-06	R
				SW-015	R
				SW-Blind Duplicate #2	R
				SW-010	R
				Trip Blank (9/29/92)	R
10/9/92	1,2-dibromo-3-chloropropane	0.02624	NA	SW-01B	R
				SW-02	R
				SW-03	R
				SW-06	R
				SW-015	R
				SW-Blind Duplicate #2	R
				SW-010	R
				Trip Blank	R
4/22/93	acetone	0.04969	NA	Olin Well	R
				Dickinson	R
4/22/93	1,2-dibromo-3-chloropropane	0.03149	31.786	Olin Well	R
				Dickinson	R
4/23/93	acetone	0.04654	NA	SW-06-02	3 J
				Trip Blank (4/13/93)	R
				Trip Blank (6/4/93)	R
				Trip Blank (6/5/93)	R
4/23/93	1,2-dibromo-3-chloropropane	0.02770	56.169	SW-06-02	R
				Trip Blank (4/13/93)	R
				Trip Blank (6/4/93)	R
				Trip Blank (6/5/93)	R
4/23/93	naphthalene	NA	43.554	SW-06-02	NA
				Trip Blank (4/13/93)	NA
				Trip Blank (6/4/93)	NA
				Trip Blank (6/5/93)	NA
4/23/93	1,2,3-trichlorobenzene	NA	41.264	SW-06-02	NA
				Trip Blank (4/13/93)	NA
				Trip Blank (6/4/93)	NA
				Trip Blank (6/5/93)	NA

NA - within established criterion or not required.

Continuing Calibration

Continuing calibration minimum RF and %D criteria of greater than 0.05 and less than 25.0%, respectively were exceeded for the compounds listed below. Qualifications due to these excursions and the affected samples are also included in the following table.

Calibration Date	Compound	Excursion		Affected Samples	Qualified Result
		RF	%D		
10/12/92	acetone	0.03064	NA	samples previously qualified	NA
10/12/92	methylene chloride	NA	27.71	Trip Blank (9/29/92)	1 J
10/12/92	2-butanone	0.04895	NA	SW-01B	R
10/12/92	1,2-dibromo-3-chloropropane	0.02595	NA	samples previously qualified	NA
10/13/92	dichlorodifluoromethane	NA	80.62	SW-06 SW-010	1 UJ 1 UJ
10/13/92	acetone	0.03050	NA	samples previously qualified	NA
10/13/92	2-butanone	0.04835	NA	SW-06 SW-010	R R
10/13/92	1,2-dibromo-3-chloropropane	0.02485	NA	samples previously qualified	NA
10/14/92	acetone	0.03532	NA	samples previously qualified	NA
10/14/92	chloromethane	NA	26.23	none affected since %D is less than 50%	NA
10/14/92	1,2-dibromo-3-chloropropane	0.02675	NA	samples previously qualified	NA
4/25/93	1,2-dibromo-3-chloropropane	0.03097	NA	samples previously qualified	NA
6/13/93	1,2,3-trichlorobenzene	NA	41.97	samples previously qualified	NA
6/15/63	acetone	0.04397	NA	samples previously qualified	NA
6/15/93	2-butanone	0.04981	NA	Olin Well Dickinson	R R
6/15/93	1,2-dibromo-3-chlorobenzene	0.04089	29.85	samples previously qualified	NA

Calibration Date	Compound	Excursion RF	Excursion %D	Affected Samples	Qualified Result
6/15/93	1,2,4-trichlorobenzene	NA	40.08	Olin Well Dickinson	NA NA
6/15/93	naphthalene	NA	51.34	Olin Well Dickinson	1 UJ 1 UJ
6/15/93	1,2,3-trichlorobenzene	NA	90.57	Olin Well Dickinson	1 UJ 1 UJ
6/16/93	acetone	0.03906	NA	samples previously qualified	NA
6/16/93	2-butanone	0.04677	NA	Trip Blank (6/4/93) Trip Blank (6/5/93)	R R
6/16/93	1,2-dibromo-3-chloropropane	0.03436	NA	samples previously qualified	NA
6/16/93	1,2,3-trichlorobenzene	NA	58.48	Trip Blank (6/4/93) Trip Blank (6/5/93)	2 UJ 2 UJ

NA - within established criterion or not required.

Blank Analysis

Methylene chloride was detected in the trip blank collected on 9/29/92 at a concentration of 1 μg/L. Qualification of sample data was not required since methylene chloride was not detected in the associated samples.

Matrix Spike\Matrix Spike Duplicate Analysis

Matrix spike recovery criteria of 80.0% to 120.0% were exceeded in the MS and MSD analyses of SW-03 for vinyl chloride, carbon tetrachloride, 1,4-dichlorobenzene, tetrachloroethene, benzene, trichloroethene, and 2-hexanone. Since the recoveries were between 45.0% and 80.0% qualification of the sample data was limited to the approximation (J) of the detected trichloroethene, vinyl chloride, and tetrachloroethene results in the unspiked sample. Matrix spike duplicate RPD criterion of less than 13.0% was exceeded for 2-hexanone in the SW-03 MS/MSD analyses. Qualification of 2-hexanone data was not required since 2-hexanone was not detected in the unspiked sample.

Matrix spike recovery criteria of 80.0% to 120.0% and RPD criterion of less than 13.0% were exceeded for vinyl chloride and 2-hexanone in the MS/MSD analyses of SW-01B-02. Qualification of sample data due to these excursions was not required since the affected compounds were not detected in the unspiked sample and the non-detected sample results for the unspiked sample were previously determined to be unusable due to sample preservation excursions.

Matrix spike/matrix spike duplicate recovery and RPD criteria were exceeded for vinyl chloride, 1,2-dichloroethane, carbon tetrachloride, 1,1,2-trichloroethane, bromoform, 1,2-dibromoethane, and 1,4-dichlorobenzene using the Ryder Spring-1 sample. Qualification of sample data was not required for these excursions since these compounds were not detected in the unspiked sample and the non-detected sample results for the unspiked sample were previously determined to be unusable.

Reference Standard Analysis

Reference standard recovery criteria of 60.0% to 140.0% were exceeded for methylene chloride with a recovery of 160.0% for samples collected on 9/29/92. Qualification of data due to this excursion was not required since the affected sample, Trip Blank (9/29/92), was previously qualified for continuing calibration excursions.

The reference standard analyzed on 4/25/93 exceeded the 60.0% to 140.0% recovery criteria for naphthalene, 1,2,3-trichlorobenzene, 4-methyl-2-pentanone, and 1,2-dibromo-3-chloropropane with recoveries of 45.0%, 54.0%, 40.0%, and 0.0%, respectively. Due to these excursions the non-detected results for naphthalene, 1,2,3-trichlorobenzene, and 4-methyl-2-pentanone were approximated (UJ) for SW-06-02 and Trip Blank (4/13/93). Additional qualification for 1,2-dibromo-3-chloropropane data was not required since the affected data was previously determined to be unusable for calibration excursions.

Reference standards analyzed on 6/13/93, 6/14/93 and 6/15/93 had several compounds that exceeded recovery criteria of 80.0% to 120.0% with recoveries greater than 120.0%. These compounds did not require qualification in the affected samples since they were not detected and the recoveries greater than 100.0%. Several compounds in the reference sample analyzed on 6/13/93 had recoveries below the lower criteria limit. Qualification of sample data for these compounds were not required since the non-detected samples results for these compounds in the affected samples were previously determined to be unusable. Compounds which exhibited low reference standard recoveries and required qualification of the affected samples are tabulated below.

Date Analyzed	Compound	%Recovery	Affected Samples	Qualified Result
6/15/93	bromoform	58.0	Olin Well Dickinson	1 UJ 1 UJ
6/15/93	1,2,4-trichlorobenzene	51.0	Olin Well Dickinson	1 UJ 1 UJ
6/15/93	naphthalene	26.0	samples previously qualified	NA
6/15/93	1,2,3-trichlorobenzene	25.0	samples previously qualified	NA
6/15/93	1,1,2,2-tetrachloroethane	59.0	Olin Well Dickinson	1 UJ 1 UJ
6/15/93	1,2-dibromo-3-chloropropane	0.0	samples previously qualified	NA
6/16/93	trichlorotrifluoromethane	39.0	Trip Blank (6/4/93) Trip Blank (6/5/93)	2 UJ 2 UJ
6/16/93	chloromethane	47.0	Trip Blank (6/4/93) Trip Blank (6/5/93)	2 UJ 2 UJ
6/16/93	1,2,4-trichlorobenzene	12.0	Trip Blank (6/4/93) Trip Blank (6/5/93)	2 UJ 2 UJ
6/16/93	naphthalene	19.0	Trip Blank (6/4/93) Trip Blank (6/5/93)	2 UJ 2 UJ
6/16/93	hexachlorobutadiene	1.0	Trip Blank (6/4/93) Trip Blank (6/5/93)	R R
6/16/93	1,2,3-trichlorobenzene	9.0	Trip Blank (6/4/93) Trip Blank (6/5/93)	R R
6/16/93	4-methyl-2-pentanone	38.0	Trip Blank (6/4/93) Trip Blank (6/5/93)	8 UJ 8 UJ
6/16/93	1,2-dibromo-3-chloropropane	0.0	samples previously qualified	NA

NA - within established criterion or not required.

Compound Identification and Quantitation

Several compounds exceeded the calibration range and required reanalysis with a dilution. Results for these samples were reported as a combination of the diluted and undiluted analyses to provide the lowest quantitation limits and the proper quantitation of the detected concentrations. Compounds that were reported from diluted analyses include: cis-1,2-dichloroethene, trichloroethene, vinyl chloride, and tetrachloroethene for SW-02; cis-1,2-dichloroethene, trichloroethene, and vinyl chloride for SW-03; cis-1,2-dichloroethene for SW-015; and cis-1,2-dichloroethene for SW-Blind Duplicate #2.

Overall Data Assessment

Overall, the laboratory performed method 524.2 volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.02. Approximately 45.0% of the method 524.2 volatile organics sample data have been determined to be unusable for qualitative and quantitative purposes based on sample preservation, calibration minimum RF, and reference standard criteria. Sample results were approximated for several compounds based matrix spike/matrix spike duplicate criteria. Compounds that were reported from diluted analyses include: cis-1,2-dichloroethene, trichloroethene, vinyl chloride, and tetrachloroethene for SW-02; cis-1,2-dichloroethene, trichloroethene, and vinyl chloride for SW-03; cis-1,2-dichloroethene for SW-015; and cis-1,2-dichloroethene for SW-Blind Duplicate #2.

4.05 Bend in the Road Soil Program Inorganics Analysis

QA/QC parameters for chromium, lead, manganese, mercury, nickel, and zinc analyses were evaluated in ten soil samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration, CRDL standard analysis, field duplicate analysis, laboratory control sample analysis, furnace atomic absorption analysis, element quantitation and reported detection limits, percent solids quantitation and content, quarterly detection limit verification and ICP interelement correction factors, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Blank Analysis

The equipment rinse blank, sample BRP-6-ER, contained concentrations of chromium, manganese, nickel, and zinc that were above the IDLs for these analytes. Equipment rinse blank action levels were calculated at five times the blank concentration for these analytes using a density of 1.0 g/ml for water and the percent solids of the affected samples. Qualification of sample data was not required since detected sample results were greater than the blank action levels established from the equipment rinse blank.

Laboratory Control Sample Analysis

Aqueous laboratory control samples (LCSs) were analyzed at the frequency specified in the QAPP. Soil LCS samples were not analyzed as required by the QAPP. Qualification of sample results was not required since the matrix spike samples were used to evaluate analyte recoveries for soil matrices and the aqueous LCS samples met the recovery criteria.

Matrix Spike Analysis

Matrix spike analysis was performed at the frequency specified in the QAPP using sample BRP-3. Recovery criteria of 75-125% were exceeded for lead and manganese in this sample. Although manganese had a spike recovery of -130%, qualification of sample results was not required since the unspiked sample concentration was more than four times greater than the spike concentration added. Post digestion matrix spike analyses for lead met recovery criteria. The low matrix spike recovery exhibited for lead may be due to sample matrix effects or laboratory error during digestion and analysis. Since the cause of the low spike recovery cannot be fully determined, detected lead results were approximated in the affected samples (J). The spike recovery for lead and the samples qualified for this excursion are tabulated below.

Matrix Spike Sample ID#	Analyte	% Recovery	Affected Samples	Qualified Results (mg/Kg)
BRP-3	lead	69.6	BRP-1	39.2 J
			BRP-2	4.8 J
			BRP-3	4.9 J
			BRP-4	3.2 J
			BRP-Blind Duplicate	3.5 J
			BRP-5	10.2 J
			BRP-6	5.2 J
			BRP-7	6.8 J
			BRP-8	14.0 J
			BRP-9	4.8 J
			BRP-10	7.9 J

ICP Interference Check Standard Analysis

ICP interference check standards were analyzed at the frequency required in the QAPP. Manganese was detected at concentrations above the IDL. Manganese was detected in the interference check sample A at concentrations of 0.035 mg/L and 0.034 mg/L in the initial and final interference check standards, respectively. Due to these excursions, samples containing concentrations of the interfering analytes at concentrations greater than 50% of those in the interference check samples required qualification. Iron was detected at levels greater than 50% of the interference check sample concentration in samples BRP-8 and BRP-10. Due to these excursions the detected manganese results for these samples were approximated (J).

Laboratory Duplicate Analysis

Laboratory duplicate sample analysis was performed at the frequency specified in the QAPP using sample BRP-3. Duplicate RPD criterion of less than 35% for soil samples was exceeded for manganese in the duplicate analysis. The RPD of 52.5% exhibited by this analyte may be due to laboratory error during digestion and analysis. Detected manganese results for samples digested with the laboratory duplicate samples were approximated (J) and are tabulated below. Samples BRP-8 and BRP-10 did not require qualification since they were previously qualified for this analyte for interference check sample excursions.

Duplicate Sample ID#	Analyte	RPD	Affected Samples	Qualified Result (mg/Kg)
BRP-3	manganese	52.5	BRP-1	130 J
			BRP-2	145 J
			BRP-3	239 J
			BRP-4	122 J
			BRP-Blind Duplicate	150 J
			BRP-5	133 J
			BRP-6	146 J
			BRP-7	165 J
			BRP-9	97.1 J

ICP Serial Dilution Analysis

ICP serial dilutions were analyzed at the required frequency specified in the QAPP. The soil matrix ICP serial dilution met validation criteria, but the water matrix, sample BRP-6-L, exceeded the percent difference criterion of less than 15% for nickel. Due to the percent difference between the serial dilution and original sample of 100.0%, the nickel result for BRP-6-ER was approximated (J).

Overall Data Assessment

Overall, the laboratory performed the chromium, lead, manganese, mercury, nickel, and zinc analyses in accordance with the requirements specified in the methods listed in Section 2.01. These data have been determined to be usable for qualitative and quantitative purposes. Minor excursions that did not result in sample qualification were observed for blank analysis and laboratory control sample analysis criteria. Lead results for BRP-3 were approximated based on matrix spike recovery criteria. Manganese results were approximated for BRP-8 and BRP-10 based on ICSA solution A criteria. Manganese results were also approximated for several samples based on laboratory duplicate analysis criteria. The detected nickel result for BRP-6-ER was approximated based on ICP serial dilution %D criteria.

4.06 Soil Boring Program

4.06.1 Target Analyte List Inorganics Analysis

QA/QC parameters for TAL inorganic analyses were evaluated for twenty-nine soil boring samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration, percent solids quantitation and content, quarterly detection limit verification and ICP interelement correction factors, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Calibration Blank Analysis

Initial and continuing calibration blanks were analyzed at the required frequency. Sample results required qualification when blank concentrations were greater than the IDLs or negative concentrations were greater than two times the absolute value of the IDLs. When positive concentrations were detected in a blank action levels were calculated at five times the concentration.

Detected sample results below the action level were qualified with a "U" indicating that the sample results may reflect internal laboratory contamination. When negative concentrations greater than two times the absolute value of the IDLs were detected the associated sample results were approximated (J, UJ). The following samples required qualification for blank contamination.

Date Analyzed	Analyte	Blank Concentration	Qualification	Affected Samples
10/20/92	potassium	-1250 µg/L	J, UJ	SBW-18A (4'-6') SBW-18A (8'-10') SBW-18A (12'-14') SBW-Blind Dup #1
10/20/92	potassium	-1100 µg/L	J, UJ	W-01/S1 (6'-8') W-01/S1 (10'-12') SBW-19 (4'-6') SBW-19 (6'-8') SBW-19 (10'-12') SBW-16 (2'-4') SBW-16 (4'-8') SBW-16 (8'-10') SBW-17 (6'-8') SBW-17 (8'-10') SBW-17 (12'-14')
10/23/92	barium	2.0 µg/L	U	SBW-EQ/Field Blank #1 SBW-EQ/Field Blank #2
10/27/92	aluminum barium manganese potassium silver	-26.0 µg/L -2.0 µg/L -3.0 µg/L -1290 µg/L -5.0 µg/L	J, UJ J, UJ J, UJ J, UJ J, UJ	SBW-EQ/Field Blank #3
11/4/92	antimony	22.0 µg/L	U	SBW-15 (2'-4') SBW-15 (4'-6') SBW-10 (14'-16')
11/4/92	silver	3.0 µg/L	U	SBW-20 (6'-8') SBW-21 (2'-4') SBW-21 (12'-14') SBW-21 (20'-22') SBW-15 (8'-10') SBW-10 (14'-16') SBW-Blind Dup #2
11/4/92	potassium	765 µg/L	U	SBW-21 (12'-14') SBW-Blind Dup #2

Preparation Blank Analysis

Matrix specific preparation blanks were analyzed for soil and water samples as specified in the QAPP. The soil preparation blank for samples digested on 10/16/92 contained magnesium, potassium and silver at negative concentrations greater than twice the absolute value of the IDLs and copper at a positive concentration above the IDL. The soil preparation blank for samples digested on 10/28/92 contained negative concentrations of potassium and silver greater than twice the absolute value of the IDLs and copper at a positive concentration greater than the IDL. Water preparation blank samples prepared on 10/16/92 and 10/26/92 contained barium and iron, respectively at concentrations above the IDLs. Additionally, the water preparation blank digested on 10/26/92 contained negative concentrations of barium, magnesium, manganese, potassium, and silver greater than twice the absolute values of the IDLs. Blank action levels were calculated at five times the blank concentration for the analytes exhibiting positive blank contamination. Sample results above the IDLs but below the action level were qualified with a "U" for the affected samples. The "U" qualifier indicates that the sample concentration may be due in part or whole to blank contamination. Samples results for those analytes exhibiting negative contamination were approximated (J, UJ) in the affected samples. Sample results qualified for preparation blank excursions are summarized below.

Date Analyzed	Analyte	Blank Concentration	Qualification	Affected Samples
10/16/92	barium	1.7 μg/L	U	SBW-EQ/Field BLK #1 SBW-EQ/Field BLK #2

Date Analyzed	Analyte	Blank Concentration	Qualification	Affected Samples
10/16/92	magnesium	-4.1 mg/Kg	J, UJ	W-01/S1 (6'-8')
	potassium	-144.9 mg/Kg		W-01/S1 (10'-12')
	silver	-0.53 mg/Kg		SBW-19 (4'-6')
				SBW-19 (6'-8')
				SBW-19 (10'-12')
				SBW-16 (2'-4')
				SBW-16 (4'-6')
				SBW-16 (8'-10')
				SBW-17 (6'-8')
				SBW-17 (8'-10')
				SBW-17 (12'-14')
				SBW-18A (4'-6')
				SBW-18A (8'-10')
				SBW-18A (12'-14')
				SBW-Blind Dup #1
10/26/92	barium	-3.0 μg/L	J, UJ	SBW-EQ/Field BLK #3
	magnesium	-37.6 μg/L		
	manganese	-2.6 μg/L		
	potassium	-2236.1 μg/L		
	silver	-6.2 μg/L		
10/28/92	potassium	-134.8 mg/Kg	J, UJ	SBW-14 (6'-8')
	silver	-0.47 mg/Kg		SBW-14 (8'-10')
				SBW-14 (12'-14')
				SBW-20 (6'-8')
				SBW-20 (12'-14')
				SBW-20 (20'-22')
				SBW-21 (2'-4')
				SBW-21 (12'-14')
				SBW-21 (20'-22')
				SBW-10 (8'-10')
				SBW-10 (10'-12')
				SBW-10 (14'-16')
				SBW-Blind Dup #2
				SBW-15 (2'-4')
				SBW-15 (4'-6')
				SBW-15 (8'-10')

CRDL Standard Analysis

Contract required detection limit (CRDL) standards for ICP analyses were analyzed at the frequency required in the QAPP. Non-detected sample results and detected results less than three times the CRDL for analytes that exceeded the recovery criteria of 80% to 120% required qualification and are tabulated below.

Date Analyzed	Analyte	%Recovery	Qualification	Affected Samples

10/23/92	antimony	67.9	UJ	SBW-EQ/Field BLK #1 SBW-EQ/Field BLK #2
11/4/92	antimony	69.6	J, UJ	SBW-14 (6'-8') SBW-14 (8'-10') SBW-14 (12'-14') SBW-20 (6'-8') SBW-20 (12'-14') SBW-20 (20'-22') SBW-21 (2'-4') SBW-21 (12'-14') SBW-21 (20'-22') SBW-10 (8'-10') SBW-10 (10'-12') SBW-10 (14'-16') SBW-Blind Dup #2 SBW-15 (2'-4') SBW-15 (4'-6') SBW-15 (8'-10')
11/4/92	lead	124.0	J	SBW-14 (8'-10')

CRA Standard Analysis

The CRA recovery of 135.0% for mercury analyzed on 10/22/92 exceeded CRA recovery criteria of 80% to 120% specified in the QAPP. Qualification of sample results was not required since mercury was not detected in the affected samples. CRA recovery criteria excursions for mercury and selenium that resulted in the qualification of data are tabulated below.

Date Analyzed	Analyte	%Recovery	Qualification	Affected Samples
10/26/92	mercury	122.5	J	SBW-18A (4'-6')
10/27/92	selenium	75.8	UJ	SBW-EQ/Field BLK #1 SBW-EQ/Field BLK #2
11/4/92	mercury	122.5	J	SBW-17 (8'-10') SBW-18A (8'-10')
11/6/92	mercury	125.0	J	SBW-14 (8'-10') SBW-21 (2'-4') SBW-21 (12'-14') SBW-15 (8'-10')

Laboratory Control Sample Analysis

Aqueous laboratory control samples (LCSs) were analyzed at the frequency specified in the QAPP. Soil LCS samples were not analyzed as required by the QAPP. Qualification of sample results was not required since the matrix spike samples were used to evaluate analyte recoveries for soil matrices and aqueous LCS samples met recovery criteria.

Matrix Spike Analysis

Matrix spike analysis was performed at the frequency specified in the QAPP using samples SBW-17 (6'-8') and SBW-10 (10'-12'). Recovery criteria of 75% to 125% were exceeded for antimony in sample SBW-17 (6'-8') and antimony, manganese, and selenium in sample SBW-10 (10'-12'). Post digestion matrix spike analyses were analyzed as required for these analytes. With the exception of selenium in sample SBW-10 (10'-12') post digestion spike recoveries met recovery criteria. The low matrix spike recoveries exhibited by these analytes may be due to sample matrix effects or laboratory error during digestion and analysis. Since the cause of the low spike recoveries cannot be fully determined the sample results for these analytes require qualification. Spike recoveries and the samples qualified for these excursions are tabulated below.

Matrix Spike Sample ID#	Analyte	%Recovery	Qualification	Affected Samples
SBW-17 (6'-8')	antimony	66.4	J, UJ	SBW-18A (4'-6') SBW-18A (8'-10') SBW-18A (12'-14') SBW-Blind Dup #1 W-01/S1 (6'-8') W-01/S1 (10'-12') SBW-19 (4'-6') SBW-19 (6'-8') SBW-19 (10'-12') SBW-16 (2'-4') SBW-16 (4'-6') SBW-16 (8'-10') SBW-17 (6'-8') SBW-17 (8'-10') SBW-17 (12'-14')
SBW-10 (10'-12')	antimony manganese selenium	55.0 36.5 49.0	UJ J UJ	SBW-14 (6'-8') SBW-14 (8'-10') SBW-14 (12'-14') SBW-20 (6'-8') SBW-20 (12'-14') SBW-20 (20'-22') SBW-21 (2'-4') SBW-21 (12'-14') SBW-21 (20'-22') SBW-10 (8'-10') SBW-10 (10'-12') SBW-10 (14'-16') SBW-Blind Dup #2 SBW-15 (2'-4') SBW-15 (4'-6') SBW-15 (8'-10')

Furnace AA Post Digestion Spike Analysis

Samples that exceeded furnace post digestion spike recovery criteria of 85% to 115% are tabulated with the appropriate qualifiers below.

Sample ID#	Analyte	Spike %Recovery	Qualification
SBW-15 (2'-4')	arsenic	21.8	UJ
SBW-18A (8'-10')	arsenic	57.8	UJ
SBW-EQ/Field Blk #1	lead	78.4	UJ
SBW-EQ/Field Blk #1	selenium	71.8	UJ
SBW-EQ/Field Blk #2	selenium	74.0	UJ
SBW-18A (4'-6')	selenium	81.2	UJ
SBW-18A (8'-10')	selenium	0	R
SBW-18A (12'-14')	selenium	65.7	UJ

Sample ID#	Analyte	Spike %Recovery	Qualification
SBW-16 (2'-4')	selenium	82.0	UJ
SBW-17 (6'-8')	selenium	72.5	UJ
SBW-14 (12'-14')	selenium	59.0	UJ
SBW-21 (12-14')	selenium	40.9	UJ
SBW-15 (2'-4')	selenium	73.5	UJ
SBW-15 (8'-1')	selenium	58.8	UJ
SBW-10 (10'-12')	selenium	57.3	UJ
SBW-10 (14'-16')	selenium	65.2	UJ
SBW-Blind Dup #2	selenium	75.2	UJ
SBW-18A (8'-10')	thallium	61.4	UJ
SBW-15 (2'-4')	thallium	60.4	UJ
SBW-15 (4'-6')	thallium	65.9	UJ
SBW-10 (14'-16')	thallium	77.5	UJ
SBW-Blind Dup #2	thallium	79.6	UJ

ICP Serial Dilution Analysis

The ICP serial dilution percent difference (%D) of 16.6% for lead utilizing sample SBW-19 (4'-6') for the analysis exceeded the criterion of less than 15% specified in the QAPP. Due to this excursion detected lead results were approximated (J) in the following samples: SBW-16 (2'-4'), SBW-16 (4'-6'), SBW-18 (4'-6'), SBW-18A (8'-10), SBW-18A (12'-14'), SBW-Blind Dup #1, SBW-14 (6'-8'), SBW-14 (12'-14'), SBW-20 (12'-14'), SBW-20 (20'-22'), SBW-21 (2'-4'), SBW-21 (12'-14'), SBW-15 (2'-4'), SBW-15 (4'-6'), and SBW-15 (8'-10').

ICP Interference Check Standard Analysis

ICP interference check standards were analyzed at the frequency required in the QAPP. Several compounds were detected at concentrations above the IDLs and negative concentrations greater than two times the absolute value of the IDLs.

Antimony, barium, beryllium, cadmium, cobalt, copper, lead, manganese, nickel, silver, sodium, vanadium and zinc were detected at concentrations above the IDLs and nickel and potassium were detected at negative concentrations greater than two times the absolute value of the IDLs in these standards. Samples results did not require qualification since the samples did not contain aluminum, calcium, iron, or magnesium concentrations greater than half the interference check sample concentrations.

Laboratory Duplicate Analysis

Laboratory duplicate analyses were performed at the required frequency using samples SBW-10 (10'-12') and SBW-17 (6'-8'). Duplicate relative percent difference (RPD) criterion of less than 35% for sample results greater than five times the CRQLs was exceeded for copper and lead in SBW-10 (10'-12') and for cyanide in SBW-17 (6'-8'). Qualifications for samples affected by these excursions are summarized below.

Duplicate Sample ID#	Analyte	RPD	Qualification	Affected Samples
SBW-10 (10'-12')	copper	40.8	J	SBW-14 (6'-8')
				SBW-14 (8'-10')
				SBW-14 (12'-14')
				SBW-20 (6'-8')
				SBW-20 (12'-14')
				SBW-20 (20'-22')
				SBW-21 (2'-4')
				SBW-21 (12'-14')
				SBW-21 (20'-22')
				SBW-10 (10'-12')
				SBW-10 (14'-16')
				SBW-Blind Dup #2
				SBW-15 (2'-4')
				SBW-15 (4'-6')
				SBW-15 (8'-10')
	lead	76.2	J	SBW-20 (6'-8')
				SBW-21 (20'-22')
				SBW-10 (8'-10')
				SBW-10 (10'-12')
				SBW-10 (14'-16')
				SBW-Blind Dup #2

Duplicate Sample ID#	Analyte	RPD	Qualification	Affected Samples
SBW-17 (6'-8')	cyanide	103.5	J	SBW-19 (4'-6') SBW-16 (2'-4') SBW-16 (4'-6') SBW-17 (6'-8') SBW-17 (8'-10')

Field Duplicate Analysis

Field duplicate RPD criterion of less than 50.0% was exceeded for beryllium, copper, iron, lead, manganese, and zinc with values that ranged from 51.5% to 123.0% for the analysis of Blind Duplicate #2 (SBW-10 (12'-14'). Detected sample results for these analytes were approximated for SBW-10 (10'-12'), SBW-10 (14'-16'), and Blind Duplicate #2 due to these excursions.

Method of Standard Additions Analysis

The method of standard additions was performed for samples analyzed by furnace AA where required. The minimum correlation coefficient of 0.995 was not achieved for lead in the analysis of SBW-19 (4'-6'). Due to this excursion the detected lead result for SBW-19 (4'-6') was approximated (J).

Element Quantitation and Reported Detection Limits

The detected mercury result for sample SBW-18A (8'-10') was incorrectly reported as 4.6 mg/Kg. The correct value for this result is 0.46 mg/Kg.

Overall Data Assessment

Overall, the laboratory performed inorganics analyses in accordance with the requirements specified in the methods listed in Section 2.01. These data have been determined to be usable for qualitative and quantitative purposes. Detected and non-detected results for several analytes were qualified with a "U" and were approximated based on positive and negative concentrations measured in the calibration and preparation blanks. Antimony, lead, mercury, and selenium results were approximated for several samples based on CRDL standard analysis criteria. Selenium, antimony, and manganese results were approximated for several samples based on matrix spike criteria. Arsenic, lead, selenium, and thallium results were approximated based on furnace analytical spike analysis criteria. Results for several analytes were also approximated based on ICP serial dilution analysis, laboratory duplicate analysis, and field duplicate analysis.

The method of standard additions was performed for samples analyzed by furnace AA where required. The minimum correlation coefficient of 0.995 was not achieved for lead in the analysis of SBW-19 (4'-6'). Due to this excursion the detected lead result for SBW-19 (4'-6') was approximated (J).

The detected mercury result for sample SBW-18A (8'-10') was incorrectly reported as 4.6 mg/Kg. The correct value for this result is 0.46 mg/Kg.

4.06.2 Target Compound List Volatiles Analysis

Twenty-nine soil boring samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, surrogate recovery, internal standards recovery, compound identification and quantitation, tentatively identified compounds, percent solids determination and content, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibrations performed for mid-level soil/water samples on 9/19/92 and 9/28/92 exceeded minimum response factor (RF) criterion of greater than 0.05 for 2-butanone. Non-detected sample results for 2-butanone were qualified as unusable (R) in samples QC Trip Blank (10/8/92), SBW-EQ/Field Blk #1, QC Trip Blank (10/9/92), SBW-18A (8'-10'), SBW-EQ/Field Blk #2, QC Trip Blank (10/14/92), QC Trip Blank (10/15/92), SBW-EQ/Field Blk #3, QC Trip Blank (10/19/92), SBW-15 (2'-4'), SBW-15 (4'-6'), SBW-15 (8'-10'), and QC Trip Blank (10/23/92) due to these excursions.

Continuing Calibration

Continuing calibration minimum RF criterion of 0.05 was exceeded for mid-level soil/water sample analyses for 2-butanone on 10/13/92, 10/19/92, 10/21/92, 11/2/92 and 11/4/92. Qualification of sample results was not required since the affected samples were previously qualified for initial calibration excursions for this compound.

Continuing calibration percent difference (%D) criterion of less than 25% was exceeded for chloromethane on 10/22/92 with a value of 27.57%. Qualification of sample results was not required since the %D is less than 50% and chloromethane was not detected in the affected samples.

Blank Analysis

Method blanks, equipment blanks and trip blanks were analyzed at the frequency required in the QAPP. Acetone was detected at a concentration of 210 $\mu g/L$ in QC Trip Blank (10/8/92). A blank action level of ten times the blank concentration was calculated using a value of 1.0 g/mL for the density of water and was corrected for dry weight using the percent solids of the affected samples. Dilutions and differences between sample and blank weights or volumes were taken into account when applying blank actions. Detected acetone results in the affected samples that were less than the action level were qualified with a "U" indicating that the sample results may reflect contamination during transportation. The following samples were qualified for blank contamination: SBW-19 (4'-6'), SBW-19 (6'-8'), and SBW-19 (10'-12').

Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike/matrix spike duplicate (MS/MSD) samples were analyzed at the frequency specified in the QAPP. Matrix spike recovery criteria specified in the QAPP were exceeded for 1,1-dichloroethene, benzene, and chlorobenzene using sample SBW-15 (8'-10'). Relative percent difference (RPD) criterion was also exceeded for trichloroethene in the MS/MSD analysis of SBW-15 (8'-10'). Qualification of sample results for these excursions was not required since the affected compounds were not detected in the unspiked sample and the MS/MSD recoveries were greater than 10%.

Reference Standard Analysis

The recovery of 83.0% for 1,1,1-trichloroethane exceeded recovery criteria of 83.9% to 125.7% in the low soil standard analyzed on 10/15/92. Qualification of sample results for this excursion was not required since trichloroethane was not detected in the affected samples and the reference standard recovery for this compound was greater than 10%.

Field Duplicate Analysis

Field duplicate RPD criterion of less than 50.0% was exceeded for acetone with a RPD value of 71.5% for the analysis of Blind Duplicate #1 (SBW-18A (12'-14'). Due to this excursion the detected acetone results for SBW-18A (12'-14') and Blind Duplicate #1 were approximated (J).

Overall Data Assessment

Overall, the laboratory performed volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the volatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Non-detected 2-butanone results were determined to be unusable for several samples based on calibration minimum RF criteria. Detected acetone results for SBW-19 (4'-6'), SBW-19 (6'-8'), and SBW-19 (10'-12') were qualified with a "U" based on blank criteria. Detected acetone results for SBW-18A (12'-14') and Blind Duplicate #1 were approximated based on field duplicate RPD criterion.

4.06.3 Target Compound List Semivolatiles Analysis

Twenty-eight soil boring samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8270 were found to meet validation criteria: GC/MS instrument tuning, field duplicate analysis, internal standards recovery, compound identification and quantitation, tentatively identified compounds, percent solids determination and content, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Holding Time

The holding time criterion of seven days from collection to extraction was exceeded for several samples. The holding time criterion of forty days from extraction to analysis was met. Samples requiring qualification for exceeding extraction holding times are tabulated below.

Sample ID#	Days from collection to extraction	Qualification
SBW-16 (2'-4')	9	UJ
SBW-16 (4'-6')	9	J, UJ
SBW-16 (8'-10')	9	UJ
SBW-17 (6'-8')	8	J, UJ
SBW-17 (8'-10')	8	UJ
SBW-17 (12'-14')	8	J, UJ
SBW-EQ/Field Blk #1	8	UJ

Initial Calibration

Initial calibration percent relative standard deviation (%RSD) criterion of less than 30% was exceeded on 10/23/92 for 2,4-dinitrophenol (42.546%) and on 10/28/92 for hexachlorocyclopentadiene (30.047%). Qualification of sample results was not required since the %RSDs were less than 50% and these compounds were not detected in the affected samples.

Continuing Calibration

Continuing calibration percent difference criterion of less than 25% and minimum response factor (RF) criterion of 0.05 were exceeded for several compounds. Compounds exceeding continuing calibration criteria and samples requiring qualification for these excursions are tabulated below.

Date	Compound	RF	%D	Qualification	Affected Samples
10/23/92	2,4,6-tribromophenol	0.30534	29.31	J	none affected
10/24/92	benzoic acid	0.13305	32.14	J	none affected
10/24/92	hexachlorocyclopentadiene	0.34817	28.91	J	none affected

Date	Compound	RF	%D	Qualification	Affected Samples
10/24/92	2,4-dinitrotoluene	0.14414	56.95	J, UJ	W-01/S1 (6'-8') W-01/S1 (10'-12') SBW-19 (4'-6') SBW-19 (10'-12')
10/25/92	benzoic acid	0.13177	30.86	J	none affected
10/25/92	hexachlorocyclopentadiene	0.34585	28.05	J	none affected
10/25/92	2,4-dinitrotoluene	0.14243	55.09	J, UJ	SBW-19 (6'-8') SBW-16 (2'-4') SBW-16 (8'-10') SBW-17 (6'-8') SBW-17 (8'-10') SBW-17 (12'-14')
10/25/92	4,6-dinitro-2-methyltoluene	0.14216	26.97	J	none affected
10/28/92	2,4-dinitrophenol	0.17565	25.51	J	none affected
10/29/92	benzyl alcohol	0.84996	43.16	J	none affected
10/29/92	benzoic acid	0.15895	28.40	J	none affected
10/29/92	2,4-dinitrophenol	0.17536	25.63	J	none affected
11/3/92	hexachlorocyclopentadiene	0.37015	33.85	J	none affected
11/3/92	3,3'-dichlorobenzidine	0.40071	36.98	J	none affected
11/3/92	benzyl alcohol	0.80088	34.89	J	none affected
11/3/92	benzoic acid	0.12896	41.91	J	none affected
11/3/92	2,4-dinitrophenol	0.16825	28.65	J	none affected
11/4/92	benzoic acid	0.13934	37.24	J	none affected
11/4/92	2,4-dinitrophenol	0.16125	31.62	J	none affected
11/4/92	4-nitrophenol	0.18870	31.63	J	none affected
11/6/92	bis (2-chloroisopropyl) ether	1.65586	26.64	J	none affected
11/6/92	benzoic acid	0.15090	32.03	J	none affected
11/6/92	2,4-dinitrophenol	0.17317	26.56	J	none affected
11/6/92	4-nitroaniline	0.30697	31.56	J	none affected
11/6/92	pentachlorophenol	0.13829	27.69	J	none affected
11/6/92	3,3'-dichlorobenzidine	0.30161	26.45	J	none affected

Blank Analysis

Soil and water method blanks were analyzed at the frequency specified in the QAPP. Two common phthalate esters, di-n-butylphthalate and bis(2-ethylhexyl) phthalate, were detected in several blanks. Blank actions levels calculated at ten times the blank concentrations and corrected for dry weight (soil samples only) were applied to the affected samples. Dilutions and differences between sample and blank weights or volumes were taken into account when applying blank actions. Detected sample results that were less than the blank action level were qualified with a "U". The "U" qualifier indicates that the sample concentration may be due in part or whole to laboratory contamination. Samples qualified for blank contamination are tabulated below.

Sample ID	Compound	Action Level	Qualified Sample Result
SBW-18A (4'-6')	di-n-butylphthalate	603 μg/Kg	430 U μg/Kg
SBW-15 (4'-6')	di-n-butylphthalate	1100 μg/Kg	1100 U μg/Kg

Surrogate Recovery

Surrogate recovery criteria were exceeded for sample SBW-15 (4'-6') since all surrogate recoveries were between 10% and 20%. Due to these excursions detected and non-detected sample results were approximated (J, UJ). Surrogate recovery criteria were exceeded for 2-fluorobiphenyl and 2-fluorophenol in samples SBW-21 (12'-14') and SBW-15 (8'-10). Qualification of sample results for these samples was not required since only one surrogate per fraction exceeded criteria and the recoveries were greater than 10%.

Matrix Spike/Matrix Spike Duplicate Analysis

The recovery of 9.0% for pentachlorophenol in the matrix spike analysis of SBW-10 (10'-12') exceeded the control limits of 10.0% to 88.9% specified in the QAPP. Qualification of sample results was not required since the matrix spike duplicate analysis of pentachlorophenol for this sample met both percent recovery and relative percent difference criteria.

Reference Standard Analysis

Several compounds exceeded recovery criteria in the water and soil reference samples that were extracted with the environmental samples. The compounds that exceeded recovery criteria and the qualifications applied to the affected samples are tabulated below.

Compound	%Recovery	%Recovery Criteria	Qualification	Affected Samples
hexachloroethane	51.0	55.2 to 100.0	UJ	SBW-EQ/Field Blk #1
benzoic acid	0	10.0 to 86.4	R	SBW-EQ/Field Blk #1
2,4-dinitrophenol	16.0	24.5 to 162.1	UJ	SBW-EQ/Field Blk #1
2,4-dinitrotoluene	137.0	88.2 to 116.2	J	none affected
benzyl alcohol	146.0	37.0 to 122.3	J	none affected
hexachloroethane	50.0	55.2 to 100.0	UJ	SBW-EQ/Field Blk #2
dimethylphthalate	22.0	36.2 to 93.4	UJ	SBW-EQ/Field Blk #2
diethylphthalate	58.0	71.8 to 126.2	UJ	SBW-EQ/Field Blk #2
benzyl alcohol	145.0	47.7 to 126.9	J	none affected

Tentatively Identified Compounds

Several tentatively identified compounds (TICs) were detected in the method blanks. Sample TICs with relative retention times matching the retention times of the

TICs in the method blanks were qualified as unusable (R). Samples requiring qualification are summarized below.

Sample ID#	TIC Retention Time (min)	
	Sample	Blank
W-01/S1 (6'-8')	5.67	5.98
	9.66	9.68
	29.98	30.00
	42.72	42.76
SBW-19 (4'-6')	9.69	9.68
	30.07	30.00
SBW-19 (6'-8')	6.08	5.98
	7.68	7.71
	9.71	9.68
	30.30	30.00
SBW-19 (10'-12')	5.99	5.98
	9.67	9.68
	30.04	30.00
	42.73	42.76
SBW-16 (2'-4')	9.70	9.68
	30.24	30.00
SBW-16 (4'-6')	5.98	5.98
	9.64	9.68
	30.12	30.00
SBW-16 (8'-10')	6.04	5.98
	9.69	9.68
	30.15	30.00
	42.93	42.76
SBW-17 (6'-8')	6.04	5.98
	7.66	7.71
	9.70	9.68
SBW-17 (8'-10')	6.09	5.98
	9.70	9.68
	30.24	30.00
SBW-17 (12'-14')	6.05	5.98
	9.70	9.68
SBW-EQ/Field Blk #1	31.02	31.11
SBW-EQ/Field Blk #1 (Reanalysis)	5.85	6.52
	29.43	31.11
	41.08	40.13
SBW-18A (4'-6')	9.64	9.64
SBW-18 (8'-10')	9.64	9.64
SBW-18A (12'-14')	9.64	9.64
SBW Blind Dup #1	9.64	9.64

Sample ID#	TIC Retention Time (min)	
SBW-EQ/Field Blk #2	6.34	6.34
	9.63	9.61
	30.03	29.97
	42.70	42.65
SBW-14 (6'-8')	9.64	9.49
	30.13	29.80
	42.73	42.18
SBW-14 (8'-10')	9.64	9.49
	30.10	29.80
	42.71	42.18
SBW-14 (12'-14')	9.62	9.49
	29.98	29.80
	42.64	42.18
SBW-20 (6'-8')	9.62	9.49
	29.96	29.80
	42.64	42.18
SBW-20 (12'-14')	9.62	9.49
	29.97	29.80
	42.66	42.18
SBW-20 (20'-22')	9.61	9.49
	29.95	29.80
	42.61	42.18
SBW-21 (2'-4')	9.49	9.49
	29.80	29.80
	42.17	42.18
SBW-21 (12'-14')	9.53	9.49
	29.84	29.80
SBW-21 (20'-22')	9.48	9.49
	29.80	29.80
	42.16	42.18
SBW-10 (8'-10')	9.49	9.49
	29.79	29.80
	42.15	42.18
SBW-10 (10'-12')	9.48	9.49
	29.83	29.80
	42.19	42.18
SBW-10 (14'-16')	9.45	9.49
	29.78	29.80
	42.05	42.18
SBW Blind Dup #2	9.45	9.49
	29.77	29.80
	42.01	42.18

Sample ID#	TIC Retention Time (min)	
SBW-EQ/Field Blk #3	6.44	6.42
	7.78	7.74
	30.80	30.80
	31.09	31.14
	31.39	31.45
	31.93	31.97
SBW-15 (8'-10')	9.45	9.45
	29.71	29.76

Overall Data Assessment

Overall, the laboratory performed semivolatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the semivolatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Sample results were approximated for seven samples based on holding time criterion of less than seven days which was exceeded by one to two days. Results were approximated for 2,4-dinitrotoluene for several samples based on continuing calibration %D criteria. Di-n-butylphthalate results were qualified with a "U" for SBW-18A (4'-6') and SBW-15 (4'-6') based on blank criteria. Detected and non-detected sample results were approximated for sample SBW-15(4-6') due to surrogate recoveries. Non-detected benzoic acid results were determined to be unusable for SBW-EQ/Field Blk #1 based on reference standard analysis criteria. Results for several compound were also approximated for SBW-EQ/Field Blk #1 and SBW-EQ/Field Blk #2 based on reference standard analysis criteria.

Sample TICs with retention times and mass spectral criteria matching TICs detected in the method blanks were determined to be unusable (R) for several samples.

4.06.4 PCB/Pesticide Analysis

Thirty-two soil boring samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8080 were found to meet validation criteria: holding times, instrument performance, blank analysis, matrix spike/matrix spike duplicate analysis, field duplicate analysis, percent solids analysis, compound identification and quantitation, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration %RSD criterion of less than 10% was exceeded for Aroclors 1016 and 1260 in the five point calibration analyzed on 11/7/92 with values of 11.0% and 12.0%. Five point initial calibrations were performed with Aroclors 1016 and 1260 to evaluate linearity and single point calibrations were utilized for the other Aroclors to perform quantitation. Therefore, the initial linearity check excursions affect all the Aroclors. Due to these excursions detected sample results for Aroclors 1242, 1254, and 1260 were approximated (J). Toxaphene also exceeded initial calibration %RSD criterion in the calibration performed on 11/7/92 with a value of 38.0%. Qualification of toxaphene data was not required since toxaphene was not detected in the associated samples. Samples qualified for initial calibration excursions are tabulated below.

Date Analyzed	Sample ID	Aroclor	Qualified Result (µg/Kg)
11/9/92	SBW-19 (4'-6')	1242	1200 J
		1254	660 J
11/9/92	SBW-19 (2'-4')	1254	270 J
11/9/92	SBW-17 (6'-8')	1254	170 J
11/10/92	SBW-18A (4'-6')	1260	880 J
11/10/92	SBW-18A (8'-10')	1254	590 J
11/10/92	SBW-18A (12'-14')	1260	110 J
11/10/92	SBW Blind Duplicate #1	1260	100 J
11/10/92	SBW-20 (6'-8')	1254	180 J
11/10/92	SBW-15 (4'-6')	1260	25,000 J
11/10/92	SBW-15 (8'-10')	1260	370 J

Continuing Calibration

Continuing calibration %D criterion of less than 15% was exceeded for several of the pesticide compounds in standards analyzed on 10/20/92, 11/10/92, 11/13/92, 11/23/92, and 11/24/92 with values that ranged from 16.0% to 62.0%. Qualification of sample data due to these excursions was not required since the pesticide compounds were not detected in the associated samples.

Surrogate Recovery

Surrogate recovery criteria of 61.3% to 153.7% for dibutylchlorendate were exceeded for SBW-18A (8'-10'), SBW-20 (12'-14'), and SBW-15 (2'-4') with recoveries of 207.0%, 500.0%, and 383.0%, respectively. Qualification of sample data for these excursions was not required since these high recoveries can be attributed to the coelution of interference peaks.

Reference Standard Recovery

Reference samples analyzed on 11/7/92 and 11/9/92 exhibited recoveries for delta-BHC and heptachlor that exceeded the upper criteria limits of 175.2% and 130.0% for these compounds, respectively. Qualification of sample data for these excursions was not required since the affected compounds were not detected in the associated samples and the recoveries were greater than 100.0%.

Endrin aldehyde was not recovered in the reference samples analyzed on 11/7/92, 11/9/92, and 11/10/92. The laboratory indicated that this compound was removed by the TBA cleanup procedure. Due to this excursion the non-detected endrin aldehyde results reported for all the samples were determined to be unusable (R).

Overall Data Assessment

Overall, the laboratory performed pesticide/PCB analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the pesticide/PCB sample data have been determined to be usable for qualitative and quantitative purposes. Initial calibration %RSD criterion of less than 10% was exceeded for Aroclors 1016 and 1260 in the five point calibration analyzed on 11/7/92 with values of 11.0% and 12.0%. Five point initial calibrations were performed with Aroclors 1016 and 1260 to evaluate linearity and single point calibrations were utilized for the other Aroclors to perform quantitation. Therefore, the initial linearity check excursions affect all the Aroclors. Due to these excursions detected sample results for Aroclors 1242, 1254, and 1260 were approximated (J).

Surrogate recovery criteria dibutylchlorendate were exceeded for SBW-18A (8'-10'), SBW-20 (12'-14'), and SBW-15 (2'-4'). Qualification of sample data for these excursions was not required since these high recoveries can be attributed to the coelution of interference peaks.

Non-detected endrin aldehyde results reported for all the samples were determined to be unusable since endrin aldehyde was not recovered in the reference samples analyzed with the samples.

4.07 Soil Borings Collected 12/16/92 Volatiles Analysis

Seven soil samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, initial calibration, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, internal standards recovery, compound identification and quantitation, tentatively identified compounds, percent solids determination and content, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Continuing Calibration

Continuing calibration %D criterion of less than 25.0% was exceeded for 2-hexanone on 12/29/92 with a value of 31.93%. Qualification of sample data was not required since 2-hexanone was not detected in the associated samples and the %D was less than 50.0%

Reference Standard Analysis

Reference standard recovery criteria of 6.5% to 120.1% for acetone were exceeded for the reference standard analyzed with these samples. Detected results were qualified as approximate (J) since the reference standard recovery for acetone was 135.0%. Samples qualified for this excursion are listed below.

W-04 (0-3')	W-04 (3'-5')
W-04 (7'-9')	W-04 (9'-11')
W-04 (11'-13')	W-04 (15'-17')
Blind Duplicate #4	

Field Duplicate Analysis

Field duplicate RPD criterion of less than 50.0% for soil samples was exceeded for trichloroethene and tetrachloroethene in the duplicate analysis of W-04 (9'-11') (Blind Duplicate #4). Due to the RPD values of 59.5% for trichloroethene and 69.9% for tetrachloroethene the detected results for these compounds were approximated (J) for W-04 (9'-11') and Blind Duplicate #4.

Overall Data Assessment

Overall, the laboratory performed volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.01. These data have been determined to be usable for qualitative and quantitative purposes. Detected acetone results for six samples and Blind Duplicate #4 were approximated based on reference standard analysis criteria. Detected trichloroethene and tetrachloroethene results for W-04 (9'-11') and Blind Duplicate #4 were approximated based on field duplicate analysis criteria.

4.08 Soil Borings Collected 1/7/93 to 1/20/93 Volatiles Analysis

Eleven soil samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, blank analysis, surrogate recovery, field duplicate analysis, internal standards recovery, tentatively identified compounds, percent solids determination and content, and system performance. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration minimum RF criterion of greater than 0.05 was exceeded for 2-butanone on 1/11/93 with a RF of 0.04826. Due to this excursion detected results were approximated (J) and non-detected results were determined to be unusable (R) for the samples listed below.

W-11/S1 (0-2')	W-11/S1 (2'-4')
W-11/S1 (4'-6')	W-11/S1 (6'-8')
W-11/S1 (8'-10')	Field/Equipment Blank (1/20/93)
Trip Blank (1/20/93)	

Continuing Calibration

Continuing calibration minimum RF criterion of greater than 0.05 was exceeded for 2-butanone on 1/22/93 and 1/25/93 with RF values of 0.04628 and 0.04755, respectively. Qualification of sample data was not required since the associated samples were previously qualified for initial calibration minimum RF excursions.

Matrix Spike/Matrix Spike Duplicate Analysis

The recovery of 84.0% for trichloroethene for the matrix spike analysis of W-03/S2 (10'-12') exceeded recovery criteria of 85.8% to 111.7%. Due to this excursion the detected trichloroethene result for the unspiked sample (W-03/S2 (10'-12') were qualified as approximate (J).

Reference Standard Analysis

Reference standard recovery criteria of 6.5% to 120.1% for acetone were exceeded for the reference standard analyzed 1/25/93. Detected results were qualified as approximate (J) since the reference standard recovery for acetone was 150.0%. Samples qualified for this excursion are listed below.

W-11/S1 (0-2')	W-11/S1 (2'-4')
W-11/S1 (4'-6')	W-11/S1 (6'-8')
W-11/S1 (8'-10')	

Compound Identification and Quantitation

The trichloroethene result was for sample W-03/S2 (10'-12') was incorrectly reported as 106 μg/Kg. The result reported to the correct number of significant figures is 110 μg/Kg.

Documentation Completeness

The instrumentation output for the 50 ppb calibration standard from the initial calibration analyzed on 1/11/93 did not match data presented on the initial calibration summary form. The correct form was received from OBG Labs on 3/29/93. Qualification of data was not required since the amended form met initial calibration criteria.

Overall Data Assessment

Overall, the laboratory performed volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the volatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Non-detected 2-butanone results were determined to be unusable for five samples, Trip Blank (1/20/93), and Field/Equipment Blank (1/20/93) based on calibration minimum RF criterion. The detected trichloroethene result for W-03/S2 (10'-12') was approximated based on matrix spike/matrix spike duplicate criteria. Detected acetone results for five samples were approximated based on reference standard analysis criteria.

The trichloroethene result was for sample W-03/S2 (10'-12') was incorrectly reported as 106 μg/Kg. The result reported to the correct number of significant figures is 110 μg/Kg.

The instrumentation output for the 50 ppb calibration standard from the initial calibration analyzed on 1/11/93 did not match data presented on the initial calibration summary form. The correct form was received from OBG Labs on 3/29/93. Qualification of data was not required since the amended form met initial calibration criteria.

4.09 Soil Borings Collected 1/27/93

4.09.1 Target Analyte List Inorganics Analysis

QA/QC parameters for TAL inorganic analyses were evaluated for one soil boring samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration, CRDL standard analysis, ICP interference check sample analysis, laboratory duplicate analysis, field duplicate analysis, laboratory control sample analysis, furnace atomic absorption analysis, percent solids quantitation and content, quarterly detection limit verification and ICP interelement correction factors, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Calibration Blank Analysis

Calibration blank #2 contained 19.9 μg/L of antimony and potassium at a negative concentration of 942.1 μg/L. Due to these excursions a blank action level was calculated for antimony and the detected antimony result for W-01B (32'-34') was qualified with a "U". Qualification of potassium data was not required since the affected sample result was qualified as approximated (J) for having a detected concentration below the CRDL.

Preparation Blank Analysis

The preparation blank associated with these samples contained concentrations of aluminum, manganese, silver, and sodium that were above their IDLs. Qualification of sample data was not required since the sample concentrations of these analytes were greater than the action level or were non-detected.

Matrix Spike Analysis

Matrix spike recovery criteria of 75.0% to 125.0% were exceeded for several analytes. The analytes that exceeded criteria and the qualifications applied to sample W-01B (32'-34') due to these excursions are tabulated below.

Analyte	Percent Recovery	Qualified Result (mg/Kg)
antimony	13.4	6.7 UJ
lead	128.8	7.7 J
manganese	133.7	211 J
mercury	60.2	0.15 J

Laboratory Duplicate Analysis

Laboratory duplicate RPD criterion of less than 35.0% for soil sample results greater than five times the CRDL was exceeded for chromium, lead, and mercury with RPD values of 98.1%, 46.1%, and 200.0%, respectively. The detected chromium result for W-01B (32'-34') was approximated (J) due to these excursions. Qualification of sample results for the other analytes that exceeded RPD criterion was not required since they were previously qualified for exceeding matrix spike recovery criteria.

ICP Serial Dilution Analysis

ICP serial dilution percent difference (%D) criterion of less than 15.0% for sample results greater than fifty times the IDL was exceeded for copper, nickel, vanadium, and zinc. The %Ds for these analytes in the serial dilution analysis ranged from 15.8% to 36.6%, therefore the detected sample results for these analytes in W-01B (32'-34') were approximated (J).

Element Quantitation and Reported Detection Limits

Detected sample results that were greater than the IDLs but less than the CRDLs which were identified by the laboratory with a "B" qualifier were qualified as approximated (J).

Overall Data Assessment

Overall, the laboratory performed inorganics analyses in accordance with the requirements specified in the methods listed in Section 2.01. These data have been determined to be usable for qualitative and quantitative purposes. The detected antimony result for W-01B (32'-34') was qualified with a "U" based on calibration blank criteria. Sample results for antimony, lead, manganese, and mercury were approximated for W-01B (32'-34') based on matrix spike analysis criteria. The detected chromium result for W-01B (32'-34') was approximated based on laboratory duplicate analysis criteria. Detected sample results for copper, nickel, vanadium, and zinc were approximated for W-01B (32'-34') based on ICP serial dilution analysis criteria.

4.09.2 Target Compound List Volatiles Analysis

Five soil samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, field duplicate analysis, internal standards recovery, compound identification and quantitation, tentatively identified compounds, percent solids determination and content, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration minimum RF criterion of greater than 0.05 was exceeded for 2-butanone on 1/20/93 with a value of 0.04826. Due to this excursion the non-detected sample results reported for the associated samples were determined to be unusable (R). Samples qualified for this excursion are listed below.

W-01B (32'-34')	W-22/S1 (4'-6')
W-22/S1 (6'-8')	W-22/S1 (8'-10')
W-22/S1 (10'-12')	Blind Duplicate #2
Field/Equipment Blank (1/27/93)	Trip Blank (1/27/93)

Continuing Calibration

Continuing calibration %D criterion of less than 25% was exceeded for chloromethane, acetone, 4-methyl-2-pentanone, and 2-hexanone with values of 38.02%, 37.43% 35.52%, and 39.02%, respectively. Due to these excursions the detected acetone results were approximated (J) for W-22/S1 (4'-6'), W-22/S1 (8'-10'), and Blind Duplicate #2.

Reference Standard Analysis

Reference standard recovery criteria were exceeded for vinyl chloride and acetone with recoveries of 130.0% and 150.0%, respectively. Since these recoveries were above the upper criteria limit only detected results required qualification. Therefore, detected acetone results were approximated for W-01B (32'-34'), W-22/S1 (6'-8'), and W-22/S1 (10'-12').

Overall Data Assessment

Overall, the laboratory performed volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the volatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Non-detected sample results were determined to be unusable for five samples, Field/Equipment Blank (1/27/93), Blind Duplicate #2, and Trip Blank (1/27/93) based on calibration minimum RF criteria. Detected acetone results were approximated for W-22/S1 (4'-6'), W-22/S1 (8'-10'), and Blind Duplicate #2 based on continuing calibration %D criteria. Detected acetone results were approximated for W-01B (32'-34'), W-22/S1 (6'-8'), and W-22/S1 (10'-12') based on reference standard analysis criteria.

4.09.3 Target Compound List Semivolatiles Analysis

One soil sample were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. No excursions from the criteria specified in Section 3.02 that would result in the qualification of data were observed.

4.10 Leachate Program

4.10.1 Target Analyte List Inorganics Analysis

QA/QC parameters for TAL inorganic analyses were evaluated for three aqueous leachate samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration, blank analysis, laboratory control sample analysis, ICP serial dilution analysis, element quantitation and reported detection limits, quarterly detection limit verification and ICP interelement correction factors, and documentation completeness. Excursions from QA/QC criteria are summarized below.

CRDL Standard Analysis

The final CRDL standard analyzed on 2/5/93 exceeded recovery criteria of 80.0% to 120.0% for antimony with a recovery of 79.5%. Qualification of sample results was not required since the affected sample result (LS-1 Toe of Landfill/North) was previously approximated (J) for having a detected concentration less than the CRDL.

The initial and final CRDL standards analyzed on 5/10/93 and 5/13/93 exceeded recovery criteria of 80.0% to 120.0% for antimony. The initial and final CRDL standard recoveries for antimony were 77.8 % and 70.7%, respectively for samples analyzed on 5/10/93 and 77.6% and 79.8%, respectively for samples analyzed on 5/13/93. Due to these excursions the non-detected sample results for LS-3, Field/Equipment Blank (5/3/93), and LS-Blind Duplicate were approximated (UJ). The detected result for LS-2 did not require qualification for this excursion since it was previously approximated (J) for having a detected concentration above the IDL but below the CRDL.

The CRDL standard for selenium analyzed on 5/24/93 exceeded recovery criteria of 80.0% to 120.0% with a recovery of 43.0%. As a result of this excursion the non-detected selenium result for LS-Blind Duplicate was approximated (UJ).

The CRDL for lead analyzed on 5/23/93 exceeded the recovery criteria of 80.0% to 120.0% with a recovery of 68.3%. Qualification of the affected sample (LS-Blind Duplicate) was not required since the detected sample concentration was greater than three times the furnace CRDL for lead analysis.

Blank Analysis

Several analytes were detected at concentrations greater than their IDLs in the calibration and preparation blanks analyzed on 2/5/93. Blank action levels were calculated at five times the highest blank concentration for each analyte detected in the blanks. Detected sample results below the blank action level were qualified with a "U". Detected sample results above the blank action levels did not require qualification. Due to these excursions the detected antimony, silver and potassium results for LS-1 Toe of Landfill/North were qualified with a "U". Potassium was detected in the continuing calibration blanks (CCBs) at negative concentrations greater than the absolute value of the instrument detection limit (IDL). Further qualification of the potassium data was not required since the detected potassium result was qualified with a "U" for initial calibration blank contamination. Blanks with detected analyte concentrations are presented below.

Blank	Analyte	Concentration (µg/L)	Action Level
ICB	manganese	1.4	7.0
	potassium	749.8	3749.0
	silver	3.6	18.0
	sodium	21.6	108.0
CCB1	potassium	-942.1	NA
CCB2	antimony	19.9	99.5
	potassium	-942.1	NA
	silver	-2.9	NA
CCB3	potassium	-1095.9	NA
	silver	-2.3	NA
Preparation	aluminum	19.9	99.5
	manganese	1.35	6.75
	silver	2.41	12.05
	sodium	23.87	119.35

NA - Not required for negative concentrations.

The blanks analyzed on 5/10/93 and 5/13/93 contained several analytes at concentrations greater than their IDLs in both the calibration and preparation blanks. Blank action levels were calculated at five times the highest blank concentration for each analyte detected in the blanks. Detected sample results below the blank action level were qualified with a "U". Detected sample results above the blank action levels did not require qualification. Due to these excursions the detected beryllium results for LS-2 and LS-3 and detected iron and zinc results for Field/Equipment Blank (5/3/93) were qualified with a "U". Blanks with detected analyte concentrations are presented below.

Blank	Analyte	Concentration (µg/L)	Action Level
ICB 5/10/93	beryllium chromium	0.9 2.3	4.5 11.5
CCB1 5/10/93	beryllium	2.6	13.0
CCB2 5/10/93	beryllium	2.6	13.0
Preparation 5/6/93	iron zinc	18.22 10.61	91.1 53.05
Preparation 5/12/93	zinc	9.1	45.5

ICP Interference Check Sample Analysis

The interference check samples (ICSA) analyzed on 2/5/93 contained several analytes in solution A at concentrations greater than twice their IDLs. Qualification of sample data was not required since none of the four interference analytes (aluminum, calcium, iron, or magnesium) were detected in the affected sample at concentrations greater than 50% of the ICSA.

The ICSAs analyzed on 5/10/93 contained several analytes in the solution A at concentrations greater than twice their IDLs. Due to these excursions detected sample results listed below were approximated (J) for sample LS-2 since it contained an iron concentration greater than the ICSA iron concentration.

Analyte	ICSA Concentration (µg/L)	Qualified Sample Result (µg/L)
barium	8	880 J
chromium	5	43.1 J
lead	87	998 J
manganese	13	10200 J
potassium	-2169	19,300 J
sodium	148	19,700 J

Analyte	ICSA Concentration (μg/L)	Qualified Sample Result (μg/L)
zinc	4	1810 J

Laboratory Duplicate Analysis

Duplicate analysis RPD criterion of less than 20.0% was exceeded for mercury and nickel with RPD values of 54.6% and 26.7%. Due to these excursions the detected mercury and nickel results for LS-2, LS-3, and LS-Blind Duplicate were approximated (J).

Field Duplicate Analysis

The field duplicate samples, LS-Blind Duplicate and LS-3, were not evaluated for RPD criterion since they were not collected on the same day. Therefore, the variability of the results cannot be evaluated for sampling and analysis accuracy and precision. These data should be useful in determining the variability of the environmental system since the average RPD for the detected analytes is 81.0%.

Matrix Spike Analysis

A matrix spike sample was only collected with the samples collected on 5/3/93, therefore matrix spike criteria were evaluated for the leachate samples using sample LS-2. Matrix spike recovery criteria of 75.0% to 125.0% were exceeded for the compounds tabulated below. A post digestion spike was also analyzed for selenium which also exceeded the recovery criteria with a recovery of 46.5%. MS/MSD data were evaluated and qualifiers were applied to the analytical results in accordance with

USEPA guidance dated February 1989 not the September 1990 guidance. This procedure was discussed and agreed upon with USEPA in a conference call held, January 25, 1995. The qualifications and samples affected by these excursions are also tabulated below.

Analyte	Spike Recovery	Affected Samples	Qualified Results
arsenic	20.6%	LS-1	R
		LS-2	R
		LS-3	R
		LS-Blind Duplicate	R
copper	73.5%	LS-1	3.0 UJ
		LS-2	206 J
		LS-3	122 J
		LS-Blind Duplicate	45.4 J
lead	49.1%	LS-2	NA
		LS-3	225 J
selenium	37.9%	LS-1	3.0 UJ
		LS-2	3.0 UJ
		LS-3	NA
		LS-Blind Duplicate	NA
zinc	13.4%	LS-1	1270 J
		LS-2	NA
		LS-3	236 J
		LS-Blind Duplicate	75.1 J

NA - sample previously qualified.

Furnace Post Digestion Spike Analysis

Post digestion spike recovery criteria of 85.0% to 115.0% were exceeded for thallium in sample LS-1 Toe of Landfill/North with a recovery of 84.0%. Due to this excursion the non-detected thallium result for this sample was approximated (UJ).

Post digestion spike recovery criteria of 85.0% to 115.0% were exceeded for arsenic with recoveries of 116.1% and 78.3% for LS-2 and LS-3, respectively. Qualification of sample data for these excursions was not required since the arsenic data were determined to be unusable for exceeded matrix spike recovery criteria. Post digestion spike recovery criteria were also exceeded for selenium with recoveries of 46.5%, 0.0%, and 76.6% for LS-2, LS-3, and LS-Blind Duplicate, respectively. The non-detected selenium result for LS-3 was determined to be unusable (R) due to these excursions. Non-detected results for LS-2 and LS-Blind Duplicate did not require further qualification since they were previously qualified as approximated (UJ) for exceeding matrix spike recovery criteria. The thallium post digestion spike recovery of 73.6% for LS-2 exceeded recovery criteria. Qualification of the thallium data for this sample was not required since the detected result was previously approximated (J) for having a concentration below the CRDL.

Overall Data Assessment

Overall, the laboratory performed inorganics analyses in accordance with the requirements specified in the methods listed in Section 2.02. The majority of the inorganics sample data have been determined to be usable for qualitative and quantitative purposes. Results for several analytes were approximated based on CRDL standard analysis criteria. Detected results for several analytes were qualified with a "U" based on calibration blank and equipment blank criteria. Detected results for barium, chromium, lead, manganese, potassium, sodium, and zinc were approximated for LS-2 based on ICSA solution A criteria. Detected mercury and nickel results for LS-2, LS-3, and LS-Blind Duplicate were approximated based on laboratory duplicate analysis criteria.

The field duplicate samples, LS-Blind Duplicate and LS-3, were not evaluated for RPD criterion since they were not collected on the same day. Therefore, the variability of the results cannot be evaluated for sampling and analysis accuracy and precision. These data should be useful in determining the variability of the environmental system since the average RPD for the detected analytes is 81.0%.

Non-detected arsenic results for LS-1, LS-2, LS-3, and LS-Blind Duplicate were determined to be unusable based on matrix spike analysis criteria. Copper, lead, selenium, and zinc data were also approximated for these samples based on matrix spike analysis criteria.

The non-detected selenium result for LS-3 was determined to be unusable based on furnace post digestion spike analysis criteria.

4.10.2 Target Compound List Volatiles Analysis

Three aqueous leachate samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, field duplicate analysis, internal standards recovery, tentatively identified compounds, and system performance. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration minimum RF criterion of greater than 0.05 was exceeded for 2-butanone on 1/26/93 and 5/13/93 with values of 0.02038 and 0.01581, respectively. Due to these excursions non-detected sample results were qualified as unusable (R) for the samples listed below.

LS-1 Toe of Landfill North	QC Trip Blank (1/28/93)
LS-2	LS-3
Field/Equipment Blank (5/3/93)	QC Trip Blank (5/3/93)
LS-Blind Duplicate #1	QC Trip Blank (5/5/93)

Continuing Calibration

Minimum RF criterion was also exceeded for 2-butanone in the continuing calibration standards analyzed on 2/8/93, 2/11/93, 5/15/93, 5/16/93, 5/18/93, and 5/23/93. Qualification of the affected samples was not required since they were previously determined to be unusable for exceeding initial calibration minimum RF criterion.

Continuing calibration %D criterion of less than 25% was exceeded for chloromethane (28.19%) on 2/8/93, acetone (31.61%) on 2/11/92, carbon tetrachloride (27.10%) on 5/16/93, and vinyl acetate (26.77%) on 5/23/93. Sample qualification was not required for these excursions since the %Ds were less than 50% and the affected compounds were not detected in the samples.

Continuing calibration %D criterion was also exceeded for 2-butanone on 2/9/93 with a value of 271.9%. Although the %D value exceeded the 50% action level, qualification of sample data was not required because the affected samples were previously determined to be unusable for exceeding initial calibration minimum RF criterion.

Reference Standard Analysis

Reference standard recovery criteria of 81.9% to 110.6% for carbon disulfide was exceeded in the reference standard analyzed on 2/8/92. This compound was reanalyzed from NEAT solution in the following analytical batch analyzed on 2/9/92. Qualification of sample data was not required since the reanalysis met recovery criteria.

Reference standard recovery data for 5/17/93 was not included in the data package, but was supplied by the laboratory on 7/23/93. This standard exceeded recovery criteria for acetone (60.0% to 140.0%) and carbon disulfide (81.9% to 110.6%). These compounds were reanalyzed from NEAT solutions in the following analytical batch analyzed on 5/18/93. Qualification of the sample data was not required since the reanalyses met recovery criteria.

Compound Identification and Quantitation

Sample LS-1 Toe of Landfill North required reanalysis with five fold dilution to properly quantitate the trichloroethene concentration. Acetone and 1,2-dichloroethene were detected in the undiluted sample, but only the 1,2-dichloroethene was reported in the diluted sample since the acetone concentration was diluted beyond the detectable range. Non-detected sample results and the detected acetone and 1,2-dichloroethene results from the undiluted sample and the detected trichloroethene result from the diluted sample were reported as a result of the validation.

Document Completeness

Reference standard data for samples analyzed on 5/17/93 were not included in the original data package, but were supplied by the laboratory on 7/23/93.

Overall Data Assessment

Overall, the laboratory performed volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.02. The majority of the volatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Non-detected 2-butanone results were determined to be unusable based on calibration minimum RF criteria.

Sample LS-1 Toe of Landfill North required reanalysis with five-fold dilution to properly quantitate the trichloroethene concentration. Acetone and 1,2-dichloroethene were detected in the undiluted sample, but only the 1,2-dichloroethene was reported in the diluted sample since the acetone concentration was diluted beyond the detectable range. Non-detected sample results and the detected acetone and 1,2-dichloroethene results from the undiluted sample and the detected trichloroethene result from the diluted sample were reported as a result of the validation.

Reference standard data for samples analyzed on 5/17/93 were not included in the original data package, but were supplied by the laboratory on 7/23/93.

4.10.3 Target Compound List Semivolatiles Analysis

Three aqueous leachate samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8270 were found to meet validation criteria: holding times, GC/MS instrument tuning, blank analysis, surrogate recovery, reference standard analysis, internal standards recovery, compound identification and quantitation, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration maximum %RSD criterion of 30% was exceeded for 4-chlorophenyl-phenylether (38.286%) and fluorene (34.118%) in the initial calibration prepared on 4/30/93. Qualification of sample results was not required since these compounds were not detected in the affected samples and the %RSDs were less than 50%.

Continuing Calibration

Continuing calibration maximum %D criterion of 25% was exceeded on 5/11/93 for 2,4-dinitrotoluene (25.24%), on 5/14/93 for 2,4-dinitrophenol (37.26%), and on 5/28/93 for bis(2-chloroisopropyl) ether (25.71%), benzoic acid (26.65%), and 2,4-dinitrophenol (32.61%). Qualification of sample data was not required since the %Ds were less than 50% and these compounds were not detected in the samples.

Matrix Spike/Matrix Spike Duplicate Analysis

The MSD analysis of sample LS-2 exceeded percent recovery criteria of 8.1% to 76.2% for 4-nitrophenol and 88.2% to 116.2% for 2,4-dinitrotoluene with recoveries of 2.0% and 29.0%, respectively. The non-detected sample result for 4-nitrophenol was qualified as unusable (R) in the unspiked sample since the MSD recovery was less than 10%. The non-detected sample result for 2,4-dinitrotoluene was approximated (UJ) in the unspiked since the recovery was less than the lower criteria limit but above 10%.

Field Duplicate Analysis

The sample location used for the blind duplicate analysis was LS-3. Duplicate RPD criterion of less than 30% was exceeded for benzoic acid with a RPD value of 200.0%. Due to this excursion, the non-detected sample result for benzoic acid was approximated (UJ) in sample LS-3 and the duplicate sample.

Tentatively Identified Compounds

Several tentatively identified compounds (TICs) were detected in the method blanks. Sample TICs with relative retention times matching the retention times of the TICs in the method blanks were qualified as unusable (R). Samples requiring qualification are summarized below.

Sample ID#	TIC Retention Time (min)	
	Sample	**Blank**
LS-1 Toe of Landfill/North	6.35	6.34
	8.39	8.39
	28.55	28.56
	38.71	38.71
LS-2	7.23	7.10
	8.38	8.36
	9.59	9.61
	26.34	26.31
LS-3	7.25	7.10
	8.37	8.36
	9.27	9.25
	9.59	9.61
Field/Equipment Blank (5/3/93)	7.30	7.10
	9.28	9.25
	26.30	26.31
LS Blind Duplicate #1	7.30	7.10
	8.40	8.36
	9.30	9.25
	9.64	9.61
	26.35	26.31

Overall Data Assessment

Overall, the laboratory performed semivolatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.02. The majority of the semivolatile organics sample data have been determined to be usable for qualitative and quantitative purposes. The non-detected sample result for 4-nitrophenol were determined to be unusable and the non-detected result for 2,4-dinitrotoluene was approximated for LS-2 based on matrix spike/matrix spike duplicate analysis criteria. The non-detected benzoic acid results for sample LS-3 and the blind duplicate were approximated based on field duplicate analysis criteria. Sample TICs with retention times and mass spectral criteria matching TICs detected in the method blanks were determined to be unusable (R) for several samples.

4.10.4 PCB/Pesticide Analysis

Three aqueous leachate samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. As a result of the validation no excursions from the QA/QC criteria specified in Section 3.02 of this report were observed.

4.11 Soil Borings Collected 2/2/93 Volatiles Analysis

One soil sample was validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, field duplicate analysis, internal standards recovery, compound identification and quantitation, tentatively identified compounds, percent solids determination and content, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration minimum RF criterion of greater than 0.05 was exceeded for 2-butanone on 1/20/93 with a value of 0.04826. Due to this excursion the non-detected sample results reported for W-24T (10'-12') and Trip Blank (2/2/93) were determined to be unusable (R).

Continuing Calibration

Continuing calibration %D criterion of less than 25% was exceeded for chloromethane, acetone, 4-methyl-2-pentanone, and 2-hexanone on 2/10/93 and 2/11/93 with values that ranged from 31.61% to 39.02%. Due to these excursions the detected acetone result for W-24T (10'-12') was approximated (J).

Reference Standard Analysis

Reference standard recovery criteria were exceeded for vinyl chloride and acetone with recoveries of 130.0% and 150.0%, respectively. Since these recoveries were above the upper criteria limit only detected results required qualification. Therefore, additional qualification of sample data was not required since the detected acetone result was previously qualified for calibration excursions.

Overall Data Assessment

Overall, the laboratory performed volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the volatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Non-detected 2-butanone results were determined to be unusable for W-24T (10'-12') and Trip Blank (2/2/93) based on calibration minimum RF criterion. The detected acetone result for W-24T (10'-12') was approximated based on continuing calibration %D criteria.

4.12 Soil Borings Collected 3/25/93 Volatiles Analysis

One soil sample was validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, surrogate recovery, matrix spike/matrix spike duplicate analysis, field duplicate analysis, internal standards recovery, compound identification and quantitation, tentatively identified compounds, percent solids determination and content, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

The initial calibration prepared for medium level soil/water samples exceeded minimum RF criterion of greater than 0.05 for 2-butanone with a value of 0.01743. Due to this excursion the detected sample result for 2-butanone reported for Equipment/Field Blank was approximated (J).

Continuing Calibration

Continuing calibration minimum RF criterion of greater than 0.05 was also exceeded for the medium soil/water calibration. Qualification of sample results was not required since the associated samples were qualified for initial calibration excursions.

Continuing calibration %D criterion of less than 25.0% was exceeded for acetone with a value of 25.82% for the medium soil/water calibration. Due to this excursion the detected acetone result for Equipment/Field Blank was approximated (J).

Continuing calibration %D criterion was also exceeded for the low level soil calibration for chloromethane, methylene chloride, acetone, 2-butanone, and 4-methyl-2-butanone with values that ranged from 25.54% to 49.11%. Qualification of sample data was not required since the %Ds were less than 50.0% and these compounds were not detected in the associated samples.

Equipment Blank Analysis

Acetone and 2-butanone were detected in the Equipment/Field Blank sample at concentrations of 26 μg/L and 83 μg/L, respectively. Sample data did not require qualification since these compound were not detected in the associated soil samples.

Reference Standard Analysis

The reference standard analyzed for low level soils exceeded recovery criteria of 55.0% to 135.7% for vinyl acetate with a recovery of 25.0%. Due to this excursion the non-detected sample results reported for vinyl acetate were approximated (UJ) for W-23T (4'-6'), Blind Duplicate #1, and Trip Blank (3/25/93).

Overall Data Assessment

Overall, the laboratory performed volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.01. These data have been determined to be usable for qualitative and quantitative purposes. The detected sample result for 2-butanone reported for Equipment/Field Blank was approximated based on calibration minimum RF criteria. The detected acetone result for Equipment/Field

Blank was also approximated based on calibration %D criteria. Non-detected sample results reported for vinyl acetate were approximated for W-23T (4'-6'), Blind Duplicate #1, and Trip Blank (3/25/93) based on reference standard analysis criteria.

4.13 Round II Sediment Program

4.13.1 Target Analyte List Inorganics Analysis

QA/QC parameters for TAL inorganic analyses were evaluated for sixteen sediment samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration, CRDL standard analysis, field duplicate analysis, laboratory control sample analysis, percent solids quantitation and content, quarterly detection limit verification and ICP interelement correction factors, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Calibration Blank Analysis

Continuing calibration blank number three contained aluminum, antimony, cadmium, and lead at concentrations greater than their IDLs. Blank action levels for these analytes were calculated for the sediment samples using a density value of 1 g/mL for water and the percent solids of the associated samples. Detected concentrations in the associated samples less than the blank action level were qualified with a "U". Samples that required qualification for these excursions are tabulated below.

Sample	Analyte	Qualifier

Equipment Blank #1-2	aluminum antimony	U
SED-01A-2	cadmium	U
SED-01B-2	cadmium	U
SED-013-2	cadmium	U
SED-08-2	antimony	U

Preparation Blank Analysis

The water preparation blank contained concentrations of aluminum, antimony, beryllium, cadmium, manganese, sodium, and zinc that were greater than their IDLs. Due to these excursions the detected beryllium, manganese, and zinc results for Equipment Blank #1-2 and Equipment Blank #2-2 were qualified with a "U".

ICP Interference Check Sample Analysis

The interference check sample (ICSA) solution A contained concentrations of barium, beryllium, cobalt, chromium, copper, manganese, vanadium, and zinc which were greater than their IDLs. Potassium was detected in solution A at a negative concentration greater than two times the absolute value of the IDL. Due to these excursions detected results for these analytes and non-detected potassium results were approximated for samples containing one or more of the interfering analytes (aluminum, calcium, iron, or magnesium) at concentrations greater than half the ICSA concentrations. The following samples were qualified for these excursions; SED-08-2, SED-09-2, and SED-010-2.

Matrix Spike Analysis

Matrix spike recovery criteria of 75.0% to 125.0% were exceeded for selenium with a recovery of 3.7%. Samples qualified for this excursion are tabulated below.

Matrix Spike Sample ID#	Analyte	Affected Samples	Qualified Result
SED-014-2	selenium	SED-04-2	0.51 J
		SED-05-2	R
		SED-06-2	R
		SED-07-2	0.40 J
		Blind Duplicate #1-2	1.5 J
		SED-02-2	0.61 J
		SED-09-2	1.9 J
		SED-011-2	1.7 J
		SED-012-2	R
		SED-03-2	2.1 J
		SED-015-2	R
		SED-014-2	1.5 J
		SED-010-2	1.5 J
		SED-01B-2	0.63 J
		SED-013-2	3.0 J
		SED-01A-2	R
		SED-08-2	J

Laboratory Duplicate Analysis

Duplicate RPD criterion of less than 35.0% for soil/sediment samples was exceeded for mercury and selenium with values of 200.0% and 107.1%, respectively. Detected mercury results were approximated (J) for SED-05-2, SED-06-2, SED-011-2, SED-012-2, and SED-014-2. Qualification of selenium results was not required since they were previously qualified for matrix spike excursions.

Furnace Duplicate Analysis

Furnace duplicate analysis percent relative standard deviation (%RSD) criterion of less than 20.0% was exceeded for thallium for SED-05-2, SED-012-2 and SED-01A-2. Due to these excursions the detected thallium results for these samples were approximated (J).

Furnace Analytical Spike Analysis

Furnace analytical spike recovery criteria of 85.0% to 115.0% were exceeded for thallium for Blind Duplicate #1-2, SED-02-2, SED-09-2, SED-011-2, SED-08-2 and SED-010-2. Due to these excursions the detected and non-detected thallium results for these samples were approximated.

Method of Standard Additions Analysis

Method of standard additions analysis minimum correlation coefficient criterion of greater than 0.995 was exceeded for selenium and lead for SED-011-2 and SED-01B-2, respectively. The detected lead result for SED-01B-2 was approximated (J) due to this excursion. Additional qualification of the selenium result for SED-011-2 was not required since it was previously qualified for matrix spike excursions.

ICP Serial Dilution Analysis

ICP serial dilution %D criterion of less than 15.0% was exceeded for beryllium, and copper with values of 100.0% and 18.7%, respectively. Due to these excursions detected results for these analytes were approximated for the samples listed below.

SED-04-2	SED-05-2	SED-06-2	SED-07-2
Blind Duplicate #1-2	SED-02-2	SED-09-2	SED-011-2
SED-012-2	SED-03-2	SED-015-2	SED-014-2
SED-010-2			

Element Quantitation and Reported Detection Limits

Detected sample results that were greater than the IDLs but less than the CRDLs which were identified by the laboratory with a "B" qualifier were qualified as approximated (J).

Overall Data Assessment

Overall, the laboratory performed inorganics analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the inorganics sample data have been determined to be usable for qualitative and quantitative purposes. Detected results for several analytes were qualified with a "U" based on calibration and preparation blank criteria. Results for several analytes detected in the ICSA solution A at positive and negative concentrations were approximated for SED-08-2, SED-0902, and SED-010-2. Non-detected selenium results were determined to be unusable and detected selenium results were approximated based on matrix spike analysis criteria. Detected mercury results were approximated for SED-05-2, SED-06-2, SED-011-2, SED-012-2, and SED-014-2 based on laboratory duplicate analysis criteria. Detected thallium results were approximated for SED-05-2, SED-012-2, and SED-01A-2 based on furnace duplicate analysis criteria. Sample results for thallium, beryllium, and copper were also approximated based on furnace analytical spike analysis and ICP serial dilution analysis criteria.

4.13.2 Target Compound List Volatiles Analysis

Sixteen sediment samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, surrogate recovery, matrix spike/matrix spike duplicate analysis, reference standard analysis, internal standards recovery, compound identification and quantitation, tentatively identified compounds, percent solids determination and content, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

TCL compound initial calibration criteria were met for the low level soil and medium level soil/water calibrations with the exception of 2-butanone for both calibrations. The RF of 0.04514 on 4/20/93 for the low level soil calibration and the RFs of 0.03911 and 0.02841 on 3/12/93 and 4/22/93, respectively for the medium level soil/water calibrations exceeded the minimum criterion of 0.05. Due to these excursion non-detected sample results for 2-butanone were determined to be unusable (R) and detected results were qualified as approximate (J). The associated samples and the qualified sample results are tabulated below.

Sample ID	Qualified Result
SED-04-2	R
SED-05-2	R
SED-06-2	R

Sample ID	Qualified Result
SED-07-2	R
Trip Blank	R
Blind Duplicate #1-2	R
SED-02-2	72 UJ
SED-09-2	R
SED-011-2	R
SED-012-2	75 UJ
SED-03-2	R
SED-015-2	29 UJ
SED Equipment/Field Blank #1-2	31 J
SED-014-2	R
SED-010-2	R
SED-01B-2	R
SED-013-2	R
SED-01A-2	R
SED-08-2	29 UJ
SED Equipment/Field Blank #2-2	39 J

Continuing Calibration

Continuing calibration minimum RF criterion was exceeded for 2-butanone in medium level soil/water and the low level soil calibration standards analyzed on 4/21/93, 4/22/93, 4/23/93, 4/14/93, and 4/27/93. Qualification of sample data was not required for these excursions since the affected samples were previously qualified for exceeding minimum RF criterion in the initial calibrations.

Continuing calibration %D criterion of less than 25% was exceeded for acetone, chloromethane, vinyl acetate, and 2-hexanone in the medium level soil/water calibrations analyzed on 4/14/93 and 4/20/93. Qualification of sample results due to these excursions was not required since the %Ds ranged from 25.24% to 42.30% and these compounds were not detected in the associated samples.

Blank Analysis

Method blanks, equipment blanks and trip blanks were analyzed at the frequency required in the QAPP. The equipment blanks, SED Equipment/Field Blank #1-2 and SED Equipment/Field Blank #2-2, contained 31 $\mu g/L$ and 39 $\mu g/L$, respectively of 2-butanone. Blank action level of five times these blank concentrations were calculated using a value of 1.0 g/mL for the density of water and were corrected for dry weight using the percent solids of the affected samples. Dilutions and differences between sample and blank weights or volumes were taken into account when applying blank actions. Detected 2-butanone results in the affected samples that were less than the action level were qualified with a "U" indicating that the sample results may reflect contamination during sampling. The following samples were qualified for blank contamination: SED-2-02, SED-012-02, SED-08-2, and SED-015-02.

Field Duplicate Analysis

Field duplicate analysis was performed using Blind Duplicate #1-2 and SED-07-2 for the duplicate samples. Field duplicated relative percent difference (RPD) criterion of less than 50% was exceeded for tetrachloroethene (66.7%). Due to this excursions the detected tetrachloroethene results for SED-07-2 and Blind Duplicate #1-2 were approximated (J).

Overall Data Assessment

Overall, the laboratory performed volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the volatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Non-detected results were determined to be unusable and detected results were approximated for 2-butanone based on calibration minimum RF criteria. Detected 2-butanone results for SED-02-2, SED-012-2, SED-08-2, and SED-015-2 were qualified with a "UJ" based on calibration RF criteria and equipment blank criteria. Detected tetrachloroethene results for SED-07-2 and Blind Duplicate #1-2 were approximated based on field duplicate criteria.

4.13.3 Target Compound List Semivolatiles Analysis

Fourteen sediment samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8270 were found to meet validation criteria: holding times, GC/MS instrument tuning, matrix spike/matrix spike duplicate analysis, field duplicate analysis, internal standards recovery, compound identification and quantitation, percent solids determination and content, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

The initial calibration analyzed on 4/30/93 exceeded minimum %RSD criterion of less than 30% for 4-chlorophenyl-phenylether (38.286%) and fluorene (34.118%). Qualification of sample data was not required since the %RSD was less than 50% and these compounds were not detected in the associated samples.

Continuing Calibration

Continuing calibration %D criterion of less than 25% was also exceeded for the continuing calibrations and compounds listed below. Qualification of sample results was not required since these compounds were not detected in the affected samples and the %Ds were less than 50%.

Date Analyzed	Compound	%D
4/21/93	2-nitroaniline	26.73
	4-nitrophenol	33.30
4/26/93	2,4-dinitrophenol	31.29
	4-nitrophenol	25.16
4/30/93	2,4-dinitrophenol	37.73
5/4/93	N-nitrosodimethylamine	27.50
	hexachlorocyclopentadiene	31.41
	2,4,6-tribromophenol	26.62
	pentachlorophenol	27.04
5/5/93	hexachlorobutadiene	27.39
	hexachlorocyclopentadiene	38.46
	2,4-dinitrophenol	31.36
	2,4,6-tribromophenol	27.12
	pentachlorophenol	27.66

Blank Analysis

The soil method blank extracted on 4/19/93 contained bis(2-ethylhexyl) phthalate at a concentration of 110 μg/Kg. Qualification of sample results was not required since bis(2-ethylhexyl) phthalate was not detected in the associated samples.

Surrogate Recovery

Surrogate recovery criteria specified in the QAPP were exceeded for sample SED-05-2. Surrogate recoveries and recovery criteria specified in the QAPP are tabulated below for this sample. Non-detected sample results for both acid and base/neutral fractions were determined to be unusable (R) and detected results were approximated (J) in this sample due to these excursions.

Surrogate	%Recovery	%Recovery Criteria
nitrobenzene-d5	1.0	47.8 to 113.6
2-fluorophenol	4.0	56.1 to 102.0

Reference Standard Analysis

The soil reference sample extracted on 4/16/93 exceeded recovery criteria of 22.0% to 123.0% for 2,4-dinitrophenol and 44.0% to 134.0% for 4,6-dinitro-2-methylphenol with recoveries of 11.0% and 26.0%, respectively. Due to these excursions the non-detected sample results for these compound were approximated (UJ) for the samples listed below.

SED-04-2	SED-07-2	Blind Duplicate #1-2
SED-02-2	SED-09-2	SED-011-2
SED-012-2	SED-03-2	SED-014-2

Tentatively Identified Compounds

Several tentatively identified compounds (TICs) were detected in the method blanks. Sample TICs with relative retention times matching the retention times of the TICs in the method blanks were determined to be unusable (R). Samples requiring qualification are summarized below.

	TIC Retention Time (min)	
Sample ID#	Sample	Blank
SED-04-2	4.59	4.57
	6.05	6.05
	6.82	6.83
	26.72	26.72
	31.51	31.50
SED-05-2	26.69	26.72
	31.49	31.50
SED-07-2	4.59	4.57
	5.42	5.46
	6.05	6.05
	6.82	6.83
	26.77	26.72
Blind Duplicate #1-2	4.59	4.57
	6.05	6.05
	6.81	6.83
	26.72	26.72
	31.50	31.50
SED-02-2	6.83	6.83
	31.51	31.50
SED-09-2	4.59	4.57
	6.05	6.05
	6.81	6.83
	31.51	31.50
SED-011-2	6.81	6.83
	31.51	31.50
SED-012-2	6.80	6.83
	26.72	26.72
	31.51	31.50
SED-03-2	4.55	4.57
	6.79	6.83
	26.69	26.72

Sample ID#	TIC Retention Time (min) Sample	Blank
SED-014-2	4.55	4.57
	5.46	5.46
	6.02	6.05
	6.79	6.83
	26.70	26.72
	31.48	31.50
SED Equipment/Field Blank #1-2	5.28	5.31
	6.06	6.08
	6.75	6.78
SED-010-2	4.53	4.62
	6.74	6.81
SED-01B-2	4.53	4.62
	6.73	6.81
SED-013-2	4.53	4.62
	6.74	6.81
SED-01A-2	6.50	6.81
SED-08-2	6.50	6.81
SED Equipment/Field Blank #2-2	6.66	6.66
	26.96	26.95
	30.82	30.81
	30.94	30.93

Overall Data Assessment

Overall, the laboratory performed semivolatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the semivolatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Non-detected results were determined to be unusable and detected results were approximated for all compound for SED-05-2 based on surrogate recovery criteria. Results were approximated for 2,4 -dinitrophenol and 4,6-dinitro-2-methylphenol for several samples based on reference standard analysis criteria. Sample TICs with retention times and mass spectral criteria matching TICs detected in the method blanks were determined to be unusable (R) for several samples.

4.13.4 PCB/Pesticide Analysis

Fourteen sediment samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8080 were found to meet validation criteria: holding times, instrument performance, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, field duplicate analysis, reference standard analysis, percent solids analysis, compound identification and quantitation, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration %RSD criterion of less than 10% was exceeded for several of the PCB/pesticide compounds for both the primary and confirmation columns. Compounds that exceeded %RSD criterion that resulted in the qualification of sample data are tabulated below.

Compound	%RSD	Affected Sample	Qualified Result
4,4'-DDT	11.01	SED-05-2	6.4 J
Aroclor 1254	13.61 (peak #2)	SED-02-2	74 J

Continuing Calibration

Continuing calibration %D criterion of less than 15% was exceeded for several PCB/pesticide compounds. Qualification of sample data for these compounds was not required since they were not detected in the affected samples or the associated samples were previously qualified for initial calibration excursions.

Overall Data Assessment

Overall, the laboratory performed pesticide/PCB analyses in accordance with the requirements specified in the methods listed in Section 2.01. These data have been determined to be usable for qualitative and quantitative purposes. Detected results for 4,4'-DDT and Aroclor 1254 were approximated for SED-05-2 and SED-02-2, respectively based on initial calibration %RSD criteria.

4.14 Round II Surface Water Program

4.14.1 Target Analyte List Inorganics Analysis

QA/QC parameters for TAL inorganic analyses were evaluated for fifteen surface water samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration, CRDL standard analysis, matrix spike analysis, laboratory duplicate analysis, field duplicate analysis, laboratory control sample analysis, ICP serial dilution analysis, quarterly detection limit verification and ICP interelement correction factors, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Blank Analysis

Calibration and preparation blanks contained several analytes at concentrations above their IDLs. Blank concentrations were multiplied by a factor of five to generate a blank action level. Sample concentrations below the blank action level were qualified with a "U". Detected sample concentrations above the blank action level were not qualified. Analytes detected in the blanks and the samples affected are tabulated below.

Blank ID#	Analyte	Blank Concentration (µg/L)	Affected Samples	Qualifier
preparation	aluminum	38.130	SW-07-2 SW-03-2 SW-012-2 SW-011-2 SW-02-2 SW-09-2 SW-014-2 SW-015-2 SW-010-2	U
preparation	beryllium	1.990	SW-06-2 SW-02-2 SW-09-2 SW-08-2 SW-010-2	U
preparation	zinc	6.980	SW-04-2 SW-Blind Duplicate #1-2 SW-07-2 SW-05-2 SW-06-2 SW-03-2 SW-012-2 SW-011-2 SW-02-2 SW-09-2 SW-014-2 SW-015-2 SW-010-2 SW-018-2 SW-013-2	U

Blank ID#	Analyte	Blank Concentration (µg/L)	Affected Samples	Qualifier
CCB #2	antimony	33.4	SW-06-2 SW-03-2 SW-012-2 SW-011-2 SW-02-2 SW-09-2 SW-015-2 SW-08-2 SW-010-2 SW-018-2 SW-013-2	U
CCB #9	selenium	3.6	SW-04-2 SW-05-2 SW-03-2	U

ICP Interference Check Sample Analysis

The interference check sample (ICSA) solution A contained concentrations of barium, beryllium, cobalt, chromium, copper, manganese, silver, sodium, and vanadium which were greater than their IDLs. Potassium was detected in solution A at a negative concentration greater than two times the absolute value of the IDL. Due to these excursions detected results for these analytes and non-detected potassium results were approximated for samples containing one or more of the interfering analytes (aluminum, calcium, iron, or magnesium) at concentrations greater than half the ICSA concentrations. Sample SW-08-2 was qualified for these excursions.

Furnace Duplicate Analysis

Furnace duplicate analysis percent relative standard deviation (%RSD) criterion of less than 20.0% was exceeded for selenium for samples SW-04-2 and SW-05-2. The non-detected sample results for these samples were qualified as approximate (UJ) for the %RSD excursions since the detected results for these samples were previously qualified with a "U" due to continuing calibration blank contamination.

Furnace Post Digestion Spike Analysis

Furnace spike recovery criteria of 85.0% to 115.0% were exceeded for arsenic with a recovery of 76.7% for SW-013-2 and for thallium with a recovery of 80.8%. Due to these excursions the non-detected results for arsenic and thallium were approximated (UJ) for SW-013-2 and SW-04-2, respectively.

Furnace spike recovery criteria were also exceeded for selenium for samples SW-018-2 and SW-013-2 with recoveries of 75.2% and 58.5%. Due to these excursions the non-detected selenium results reported for these samples were approximated (UJ).

Element Quantitation and Reported Detection Limits

Detected sample results that were greater than the IDLs but less than the CRDLs which were identified by the laboratory with a "B" qualifier were qualified as approximated (J).

Overall Data Assessment

Overall, the laboratory performed inorganics analyses in accordance with the requirements specified in the methods listed in Section 2.02. These data have been determined to be usable for qualitative and quantitative purposes. Detected results for several analytes were qualified with a "U" based calibration and preparation blank criteria. Several analytes detected in the ICSA solution A at positive and negative concentrations were approximated for SW-08-2. Selenium results for SW-04-2 and SW-05-2 that were previously qualified with a "U" were approximated based on furnace duplicate analysis criteria. Results for arsenic, selenium, and thallium were approximated for several samples based on furnace post digestion spike analysis criteria.

4.14.2 Target Compound List Volatiles Analysis

Ten surface water samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, reference standard analysis, field duplicate analysis, internal standards recovery, compound identification and quantitation, tentatively identified compounds, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration minimum RF criterion of greater than 0.05 was exceeded for 2-butanone on 3/12/93 and 4/24/93 with values of 0.03911 and 0.02841, respectively. Due to these excursions non-detected 2-butanone results were qualified as unusable (R) for the samples listed below.

SW-04-2	SW-Blind Duplicate #1-2	SW-07-2

SW-05-2	SW-012-2	SW-011-2
SW-09-2	SW-014-2	Trip Blank (4/14/93)
SW-08-2	SW-10-2	SW-013-2

Continuing Calibration

Minimum RF criterion of greater than 0.05 was also exceeded for 2-butanone in the continuing calibration standards analyzed on 4/14/93, 4/16/93, 4/19/93, 4/20/93 and 4/27/93. Qualification of sample data due to these excursions was not required since the affected data were previously qualified for exceeding initial calibration minimum RF criterion.

Continuing calibration %D criterion of less than 25% was exceeded for acetone, chloromethane, vinyl acetate, and 2-hexanone in the calibrations analyzed on 4/14/93, 4/16/93, 4/19/93 and 4/20/93. Qualification of sample results due to these excursions was not required since the %Ds ranged from 25.24% to 42.30% and these compounds were not detected in the associated samples.

Overall Data Assessment

Overall, the laboratory performed volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.02. The majority of the volatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Non-detected 2-butanone results were determined to be unusable based calibration minimum RF criterion.

4.14.3 Target Compound List Semivolatiles Analysis

Thirteen surface water samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8270 were found to meet validation criteria: holding times, GC/MS instrument tuning, blank analysis, matrix spike/matrix spike duplicate analysis, field duplicate analysis, internal standards recovery, compound identification and quantitation, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

The initial calibration analyzed on 4/30/93 exceeded minimum %RSD criterion of less than 30% for 4-chlorophenyl-phenylether (38.286%) and fluorene (34.118%). Qualification of sample data was not required since the %RSD was less than 50% and these compounds were not detected in the associated samples.

Continuing Calibration

Continuing calibration %D criterion of less than 25% was also exceeded for the continuing calibrations and compounds listed below. Qualification of sample results was not required since these compounds were not detected in the affected samples and the %Ds were less than 50%.

Date Analyzed	Compound	%D
4/21/93	2-nitroaniline	26.73
	4-nitrophenol	33.30
4/26/93	2,4-dinitrophenol	31.29
	4-nitrophenol	25.16

Date Analyzed	Compound	%D
4/30/93	2,4-dinitrophenol	37.73
5/4/93	N-nitrosodimethylamine	27.50
	hexachlorocyclopentadiene	31.41
	2,4,6-tribromophenol	26.62
	pentachlorophenol	27.04
5/5/93	hexachlorobutadiene	27.39
	hexachlorocyclopentadiene	38.46
	2,4-dinitrophenol	31.36
	2,4,6-tribromophenol	27.12
	pentachlorophenol	27.66

Surrogate Recovery

Surrogate recovery criteria of 41.0% to 111.0% for 2-fluorophenol and 45.0% to 115.0% for 2,4,6-tribromophenol were exceeded for SW-Blind Duplicate #1-2 with recoveries of 32.0% and 40.0%, respectively. Due to these excursions the non-detected sample results reported for the acid extractable compounds were approximated (UJ).

Reference Standard Analysis

Diethylphthalate exceeded recovery criteria of 43.0% to 126.0% with a recovery of 32.0% for the reference standard extracted on 4/20/93. Due to this excursion the non-detected sample results reported for SW-08-2, SW-010-2, SW-018-2, and SW-013-2 were approximated (UJ).

Tentatively Identified Compounds

Several tentatively identified compounds (TICs) were detected in the method blanks. Sample TICs with relative retention times matching the retention times of the TICs in the method blanks were qualified as unusable (R). Samples requiring qualification are summarized below.

Sample ID#	TIC Retention Time (min)	
	Sample	Blank
SW-04-2	5.29	5.31
	6.05	6.08
	6.74	6.78
SW-Blind Duplicate #1-2	5.27	5.31
	6.00	6.08
	6.69	6.78
SW-07-2	6.73	6.78
SW-05-2	5.37	5.31
	6.77	6.78
SW-03-2	7.06	7.01
	8.41	8.41
SW-012-2	7.07	7.01
	8.40	8.41
SW-011-2	7.07	7.01
	8.41	8.41
SW-02-2	7.04	7.01
	8.41	8.41
SW-09-2	7.08	7.01
	8.40	8.41
SW-014-2	7.10	7.01
	8.40	8.41
SW-08-2	6.64	6.66
	26.96	26.95
	30.80	30.81
	30.92	30.93
SW-010-2	6.64	6.66
	26.94	26.95
	30.80	30.81
	30.93	30.93
SW-018-2	6.65	6.66
	26.94	26.95
	30.80	30.81
	30.93	30.93
SW-013-2	6.65	6.66
	26.94	26.95
	30.80	30.81
	30.94	30.93

Overall Data Assessment

Overall, the laboratory performed semivolatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.02. The majority of the semivolatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Results for the acid extractable compounds for SW-Blind Duplicate #1-2 were approximated based on surrogate recovery criteria. Diethylphthalate results were approximated for SW-08-2, SW-010-2, SW-018-2, and SW-013-2 based on reference standard analysis criteria. Sample TICs with retention times and mass spectral criteria matching TICs detected in the method blanks were determined to be unusable (R) for several samples.

4.14.4 PCB/Pesticide Analysis

Thirteen water samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8080 were found to meet validation criteria: holding times, instrument performance, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, field duplicate analysis, reference standard analysis, compound identification and quantitation, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration %RSD criterion of less than 10% was exceeded for several of the PCB/pesticide compounds with values that ranged as high as 19.52% Qualification of sample data for these compounds was not required since they were not detected in the associated samples.

Continuing Calibration

Continuing calibration %D criterion of less than 15% was exceeded for endrin, 4,4'-DDD, 4,4'-DDT, and methoxychlor. Qualification of sample data for these compounds was not required since they were not detected in the affected samples.

Overall Data Assessment

Overall, the laboratory performed pesticide/PCB analyses in accordance with the requirements specified in the methods listed in Section 2.02. These data have been determined to be usable for qualitative and quantitative purposes. Minor excursions that did not result in the qualification of data were observed for initial and continuing calibration criteria.

4.15 Round I Ground Waters

4.15.1 Target Analyte List Inorganics Analysis

QA/QC parameters for TAL inorganic analyses were evaluated for seventy-one water samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration, CRDL standard analysis, quarterly detection limit verification and ICP interelement correction factors, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Preparation Blank Analysis

The preparation blanks contained concentrations of various analytes that were greater than their IDLs. Potassium was detected in several blanks at both positive and negative concentrations that were greater than twice the absolute value of the IDL. Detected and non-detected potassium results for samples associated with blanks exhibiting negative concentrations were approximated (J, UJ) due to these excursions. Blank action levels were calculated for the analytes with positive concentrations at five times the blank concentration. Detected sample results that were less than the blank action level were qualified with a "U". Detected results that were greater than the blank action level did not require qualification. The blanks containing analytes above their IDLs and the qualifications applied to the associated samples are tabulated below.

Blank Sample ID	Analyte	Concentration (µg/L)	Affected Samples	Qualifier

PB052793W2	aluminum	34.8	W-23T-1-F W-24T-1-F Field Blank #1-1-F SBW-10-1-F W-01S1-1-F Blind Duplicate #1-1-F W-08/S1-1-F W-09/S1-1-F W-25S1-1-F	U
	potassium	29.3	W-23T-1-F W-24T-1-F Field Blank #1-1-F SBW-10-1-F W-01S1-1-F Blind Duplicate #1-1-F W-08/S1-1-F W-09/S1-1-F W-25S1-1-F	U
	vanadium	6.0	W-23T-1-F W-24T-1-F Field Blank #1-1-F SBW-10-1-F W-01S1-1-F Blind Duplicate #1-1-F W-08/S1-1-F W-09/S1-1-F W-25S1-1-F	U
PB052893W1	potassium	-1599.1	Field Blank #1-1	UJ
PB060293W1	aluminum	40.5	SBW-21-1-F Equipment Blank #2-1-F W-12/S1-1-F W-03-1-F W-02-1-F W-05-1-F W-06S-1-F W-22/S1-1-F W-04D-1-F W-06D-1-F W-07/S1-1-F	U
	magnesium	44.7	Equipment Blank #2-1-F	U
	potassium	1648.2	Equipment Blank #2-1-F W-12/S1-1-F W-03-1-F W-02-1-F W-03/S2-1-F W-05-1-F W-06S-1-F W-22/S1-1-F W-06S-1-F W-07/S1-1-F W-04D-1-F	U

	silver	6.3	SBW-21-1-F W-12/S1-1-F W-06S-1-F W-06D-1-F W-07/S1-1-F	U
	vanadium	7.4	SBW-21-1-F W-12/S1-1-F W-03-1-F W-04S-1-F W-02-1-F W-03/S2-1-F W-05-1-F W-06S-1-F W-22/S1-1-F W-04D-1-F W-06D-1-F W-07/S1-1-F	U
PB060393W1	aluminum	42.9	Equipment Blank #2-1	U
	calcium	1001.5	Equipment Blank #2-1	U
	copper	15.9	Equipment Blank #2-1 W-03-1 W-02-1 Blind Duplicate #2-1 W-05-1 W-06S-1 W-22/S1-1 W-04D-1 W-07/S1-1	U
	iron	31.3	Equipment Blank #2-1	U
	lead	1.3	SBW-21-1 Equipment Blank #2-1 Blind Duplicate #2-1	U
	magnesium	81.6	Equipment Blank #2-1	U
	manganese	1.2	Equipment Blank #2-1	U
	sodium	1410.8	Equipment Blank #2-1 W-12/S1-1 W-05-1 W-06S-1 W-06D-1 W-07/S1-1	U
	vanadium	8.6	W-03-1 W-02-1 Blind Duplicate #2-1 W-05-1 W-22/S1-1 W-04D-1	U

PB060893W1	potassium	-1527.4	Pump/Field Equipment Blank #1-1 W-25DI-1 W-25SI-1 W-01B-1 W-09SI-1 Ryder Spring-1 W-09SI-1	UJ
PB061593W3	aluminum	41.8	W-01B-1-F W-07SI-1-F W-09B-1-F Ryder Spring-1-F W-09SI-1-F Olin-1-F Dickinson-1-F W-04DI-1-F W-04B-1-F	U
	antimony	30.6	W-01B-1-F W-07SI-1-F W-09B-1-F Ryder Spring-1-F W-09SI-1-F Olin-1-F	U
	beryllium	1.9	W-01B-1-F W-07SI-1-F W-09B-1-F Ryder Spring-1-F W-09SI-1-F Olin-1-F W-04DI-1-F W-04B-1-F W-08B-1-F	U
	potassium	1354.1	W-01B-1-F W-07SI-1-F W-09B-1-F Ryder Spring-1-F W-09SI-1-F Olin-1-F Dickinson-1-F W-04DI-1-F W-04B-1-F W-08B-1-F	U
	silver	5.1	W-01B-1-F W-07SI-1-F W-09B-1-F Ryder Spring-1-F W-09SI-1-F Olin-1-F	U
PB062593W1	copper	5	W-04DI-1	U
	potassium	-1485.8	Olin-1 Dickinson-1 W-04B-1	UJ

sodium	1713.1	Olin-1 W-04DI-1 W-04B-1	U

Field/Equipment Blank Analysis

The field/equipment blanks contained concentrations various analytes that were greater than their IDLs. Blank action levels were calculated at five times the blank concentration for each of these analytes. Detected sample results that were less than the blank action level were qualified with a "U". The blanks containing analytes above their IDLs and the qualifications applied to the associated samples are tabulated below.

Blank Sample ID	Analyte	Concentration (µg/L)	Affected Samples	Qualifier
Field Blank #1-1	sodium	1340	W-23T-1 W-24T-1 SBW-10-1 W-01S1-1 Blind Duplicate #1-1 W-08/S1-1 W-09/S1-1 W-25S1-1	U
Field Blank #1-1-F	antimony	29.2	W-23T-1-F W-24T-1-F SBW-10-1-F W-01S1-1-F Blind Duplicate #1-1-F W-08/S1-1-F W-09/S1-1-F W-25S1-1-F	U
	manganese	1.8	SBW-10-1-F W-01S1-1-F Blind Duplicate #1-1-F W-08/S1-1-F	U
	silver	4.0	W-23T-1-F W-24T-1-F SBW-10-1-F W-01S1-1-F Blind Duplicate #1-1-F W-08/S1-1-F W-09/S1-1-F W-25S1-1-F	U
	zinc	3.6	W-09/S1-1-F W-25S1-1-F	U

Blank Sample ID	Analyte	Concentration (µg/L)	Affected Samples	Qualifier
Equipment Blank #2-1	lead	4.7	W-03-1 W-05-1 W-22/S1-1 W-04D-1	U
Equipment Blank #2-1-F	manganese	2.0	W-05-1-F W-06S-1-F	U
	zinc	2.4	W-04S-1-F W-03/S2-1-F W-21-1-F	U
Pump/Field Equipment Blank #1-1	aluminum	30.9	W-01B-1 W-09SI-1 Dickinson-1 W-04DI-1 W-08B-1	U
	chromium	3.2	W-09SI-1 W-04DI-1 W-04B-1 W-08B-1	U
	copper	34.6	W-04SI-1 Blind Duplicate #3-1 W-25DI-1 W-25SI-1 W-01B-1 W-07SI-1 W-09SI-1 Ryder Spring-1 W-09SI-1 Olin-1 Dickinson-1 W-08B-1 W-04B-1	U
	iron	46.6	Blind Duplicate #3-1 Ryder Spring-1 Dickinson-1	U
	lead	3.0	W-25DI-1 W-01B-1 W-09SI-1 Ryder Spring-1 W-09SI-1 W-08SI-1 Olin-1 W-04DI-1 W-04B-1 W-08B-1	U
	manganese	3.2	W-01B-1	U
	sodium	1140	W-01B-1 W-09SI-1 W-08B-1	U

Blank Sample ID	Analyte	Concentration (µg/L)	Affected Samples	Qualifier
	zinc	19.5	Blind Duplicate #3-1 W-25DI-1 W-01B-1 W-09SI-1 Ryder Spring-1 W-08SI-1 W-04B-1 W-08B-1 Olin-1 Dickinson-1 W-04DI-1	U
Pump/Field Equipment Blank #1-1-F	copper	25.9	W-01B-1-F W-09B-1-F W-09SI-1-F Olin-1-F W-04DI-1-F W-04B-1-F	U
	iron	25.6	W-04B-1-F	U
	manganese	4.5	W-01B-1-F W-07SI-1-F W-09B-1-F W-09SI-1-F W-04DI-1-F W-08B-1-F W-25DI-1-F W-25SI-1-F W-08SI-1-F	U
	nickel	9.4	W-04DI-1-F	U
	zinc	16.3	W-01B-1-F W-09B-1-F Ryder Spring-1-F Olin-1-F Dickinson-1-F W-04DI-1-F W-04B-1-F W-08-1-F	U

Calibration Blank Analysis

Continuing calibration blanks contained various analytes at concentration greater than their IDLs. Blank action levels were calculated as five times the concentration in the blank. Detected concentrations in the associated samples less than the blank action level were qualified with a "U". Samples that required qualification for these excursions are tabulated below.

Blank ID	Analyte	Concentration (µg/L)	Affected Samples	Qualifier
CCB6 6/3/93	aluminum	45.1	Field Blank #1-1	U
	antimony	20.4	W-24T-1 W-01S1-1	U
	magnesium	29.3	Field Blank #1-1	U
CCB7 6/3/93	antimony	26.3	Blind Duplicate #1-1 W-09/S1-1 W-25S1-1	U
	potassium	1290.2	Blind Duplicate #1-1	U
	silver	5.4	W-08/S1-1 W-09/S1-1 W-25S1-1	U
CCB3 6/8/93	potassium	-1215.3	Pump/Field Equipment Blank #1-1-F	UJ
CCB2 6/10/93	aluminum	16.7	Pump/Field Equipment Blank #1-1-F	U
CCB4 6/10/93	antimony	29.7	W-09SI-1	U
CCB3 6/21/93	copper	3.6	Dickinson-1-F	U

ICP Interference Check Sample Analysis

The ICSAs analyzed on 6/3/93, 6/7/93, and 6/8/93 contained concentrations of various analytes in solution A that were greater than their IDLs. Potassium was detected in the ICSA A solutions at negative concentrations greater than two times the absolute value of the IDL. Due to these excursions, detected results for the analytes listed below were approximated for samples containing one or more of the interfering analytes (aluminum, calcium, iron, or magnesium) at concentrations greater than half the ICSA concentrations. Detected sample results previously qualified for blank contamination were qualified with a "UJ". Samples requiring qualification for these excursions and the affected analytes are tabulated below.

ICSA ID#	Analyte	ICSA concentration (µg/L)	Affected Samples	Qualified Result (µg/L)
ICSA 6/3/93	antimony	100	W-23T-1	108 J
			W-24T-1	79.4 UJ
			W-08/S1-1	132 J
			W-09/S1-1	122 UJ
	barium	5	W-23T-1	974 J
			W-24T-1	532 J
			SBW-10-1	2350 J
			W-08/S1-1	1030 J
			W-09/S1-1	1080 J
	beryllium	3	W-23T-1	10 J
			W-24T-1	6.5 J
			SBW-10-1	16.6 J
			W-08/S1-1	9.4 J
			W-09/S1-1	12.5 J
	cobalt	7	W-23T-1	152 J
			W-24T-1	107 J
			SBW-10-1	277 J
			W-08/S1-1	145 J
			W-09/S1-1	244 J
	copper	5	W-23T-1	221 J
			W-24T-1	124 J
			SBW-10-1	423 J
			W-08/S1-1	218 J
			W-09/S1-1	255 J
	manganese	13	W-23T-1	8130 J
			W-24T-1	4530 J
			SBW-10-1	14600 J
			W-08/S1-1	7480 J
			W-09/S1-1	13000 J
	silver	9	SBW-10-1	12.3 J
			W-09/S1-1	12.1 UJ
	sodium	164	W-23T-1	5000 UJ
			W-24T-1	
			SBW-10-1	
			W-08/S1-1	
			W-09/S1-1	
	vanadium	43	W-23T-1	219 J
			W-24T-1	125 J
			SBW-10-1	382 J
			W-08/S1-1	204 J
			W-09/S1-1	270 J
	zinc	5	W-23T-1	612 J
			W-24T-1	372 J
			SBW-10-1	1380 J
			W-08/S1-1	721 J
			W-09/S1-1	703 J

ICSA ID#	Analyte	ICSA concentration (µg/L)	Affected Samples	Qualified Result (µg/L)
ICSA 6/7/93	antimony	32	W-011/S1-1	86.2 J
			W-12/S1-1	102 J
			W-03/S2-1	116 J
			W-06D-1	71.7 J
	barium	5	SBW-21-1	669 J
			W-011/S1-1	1830 J
			W-21/S1-1	1140 J
			W-03/S2-1	2960 J
			W-06D-1	512 J
	beryllium	3	SBW-21-1	6.8 J
			W-011/S1-1	13.4 J
			W-21/S1-1	10.0 J
			W-03/S2-1	20.0 J
			W-06D-1	6.0 J
	chromium	5	SBW-21-1	178 J
			W-011/S1-1	221 J
			W-21/S1-1	581 J
			W-03/S2-1	401 J
			W-06D-1	83.2 J
	cobalt	8	SBW-21-1	107 J
			W-011/S1-1	223 J
			W-21/S1-1	329 J
			W-03/S2-1	410 J
			W-06D-1	86.5 J
	manganese	11	SBW-21-1	3360 J
			W-011/S1-1	16600 J
			W-21/S1-1	8670 J
			W-03/S2-1	18000 J
			W-06D-1	3400 J
	sodium	138	SBW-21-1	8360 J
			W-011/S1-1	16000 J
			W-21/S1-1	6370 UJ
			W-03/S2-1	9680 J
			W-06D-1	5000 UJ
	vanadium	33	SBW-21-1	134 J
			W-011/S1-1	305 J
			W-21/S1-1	241 J
			W-03/S2-1	474 J
			W-06D-1	101 J
ICSA 6/8/93	barium	5	W-08SI-1	3160 J
			W-08SI-1-F	3320 J
	chromium	5	W-08SI-1	19.0 J
	manganese	11	W-08SI-1	20.8 J
			W-08SI-1-F	15 UJ
	sodium	131	W-08SI-1	38500 J
			W-08SI-1-F	39400 J

Matrix Spike Analysis

Matrix spike criteria of 75.0% to 125.0% were exceeded for several analytes. The analytes that exceeded criteria and the qualification applied to the associated samples are tabulated below.

Matrix Spike Sample ID#	Analyte	%Recovery	Affected Samples	Qualified Result (µg/L)
W-23T-1	antimony	39.1	W-01S1-1	60.0 UJ
			Blind Duplicate #1-1	60 UJ
			W-25S1-1	66.0 UJ
			SBW-10-1	90.0 UJ
			Field Blank #1-1	18.0 UJ
	arsenic	0.0	W-01S1-1	R
			Blind Duplicate #1-1	
			W-25S1-1	
			W-23T-1	
			W-24T-1	
			SBW-10-1	
			W-08/S1-1	
			Field Blank #1-1	
	selenium	0.0	W-01S1-1	R
			Blind Duplicate #1-1	
			W-25S1-1	
			W-23T-1	
			W-24T-1	
			SBW-10-1	
			W-08/S1-1	
			W-09/S1-1	
			Field Blank #1-1	
	thallium	73.4	W-01S1-1	1.0 UJ
			W-23T-1	
			W-24T-1	
			SBW-10-1	
			W-08/S1-1	
			Field Blank #1-1	
W-23T-1-F	selenium	65.3	W-23T-1-F	3.0 UJ
			W-24T-1-F	
			Field Blank #1-1-F	
			SBW-10-1-F	
			W-01S1-1-F	
			Blind Duplicate #1-1-F	
			W-08/S1-1-F	
			W-09/S1-1-F	
			W-25S1-1-F	

Matrix Spike Sample ID#	Analyte	%Recovery	Affected Samples	Qualified Result (µg/L)
W-02-1	arsenic	53.2	SBW-21-1	4.0 UJ
			W-011/S1-1	
			Equipment Blank #2-1	
			W-12/S1-1	
			W-03-1	
			W-02-1	
			Blind Duplicate #2-1	
			W-03/S2-1	
			W-05-1	
			W-22/S1-1	
			W-04D-1	
			W-06D-1	
			W-07/S1-1	
	selenium	0.0	SBW-21-1	R
			W-011/S1-1	
			Equipment Blank #2-1	
			W-12/S1-1	
			W-03-1	
			W-04S1-1	
			W-02-1	
			Blind Duplicate #2-1	
			W-03/S2-1	
			W-05-1	
			W-06S-1	
			W-22/S1-1	
			W-04D-1	
			W-06D-1	
			W-07/S1-1	
W-08SI-1	selenium	56.9	W-08SI-1	3.0 UJ
	silver	66.5	W-08SI-1	4.0 UJ
W-04SI-1	arsenic	66.4	W-04SI-1	4.0 UJ
			Blind Duplicate #3-1	
			Pump/Field Equipment Blank #1-1	
			W-25DI-1	
			W-25SI-1	
			W-01B-1	
			W-07SI-1	
			W-09B-1	
			Ryder Spring-1	
			W-09SI-1	
	lead	142.6	W-04SI-1	38.1 J
			Pump/Field Equipment Blank #1-1	3.0 J
			W-25DI-1	11.7 UJ
			W-25SI-1	428 J
			W-01B-1	4.1 UJ
			W-07SI-1	21.9 J
			W-09B-1	5.0 UJ
			Ryder Spring-1	4.2 UJ
			W-09SI-1	5.1 UJ

Matrix Spike Sample ID#	Analyte	%Recovery	Affected Samples	Qualified Result (µg/L)
W-08SI-1-F	selenium	63.1	W-08SI-1-F	3.0 UJ
			W-04SI-1-F	
			Blind Duplicate #3-1-F	
			Pump/Field equipment Blank #1-1-F	
			W-25DI-1-F	
			W-25SI-1-F	

Laboratory Duplicate Analysis

Duplicate RPD criterion of less than 20.0% for analytes for water samples was exceeded for copper with a value of 22.1% for the duplicate analysis of sample W-02-1. Detected copper results were approximated (J) for the associated samples tabulated below.

Lab Duplicate Sample ID	Analyte	Affected Samples	Qualified Result (µg/L)
W-02-1	copper	SBW-21-1	153 J
		W-011/S1-1	343 J
		Equipment Blank #2-1	6.4 J
		W-12/S1-1	384 J
		W-03-1	21.1 UJ
		W-04S1-1	84.6 J
		W-02-1	30.5 UJ
		Blind Duplicate #2-1	12.9 UJ
		W-03/S2-1	698 J
		W-05-1	34.6 UJ
		W-06S-1	69.3 UJ
		W-22/S1-1	44.7 UJ
		W-04D-1	14.6 UJ
		W-06D-1	93.7 J
		W-07/S1-1	69.0 UJ

Field Duplicate Sample Analysis

Field Duplicate RPD criterion of less than 30% for water samples was exceeded for various analytes in field duplicate samples BD1-1, BD2-1, BD3-1, BD3-1-F. A filtered duplicate sample was not collected for sample BD2-1. However, since other filtered field duplicates and laboratory duplicates were within criteria, no action was required. Detected sample results were qualified as approximated (J) as tabulated below.

Field Duplicate Sample ID	Analyte	RPD	Affected Samples	Qualified Result (µg/L)
Blind Duplicate #1-1	aluminum	157.7	SBW-10-1	295000 J
			W-23T-1	149000 J
			W-24T-1	88500 J
			Field Blank #1-1	200 UJ
			W-01S1-1	55100 J
			W-09/S1-1	144000 J
			W-25S1-1	46000 J
			W-08/S1-1	154000 J
			Blind Duplicate #1-1	34900 J
	barium	155.7	W-01S1-1	457 J
			W-25S1-1	376 J
			Blind Duplicate #1-1	293 J
	calcium	140.9	SBW-10-1	491000 J
			W-23T-1	189000 J
			W-24T-1	241000 J
			W-01S1-1	85100 J
			W-09/S1-1	236000 J
			W-25S1-1	131000 J
			W-08/S1-1	512000 J
			Blind Duplicate #1-1	85100 J
	chromium	109.7	SBW-10-1	290 J
			W-23T-1	179 J
			W-24T-1	139 J
			W-01S1-1	97.0 J
			W-09/S1-1	186 J
			W-25S1-1	74.1 J
			W-08/S1-1	168 J
			Blind Duplicate #1-1	84.6 J
	cobalt	156.4	W-01S1-1	59.9 J
			W-25S1-1	54.7 J
	copper	156.9	W-01S1-1	79.8 J
			W-25S1-1	65.9 J
			Blind Duplicate #1-1	51.1 J
	iron	160.8	SBW-10-1	613000 J
			W-23T-1	286000 J
			W-24T-1	161000 J
			W-01S1-1	92900 J
			W-09/S1-1	303000 J
			W-25S1-1	89600 J
			W-08/S1-1	281000 J
			Blind Duplicate #1-1	66600 J

Field Duplicate Sample ID	Analyte	RPD	Affected Samples	Qualified Result (µg/L)
	lead	145.2	SBW-10-1	163 J
			W-23T-1	106 J
			W-24T-1	52.3 J
			W-01S1-1	48.2 J
			W-09/S1-1	116 J
			W-25S1-1	37.3 J
			W-08/S1-1	78.5 J
			Blind Duplicate #1-1	25.9 J
	magnesium	143.0	SBW-10-1	316000 J
			W-23T-1	136000 J
			W-24T-1	125000 J
			Field/Equipment Blank #1-1	5000 UJ
			W-01S1-1	57200 J
			W-09/S1-1	153000 J
			W-25S1-1	86500 J
			W-08/S1-1	253000 J
			Blind duplicate #1-1	52500 J
	manganese	157.6	W-01S1-1	2640 J
			W-25S1-1	4030 J
			Blind Duplicate #1-1	1730 J
	nickel	142.1	SBW-10-1	371 J
			W-23T-1	212 J
			W-24T-1	137 J
			W-01S1-1	82.8 J
			W-09/S1-1	240 J
			W-25S1-1	90.0 J
			W-08/S1-1	228 J
			Blind Duplicate #1-1	62.8 J
	potassium	145.0	SBW-10-1	38200 J
			W-23T-1	16800 J
			W-24T-1	10200 J
			W-01S1-1	9010 J
			W-09/S1-1	17900 J
			W-25S1-1	6740 J
			W-08/S1-1	19400 J
			Blind Duplicate #1-1	6090 UJ
	vanadium	151.5	W-01S1-1	85.0 J
			W-25S1-1	73.4 J
			Blind Duplicate #1-1	52.7 J
	zinc	159.6	W-01S1-1	232 J
			W-25S1-1	239 J
			Blind Duplicate #1-1	155 J

Field Duplicate Sample ID	Analyte	RPD	Affected Samples	Qualified Result (µg/L)
Blind Duplicate #2-1	aluminum	185.4	SBW-21-1	93200 J
			W-011/S1-1	234000 J
			Equipment Blank #2-1	200 UJ
			W-12/S1-1	181000 J
			W-03-1	11500 J
			W-04S1-1	62200 J
			W-02-1	12000 J
			Blind Duplicate #2-1	455 J
			W-03/S2-1	375000 J
			W-05-1	19300 J
			W-06S-1	30600 J
			W-22/S1-1	22900 J
			W-04D-1	11200 J
			W-06D-1	59600 J
			W-07/S1-1	37500 J
	calcium	58.9	SBW-21-1	77500 J
			W-011/S1-1	758000 J
			Equipment Blank #2-1	5000 UJ
			W-12/S1-1	560000 J
			W-03-1	74800 J
			W-04S1-1	126000 J
			W-02-1	135000 J
			Blind Duplicate #2-1	73600 J
			W-03/S2-1	777000 J
			W-05-1	128000 J
			W-06S-1	106000 J
			W-22/S1-1	97000 J
			W-04D-1	123000 J
			W-06D-1	332000 J
			W-07/S1-1	113000 J
	chromium	160.0	W-03-1	56.3 J
			W-04S1-1	280 J
			W-02-1	345 J
			Blind Duplicate #2-1	38.3 J
			W-05-1	23.5 J
			W-06S-1	91.6 J
			W-22/S1-1	109 J
			W-04D-1	16.4 J
			W-07/S1-1	38.3 J

Field Duplicate Sample ID	Analyte	RPD	Affected Samples	Qualified Result (μg/L)
	iron	144.7	SBW-21-1	156000 J
			W-011/S1-1	456000 J
			Equipment Blank #2-1	100 UJ
			W-12/S1-1	325000 J
			W-03-1	22400 J
			W-04S1-1	125000 J
			W-02-1	29200 J
			Blind Duplicate #2-1	4680 J
			W-03/S2-1	566000 J
			W-05-1	34600 J
			W-06S-1	72800 J
			W-22/S1-1	41200 J
			W-04D-1	18300 J
			W-06D-1	113000 J
			W-07/S1-1	60000 J
	lead	167.6	SBW-21-1	126 UJ
			W-011/S1-1	194 J
			Equipment Blank #2-1	4.7 UJ
			W-12/S1-1	120 J
			W-03-1	14.0 UJ
			W-04S1-1	241 J
			W-02-1	47.7 J
			Blind Duplicate #2-1	4.2 UJ
			W-03/S2-1	188 J
			W-05-1	16.8 UJ
			W-06S-1	30.4 J
			W-22/S1-1	19.3 UJ
			W-04D-1	10.3 UJ
			W-06D-1	48.7 J
			W-07/S1-1	50.8 J
	magnesium	69.4	SBW-21-1	56100 J
			W-011/S1-1	336000 J
			Equipment Blank #2-1	5000 UJ
			W-12/S1-1	265000 J
			W-03-1	42900 J
			W-04S1-1	60800 J
			W-02-1	58200 J
			Blind Duplicate #2-1	28200 J
			W-03/S2-1	373000 J
			W-05-1	59800 J
			W-06S-1	62900 J
			W-22/S1-1	48100 J
			W-04D-1	57700 J
			W-06D-1	145000 J
			W-07/S1-1	59000 J

Field Duplicate Sample ID	Analyte	RPD	Affected Samples	Qualified Result (µg/L)
	manganese	65.4	Equipment Blank #2-1	15 UJ
			W-03-1	1040 J
			W-04S1-1	2270 J
			W-02-1	1550 J
			Blind Duplicate #2-1	786 J
			W-05-1	1360 J
			W-06S-1	2810 J
			W-22/S1-1	1780 J
			W-04D-1	1230 J
			W-07/S1-1	4500 J
	nickel	150.6	SBW-21-1	166 J
			W-011/S1-1	311 J
			W-12/S1-1	310 J
			W-03-1	65.1 J
			W-04S1-1	1400 J
			W-02-1	469 J
			Blind Duplicate #2-1	66.1 J
			W-03/S2-1	1080 J
			W-05-1	46.6 J
			W-06S-1	51.1 J
			W-22/S1-1	120 J
			W-06D-1	82.2 J
			W-07/S1-1	56.7 J
	zinc	113.6	SBW-21-1	546 J
			W-011/S1-1	1050 J
			W-12/S1-1	1240 J
			W-03-1	56.7 J
			W-04S1-1	389 J
			W-02-1	74.4 J
			Blind Duplicate #2-1	20.5 J
			W-03/S2-1	1540 J
			W-05-1	84.5 J
			W-06S-1	155 J
			W-22/S1-1	174 J
			W-04D-1	44.5 J
			W-06D-1	273 J
			W-07/S1-1	173 J
Blind Duplicate #3-1	aluminum	191.5	W-04SI-1	553 J
			W-08SI-1	1680 J
			Pump/Field Equipment Blank #1-1	200 UJ
			W-25DI-1	1180 J
			W-25SI-1	2900 J
			W-01B-1	200 UJ
			W-07SI-1	12700 J
			W-09B-1	200 UJ
			W-09SI-1	1910 J
			Dickinson-1	200 UJ
			W-04DI-1	200 UJ
			W-08B-1	200 UJ

Field Duplicate Sample ID	Analyte	RPD	Affected Samples	Qualified Result (µg/L)
	chromium	159.3	W-04SI-1	26.5 J
			W-25DI-1	30.2 J
			W-25SI-1	75.9 J
			W-07SI-1	136 J
			W-09B-1	10 UJ
			W-09SI-1	148 J
			W-01DI-1	10 UJ
			W-04B-1	10 UJ
			W-08B-1	10 UJ
	iron	198.8	W-04SI-1	5160 J
			Blind Duplicate #3-1	100 UJ
			W-08SI-1	534 J
			W-25DI-1	3140 J
			W-25SI-1	9220 J
			W-01B-1	516 J
			W-07SI-1	31000 J
			W-09B-1	2560 J
			Ryder Spring-1	100 UJ
			W-09SI-1	22500 J
			Dickinson-1	100 UJ
			W-04DI-1	485 J
			W-04B-1	620 J
			W-08B-1	910 J
	lead	189.8	W-08SI-1	3 UJ
			Olin-1	3 UJ
			Dickinson-1	18.6 J
			W-04DI-1	3.3 UJ
			W-04B-1	3 UJ
			W-08B-1	3 UJ
	manganese	198.3	W-04SI-1	238 J
			W-25DI-1	92.5 J
			W-25SI-1	380 J
			W-01B-1	15 UJ
			W-07SI-1	724 J
			W-09B-1	41.6 J
			W-09SI-1	326 J
			W-04DI-1	16.9 J
			W-04B-1	33.8 J
			W-08B-1	19.2 J

Field Duplicate Sample ID	Analyte	RPD	Affected Samples	Qualified Result (µg/L)
	zinc	188.7	W-04SI-1	131 J
			Blind Duplicate #3-1	20 UJ
			W-08SI-1	26.5 UJ
			W-25DI-1	20.5 UJ
			W-25SI-1	109 J
			W-01B-1	33.4 UJ
			W-07SI-1	101 J
			W-09B-1	34.7 UJ
			Ryder Spring-1	20 UJ
			W-09SI-1	468 J
			Olin-1	20 UJ
			Dickinson-1	20 UJ
			W-04DI-1	20 UJ
			W-04B-1	47.0 UJ
			W-08B-1	57.2 UJ
Blind Duplicate #3-1-F	aluminum	196.3	Blind Duplicate #3-1-F	1290 J
			W-08SI-1-F	357 J
			W-25DI-1-F	407 J
			W-25SI-1-F	299 J
			W-01B-1-F	200 UJ
			W-07SI-1-F	200 UJ
			W-09B-1-F	200 UJ
			Ryder Spring-1-F	200 UJ
			W-09SI-1-F	200 UJ
			Olin-1-F	200 UJ
			Dickinson-1-F	200 UJ
			W-04DI-1-F	200 UJ
			W-04B-1-F	200 UJ
	iron	199.2	Blind Duplicate #3-1-F	1410 J
			W-09B-1-F	181 J
			W-04B-1-F	100 UJ
	lead	189.2	Blind Duplicate #3-1-F	36.2 J
	manganese	198.0	Blind Duplicate #3-1-F	203 J
			W-25DI-1-F	15 UJ
			W-25SI-1-F	15 UJ
			W-01B-1-F	15 UJ
			W-07SI-1-F	15 UJ
			W-09B-1-F	18.3 UJ
			W-09SI-1-F	15 UJ
			W-04DI-1-F	15 UJ
			W-04B-1-F	34.6 J
			W-08B-1-F	15 UJ
	zinc	192.3	Blind Duplicate #3-1-F	102 J
			W-01B-1-F	20 UJ
			W-09B-1-F	20 UJ
			Ryder Spring-1-F	20 UJ
			Olin-1-F	20 UJ
			Dickinson-1-F	20 UJ
			W-04DI-1-F	20 UJ
			W-04B-1-F	20 UJ
			W-08B-1-F	20 UJ

Laboratory Control Sample Analysis

LCS analysis percent recovery criteria of 80.0% to 120.0% were exceeded for silver for analyzed on 6/10/93. Samples qualified for this excursion are tabulated below.

Laboratory Control Sample ID	Analyte	Affected Samples	Qualified Result (µg/L)
L060893W1	silver	W-04SI-1	4.0 UJ
		Blind Duplicate #3-1	
		Pump/Field Equipment Blank #1-1	
		W-25DI-1	
		W25SI-1	
		W-01B-1	
		W-07SI-1	
		W-09B-1	
		Ryder Spring-1	
		W-09SI-1	

Furnace Analytical Spike Analysis

Furnace analytical spike recovery of 85.0% to 115.0% were exceeded for arsenic, thallium, and selenium. Due to these excursions, the detected and non-detected results for these samples were approximated as tabulated below.

Analyte	Affected Samples	%Recovery	Qualified Result (µg/L)
arsenic	SBW-10-1-F	47.7	4.0 UJ
	W-07/S1-1-F	82.1	4.0 UJ
	Olin-1	80.4	4.0 UJ
	W-04B-1	77.0	4.0 UJ

Analyte	Affected Samples	%Recovery	Qualified Result (µg/L)
thallium	Blind Duplicate #1-1-F	74.8	1.0 UJ
	Field Blank #1-1-F	73.9	1.0 UJ
	SBW-10-1-F	70.5	1.0 UJ
	W-01S1-1-F	73.0	1.0 UJ
	W-08/S1-1-F	70.5	1.0 UJ
	W-09/S1-1-F	72.0	1.0 UJ
	W-24T-1-F	76.6	1.0 UJ
	W-25S1-1-F	71.4	1.0 UJ
	SBW-21-1	65.8	1.0 UJ
	W-011/S1-1	32.2	1.0 UJ
	W-12/S1-1	76.6	1.0 UJ
	W-02-1	79.5	1.0 UJ
	Blind Duplicate #2-1	77.9	1.0 UJ
	W-03/S2-1	70.8	1.0 UJ
	W-22/S1-1	34.6	1.0 UJ
	SBW-21-1-F	83.3	1.0 UJ
	W-011/S1-1-F	46.8	1.0 UJ
	W-02-1-F	77.1	1.0 UJ
selenium	W-04S-1-F	74.9	3.0 UJ
	W-02-1-D	84.3	3.0 UJ
	W-04D-1-F	82.5	3.0 UJ
	W-25DI-1	84.0	3.0 UJ
	W-25SI-1	67.3	3.0 UJ
	W-01B-1	74.3	3.0 UJ
	W-09SI-1	76.5	3.0 UJ
	Dickinson-1	79.7	3.0 UJ
	W-04B-1	71.2	3.0 UJ
	W-09B-1-F	84.3	3.0 UJ

ICP Serial Dilution Analysis

ICP serial dilution %D criterion of less than 15% was exceeded for beryllium with a value of 95.9% for serial dilution sample SBW-21-1. Due to this excursion, detected results for this analyte were approximated (J) as tabulated below.

ICP Serial Dilution ID	Analyte	%D	Affected Samples	Qualified Result (µg/L)
SBW-21-1	beryllium	95.9	Equipment Blank #2-1 Blind Duplicate #2-1	0.10 UJ

Element Quantitation and Reported Detection Limits

Detected sample results that were greater than the IDLs but less than the CRDLs which were identified by the laboratory with a "B" qualifier were qualified as approximated (J).

Overall Data Assessment

Overall, the laboratory performed inorganics analyses in accordance with the requirements specified in the methods listed in Section 2.02. These data have been determined to be usable for qualitative and quantitative purposes. Results for several analytes were qualified with a "U" based on calibration, field/equipment, and preparation blank criteria. Results were approximated for analytes detected at positive and negative concentrations in the ICSA solution A for several samples. Analyte results were also approximated in a majority of the samples for matrix spike analysis, laboratory duplicate analysis, field duplicate analysis, laboratory control sample analysis, furnace analytical spike analysis, and ICP serial dilution analysis criteria.

4.15.2 Target Compound List Volatiles Analysis

Thirty-one ground water samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, field duplicate analysis, internal standards recovery, compound identification and quantitation, tentatively identified compounds, and system performance. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration minimum RF criterion of greater than 0.05 was exceeded for 2-butanone with values of 0.02382 and 0.02237 for the initial calibrations analyzed on 5/29/93 and 6/4/93, respectively. Due to these excursions the non-detected samples results reported for 2-butanone were determined to be unusable (R) in 88 Round I ground water volatile samples, equipment blanks, and trip blanks.

Initial calibration %RSD criterion of less than 30.0% was exceeded for bromomethane with a value of 30.590% for the calibration analyzed on 5/29/93. Qualification of sample results due to this excursion were not required since the %RSD was less then 50.0% and this compound was not detected in the associated samples.

Continuing Calibration

Continuing calibration minimum RF criterion of greater than 0.05 was exceeded for 2-butanone for continuing calibrations analyzed on 6/1/93, 6/2/93, 6/3/93, 6/5/93, 6/9/93, and 6/10/93. Qualification of sample results due to these excursions was not required since the associated samples were previously qualified for exceeding initial calibration minimum RF criterion.

Continuing calibration %D criterion of less than 25.0% was exceeded for bromomethane for the calibrations analyzed on 6/1/93, 6/3/93, 6/5/93, and 6/10/93.

Qualification of sample results for these excursions was not required since the %Ds were less than 50.0% and bromomethane was not detected in the associated samples.

Reference Standard Analysis

Reference standard recovery criteria of 60.0% to 140.0% specified in the QAPP for bromomethane were exceeded on 6/1/93 and 6/4/93 with recoveries of 170.0% and 160.0%, respectively. Qualification of sample data was not required since bromomethane was not detected in the associated samples.

Document Completeness

The Form I VOA for lab sample ID# S2063 reported the sample number as W-06S-1. The correct sample number for lab sample ID# S2063 is W-22/S1-1.

Overall Data Assessment

Overall, the laboratory performed volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.02. The majority of the volatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Results for 2-butanone were determined to be unusable based on calibration minimum RF criteria. The Form I VOA for lab sample ID# S2063 reported the sample number as W-06S-1. The correct sample number for lab sample ID# S2063 is W-22/S1-1.

4.15.3 Target Compound List Semivolatiles Analysis

Twenty water samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8270 were found to meet validation criteria: holding times, GC/MS instrument tuning, blank analysis, matrix spike/matrix spike duplicate analysis, reference standard analysis, field duplicate analysis, compound identification and quantitation, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

The initial calibration analyzed on 4/30/93 exceeded minimum %RSD criterion of less than 30% for 4-chlorophenyl-phenylether (38.286%) and fluorene (34.118%). Qualification of sample data was not required since the %RSD was less than 50% and these compounds were not detected in the associated samples.

Continuing Calibration

Continuing calibration %D criterion of less than 25% was also exceeded for the continuing calibrations and compounds listed below. Qualification of sample results was not required since these compounds were not detected in the affected samples and the %Ds were less than 50%.

Date Analyzed	Compound	%D
6/9/93	2,4-dinitrophenol	32.28
6/15/93	1,2-diphenylhydrazine	28.43

Surrogate Recovery

Samples W-24T-1 and W-04DI-1 exceeded the surrogate recovery upper criteria limits for 2-fluorobiphenyl, terphenyl-d14, and 2,4,6-tribromophenol. These criteria were exceeded due to the low internal standard recoveries exhibited for these samples. Qualification of sample results for exceeded surrogate recovery criteria was not required since recoveries were greater than 100.0% and the affected compounds were not detected in the samples.

Internal Standards Recovery

Internal standard recovery criteria of -50.0%/+100.0% were exceeded for samples W-24T-1, W-04DI-1, and Blind Duplicate #1-1. The internal standards that exceeded criteria and the associated compounds for these samples are tabulated below. Due to these excursions the non-detected results for the associated compounds listed below were determined to be unusable (R).

Sample ID	Internal Standard	Internal Standard Area	Internal Standard Area Limits	Affected Compounds
W-24T-1	acenaphthene-d10	18966	50912 to 203646	hexachlorocyclopentadiene 2,4,6-trichlorophenol 2,4,5-trichlorophenol 2-chloronaphthalene 2-nitroaniline dimethylphthalate acenaphthylene 2,6-dinitrotoluene 3-nitroaniline acenaphthene 2,4-dinitrophenol 4-nitrophenol dibenzofuran 2,4-dinitrotoluene diethylphthalate 4-chlorophenyl-phenylether fluorene 4-nitroaniline

Sample ID	Internal Standard	Internal Standard Area	Internal Standard Area Limits	Affected Compounds
W-24T-1	phenanthrene-d10	62679	93737 to 374948	4,6-dinitro-2-methylphenol N-nitrosodiphenylamine 4-bromophenyl-phenylether hexachlorobenzene pentachlorophenol phenanthrene anthracene di-n-butylphthalate fluoranthene
W-24T-1	chrysene-d12	6382	97424 to 389696	pyrene butylbenzylphthalate 3,3'-dichlorobenzidine benzo(a)anthracene chrysene bis(2-ethylhexyl)phthalate
W-24T-1	perylene-d12	221	115303 to 461212	di-n-octylphthalate benzo(b)fluoranthene benzo(k)fluoranthene benzo(a)pyrene indeno(1,2,3-cd)pyrene dibenzo(a,h)anthracene benzo(g,h,i)perylene
Blind Duplicate #1-1	perylene-d12	32692	109001 to 436006	di-n-octylphthalate benzo(b)fluoranthene benzo(k)fluoranthene benzo(a)pyrene indeno(1,2,3-cd)pyrene dibenzo(a,h)anthracene benzo(g,h,i)perylene
W-04DI-1	chrysene-d12	54762	95886 to 383544	pyrene butylbenzylphthalate 3,3'-dichlorobenzidine benzo(a)anthracene chrysene bis(2-ethylhexyl)phthalate
W-04DI-1	perylene-d12	1350	115038 to 460152	di-n-octylphthalate benzo(b)fluoranthene benzo(k)fluoranthene benzo(a)pyrene indeno(1,2,3-cd)pyrene dibenzo(a,h)anthracene benzo(g,h,i)perylene

Tentatively Identified Compounds

Several tentatively identified compounds (TICs) were detected in the method blanks. Sample TICs with relative retention times matching the retention times of the

TICs in the method blanks were qualified as unusable (R). Samples requiring qualification are summarized below.

Sample ID#	TIC Retention Time (min)	
	Sample	Blank
W-23T-1	8.31 26.28	8.30 26.29
Field Equipment Blank (5/24/93)	6.94 8.29	6.92 8.30
Blind Duplicate #1-1	6.83 7.85 8.17	6.83 7.82 8.18
SBW-21-1	11.42 19.63	11.43 19.57
W-03-1	9.36 10.71	9.34 10.69
W-04S-1	9.33	9.34
W-02-1	9.37 10.70	9.34 10.69
W-03/S2-1	9.39 10.74	9.34 10.69
W-05-1	7.94 9.35 10.69	7.94 9.34 10.69
W-06S-1	7.95 9.36 10.69	7.94 9.34 10.69
W-08SI-1	9.30	9.29
W-04SI-1	9.28 10.64	9.29 10.63
Blind Duplicate #3-1	7.87 9.28 10.64	7.95 9.29 10.63
Pump Field/Equipment Blank #1-1	9.27 10.64	9.29 10.63
W-01B-1	8.00 9.29 10.64	7.95 9.29 10.63
W-07SI-1	7.91 9.28 10.63	7.95 9.29 10.63
W-04B-1	7.85 9.23 10.56	7.95 9.29 10.63

Sample ID#	TIC Retention Time (min)	
	Sample	Blank
W-08B-1	7.92	7.95
	9.27	9.29
	10.62	10.63

Overall Data Assessment

Overall, the laboratory performed semivolatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.02. The majority of the semivolatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Non-detected results for several compounds were determined to be unusable for W-24T-1, W-04DI-1, and Blind Duplicate #1-1 based in internal standard recovery criteria. Sample TICs with retention times and mass spectral criteria matching TICs detected in the method blanks were determined to be unusable (R) for several samples.

4.15.4 PCB/Pesticide Analysis

Two water samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8080 were found to meet validation criteria: holding times, instrument performance, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, field duplicate analysis, reference standard analysis, compound identification and quantitation, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration %RSD criterion of less than 10% was exceeded for several of the PCB/pesticide compounds with values that ranged as high as 19.89% Qualification of sample data for these compounds was not required since they were not detected in the associated samples.

Continuing Calibration

Continuing calibration %D criterion of less than 15% was exceeded for endrin aldehyde. Qualification of sample data for this compound was not required since it was not detected in the associated samples.

Overall Data Assessment

Overall, the laboratory performed pesticide/PCB analyses in accordance with the requirements specified in the methods listed in Section 2.02. These data have been determined to be usable for qualitative and quantitative purposes. Minor excursions that did not result in the qualification of data were observed for initial and continuing calibration criteria.

4.16 Round II Ground Waters

4.16.1 Target Analyte List Inorganics Analysis

QA/QC parameters for TAL inorganic analyses were evaluated for sixty-seven water samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February

1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration, CRDL standard analysis, laboratory control sample analysis, quarterly detection limit verification and ICP interelement correction factors, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Preparation Blank Analysis

The preparation blanks contained concentrations of aluminum, antimony, calcium, chromium, copper, lead, magnesium, sodium, and zinc that were greater than their IDLs. Blank action levels were calculated at five times the blank concentration for each of these analytes. Detected sample results that were less than the blank action level were qualified with a "U". The blanks containing analytes above their IDLs and the qualifications applied to the associated samples are tabulated below.

Blank Sample ID	Analyte	Blank Concentration (µg/L)	Affected Samples	Qualifier
PB062893W1	copper	3.0	Equipment Blank #1-2	U
	magnesium	5.5	Equipment Blank #1-2	U
	sodium	1700	W-23T-2 W-24T-2 W-01S1-2 SBW-10-2 W-09S1-2 W-25S1-2 W-08S1-2 SBW-21-2 Equipment Blank #1-2	U
	zinc	2.0	Equipment Blank #1-2	U

Blank Sample ID	Analyte	Blank Concentration (µg/L)	Affected Samples	Qualifier
PB062993W1	antimony	2.6	W-23T-2F W-24T-2F W-01S1-2F SBW-10-2F W-09S1-2F W-25S1-2F W-08S1-2F SBW-21-2F W-04D-2F	U
PB070693W2	lead	1.0	W-09B-2F	U
PB070793W1	calcium	840	Equipment Blank #3-2 Equipment Blank #4-2	U
	sodium	1200	W-09SI-2 W01B W-04B-2 W-04DI-2 Equipment Blank #3-2 Equipment Blank #4-2 W-08B-2 Olin-2 W-09B-2 Ryder Spring-2	U

Equipment Blank Analysis

The equipment blanks contained concentrations of chromium, copper, iron, lead, manganese, sodium, and zinc that were greater than their IDLs. Blank action levels were calculated at five times the blank concentration for each of these analytes. Detected sample results that were less than the blank action level were qualified with a "U". The blanks containing analytes above their IDLs and the qualifications applied to the associated samples are tabulated below.

Blank Sample ID	Analyte	Concentration (µg/L)	Affected Samples	Qualifier
Equipment Blank #1-2	chromium	4.3	W-01S1-2 W-25S1-2 W-04D-2	U

Blank Sample ID	Analyte	Concentration (µg/L)	Affected Samples	Qualifier
	copper	8.1	W-23T-2 W-01S1-2 SBW-10-2 W-09S1-2 W-08S1-2 SBW-21-2 W-04S-2 W-25S1-2 W-04D-2 W-24T-2	U
	lead	2.1	W-24T-2 W-25S1-2 W-04D-2	U
Equipment Blank #2-2	sodium	1610	W-05-2 W-06S-2 W-03S2-2 Blind Duplicate #1-2 W-07S1-2 Blind Duplicate #2-2 W-06D-2 W-12S1-2	U
	zinc	18.5	W-05-2 W-03-2 W-06S-2 Blind Duplicate #2-2 W-07S1-2 W-11S1-2 W-22S1-2 Blind Duplicate #2-2	U
Equipment Blank #3-2	iron	5.3	W-04DI-2	U
	manganese	1.4	W01B W-04DI-2	U
	zinc	7.2	W01B W-04B-2 W-04DI-2	U
Equipment Blank #4-2	zinc	7.2	W-08SI-2 W-25DI-2 Olin-2 W-09B-2 Ryder Spring-2 Dickinson-2	U

ICP Interference Check Sample Analysis

The interference check samples analyzed on 7/7/93, 7/13/93, and 7/14/93 contained concentrations of various analytes in solution A that were greater than their IDLs. Potassium was detected in the ICSA A solutions at negative concentrations greater than two times the absolute value of the IDL. Due to these excursions, detected results for the analytes listed below were approximated for samples containing one or more of the interfering analytes (aluminum, calcium, iron, or magnesium) at concentrations greater than half the ICSA concentrations. Detected sample results previously qualified for blank contamination were qualified with a "UJ". Samples requiring qualification for these excursions and the affected analytes are tabulated below.

Date Analyzed	Analyte	ICSA Solution A Concentration (µg/L)	Affected Samples	Qualified Result (µg/L)
7/7/93	antimony	96	W-03S2-2	127 J
	barium	5.0		1430 J
	beryllium	3.0		9.7 J
	chromium	6.0		180 J
	cobalt	9.0		205 J
	copper	5.0		295 J
	manganese	12		9290 J
	potassium	-3390		23900 J
	sodium	139		6340 UJ
	vanadium	34		206 J
	zinc	7.0		702 J
7/13/93	barium	5.0	W-08SI-2F	2490 J
	potassium	-2890		30000 J
	sodium	141		28400 J
7/14/93	barium	3.0	W-08SI-2	2230 J
	potassium	-2880		26100 J
	sodium	134		26700 J

Matrix Spike Analysis

Matrix spike recovery criteria of 75.0% to 125.0% were exceeded several analytes. The analytes that exceeded criteria and the qualification applied to the associated samples are tabulated below.

Matrix Spike Sample ID	Analyte	%Recovery	Affected Samples	Qualified Result (µg/L)
W-08SI-2	silver	68.4	W-04SI-2	4.0 UJ
			W01B	4.0 UJ
			W-09SI-2	4.0 UJ
			W-04B-2	4.0 UJ
			W-04DI-2	4.0 UJ
			W-25SI-2	4.0 UJ
			W-07SI-2	4.0 UJ
			W-08SI-2	4.0 UJ
			W-25DI-2	4.0 UJ
W-03-2	arsenic	42.3	W-05-2	4.0 UJ
			W-03-2	4.0 UJ
			W-03S2-2	4.0 UJ
			Blind Duplicate #1-2	4.0 UJ
			W-07S1-2	4.0 UJ
			W-02-2S1-2	4.0 UJ
			Equipment Blank #2-2	4.0 UJ
			Blind Duplicate #2-2	4.0 UJ
			W-06D-2	4.0 UJ
			W-12S1-2	4.0 UJ
	manganese	136.0	W-05-2	212 J
			W-03-2	1280 J
			W-06S-2	865 J
			Blind Duplicate #1-2	987 J
			W-07S1-2	3350 J
			W-11S1-2	5450 J
			W-02-2S1-2	746 J
			Blind Duplicate #2-2	366 J
			W-06D-2	1420 J
			W-12S1-2	1830 J
			W-22S1-2	3000 J
	selenium	65.2	W-05-2	3.0 UJ
			W-03-2	3.0 UJ
			W-06S-2	3.0 UJ
			W-03S2-2	15.0 UJ
			Blind Duplicate #1-2	3.0 UJ
			W-07S1-2	15.0 UJ
			W-11S1-2	3.0 UJ
			W-02-2S1-2	3.0 UJ
			Equipment Blank #2-2	3.0 UJ
			Blind Duplicate #2-2	3.0 UJ
			W-06D-2	3.0 UJ
			W-12S1-2	3.0 UJ
			W-22S1-2	3.0 UJ

Matrix Spike Sample ID	Analyte	%Recovery	Affected Samples	Qualified Result (µg/L)
W-25S1-2	aluminum	157.5	W-23T-2	20800 J
			W-24T-2	6780 J
			W-01S1-2	9710 J
			SBW-10-2	20900 J
			W-09S1-2	12900 J
			W-25S1-2	7460 J
			W-08S1-2	17000 J
			SBW-21-2	10500 J
			W-04S-2	8210 J
			W-04D-2	7280 J
	selenium	74.1	W-23T-2	15.0 UJ
			W-24T-2	3.0 UJ
			W-01S1-2	3.0 UJ
			SBW-10-2	3.0 UJ
			W-09S1-2	3.0 UJ
			W-25S1-2	3.0 UJ
			W-08S1-2	3.0 UJ
			SBW-21-2	3.0 UJ
			W-04S-2	3.0 UJ
			W-04D-2	3.0 UJ
			Equipment Blank #1-2	3.0 UJ
	thallium	57.2	W-23T-2	1.0 UJ
			W-24T-2	1.0 UJ
			W-01S1-2	1.0 UJ
			SBW-10-2	10.0 UJ
			W-09S1-2	1.0 UJ
			W-25S1-2	1.0 UJ
			W-08S1-2	1.0 UJ
			SBW-21-2	1.0 UJ
			W-04S-2	1.0 UJ
			W-04D-2	1.0 UJ
			Equipment Blank #1-2	1.0 UJ
W-25S1-2	selenium	73.5	W-23T-2F	3.0 UJ
			W-24T-2F	3.0 UJ
			W-01S1-2F	3.0 UJ
			SBW-10-2F	3.0 UJ
			W-09S1-2F	3.0 UJ
			W-25S1-2F	3.0 UJ
			W-08S1-2F	3.0 UJ
			SBW-21-2F	3.0 UJ
			W-04S-2F	3.0 UJ
			W-04D-2F	3.0 UJ
			Equipment Blank #1-2F	3.0 UJ

Laboratory Duplicate Analysis

Duplicate RPD criterion of less than 20.0% for water samples was exceeded for copper with a value of 200.0% for the duplicate analysis of sample W-08SI-2. Detected copper results were approximated (J) for the associated samples tabulated below.

Lab Duplicate Sample ID	Analyte	Affected Samples	Qualified Result (µg/L)
W-08SI-2	copper	W-04SI-2	26.1 J
		W01B	10.2 J
		W-09SI-2	7.9 J
		W-04B-2	7.2 J
		W-04DI-2	10.2 J
		W-25SI-2	269 J
		W-07SI-2	43.5 J
		W-08SI-2	10.9 J

Field Duplicate Analysis

Field duplicate RPD criterion of less than 30% for water samples was exceeded for aluminum, iron, and manganese for Blind Duplicate #1-2 (W-11/S1-2) and Blind Duplicate #2-2 (W-05-2). Detected sample results were qualified as approximate (J) for the total metals samples tabulated below. Analytes that exceeded RPD criterion for only one of the duplicate samples did not require qualification.

Analyte	Associated Samples	Qualified Results (µg/L)
aluminum	W-05-2	2410 J
	W-03-2	12900 J
	W-06S-2	8700 J
	W-03S2-2	143000 J
	Blind Duplicate #1-2	10300 J
	W-07S1-2	12500 J
	W-11/S1-2	13300 J
	W-02-2S1-2	451 J
	Blind Duplicate #2-2	3740 J
	W-06D-2	22000 J
	W-12/S1-2	17500 J
	W-22/S1-2	45400 J
	W-04SI-2	1450 J
	W-09SI-2	995 J
	W-25SI-2	8420 J
	W-07SI-2	17100 J
	W-08SI-2	1070 J
	W-25DI-2	1000 J
iron	W-23T-2	38400 J
	W-24T-2	11600 J
	W-01S1-2	13700 J
	SBW-10-2	38400 J
	W-09S1-2	35700 J
	W-25S1-2	16300 J
	W-08/S1-2	31600 J
	SBW-21-2	20200 J
	W-04S-2	18900 J
	W-04D-2	11500 J
	W-05-2	4860 J
	W-03-2	28900 J
	W-06S-2	19300 J
	W-03S2-2	243000 J
	Blind Duplicate #1-2	18000 J
	W-07S1-2	18900 J
	W-11/S1-2	71500 J
	W-02-2S1-2	2930 J
	Blind Duplicate #2-2	7140 J
	W-06D-2	41900 J
	W-12/S1-2	32600 J
	W-22/S1-2	81800 J
	W-04SI-2	15200 J
	W01B	172 J
	W-09SI-2	10300 J
	W-04B-2	235 J
	W-25SI-2	32600 J
	W-07SI-2	42000 J
	W-08SI-2	327 J
	W-25DI-2	122 J
	W-08B-2	254 J
	W-09B-2	424 J

Analyte	Associated Samples	Qualified Results (µg/L)
manganese	W-23T-2	1080 J
	W-24T-2	600 J
	W-01S1-2	1170 J
	SBW-10-2	1260 J
	W-09S1-2	9550 J
	W-25S1-2	3640 J
	W-08/S1-2	1220 J
	SBW-21-2	1430 J
	W-04S-2	776 J
	W-04D-2	535 J
	W-04SI-2	737 J
	W-09SI-2	153 J
	W-04B-2	34.8 J
	W-25SI-2	1520 J
	W-07SI-2	1190 J
	W-08B-2	21.7 J
	W-09B-2	18.4 J

Laboratory Control Sample Analysis

Laboratory control sample percent recovery criteria of 80.0% to 120.0% were exceeded for silver analyzed on 7/6/93. Samples qualified for this excursion are tabulated below.

Analyte	Affected Samples	Qualified Result (µg/L)
silver	W-23T-2	4.0 UJ
	W-24T-2	4.0 UJ
	W-01S1-2	4.0 UJ
	SBW-10-2	4.0 UJ
	W-09S1-2	4.0 UJ
	W-25S1-2	4.0 UJ
	W-08S1-2	4.0 UJ
	SBW-21-2	4.0 UJ
	W-04S-2	4.0 UJ
	W-04D-2	4.0 UJ
	Equipment Blank #1-2	4.0 UJ

Furnace Duplicate Analysis

Furnace duplicate analysis %RSD criterion of less than 20.0% was exceeded for arsenic for sample W-06S-2. This sample was previously qualified for matrix spike interference so no additional qualification was necessary.

Furnace Analytical Spike Analysis

Furnace analytical spike recovery criteria of 85.0% to 115.0% were exceeded for arsenic, selenium, lead, and thallium. Due to these excursions, the detected and non-detected results for these samples were approximated as tabulated below.

Analyte	Affected Samples	%Recovery	Qualified Result (μg/L)
arsenic	W-04DI-2F	82.0%	4.0 UJ
selenium	W-03S2-2F	77.8	15.0 UJ
	Blind Duplicate #1-2F	83.7	3.0 UJ
	W-11S1-2F	73.0	3.0 UJ
	W-01B F	79.3	3.0 UJ
	W-25SI-2	74.8	3.0 UJ
	W-07SI-2	60.4	3.0 UJ
	W-09B-2	74.3	3.0 UJ
lead	W-02-2S1-2	81.5	3.6 J
thallium	W-25S1-2F	83.0	1.0 UJ
	W-07S1-2	67.7	1.0 UJ
	W-11S1-2	60.6	1.0 UJ
	W-02-2S1-2	82.9	1.0 UJ
	W-11S1-2F	58.5	1.0 UJ
	W-08SI-2	82.3	1.0 UJ
	Dickinson-2F	57.4	1.0 UJ

Furnace Method of Standard Additions Analysis

Furnace MSA analysis minimum correlation coefficient criterion of greater than 0.995 was exceeded for the lead analysis of W-01S1-2 and SBW-21-2. The detected lead results were approximated (J) for these samples due to these excursions.

ICP Serial Dilution Analysis

ICP serial dilution %D criterion of less than 15% was exceeded for barium, beryllium, and nickel with values of 18.6%, 38.3% and 19.3%, respectively. Due to these excursions, detected results for these analytes were approximated as tabulated below.

Analyte	%D	Affected Samples	Qualified Result (µg/L)
beryllium	38.3	W-05-2	0.10 UJ
		W-06S-2	0.10 UJ
		W-02-2S1-2	0.10 UJ
		Equipment Blank #2-2	0.10 UJ
		Blind Duplicate #2-2	0.10 UJ
nickel	19.3	W-03-2	107 J
		W-03S2-2	495 J
		W-02-2S1-2	45.3 J
		Equipment Blank #2-2	8.0 UJ
		W-06D-2	48.0 J
		W-12/S1-2	54.8 J
		W-22/S1-2	117 J
barium	18.6	W-25SI-2	489 J
		W-07SI-2	200 J
		W-25DI-2	258 J

Element Quantitation and Reported Detection Limits

Detected sample results that were greater than the IDLs but less than the CRDLs which were identified by the laboratory with a "B" qualifier were qualified as approximated (J).

Overall Data Assessment

Overall, the laboratory performed inorganics analyses in accordance with the requirements specified in the methods listed in Section 2.02. These data have been determined to be usable for qualitative and quantitative purposes. Detected results for several analytes were qualified with a "U" based on field/equipment and preparation blank criteria. Analytes detected in the ICSA solution A at positive and negative concentrations were approximated for several samples. Analyte results were also approximated for matrix spike analysis, laboratory duplicate analysis, field duplicate analysis, laboratory control sample analysis, furnace duplicate analysis, furnace analytical spike analysis, furnace method of standard additions, and ICP serial dilution analysis criteria.

4.16.2 Target Compound List Volatiles Analysis

Thirty-one ground water samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, surrogate recovery, matrix spike/matrix spike duplicate analysis, internal standards recovery, compound identification and quantitation, tentatively identified compounds, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration minimum RF criterion of greater than 0.05 was exceeded for 2-butanone with values of 0.02237, 0.01841, and 0.01852 for the initial calibrations analyzed on 6/4/93, 6/24/93, and 7/11/93, respectively. Due to these excursions the non-detected samples results reported for 2-butanone were determined to be unusable (R) all of the Round II ground water volatile samples, equipment blanks, and trip blanks.

Continuing Calibration

Continuing calibration minimum RF criterion of greater than 0.05 was exceeded for 2-butanone for continuing calibrations analyzed on 6/23/93, 6/28/93, 7/3/93, 7/4/93, 7/6/93, 7/9/93, 7/12/93, and 7/13/93. Qualification of sample results due to these excursions was not required since the associated samples were previously qualified for exceeding initial calibration minimum RF criterion.

Continuing calibration %D criterion of less than 25.0% was exceeded for acetone for the calibration analyzed on 6/28/93. Continuing calibration %D criterion was also exceeded for 4-methyl-2-pentanone and 2-hexanone for the calibrations analyzed on 6/28/93 and 7/4/93. Chloroform exceeded %D criterion for the calibration analyzed on 7/6/93. Qualification of sample results for these excursions was not required since the %Ds were less than 50.0% and these compounds were not detected in the associated samples.

<u>**Blank Analysis**</u>

Acetone was detected in Equipment/Field Blank #1-2 at a concentration of 15 μg/L. A blank action level was calculated at ten times the blank concentration. Dilutions and differences between sample and blank weights or volumes were taken into account when applying blank actions. Detected sample results below the action level were qualified with a "U". The detected acetone result for W-25S1-2 was qualified with a "U" due to this excursion.

Reference Standard Analysis

Reference standard recovery criteria of 60.0% to 140.0% specified in the QAPP for bromomethane were exceeded on 6/23/93 with a recovery of 160.0%. Qualification of sample data was not required since bromomethane was not detected in the associated samples.

Field Duplicate Analysis

Field duplicate RPD criterion of less than 30.0% was exceeded for the duplicate analysis of W-22/S1-1 (Blind Duplicate #2-2). Due to the RPD values of 200.0%, 79.4%, and 96.3% for carbon disulfide, 1,2-dichloroethene, and trichloroethene, respectively the results for these compounds reported for Blind Duplicate #2-2 and W-22/S1-2 were approximated (J, UJ).

Overall Data Assessment

Overall, the laboratory performed volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.02. The majority of the volatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Results for 2-butanone were determined to be unusable based on calibration minimum RF criteria. The detected acetone result for W-25S1-2 was qualified with a "U" based on equipment blank criteria. Results for carbon disulfide, 1,2-dichloroethene, and trichloroethene were approximated for Blind Duplicate #2-2 and W-22/S1-2 based on field duplicate criteria.

4.16.3 Target Compound List Semivolatiles Analysis

Twenty water samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8270 were found to meet validation criteria: holding times, GC/MS instrument tuning, blank analysis, matrix spike/matrix spike duplicate analysis, reference standard analysis, compound identification and quantitation, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Continuing Calibration

Continuing calibration %D criterion of less than 25% was exceeded for several compound with %D values that ranged from 25.07% to 38.54% for the calibrations analyzed on 7/1/93, 7/2/93, 7/6/93, 7/7/93, 7/13/93, and 7/23/93. Qualification of sample results was not required since these compounds were not detected in the affected samples and the %Ds were less than 50%.

Surrogate Recovery

Laboratory surrogate recovery criteria were exceeded for several samples. Sample W-02-2 exceeded surrogate recovery criteria but was also previously qualified for exceeding internal standard recovery criteria. Compounds not previously qualified for internal standard excursions were qualified for exceeding surrogate recovery criteria for this sample. The samples which exhibited surrogate recovery excursions and the qualification of data due to these excursions are tabulated below.

Sample ID	Surrogate	%Recov-ery	%Recovery Limits	Affected Compounds	Qualified Results (µg/L)
SBW-21-2	2-fluorophenol	13.0	41.0 to 111.0	phenol	10 UJ
	2,4,6-tribromophenol	18.0	45.0 to 115.0	2-chlorophenol	10 UJ
				benzyl alcohol	10 UJ
				2-methylphenol	10 UJ
				4-methylphenol	10 UJ
				2-nitrophenol	10 UJ
				2,4-dimethylphenol	10 UJ
				benzoic acid	50 UJ
				2,4-dichlorophenol	10 UJ
				4-chloro-3-methylphenol	10 UJ
				2,4,6-trichlorophenol	10 UJ
				2,4,5-trichlorophenol	50 UJ
				2,4-dinitrophenol	50 UJ
				4,6-dinitro-2-methylphenol	50 UJ
				pentachlorophenol	50 UJ
Blind Duplicate #1-2	2-fluorophenol	24.0	41.0 to 111.0	phenol	R
	2,4,6-tribromophenol	4.0	45.0 to 115.0	2-chlorophenol	R
				benzyl alcohol	R
				2-methylphenol	R
				4-methylphenol	12 J
				2-nitrophenol	R
				2,4-dimethylphenol	R
				benzoic acid	R
				2,4-dichlorophenol	R
				4-chloro-3-methylphenol	R
				2,4,6-trichlorophenol	R
				2,4,5-trichlorophenol	R
				2,4-dinitrophenol	R
				4,6-dinitro-2-methylphenol	R
				pentachlorophenol	R

Sample ID	Surrogate	%Recovery	%Recovery Limits	Affected Compounds	Qualified Results (μg/L)
W-02-2	2-fluorobiphenyl	476.0	43.0 to 116.0	phenol	12 UJ
	terphenyl-d14	596.0	31.0 to 128.0	bis(2-chloroethyl) ether	12 UJ
	phenol-d6	10.0	31.0 to 118.0	2-chlorophenol	12 UJ
	2-fluorophenol	39.0	41.0 to 111.0	1,3-dichlorobenzene	12 UJ
	2,4,6-tribromophenol	221.0	45.0 to 115.0	1,4-dichlorobenzene	12 UJ
				benzyl alcohol	12 UJ
				1,2-dichlorobenzene	12 UJ
				2-methylphenol	12 UJ
				bis(2-chloroisopropyl) ether	12 UJ
				4-methylphenol	12 UJ
				N-nitroso-di-n-propylamine	12 UJ
				hexachloroethane	12 UJ
				nitrobenzene	12 UJ
				isophorone	12 UJ
				2-nitrophenol	12 UJ
				2,4-dimethylphenol	12 UJ
				benzoic acid	60 UJ
				bis(2-chloroethoxy) methane	12 UJ
				2,4-dichlorophenol	12 UJ
				1,2,4-trichlorobenzene	12 UJ
				naphthalene	12 UJ
				4-chloroaniline	12 UJ
				hexachlorobutadiene	12 UJ
				4-chloro-3-methylphenol	12 UJ
				2-methylnaphthalene	12 UJ

Field Duplicate Analysis

Field duplicate RPD criterion of less than 30.0% for water samples was exceeded for 4-methylphenol for the analysis of Blind Duplicate #1-2 (W-05-2) with a RPD value of 200.0%. Due to this excursion the non-detected 4-methylphenol result reported for W-05-2 was approximated (UJ).

Internal Standard Analysis

Internal standard recovery criteria of -50.0%/+100.0% were exceeded for the samples and internal standard compound tabulated below. To evaluate the cause of the low internal standard recoveries these samples were reextracted and reanalyzed. The reanalyses exceeded holding time criterion of less than seven days and also exhibited low internal standard recoveries. Therefore, the reanalyses for these samples were determined to be unusable. Internal standards that exceeded criteria for the original sample analyses and the compounds requiring qualification are tabulated below. Due to these excursions detected results were approximated (J) and non-detected sample results were determined to be unusable (R) for the affected compounds.

Sample ID	Internal Standard	Internal Standard Area	Internal Standard Area Limits	Affected Compounds
W-01S1-2	chrysene-d12	47001	64664 to 258654	pyrene butylbenzylphthalate 3,3'-dichlorobenzidine benzo(a)anthracene chrysene bis(2-ethylhexyl)phthalate
W-01S1-2	perylene-d12	1040	72081 to 288324	di-n-octylphthalate benzo(b)fluoranthene benzo(k)fluoranthene benzo(a)pyrene indeno(1,2,3-cd)pyrene dibenzo(a,h)anthracene benzo(g,h,i)perylene
W-06S-2	chrysene-d12	39398	49266 to 197064	pyrene butylbenzylphthalate 3,3'-dichlorobenzidine benzo(a)anthracene chrysene bis(2-ethylhexyl)phthalate
W-06S-2	perylene-d12	938	55486 to 221946	di-n-octylphthalate benzo(b)fluoranthene benzo(k)fluoranthene benzo(a)pyrene indeno(1,2,3-cd)pyrene dibenzo(a,h)anthracene benzo(g,h,i)perylene

Sample ID	Internal Standard	Internal Standard Area	Internal Standard Area Limits	Affected Compounds
W-02-2	acenaphthene-d10	8930	28160 to 112640	hexachlorocyclopentadiene 2,4,6-trichlorophenol 2,4,5-trichlorophenol 2-chloronaphthalene 2-nitroaniline dimethylphthalate acenaphthylene 2,6-dinitrotoluene 3-nitroaniline acenaphthene 2,4-dinitrophenol 4-nitrophenol dibenzofuran 2,4-dinitrotoluene diethylphthalate 4-chlorophenyl-phenylether fluorene 4-nitroaniline
W-02-2	phenanthrene-d10	37717	51715 to 206862	4,6-dinitro-2-methylphenol N-nitrosodiphenylamine 4-bromophenyl-phenylether hexachlorobenzene pentachlorophenol phenanthrene anthracene di-n-butylphthalate fluoranthene
W-02-2	chrysene-d12	4324	49266 to 197064	pyrene butylbenzylphthalate 3,3'-dichlorobenzidine benzo(a)anthracene chrysene bis(2-ethylhexyl)phthalate
W-02-2	perylene-d12	0	55486 to 221946	di-n-octylphthalate benzo(b)fluoranthene benzo(k)fluoranthene benzo(a)pyrene indeno(1,2,3-cd)pyrene dibenzo(a,h)anthracene benzo(g,h,i)perylene
W-04SI	perylene-d12	6238	44753 to 179010	di-n-octylphthalate benzo(b)fluoranthene benzo(k)fluoranthene benzo(a)pyrene indeno(1,2,3-cd)pyrene dibenzo(a,h)anthracene benzo(g,h,i)perylene

Sample ID	Internal Standard	Internal Standard Area	Internal Standard Area Limits	Affected Compounds
W-04B-2	perylene-d12	94119	128501 to 514004	di-n-octylphthalate benzo(b)fluoranthene benzo(k)fluoranthene benzo(a)pyrene indeno(1,2,3-cd)pyrene dibenzo(a,h)anthracene benzo(g,h,i)perylene

Tentatively Identified Compounds

Several tentatively identified compounds (TICs) were detected in the method blanks. Sample TICs with relative retention times matching the retention times of the TICs in the method blanks were qualified as unusable (R). Samples requiring qualification are summarized below.

Sample ID#	TIC Retention Time (min)	
	Sample	Blank
W-23T-2	7.97	7.97
W-24T-2	6.74 7.96	6.67 7.97
W-01S1-2	6.60 7.92	6.67 7.97
SBW-10-2	6.76 7.95	6.67 7.97
W-08/S1-2	7.96	7.99
SBW-21-2	7.95	7.99
W-04S-2	6.82 7.97	6.90 7.99
Field Equipment Blank #1-2	6.81 7.96	6.90 7.99
W-05-2	6.86 7.95	6.90 7.99
W-03-2	6.83 8.01	6.90 7.99
W-06S-2	6.84 7.92	6.90 7.99

Sample ID#	TIC Retention Time (min)	
	Sample	Blank
W-03S2-2	7.94	7.99
Blind Duplicate #1-2	8.07	7.99
	9.41	9.31
	12.58	12.57
W-07S1-2	6.88	6.90
	8.01	7.99
	9.28	9.31
	12.56	12.57
Field/Equipment Blank #2-2	6.91	6.90
	7.95	7.99
	9.26	9.31
W-04Sl	6.85	6.87
	7.90	7.98
	9.19	9.28
	30.10	30.04
	31.44	31.45
W-01B	6.87	6.87
	7.93	7.98
	8.82	8.82
	9.19	9.28
	25.79	25.80
	34.71	34.78
W-04B-2	7.98	8.01
	9.05	9.10
	10.08	10.11
	14.23	14.22
	30.51	30.52
	32.83	32.83
W-04DI-2	7.91	8.01
	9.07	9.10
	10.09	10.11
	10.47	10.53
	14.21	14.22
	40.51	40.51
W-07SI-2	7.93	8.01
	9.08	9.10
	10.09	10.11
	10.46	10.53
	14.19	14.22
	29.37	29.29
	40.50	40.51

Sample ID#	TIC Retention Time (min)	
	Sample	Blank
W-08SI-2	7.97	8.01
	9.08	9.10
	10.09	10.11
	10.49	10.53
	12.20	12.23
	14.19	14.22
	15.75	15.77
	29.23	29.29
	40.52	40.51
W-08B-2	7.98	8.01
	9.09	9.10
	10.09	10.11
	10.49	10.53
	29.27	29.29
	30.51	30.52
	32.82	32.83
	40.52	40.51

Overall Data Assessment

Overall, the laboratory performed semivolatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.02. The majority of the semivolatile organics sample data were qualified as unusable or were approximated based on surrogate recovery and internal standard recovery criteria. The non-detected 4-methylphenol result for W-05-2 was approximated based on field duplicate analysis criteria. Sample TICs with retention times and mass spectral criteria matching TICs detected in the method blanks were determined to be unusable (R) for several samples.

4.16.4 PCB/Pesticide Analysis

Two water samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic*

Analyses, USEPA Region I, November 1988. As a result of the validation no excursions from the QA/QC criteria specified in Section 3.02 of this report were observed.

4.17 Air Sampling Program

4.17.1 Target Compound List Volatiles Analysis

Six air samples collected on carbon molecular sieve tubes were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method TO-2 were found to meet validation criteria: holding times, GC/MS instrument tuning, surrogate recovery, matrix spike/matrix spike duplicate analysis, reference standard analysis, internal standards recovery, compound identification and quantitation, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

Initial calibration %RSD criterion of less than 30.0% was exceeded on 10/23/93 acetone (32.0%), vinyl acetate (32.0%), 2-hexanone (40.0%) and 1,1,2,2-tetrachloro-ethane (48.5%). Qualification of sample results was not required since these compounds were not detected above their CRDLs and the %RSDs were less than 50.0%.

Continuing Calibration

The continuing calibration analyzed on 10/26/92 exceeded the %D criterion of less than 25.0% for vinyl chloride (40.0%), bromomethane (38.2%), vinyl acetate (65.7%) and 2-hexanone (26.7%). The non-detected sample results for vinyl acetate were approximated (UJ) for AS-01, AS-02, AS-03, AS-04 and AS-05 due to these excursions. Qualification of sample results was not required for vinyl chloride, bromomethane, or 2-hexanone since these compounds were not detected above their CRDLs and the %Ds were less than 50.0%. The detected results for acetone for AS-01, AS-02, AS-03, AS-04, and AS-05 were qualified with a "UJ" due to blank contamination and these calibration excursions.

Continuing calibration %D criterion were also exceeded on 10/27/92 acetone (49.6%), vinyl acetate (62.7%), 2-butanone (62.5%), benzene (26.2%), 1,2-dichloroethane (25.3%), 1,2-dichloropropane (42.8%), bromodichloromethane (32.0%), 2-hexanone (51.8%) and 1,1,2,2-tetrachloroethane (44.2%). Non-detected sample results for vinyl acetate, 2-butanone and 2-hexanone were approximated (UJ) for AS-06 and AS-07 due to these excursions. Qualification of sample results was not required for 1,2-dichloroethane, 1,2-dichloropropane, bromodichloromethane, and 1,1,2,2-tetrachloroethane since these compounds were not detected above their CRDLs and the %Ds were less than 50.0%. The detected results for acetone and benzene for AS-06 and AS-07 were qualified with a "UJ" due to blank contamination and these calibration excursions.

Blank Analysis

The method blank analyzed on 10/26/92 contained 140 ng of acetone and 46 ng of methylene chloride. Blank action levels were calculated at five times these concentrations to evaluate the effects of the blank contamination. Dilutions and differences between sample and blank weights or volumes were taken into account when applying blank actions. Detected samples results for these compounds that were less than the blank action levels were qualified with a "U". Samples qualified for these excursions included AS-01, AS-02, AS-03, AS-04, and AS-05.

The method blank analyzed on 10/27/93 contained 150 ng of acetone and 7 ng of methylene chloride. Blank action levels were calculated at ten times these concentrations to evaluate the effects of the blank contamination. Detected samples results for these compounds that were less than the blank action levels were qualified with a "U". Samples qualified for these excursions included AS-06 and AS-07.

The trip blank contained 120 ng of acetone, 55 ng of methylene chloride, 20 ng of 1,1,1-Trichloroethane, 11 ng of benzene, and 600 ng of trichlorofluoromethane. Qualification of methylene chloride data was not required since the detected methylene chloride results in the associated samples were previously qualified for method blank excursions. Detected benzene, 1,1,1-trichloroethane, and trichlorofluoromethane results were qualified with a "U" for samples AS-01, AS-02, AS-03, AS-04, AS-05, AS-06 and AS-07 due to these excursions.

Field Duplicate Analysis

Field duplicate RPD criterion of less than 50.0% were exceeded for the analysis of duplicate sample AS-07 (AS-03). The compounds that exceeded criteria and the RPD values are tabulated below. Detected and non-detected results for these compounds were approximated for AS-03 and AS-07 due to these excursions.

Compound	RPD
carbon disulfide	200.0%
carbon tetrachloride	54.3%
m,p-xylene	75.0%
tetrachloroethene	200.0%
trichloroethene	200.0%

Tentatively Identified Compounds

TICs were detected in the media blank at retention times of 10.45 and 17.18 minutes. Sample TIC results matching these retention times were determined to be unusable (R).

Overall Data Assessment

Overall, the laboratory performed method TO-2 volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.02. The majority of the volatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Detected results for acetone and benzene were qualified as "UJ" based on blank and continuing calibration %D criteria. Detected results for methylene chloride and 1,1,1-trichloroethane were qualified with a "U" based on blank criteria. Results for carbon disulfide, carbon tetrachloride, m,p-xylene, tetrachloroethene, and trichloroethene were approximated for AS-03 and AS-07 based on field duplicate analysis criteria.

TICs were detected in the media blank at retention times of 10.45 and 17.18 minutes. Sample TIC results matching these retention times were determined to be unusable (R).

4.17.2 Target Compound List Semivolatiles Analysis

Six air samples collected on XAD-2 media were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method TO-13 were found to meet validation criteria: holding times, GC/MS instrument tuning, initial calibration, surrogate recovery, reference standard analysis, field duplicate analysis, internal standards recovery, compound identification and quantitation, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Continuing Calibration

The continuing calibration analyzed on 10/26/92 exceeded %D criterion of less than 25.0% for 2-methylnaphthalene (39.7%), 3-nitroaniline (27.3%), and 4-nitrophenol (34.6%). Qualification of sample data for these compounds was not required since they were not detected in the associated samples and the %Ds were less than 50.0%.

Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike recovery criteria specified in the QAPP were exceeded for several compounds in the analysis of the media blank MS/MSD. The compounds that exceeded recovery criteria and the qualification of the associated samples are tabulated below. Qualification of data was not required for 4-nitrophenol or pentachlorophenol since the recoveries exceeded the upper criteria limits and these compounds were not detected in the associated samples.

Compound	%Recovery	%Recovery Limits	Affected Samples	Qualified Results ($\mu g/m^3$)
phenol	MS 19.0	26.0 to 90.0	AS-01	520 UJ
			AS-02	560 UJ
			AS-03	520 UJ
			AS-04	510 UJ
			AS-05	460 UJ
			AS-06	500 UJ
			AS-07	530 UJ
2,4-dinitrotoluene	MS 96.0 MSD 21.0	28.0 to 89.0	AS-01	520 UJ
			AS-02	560 UJ
			AS-03	520 UJ
			AS-04	510 UJ
			AS-05	460 UJ
			AS-06	500 UJ
			AS-07	530 UJ
pentachlorophenol	MS 190.0 MSD 200.0	17.0 to 109.0	NA	NA
4-nitrophenol	MSD 145.0	11.0 to 114.0	NA	NA

NA = None Affected

Blank Analysis

The method blank extracted on 10/20/92 and the media blank contained 19.0 ng and 73.0 ng, respectively of di-n-butylphthalate. A blank action level was calculated at ten times the highest blank concentration to evaluate the effects of the blank contamination. Dilutions and differences between sample and blank weights or volumes were taken into account when applying blank actions. Detected samples results for this compound that were less than the blank action level were qualified with a "U". Samples qualified for these excursions included AS-01, AS-02, AS-03, AS-04, AS-05, AS-06, and AS-07.

Tentatively Identified Compounds

Tentatively identified compounds were detected in the media blank at 28.36 and 34.95 minutes. A TIC and an acetic acid ester were also detected in the method blank extracted on 10/20/92 at 31.19 minutes and 34.95 minutes, respectively. Sample TIC results matching these retention times were determined to be unusable (R).

Overall Data Assessment

Overall, the laboratory performed method TO-13 semivolatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.02. The majority of the semivolatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Non-detected results for phenol and 2,4-dinitrotoluene were approximated based on matrix spike/matrix spike duplicate analysis criteria. Detected di-n-butylphthalate results were qualified with a "U" based on blank analysis criteria.

Tentatively identified compounds were detected in the media blank at 28.36 and 34.95 minutes. A TIC and an acetic acid ester were also detected in the method blank extracted on 10/20/92 at 31.19 minutes and 34.95 minutes, respectively. Sample TIC results matching these retention times were determined to be unusable (R).

4.18 Hexavalent Chromium Analysis

QA/QC parameters for hexavalent chromium analyses were evaluated for sixty-one water samples collected from 9/29/92 to 6/29/93 according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. As a result of the validation no excursions from the QA/QC criteria specified in Section 3.01 of this report were observed.

4.19 BOD Analysis

QA/QC parameters for BOD analyses were evaluated for fifty water samples collected from 9/21/92 to 6/29/93 according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters for EPA method 405.1 were found to meet validation criteria: holding times, blank analysis, laboratory duplicate analysis, field duplicate analysis, laboratory control sample analysis, and documentation completeness. Excursions from QA/QC criteria are summarized below.

BOD Quantitation

The BOD values originally reported for these samples did not meet the minimum dissolved oxygen (DO) depletion criterion of 2 mg/L specified in the method. The reported sample results and detection limits were determined using a minimum DO of 1 mg/L. Non-detected sample results were also calculated without correction for sample dilution. Due to these excursions the laboratory was requested to re-calculate these

BOD data following the 2 mg/L DO depletion criterion and correcting for sample dilution. The resubmitted data were received from OBG Labs on 9/17/93.

Overall Data Assessment

In addition to the calculation excursions for the BOD analyses, initial DO values were not determined for each sample as specified by the method. Sample results were calculated using the initial DO value of the dilution water and the final DO of the samples. It was determined that this practice would lead to the reporting of false positive values since the initial DO of the dilution water, which ranged from 9.2 mg/L to 9.8 mg/L, was expected to be higher than the diluted sample initial DO. Although there was higher probability of reporting false positive values, the non-detected BOD results reported for all the BOD analyses were approximated (UJ) based on the small probability that an initial sample DO was higher than the dilution water DO.

4.20 TOC Analysis

QA/QC parameters for TOC analyses were evaluated for fifty water and fifty-two soil/sediment samples collected from 9/30/92 to 4/13/93 according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters for EPA methods 415.1 and 9060 were found to meet validation criteria: holding times, laboratory duplicate analysis, field duplicate analysis, laboratory control sample analysis, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Blank Analysis

The equipment blanks collected on 5/25/93 and 6/2/93 contained TOC at concentrations of 7 mg/L and 5 mg/L, respectively. Blank action levels were calculated at five times these concentrations to evaluated the effects of blank contamination. Detected TOC results that were below these blank action levels were qualified with a "U". Samples qualified for this excursion included W-01/S1-1, W-03-1, W-02-1, W-05-1, W-06S-1, W-04SI-1, W-01B-1, W-04DI-1, and W-04B-1.

The equipment blank collected on 6/23/93 contained TOC at a concentration of 3mg/L. Due to this excursion the detected TOC results reported for W-01S1-2, W-04S-2, W-05-2, W-03-2, W-06S-2, Blind Duplicate #1-2, W-02-2, W-04S1-2, W01B, W-04B-2, and W-04DI-2 were qualified with a "U".

Field Duplicate Analysis

Field duplicate RPD criterion of less than 50.0% was exceeded for LS-Blind Duplicate #1 (LS-3) with a value of 74.0%. Due to this excursion the detected TOC results for LS-2, LS-3, and LS-Blind Duplicate #1 were approximated (J).

RPD criterion were also exceeded for Blind Duplicate #2-1 (W-02-1) with a value of 84.2%. Detected results were approximated (J) for W-01/S1-1, W-03-1, W-04S-1, W-02-1, Blind Duplicate #2-1, W-05-1, W-06S-1, W-04S-1, W-01B-1, W-04DI-1, and W-04B-1 due to this excursion. Detected results previously qualified for blank contamination were qualified with a "UJ".

Overall Data Assessment

Overall, the laboratory performed TOC analyses in accordance with the requirements specified in the methods listed in Section 2.02. These TOC sample data have been determined to be usable for qualitative and quantitative purposes. Results for several samples were qualified with a "U" based on equipment blank analysis criteria. Detected TOC results were also approximated based on field duplicate analysis criteria.

4.21 Hardness Analysis

QA/QC parameters for hardness analyses were evaluated for fifty water samples collected from 9/21/92 to 6/29/93 according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters for EPA method 130.2 were found to meet validation criteria: holding times, laboratory duplicate analysis, laboratory control sample analysis, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Field Duplicate Analysis

Field duplicate RPD criterion of less than 50.0% was exceeded for LS-Blind Duplicate #1 (LS-3) with a value of 76.5%. Due to this excursion the detected hardness results for LS-2, LS-3, and LS-Blind Duplicate #1 were approximated (J).

RPD criterion were also exceeded for Blind Duplicate #2-1 (W-02-1) with a value of 63.6%. Detected results were approximated (J) for W-01/S1-1, W-03-1, W-

04S-1, W-02-1, Blind Duplicate #2-1, W-05-1, W-06S-1, W-04S-1, W-01B-1, W-04DI-1, and W-04B-1 due to this excursion.

Overall Data Assessment

Overall, the laboratory performed hardness analyses in accordance with the requirements specified in the methods listed in Section 2.02. These hardness sample data have been determined to be usable for qualitative and quantitative purposes. Several detected results were approximated based on field duplicate analysis criteria.

SECTION 5 - SUMMARY AND DATA USABILITY

The analytical data generated for the Burgess Brothers Superfund Site located in Woodford and Bennington, Vermont were evaluated based on QA/QC criteria established by the USEPA CLP and criteria presented in the QAPP for this investigation. Validation procedures were based on CLP data validation guidelines developed by USEPA Region I. Data qualified with a "R", which are considered unusable for either qualitative or quantitative purposes, resulted when a major deficiency was noted in the data generation process. Minor deficiencies in the data generation process resulted in approximation of sample data. Approximation of a data point indicates uncertainty in the reported concentration of the chemical, but not its assigned identity. The conservative assumptions used in the development of conclusions made based on these analytical results allow for the quantitative use of approximated analytical data while still adhering to the project data quality objectives. This approach to the use of analytical data is consistent with the guidance presented in *U.S. EPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), 540/1-891002*, December 1989. A summary of specific QA/QC excursions that resulted in qualification of sample data is presented in Section 4.

Data quality objectives (DQOs) are quantitative and qualitative statements specifying the quality of the environmental data required to support the decision making process. DQOs define the total uncertainty in the data that is acceptable. The DQOs for this investigation require that the total uncertainty of the analytical data remain within an acceptable range so as not to hinder the intended use of the data. For this investigation, soil boring, surface soil, and sediment investigation data were used to characterize contaminant concentrations in specific areas, while well investigation data will be used to characterize background ground water quality and contaminant concentrations in specific areas of the site.

This section summarizes the analytical data in terms of its completeness and useability for these site characterization purposes. Data completeness is defined as the percentage of sample results that have been determined to be useable during the data validation process. Data completeness with respect to useability was calculated separately for each analysis for each round of sampling and analysis. Sampling and analysis programs that were collected over several rounds were combined to determine data usability. The data uses and percent completeness for each round of sampling and analysis are tabulated below. The percent usability calculation did not include quality control samples collected to aid in the evaluation of data usability. Therefore, field/equipment blank, trip blank, and field duplicate data determined to be unusable as a result of the validation process are not represented in the percent usability value tabulated below.

Sampling Program	Data Uses	Analysis	Percent Usability	Excursions
Sediments	To characterize distribution of volatiles and metals and other parameters in unnamed tributary and Barney Brook.	inorganics	99.3	5 selenium results due to matrix spike recovery criteria.
		volatiles	98.9	12 2-butanone results due to calibration RF criterion.
		semivolatiles	96.7	61 compounds for SED-05-2 due to surrogate recovery criteria.
		pesticide/PCBs	98.1	14 endrin aldehyde results due to reference standard analysis criteria.
Surface Waters	To characterize distribution of volatiles and metals and other parameters in unnamed tributary and Barney Brook.	inorganics	100	NA
		volatiles	97.1	27 2-butanone results due to calibration RF criterion.
		semivolatiles	100.0	NA
		pesticide/PCBs	98.2	14 endrin aldehyde results due to reference standard analysis criteria.

Sampling Program	Data Uses	Analysis	Percent Usability	Excursions
Surface Soils	To characterize surface concentrations of volatiles, semivolatiles, and metals for risk assessment.	inorganics	98.1	14 antimony results due to matrix spike recovery criteria.
		volatiles	100.0	NA
		semivolatiles	100.0	NA
		pesticide/PCBs	96.2	10 endrin aldehyde results due to reference standard analysis criteria.
EPA 524.2 Analysis	Characterize volatile organic water quality in three residential wells and Ryder spring municipal supply.	volatiles	55.0	484 compounds due to holding time criteria. 20 compounds due to calibration criteria.
Bend in the Road	To characterize subsurface soils for the possible presence of landfill materials.	inorganics	100.0	NA
Soil Borings	To characterize the materials in the landfill at former lagoon locations and other suspected areas of releases.	inorganics	99.9	1 selenium result due to furnace post digestion spike recovery criteria.
		volatiles	99.2	14 2-butanone results due to calibration RF criterion.
		semivolatiles	100.0	NA
		pesticide/PCBs	96.2	32 endrin aldehyde results due to reference standard analysis criteria.
Leachate	To characterize contaminant concentrations in seeps.	inorganics	94.4	3 arsenic results due to matrix spike recovery criteria. 1 selenium result due to furnace post digestion spike recovery criteria.
		volatiles	97.1	3 2-butanone results due to calibration RF criterion.
		semivolatiles	99.5	1 4-nitrophenol result due to matrix spike recovery criteria.
		pesticide/PCBs	100.0	NA
Ground Water	To characterize ground water quality and separate phase fluids in upper and lower sand and bedrock in marshy area.	inorganics	99.2	6 arsenic and 20 selenium results due to matrix spike recovery criteria.
		volatiles	97.1	62 2-butanone results due to calibration RF criterion.
		semivolatiles	94.2	132 compounds due to internal standard recovery criteria.
		pesticide/PCBs	100.0	NA
Air	To evaluate if potential site related residues are being transported from the site via air transport.	volatiles	100.0	NA
		semivolatiles	100.0	NA

Sampling Program	Data Uses	Analysis	Percent Usability	Excursions
Cr^{+6} Analysis	To characterize ground and surface water hexavalent chromium concentrations.	Cr^{+6}	100.0	NA
BOD Analysis	To characterize ground and surface water and leachate biochemical oxygen demand.	BOD	100.0	NA
TOC Analysis	To characterize ground and surface water and soil/sediment TOC concentrations.	TOC	100.0	NA
Hardness Analysis	To characterize the concentrations of metals in the ground and surface waters.	Hardness	100.0	NA

NA = Not Applicable

Validation of the Phase 1A analytical data indicated that the data quality objectives defined in the QAPP, were met. The following sections present the adherence of the data to the PARCC parameters presented in the QAPP. Additional information on the impact of excursions from QC measurements on the analytical data was found in the risk assessment guidance document: *Guidance for Data Useability in Risk Assessment (Part A) Final*, USEPA, 9285.7-09A, April 1992.

Precision is measured through field duplicate samples and laboratory duplicate samples. Split samples were collected, but the information from those analyses was not available for this data validation. For the sampling program associated with this phase of the RI, 0.61% and 1.37% of the analytical data were qualified due to excursions from laboratory and field duplicate sample analyses, respectively.

Matrix spike sample, reference standards, surrogate recoveries, internal standard recoveries and calibration criteria indicate the accuracy of the data. For the Phase 1A sampling program, 1.52% of the analytical data were qualified for excursions from matrix spike sample criteria, 0.40% of the analytical data were qualified for excursions from reference standard, 0.88% of the analytical data were qualified for excursions from surrogate recovery criteria, 0.76% of the analytical data were qualified for excursions from calibration criteria, and 0.55% of the analytical data were qualified for excursions from internal standard recovery criteria.

Holding times, sample preservation, and extraction procedures are indicators of the representativeness of the analytical data. For the sampling program associated with this phase of the RI, 1.51% and 2.03% of the data were qualified for holding time and blank excursions, respectively. Sample preservation excursions resulted in the qualification of 1.82% of the analytical data. Extraction procedures did not result in the qualification of Phase 1A analytical data.

Comparability is not compromised provided that the analytical methods did not change over time. Since standard analytical methods and reporting procedures were consistently used by the laboratory, the comparability criteria for the analytical data were met.

The percent usability, or completeness, of the data ranged from 96.2 to 100 percent for data collected from the surface and subsurface soils, ground water, air, surface water, sediments, and leachate/seeps, excluding the VOC analyses from the residential wells and Ryder Spring. Shipping delays resulted in a 55% usability for the VOC analyses from the residential well and Ryder Spring.

Overall, the Phase 1A analytical data is of sufficient quality to meet the project data quality objectives and may be used for qualitative and quantitative purposes. These uses include, but are not limited to, performance of human health and ecological risk assessments, evaluation of remedial alternatives, and estimation of the nature and extent of contamination.

DATA VALIDATION REPORT

November Interim Sampling Program
Burgess Brothers Superfund Site
Woodford and Bennington, Vermont

Burgess Brothers
Superfund Site Steering
Committee

January 1994

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EXECUTIVE SUMMARY

This report presents the results of a data validation on analytical data quality for samples collected at the Burgess Brothers Superfund Site located in Woodford and Bennington, Vermont. Site characterization activities conducted by O'Brien & Gere Engineers, Inc. (O'Brien & Gere Engineers) as part of the November Interim Sampling Program (NISP) included sampling and analysis of sediment, ground water, and surface water. The analytical data generated for the NISP were evaluated based on QA/QC criteria established by the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) and criteria presented in the Quality Assurance Project Plan (QAPP) for this investigation. Validation procedures were based on data validation guidelines developed by the USEPA.

The data quality objectives (DQOs) for this investigation require that the total uncertainty of the analytical data remain within a pre-determined acceptable range so as not to hinder the intended use of the data. For this investigation, sediment data will be used to characterize contaminant concentrations in specific areas, while ground water and surface water data will be used to characterize background ground water quality and contaminant concentrations in specific areas of the site.

Data completeness is defined as the percentage of sample results that have been determined to be useable during the data validation process. Data qualified with an "R", which are considered unuseable for either qualitative or quantitative purposes, resulted when a major deficiency was noted in the data generation process. Data completeness with respect to useability was calculated separately for each type of analysis and is tabulated below. The percent useability calculation did not include quality control samples collected to aid in the evaluation of data useability. Therefore, field/equipment blank, trip blank, and field duplicate data determined to be unuseable as a result of the validation process are not represented in the percent useability value.

Analysis	Percent Useability	Excursions
TAL Inorganics	99.6	Non-detected total selenium results were qualified as unuseable for W-04S-3, W-05-3, W-03-3, W-03/S2-3, W-06S-3, W-06D-3, W-12-S1-3, and W-22/S1-3 due to 0 % recoveries for the MS/MSD analysis of W-04S-3.
Hexavalent Chromium	100.0	NA
TCL Volatiles	100.0	NA
EPA 524.2 Volatiles	96.8	Non-detected results for acetone and 2-butanone were qualified as unuseable due to initial calibration minimum RRF criteria excursions.
TCL Semivolatiles	97.8	Non-detected sample results were qualified as unuseable for 16 compounds for SBW-10-3 and W-07S1-3 due to surrogate recovery values that were less than 10 percent.

Analysis	Percent Useability	Excursions
pesticide/PCBs	100.0	NA
BOD, TOC, and Hardness	100.0	NA

NA = Not Applicable

The percent useability, or completeness, of the data ranged from 96.8% to 100.0% for data collected for this investigation. Overall, the analytical data are of sufficient quality to meet the project data quality objectives and may be used for qualitative and quantitative purposes. These uses include, but are not limited to, performance of human health and ecological risk assessments, evaluation of remedial alternatives, and estimation of the nature and extent of contamination.

SECTION 1 - INTRODUCTION

1.1 Introduction

This report presents the results of a data validation on analytical data quality for the samples collected at the Burgess Brothers Superfund Site located in Woodford and Bennington, Vermont. Site characterization activities conducted by O'Brien & Gere Engineers, Inc. (O'Brien & Gere Engineers) as part of the November Interim Sampling Program (NISP) included sampling and analysis of sediment, ground water, and surface water. The quantity, types of samples collected, the dates of sample collection for these programs, and the appropriate reference to Appendix 12 are tabulated below.

Sampling Program	Collection Date	Sample Identification		Appendix 15 Reference
		O'Brien & Gere Engineers ID	Laboratory ID	
Surface Water	11/16/93	SW-017-3 SW-016-3 SW-05-3 SW-06-3 SW-07-3 SW-04-3 SW-015-3 SW-015-3 MS SW-015-3 MSD Ryder Spring-3 Blind Duplicate-1-3	032333-0001-SA 032333-0003-SA 032333-0004-SA 032333-0005-SA 032333-0006-SA 032333-0007-SA 032333-0008-SA 032333-0008-MS 032333-0008-SD 032333-0009-SA 032333-0002-SA	Table 19 - Inorganics BOD Hardness Table 14D - Inorganics BOD Hardness
Surface Water	11/16/93 to 11/18/93	SW-17-3 SW-16-3 SW-05-3 SW-06-3 SW-07-3 SW-04-3 SW-015-3 SW-015-3 MS SW-015-3 MSD Blind Duplicate-1-3 Equipment Blank-3-1	931116-AB01 931116-AB02 931116-AB04 931116-AB05 931116-AB06 931116-AB07 931116-AB08 931116-AB08-MS 931116-AB08-MSD 931116-AB03 931119-A01	Table 19 - Inorganics BOD Hardness

Sampling Program	Collection Date	Sample Identification		Appendix 15 Reference
		O'Brien & Gere Engineers ID	Laboratory ID	
Surface and Ground Water	11/16/93 to 11/22/93	SW-17-3 SW-16-3 SW-05-3 SW-06-3 SW-07-3 SW-04-3 SW-15-3 SW-15-3 MS SW-15-3 MSD Blind Duplicate-1-3 Trip Blank SW-014-3 SW-03-3 SW-012-3 SW-011-3 Equipment Blank Trip Blank Ryder Spring-3 Dickinson-3 Blind Duplicate-2-3 Trip Blank	9335943 9335942 9335935 9335936 9335937 9335934 9335941 9335941-MS 9335941-MSD 9335944 9335948 9335940 9335933 9335939 9335938 9335946 9335947 9336308 9336309 9336310 9336311	Table 15B - Volatiles -524.2 Table 11 - Volatiles - 524.2
Surface Water and Sediment	11/17/93	SW-12-3 SW-03-3 SW-11-3 SW-14-3 SED-11-3 SED-12-3 SED-14-3 SED-14-3 MS SED-14-3 MSD Equipment Blank (sediment) Blind Duplicate (sediment)	032367-0001-SA 032367-0002-SA 032367-0003-SA 032367-0004-SA 032367-0006-SA 032367-0007-SA 032367-0008-SA 032367-0008-MS 032367-0008-SD 032367-0005-SA 032367-0009-SA	Table 19 - Inorganics BOD Hardness Table 20 - Volatiles - 8240 Table 23 - Inorganics BOD Hardness Table 14D - Inorganics BOD Hardness Table 23A - TOC
Ground Water	11/18/93	Equipment Blank-3-1 Trip Blank	032398-0001-SA 032398-0002-TB	Table 10B - Volatiles - 8240 Table 12B - Semi-volatiles - 8270 Table 14D - Inorganics BOD Hardness Table 14E - TOC

Sampling Program	Collection Date	Sample Identification		Appendix 15 Reference
		O'Brien & Gere Engineers ID	Laboratory ID	
Ground Water	11/22/93	W-01/S1-3 Ryder Spring-3 Dickinson-3 SBW-21-3 Blind Duplicate-2-3 Trip Blank	032457-0001-SA 032457-0002-SA 032457-0003-SA 032457-0004-SA 032457-0006-SA 032457-0005-TB	Table 10A - Volatiles - 8240 Table 11 - Volatiles 524.2 Table 12A - Semi-volatiles - 8270 Table 14A - Inorganics BOD Hardness Table 14D - Inorganics BOD Hardness Table 10C - TOC Table 14E - TOC
Ground Water	11/23/93	Olin-3 Olin-3 MS Olin-3 MSD	032497-0001-SA 032497-0001-MS 032497-0001-SD	Table 14D - Inorganics BOD Hardness
Ground Water	11/23/93	W-08S1-3 W-25S1-3 W-09S1-3 W-04D-3 W-23T-3 W-24T-3 Blind Duplicate-3-3 Equipment Blank-3-3 Equipment Blank-4-3 Trip Blank	032492-0003-SA 032492-0004-SA 032492-0005-SA 032492-0006-SA 032492-0008-SA 032492-0009-SA 032492-0010-SA 032492-0001-SA 032492-0007-SA 032492-0002-TB	Table 10A - Volatiles - 8240 Table 10B - Volatiles - 8240 Table 12A - Semi-volatiles - 8270 Table 12B - Semi-volatiles - 8270 Table 13 - PCB/Pesticides - 8080 Table 14A - Inorganics BOD Hardness Table 14B - Inorganics BOD Hardness Table 14D - Inorganics BOD Hardness
Ground Water	11/27/93 to 11/29/93	W-02-3 W-02-3 MS W-02-3 MSD W-04S-3 W-04S-3 MS W-04S-3 MSD W-05-3 W-03-3 W-03/S2-3 W-06S-3 W-06D-3 W-12/S1-3 W-22/S1-3 Blind Duplicate-4-3 Trip Blank	032521-0002-SA 032521-0002-MS 032521-0002-SD 032521-0003-SA 032521-0003-MS 032521-0003-SD 032521-0004-SA 032521-0005-SA 032521-0006-SA 032521-0007-SA 032521-0008-SA 032521-0009-SA 032521-0010-SA 032521-0011-SA 032521-0001-TB	Table 10A - Volatiles - 8240 Table 10B - Volatiles - 8240 Table 12A - Semi-volatiles - 8270 Table 13 - PCB/Pesticides - 8080 Table 14B - Inorganics BOD Hardness Table 14E - TOC

Sampling Program	Collection Date	Sample Identification		Appendix 15 Reference
		O'Brien & Gere Engineers ID	Laboratory ID	
Ground Water	11/30/93	W-02-3 W-02-3 MS W-02-3 MSD SBW-10-3 W-07S1-3 W-11/S1-3 W-07SI-3 W-07DI-3 W-04SI-3 Blind Duplicate-4-3 Equipment Blank-5-3 Trip Blank	032557-0001-SA 032557-0001-MS 032557-0001-SD 032557-0002-SA 032557-0003-SA 032557-0006-SA 032557-0008-SA 032557-0009-SA 032557-0010-SA 032557-0004-SA 032557-0007-SA 032557-0005-TB	Table 10A - Volatiles - 8240 Table 10B - Volatiles - 8240 Table 12A - Semi-volatiles - 8270 Table 12B - Semi-volatiles - 8270 Table 13 - PCB/Pesticides - 8080 Table 14A - Inorganics BOD Hardness Table 14B - Inorganics BOD Hardness Table 14C - Inorganics BOD Hardness Table 14D - Inorganics BOD Hardness Table 14E - TOC
Ground Water	12/01/93	Olin-3 Olin-3 MS Olin-3 MSD Trip Blank	9337103 9337103-MS 9337103-MSD 9337104	Table 11 - Volatiles 524.2
Ground Water	12/01/93	W-04DI-3 W-09SI-3 W-09B-3 W-08SI-3 W-04B-3 W-04B-3 MS W-04B-3 MSD W-25SI-3 Trip Blank	032583-0001-SA 032583-0002-SA 032583-0004-SA 032583-0005-SA 032583-0006-SA 032583-0006-MS 032583-0006-SD 032583-0007-SA 032583-0003-TB	Table 10B - Volatiles - 8240 Table 12B - Semi-volatiles - 8270 Table 14C - Inorganics BOD Hardness Table 14D - Inorganics BOD Hardness Table 14E - TOC
Ground Water	12/02/93	W-08B-3 W-25DI-3 W-01B-3 Trip Blank	032600-0002-SA 032600-0003-SA 032600-0004-SA 032600-0001-TB	Table 10B - Volatiles - 8240 Table 12B - Semi-volatiles - 8270 Table 14C - Inorganics BOD Hardness Table 14D - Inorganics BOD Hardness Table 14E - TOC

1.2 General Considerations

Validation is a process of determining the suitability of a measurement system for providing useful analytical data. Although the term is frequently used in discussing methodologies, it applies to all aspects of the system and especially to samples, their measurement, and the actual data output. Accordingly, this report outlines excursions from the applicable quality control criteria outlined in the following documents:

> *Quality Assurance Project Plan (QAPP) for the Remedial Investigation, Burgess Brothers Superfund Site*, Woodford and Bennington, Vermont, O'Brien & Gere Engineers, Inc., September 1992.
>
> *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988.
>
> *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989.
>
> *Test Methods for Evaluating Solid Wastes*, SW-846 Third Edition, USEPA, November 1986.

The following four sections of this document address distinct aspects of the validation process. Section 2 provides the analytical methodology employed in sample analysis. Section 3 lists the data quality assurance/quality control (QA/QC) protocols used to validate the sample data. Specific QA/QC excursions and qualifications performed on the sample data are discussed in Section 4. Finally, data completeness and useability with respect to the intended purposes of the data are discussed in Section 5. Each section is subdivided with respect to the type of analyses performed.

SECTION 2 - ANALYTICAL METHODS

2.1 Sediment Samples

Sediment samples were analyzed utilizing the methods listed below. Sample analyses were provided by Enseco-Rocky Mountain Analytical Laboratory (Enseco-RMAL) located Arvada, Colorado.

Parameter	Analytical/Extraction	Reference
Volatile Organics	8240/5030	1
Semivolatile Organics	8270/3550	1
Pesticides/PCBs	8080/3550	1
Trace Metals	6010/3050	1
Arsenic	7060/3050	1
Lead	7421/3050	1
Selenium	7740/3050	1
Thallium	7841/3050	1
Mercury	7471	1
Cyanide	9010	1
Total Organic Carbon	9060	1
Percent Solids	209F	2

Analytical Method References

1. *Test Methods for Evaluating Solid Waste*: Physical/Chemical Methods, SW-846, 3rd Edition, USEPA, September 1986.

2. *Standard Methods for the Examination of Water Wastewater*, 16th Edition, 1985.

The following qualifiers have been used in this data validation.

U Indicates that the compound was analyzed for, but was not detected. The sample quantitation limit is presented and adjusted for dilution and percent moisture (solid samples only). This qualifier is also used to signify that the detection limit of an analyte was raised due to blank contamination.

J Indicates that the result should be considered approximate. This qualifier is used when the data validation procedure identifies a deficiency in the data generation process. Additionally, for organic analyses this qualifier is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria but, the result is less than the sample quantification limit but greater than zero.

UJ Indicates that the detection limit for the analyte in this sample should be considered approximate. This qualifier is used when the data validation process identifies a deficiency in the data generation process.

R Indicates that the previously reported detection limit or sample result has been determined to be unuseable due to a major deficiency in the data generation procedure. The data should not be used for any qualitative or quantitative purposes.

2.2 Ground Water and Surface Water Samples

Ground and surface water samples were analyzed utilizing the analytical methods listed below. With the exception of volatile organics by EPA method 524.2 and hexavalent chromium analyses, sample analyses were provided by Enseco-RMAL. Method 524.2 volatile organics analyses were provided by H2M Environmental Testing Laboratories, Inc. (H2M Labs) of Melville, New York and hexavalent chromium analyses were provided by Adirondack Environmental Services, Inc. (AES) of Albany, New York. Qualifiers utilized for these sample results are as described in Section 2.01.

Parameter	Analytical/Extraction	Reference
Volatile Organics	8240/5030	1
524.2 Volatile Organics	524.2	2
Semivolatile Organics	8270/3520	1
PCBs	8080/3520	1
Trace Metals	6010/3010	1
As	7060/3020	1
Se	7740/3020	1
Pb	7421/3020	1
Tl	7841/3020	1
Hg	7470	1
CN	9010	1
TOC	415.1	3
BOD	405.1	3
Hardness	130.2	3
Cr^{+6}	7196	1

Analytical Method References

1. *Test Methods for Evaluating Solid Waste*: Physical/Chemical Methods, SW-846, 3rd

Edition, USEPA, September 1986.

2. *Methods for the Determination of Organic Compounds in Water*, USEPA, EPA-600/4-88/039, December 1988.

3. *Methods for Chemical Analysis of Water and Wastes*, USEPA, EPA 600/4-79-020, March 1979.

SECTION 3 - DATA VALIDATION PROTOCOLS

3.1 Target Analyte List Inorganics Analysis

Target analyte list (TAL) inorganics analyses were performed using the USEPA analytical methods outlined in Section 2. The validation of TCL inorganics followed the requirements presented in the QAPP and the analytical methodology presented in *Test Methods for Evaluating Solid Wastes*, SW-846 Third Edition, USEPA, November 1986. Qualification of sample data was based on the validation guidelines presented in *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were evaluated for TCL inorganic analyses:

1. Holding Times
2. Calibration
    a. Initial Calibration Verification
    b. Continuing Calibration Verification
3. Blank Analysis
4. ICP Interference Check Sample Analysis (ICP only)
5. Matrix Spike Analysis
6. Laboratory Duplicate Analysis
7. Field Duplicate Analysis
8. Laboratory Control Sample Analysis
9. Furnace Atomic Absorption Analysis
10. ICP Serial Dilution Analysis (ICP only)

11. Element Quantitation and Reported Detection Limits

12. Percent Solids Quantitation and Content (sediments only)

13. Document Completeness

14. Overall Data Assessment

Hexavalent chromium analyses were performed using the USEPA analytical methods outlined in Section 2. The validation of hexavalent chromium followed the requirements presented in the QAPP and the analytical methodology presented in *Test Methods for Evaluating Solid Wastes*, SW-846 Third Edition, USEPA, November 1986, Method 7196. Qualification of sample data was based on the validation guidelines presented in *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC criteria were evaluated and the actions performed for Cr^{+6} analyses:

1. Holding Times:
   - Criteria as listed in *Test Methods for Evaluating Solid Wastes*, SW-846 Third Edition, USEPA, November 1986, Method 7196, page 2.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 18.

2. Calibration
   - Criteria - daily 3 point initial calibration, %RSD less than or equal to 10, continuing calibration every 10 samples, less than 10% difference between the actual and expected values.
   - Action - initial calibration %RSD greater than 10, or continuing calibration greater than 10% difference, detected and nondetected sample results qualified J, UJ respectively; continuing calibration results greater than 90% difference, nondetected sample results qualified as unusable (R) and detected results qualified as approximate (J).

3. Blank Analysis
   - Criteria - frequency of 1 per matrix and every 10 samples.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 22.

4. Matrix Spike Analysis
   - Criteria - frequency of 1 per matrix and every 20 samples, percent recovery of 75 to 125.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 28.

5. Laboratory Duplicate Analysis
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, pages 29 and 30.

6. Field Duplicate Analysis
   - Criteria - less than or equal to 30% difference for water samples, less than or equal to 50% difference for sediment or soil samples.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 31.

7. Laboratory Control Sample Analysis
   - Criteria - frequency of every 15 samples, percent recovery of 85 to 115.
   - Action - Percent recovery of 50 to 85 or greater than 120, detected results qualified as approximate (J); recovery of 50 to 85 percent, nondetected results qualified as approximate (UJ); nondetected results were qualified as unusable (R) and detected results were qualified as approximate when recoveries were less than 50%.

8. Documentation Completeness
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 17.

9. Overall Data Assessment
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 38.

3.2 Target Compound List Organics Analysis

Target compound list (TCL) organics analyses were performed using USEPA analytical methods outlined in Section 2. The validation of volatile, semivolatile, and pesticide/PCB analyses data followed the requirements presented in the QAPP and in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters were evaluated for the TCL organics analyses:

Volatile and Semivolatile Analysis

1. Holding Times
2. GC/MS Instrument Tuning Criteria
3. Calibration
   a. Initial Calibration
   b. Continuing Calibration
4. Blank Analysis

5. Surrogate Recovery

6. Matrix Spike / Matrix Spike Duplicate Analysis

7. Reference Standard Analysis

8. Field Duplicate Analysis

9. Internal Standards Recovery

10. Compound Identification and Quantitation

11. Percent Solids Determination and Content (sediments only)

12. System Performance

13. Documentation Completeness

14. Overall Data Assessment

Pesticide/PCB Analysis

1. Holding Times

2. Instrument Performance

    a. Standards Retention Time Windows

    b. DCBP Retention Time Shift

    c. Endrin and Dieldrin Degradation

    d. Baseline Stability

    e. Chromatographic Resolution

3. Calibration

    a. Initial Calibration

    b. Analytical Sequence Verification

    c. Continuing Calibration Verification

4. Blank Analysis

5. Surrogate Recovery

6. Matrix Spike / Matrix Spike Duplicate Analysis

7. Field Duplicate Analysis

8. Reference Standard Analysis

9. Compound Identification and Quantitation

10. Documentation Completeness

11. Overall Data Assessment

3.3 Wet Chemistry Analysis

Wet chemistry analyses were performed using the USEPA analytical methods outlined in Section 2. The validation of TOC, BOD, and hardness followed the requirements presented in the QAPP and the analytical methodology presented in *Test Methods for Evaluating Solid Wastes*, SW-846 Third Edition, USEPA, November 1986, Methods 415.1, 405.1, and 130.2 respectively. Qualification of sample data was based on the validation guidelines presented in *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were evaluated for wet chemistry analyses:

TOC Analysis

1. Holding Times
   - Criteria of 28 days from collection to analysis.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 18.

2. Calibration
   - Criteria - daily 3 point initial calibration, RSD less than or equal to 10, continuing calibration every 10 samples, less than 10% difference between the actual and expected values.
   - Action - initial calibration %RSD greater than 10, or continuing calibration between 10 and 90 percent difference, detected and nondetected sample results qualified J, UJ respectively; continuing calibration %D greater than 90%, nondetected sample results were qualified as unusable (R), and detected sample results were qualified as approximate (J).

3. Blank Analysis
   - Criteria - frequency of 1 per matrix and every 10 samples
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 22.

4. Matrix Spike Analysis
    - Criteria - frequency of 1 per matrix and every 20 samples, percent recovery of 75 to 125.
    - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 28.

5. Laboratory Duplicate Analysis
    - Criteria - frequency of 1 per matrix and every 20 samples, less than or equal to 20 percent difference.
    - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, pages 29 and 30.

6. Field Duplicate Analysis
    - Criteria - frequency of 1 per matrix and every 20 samples, less than or equal to 30 percent difference.
    - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 31.

7. Laboratory Control Sample Analysis
    - Criteria - frequency of every 20 samples, percent recovery of 85 to 115.
    - Action - Percent recovery of 50 to 85 or greater than 120, detected results qualified as approximate (J); recovery of 50 to 85 percent, nondetected results qualified as approximate (UJ); nondetected sample results qualified as unusable (R) when percent recovery was less than 50, and detected sample results were qualified as approximate (J).

8. Documentation Completeness
    - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 17.

9. Overall Data Assessment
    - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 38.

BOD Analysis

1. Holding Times
    - Criteria - preserve samples at 4°C, 48 hours from collection to analysis.
    - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 18.

2. Blank Analysis
    - Criteria - frequency of 1 per matrix and every 10 samples.
    - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 22.

3. Laboratory Duplicate Analysis
    - Criteria - frequency of 1 per every 10 samples, RPD within 30 percent.
    - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 30.

4. Field Duplicate Analysis
    - Criteria - frequency of 1 per matrix and every 20 samples, RPD within 30 for water samples and RPD within 50 for sediment and soil samples.
    - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 31.

5. Laboratory Control Sample Analysis
    - Criteria - frequency of every batch or 10% of samples, percent recovery of 90 to 110.
    - Action - Percent recovery of 50 to 90 or greater than 110, detected results qualified as approximate (J); recovery of 50 to 90

percent, nondetected results qualified as approximate (UJ); nondetected sample results qualified as unusable (R) and detected results as approximate (J) for recoveries less than 50%.

6. BOD Quantitation
   - Criteria - mimimum dissolved oxygen depletion of 2 mg/L.
   - Action - resubmit corrected data.

7. Documentation Completeness
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 17.

9. Overall Data Assessment
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 38.

<u>Hardness Analysis</u>

1. Holding Times
   - Criteria - preservation of samples with HNO3 to pH of less than 2, 6 months from collection to analysis of samples.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 18.
2. Calibration
   - Criteria - daily initial calibration, continuing calibration verification every 2 hours or 10 percent frequency, continuing calibration results within 10 percent of the true value.
   - Action - detected and nondetected sample results were qualified as approximate (J, UJ) when continuing calibration results were between 10 and 90 percent difference; sample results were qualified as unusable (R) when continuing calibration results were greater than 90 percent difference.

3. Blank Analysis

- Criteria - calibration blank at a frequency of the beginning and end of run and 10 percent of samples, preparation blank at a frequency of 1 per batch or 5 percent of samples.
- Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 22.

4. Matrix Spike Analysis
    - Criteria - frequency of 1 per batch and every 20 samples, within 25% recovery of true value.
    - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 28.

5. Laboratory Duplicate Analysis
    - Criteria - within 25 percent RPD for values five times the detection limit or the value of the detection limit for sample results less than five times the detection limits.
    - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, pages 29 and 30.

6. Field Duplicate Analysis
    - Criteria - frequency of 1 per matrix and every 20 samples, RPD within 30 for water samples and RPD within 50 for sediment and soil samples.
    - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 31.

7. Laboratory Control Sample Analysis
    - Criteria - frequency of 10% of samples, percent recovery within 10 percent of true value.
    - Action - Detected sample results were quallified as approximate (J) when the percent recovery was greater than 110; detected and nondetected sample results were qualified as approximate (J) or (UJ) respectively when percent recovery was 10 to 50; detected results were approximate and nondetected results were qualified as unusable (R) when recoveries were greater than 90 percent.

8. Documentation Completeness

- Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 17.

9. Overall Data Assessment

- Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989 page 38.

SECTION 4 - DATA QUALITY EVALUATION

This section summarizes the QA/QC parameters, validation criteria, and qualifications performed on the sample data when the QA/QC parameters specified in Section 3 did not meet criteria. Samples that required qualification are identified in the following sections by the description documented on the sample chain of custody records. Only one qualifier was used for an individual sample result. When the data validation process identified several quality control deficiencies, the cumulative effect of the various excursions were employed in assigning the final data qualifier.

4.1 TAL Inorganics Analysis

QA/QC parameters for TAL inorganic analyses were evaluated for thirty-five total ground water, twelve total surface water, thirty-five filtered ground water, twelve filtered surface water, three sediment, four blind duplicates, and five equipment blank samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration verification, laboratory control sample analysis, laboratory control sample analysis, ICP serial dilution analysis, percent solids quantitation and content, and document completeness. Excursions from QA/QC criteria are summarized below.

Blank Analysis

Blank samples that contained concentrations of TAL inorganics that exceeded the Enseco-RMAL reporting limits or contained negative concentrations that were greater than two times the absolute values of the reporting limits are tabulated below. Action levels were calculated at five times the blank concentrations for the analytes detected in the blank samples. Action levels for aqueous blank samples associated with sediment samples were calculated using a density of 1.0 g/ml for water and the percent solids of the affected samples. Detected sample results which were less than the blank action levels for the analytes detected in the blank samples were qualified with a "U" in the associated samples. The "U" qualifier indicates that the TAL inorganic was analyzed for but was not detected above the reportable limit.

Blank ID	TAL Inorganic	Blank Concentration	Blank Action Level	Associated Samples	Qualified Sample Result
ICP Preparation 29NOV934A	total - copper	0.0064 mg/L	0.032 mg/L	SW-017-3 Blind Duplicate-1-3 SW-016-3 SW-05-3 SW-06-3 SW-07-3 SW-04-3 SW-015-3 Ryder Spring-3 Equipment Blank-3-1	0.0084 U mg/L 0.0058 U mg/L 0.0063 U mg/L 0.0039 U mg/L 0.0047 U mg/L 0.0062 U mg/L 0.0048 U mg/L 0.0052 U mg/L 0.0038 U mg/L 0.018 U mg/L
ICP Preparation 29Nov934B	total - zinc	0.0276 mg/L	0.138 mg/L	SW-017-3 Blind Duplicate-1-3 SW-016-3 SW-05-3 SW-06-3 SW-07-3 SW-04-3 SW-015-3 Ryder Spring-3 Equipment Blank-3-1	0.078 U mg/L 0.025 U mg/L 0.017 U mg/L 0.024 U mg/L 0.029 U mg/L 0.019 U mg/L 0.021 U mg/L 0.023 U mg/L 0.024 U mg/L 0.033 U mg/L

Blank ID	TAL Inorganic	Blank Concentration	Blank Action Level	Associated Samples	Qualified Sample Result
ICP Preparation 29NOV934B	total - copper	0.015 mg/L	0.075 mg/L	Equipment Blank-3-3 W-08S1-3 W-25S1-3 W-09S1-3 W-04D-3 Equipment Blank-4-3 W-24T-3 Blind Duplicate-3-3	0.0077 U mg/L 0.032 U mg/L 0.029 U mg/L 0.066 U mg/L 0.036 U mg/L 0.0075 U mg/L 0.018 U mg/L 0.016 U mg/L
	total - zinc	0.031 mg/L	0.155 mg/L	Equipment Blank-3-3 W-08S1-3 W-25S1-3 W-04D-3 Equipment Blank-4-3 W-24T-3 Blind Duplicate-3-3	0.020 U mg/L 0.14 U mg/L 0.12 U mg/L 0.13 U mg/L 0.040 U mg/L 0.068 U mg/L 0.050 U mg/L
ICP Preparation 30NOV934A	dissolved - zinc	0.024 mg/L	0.120 mg/L	SW-017-3 Blind Duplicate-1-3 SW-016-3 SW-05-3 SW-06-3 SW-07-3 SW-04-3 SW-015-3 Ryder Spring-3 Equipment Blank	0.017 U mg/L 0.015 U mg/L 0.011 U mg/L 0.021 U mg/L 0.014 U mg/L 0.012 U mg/L 0.025 U mg/L 0.019 U mg/L 0.019 U mg/L 0.065 U mg/L
ICP Preparation 29NOV934A	total - copper	0.006 mg/L	0.030 mg/L	SW-03-3 SW-14-3	0.0072 U mg/L 0.0057 U mg/L
	total - zinc	0.028 mg/L	0.140 mg/L	SW-12-3 SW-03-3 SW-11-3 SW-14-3 Equipment Blank	0.019 U mg/L 0.024 U mg/L 0.12 U mg/L 0.034 U mg/L 0.13 U mg/L
ICP Preparation 30NOV934A	dissolved - zinc	0.024 mg/L	0.120 mg/L	SW-12-3 SW-03-3 SW-11-3 SW-14-3 Equipment Blank	0.014 U mg/L 0.011 U mg/L 0.037 U mg/L 0.019 U mg/L 0.026 U mg/L

Blank ID	TAL Inorganic	Blank Concentration	Blank Action Level	Associated Samples	Qualified Sample Result
ICP Preparation 07DEC934A	dissolved - chromium	0.019 mg/L	0.095 mg/L	W-04S-3 W-05-3 W-03-3 W-03/S2-3 W-06D-3 W-07S1-3 W-11/S1-3 W-07DI-3 W-04SI-3	0.0082 U mg/L 0.018 U mg/L 0.015 U mg/L 0.014 U mg/L 0.0096 U mg/L 0.013 U mg/L 0.017 U mg/L 0.028 U mg/L 0.014 U mg/L
	dissolved - copper	0.0078 mg/L	0.039 mg/L	W-04S-3 W-05-3 W-03-3 W-03/S2-3 W-06S-3 W-06D-3 W-12/S1-3 W-22/S1-3 W-07S1-3 Blind Duplicate-4-3 W-07SI-3 W-07DI-3	0.0052 U mg/L 0.0072 U mg/L 0.014 U mg/L 0.0075 U mg/L 0.0046 U mg/L 0.0036 U mg/L 0.0056 U mg/L 0.0075 U mg/L 0.0056 U mg/L 0.0046 U mg/L 0.0078 U mg/L 0.0095 U mg/L
ICP Preparation 14DEC934A	total - copper	0.0078 mg/L	0.039 mg/L	W-02-3 SBW-10-3 Blind Duplicate-4-3 W-07SI-3 W-07DI-3 W-04SI-3 W-04DI-3 W-09SI-3 W-09B-3 W-08SI-3 W-04B-3 W-25SI-3	0.0088 U mg/L 0.034 U mg/L 0.0078 U mg/L 0.0068 U mg/L 0.019 U mg/L 0.029 U mg/L 0.024 U mg/L 0.0066 U mg/L 0.0089 U mg/L 0.017 U mg/L 0.0085 U mg/L 0.037 U mg/L
	total - zinc	0.030 mg/L	0.15 mg/L	W-02-3 SBW-10-3 W-07S1-3 Blind Duplicate-4-3 W-11/S1-3 W-07SI-3 W-04DI-3 W-09B-3 W-04B-3	0.053 U mg/L 0.079 U mg/L 0.12 U mg/L 0.028 U mg/L 0.14 U mg/L 0.025 U mg/L 0.078 U mg/L 0.030 U mg/L 0.087 U mg/L

Blank ID	TAL Inorganic	Blank Concentration	Blank Action Level	Associated Samples	Qualified Sample Result
Equipment-3-3	total - cadmium	0.00025 mg/L	0.0013 mg/L	W-08S1-3 W-25S1-3 W-09S1-3 W-04D-3 W-23T-3 W-24T-3 Blind Duplicate-3-3	0.00033 U mg/L 0.00075 U mg/L 0.0012 U mg/L 0.00047 U mg/L 0.0010 U mg/L 0.00012 U mg/L 0.00026 U mg/L
	total - lead	0.0034 mg/L	0.017 mg/L	W-08S1-3 W-24T-3 Blind Duplicate-3-3	0.016 U mg/L 0.0074 U mg/L 0.013 U mg/L
	dissolved - iron	0.057 mg/L	0.285 mg/L	W-08S1-3 W-04D-3 W-23T-3 W-24T-3 Blind Duplicate-3-3	0.23 U mg/L 0.051 U mg/L 0.045 U mg/L 0.052 U mg/L 0.052 U mg/L
Equipment-4-3	total - silver	0.0078 mg/L	0.039 mg/L	W-08S1-3 W-25S1-3 W-09S1-3 W-04D-3 W-23T-3 Blind Duplicate-3-3	0.0075 U mg/L 0.0039 U mg/L 0.0060 U mg/L 0.0063 U mg/L 0.0033 U mg/L 0.0065 U mg/L
	dissolved - chromium	0.0062 mg/L	0.031 mg/L	W-08S1-3 W-25S1-3 W-09S1-3 W-04D-3 W-23T-3 W-24T-3 Blind Duplicate-3-3	0.23 U mg/L 0.0074 U mg/L 0.0045 U mg/L 0.0057 U mg/L 0.0048 U mg/L 0.0067 U mg/L 0.0053 U mg/L
	dissolved - manganese	0.0038 mg/L	0.019 mg/L	W-23T-3	0.0072 U mg/L
	dissolved - sodium	0.70 mg/L	3.5 mg/L	W-23T-3 W-24T-3 Blind Duplicate-3-3	1.2 U mg/L 1.4 U mg/L 1.1 U mg/L
	dissolved - zinc	0.031 mg/L	0.155 mg/L	W-08S1-3 W-25S1-3 W-09S1-3 W-04D-3 W-23T-3 W-24T-3 Blind Duplicate-3-3	0.041 U mg/L 0.027 U mg/L 0.024 U mg/L 0.016 U mg/L 0.012 U mg/L 0.023 U mg/L 0.012 U mg/L

Blank ID	TAL Inorganic	Blank Concentration	Blank Action Level	Associated Samples	Qualified Sample Result
Equipment-5-3	dissolved - cadmium	0.00015 mg/L	0.00075 mg/L	W-07DI-3 W-04SI-3	0.00010 U mg/L 0.00020 U mg/L
	dissolved - nickel	0.010 mg/L	0.050 mg/L	W-02-3 W-07S1-3 Blind Duplicate-4-3 W-11/S1-3 W-07SI-3	0.039 U mg/L 0.0084 U mg/L 0.042 U mg/L 0.0090 U mg/L 0.011 U mg/L
	dissolved - lead	0.0016 mg/L	0.0080 mg/L	SBW-10-3 W-07DI-3	0.0014 U mg/L 0.0012 U mg/L
	dissolved - iron	0.020 mg/L	0.10 mg/L	W-07DI-3	0.0099 U mg/L
	dissolved - magnesium	0.018 mg/L	0.090 mg/L	W-07DI-3	0.022 U mg/L

Matrix Spike/Matrix Spike Duplicate Analysis

Matrix spike/matrix spike duplicate (MS/MSD) recovery criteria requiring spike recoveries to be between 75.0 and 125.0 percent were exceeded for several samples. Qualification of sample results that exceeded MS/MSD recovery limits included the approximation (J) of detected results when spike recoveries were above the upper limit or below the lower limit. Non-detected sample results were approximated (UJ) when MS/MSD recoveries were below the lower limit but above 30.0 percent. MS/MSD data were evaluated and qualifiers were applied to the analytical results in accordance with USEPA guidance dated February 1989 not the September 1990 guidance. This procedure was discussed and agreed upon with USEPA in a conference call held, January 25, 1995. Non-detected sample results were qualified as unuseable (R) when MS/MSD recoveries were below 30.0 percent. Samples qualified due to MS/MSD recovery excursions are tabulated below.

MS/MSD Sample ID	TAL Inorganic	Percent Recovery		Affected Samples	Qualified Sample Results
		MS	MSD		
SED-14-3	total - manganese	62.5	39.7	SED-11-3 SED-12-3 SED-14-3 Blind Duplicate	1160 J mg/Kg 193 J mg/Kg 117 J mg/Kg 1750 J mg/Kg
SED-14-3	total - antimony	60.9	67.2	SED-11-3 SED-12-3 SED-14-3 Blind Duplicate	12.2 UJ mg/Kg 9.1 UJ mg/Kg 7.8 UJ mg/Kg 14.5 UJ mg/Kg
	total - selenium	61.0	61.3	SED-11-3 SED-12-3 SED-14-3 Blind Duplicate	qualification not required since results were approximated due to furnace post digestion spike recovery excursions
Olin-3	total - selenium	35.0	31.0	Olin-3	0.005 UJ mg/L
W-04S-3	dissolved - cadmium	84.0	61.0	W-04S-3 W-22/S1-3	qualification not required since results were approximated due to furnace post digestion spike recovery excursions
				W-05-3 W-06S-3 W-12/S1-3	qualification of sample results was not required for these samples since they were previously approximated for having detected results below the reporting limit
				W-03-3 W-03/S2-3 W-06D-3	0.0005 UJ mg/L 0.0005 UJ mg/L 0.0005 UJ mg/L

MS/MSD Sample ID	TAL Inorganic	Percent Recovery		Affected Samples	Qualified Sample Results
		MS	MSD		
W-04S-3	total - selenium	0	0	W-04S-3 W-05-3 W-03-3 W-03/S2-3 W-06S-3 W-06D-3 W-12-S1-3 W-22/S1-3	R R R R R R R R
W-04S-3	dissolved - selenium	69.7	70.0	W-04S-3 W-05-3 W-03-3 W-06D-3 W-22/S1-3	qualification not required since results were approximated due to furnace post digestion spike recovery excursions
				W-03/S2-3 W-06S-3 W-12/S1-3	0.005 UJ mg/L 0.005 UJ mg/L 0.005 UJ mg/L
W-25DI-3	total - lead	161.0	81.0	W-08B-3 W-25DI-3 W-01B-3	0.0047 J mg/L 0.0071 J mg/L 0.011 J mg/L

Field Duplicate Analysis

Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The relative percent difference (RPD) between duplicate samples is required to be less than 30.0 and 50.0 percent for water and soil samples, respectively. The identity of blind duplicate samples and the TAL inorganics that exceeded RPD criteria are tabulated below.

Blind Duplicate Collection Date	Corresponding Sample ID	TAL Inorganic	RPD	Affected Samples	Qualified Sample Result
11/16/93	SW-017-3	total - iron	84.4	SW-017-3 Blind Duplicate-1-3 SW-016-3 SW-05-3 SW-06-3 SW-07-3 SW-04-3 SW-015-3 Ryder Spring-3	0.32 J mg/L 0.13 J mg/L NA NA NA 0.30 J mg/L NA 0.16 J mg/L NA
11/16/93	SW-017-3	total - manganese	46.2	SW-017-3 Blind Duplicate-1-3 SW-016-3 SW-05-3 SW-06-3 SW-07-3 SW-04-3 SW-015-3 Ryder Spring-3	0.032 J mg/L 0.020 J mg/L 0.017 J mg/L NA NA 0.060 J mg/L 0.020 J mg/L 0.075 J mg/L NA
		dissolved - barium	53.7	SW-017-3 Blind Duplicate-1-3 SW-016-3 SW-05-3 SW-06-3 SW-07-3 SW-04-3 SW-015-3 Ryder Spring-3	0.015 J mg/L 0.026 J mg/L 0.016 J mg/L 0.016 J mg/L 0.016 J mg/L 0.022 J mg/L 0.019 J mg/L 0.021 J mg/L 0.018 J mg/L
11/17/93	SED-11-3	total - beryllium	200.0	SED-11-3 SED-12-3 SED-14-3 Blind Duplicate	0.41 UJ mg/Kg 0.46 J mg/Kg 0.34 J mg/Kg 0.61 J mg/Kg
		total - cadmium	200.0	SED-11-3 SED-12-3 SED-14-3 Blind Duplicate	1.0 UJ mg/Kg 0.76 UJ mg/Kg 0.65 UJ mg/Kg 1.6 J mg/Kg
11/22/93	Ryder Spring-3	dissolved - calcium	67.1	W-01/S1-3 Ryder Spring-3 Dickinson-3 SBW-21-3 Blind Duplicate-2-3	31.1 J mg/L 9.5 J mg/L 108 J mg/L 70.7 J mg/L 19.1 J mg/L
		dissolved - sodium	163.5	W-01/S1-3 Ryder Spring-3 Dickinson-3 SBW-21-3 Blind Duplicate-2-3	NA NA 251 J mg/L 9.0 J mg/L 26.9 J mg/L
11/23/93	W-24T-3	none affected	NR	none affected	NR

Blind Duplicate Collection Date	Corresponding Sample ID	TAL Inorganic	RPD	Affected Samples	Qualified Sample Result
11/30/93	W-02-3	total - chromium	200.0	W-02-3 SBW-10-3 W-07S1-3 Blind Duplicate-4-3 W-11/S1-3 W-07SI-3 W-07DI-3 W-04SI-3	0.010 UJ mg/L 0.010 J mg/L 0.025 J mg/L 0.018 J mg/L 0.049 J mg/L 0.010 UJ mg/L 0.029 J mg/L 0.026 J mg/L

NA = Sample previously qualified.
NR = Not required since duplicate RPDs were within control limits.

Furnace Atomic Absorption Analysis

The QA/QC criteria specified for furnace atomic absorption post digestion matrix spike performance requires that the spike percent recoveries (%R) be between 85 and 115 percent. Samples that exceeded these criteria and the qualification of sample results due to these excursions are tabulated below.

TAL Inorganic	Sample ID	Spike Recovery	Qualified Sample Result
total - arsenic	W-01B-3	153.0 %	qualification of sample result was not required for this sample since it was previously approximated for having a detected result below the reporting limit
dissolved - arsenic	Equipment Blank-5-3	66.0 %	0.005 UJ mg/L

TAL Inorganic	Sample ID	Spike Recovery	Qualified Sample Result
total - cadmium	SW-017-3 Blind Duplicate-1-3 SW-016-3 SW-05-3 SW-06-3 SW-07-3 SW-12-3 SW-03-3 SW-11-3 Equipment Blank Ryder Spring Blind Duplicate-2-3 W-03/S2-3 W-02-3 SBW-10-3 W-07DI-3	121.0 % 127.0 % 128.0 % 120.0 % 139.0 % 146.0 % 137.0 % 133.0 % 133.0 % 124.0 % 133.0 % 136.0 % 125.0 % 70.0 % 60.0 % 60.0 %	qualification of sample results was not required for these samples since they were previously approximated for having detected results below the reporting limit
	W-03-3 W-07S1-3 W-08SI-3 W-08B-3 W-25DI-3 W-01B-3	82.0 % 70.0 % 50.0 % 70.0 % 60.0 % 60.0 %	0.0011 J mg/L 0.002 UJ mg/L 0.0010 J mg/L 0.0005 UJ mg/L 0.0005 UJ mg/L 0.0005 UJ mg/L
dissolved - cadmium	SW-017-3 Blind Duplicate-1-3 SW-016-3 SW-05-3 SW-06-3 SW-07-3 SW-015-3 SW-12-3 SW-03-3 SW-14-3 Blind Duplicate W-06S-3 W-07DI-3 W-09B-3	123.0 % 137.0 % 127.0 % 132.0 % 151.0 % 156.0 % 128.0 % 138.0 % 134.0 % 122.0 % 130.0 % 116.0 % 60.0 % 128.0 %	qualification of sample results was not required for these samples since they were previously approximated for having detected results below the reporting limit
dissolved - cadmium	SW-11-3 Dickinson-3 W-04D-3 W-04S-3 W-22/S1-3 W-02-3 SBW-10-3 W-07S1-3 Blind Duplicate-4-3 W-08SI-3	81.0 % 50.0 % 79.0 % 83.0 % 58.0 % 70.0 % 73.0 % 71.0 % 77.0 % 66.0 %	0.0005 UJ mg/L 0.0005 UJ mg/L 0.0005 UJ mg/L 0.0005 UJ mg/L 0.0005 UJ mg/L 0.0005 UJ mg/L 0.0005 UJ mg/L 0.0005 UJ mg/L 0.0005 UJ mg/L 0.0005 UJ mg/L

TAL Inorganic	Sample ID	Spike Recovery	Qualified Sample Result
total - selenium	SW-11-3	43.0 %	0.005 UJ mg/L
	SED-11-3	76.0 %	1.0 UJ mg/Kg
	SED-12-3	77.0 %	0.76 UJ mg/Kg
	SED-14-3	73.0 %	0.67 UJ mg/Kg
	Blind Duplicate	66.0 %	1.2 UJ mg/Kg
	W-01/S1-3	61.0 %	0.05 UJ mg/L
	Dickinson-3	68.0 %	0.005 UJ mg/L
	SBW-21-3	71.0 %	0.05 UJ mg/L
	Blind Duplicate-2-3	83.0 %	0.005 UJ mg/L
	W-08S1-3	49.0 %	0.01 UJ mg/L
	W-25S1-3	65.0 %	0.01 UJ mg/L
	W-09S1-3	66.0 %	0.01 UJ mg/L
	W-04D-3	48.0 %	0.01 UJ mg/L
	W-23T-3	52.0 %	0.01 UJ mg/L
	W-24T-3	47.0 %	0.005 UJ mg/L
	Blind Duplicate-3-3	46.0 %	0.005 UJ mg/L
	W-02-3	50.0 %	0.005 UJ mg/L
	Blind Duplicate-4-3	43.0 %	0.005 UJ mg/L
	W-04DI-3	80.0 %	0.005 UJ mg/L
	W-08SI-3	58.0 %	0.005 UJ mg/L
	W-25SI-3	60.0 %	0.005 UJ mg/L
	W-25DI-3	80.0 %	0.005 UJ mg/L
total-selenium	W-04S-3	68.0 %	qualification of sample results was not required for these samples since they were qualified as unuseable for MS/MSD recovery excursions
	W-05-3	70.0 %	
	W-03-3	54.0 %	
	W-03/S2-3	60.0 %	
	W-06S-3	70.0 %	
	W-06D-3	74.0 %	
	W-12-S1-3	75.0 %	

TAL Inorganic	Sample ID	Spike Recovery	Qualified Sample Result
dissolved - selenium	Blind Duplicate-1-3	81.0 %	0.005 UJ mg/L
	SW-12-3	84.0 %	0.005 UJ mg/L
	SW-03-3	79.0 %	0.005 UJ mg/L
	SW-11-3	79.0 %	0.005 UJ mg/L
	SW-14-3	76.0 %	0.005 UJ mg/L
	Equipment Blank	81.0 %	0.005 UJ mg/L
	Ryder Spring-3	78.0 %	0.005 UJ mg/L
	Dickinson-3	62.0 %	0.005 UJ mg/L
	SBW-21-3	66.0 %	0.005 UJ mg/L
	Blind Duplicate-2-3	73.0 %	0.005 UJ mg/L
	Equipment Blank-3-3	82.0 %	0.005 UJ mg/L
	W-08S1-3	70.0 %	0.005 UJ mg/L
	W-25S1-3	82.0 %	0.005 UJ mg/L
	W-09S1-3	82.0 %	0.005 UJ mg/L
	W-04D-3	63.0 %	0.005 UJ mg/L
	Equipment Blank-4-3	80.0 %	0.005 UJ mg/L
	W-23T-3	78.0 %	0.005 UJ mg/L
	W-24T-3	76.0 %	0.005 UJ mg/L
	Blind Duplicate-3-3	80.0 %	0.005 UJ mg/L
	Olin-3	70.0 %	0.005 UJ mg/L
	W-04S-3	71.0 %	0.005 UJ mg/L
	W-03-3	62.0 %	0.005 UJ mg/L
	W-06D-3	81.0 %	0.005 UJ mg/L
	W-22-S1-3	82.0 %	0.005 UJ mg/L
	W-02-2	61.0 %	0.01 UJ mg/L
	SBW-10-3	72.0 %	0.005 UJ mg/L
	W-07S1-3	65.0 %	0.005 UJ mg/L
	Blind Duplicate-4-3	67.0 %	0.005 UJ mg/L
	W-11/S1-3	70.0 %	0.005 UJ mg/L
	Equipment Blank-5-3	59.0 %	0.005 UJ mg/L
	W-07DI-3	55.0 %	0.01 UJ mg/L
	W-04SI-3	71.0 %	0.005 UJ mg/L
	W-04DI-3	83.0 %	0.005 UJ mg/L
	W-09SI-3	80.0 %	0.005 UJ mg/L
	W-09B-3	76.0 %	0.005 UJ mg/L
	W-08SI-3	49.0 %	0.005 UJ mg/L
	W-04B-3	71.0 %	0.005 UJ mg/L
	W-25SI-3	74.0 %	0.005 UJ mg/L
	W-25DI-3	78.0 %	0.005 UJ mg/L
	W-01B-3	78.0 %	0.005 UJ mg/L

TAL Inorganic	Sample ID	Spike Recovery	Qualified Sample Result
dissolved - selenium	W-05-3	56.0 %	qualification not required for these samples since they were previously approximated for having detected results below the reporting limit
total - lead	W-08SI-3	77.0 %	
dissolved - lead	Equipment Blank-5-3	64.0 %	
	W-07DI-3	70.0 %	
	W-22/S1-3	84.0 %	0.003 UJ mg/L
	W-03-3	83.0 %	0.003 UJ mg/L
	W-08SI-3	60.0 %	0.003 UJ mg/L
total - thallium	SW-11-3	78.0 %	0.005 UJ mg/L
	SED-14-3	81.0 %	0.67 UJ mg/Kg
	SBW-21-3	76.0 %	0.005 UJ mg/L
	W-08S1-3	76.0 %	0.005 UJ mg/L
	W-25S1-3	70.0 %	0.005 UJ mg/L
	W-09S1-3	82.0 %	0.005 UJ mg/L
	W-04D-3	54.0 %	0.005 UJ mg/L
	W-04S-3	68.0 %	0.005 UJ mg/L
	W-05-3	57.0 %	0.005 UJ mg/L
	W-03-3	46.0 %	0.005 UJ mg/L
	W-06S-3	50.0 %	0.005 UJ mg/L
	W-12/S1-3	66.0 %	0.005 UJ mg/L
	W-22/S1-3	56.0 %	0.005 UJ mg/L
	W-02-3	60.0 %	0.005 UJ mg/L
	SBW-10-3	61.0 %	0.005 UJ mg/L
	W-07S1-3	60.0 %	0.005 UJ mg/L
	Blind Duplicate-4-3	64.0 %	0.005 UJ mg/L
	W-11/S1-3	68.0 %	0.005 UJ mg/L
	W-07DI-3	52.0 %	0.005 UJ mg/L
	W-08SI-3	42.0 %	0.005 UJ mg/L
dissolved - thallium	Dickinson-3	48.0 %	0.005 UJ mg/L
	SBW-21-3	60.0 %	0.005 UJ mg/L
	Blind Duplicate-2-3	72.0 %	0.005 UJ mg/L
	W-08S1-3	74.0 %	0.005 UJ mg/L
	W-25S1-3	76.0 %	0.005 UJ mg/L
	W-09S1-3	84.0 %	0.005 UJ mg/L
	W-04D-3	64.0 %	0.005 UJ mg/L
	W-04S-3	67.0 %	0.005 UJ mg/L
	W-03-3	79.0 %	0.005 UJ mg/L
	W-22/S1-3	73.0 %	0.005 UJ mg/L
	W-02-3	65.0 %	0.005 UJ mg/L
	SBW-10-3	84.0 %	0.005 UJ mg/L
	W-07S1-3	64.0 %	0.005 UJ mg/L
	Blind Duplicate-4-3	62.0 %	0.005 UJ mg/L
	W-11/S1-3	76.0 %	0.005 UJ mg/L
	Equipment Blank-5-3	63.0 %	0.005 UJ mg/L
	W-07SI-3	81.0 %	0.005 UJ mg/L
	W-07DI-3	50.0 %	0.005 UJ mg/L
	W-08SI-3	48.0 %	0.01 UJ mg/L

ICP Interference Check Sample Analysis

Several interference check samples (ICSA) contained concentrations of TAL inorganics in the A solutions which were greater than their reporting limits. TAL inorganics were also detected in the A solutions at a negative concentration greater than two times the absolute value of the reporting limits. Qualification of the affected TAL inorganics detected at positive concentrations in the ICSA solution was to approximate (J) the detected results for samples containing one or more of the interferant analytes (Al, Ca, Fe, or Mg) at concentrations greater than fifty percent of the ICSA concentrations. Non-detected sample results were also approximated (UJ) for those analytes detected at negative concentrations in the ICSA solution for samples containing one or more of the interferant analytes at concentrations greater than fifty percent of the ICSA concentrations. The TAL inorganics detected in the ICSA samples at both positive and negative concentrations and the samples qualified as a result of these excursions are tabulated below.

Date Analyzed	Affected Samples	TAL Inorganic	ICSA Concentration	Qualified Sample Result
12/01/93	W-04D-3	total - manganese	0.017 mg/L	2.8 J mg/L
		total - chromium	0.012 mg/L	0.023 J mg/L
	W-23T-3	total - manganese	0.017 mg/L	5.4 J mg/L
		total - chromium	0.012 mg/L	0.073 J mg/L
		total - zinc	0.022 mg/L	0.33 J mg/L
12/02/93	SW-11-3	total - chromium	0.012 mg/L	0.034 J mg/L
		total - copper	-0.016 mg/L	0.005 UJ mg/L
		total - manganese	0.017 mg/L	22.8 J mg/L
		total - zinc	0.022 mg/L	0.12 UJ mg/L

Date Analyzed	Affected Samples	TAL Inorganic	ICSA Concentration	Qualified Sample Result
12/06/93	SED-11-3	total - barium	0.014 mg/L	94.0 J mg/Kg
		total - copper	0.011 mg/L	12.2 J mg/Kg
		total - manganese	0.013 mg/L	not required since result was previously approximated due to MS/MSD excursions
		total - zinc	0.024 mg/L	105 J mg/Kg
12/06/93	Blind Duplicate	total - barium	0.014 mg/L	147 J mg/Kg
		total - copper	0.011 mg/L	17.0 J mg/Kg
		total - manganese	0.013 mg/L	not required since result was previously approximated due to MS/MSD excursions
		total - zinc	0.024 mg/L	152 J mg/Kg
12/08/93	W-05-3	total - barium	0.011 mg/L	0.30 J mg/L
		total - copper	0.0077 mg/L	0.059 J mg/L
		total - zinc	0.021 mg/L	0.17 J mg/L
	W-03-3	total - barium	0.011 mg/L	0.47 J mg/L
		total - copper	0.0077 mg/L	0.11 J mg/L
		total - zinc	0.021 mg/L	0.34 J mg/L
12/15/93	W-07S1-3	total - copper	0.010 mg/L	0.097 J mg/L
	W-11/S1-3	total - copper	0.010 mg/L	0.050 J mg/L
12/24/93	W-08SI-3	dissolved - copper	0.0058 mg/l	0.0065 J mg/L

Element Quantitation and Reported Detection Limits

Detected sample results that were greater than the IDLs but less than the Enseco-RMAL reporting limits were qualified as approximated (J). Additionally, Enseco-RMAL raised the reporting limits for non-detected sample results by a factor of two for graphite furnace atomic absorption (GFAA) analyses that did not meet post digestion matrix spike recovery criteria. As a result of the validation, the affected non-detected GFAA sample results that had post digestion spike recoveries between 10.0 and 85.0 percent were qualified as approximated (UJ) and reported with the non-elevated reporting limits. The affected samples with post digestion spike recoveries greater than 115.0 percent were reported with the non-elevated reporting limits without qualification.

Overall Data Assessment

Overall, the laboratory performed TAL inorganics analyses in accordance with the requirements specified in the methods listed in Section 2.0. These data have been determined to be useable for qualitative and quantitative purposes with the exception of eight total selenium results which were qualified as unuseable due to low MS/MSD recoveries. Detected sample results for several analytes were qualified with a "U" based on equipment and preparation blank criteria. Detected and non-detected sample results for several analytes were also approximated based on excursions from ICP interference check sample analysis, matrix spike analysis, field duplicate analysis, and furnace analytical spike analysis criteria.

4.2 Hexavalent Chromium Analysis

QA/QC parameters for hexavalent chromium analyses were evaluated for twenty-seven ground water, two blind duplicates, and two equipment blank samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration verification, blank analysis, matrix spike analysis, laboratory duplicate analysis, laboratory control sample analysis, and document completeness. Excursions from QA/QC criteria are summarized below.

Field Duplicate Analysis

Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The RPD between duplicate samples is required to be less than 30.0 and 50.0 percent for water and soil samples, respectively. The identity of blind duplicate samples and the samples qualified for RPD excursions are tabulated below.

Blind Duplicate Collection Date	Corresponding Sample ID	RPD	Affected Samples	Qualififed Sample Result
11/16/93	SW-017-3	NR	none affected	NR
11/30/93	W-02-3	NR	none affected	NR

NR = Not required since duplicate RPDs were within control limits.

Overall Data Assessment

Overall, the laboratory performed hexavalent chromium analyses in accordance with the requirements specified in the methods listed in Section 2.0. These data have been determined to be useable for qualitative and quantitative purposes since no excursions resulting in the qualification of data were observed.

4.3 TCL Volatiles Analysis

Three sediment, thirty-two ground water, three blind duplicate, four equipment blank, and seven trip blank samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: holding times, GC/MS instrument tuning, surrogate recovery, matrix spike/matrix spike duplicate analysis, reference standard analysis, internal standards recovery, compound identification and quantitation, percent solids determination and content, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Blank Analysis

Blank samples that contained concentrations of TCL volatile organics that exceeded the method detection limits (MDLs) are tabulated below. Action levels were calculated at five times the blank concentrations for the compounds detected in the blank samples. Blank action levels for the common laboratory contaminant compounds (acetone, methylene chloride, and 2-butanone) detected in the blanks were calculated at ten times the blank concentrations. Dilutions and differences between sample and blank weights or volumes were taken into account when applying blank actions. Action levels for aqueous blank samples associated with sediment samples were calculated using a density of 1.0 g/ml for water and the percent solids of the affected samples. Detected sample results which were less than the blank action levels for the compounds detected in the blank samples were qualified with a "U" in the associated samples. Detected sample results below the blank action level which were above the MDL but less than the Enseco-RMAL reporting limit were raised to the Enseco-RMAL reporting limit and qualified with a "U". The "U" qualifier indicates that the TCL volatile organic was analyzed for but was not detected above the reported quantitation limit.

Blank ID	TAL Volatile Organic	Blank Concentration	Blank Action Level	Associated Samples	Qualified Sample Result
Method 24NOV932B	methylene chloride	1.54 µg/L	15.4 µg/L	Trip Blank (11/18/93)	5.0 U µg/L
Method 24NOV93V2	acetone	2.88 µg/L	28.8 µg/L	Equipment Blank-3-1	10 U µg/L
Method BL120693	acetone	6.54 µg/L	65.4 µg/L	Trip Blank (11/23/93) W-08S1-3 W-09S1-3 Blind Duplicate-3-3	10 U µg/L 19 U µg/L 20 U µg/L 10 U µg/L
	methylene chloride	0.89 µg/L	8.9 µg/L	Equipment Blank-3-3 Trip Blank (11/23/93)	5.0 U µg/L 5.0 U µg/L
Method 07DEC93H2	carbon disulfide	1.02 µg/L	10.2 µg/L	Blind Duplicate-4-3	500 U µg/L
Method BL120793	acetone	4.61 µg/L	46.1 µg/L	SBW-10-3 W-07S1-3 W-11/S1-3 W-07SI-3 W-07DI-3	10 U µg/L 10 U µg/L 700 U µg/L 10 U µg/L 43 U µg/L
	methylene chloride	0.55 µg/L	5.5 µg/L	Trip Blank (11/30/93) W-07SI-3	5.0 U µg/L 5.0 U µg/L

Blank ID	TAL Volatile Organic	Blank Concentration	Blank Action Level	Associated Samples	Qualified Sample Result
Method BL120893	methylene chloride	0.62 μg/L	6.2 μg/L	W-22/S1-3 W-04DI-3 W-09SI-3 Trip Blank (12/01/93) W-09B-3 W-08SI-3 W-04B-3	250 U μg/L 5.0 U μg/L 5.0 U μg/L 5.0 U μg/L 5.0 U μg/L 5.0 U μg/L 5.0 U μg/L
Method 09DEC93v	methylene chloride	1.93 μg/L	19.3 μg/L	W-25SI-3	5.0 U μg/L
Method 10DEC93e	methylene chloride	5.36 μg/L	53.6 μg/L	Trip Blank (12/02/93) W-08B-3 W-01B-3	5.0 U μg/L 5.0 U μg/L 5.0 U μg/L
Equipment-3-3	carbon disulfide	2.3 μg/L	23 μg/L	W-25S1-3 W-24T-3 Blind Duplicate-3-3	5.0 U μg/L 12 U μg/L 5.0 U μg/L
Trip (11/30/93)	carbon disulfide	4.8 μg/L	48 μg/L	W-07SI-3	5.0 U μg/L

Initial Calibration

TCL volatile organics initial calibration criteria requires that the average relative response factor (RRF) have a minimum value of 0.05. Initial calibration criteria also requires that the percent relative standard deviation (%RSD) for the initial calibration be less than 30.0 percent. Qualification of sample results when these criteria were exceeded included the approximation (J) of detected results and the qualification of non-detected results as unuseable (R) for compounds with RRFs below 0.05. Detected results for TCL volatile compounds with %RSD values greater than 30.0 percent were qualified as approximated (J). Non-detected sample results were approximated (UJ) for compounds with %RSD values greater than 50.0 percent. TCL volatile compounds that exceeded initial calibration criteria and the samples qualified due to those excursions are tabulated below.

Date Analyzed	TCL Volatile Compound	RRF	%RSD	Affected Samples	Qualified Sample Result
11/23/93	bromomethane	0.86395	52.82	SED-11-3 SED-12-3 SED-14-3	41 UJ μg/Kg 15 UJ μg/Kg 13 UJ μg/Kg
12/01/93	bromomethane	0.86395	52.82	Blind Duplicate	120 UJ μg/Kg

Continuing Calibration

TCL volatile organics continuing calibration criteria requires that the daily RRF have a minimum value of 0.05. Continuing calibration criteria also requires that the percent difference (%D) between the initial calibration average RRF and the daily RRF be less than 25.0 percent. Qualification of sample results when these criteria were exceeded included the approximation (J) of detected results and the qualification of non-detected results as unuseable (R) for compounds with RRFs below 0.05. Detected results for TCL volatile compounds with %D values greater than 25.0 percent were qualified as approximated (J). Non-detected sample results were approximated (UJ) for compounds with %D values greater than 50.0 percent. TCL volatile compounds that exceeded continuing calibration criteria and the samples qualified due to those excursions are tabulated below.

Date Analyzed	TCL Volatile Compound	RRF	%D	Affected Samples	Qualified Sample Result
11/23/93	o-xylene	0.507	28.3	SW-12-3	qualification of sample result was not required since the result was previously approximated for having a detected value below the reporting limit
12/02/93	acetone	1.109	64.2	W-01/S1-3	qualification of sample result was not required since the result was previously approximated for having a detected value below the reporting limit
				SBW-21-3 Trip Blank (11/22/93)	50 UJ μg/L 10 UJ μg/L
12/02/93	chloromethane	3.266	32.1	SBW-21-3	140 J μg/L
12/07/93	1,1,1-trichloroethane	0.8388 1	59.0	Trip Blank (11/29/93) W-02-3 W-04S-3 W-05-3 W-03-3 W-03/S2-3 W-06S-3 W-06D-3 W-12/S1-3 Blind Duplicate-4-3	5.0 UJ μg/L 500 UJ μg/L 160 UJ μg/L 50 UJ μg/L 500 UJ μg/L 5.0 UJ μg/L 5.0 UJ μg/L 5.0 UJ μg/L 5.0 UJ μg/L 500 UJ μg/L
12/07/93	carbon tetrachloride	0.8400 0	75.3	Trip Blank (11/29/93) W-02-3 W-04S-3 W-05-3 W-03-3 W-03/S2-3 W-06S-3 W-06D-3 W-12/S1-3 Blind Duplicate-4-3	5.0 UJ μg/L 500 UJ μg/L 160 UJ μg/L 50 UJ μg/L 500 UJ μg/L 5.0 UJ μg/L 5.0 UJ μg/L 5.0 UJ μg/L 5.0 UJ μg/L 500 UJ μg/L
	trichloroethene	0.5075 2	28.7	W-02-3 W-04S-3 W-05-3 W-03-3 Blind Duplicate-4-3	1500 J μg/L 2000 J μg/L 870 J μg/L 1300 J μg/L 1900 J μg/L

Date Analyzed	TCL Volatile Compound	RRF	%D	Affected Samples	Qualified Sample Result
12/07/93	trichloroethene	0.50752	28.7	W-03/S2-3 W-06S1-3	qualification of sample results were not required since the results were previously approximated for having detected values below the reporting limits
	tetrachloroethene	0.70659	42.0	W-02-3	
				W-04S-3 W-05-3 W-03-3 W-03/S2-3 Blind Duplicate-4-3	640 J μg/L 130 J μg/L 350 J μg/L 6.2 J μg/L 860 J μg/L
	xylenes (total)	0.59531	29.89	W-07DI-3	qualification of sample result was not required since the result was previously approximated for having a detected value below the reporting limits
12/08/93	bromodichloromethane	0.29847	61.7	W-22/S1-3 W-04DI-3 W-09SI-3 Trip Blank (12/01/93) W-09B-3 W-08SI-3 W-04B-3	250 UJ μg/L 5.0 UJ μg/L 5.0 UJ μg/L 5.0 UJ μg/L 5.0 UJ μg/L 5.0 UJ μg/L 5.0 UJ μg/L

Field Duplicate Analysis

Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The RPD between duplicate samples is required to be less than 30.0 and 50.0 percent for water and soil samples, respectively. The identity of blind duplicate samples and the TCL volatile organics that exceeded RPD criteria are tabulated below.

Blind Duplicate Collection Date	Corresponding Sample ID	TCL Volatile Organic	RPD	Affected Samples	Qualified Sample Result
11/16/93	SED-11-3	acetone	78.4	SED-11-3 SED-12-3 SED-14-3 Blind Duplicate	340 J μg/Kg 59 J μg/Kg 26 J μg/Kg 930 J μg/Kg
11/23/93	W-24T-3	none affected	NR	none affected	NR
11/29/93	W-02-3	benzene	200.0	W-02-3 Blind Duplicate-4-3 W-04S-3	550 J μg/L 500 UJ μg/L NA
		chlorobenzene	200.0	W-02-3 Blind Duplicate-4-3 W-04S-3	580 J μg/L 500 UJ μg/L NA
		toluene	200.0	W-02-3 Blind Duplicate-4-3 W-04S-3	610 J μg/L 500 UJ μg/L NA
		1,1-dichloroethene	200.0	W-02-3 Blind Duplicate-4-3 W-04S-3	620 J μg/L 500 UJ μg/L NA

NA = Sample previously qualified.
NR = Not required since duplicate RPDs were within control limits.

Overall Data Assessment

Overall, the laboratory performed TCL volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.0. These data have been determined to be useable for qualitative and quantitative purposes. Detected results for acetone, carbon disulfide, and methylene chloride were qualified with a "U" or raised to the Enseco-RMAL reporting limit and qualified with a "U" for several samples due to method, equipment, and trip blank. Detected and non-detected sample results were approximated for several TCL compounds due to initial and continuing calibration and field duplicate excursions.

4.4 EPA 524.2 Volatiles Analysis

Two ground water, twelve surface water, two blind duplicate, one equipment blank, and four trip blank samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 524.2 were found to meet validation criteria: holding times, GC/MS instrument tuning, surrogate recovery, matrix spike/matrix spike duplicate analysis, reference standard analysis, internal standards recovery, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Initial Calibration

EPA 524.2 volatile organics initial calibration criteria requires that the average RRF have a minimum value of 0.05. Initial calibration criteria also requires that the %RSD for the initial calibration be less than 30.0 percent. Qualification of sample results when these criteria were exceeded included the approximation (J) of detected results and the qualification of non-detected results as unuseable (R) for compounds with RRFs below 0.05. Detected results for EPA 524.2 volatile compounds with %RSD values greater than 30.0 percent were qualified as approximated (J). Non-detected sample results were approximated (UJ) for compounds with %RSD values greater than 50.0 percent. EPA 524.2 volatile compounds that exceeded initial calibration criteria and the samples qualified due to those excursions are tabulated below.

Date Analyzed	EPA 524.2 Volatile Compound	RRF	%RSD	Affected Samples	Qualified Sample Result
11/26/93	acetone	0.02785	81.033	Blind Duplicate -2-3	R
				Dickinson-3	R
				Equipment Blank	R
				Trip Blank (11/16/93)	R
				Ryder Spring	R
				SW-03-3	R
				SW-04-3	R
				SW-05-3	R
				SW-06-3	R
				SW-07-3	R
				SW-011-3	R
				SW-012-3	R
				SW-014-3	R
				SW-015-3	R
				SW-016-3	R
				SW-017-3	R
				Blind Duplicate-1-3	R
				Trip Blank (11/17/93)	R
				Trip Blank (11/22/93)	R
				Olin-3	R
11/26/93	2-butanone	0.02929	64.704	Blind Duplicate -2-3	R
				Dickinson-3	R
				Equipment Blank	R
				Trip Blank (11/16/93)	R
				Ryder Spring	R
				SW-03-3	R
				SW-04-3	R
				SW-05-3	R
				SW-06-3	R
				SW-07-3	R
				SW-011-3	R
				SW-012-3	R
				SW-014-3	R
				SW-015-3	R
				SW-016-3	R
				SW-017-3	R
				Blind Duplicate-1-3	R
				Trip Blank (11/17/93)	R
				Trip Blank (11/22/93)	R
				Olin-3	R

Date Analyzed	EPA 524.2 Volatile Compound	RRF	%RSD	Affected Samples	Qualified Sample Result
11/26/93	2,2-dichloropropane	0.20392	56.388	Blind Duplicate -2-3	1 UJ μg/L
				Dickinson-3	1 UJ μg/L
				Equipment Blank	1 UJ μg/L
				Trip Blank (11/16/93)	1 UJ μg/L
				Ryder Spring	1 UJ μg/L
				SW-03-3	1 UJ μg/L
				SW-04-3	1 UJ μg/L
				SW-05-3	1 UJ μg/L
				SW-06-3	1 UJ μg/L
				SW-07-3	1 UJ μg/L
				SW-011-3	1 UJ μg/L
				SW-012-3	1 UJ μg/L
				SW-014-3	1 UJ μg/L
				SW-015-3	1 UJ μg/L
				SW-016-3	1 UJ μg/L
				SW-017-3	1 UJ μg/L
				Blind Duplicate-1-3	1 UJ μg/L
				Trip Blank (11/17/93)	1 UJ μg/L
				Trip Blank (11/22/93)	1 UJ μg/L
				Olin-3	1 UJ μg/L

Continuing Calibration

EPA 524.2 volatile organics continuing calibration criteria requires that the daily RRF have a minimum value of 0.05. Continuing calibration criteria also requires that the %D between the initial calibration average RRF and the daily RRF be less than 25.0 percent. Qualification of sample results when these criteria were exceeded included the approximation (J) of detected results and the qualification of non-detected results as unuseable (R) for compounds with RRFs below 0.05. Detected results for EPA 524.2 volatile compounds with %D values greater than 25.0 percent were qualified as approximated (J). Non-detected sample results were approximated (UJ) for compounds with %D values greater than 50.0 percent. EPA 524.2 volatile compounds that exceeded continuing calibration criteria and the samples qualified due to those excursions are tabulated below.

Date Analyzed	EPA 524.2 Volatile Compound	RRF	%D	Affected Samples	Qualified Sample Result
11/27/93	2-hexanone	0.37498	60.61	SW-03-3 SW-05-3 SW-07-3 SW-011-3 SW-012-3	5 UJ μg/L 5 UJ μg/L 5 UJ μg/L 5 UJ μg/L 5 UJ μg/L
11/30/93	carbon disulfide	0.15701	63.02	Equipment Blank SW-04-3 SW-06-3 SW-016-3 SW-017-3 Blind Duplicate-1-3	1 UJ μg/L 1 UJ μg/L 1 UJ μg/L 1 UJ μg/L 1 UJ μg/L 1 UJ μg/L

Field Duplicate Analysis

Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The RPD between duplicate samples is required to be less than 30.0 and 50.0 percent for water and soil samples, respectively. The identity of blind duplicate samples and the EPA 524.2 volatile organics that exceeded RPD criteria are tabulated below.

Blind Duplicate Collection Date	Corresponding Sample ID	TCL Volatile Organic	RPD	Affected Samples	Qualified Sample Result
11/16/93	SW-017-3	none affected	NR	none affected	NR
11/22/93	Ryder Spring-3	none affected	NR	none affected	NR

NR = Not required since duplicate RPDs were within control limits.

Compound Identification and Quantitation

Several samples contained concentrations of EPA 524.2 volatile compounds that exceeded the linear calibration range of the instrument. These samples were re-analyzed with an appropriate dilution to properly quantitate the detected results. The reported results for these samples combined the undiluted and diluted analyses results to provide the lowest reporting limits for non-detected compounds. The samples requiring dilution and the compounds that were reported from a diluted analysis are tabulated below.

Sample ID	Dilution Factor	Compounds That Exceeded Calibration Range
SW-03-3	10	trichloroethene cis-1,2-dichloroethene
SW-011-3	10	vinyl chloride cis-1,2-dichloroethene
SW-012-3	10	trichloroethene tetrachloroethene cis-1,2-dichloroethene
SW-014-3	10	trichloroethene cis-1,2-dichloroethene
SW-015-3	10	trichloroethene cis-1,2-dichloroethene

Overall Data Assessment

Overall, the laboratory performed EPA 524.2 volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.0. With the exception of acetone and 2-butanone results which were qualified as unuseable (R) due to calibration excursions, these data have been determined to be useable for qualitative and quantitative purposes. Non-detected results for 2,2-dichloropropane, 2-

hexanone, and carbon disulfide were also qualified as approximated (UJ) due to calibration excursions.

4.5 TCL Semivolatiles Analysis

Twenty-two ground water, one blind duplicate, and three equipment blank samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8270 were found to meet validation criteria: holding times, GC/MS instrument tuning, initial calibration, matrix spike/matrix spike duplicate analysis, reference standard analysis, internal standards recovery, compound identification and quantitation, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Blank Analysis

Blank samples that contained concentrations of TCL semivolatile organics that exceeded the MDLs are tabulated below. Action levels were calculated at five times the blank concentrations for the compounds detected in the blank samples. Blank action levels for the common laboratory contaminant compounds (common phthalate esters) detected in the blanks were calculated at ten times the blank concentrations. Dilutions and differences between sample and blank weights or volumes were taken into account when applying blank actions. Action levels for aqueous blank samples associated with sediment samples were calculated using a density of 1.0 g/ml for water and the percent solids of the affected samples. Detected sample results which were less than the blank action levels for the compounds detected in the blank samples were qualified with a "U" in the associated samples. Detected sample results below the blank action level which were above the MDL but less than the Enseco-RMAL reporting limit were raised to the Enseco-RMAL reporting limit and qualified with a "U". The "U" qualifier indicates that the TCL semivolatile organic was analyzed for but was not detected above the reported quantitation limit.

Blank ID	TAL Semivolatile Organic	Blank Concentration	Blank Action Level	Associated Samples	Qualified Sample Result
Method 32521-bl	bis(2-ethylhexyl)phthalate	5.44 μg/L	54.4 μg/L	W-02-3 W-04S-3 W-05-3 W-03-3 W-03/S2-3 W-06S-3 Blind Duplicate-4-3	10 U μg/L 10 U μg/L 10 U μg/L 10 U μg/L 10 U μg/L 10 U μg/L 10 U μg/L

Continuing Calibration

TCL semivolatile organics continuing calibration criteria requires that the daily RRF have a minimum value of 0.05. Continuing calibration criteria also requires that the %D between the initial calibration average RRF and the daily RRF be less than 25.0 percent. Qualification of sample results when these criteria were exceeded included the approximation (J) of detected results and the qualification of non-detected results as unuseable (R) for compounds with RRFs below 0.05. Detected results for TCL semivolatile compounds with %D values greater than 25.0 percent were qualified as approximated (J). Non-detected sample results were approximated (UJ) for compounds with %D values greater than 50.0 percent. TCL semivolatile compounds that exceeded continuing calibration criteria and the samples qualified due to those excursions are tabulated below.

Date Analyzed	TCL Semivolatile Compound	RRF	%D	Affected Samples	Qualified Sample Result
11/30/93	4-nitrophenol	0.247	58.3	Equipment Blank-3-1	50 UJ $\mu g/L$
12/09/93	bis(2-ethylhexyl)phthalate	1.046	31.4	W-07S1-3 W-07SI-3 W-07DI-3 W-04SI-3	qualification of sample results were not required since the results were previously approximated for having detected values below the reporting limits
	di-n-octyl phthalate	1.740	27.7	W-04SI-3	

Surrogate Recovery

The surrogate compounds that exceeded recovery criteria and the sample results qualified due to these excursions are tabulated below. Qualification of sample results were limited to only those compounds associated with the surrogate fraction (acid or base/neutral) that exceeded criteria. Sample results required qualification when two or more surrogate compounds per fraction exceeded criteria. Non-detected sample results were determined to be unuseable (R) when one surrogate compound recovery for a fraction was less than 10 percent.

Sample	Surrogate	%Recovery	%Recovery Criteria	Affected Compounds	Qualified Result

SBW-10-3	phenol-d5	7.8	10 to 94	benzoic acid	R
	2-fluorophenol	0	21 to 100	benzyl alcohol	R
	2,4,6-tribromophenol	2.8	10 to 123	4-chloro-3-methyl phenol	R
				2-chlorophenol	R
W-07S1-3	phenol-d5	8.8	10 to 94	2,4-dichlorophenol	R
	2-fluorophenol	0	21 to 100	2,4-dimethylphenol	R
	2,4,6-tribromophenol	3.0	10 to 123	4,6-dinitro-2-methylphenol	R
				2,4-dinitrophenol	R
				2-methylphenol	R
				4-methylphenol	R
				2-nitrophenol	R
				4-nitrophenol	R
				pentachlorophenol	R
				phenol	R
				2,4,5-trichlorophenol	R
				2,4,6-trichlorophenol	R

Field Duplicate Analysis

Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The RPD between duplicate samples is required to be less than 30.0 and 50.0 percent for water and soil samples, respectively. The identity of blind duplicate samples and the TCL semivolatile organics that exceeded RPD criteria are tabulated below.

Blind Duplicate Collection Date	Corresponding Sample ID	TCL Semivolatile Organic	RPD	Affected Samples	Qualified Sample Result
11/29/93	W-02-3	none affected	NR	none affected	NR

NA = Sample previously qualified.
NR = Not required since duplicate RPDs were within control limits.

Overall Data Assessment

Overall, the laboratory performed semivolatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.0. With the exception of sixteen compounds qualified as unuseable (R) for samples SBW-10-3 and W-07S1-3 due to surrogate recovery excursions, the semivolatile organics sample data have been determined to be useable for qualitative and quantitative purposes. Detected sample results for bis(2-ethylhexyl)phthalate were qualified with a "U" due to method blank excursions for several samples.

4.6 PCB/Pesticide Analysis

Two ground water, one blind duplicate, and one equipment blank samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8080 were found to meet validation criteria: holding times, instrument performance, blank analysis, surrogate recovery, matrix spike/matrix spike duplicate analysis, reference standard analysis, compound identification and quantitation, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Field Duplicate Analysis

Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The RPD between duplicate samples is required to be less than 30.0 and 50.0 percent for water and soil samples, respectively. The identity of blind duplicate samples and the PCB/pesticide compounds that exceeded RPD criteria are tabulated below.

Blind Duplicate Collection Date	Corresponding Sample ID	PCB/Pesticide Compound	RPD	Affected Samples	Qualified Sample Result
11/29/93	W-02-3	none affected	NR	none affected	NR

NR = Not required since duplicate RPDs were within control limits.

Overall Data Assessment

Overall, the laboratory performed PCB/pesticide analyses in accordance with the requirements specified in the methods listed in Section 2.01. The majority of the PCB/pesticide sample data have been determined to be useable for qualitative and quantitative purposes. No excursions that resulted in the qualification of data were observed for the PCB/pesticide analyses.

4.7 BOD, TOC, and Hardness Analyses

QA/QC parameters for BOD, TOC, and hardness analyses were evaluated for eleven ground water, three sediments, three blind duplicates, and two equipment blank samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration verification, blank analysis, matrix spike analysis, laboratory control sample analysis, laboratory duplicate analysis, BOD quantitation, and document completeness. Excursions from QA/QC criteria are summarized below.

Field Duplicate Analysis

Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The RPD between duplicate samples is required to be less than 30.0 and 50.0 percent for water and soil samples, respectively. The identity of blind duplicate samples and the samples qualified for RPD excursions are tabulated below.

Blind Duplicate Collection Date	Corresponding Sample ID	RPD	Affected Samples	Qualified Sample Result
11/17/93	SED-11-3	NR	none affected	NR
11/29/93	W-02-3	NR	none affected	NR
11/30/93	W-02-3	NR	none affected	NR

NR = Not required since duplicate RPDs were within control limits.

Overall Data Assessment

Overall, the laboratory performed BOD, TOC, and hardness analyses in accordance with the requirements specified in the methods listed in Section 2.0. These data have been determined to be useable for qualitative and quantitative purposes since no excursions resulting in the qualification of data were observed.

SECTION 5 - SUMMARY AND DATA USEABILITY

The analytical data generated for the November Interim Sampling Program (NISP) conducted at the Burgess Brothers Superfund Site located in Woodford and Bennington, Vermont were evaluated based on QA/QC criteria established by the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) and criteria presented in the QAPP for this investigation. Validation procedures were based on CLP data validation guidelines developed by the USEPA. Data qualified with a "R", which are considered unuseable for either qualitative or quantitative purposes, resulted when a major deficiency was noted in the data generation process. Minor deficiencies in the data generation process resulted in approximation of sample data. Approximation of a data point indicates uncertainty in the reported concentration of the chemical, but not its assigned identity. The conservative assumptions used in the development of conclusions made based on these analytical results allow for the quantitative use of approximated analytical data while still adhering to the project data quality objectives. This approach to the use of analytical data is consistent with the guidance presented in *U.S. EPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), 540/1-891002*, December 1989. A summary of specific QA/QC excursions that resulted in qualification of sample data is presented in Section 4.

Data quality objectives (DQOs) are quantitative and qualitative statements specifying the quality of the environmental data required to support the decision making process. DQOs define the total uncertainty in the data that is acceptable. The DQOs for this investigation require that the total uncertainty of the analytical data remain within a pre-determined acceptable range so as not to hinder the intended use of the data. For this investigation, sediment data will be used to characterize contaminant concentrations in specific areas, while ground water and surface water data will be used to characterize background ground water quality and contaminant concentrations in specific areas of the site.

This section summarizes the analytical data in terms of its completeness and useability for these site characterization purposes. Data completeness is defined as the percentage of sample results that have been determined to be useable during the data validation process. Data completeness with respect to useability was calculated separately for each type of analysis and is tabulated below. The percent useability calculation did not include quality control samples collected to aid in the evaluation of data useability. Therefore, field/equipment blank, trip blank, and field duplicate data determined to be unuseable as a result of the validation process are not represented in the percent useability value.

Analysis	Percent Useability	Excursions
TAL Inorganics	99.6	Non-detected total selenium results were qualified as unuseable for W-04S-3, W-05-3, W-03-3, W-03/S2-3, W-06S 3, W-06D-3, W-12-S1-3, and W-22/S1-3 due to 0 % recoveries for the MS/MSD analysis of W-04S-3.
Hexavalent Chromium	100.0	NA
TCL Volatiles	100.0	NA
EPA 524.2 Volatiles	96.8	Non-detected results for acetone and 2-butanone were qualified as unuseable due to initial calibration minimum RRF criteria excursions.
TCL Semivolatiles	97.8	Non-detected sample results were qualified as unuseable for 16 compounds for SBW-10-3 and W-07S1-3 due to surrogate recovery values that were less than 10 percent.
pesticide/PCBs	100.0	NA

Analysis	Percent Useability	Excursions
BOD, TOC, and Hardness	100.0	NA

NA = Not Applicable

Validation of the NISP analytical data indicated that the data quality objectives defined in the QAPP were met. The following sections present the adherence of the data to the precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters presented in the QAPP. Additional information on the impact of excursions from QC measurements on the analytical data was found in the risk assessment guidance document: *Guidance for Data Useability in Risk Assessment (Part A) Final*, USEPA, 9285.7-09A, April 1992.

Precision is measured through field duplicate samples, split samples, and laboratory duplicate samples. For the analysis programs associated with the NISP, 0.62% of the analytical data were qualified due to excursions from field duplicate sample analyses.

Matrix spike sample, reference standards, surrogate recoveries, and calibration criteria indicate the accuracy of the data. For the NISP, 2.18% of the analytical data were qualified for excursions from matrix spike sample criteria. Additionally, 0.55% and 1.54% of the analytical data were qualified for excursions from surrogate recovery and calibration criteria, respectively.

Holding times, sample preservation, extraction procedures, and blank analyses are indicators of the representativeness of the analytical data. For the analysis programs associated with the NISP, 2.95% the data were qualified for blank excursions.

Comparability is not compromised provided that the analytical methods did not change over time. A major component of comparability is the use of standard reference materials for calibration and QC. These standards are compared to other unknowns to verify their concentrations. Since standard analytical methods and reporting procedures were consistently used by the laboratory, the comparability criteria for the analytical data were met.

The percent useability, or completeness, of the data ranged from 96.8% to 100.0% for data collected for this investigation. Overall, the analytical data are of sufficient quality to meet the project data quality objectives and may be used for qualitative and quantitative purposes. These uses include, but are not limited to, performance of human health and ecological risk assessments, evaluation of remedial alternatives, and estimation of the nature and extent of contamination.

Respectfully submitted,

O'BRIEN & GERE ENGINEERS,INC.

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DATA VALIDATION REPORT

February Interim Sampling Program Burgess Brothers Superfund Site Woodford and Bennington, Vermont

Burgess Brothers Superfund Site Steering Committee

April 1994

Contents

Executive summary

This report addresses data quality for samples collected at the Burgess Brothers Superfund Site located in Woodford and Bennington, Vermont. Site characterization activities conducted by O'Brien & Gere Engineers, Inc. (O'Brien & Gere Engineers) as part of the February Interim Sampling Program (FISP) included sampling and analysis of ground water and surface water. The analytical data generated for the FISP were evaluated based on quality assurance/quality control (QA/QC) criteria established by the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) and criteria presented in the Quality Assurance Project Plan (QAPP) for this investigation. Validation procedures were based on data validation guidelines developed by the USEPA.

The data quality objectives (DQOs) for this investigation require that the total uncertainty of the analytical data remain within an acceptable range so as not to hinder the intended use of the data. For this investigation ground water and surface water data will be used to characterize background water quality and contaminant concentrations in specific areas of the site.

Data completeness is defined as the percentage of sample results that have been determined to be useable during the data validation process. Data qualified with an "R", which are considered unuseable for either qualitative or quantitative purposes, resulted when a major deficiency was noted in the data generation process. Data completeness with respect to useability was calculated separately for each type of analysis and is tabulated below. The percent useability calculation did not include quality control samples collected to aid in the evaluation of data useability. Therefore, field/equipment blank, trip blank, and field duplicate data determined to be unuseable as a result of the validation process are not represented in the percent useability value.

Analysis	Percent Useability	Excursions

TAL Inorganics	99.6	Non-detected total selenium results were qualified as unusable for W-01-4, W-07S1-4, W-09S1-4, W-01S1-4, W-11S1-4, W-22S1-4, W-12S1, and non-detected mercury results for W-09S1-4, W-01S1-4, W-11S1-4, and W-22S1-4 due to 0% recoveries for the MS/MSD analysis of W-01-4.
TCL Volatiles	100.0	NA
EPA 524.2 Volatiles	100.0	NA
BOD, TOC, and Hardness	100.0	NA

NA = Not Applicable

The percent useability, or completeness, of the data ranged from 99.6 to 100.0 percent for data collected for this investigation. Overall, the analytical data are of sufficient quality to meet the project data quality objectives and may be used for qualitative and quantitative purposes. These uses include, but are not limited to, performance of human health and ecological risk assessments, evaluation of remedial alternatives, and estimation of the nature and extent of contamination.

1. Introduction

1.1. Introduction

This report addresses data quality for the fourth round of samples collected at the Burgess Brothers Superfund Site located in Woodford and Bennington, Vermont. Site characterization activities conducted by O'Brien & Gere Engineers, Inc. (O'Brien & Gere Engineers) as part of a Remedial Investigation (RI) included sampling and analysis of ground water and surface water. The quantity, types of samples collected, the dates of sample collection for these programs, and the appropriate reference to Appendix 12 are tabulated below.

Sampling program	Collection date	Sample identification: O'Brien & Gere Engineers ID	Sample identification: Laboratory ID	Sample identification: Appendix 15 Reference
Surface Water	2/22/94	SW-17-4	033936-0001-SA	Table 15B - Volatiles - 524.2
Surface Water USEPA 524.2 Analysis	2/22/94	SW-17-4	C4B250025-001	Table 19 - Inorganics BOD Hardness

Sampling program	Collection date	Sample identification: O'Brien & Gere Engineers ID	Sample identification: Laboratory ID	Sample identification: Appendix 15 Reference
Ground Water	2/23/94	SBW-21-4 W-08S1-4 W-25S1-4 W-25S1-4 MS W-25S1-4 MSD	033965-0001-SA 033965-0002-SA 033965-0003-SA 033965-0003-MS 033965-0003-SD	Table 10A - Volatiles - 8240 Table 14A - Inorganics BOD Hardness Table 14B - Inorganics BOD Hardness Table 14C - Inorganics BOD Hardness
Ground Water	2/24/94	W-07S1-4 W-09S1-4 W-01S1-4 W-01-4 W-01-4 MS W-01-4 MSD W-11S1-4 W-22S1-4 Trip Blank	033979-0001-SA 033979-0002-SA 033979-0003-SA 033979-0004-SA 033979-0004-MS 033979-0004-SD 033979-0005-SA 033979-0006-SA 033979-0007-TB	Table 10A - Volatiles - 8240 Table 10B - Volatiles - 8240 Table 14B - Inorganics BOD Hardness

Sampling program	Collection date	Sample identification: O'Brien & Gere Engineers ID	Sample identification: Laboratory ID	Sample identification: Appendix 15 Reference
Ground Water	2/24/94 to 2/25/94	W-01-4 W-01-4 MS W-01-4 MSD W-07S1-4 W-09S1-4 W-01S1-4 W-11S1-4 W-22S1-4 Equipment Blank-1-4 W-12S1 Trip Blank	034013-0001-SA 034013-0001-MS 034013-0001-SD 034013-0002-SA 034013-0003-SA 034013-0004-SA 034013-0005-SA 034013-0006-SA 034013-0007-EB 034013-0008-SA 034013-0009-TB	Table 10B - Volatiles - 8240 Table 14A - Inorganics BOD Hardness Table 14B - Inorganics BOD Hardness Table 14D - Inorganics BOD Hardness Table 14E - TOC
Ground Water	2/28/94	W-08SI-4 W-25SI-4 W-09SI-4 Blind Duplicate-2-4 Trip Blank	034045-0001-SA 034045-0002-SA 034045-0003-SA 034045-0004-SA 034045-0005-TB	Table 10A - Volatiles - 8240 Table 10B - Volatiles - 8240 Table 14C - Inorganics BOD Hardness Table 14D - Inorganics BOD Hardness
Ground Water	3/1/94	Ryder Spring-4 Dickinson-4 Olin-4	034065-0001-SA 034065-0002-SA 034065-0003-SA	Table 14D - Inorganics BOD Hardness Table 11 - Volatiles - 524.2

Sampling program	Collection date	Sample identification: O'Brien & Gere Engineers ID	Laboratory ID	Appendix 15 Reference
Ground Water USEPA 524.2 Analysis	3/1/94	Ryder Spring-4 Dickinson-4 Olin-4 Blind Duplicate-3-4 Trip Blank	C4C040003-001 C4C040003-002 C4C040003-003 C4C040003-004 C4C040003-005	Table 11 - Volatiles - 524.2 Table 16 - Volatiles 524.2
Ground Water	3/2/94	W-04SI-4 W-09B-4 W-04DI-4 W-04B-4 W-25DI-4 Blind Duplicate-1-4 Trip Blank	034086-0001-SA 034086-0002-SA 034086-0003-SA 034086-0004-SA 034086-0005-SA 034086-0006-SA 034086-0007-TB	Table 10B - Volatiles - 8240 Table 14C - Inorganics BOD Hardness Table 14D - Inorganics BOD Hardness Table 14E - TOC
Ground Water	3/3/94	W-01B-4 W-07SI-4 Equipment Blank-2-4 Trip Blank	034110-0002-SA 034110-0003-SA 034110-0001-SA 034110-0004-TB	Table 10B - Volatiles - 8240 Table 14C - Inorganics BOD Hardness Table 14D - Inorganics BOD Hardness Table 14E - TOC

1.2. General considerations

Data validation is a process of reviewing written records and documentation generated during an analytical measurement for the purpose of providing an independent opinion regarding the quality and useability of data generated by that measurement. During the validation, data are evaluated to determine if the measurement was conducted in accordance with the quality assurance criteria specified for that measurement.

Validation is also a process of determining the suitability of a measurement system for providing useful analytical data. Although the term is frequently used in discussing methodologies, it applies to all aspects of the system and especially to samples, their measurement, and the actual data output. Accordingly, this report outlines excursions from the applicable quality control criteria outlined in the following documents:

Quality Assurance Project Plan (QAPP) for the Remedial Investigation, Burgess Brothers Superfund Site, Woodford and Bennington, Vermont, O'Brien & Gere Engineers, Inc., September 1992.

Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses, United States Environmental Protection Agency, (USEPA) Region I, November 1988.

Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses, USEPA Region I, February 1989.

Test Methods for Evaluating Solid Wastes, SW-846 Third Edition, USEPA, November 1986.

The following four sections of this document address distinct aspects of the validation process. Section 2 provides the analytical methodology employed in sample analysis. Section 3 lists the data quality assurance/quality control (QA/QC) protocols used to validate the sample data. Specific QA/QC excursions and qualifications performed on the sample data are discussed in Section 4. Finally, data completeness and useability with respect to the intended purposes of the data are discussed in Section 5. Each section is subdivided with respect to the type of analyses performed.

2. Analytical methods

Ground and surface water samples were analyzed utilizing the analytical methods listed below. With the exception of volatile organics by USEPA Method 524.2, sample analyses were provided by Enseco-Rocky Mountain Analytical Laboratories (RMAL) of Denver, Colorado. USEPA Method 524.2 volatile organics analyses were provided by Enseco-Wadsworth/Alert Laboratory (Enseco-Wadsworth) of Pittsburgh, Pennsylvania.

Parameter	Analytical/extraction	Reference
Volatile Organics	8240/5030	1
524.2 Volatile Organics	524.2	2
Trace Metals	6010/3010	1
As	7060/3020	1
Se	7740/3020	1
Pb	7421/3020	1
Tl	7841/3020	1
Hg	7470	1
CN	9010	1
TOC	415.1	3
BOD	405.1	3
Hardness	130.2	3

Analytical Method References

1. *Test Methods for Evaluating Solid Waste:* Physical/Chemical Methods, SW-846, 3rd Edition, USEPA, September 1986.

2. *Methods for the Determination of Organic Compounds in Water*, USEPA, EPA-600/4-88/039, December 1988.

3. *Methods for Chemical Analysis of Water and Wastes*, USEPA, EPA 600/4-79-020, March 1979.

The following qualifiers have been used in this data validation.

U Indicates that the compound was analyzed for, but was not detected. The sample quantitation limit is presented and adjusted for dilution. This qualifier is also used to signify that the detection limit of an analyte was raised due to blank contamination.

J Indicates that the result should be considered approximate. This qualifier is used when the data validation procedure identifies a deficiency in the data generation process. Additionally, for organic analyses this qualifier is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria but, the result is less than the sample quantification limit but greater than zero.

UJ Indicates that the detection limit for the analyte in this sample should be considered approximate. This qualifier is used when the data validation process identifies a deficiency in the data generation process.

R Indicates that the previously reported detection limit or sample result has been determined to be unuseable due to a major deficiency in the data generation procedure. The data should not be used for any qualitative or quantitative purposes.

3. Data validation protocols

3.1. Target analyte list inorganics analysis

Target analyte list (TAL) inorganics analyses were performed using the USEPA analytical methods outlined in Section 2. The validation of TAL inorganics followed the requirements presented in the QAPP and the analytical methodology presented in *Test Methods for Evaluating Solid Wastes*, SW-846 Third Edition, USEPA, November 1986. Qualification of sample data was based on the validation guidelines presented in *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were evaluated for TAL inorganic analyses:

- Holding Times
- Calibration
  - Initial Calibration Verification
  - Continuing Calibration Verification
- Blank Analysis
- ICP Interference Check Sample Analysis (ICP only)
- Matrix Spike/Matrix Spike Duplicate Analysis
- Laboratory Duplicate Analysis
- Field Duplicate Analysis
- Laboratory Control Sample Analysis
- Furnace Atomic Absorption Analysis
- ICP Serial Dilution Analysis (ICP only)
- Element Quantitation and Reported Detection Limits
- Document Completeness
- Overall Data Assessment

3.2. Target compound list organics analysis

Target compound list (TCL) volatile organics analyses were performed using USEPA analytical methods outlined in Section 2. The validation of USEPA SW-846 method 8240, USEPA method 524.2 volatile organics, TOC, BOD, and hardness data followed the requirements presented in the QAPP and in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters were evaluated for the TCL volatile organics, TOC, BOD, and hardness analyses:

Volatile Organics Analyses

- Holding Times
- GC/MS Instrument Tuning Criteria
- Calibration
  - Initial Calibration
  - Continuing Calibration
- Blank Analysis
- Surrogate Recovery
- Matrix Spike/Matrix Spike Duplicate Analysis
- Laboratory Control Samples
- Field Duplicate Analysis
- Internal Standards Recovery
- Compound Identification and Quantitation
- System Performance
- Documentation Completeness
- Overall Data Assessment

3.3. Wet Chemistry analysis

Wet chemistry analyses were performed using the USEPA analytical methods outlined in Section 2. The validation of TOC, BOD, and hardness followed the requirements presented in the QAPP and the analytical methodology presented in *Test Methods for Evaluating Solid Wastes*, SW-846 Third Edition, USEPA, November 1986, Methods 415.1, 405.1, and 130.2 respectively. Qualification of sample data was based on the validation guidelines presented in *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics*

Analyses, USEPA Region I, February 1989. The following QA/QC parameters were evaluated for wet chemistry analyses:

TOC Analysis

1. Holding Times
   - Criteria of 28 days from collection to analysis.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 18.

2. Calibration
   - Criteria - daily 3 point initial calibration, RSD less than or equal to 10, continuing calibration every 10 samples, less than 10% difference between the actual and expected values.
   - Action - initial calibration %RSD greater than 10, or continuing calibration between 10 and 90 percent difference, detected and nondetected sample results qualified J, UJ respectively; continuing calibration %D greater than 90%, nondetected sample results were qualified as unusable (R), and detected sample results were qualified as approximate (J).

3. Blank Analysis
   - Criteria - frequency of 1 per matrix and every 10 samples
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 22.

4. Matrix Spike Analysis
   - Criteria - frequency of 1 per matrix and every 20 samples, percent recovery of 75 to 125.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 28.

5. Laboratory Duplicate Analysis
   - Criteria - frequency of 1 per matrix and every 20 samples, less than or equal to 20 percent difference.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, pages 29 and 30.

6. Field Duplicate Analysis

- Criteria - frequency of 1 per matrix and every 20 samples, less than or equal to 30 percent difference.
- Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 31.

7. Laboratory Control Sample Analysis
   - Criteria - frequency of every 20 samples, percent recovery of 85 to 115.
   - Action - Percent recovery of 50 to 85 or greater than 120, detected results qualified as approximate (J); recovery of 50 to 85 percent, nondetected results qualified as approximate (UJ); nondetected sample results qualified as unusable (R) when percent recovery was less than 50, and detected sample results were qualified as approximate (J).

8. Documentation Completeness
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 17.

9. Overall Data Assessment
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 38.

BOD Analysis

1. Holding Times
   - Criteria - preserve samples at 4°C, 48 hours from collection to analysis.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 18.

2. Blank Analysis
   - Criteria - frequency of 1 per matrix and every 10 samples.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 22.

3. Laboratory Duplicate Analysis
   - Criteria - frequency of 1 per every 10 samples, RPD within 30 percent.

- Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 30.

4. Field Duplicate Analysis
   - Criteria - frequency of 1 per matrix and every 20 samples, RPD within 30 for water samples and RPD within 50 for sediment and soil samples.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 31.

5. Laboratory Control Sample Analysis
   - Criteria - frequency of every batch or 10% of samples, percent recovery of 90 to 110.
   - Action - Percent recovery of 50 to 90 or greater than 110, detected results qualified as approximate (J); recovery of 50 to 90 percent, nondetected results qualified as approximate (UJ); nondetected sample results qualified as unusable (R) and detected results as approximate (J) for recoveries less than 50%.

6. BOD Quantitation
   - Criteria - minimum dissolved oxygen depletion of 2 mg/L.
   - Action - resubmit corrected data.

7. Documentation Completeness
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 17.

9. Overall Data Assessment
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 38.

Hardness Analysis

1. Holding Times
   - Criteria - preservation of samples with HNO3 to pH of less than 2, 6 months from collection to analysis of samples.

- Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 18.

2. Calibration
   - Criteria - daily initial calibration, continuing calibration verification every 2 hours or 10 percent frequency, continuing calibration results within 10 percent of the true value.
   - Action - detected and nondetected sample results were qualified as approximate (J, UJ) when continuing calibration results were between 10 and 90 percent difference; sample results were qualified as unusable (R) when continuing calibration results were greater than 90 percent difference.

3. Blank Analysis
   - Criteria - calibration blank at a frequency of the beginning and end of run and 10 percent of samples, preparation blank at a frequency of 1 per batch or 5 percent of samples.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 22.

4. Matrix Spike Analysis
   - Criteria - frequency of 1 per batch and every 20 samples, within 25% recovery of true value.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 28.

5. Laboratory Duplicate Analysis
   - Criteria - within 25 percent RPD for values five times the detection limit or the value of the detection limit for sample results less than five times the detection limits.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, pages 29 and 30.

6. Field Duplicate Analysis
   - Criteria - frequency of 1 per matrix and every 20 samples, RPD within 30 for water samples and RPD within 50 for sediment and soil samples.

- Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 31.

7. Laboratory Control Sample Analysis
   - Criteria - frequency of 10% of samples, percent recovery within 10 percent of true value.
   - Action - Detected sample results were quallified as approximate (J) when the percent recovery was greater than 110; detected and nondetected sample results were qualified as approximate (J) or (UJ) respectively when percent recovery was 10 to 50; detected results were approximate and nondetected results were qualified as unusable (R) when recoveries were greater than 90 percent.

8. Documentation Completeness
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 17.

9. Overall Data Assessment
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 38.

4. Data quality evaluation

This section summarizes the QA/QC parameters, validation criteria, and qualifications performed on the sample data when the QA/QC parameters specified in Section 3 did not meet criteria. Samples that required qualification are identified in the following sections by the description documented on the sample chain of custody records. Only one qualifier was used for an individual sample result. When the data validation process identified several quality control deficiencies, the cumulative effect of the various excursions were employed in assigning the final data qualifier.

4.1. TAL inorganics analysis

QA/QC parameters for TAL inorganic analyses were evaluated for twenty-three total ground water, one total surface water, twenty-three filtered ground water, one filtered surface water, two blind duplicate, and two equipment blank samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration verification, laboratory control sample analysis, laboratory duplicate analysis, ICP serial dilution analysis, and document completeness. Excursions from QA/QC criteria are summarized below.

Blank Analysis Blank samples that contained concentrations of TAL inorganics that exceeded the Enseco-RMAL reporting limits or contained negative concentrations that were greater than two times the absolute values of the reporting limits are tabulated below. Action levels were calculated at five times the blank concentrations for the analytes detected in the blank samples. Detected sample results which were less than the blank action levels for the analytes detected in the blank samples were qualified with a "U" in the associated samples. The "U" qualifier indicates that the TAL inorganic was analyzed for but was not detected above the reportable limit.

Blank ID	TAL inorganic	Blank concentration (mg/L)	Blank action level (mg/L)	Associated samples	Qualified sample result (mg/L)
ICP Preparation 25FEB944A	dissolved - cobalt	0.0025	0.0125	SW-17-4	0.0050 U
	dissolved - iron	0.033	0.165	SW-17-4	0.055 U
	dissolved - zinc	0.013	0.065	SW-17-4 SBW-21-4 W-08S1-4 W-25S1-4	0.031 U 0.011 U 0.0067 U 0.041 U
ICP Preparation 27FEB944A	total - sodium	2.67	13.4	SW-17-4 SBW-21-4 W-25S1-4 W-09S1-4 W-11S1-4	0.89 U 4.9 U 9.2 U 3.0 U 12.4 U
	total - zinc	0.0031	0.016	SW-17-4 W-22S1-4 Equipment Blank-1-4	0.0060 U 0.016 U 0.0091 U
ICP Preparation 01MAR944A	dissolved - copper	0.0069	0.035	W-07S1-4 W-01S1-4 W-22S1-4 W-12S1	0.0078 U 0.0068 U 0.0044 U 0.0036 U
	dissolved - zinc	0.020	0.10	W-01-4 W-07S1-4 W-09S1-4 W-01S1-4 W-22S1-4 Equipment Blank-1-4 W-12S1	0.011 U 0.016 U 0.014 U 0.010 U 0.022 U 0.0090 U 0.012 U
ICP Preparation 04MAR944A	dissolved - copper	0.0022	0.011	Ryder Spring-4 W-25DI-4	0.0039 U 0.0050 U
	dissolved - iron	0.0048	0.024	Ryder Spring-4 Dickinson-4 W-04DI-4 W-25DI-4	0.012 U 0.014 U 0.019 U 0.0093 U

Blank ID	TAL inorganic	Blank concentration (mg/L)	Blank action level (mg/L)	Associated samples	Qualified sample result (mg/L)
	dissolved - vanadium	0.0019	0.0095	Dickinson-4 W-25DI-4	0.0041 U 0.0041 U
ICP Preparation 10MAR944 A	dissolved - zinc	0.0038	0.019	Ryder Spring-4 Olin-4 W-09B-4 W-25DI-4 Blind Duplicate-1-4	0.012 U 0.010 U 0.013 U 0.0069 U 0.016 U
	total - calcium	0.31	1.6	Equipment Blank-2-4	0.69 U
	total - iron	0.021	0.11	Dickinson-4 Olin-4 Equipment Blank-2-4	0.092 U 0.0096 U 0.080 U
	total - magnesium	0.15	0.75	Equipment Blank-2-4 W-25DI-4	0.18 U 0.37 U
	total - potassium	0.37	1.9	Ryder Spring-4 Olin-4 W-01B-4 W-09B-4 W-04B-4 Blind Duplicate-1-4	1.2 U 0.95 U 0.70 U 0.63 U 1.0 U 0.66 U
	total - sodium	1.3	6.5	Ryder Spring-4 Olin-4 W-01B-4 W-04SI-4 W-04DI-4	4.3 U 4.0 U 2.2 U 2.6 U 4.5 U
	total - zinc	0.0067	0.034	Dickinson-4 Olin-4 Equipment Blank-2-4 W-07SI-4 W-04SI-4 W-09B-4	0.019 U 0.0085 U 0.0096 U 0.030 U 0.022 U 0.021 U
ICP Preparation 14MAR944 A	dissolved - calcium	0.078	0.39	Equipment Blank-2-4	0.24 U
	dissolved - copper	0.0069	0.035	Equipment Blank-2-4 W-01B-4 W-07SI-4	0.0084 U 0.0049 U 0.0059 U

Blank ID	TAL inorganic	Blank concentration (mg/L)	Blank action level (mg/L)	Associated samples	Qualified sample result (mg/L)
	dissolved - iron	0.019	0.095	Equipment Blank-2-4 W-07SI-4	0.017 U 0.014 U
	dissolved - vanadium	0.0020	0.010	W-07SI-4	0.0050 U
	dissolved - zinc	0.013	0.065	Equipment Blank-2-4 W-01B-4 W-07SI-4	0.015 U 0.041 U 0.0068 U
ICP Preparation 18MAR944A	dissolved - copper	0.0096	0.048	W-11S1-4 W-08SI-4 W-09SI-4	0.0031 U 0.0036 U 0.0039 U
	dissolved - vanadium	0.0039	0.020	W-25SI-4 Blind Duplicate-2-4	0.0081 U 0.0078 U
	dissolved - zinc	0.0052	0.026	W-11S1-4 W-08SI-4 W-09SI-4 Blind Duplicate-2-4	0.0088 U 0.017 U 0.0051 U 0.0040 U
ICP Continuing Calibration (3/24/94)	dissolved - calcium	0.032	0.16	Equipment Blank-1-4	0.12 U
	dissolved - magnesium	0.039	0.20	Equipment Blank-1-4	0.074 U
Equipment-1-4	dissolved - iron	0.013	0.065	W-01-4 W-07S1-4 W-22S1-4	0.0083 U 0.033 U 0.037 U
Equipment-2-4	total - copper	0.0039	0.020	W-01B-4	0.016 U

Matrix Spike/Matrix Spike Duplicate Analysis Matrix spike/matrix spike duplicate (MS/MSD) recovery criteria requiring spike recoveries to be between 75.0 and 125.0 percent were exceeded for several samples. Qualification of sample results that exceeded MS/MSD recovery limits included the approximation (J) of detected results when spike recoveries were above the upper limit or below the lower limit. Non-detected sample results were approximated (UJ) when MS/MSD recoveries were below the lower limit but above 30.0 percent. Non-detected sample results were qualified as unuseable (R) when MS/MSD recoveries were below 30.0 percent. MS/MSD data were evaluated and qualifiers were applied to the analytical results in accordance with USEPA guidance dated February 1989 not the September 1990 guidance. This procedure was discussed and agreed upon with USEPA in a conference call held, January 25, 1995. Samples qualified due to MS/MSD recovery excursions are tabulated below.

MS/MSD sample ID	TAL inorganic	Percent recovery MS	Percent recovery MSD	Affected samples	Qualified sample results
W-25S1-4	total - arsenic	62.7	62.0	SBW-21-4 W-08S1-4 W-25S1-4	qualification of sample results was not required for these samples since they were previously approximated for having detected results below the reporting limit
	total - selenium	36.3	37.7	SBW-21-4 W-08S1-4 W-25S1-4	0.05 UJ mg/L 0.05 UJ mg/L 0.005 UJ mg/L
W-01-4	total - antimony	51.0	55.0	W-01-4 W-07S1-4 W-09S1-4 W-01S1-4 W-11S1-4 W-22S1-4 W-12S1	0.060 UJ mg/L 0.060 UJ mg/L 0.060 UJ mg/L 0.060 UJ mg/L 0.060 UJ mg/L 0.060 UJ mg/L 0.060 UJ mg/L
04MAR944 A	total - arsenic	213.0	227.0	W-07S1-4 W-09S1-4 W-01S1-4 W-11S1-4 W-12S1	qualification of sample results was not required for these samples since they were previously approximated for having detected results below the reporting limit
	total - mercury	0	0	W-01-4 W-07S1-4 W-09S1-4 W-01S1-4 W-11S1-4 W-22S1-4 W-12S1	0.00065 J mg/L 0.00089 J mg/L R R R R 0.00033 J mg/L

MS/MSD sample ID	TAL inorganic	Percent recovery MS	Percent recovery MSD	Affected samples	Qualified sample results
	total - selenium	0	0	W-01-4	R
				W-07S1-4	R
				W-09S1-4	R
				W-01S1-4	R
				W-11S1-4	R
				W-22S1-4	R
				W-12S1	R
	total - thallium	69.7	71.3	W-01-4	0.005 UJ mg/L
				W-07S1-4	0.005 UJ mg/L
				W-09S1-4	0.005 UJ mg/L
				W-01S1-4	0.005 UJ mg/L
				W-11S1-4	0.005 UJ mg/L
				W-22S1-4	0.005 UJ mg/L
				W-12S1	0.005 UJ mg/L
W-25SI-4	total - iron	13.0	15.0	W-08SI-4	0.78 J mg/L
				W-25SI-4	1.6 J mg/L
				W-09SI-4	0.60 J mg/L
				Blind Duplicate-2-4	1.0 J mg/L
	total - thallium	61.0	64.0	W-08SI-4	0.005 UJ mg/L
				W-25SI-4	0.005 UJ mg/L
				W-09SI-4	0.005 UJ mg/L
				Blind Duplicate-2-4	0.005 UJ mg/L

Field Duplicate Analysis Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The relative percent difference (RPD) between duplicate sample results greater than five times the reporting limit was required to be less than 30.0 percent. Duplicate sample results less than five times the reporting limit were required to have a difference less than the value of the reporting limit. The identity of blind duplicate samples and the TAL inorganics that exceeded RPD criteria are tabulated below.

Blind duplicate collection date	Correspondin g sample ID	TAL inorganic	RPD	Affected samples	Qualified Sample Result
2/28/94	W-25SI-4	none affected	NR	none affected	NR
3/2/94	W-04B-4	total - iron	44.1	W-04SI-4 W-09B-4 W-04DI-4 W-04B-4 W-25DI-4 Blind Duplicate-1-4	2.4 J mg/L 0.50 J mg/L 4.5 J mg/L 1.3 J mg/L 2.4 J mg/L 0.83 J mg/L
		total - zinc	200.0	W-04DI-4 W-04B-4 W-25DI-4	0.063 J mg/L 0.046 J mg/L 0.053 J mg/L

NR = Not required since duplicate RPDs were within control limits.

Furnace Atomic Absorption Analysis The QA/QC criteria specified for furnace atomic absorption post digestion spike performance requires that the spike percent recoveries (%R) be between 85 and 115 percent. Samples that exceeded these criteria and the qualification of sample results due to these excursions are tabulated below.

TAL inorganic	Sample ID	Spike recovery	Qualified sample result
total - arsenic	SBW-21-4 W-08S1-4 W-09S1-4 W-12S1	121.0 % 119.0 % 128.0 % 123.0 %	qualification of sample results was not required for these samples since they were previously approximated for having detected results below the reporting limit
total - cadmium	W-04DI-4	121.0 %	
	W-11S1-4	83.0 %	0.0005 UJ mg/L
total - selenium	SBW-21-4 W-08S1-4 W-25S1-4	64.0 % 56.0 % 48.0 %	qualification of sample results was not required for these samples since they were previously qualified for MS/MSD recovery excursions

TAL inorganic	Sample ID	Spike recovery	Qualified sample result
	W-01-4	66.0 %	qualification of sample results was not required for these samples since they were previously qualified as unuseable for MS/MSD recovery excursions
	W-07S1-4	56.0 %	
	W-09S1-4	84.0 %	
	W-11S1-4	82.0 %	
	W-22S1-4	76.0 %	
	W-12S1	77.0 %	
	W-08SI-4	42.0 %	0.005 UJ mg/L
	W-01B-4	83.0 %	0.005 UJ mg/L
dissolved - selenium	W-09S1-4	62.0 %	0.005 UJ mg/L
	W-11S1-4	80.0 %	0.005 UJ mg/L
	W-08SI-4	71.0 %	0.005 UJ mg/L
	W-25SI-4	82.0 %	0.005 UJ mg/L
	Dickinson-4	75.0 %	0.005 UJ mg/L
	Olin-4	82.0 %	0.005 UJ mg/L
	W-25DI-4	72.0 %	0.005 UJ mg/L
	Blind Duplicate-1-4	84.0 %	0.005 UJ mg/L
total - lead	W-04B-4	84.0 %	qualification of sample results was not required for these samples since they were previously approximated for having detected results below the reporting limit
dissolved - lead	W-07S1-4	70.0 %	0.003 UJ mg/L
total - thallium	W-08S1-4	60.0 %	0.005 UJ mg/L
	Dickinson-4	54.0 %	0.005 UJ mg/L
	W-01-4	76.0 %	qualification of sample results was not required for these samples since they were previously qualified as unuseable for MS/MSD recovery excursions
	W-07S1-4	76.0 %	
	W-11S1-4	64.0 %	
	W-22S1-4	76.0 %	
	W-12S1	84.0 %	
	W-08SI-4	56.0 %	
dissolved - thallium	SBW-21-4	46.0 %	0.005 UJ mg/L
	W-08S1-4	60.0 %	0.005 UJ mg/L
	W-25S1-4	80.0 %	0.005 UJ mg/L
	W-07S1-4	78.0 %	0.005 UJ mg/L
	W-11S1-4	84.0 %	0.005 UJ mg/L
	W-08SI-4	76.0 %	0.005 UJ mg/L
	Dickinson-4	42.0 %	0.005 UJ mg/L

ICP Interference Check Sample Analysis

Several interference check samples (ICSA) contained concentrations of TAL inorganics in the A solutions which were greater than their reporting limits. TAL inorganics were also detected in the A solutions at a negative concentration greater than two times the absolute value of the reporting limits. Qualification of the affected TAL inorganics detected at positive concentrations in the ICSA solution was to approximate (J) the detected results for samples containing one or more of the interferant analytes (Al, Ca, Fe, or Mg) at concentrations greater than fifty percent of the ICSA concentrations. The TAL inorganics detected in the ICSA samples and the samples qualified as a result of these excursions are tabulated below.

Date analyzed	Affected samples	TAL inorganic	ICSA concentration	Qualified sample result
3/09/94	SBW-21-4	total - copper	0.008 mg/L	0.14 J mg/L
	W-08S1-4	total - copper	0.008 mg/L	0.092 J mg/L
	W-01-4	total - copper	0.008 mg/l	0.093 J mg/L
	W-11S1-4	total - copper	0.008 mg/L	0.046 J mg/L
	W-12S1	total - copper	0.008 mg/L	0.11 J mg/L
3/21/94	W-08SI-4	total - sodium	3.1 mg/L	17.4 J mg/L

Element Quantitation and Reported Detection Limits Detected sample results that were greater than the IDLs but less than the Enseco-RMAL reporting limits were qualified as approximated (J). Additionally, Enseco-RMAL raised the reporting limits for non-detected sample results by a factor of two for graphite furnace atomic absorption (GFAA) analyses that did not meet post digestion spike recovery criteria. As a result of the validation, the affected non-detected GFAA sample results that had post digestion spike recoveries between 10.0 and 85.0 percent were qualified as approximated (UJ) and reported with the non-elevated reporting limits. The affected samples with post digestion spike recoveries greater than 115.0 percent were reported with the non-elevated reporting limits without qualification.

Overall Data Assessment Overall, the laboratory performed TAL inorganics analyses in accordance with the requirements specified in the methods listed in Section 2.0. These data have been determined to be useable for qualitative and quantitative purposes with the exception of four total mercury and seven total selenium results which were qualified as unuseable due to low MS/MSD recoveries. Detected sample results for several analytes were qualified with a "U" based on equipment and preparation blank contamination. Detected and non-detected sample results for several analytes were also approximated based on excursions from ICP interference check sample analysis, matrix spike analysis, field duplicate analysis, and furnace analytical spike analysis criteria.

4.2. TCL volatiles analysis

Twenty ground water, two blind duplicate, two equipment blank, and five trip blank samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: GC/MS instrument tuning, initial calibration, surrogate recovery, matrix spike/matrix spike duplicate analysis, laboratory control sample analysis, internal standards recovery, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Holding Time The analysis holding time criterion that requires samples for TCL volatile organics analyses to be analyzed within fourteen days of sample collection was exceeded for several samples. Detected and non-detected sample results for samples that exceeded holding time criterion by less than fourteen days were approximated. Samples that exceeded holding time criterion are tabulated below.

Sample ID	Date collected	Date analyzed	Holding time (days)	Qualification
W-01-4	2/24/94	3/11/94	15	The non-detected sample results reported for each TCL compound were approximated (UJ).
Trip Blank (2/24/94)	2/24/94	3/11/94	15	

Sample ID	Date collected	Date analyzed	Holding time (days)	Qualification
W-01-4	2/24/94	3/11/94	15	The non-detected sample results reported for each TCL compound were approximated (UJ).
W-11S1-4	2/24/94	3/11/94	15	Detected and non-detected sample results were approximated (J, UJ).
W-22S1-4	2/24/94	3/14/94	18	

Blank Analysis Blank samples that contained concentrations of TCL volatile organics that exceeded the method detection limits (MDLs) are tabulated below. Action levels were calculated at five times the blank concentrations for the compounds detected in the blank samples. Blank action levels for the common laboratory contaminant compounds (acetone, methylene chloride, and 2-butanone) detected in the blanks were calculated at ten times the blank concentrations. Dilutions and differences between sample and blank weights or volumns were taken into account when applying blank actions. Detected sample results which were less than the blank action levels for the compounds detected in the blank samples were qualified with a "U" in the associated samples. Detected sample results below the blank action level which were above the MDL but less than the Enseco-RMAL reporting limit were raised to the Enseco-RMAL reporting limit and qualified with a "U". The "U" qualifier indicates that the TCL volatile organic was analyzed for but was not detected above the reported quantitation limit.

Blank ID	TAL volatile organic	Blank concentration	Blank action level	Associated samples	Dilution Factor	Qualified Sample Result (µg/L)
Method BL030794	methylene chloride	0.75 µg/L	7.5 µg/L	W-09S1-4 W-01S1-4	1 1	5.0 U 5.0 U
Method BL031194	methylene chloride	2.08 µg/L	20.8 µg/L	W-11S1-4	20	100 U
Method 14MAR94E1	methylene chloride	2.80 µg/L	28.0 µg/L	W-22S1-4	100	780 U

Blank ID	TAL volatile organic	Blank concentratio n	Blank action level	Associated samples	Dilutio n Factor	Qualified Sample Result (µg/L)
Method BL030794	methylene chloride	0.75 µg/L	7.5 µg/L	W-09S1-4 W-01S1-4	1 1	5.0 U 5.0 U
Method BL031794	acetone	6.96 µg/L	69.6 µg/L	Equipment Blank-2-4	1	10 U
	methylene chloride	0.86 µg/L	8.6 µg/L	W-07SI-4 Trip Blank (3/3/94)	1 1	5.0 U 5.0 U

Continuing Calibration TCL volatile organics continuing calibration criteria requires that the daily RRF have a minimum value of 0.05. Continuing calibration criteria also requires that the percent difference (%D) between the initial calibration average RRF and the daily RRF be less than 25.0 percent. Qualification of sample results when these criteria were exceeded included the approximation (J) of detected results and the qualification of non-detected results as unuseable (R) for compounds with RRFs below 0.05. Detected results for TCL volatile compounds with %D values greater than 25.0 percent are qualified as approximated (J). Non-detected sample results are approximated (UJ) for compounds with %D values greater than 50.0 percent. TCL volatile compounds that exceeded continuing calibration criteria and the samples qualified due to those excursions are tabulated below.

Date analyzed	TCL volatile compound	RRF	%D	Affected samples	Qualified sample result
3/11/94	chloroethane	0.07161	52.2	W-11SI-4	qualification of sample result was not required since the result was previously approximated for exceeding holding time criterion

3/14/94	carbon disulfide	7.123	54.3	W-04SI-4	5.0 UJ µg/L
				W-09B-4	5.0 UJ µg/L
				W-04DI-4	5.0 UJ µg/L
				W-04B-4	5.0 UJ µg/L
				W-25DI-4	5.0 UJ µg/L
				Blind Duplicate-1-4	5.0 UJ µg/L
				Trip Blank (3/2/94)	5.0 UJ µg/L

Field Duplicate Analysis Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The relative percent difference (RPD) between duplicate samples was required to be less than 30.0 percent. The identity of blind duplicate samples and the TCL volatile organics that exceeded RPD criteria are tabulated below.

Blind duplicate collection date	Correspondin g sample ID	TCL volatile organic	RPD	Affected samples	Qualified sample result
2/28/94	W-25SI-4	none affected	NR	none affected	NR
3/2/94	W-04B-4	none affected	NR	none affected	NR

NR = Not required since duplicate RPDs were within control limits.

Compound Identification and Quantitation A tentatively identified compound (TIC) with a relative retention time (RRT) that matched the RRT of acetone was detected in the method blank and several environmental samples analyzed on March 14, 1994. Although, the RRT criterion of acetone was met the mass spectral data did not confirm the presence of acetone in the associated environmental samples. Due to the lack of confirmation by the mass spectral data and the presence of the TIC in the method blank the detected acetone results reported by the laboratory were reported as non-detected at the Enseco-RMAL reporting limit. The following samples were associated with this excursion; W-04SI-4, W-09B-4, W-04DI-4, and W-25DI-4.

Overall Data Assessment Overall, the laboratory performed TCL volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.0. These data have been determined to be useable for qualitative and quantitative purposes.

Detected results for acetone and methylene chloride were qualified with a "U" or raised to the Enseco-RMAL reporting limit and qualified with a "U" for several samples due to method blank contamination. Detected and non-detected sample results were approximated for several TCL compounds due to holding time and continuing calibration excursions.

4.3. USEPA 524.2 volatiles analysis

Three ground water, one surface water, one blind duplicate, and one trip blank samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for USEPA Method 524.2 were found to meet validation criteria: holding times, GC/MS instrument tuning, initial and continuing calibration, surrogate recovery, matrix spike/matrix spike duplicate analysis, reference standard analysis, internal standards recovery, compound identification and quantitation, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

Blank Analysis Blank samples that contained concentrations of USEPA Method 524.2 volatile organics that exceeded the method detection limits (MDLs) are tabulated below. Action levels were calculated at five times the blank concentrations for the compounds detected in the blank samples. Blank action levels for the common laboratory contaminant compounds (acetone, methylene chloride, and 2-butanone) detected in the blanks were calculated at ten times the blank concentrations. Dilutions and differences between sample and blank weights or volumns were taken into account when applying blank actions. Detected sample results which were less than the blank action levels for the compounds detected in the blank samples were qualified with a "U" in the associated samples. Detected sample results below the blank action level which were above the MDL but less than the Enseco-Wadsworth reporting limit were raised to the Enseco-Wadsworth reporting limit and qualified with a "U". The "U" qualifier indicates that the TCL volatile organic was analyzed for but was not detected above the reported quantitation limit.

Blank ID	USEPA 524.2 volatile organic	Blank concentration	Blank action level	Associated samples	Qualified sample result
Method 01MAR94	methylene chloride	1.0 µg/L	10.0 µg/L	SW-17-4	1.0 U µg/L
Method 08MAR94	methylene chloride	1.6 µg/L	16.0 µg/L	Ryder Spring-4 Dickinson-4 Olin-4 Blind Duplicate-3-4 Trip Blank (3/1/94)	1.2 U µg/L 0.76 U µg/L 0.50 U µg/L 0.50 U µg/L 1.1 U µg/L

Field Duplicate Analysis Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The relative percent difference (RPD) between duplicate samples was required to be less than 30.0 percent. The identity of blind duplicate samples and the USEPA Method 524.2 volatile organics that exceeded RPD criteria are tabulated below.

Blind duplicate collection date	Corresponding sample ID	TCL volatile organic	RPD	Affected samples	Qualified sample result
3/1/94	Dickinson-4	none affected	NR	none affected	NR

NR = Not required since duplicate RPDs were within control limits.

Overall Data Assessment Overall, the laboratory performed USEPA Method 524.2 volatile organics analyses in accordance with the requirements specified in the methods listed in Section 2.0. These data have been determined to be useable for qualitative and quantitative purposes. Detected results for methylene chloride were qualified with a "U" or raised to the Enseco-Wadsworth reporting limit and qualified with a "U" for several samples due to method blank contamination.

4.4. BOD, TOC, and hardness analyses

QA/QC parameters for BOD, TOC, and hardness analyses were evaluated for six ground water, one blind duplicate, and one equipment blank samples according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration verification, blank analysis, matrix spike analysis, laboratory control sample analysis, laboratory duplicate analysis, BOD quantitation, and document completeness. Excursions from QA/QC criteria are summarized below.

Field Duplicate Analysis Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The RPD between duplicate samples was required to be less than 30.0 percent. The identity of blind duplicate samples that exceeded RPD criteria are tabulated below.

Blind duplicate collection date	Correspondin g sample ID	RPD	Affected samples	Qualified sample result
3/2/94	W-04B-4	NR	none affected	NR

NR = Not required since duplicate RPDs were within control limits.

Overall Data Assessment Overall, the laboratory performed BOD, TOC, and hardness analyses in accordance with the requirements specified in the methods listed in Section 2.0. These data have been determined to be useable for qualitative and quantitative purposes since no excursions resulting in the qualification of data were observed.

5. Summary and data useability

The analytical data generated for the fourth round of sampling conducted at the Burgess Brothers Superfund Site located in Woodford and Bennington, Vermont were evaluated based on QA/QC criteria established by the United States Environmental Protection Agency (USEPA) Contract laboratory Program (CLP) and criteria presented in the QAPP for this investigation. Validation procedures were based on CLP data validation guidelines developed by the USEPA. Data qualified with an "R", which are considered unuseable for either qualitative or quantitative purposes, resulted when a major deficiency was noted in the data generation process. Minor deficiencies in the data generation process resulted in approximation of sample data. Approximation of a data point indicates uncertainty in the reported concentration of the chemical, but not its assigned identity. The conservative assumptions used in the development of conclusions made based on these analytical results allow for the quantitative use of approximated analytical data while still adhering to the project data quality objectives. This approach to the use of analytical data is consistent with the guidance presented in *U.S. EPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), 540/1-891002*, December 1989. A summary of specific QA/QC excursions that resulted in qualification of sample data is presented in Section 4.

Data quality objectives (DQOs) are quantitative and qualitative statements specifying the quality of the environmental data required to support the decision making process. DQOs define the total uncertainty in the data that is acceptable. The DQOs for this investigation require that the total uncertainty of the analytical data remain within an acceptable range so as not to hinder the intended use of the data. For this investigation ground water and surface water data will be used to characterize background ground water quality and contaminant concentrations in specific areas of the site.

This section summarizes the analytical data in terms of its completeness and useability for these site characterization purposes. Data completeness is defined as the percentage of sample results that have been determined to be useable during the data validation process. Data completeness with respect to useability was calculated separately for each type of analysis and is tabulated below. The percent useability calculation did not include quality control samples collected to aid in the evaluation of data useability. Therefore, field/equipment blank, trip blank, and field duplicate data determined to be unuseable as a result of the validation process are not represented in the percent useability value tabulated below.

Analysis	Percent useability	Excursions
TAL Inorganics	99.6	Non-detected total selenium results were qualified as unuseable for W-01-4, W-07S1-4, W-09S1-4, W-01S1-4, W-11S1-4, W-22S1-4, W-12S1, and non-detected mercury results for W-09S1-4, W-01S1-4, W-11S1-4, and W-22S1-4 due to 0 % recoveries for the MS/MSD analysis of W-01-4.
TCL Volatiles	100.0	NA
USEPA 524.2 Volatiles	100.0	NA
BOD, TOC, and Hardness	100.0	NA

NA = Not Applicable

Validation of the fourth round of sampling conducted at the Burgess Brothers Superfund Site analytical data indicated that the data quality objectives defined in the QAPP were met. The following sections provide evaluation of the adherence of the data to the precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters presented in the QAPP. Additional information on the impact of excursions from QC measurements on the analytical data was found in the risk assessment guidance document: *Guidance for Data Useability in Risk Assessment (Part A) Final*, USEPA, 9285.7-09A, April 1992.

Precision is measured through field duplicate samples, split samples, and laboratory duplicate samples. For the sampling programs associated with this investigation, 0.39% of the analytical data were qualified due to excursions from field duplicate sample analyses.

Matrix spike sample, reference standards, surrogate recoveries, and calibration criteria indicate the accuracy of the data. For these sampling programs, 2.8% of the analytical data were qualified for excursions from matrix spike sample criteria. Additionally, 0.24% of the analytical data were qualified for excursions from calibration criteria.

Holding times, sample preservation, extraction procedures, and blank analyses are indicators of the representativeness of the analytical data. For the sampling programs associated with this investigation, 2.3% and 3.8% of the data were qualified for holding time and blank excursions, respectively.

Comparability is not compromised provided that the analytical methods did not change over time. A major component of comparability is the use of standard reference materials for calibration and QC. The results from the analysis of standard reference materials are compared to the theoretical concentrations of the standard reference materials to verify the performance of the analytical system. Since standard analytical methods and reporting procedures were consistently used by the laboratory, the comparability criteria for the analytical data were met.

The percent useability, or completeness, of the data ranged from 99.6% to 100.0% for data collected for this investigation. Overall, the analytical data are of sufficient quality to meet the project data quality objectives and may be used for qualitative and quantitative purposes. These uses include, but are not limited to, performance of human health and ecological risk assessments, evaluation of remedial alternatives, and estimation of the nature and extent of contamination.

Respectfully submitted,

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DATA VALIDATION REPORT

Remedial Investigation Phase 1B
Burgess Brothers Superfund Site
Woodford and Bennington, Vermont

Burgess Brothers
Superfund Site Steering
Committee

August 1994

Contents

Executive summary

This report addresses data quality for samples collected at the Burgess Brothers Superfund Site located in Woodford and Bennington, Vermont. Site characterization activities conducted by O'Brien & Gere Engineers, Inc. (O'Brien & Gere Engineers) as part of the Phase 1B Investigation included sampling and analysis of ground water, surface soil, and subsurface soils. The analytical data generated for this investigation were evaluated based on quality assurance/quality control (QA/QC) criteria established by the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) and criteria presented in the Quality Assurance Project Plan (QAPP) for this investigation. Validation procedures were based on data validation guidelines developed by the USEPA.

The data quality objectives (DQOs) for this investigation require that the total uncertainty of the analytical data remain within an acceptable range so as not to hinder the intended use of the data. For this investigation ground water and surface water data will be used to characterize background water quality and contaminant concentrations in specific areas of the site.

Data completeness is defined as the percentage of sample results that have been determined to be usable during the data validation process. Data qualified with an "R", which are considered unusable for either qualitative or quantitative purposes, resulted when a major deficiency was noted in the data generation process. Data completeness with respect to usability was calculated separately for each type of analysis and is tabulated below. The percent usability calculation did not include quality control samples collected to aid in the evaluation of data usability. Therefore, field/equipment blank, trip blank, and field duplicate data determined to be unusable as a result of the validation process are not represented in the percent usability value.

Analysis	Percent Usability	Excursions
TAL Inorganics	98.1	Data qualified as unusable included: non-detected selenium results for W-01, W-01DI, W-27T, W-27SI, W-22T, W-26T, W-TP-12, W-04T, TP-11 (10'-12'), and SP-26; non-detected arsenic results for W-01DI, W-27T, W-22T, and W-TP-12; and non-detected thallium results for SP-27, SP-29, SP-28, SP-30, SP-25, and SP-24 due to MS/MSD recovery excursions.
TCL Volatiles	99.9	The non-detected 2-butanone result was qualified as unusable for TP-11 (10'-12') due to a calibration excursion.
TCL Semivolatiles	100.0	NA
TCL Pesticides/PCBs	99.2	The non-detected endrin aldehyde result was qualified as unusable for W-TP-12 due to a MS/MSD recovery excursion.
TOC	100.0	NA

NA = Not Applicable

The percent usability, or completeness, of the data ranged from 98.1 to 100.0 percent for data collected for this investigation. Overall, the analytical data are of sufficient quality to meet the project data quality objectives and may be used for qualitative and quantitative purposes. These uses include, but are not limited to, performance of human health and ecological risk assessments, evaluation of remedial alternatives, and estimation of the nature and extent of contamination.

1. Introduction

This report addresses data quality for the fifth round of samples collected at the Burgess Brothers Superfund Site located in Woodford and Bennington, Vermont. Site characterization activities conducted by O'Brien & Gere Engineers, Inc. (O'Brien & Gere Engineers) as part of a Remedial Investigation (RI) included sampling and analysis of ground water, surface soil, and subsurface soil. The quantity, types of samples collected, the dates of sample collection for these programs, and the appropriate reference to Appendix 12 are tabulated below.

Sampling Program	Collection Date	Sample Identification		Appendix 15 Reference
		O'Brien & Gere Engineers ID	Laboratory ID	
Subsurface soil Grab Samples	3/23/94 to 3/24/94	W-22T (17'-19') W-4T (19'-21') W-4T (19'-21') MS W-4T (19'-21') MSD W-4T (19'-21')D Equipment Blank Blind Duplicate-1 Trip Blank	T4374 T4375 T4375MS T4375MSD T4375D T4373 T4376 T4377	Table 5A - Volatiles - 8240 Table 5B - Volatiles - 8240 Table 8 - Inorganics Table 8A - TOC
Subsurface soil Grab Samples	4/11/94 to 4/12/94	SB-23 (0'-2') SB-23 (0'-2') MS SB-23 (0'-2') MSD SB-23 (0'-2') D SB-23 (6'-7') SB-22 (0'-2') SB-22 (4'-6') SB-24 (0'-2') SB-24 (2'-4') SB-25 (0'-2') SB-25 (2'-4') Blind Duplicate Field/Equipment Blank-1 Trip Blank	T5294 T5294MS T5294MSD T5294D T5295 T5296 T5297 T5298 T5299 T5300 T5301 T5302 T5303 T5304	Table 5A - Volatiles - 8240 Table 5B - Volatiles - 8240

Sampling Program	Collection Date	Sample Identification		Appendix 15 Reference
		O'Brien & Gere Engineers ID	Laboratory ID	
Subsurface soil Grab Samples	5/16/94	TP-13 (0'-2') TP-13 (2'-4') Equipment/Field Pump Blank	T7164 T7166 T8666	Table 30 - Volatiles - 8240 Table 4 - Inorganics
Subsurface soil Composite Samples	5/16/94	TP-13 (0'-2') TP-13 (2'-4')	T7156 T7149	Table 33 - Inorganics
Surface Soil Grab Samples	5/17/94	SP-27 SP-29 SP-28 SP-30 SP-25 SP-26 SP-23 SP-23 MS SP-23 MSD SP-24 SP-Blind Duplicate #1 SP-Equipment Blank Trip Blank	T7126 T7127 T7128 T7129 T7130 T7131 T7132 T7132MS T7132MSD T7133 T7134 T7135 T7136	Table 1 - Volatiles - 8240 Table 4 - Inorganics
Surface Soil Composite Samples	5/17/94	SP-27 SP-29 SP-28 SP-30 SP-25 SP-26 SP-23 SP-23 MS SP-23 MSD SP-24 SP-Blind Duplicate #1	T7137 T7138 T7139 T7140 T7141 T7142 T7143 T7143MS T7143MSD T7144 T7145	Table 4 - Inorganics
Subsurface soil Grab Samples	5/17/94	TP-12 (14'-16') TP-11 (17'-19') TP-11 (10'-12') TP-8 (10'-12') TP-14 (12'-14') TP-12 (10'-12') TP-Equipment/Field Blank Trip Blank	T7159 T7160 T7161 T7162 T7163 T7165 T7158 T7167	Table 30 - Volatiles - 8240 Table 31 - Semi-volatiles - 8240 Table 32 - PCB\Pesticides - 8080 Table 33 - Inorganics

Sampling Program	Collection Date	Sample Identification		Appendix 15 Reference
		O'Brien & Gere Engineers ID	Laboratory ID	
Subsurface soil Composite Samples	5/17/94	TP-12 (14'-16') TP-11 (17'-19') TP-11 (10'-12') TP-7 (6'-8') TP-7 (10'-12') TP-8 (4'-6') TP-8 (10'-12') TP-14 (10'-12') TP-14 (10'-12') MS TP-14 (10'-12') D TP-14 (12'-14') TP-12 (10'-12')	T7146 T7147 T7148 T7150 T7151 T7152 T7153 T7154 T7154MS T7154D T7155 T7157	Table 31 - Semi-volatiles - 8270 Table 32 - PCB\Pesticides - 8080 Table 33 - Inorganics
Subsurface soil Composite Samples	5/18/94	W-01SI (4'-6')	T7168	Table 8 - Inorganics
Subsurface soil Grab Samples	5/25/94	TP-9 (6'-8') TP-9 (6'-8') MS TP-9 (6'-8') MSD TP-9 (6'-8') D TP-9 (10'-12') TP-10 (2'-4') TP-10 (8'-10') Blind Duplicate-TP TP-19 Drum Water W-01SI (210'-212') Equipment/Field Blank-TP2 Trip Blank	T7561 T7561MS T7561MSD T7561D T7562 T7563 T7564 T7565 T7566 T7560 T7567 T7568	Table 30 - Volatiles - 8240 Table 5B - Volatiles - 8240 Table 33 - Inorganics
Subsurface soil Composite Samples	5/25/94	TP-9 (6'-8') TP-9 (6'-8') MS TP-9 (6'-8') MSD TP-9 (6'-8') D TP-9 (10'-12') TP-10 (2'-4') TP-10 (8'-10') Blind Duplicate-TP TP-19 (12'-14')	T7554 T7554MS T7554MSD T7554D T7555 T7556 T7557 T7558 T7559	Table 31 - Semi-volatiles - 8270 Table 33 - Inorganics
Subsurface soil Grab Samples	5/25/94	TP-19 (14'-16') TP-19 (20'-22') Trip Blank	T7596 T7597 T7598	Table 30 - Volatiles - 8240

Sampling Program	Collection Date	Sample Identification		Appendix 15 Reference
		O'Brien & Gere Engineers ID	Laboratory ID	
Subsurface soil Composite Samples	5/25/94	TP-19 (14'-16') TP-19 (20'-22')	T7594 T7595	Table 31 - Semi-volatiles - 8270 Table 33 - Inorganics
Subsurface soil Grab Samples	6/7/94	W-TP-12 (20'6"-22'6") BDSB-1 W-TP-12 (22'6"-24'6") W-TP-12 (22'6"-24'6") MS W-TP-12 (22'6"-24'6") MSD W-TP-12 (22'6"-24'6") D W-TP-12 (24'6"-26'6") W-TP-12 (26'6"-28'6") Trip Blank SS-Equipment/Field Blank	T8138 T8139 T8140 T8140MS T8140MSD T8140D T8141 T8142 T8144 T8143	Table 5A - Volatiles - 8240
Subsurface soil Composite Samples	6/7/94	W-TP-12 (22'6"-24'6") W-TP-12 (22'6"-24'6") MS W-TP-12 (22'6"-24'6") MSD W-TP-12 (22'6"-24'6") D BDSB-2 W-TP-12 (24'6"-26'6") W-TP-12 (24'6"-26'6") MS W-TP-12 (24'6"-26'6") MSD W-TP-12 (24'6"-26'6") D BDSB-3 SS-Equipment/Field Blank	T8145 T8145MS T8145MSD T8145D T8146 T8147 T8147MS T8147MSD T8147D T8148 T8149	Table 4 - Inorganics Table 6 - Semi-volatiles - 8270 Table 7 - PCB\Pesticides - 8080 Table 8 - Inorganics

Sampling Program	Collection Date	Sample Identification		Appendix 15 Reference
		O'Brien & Gere Engineers ID	Laboratory ID	
Ground Water	7/5/94 to 7/6/94	W-01 W-01DI Blind Duplicate #1 Trip Blank W-01 (filtered) W-01DI (filtered) Blind Duplicate #1 (filtered) W-27T W-27SI W-22T W-22T MS W-22T D W-26T Equipment Blank #1 W-TP-12 W-TP-12 MS W-TP-12 MSD Equipment Blank #2 Blind Duplicate #2 W-04T Dickinson Dickinson MS Dickinson D Equipment Blank #3 Blind Duplicate #3 Trip Blank W-27T (filtered) W-27SI (filtered) W-22T (filtered) W-22T MS (filtered) W-22T D (filtered) W-26T (filtered) Equipment Blank #1 (filtered) W-TP-12 (filtered) W-04T (filtered) Dickinson (filtered) Dickinson MS (filtered) Dickinson D (filtered) Equipment Blank #3 (filtered) Blind Duplicate #3 (filtered)	T9319 T9320 T9321 T9322 T9323 T9324 T9325 T9396 T9397 T9398 T9398MS T9398D T9399 T9400 T9401 T9401MS T9401MSD T9402 T9403 T9404 T9405 T9405MS T9405D T9406 T9407 T9408 T9409 T9410 T9411 T9411MS T9411D T9412 T9413 T9414 T9415 T9416 T9416MS T9416D T9417 T9418	Table 10A - Volatiles - 8240 Table 10B - Volatiles - 8240 Table 12A - Semi-volatiles - 8270 Table 12B - Semi-volatiles - 8270 Table 13 - PCB\Pesticides - 8080 Table 14B - Inorganics BOD Hardness Table 14D - Inorganics BOD Hardness

1.1. General Considerations

Validation is a process of determining the suitability of a measurement system for providing useful analytical data. Although the term is frequently used in discussing methodologies, it applies to all aspects of the system and especially to samples, their measurement, and the actual data output. Accordingly, this report outlines excursions from the applicable quality control criteria outlined in the following documents:

> *Quality Assurance Project Plan (QAPP) for the Remedial Investigation, Burgess Brothers Superfund Site*, Woodford and Bennington, Vermont, O'Brien & Gere Engineers, Inc., September 1992.
>
> *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988.
>
> *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989.
>
> *Test Methods for Evaluating Solid Wastes*, SW-846 Third Edition, USEPA, November 1986.

The following four sections of this document address distinct aspects of the validation process. Section 2 provides the analytical methodology employed in sample analysis. Section 3 lists the data quality assurance/quality control (QA/QC) protocols used to validate the sample data. Specific QA/QC excursions and qualifications performed on the sample data are discussed in Section 4. Finally, data completeness and usability with respect to the intended purposes of the data are discussed in Section 5. Each section is subdivided with respect to the type of analyses performed.

2. Analytical methods

Surface soil, subsurface soil, and ground water samples were analyzed utilizing the USEPA SW-846[1] analytical methods listed below. With the exception of total organic carbon (TOC) analyses, sample analyses were provided by OBG Laboratories, Inc. (OBG Labs) of Syracuse, New York. Total organic carbon analysis was provided by Hudson Environmental Services, Inc. (HES) of Queensbury, New York.

Parameter	Analytical/Extraction
Volatile Organics	8240/5030A
Semivolatile Organics	8270/3520A/3540A
Pesticides/PCBs	8080/3520A/3540A
Trace Metals	6010/3010A/3050A
As	7060/3020A/3050A
Se	7740/3020A/3050A
Pb	7421/3020A/3050A
Tl	7841/3020A/3050A
Hg	7470/7471
CN	9010A/9013
TOC	415.1[2]

[1] *Test Methods for Evaluating Solid Waste*: Physical/Chemical Methods, SW-846, 3rd Edition, USEPA, September 1986.

[2] *Methods for Chemical Analysis of Water and Wastes*, USEPA, EPA 600/4-79-020, March 1979.

The following qualifiers have been used in this data validation.

U Indicates that the compound was analyzed for, but was not detected. The sample quantitation limit is presented and adjusted for dilution. This qualifier is also used to signify that the detection limit of an analyte was raised due to blank contamination.

J Indicates that the result should be considered approximate. This qualifier is used when the data validation procedure identifies a deficiency in the data generation process. Additionally, for organic analyses this qualifier is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria but, the result is less than the sample quantification limit but greater than zero.

UJ Indicates that the detection limit for the analyte in this sample should be considered approximate. This qualifier is used when the data validation process identifies a deficiency in the data generation process.

R Indicates that the previously reported detection limit or sample result has been determined to be unusable due to a major deficiency in the data generation procedure. The data should not be used for any qualitative or quantitative purposes.

3. Data validation protocols

3.1. Target analyte list inorganics analysis

Target analyte list (TAL) inorganics analyses were performed using the USEPA analytical methods outlined in Section 2. The validation of TAL inorganics followed the requirements presented in the QAPP and the analytical methodology presented in *Test Methods for Evaluating Solid Wastes*, SW-846 Third Edition, USEPA, November 1986. Qualification of sample data was based on the validation guidelines presented in *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were evaluated for TAL inorganic analyses:

1. Holding Times
2. Calibration
    a. Initial Calibration Verification
    b. Continuing Calibration Verification
3. Blank Analysis
4. ICP Interference Check Sample Analysis (ICP only)
5. Matrix Spike Analysis
6. Laboratory Duplicate Analysis
7. Field Duplicate Analysis
8. Laboratory Control Sample Analysis
9. Furnace Atomic Absorption Analysis
10. ICP Serial Dilution Analysis (ICP only)
11. Element Quantitation and Reported Detection Limits
12. Percent Solids Content and Determination (soils only)
13. Document Completeness
14. Overall Data Assessment

3.2. Target compound list organics analysis

Target compound list (TCL) organics analyses were performed using USEPA analytical methods outlined in Section 2. The validation of USEPA SW-846 methods 8080, 8240, and 8270 data followed the requirements presented in the QAPP and in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters were evaluated for the TCL organics analyses:

3.2.1. Pesticide/PCB analysis

1. Holding Times
2. Instrument Performance
   a. Standards Retention Time Windows
   b. DCBP Retention Time Shift
   c. Endrin and Dieldrin Degradation
   d. Baseline Stability
   e. Chromatographic Resolution
3. Calibration
   a. Initial Calibration
   b. Analytical Sequence Verification
   c. Continuing Calibration Verification
4. Blank Analysis
5. Surrogate Recovery
6. Matrix Spike / Matrix Spike Duplicate Analysis
7. Field Duplicate Analysis
8. Reference Standard Analysis
9. Compound Identification and Quantitation
10. Percent Solids Content and Determination (soils only)
11. Documentation Completeness
12. Overall Data Assessment

3.2.2. Volatile and semivolatile organics analyses

1. Holding Times
2. GC/MS Instrument Tuning Criteria
3. Calibration
   a. Initial Calibration
   b. Continuing Calibration
4. Blank Analysis

5. Surrogate Recovery
6. Matrix Spike / Matrix Spike Duplicate Analysis
7. Reference Standard Analysis
8. Field Duplicate Analysis
9. Internal Standards Recovery
10. Compound Identification and Quantitation
11. Percent Solids Determination and Content (soils only)
12. System Performance
13. Documentation Completeness
14. Overall Data Assessment

3.2.3. TOC Analysis

1. Holding Times
    - Criteria of 28 days from collection to analysis.
    - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 18.

2. Calibration
    - Criteria - daily 3 point initial calibration, RSD less than or equal to 10, continuing calibration every 10 samples, less than 10% difference between the actual and expected values.
    - Action - initial calibration %RSD greater than 10, or continuing calibration between 10 and 90 percent difference, detected and nondetected sample results qualified J, UJ respectively; continuing calibration %D greater than 90%, nondetected sample results were qualified as unusable (R), and detected sample results were qualified as approximate (J).

3. Blank Analysis
    - Criteria - frequency of 1 per matrix and every 10 samples
    - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 22.

4. Matrix Spike Analysis

- Criteria - frequency of 1 per matrix and every 20 samples, percent recovery of 75 to 125.
- Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 28.

5. Laboratory Duplicate Analysis
   - Criteria - frequency of 1 per matrix and every 20 samples, less than or equal to 20 percent difference.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, pages 29 and 30.

6. Field Duplicate Analysis
   - Criteria - frequency of 1 per matrix and every 20 samples, less than or equal to 30 percent difference.
   - Action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 31.

7. Laboratory Control Sample Analysis
   - Criteria - frequency of every 20 samples, percent recovery of 85 to 115.
   - Action - Percent recovery of 50 to 85 or greater than 120, detected results qualified as approximate (J); recovery of 50 to 85 percent, nondetected results qualified as approximate (UJ); nondetected sample results qualified as unusable (R) when percent recovery was less than 50, and detected sample results were qualified as approximate (J).

8. Documentation Completeness
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional*

Guidelines for Evaluating Inorganics Analyses, USEPA Region I, February 1989, page 17.

9. Overall Data Assessment
   - Criteria and action as listed in the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989, page 38.

4. Data quality evaluation

This section summarizes the QA/QC parameters, validation criteria, and qualifications performed on the sample data when the QA/QC parameters specified in Section 3 did not meet criteria. Samples that required qualification are identified in the following sections by the description documented on the sample chain of custody records. Only one qualifier was used for an individual sample result. When the data validation process identified several quality control deficiencies, the cumulative effect of the various excursions were employed in assigning the final data qualifier.

4.1. TAL inorganics analysis

QA/QC parameters for TAL inorganic analyses were evaluated for nine total ground water, nine filtered ground water, eight surface soil, twenty-two subsurface soil, seven blind duplicate, and nine equipment blank samples according to the QAPP and the *Region I Laboratory Data Validation -Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial calibration verification, laboratory control sample analysis, ICP serial dilution analysis, percent solids content and determination, and document completeness. Excursions from QA/QC criteria are summarized below.

4.1.1. Blank analysis

Blank samples that contained concentrations of TAL inorganics that exceeded the reporting limits or contained negative concentrations that were greater than two times the absolute values of the reporting limits are tabulated below. Action levels were calculated at five times the blank concentrations for the analytes detected in the blank samples. Detected results which were less than the blank action levels were qualified with a "U" in the associated samples. The "U" qualifier indicates that the TAL inorganic was analyzed for but was not detected above the reporting limit. Action levels for the analytes that were detected at negative concentrations in the blank were calculated as the absolute value of five times the blank concentration. Non-detected sample results and detected results below the absolute value of the action level were approximated.

Blank ID	TAL Inorganic	Blank Concentration	Blank Action Level	Associated Samples	Qualified Sample Result
Preparation 7/13/94	calcium	33.7 µg/L	168.5 µg/L	Equipment Blank #1	47.8 U µg/L
	iron	7 µg/L	35 µg/l	Blind Duplicate #1 Equipment Blank #1	27.8 U µg/L 7.0 U µg/L
	potassium	-287 µg/L	1435 µg/L	W-01 F W-01DI F Blind Duplicate #1 Equipment Blank #1	301 J µg/L 1140 J µg/L 956 J µg/L 100 UJ µg/L
	sodium	59.8 µg/L	299 µg/L	Equipment Blank #3	133 U µg/L
	antimony	2.3 µg/L	11.5 µg/L	W-01 W-01DI Blind Duplicate #1 W-01 F W-01DI F Blind Duplicate #1 W-27T W-27SI W-22T W-26T W-TP-12 W-04T	3.8 U µg/L 4.5 U µg/L 4.5 U µg/L 9.2 U µg/L 8.4 U µg/L 9.0 U µg/L 3.3 U µg/L 3.2 U µg/L 5.1 U µg/L 4.6 U µg/L 4.1 U µg/L 4.9 U µg/L
Preparation 7/14/94	aluminum	52 µg/L	260 µg/L	W-04T F	22.9 U µg/L
	calcium	26.7 µg/L	133.5 µg/L	Equipment Blank #1 F	64.9 U µg/L
	iron	6.9 µg/L	35.4 µg/L	W-27SI F W-26T F W-04T F	19.9 U µg/L 30.8 U µg/L 26.7 U µg/L
	potassium	-267 µg/L	1335 µg/L	W-26T F Equipment Blank #1 F	289 J µg/L 100 UJ µg/L
	magnesium	-22.9 µg/L	114.5 µg/L	Equipment Blank #1 F	10 UJ µg/L
	sodium	9 µg/L	45 µg/L	Equipment Blank #1 F	18.1 U µg/L

Blank ID	TAL Inorganic	Blank Concentration	Blank Action Level	Associated Samples	Qualified Sample Result
Preparation 7/14/94	antimony	3 μg/L	15 μg/L	W-27T F W-27SI F W-22T F W-26T F Equipment Blank #1 F WTP12 F W-04T F	10.6 U μg/L 19.9 U μg/L 7.6 U μg/L 3.9 U μg/L 14.5 U μg/L 3.0 U μg/L 10.9 U μg/L

4.1.2. Continuing calibration verification

The initial and final low level continuing calibration standards (CRI and CRIF, respectively), which have concentrations at or near the contract required detection limit (CRDL), are required to have recoveries between 80 and 120 percent. Detected sample results near the CRDL for compounds that exceeded these control limits require qualification. Therefore, detected sample results that were less than three times the CRDL were approximated for analytes that exceeded the recovery limits. The analytes that exceeded the recovery limits and the samples that required qualification are tabulated below.

Date Analyzed	TAL Inorganic	Percent Recovery		Affected Samples	Qualified Sample Result (μg/L)
		CRI	CRIF		
7/20/94	zinc	73.7	71.9	W-01DI F W-04T F	21.8 J 21.0 J

4.1.3. Matrix spike analysis

Matrix spike (MS) recovery criteria requiring spike recoveries to be between 75.0 and 125.0 percent were exceeded for several samples. Qualification of sample results that exceeded MS recovery limits included the approximation (J) of detected results when spike recoveries were above the upper limit or below the lower limit. Non-detected sample results were approximated (UJ) when MS recoveries were below the lower limit but above 30.0 percent. Non-detected sample results were qualified as unusable (R) when MS recoveries were below 30.0

percent. MS/MSD data were evaluated and qualifiers were applied to the analytical results in accordance with USEPA guidance dated February 1989 not the September 1990 guidance. This procedure was discussed and agreed upon with USEPA in a conference call held, January 25, 1995. Samples qualified due to MS recovery excursions are tabulated below.

TAL Inorganic	MS Sample ID	Percent Recovery	Affected Samples	Qualified Sample Results (µg/L)
selenium	W-TP-12	12.7	W-01	R
			W-01DI	R
			Blind Duplicate #1	R
			W-27T	R
			W-27SI	R
	W-22T	0.0	W-22T	R
			W-26T	R
			Equipment Blank #1	R
			W-TP-12	R
			W-04T	R
	SP-23	13.5	SP-27	0.22 J
			SP-29	0.26 J
			SP-28	0.35 J
			SP-30	0.52 J
			SP-25	0.29 J
			SP-26	R
			SP-23	0.31 J
			SP-24	0.21 J
			SP-Blind Duplicate #1	0.29 J
	TP-14 (10'-12')	52.3	TP-11 (10'-12')	0.89 UJ
			TP-11 (17'-19')	0.12 UJ
			TP-12 (14'-16')	0.11 UJ
			TP-13 (2'-4')	0.15 J
			TP-7 (6'-8')	0.29 J
			TP-7 (10'-12')	0.12 UJ
			TP-8 (4'-6')	0.27 J
			TP-8 (10'-12')	0.12 J
			TP-14 (10'-12')	0.71 UJ

TAL Inorganic	MS Sample ID	Percent Recovery	Affected Samples	Qualified Sample Results (μg/L)
	TP-9 (6'-8')	74.9	TP-14 (12'-14') TP-13 (0'-2') TP-12 (10'-12') W-01SI TP-9 (6'-8') TP-9 (10'-12') TP-10 (2'-4') TP-10 (8'-10') Blind Duplicate-TP TP-19 (14'-16') TP-19 (20'-22')	0.24 UJ 0.24 UJ 0.23 UJ 0.25 UJ 0.23 UJ 0.22 UJ 0.22 UJ 0.23 UJ 0.22 UJ 0.26 UJ 0.25 UJ
arsenic	W-22T	8.9	W-01 W-01DI Blind Duplicate #1 W-27T W-27SI W-22T W-26T Equipment Blank #1 W-TP-12 W-04T	1.8 J R R R 2.4 J R 3.0 J R R 4.1 J
	SP-23	7.4	SP-27 SP-29 SP-28 SP-30 SP-25 SP-26 SP-23 SP-24 SP-Blind Duplicate #1	2.2 J 2.6 J 2.5 J 3.3 J 1.7 J 2.0 J 2.5 J 2.9 J 3.6 J
	TP-14 (10'-12')	-192.6	TP-11 (10'-12') TP-11 (17'-19') TP-12 (14'-16') TP-13 (2'-4') TP-7 (6'-8') TP-7 (10'-12') TP-8 (4'-6') TP-8 (10'-12') TP-14 (10'-12')	1.0 J 1.4 J 1.2 J 1.3 J 3.3 J 3.0 J 5.7 J 2.0 J 17.6 J

TAL Inorganic	MS Sample ID	Percent Recovery	Affected Samples	Qualified Sample Results (μg/L)
	W-TP-12 (24'6"-26'6")	60.5	W-TP-12 (24'6"-26'6") BDSB-3	Not required because results were previously qualified for duplicate excursions
cadmium	W-22T	71.9	W-01 W-01DI Blind Duplicate #1 W-27T W-27SI W-22T W-26T Equipment Blank #1 W-TP-12 W-04T	1.0 UJ 1.0 UJ 1.0 UJ 1.0 UJ 1.0 UJ 1.0 UJ 1.0 UJ 1.0 UJ 1.0 UJ 1.0 UJ
chromium	W-22T	70.7	W-01 W-01DI Blind Duplicate #1 W-27T W-27SI W-22T W-26T Equipment Blank #1 W-TP-12 W-04T	57.5 J 165 J 139 J 53.9 J 48.5 J 229 J 79.4 J 2.0 UJ 104 J 157 J
thallium	W-22T	67.4	W-01 W-01DI Blind Duplicate #1 W-27T W-27SI W-22T W-26T Equipment Blank #1 W-TP-12 W-04T	1.0 UJ 6.0 J 6.5 J 1.0 UJ 1.0 UJ 3.1 J 1.0 UJ 1.0 UJ 1.0 UJ 1.4 J

TAL Inorganic	MS Sample ID	Percent Recovery	Affected Samples	Qualified Sample Results (μg/L)
	SP-23	0.9	SP-27	R
			SP-29	R
			SP-28	R
			SP-30	R
			SP-25	R
			SP-26	0.21 J
			SP-23	0.19 J
			SP-24	R
			SP-Blind Duplicate #1	R
zinc	W-22T	67.6	W-01	131 J
			W-01DI	1420 J
			Blind Duplicate #1	1160 J
			W-27T	202 J
			W-27SI	151 J
			W-22T	651 J
			W-26T	354 J
			Equipment Blank #1	1.0 UJ
			W-TP-12	1730 J
			W-04T	327 J
lead	SP-23	42.0	SP-27	10.1 J
			SP-29	16.7 J
			SP-28	11.4 J
			SP-30	35.9 J
			SP-25	31.4 J
			SP-23	18.7 J
			SP-24	12.6 J
			SP-Blind Duplicate #1	24.0 J
antimony	SP-23	63.7	SP-27	0.12 UJ
			SP-29	0.27 J
			SP-28	0.15 UJ
			SP-30	0.31 J
			SP-25	0.13 UJ
			SP-26	0.19 UJ
			SP-23	0.24 J
			SP-24	0.30 J
			SP-Blind Duplicate #1	0.27 J

TAL Inorganic	MS Sample ID	Percent Recovery	Affected Samples	Qualified Sample Results (μg/L)
	TP-14 (10'-14')	74.6	TP-11 (10'-12') TP-11 (17'-19') TP-12 (14'-16') TP-13 (2'-4') TP-7 (6'-8') TP-7 (10'-12') TP-8 (4'-6') TP-8 (10'-12') TP-14 (10'-12')	158 J 0.86 J 0.11 UJ 0.23 UJ 0.23 UJ 0.38 J 0.53 J 0.24 UJ 0.28 UJ
antimony	W-22T	68.8	W-01 W-01DI Blind Duplicate #1 W-27T W-27SI W-22T W-26T Equipment Blank #1 W-TP-12 W-04T	3.8 UJ 4.5 UJ 4.5 UJ 3.3 UJ 3.2 UJ 5.1 UJ 4.6 UJ 2.0 UJ 4.1 UJ 4.9 UJ
	TP-9 (6'-8')	63.4	TP-14 (12'-14') TP-13 (0'-2') TP-12 (10'-12') W-01SI TP-9 (6'-8') TP-9 (10'-12') TP-10 (2'-4') TP-10 (8'-10') Blind Duplicate-TP TP-19 (14'-16') TP-19 (20'-22')	0.46 J 0.24 UJ 0.23 UJ 0.25 UJ 0.23 UJ 0.22 UJ 0.22 UJ 0.90 J 0.22 UJ 0.26 UJ 0.25 UJ
	W-TP-12 (22'6"-24'6")	67.7	W-TO-12 (22'6"-24'6")	0.25 UJ
	W-TP-12 (24'6"-26'6")	61.1	W-TP-12 (24'6"-26'6") BDSB-3	0.25 UJ 0.40 J
chromium	TP-14 (10'-14')	71.9	TP-11 (10'-12') TP-11 (17'-19') TP-12 (14'-16') TP-13 (2'-4') TP-7 (6'-8') TP-7 (10'-12') TP-8 (4'-6') TP-8 (10'-12') TP-14 (10'-12')	102 J 7.3 J 6.0 J 8.2 J 7.2 J 8.3 J 11.6 J 5.9 J 24.0 J

TAL Inorganic	MS Sample ID	Percent Recovery	Affected Samples	Qualified Sample Results (μg/L)
mercury	TP-14 (10'-14')	63.8	TP-11 (10'-12') TP-11 (17'-19') TP-12 (14'-16') TP-13 (2'-4') TP-7 (6'-8') TP-7 (10'-12') TP-8 (4'-6') TP-8 (10'-12') TP-14 (10'-12')	85.9 J 4.0 J 0.11 UJ 53.5 J 0.25 J 0.38 J 2.9 J 3.5 J 0.74 J

TAL Inorganic	MS Sample ID	Percent Recovery	Affected Samples	Qualified Sample Results ($\mu g/L$)
barium	W-TP-12 (22'6"-24'6")	327.5	W-TP-12 (22'6"-24'6")	23.2 J
manganese	W-TP-12 (22'6"-24'6")	4455.4	W-TP-12 (22'6"-24'6")	77.5 J

4.1.4. Field duplicate analysis

Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The relative percent difference (RPD) between duplicate sample results greater than five times the reporting limit is required to be less than 30.0 percent (35 percent for soils). Duplicate sample results less than five times the reporting limit are required to have a difference less than the value of the reporting limit. The identity of blind duplicate samples and the TAL inorganics that exceeded RPD criteria are tabulated below.

Blind Duplicate Collection Date	Corresponding Sample ID	TAL Inorganic	RPD	Affected Samples	Qualified Sample Result
5/25/94	SP-26	arsenic	57.1	SP-26	NA
		cadmium	200.0	SP-26	4.5 J
		lead	118.6	SP-26	93.9 J
	TP-10 (2'-4')	zinc	44.8	TP-12 (14'-16') TP-11 (17'-19') TP-9 (6'-8') TP-9 (10'-12') TP-10 (2'-4') TP-10 (8'-10') Blind Duplicate-TP W-01SI (210'-212') TP-19 (14'-16') TP-19 (20'-22')	21.7 J 194 J 51.7 J 34.9 J 106 J 132 J 67.2 J 175 J 31.8 J 62.2 J
	W-TO-12 (24'6"-26'6")	zinc	119.4	W-TP-12 (22'6"-24'6")	43.2 J

Blind Duplicate Collection Date	Corresponding Sample ID	TAL Inorganic	RPD	Affected Samples	Qualified Sample Result
7/5/94	W-01DI	NR	NR	NR	NR
	W-01DI F	NR	NR	NR	NR
7/6/94	Dickinson	NR	NR	NR	NR
	Dickinson F	NR	NR	NR	NR

NA = Sample previously qualified.
NR = Not required since duplicate RPDs were within control limits.

4.1.5. Laboratory duplicate analysis

Laboratory duplicate samples were analyzed to evaluate the precision of the laboratory procedures. The relative percent difference (RPD) between duplicate sample results greater than five times the reporting limit is required to be less than 20.0 percent (35 percent for soils). Duplicate sample results less than five times the reporting limit are required to have a difference less than the value of the reporting limit (less than two times the value of the reporting limit for soils). The TAL inorganics that exceeded laboratory duplicate criteria are tabulated below.

Duplicate Sample ID	TAL Inorganic	RPD	Affected Samples	Qualified Sample Result (μg/L or mg/Kg)
W-22T	lead	53.1	W-01	17.6 J
			W-01DI	114 J
			Blind Duplicate #1	103 J
			W-27T	23.5 J
			W-27SI	21.3 J
			W-22T	186 J
			W-26T	53.2 J
			Equipment Blank #1	1.0 J
			W-TP-12	3370 J
			W-04T	69.2 J

Duplicate Sample ID	TAL Inorganic	RPD	Affected Samples	Qualified Sample Result (µg/L or mg/Kg)
TP-14 (10'-12')	barium	182.8	TP-11 (10'-12') TP-13 (2'-4') TP-7 (6'-8') TP-7 (10'-12') TP-8 (4'-6') TP-8 (10'-12') TP-14 (10'-12') TP-14 (12'-14') TP-13 (0'-2') TP-12 (10'-12') W-01SI	53.5 J 29.3 J 66.1 J 34.0 J 77.9 J 38.5 J 2650 J 27.0 J 33.9 J 27.1 J 22.9 J
	copper	103.3	TP-11 (10'-12') TP-13 (2'-4') TP-7 (6'-8') TP-7 (10'-12') TP-8 (4'-6') TP-8 (10'-12') TP-14 (10'-12') TP-14 (12'-14') TP-13 (0'-2') TP-12 (10'-12') W-01SI	123 J 8.8 J 8.2 J 10.6 J 18.1 J 6.7 J 16.1 J 5.8 J 60.1 J 6.7 J 4.4 J
	lead	46.8	TP-11 (10'-12') TP-13 (2'-4') TP-14 (10'-12')	498,000 J 177 J 417 J
	manganese	57.0	TP-11 (10'-12') TP-13 (2'-4') TP-7 (6'-8') TP-7 (10'-12') TP-8 (4'-6') TP-8 (10'-12') TP-14 (10'-12') TP-14 (12'-14') TP-13 (0'-2') TP-12 (10'-12') W-01SI	86.0 J 196 J 171 J 186 J 430 J 304 J 211 J 66.7 J 169 J 160 J 132 J

Duplicate Sample ID	TAL Inorganic	RPD	Affected Samples	Qualified Sample Result (µg/L or mg/Kg)
TP-14 (10'-12')	zinc	121.6	TP-11 (10'-12') TP-13 (2'-4') TP-7 (6'-8') TP-7 (10'-12') TP-8 (4'-6') TP-8 (10'-12') TP-14 (10'-12') TP-14 (12'-14') TP-13 (0'-2') TP-12 (10'-12') W-01SI	572 J 1180 J 140 J 131 J 238 J 109 J 1350 J 28.8 J 6980 J 34.5 J 20.2 J
W-TP-12 (24'6"-26'6")	arsenic	79.3	W-TP-12 (24'6"-26'6") BDSB-3	2.3 J 1.9 J
	copper	48.4	W-TP-12 (24'6"-26'6") BDSB-3	7.7 J 5.6 J
	zinc	144.4	W-TP-12 (24'6"-26'6") BDSB-3	220 J 55.5 J

4.1.6. Furnace atomic absorption analysis

The QA/QC criteria specified for furnace atomic absorption post digestion matrix spike performance requires that the spike percent recoveries (%R) be between 85 and 115 percent. Samples that exceeded these criteria and the qualification of sample results due to these excursions are tabulated below.

TAL Inorganic	Sample ID	Spike Recovery	Qualified Sample Result (µg/L)
arsenic	TP-11 (10'-12') SP-29	76.2 % 23.8 %	Qualification was not required because these samples were qualified as approximated for deviations from matrix spike recovery criteria.
	SP-Equipment Blank TP-Equipment/Field Blank W-TP-12 (22'6"-24'6")	83.2 % 84.1 % 84.5 %	1.0 UJ 1.0 UJ 1.0 J

TAL Inorganic	Sample ID	Spike Recovery	Qualified Sample Result (μg/L)
lead	SP-Equipment Blank	78.2 %	1.0 UJ
	TP-Equipment/Field Blank	79.5 %	1.0 UJ
	Equipment Blank-TP2	82.8 %	1.0 UJ
selenium	W-27SI	66.9 %	Qualification was not required because these samples were qualified as unusable for deviations from matrix spike recovery criteria.
	W-22T	58.6 %	
	W-04T	74.1 %	
	W-01	44.7 %	
	W-01DI	73.6 %	
	Blind Duplicate #1	79.3 %	
	W-TP-12	70.2 %	
	SP-27	70.8 %	
	SP-29	40.6 %	
	SP-28	63.4 %	
	SP-30	47.6 %	
	SP-25	70.0 %	
	SP-23	52.4 %	
	SP-24	72.4 %	
	SP-Blind Duplicate #1	44.5 %	
	TP-11 (17'-19')	72.3 %	
	TP-13 (2'-4')	81.4 %	
	TP-7 (6'-8')	67.2 %	
	TP-8 (4'-6')	71.9 %	
	TP-8 (10'-12')	82.6 %	
	SP-26	84.2 %	
	TP-14 (10'-12')	81.1 %	
	TP-13 (0'-2')	77.7 %	
	TP-12 (10'-12')	77.6 %	
	W-01SI	77.4 %	
	TP-9 (10'-12')	79.8 %	
	TP-10 (2'-4')	84.4 %	
	TP-10 (8'-10')	78.0 %	
	Blind Duplicate-TP	72.4 %	
	TP-19 (14'-16')	76.2 %	
	TP-19 (20'-22')	78.6 %	
	TP-14 (12'-14')	84.5 %	
	WTP-12 (24'6"-26'6")	82.7 %	
	WTP-12 (22'6"-24'6")	75.5 %	
selenium	SP-Equipment Blank	76.7 %	1.0 UJ
	TP Equipment/Field Blank	75.2 %	1.0 UJ
	Equipment/Field Blank-TP2	77.4 %	1.0 UJ
	Equipment/Field Blank (5/16/94)	76.2 %	1.3 J
	TP-11 (10'-12')	0 %	R

TAL Inorganic	Sample ID	Spike Recovery	Qualified Sample Result (μg/L)
dissolved - selenium	W-01 F	70.6 %	1.1 J
	W-01DI F	79.9 %	1.2 J
	Blind Duplicate #1 F	82.0 %	1.0 UJ
	W-27T F	80.3 %	1.0 UJ
	Equipment Blank #1 F	79.0 %	1.0 UJ
	W-TP-12 F	63.6 %	1.4 J
thallium	W-27T	84.5 %	Qualification was not required because these samples were also qualified for deviations from matrix spike recovery criteria.
	W-22T	79.4 %	
	W-26T	82.9 %	
	W-04T	79.6 %	
	SP-27	62.1 %	
	SP-29	71.6 %	
	SP-28	73.2 %	
	SP-30	69.4 %	
	SP-25	77.5 %	
	SP-24	82.1 %	
	SP-Blind Duplicate	81.9 %	
	SP-26	71.4 %	
	SP-23	74.3 %	
	TP-11 (10'-12')	67.1 %	0.18 UJ
	TP-7 (6'-8')	75.5 %	0.15 J
	TP-7 (10'-12')	74.5 %	0.12 UJ
	TP-8 (4'-6')	59.4 %	0.13 J
	TP-8 (10'-12')	74.1 %	0.12 J
	TP-14 (10'-12')	80.6 %	0.14 UJ
	SP-Equipment Blank	84.2 %	1.0 UJ
	TP-Equipment/Field Blank	82.7 %	1.0 UJ
	TP-14 (12'-14')	72.4 %	0.24 UJ
	TP-13 (0'-2')	74.2 %	0.24 UJ
	TP-12 (10'-12')	74.2 %	0.23 UJ
	W-01SI	62.3 %	0.25 UJ
	TP-9 (6'-8')	76.3 %	0.23 UJ
	TP-9 (10'-12')	75.3 %	0.22 UJ
	TP-10 (2'-4')	67.9 %	0.22 UJ
	Blind Duplicate-TP	68.7 %	0.22 UJ
	TP-19 (14'-16')	76.2 %	0.26 UJ
	TP-19 (20'-22')	71.5 %	0.25 UJ
	W-01SI (210'-212')	73.2 %	1.2 J
	Equipment/Field Blank-TP-2	76.8 %	1.0 UJ
dissolved - thallium	W-01DI F	84.0 %	1.0 UJ
	W-27T F	82.6 %	1.0 UJ
	W-22T F	81.3 %	1.0 UJ
	W-TP-12 F	56.0 %	1.0 UJ

4.1.7. ICP interference check sample analysis

Several interference check samples (ICSA) contained concentrations of TAL inorganics in the A solutions which were greater than their reporting limits. TAL inorganics were also detected in the A solutions at a negative concentration greater than two times the absolute value of the reporting limits. Qualification of the affected TAL inorganics detected at positive concentrations in the ICSA solution was to approximate (J) the detected results for samples containing one or more of the interferant analytes (Al, Ca, Fe, or Mg) at concentrations greater than fifty percent of the ICSA concentrations. The TAL inorganics detected in the ICSA samples and the samples qualified as a result of these excursions are tabulated below.

Date Analyzed	TAL Inorganic	ICSA Concentration ($\mu g/L$)	Qualification	Affected Sample
7/20/94	barium	23.3	J	W-01 W-01D1 Blind Duplicate #1 W-27T W-27SI W-22T W-26T W-04T
	cadmium	-9	J or UJ	
	cobalt	4.3	J	
	copper	7	J	
	potassium	-720	J or UJ	
	manganese	-9	J or UJ	
	sodium	310	J	
	nickel	8	J	
	zinc	-10	J or UJ	

4.1.8. Element quantitation and reported detection limits

Detected sample results that were greater than the IDLs but less than the reporting limits were reported by the laboratory with a "B" qualifier. These results were qualified as approximated (J) as a results of the data validation.

4.1.9. Overall data assessment

Overall, the laboratory performed TAL inorganics analyses in accordance with the requirements specified in the methods listed in

Section 2. A total of 98.1 percent of these data have been determined to be usable for qualitative and quantitative purposes. Data were qualified as unusable for arsenic, selenium, and thallium due to matrix spike and furnace post-digestion spike recovery deviations. Detected sample results for several analytes were qualified with a "U" based on preparation blank criteria. Detected and non-detected sample results for several analytes were also approximated based on excursions from blank analysis, continuing calibration, ICP interference check sample analysis, matrix spike analysis, field duplicate analysis, laboratory duplicate analysis, and furnace analytical spike analysis criteria.

4.2. TCL volatiles analysis

Twenty-eight subsurface soil, eight surface soil, nine ground water, six blind duplicate, six equipment blank, and nine trip blank samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8240 were found to meet validation criteria: holding times, blank analysis, GC/MS instrument tuning, continuing calibration, system performance, percent solids determination and content, and documentation completeness. Excursions from QA/QC criteria are summarized below.

4.2.1. Initial calibration

TCL volatile organics initial calibration criteria requires that the average relative response factor (RRF) have a minimum value of 0.05. Qualification of sample results when this criterion was exceeded included the qualification of non-detected results as unusable (R) for compounds with RRFs below 0.05. TCL volatile compounds that exceeded initial calibration criteria and the samples qualified due to those excursions are tabulated below.

Date Analyzed	TCL Volatile Compound	RRF	Affected Samples	Qualified Sample Result

5/28/94	2-butanone	0.041	TP-Equipment/Field Blank Equipment/Field Blank-TP2 Trip Blank-#1 (5/17/94) Trip Blank-#2 (5/17/94) Trip Blank-#3 (5/25/94) Trip Blank-#4 (5/25/94)	R R R R R R
5/31/94	2-butanone	0.041	SP-Equipment Blank TP-11 (10'-12')	R R

4.2.2. Reference standard analysis

Method accuracy was evaluated by the analysis of reference samples. The reference sample analyzed on April 1, 1994 exhibited a recovery of 160 percent for acetone. Although, this recovery did not exceed the laboratory generated control limits (36 to 199 percent) it was identified as a biased high result. Therefore, the detected acetone result for sample W-22T (17'-19') was qualified as approximated (J).

4.2.3. Matrix spike/matrix spike duplicate analysis

Matrix spike/matrix spike/duplicate (MS/MSD) recovery limits (64 to 128 percent) were exceeded for trichloroethene in the MSD analysis of W-4T (19'-21') with a recovery of 62 percent. Due to this deviation the detected trichloroethene result for W-4T (19'-21') was approximated (J).

4.2.4. Internal standards recovery

Internal standard recovery limits were exceeded for several samples. Internal standard recovery criteria requires the area of a internal standard in a sample to be no less than 50 percent below or no greater than 100 percent above the corresponding internal standard area from the daily continuing calibration standard. Qualification of sample results for these deviations was limited to the approximation (J or UJ) of results for the TCL compounds that were quantitated with the internal standard compound that exceeded recovery limits. Samples that exceeded these criteria and the resulting sample qualifications are tabulated below.

Sample ID	Internal Standard	Area	Control Limits	Affected Compounds	Qualified Results (μg/Kg)
SP-23	chlorobenzene-d5	2390276	2671344 to 10685370	4-methyl-2-pentanone 2-hexanone tetrachloroethene 1,1,2,2-tetrachloroethane toluene chlorobenzene ethylbenzene styrene xylene (total)	15 UJ 15 UJ 99 J 7 UJ 7 UJ 7 UJ 7 UJ 7 UJ 7 UJ
SP-24	chlorobenzene-d5	1597479	1619426 to 6477702	4-methyl-2-pentanone 2-hexanone tetrachloroethene 1,1,2,2-tetrachloroethane toluene chlorobenzene ethylbenzene styrene xylene (total)	15 UJ 15 UJ 22 J 8 UJ 8 UJ 8 UJ 8 UJ 8 UJ 8 UJ
SP-29	chlorobenzene-d5	1494693	1619426 to 6477702	4-methyl-2-pentanone 2-hexanone tetrachloroethene 1,1,2,2-tetrachloroethane toluene chlorobenzene ethylbenzene styrene xylene (total)	16 UJ 16 UJ 8 UJ 8 UJ 8 UJ 8 UJ 8 UJ 8 UJ 8 UJ

4.2.5. Surrogate recovery

The laboratory generated surrogate recovery control limits were exceeded in several samples for the toluene-d8 and 4-bromofluorobenzene surrogates. The samples that exceeded surrogate recovery criteria and the resulting sample qualifications are tabulated below.

Sample ID	Surrogate	Recovery	Control Limits (%)	Affected Compounds	Qualified Results (μg/Kg)

SP-23	4-bromofluorobenzene	73 %	80 to 118	All compounds not previously qualified	J or UJ
SP-24	4-bromofluorobenzene	74 %			
SP-25	4-bromofluorobenzene	71 %			
SP-28	4-bromofluorobenzene	69 %			
SP-29	4-bromofluorobenzene	69 %			
	toluene-d8	121 %	56 to 115		

4.2.6. Field duplicate analysis

Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The relative percent difference (RPD) between duplicate samples is required to be less than 30.0 percent (50 percent for soils). The identity of blind duplicate samples and the TCL volatile organics that exceeded RPD criteria are tabulated below.

Blind Duplicate Collection Date	Corresponding Sample ID	TCL Volatile Organic	RPD	Affected Samples	Qualified Sample Result (µg/Kg)
3/24/94	W-4T (19'-21')	trichloroethene	148.9	Blind Duplicate-1	150 J
		tetrachloroethene	141.0	W-4T (19'-21') Blind Duplicate-1	9 J 52 J
4/11/92	SB-23 (6'-7')	NR	NR	NR	NR
5/17/94	SP-26	NR	NR	NR	NR
5/25/94	TP-10 (2'-4')	tetrachloroethene	97.4	TP-10 (2'-4') Blind Duplicate-TP	690 J 2000 J
6/7/94	WTP-12 (20'6"-22'6")	trichloroethene	NC	WTP-12 (20'6"-22'6") BDSB-1	54,000 J
7/5/94	W-01DI	NR	NR	NR	NR

NR = Not required since duplicate RPDs were within control limits.

NC = Not calculated since the compound was detected only in the original sample or the field duplicate. Detected sample results were qualified as a result.

4.2.7. Compound identification and quantitation

The non-detected samples results for 2-hexanone and 1,1,2,2-tetrachloroethane for W-TP-12 were reported with elevated quantitation limits. The quantitation limits reported for these compounds were obtained from the diluted analysis of the sample. The diluted analysis results were chosen for these compounds because the undiluted analysis exhibited interference from the elevated concentration of tetrachloroethene in the sample. The interference in the undiluted sample was caused by the flooding of the detector with ions from tetrachloroethene over the retention time windows of 2-hexanone and 1,1,2,2-tetrachloroethane. Therefore these compounds were reported in sample W-TP-12 as 5000 U and 2500 U for 2-hexanone and 1,1,2,2-tetrachloroethane, respectively.

4.2.8. Overall data assessment

Overall, the laboratory performed TCL volatile organics analyses in accordance with the requirements specified in the method listed in Section 2. A total of 99.9 percent of these data have been determined to be usable for qualitative and quantitative purposes. One non-detected 2-butanone results was qualified as unusable due to initial calibration deviations. Detected and non-detected sample results were approximated for several TCL compounds due to reference standard recovery, MS/MSD analysis, internal standard recovery, and field duplicate deviations.

4.3. TCL semivolatiles analysis

One ground water, seven subsurface soil, three blind duplicate, and three equipment blank samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8270 were found to meet validation criteria: holding times, GC/MS instrument tuning, initial and continuing calibration, surrogate recovery, reference standard analysis, internal standards recovery, compound identification and quantitation, percent solids determination and content, system performance, and documentation completeness. Excursions from QA/QC criteria are summarized below.

4.3.1. Blank analysis

One soil preparation blank contained detectable concentrations of benzoic acid, di-n-butylphthalate, and bis(2-ethylhexyl)phthalate. Of these compounds only bis(2-ethylhexyl)phthalate was detected in the associated samples. Bis(2-ethylhexyl)phthalate was detected in the undiluted preparation blank (6/14/94) at a concentration of 3,300 ug/Kg. Associated samples W-TP-12 (22'6"-24'6") and BDSB-2 also contained bis(2-ethylhexyl)phthalate at high concentrations, indicating laboratory extraction contamination. As a result, the associated samples were qualified properly for blank contamination. A blank action level was calculated at ten times the blank concentration because this compound is considered a common laboratory contaminant. Detected sample results which were less than the blank action levels for the compounds detected in the blank samples were qualified with a "U" in the associated samples. The "U" qualifier indicates that the TCL semivolatile organic was analyzed for but was not detected above the reported quantitation limit. Sample qualified for blank contamination are tabulated below.

Blank ID	TAL Semivolatile Organic	Blank Action Level (μg/Kg)	Associated Samples	Qualified Sample Result
Preparation (6/14/94)	bis(2-ethylhexyl)phthalate	33,000	W-TP-12 (22'6"-24'6") BDSB-2	3800 U μg/Kg 3800 U μg/Kg

4.3.2. Matrix spike/matrix spike duplicate analysis

MS/MSD recovery limits (62 to 105 percent) were exceeded for N-nitroso-di-n-propylamine in the MS/MSD analyses of TP-12 (14'-16'), TP-9 (6'-8'), and W-TP-12 (22'6"-24'6") with recoveries that ranged from 38 to 49 percent. Due to these deviations the non-detected N-nitroso-di-n-propylamine results for TP-12 (14'-16'), TP-9 (6'-8'), and W-TP-12 (22'6"-24'6") were approximated (UJ).

MS/MSD recovery limits (76 to 106 percent) were also exceeded for 2-nitrophenol in the MS/MSD analysis of W-TP-12 with recoveries of 15.1 and 58.5 percent. These analyses also exceeded MS/MSD RPD criterion (less than 15 percent) with a value of 118 percent. Due to these excursions the non-detected 2-nitrophenol result for W-TP-12 was qualified as approximate (UJ).

4.3.3. Field duplicate analysis

Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The relative percent difference (RPD) between duplicate samples is required to be less than 30.0 and 50.0 percent for water and soil samples, respectively. The identity of blind duplicate samples are tabulated below.

Blind Duplicate Collection Date	Corresponding Sample ID	TCL Semivolatile Organic	RPD	Affected Samples	Qualified Sample Result
5/25/94	TP-10 (2'-4')	NR	NR	NR	NR
6/7/94	W-TP-12 (22'6"-24'6")	NR	NR	NR	NR
7/6/94	W-TP-12	NR	NR	NR	NR

NR = Not required since duplicate RPDs were within control limits.

4.3.4. Tentatively identified compounds

Several tentatively identified compounds (TICs) were detected in the sample preparation blanks. Sample TICs with relative retention times matching the retention times of the TICs in the method blanks were qualified as unusable (R). TICs which were identified as polychlorinated biphenyls (PCBs) were identified in samples TP-19 (14'-16') and TP-19 (20'-22').

4.3.5. Overall data assessment

Overall, the laboratory performed semivolatile organics analyses in accordance with the requirements specified in the method listed in Section 2. The semivolatile organics sample data have been determined to be usable for qualitative and quantitative purposes. Detected sample results for bis(2-ethylhexyl)phthalate were qualified with a "U" due to method blank excursions for two samples. Non-detected sample results were also qualified as approximated (UJ) due to MS/MSD recovery deviations.

4.4. Pesticide/PCB analysis

One ground water, four subsurface soil, two blind duplicate, and three equipment blank samples were validated according to procedures in the QAPP and *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses*, USEPA Region I, November 1988. The following QA/QC parameters for method EPA 8080 were found to meet validation criteria: holding times, instrument performance, calibration, blank analysis, reference standard analysis, compound identification and quantitation, percent solids content and determination, and documentation completeness. Excursions from QA/QC criteria are summarized below.

4.4.1. Matrix spike/matrix spike duplicate analysis

MS/MSD recovery limits (42 to 116 percent) were exceeded for endrin aldehyde in the MS/MSD analyses of TP-12 (14'-16') with recoveries of 40 and 30 percent. Due to these deviations the non-detected endrin aldehyde result for TP-12 (14'-16') was approximated (UJ).

MS/MSD recovery limits (42 to 116 percent) were also exceeded for endrin aldehyde in the MS/MSD analysis of W-TP-12 with recoveries of zero percent for both samples. Due to these excursions the non-detected endrin aldehyde result for W-TP-12 was qualified as unusable (R).

4.4.2. Surrogate recovery

The laboratory generated surrogate recovery control limits (68 to 145 percent) were exceeded for the decachlorobiphenyl surrogate in Blind Duplicate #2 with a recovery of 17 percent. Only the detected result for endrin in this sample was approximated because the recovery for the 2,4,5,6-tetrachloro-m-xylene surrogate was within the established recovery limits.

4.4.3. Field duplicate analysis

Field duplicate samples collected as blind duplicates were analyzed to evaluate the precision of field and laboratory procedures. The relative percent difference (RPD) between duplicate samples is required to be less than 30.0 and 50.0 percent for water and soil samples, respectively. The identity of blind duplicate samples and the PCB/Pesticide compounds that exceeded RPD criteria are tabulated below.

Blind Duplicate Collection Date	Corresponding Sample ID	PCB/Pesticide Compound	RPD	Affected Samples	Qualified Sample Result
6/7/94	W-TP-12 (24'6"-26'6")	NR	NR	NR	NR
7/6/94	W-TP-12	endrin	200.0	W-TP12	0.026 UJ

NR = Not required since duplicate RPDs were within control limits.

4.4.4. Overall data assessment

Overall, the laboratory performed pesticide/PCB analyses in accordance with the requirements specified in the method listed in Section 2. With the exception of one endrin aldehyde result which was qualified as unusable for MS/MSD deviations, the PCB/pesticide sample data have been determined to be usable for qualitative and quantitative purposes. Sample data were qualified as approximated for MS/MSD recovery, surrogate recovery, and field duplicate criteria deviations.

4.5. TOC analyses

QA/QC parameters for TOC analyses were evaluated for two subsurface soils, one blind duplicate, and one equipment blank sample according to the QAPP and the *Region I Laboratory Data Validation - Functional Guidelines for Evaluating Inorganics Analyses*, USEPA Region I, February 1989. The following QA/QC parameters were found to meet validation criteria: holding times, initial and continuing calibration, blank analysis, matrix spike analysis, laboratory duplicate analysis, laboratory control sample analysis, and documentation completeness. Excursions from QA/QC criteria are summarized below.

4.5.1. Field duplicate analysis

A field duplicate sample collected as a blind duplicate was analyzed to evaluate the precision of field and laboratory procedures. The RPD between duplicate samples is required to be less than 50.0 percent for soil samples. The identity of the blind duplicate sample is tabulated below.

Blind Duplicate Collection Date	Corresponding Sample ID	RPD	Affected Samples	Qualified Sample Result
3/23/94	W-04T (16'-21')	42.0	none affected	NR

NR = Not required since duplicate RPDs were within control limits.

4.5.2. Overall data assessment

Overall, the laboratory performed TOC analyses in accordance with the requirements specified in the method listed in Section 2.0. These data have been determined to be usable for qualitative and quantitative purposes because excursions resulting in the qualification of data were not observed.

5. Summary and data usability

The analytical data generated for the fifth round of sampling conducted at the Burgess Brothers Superfund Site located in Woodford and Bennington, Vermont were evaluated based on QA/QC criteria established by the United States Environmental Protection Agency (USEPA) Contract laboratory Program (CLP) and criteria presented in the QAPP for this investigation. Validation procedures were based on CLP data validation guidelines developed by the USEPA. Data qualified with an "R", which are considered unusable for either qualitative or quantitative purposes, resulted when a major deficiency was noted in the data generation process. Minor deficiencies in the data generation process resulted in approximation of sample data. Approximation of a data point indicates uncertainty in the reported concentration of the chemical, but not its assigned identity. The conservative assumptions used in the development of conclusions made based on these analytical results allow for the quantitative use of approximated analytical data while still adhering to the project data quality objectives. This approach to the use of analytical data is consistent with the guidance presented in *U.S. EPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), 540/1-891002*, December 1989. A summary of specific QA/QC excursions that resulted in qualification of sample data is presented in Section 4.

Data quality objectives (DQOs) are quantitative and qualitative statements specifying the quality of the environmental data required to support the decision making process. DQOs define the total uncertainty in the data that is acceptable. The DQOs for this investigation require that the total uncertainty of the analytical data remain within an acceptable range so as not to hinder the intended use of the data. For this investigation ground water and surface water data will be used to characterize background ground water quality and contaminant concentrations in specific areas of the site.

This section summarizes the analytical data in terms of its completeness and usability for these site characterization purposes. Data completeness is defined as the percentage of sample results that have been determined to be usable during the data validation process. Data completeness with respect to usability was calculated separately for each type of analysis and is tabulated below. The percent usability calculation did not include quality control samples collected to aid in the evaluation of data usability. Therefore, field/equipment blank, trip blank, and field duplicate data determined to be unusable as a result of the validation process are not represented in the percent usability value tabulated below.

Analysis	Percent Usability	Excursions
TAL Inorganics	98.1	Data qualified as unusable included: non-detected selenium results for W-01, W-01DI, W-27T, W-27SI, W-22T, W-26T, W-TP-12, W-04T, TP-11 (10'-12'), and SP-26; non-detected arsenic results for W-01DI, W-27T, W-22T, and W-TP-12; and non-detected thallium results for SP-27, SP-29, SP-28, SP-30, SP-25, and SP-24 due to MS/MSD recovery excursions.
TCL Volatiles	99.9	The non-detected 2-butanone result was qualified as unusable for TP-11 (10'-12') due to calibration excursions.
TCL Semivolatiles	100.0	NA
TCL Pesticides/PCBs	99.2	The non-detected endrin aldehyde result was qualified as unusable for W-TP-12 due to matrix spike excursions.
TOC	100.0	NA

NA = Not Applicable

Validation of the fifth round of sampling conducted at the Burgess Brothers Superfund Site analytical data indicated that the data quality objectives defined in the QAPP were met. The following sections present the adherence of the data to the precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters presented in the QAPP. Additional information on the impact of excursions from QC measurements on the analytical data was found in the risk assessment guidance document: *Guidance for Data Usability in Risk Assessment (Part A) Final*, USEPA, 9285.7-09A, April 1992.

Precision is measured through field duplicate samples, split samples, and laboratory duplicate samples. For the sampling programs associated with this investigation, 2.53% of the analytical data were qualified due to deviations from field duplicate sample analyses.

Matrix spike sample, reference standards, surrogate recoveries, and calibration criteria indicate the accuracy of the data. For these sampling programs, 4.8% of the analytical data were qualified for deviations from matrix spike recovery criteria; 0.03 percent were qualified for reference standard criteria deviations; 4.7 percent were qualified for surrogate recovery deviations; and 0.31 percent were qualified for calibration criteria deviations.

Holding times, sample preservation, extraction procedures, and blank analyses are indicators of the representativeness of the analytical data. For the sampling programs associated with this investigation, 1.17 percent of these data were qualified for blank criteria deviations.

Comparability is not compromised provided that the analytical methods did not change over time. A major component of comparability is the use of standard reference materials for calibration and QC. These standards are compared to other unknowns to verify their concentrations. Since standard analytical methods and reporting procedures were consistently used by the laboratory, the comparability criteria for the analytical data were met.

The percent usability, or completeness, of the data ranged from 98.1 to 100.0 percent for data collected for this investigation. Overall, the analytical data are of sufficient quality to meet the project data quality objectives and may be used for qualitative and quantitative purposes. These uses include, but are not limited to, performance of human health and ecological risk assessments, evaluation of remedial alternatives, and estimation of the nature and extent of contamination.

Respectfully submitted,

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Appendix 2

LABORATORY AND FIELD AUDITS REPORT

Remedial Investigation
Burgess Brothers Superfund Site
Woodford and Bennington, Vermont

Burgess Brothers
Superfund Site Steering
Committee

September 1994

SUMMARY

This report describes a laboratory audit and a field audit that were performed by O'Brien & Gere, Syracuse, New York as part of the Remedial Investigation (RI) at the Burgess Brothers Superfund Site, Woodford and Bennington, Vermont.

The laboratory, OBG Laboratories, Inc., Syracuse, New York, was audited by O'Brien & Gere on June 17 & 18, 1993. The laboratory on-site audit was conducted to evaluate the systems and procedures described in the Quality Assurance Project Plan (QAPP) were operational and contributing to the production of accurate, precise, and defensible analytical results. Analytical and Quality Assurance/Quality Control (QA/QC) procedures relevant to the analysis of Target Analyte List (TAL) inorganics and Target Compound List (TCL) organics including semi-volatiles, volatiles, PCB/Pesticides, and wet chemistry techniques for Biochemical Oxygen Demand (BOD) and Total Organic Carbon (TOC) were the focus of the evaluation. The laboratory audit was consistent with QA/QC and evaluation procedures presented in the following documents:

- *United States Environmental Protection Agency (U.S. EPA) Contract Laboratory Program (CLP), Statement of Work (SOW) for Organic Analysis OLM01.8*, Revision March 1990.
- *U.S. EPA CLP SOW for Inorganic Analysis ILM01.0*, Revision August 1991.
- *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, SW-846, 3rd Edition, U.S. EPA, September 1986.
- *Standard Methods for the Examination of Water and Wastes*, 16th Edition, U.S. EPA, 1985.

With minor exceptions, the analytical activities were conducted in accordance with the Work Plan. The issues described in this report do not significantly compromise the integrity or quality of the data.

OBG Laboratories, Inc. was found to have several minor deviations from its acceptable laboratory procedures. These deviations from acceptable protocols require future corrective actions, but were not deemed serious enough to halt analysis of samples or require resampling. Corrective actions to remedy these deviations will be enacted prior to the analysis of future samples from the Burgess Brothers Superfund Site.

A field audit was performed by O'Brien & Gere on May 25 & 26, 1993 to evaluate the implementation of the field activities outlined in the QAPP, identify potential deviations, and recommend corrective action procedures. Field practices with respect to ground water sample collection, decontamination of sampling equipment, and calibration of field equipment, as well as record-keeping procedures, sample documentation, and shipping procedures were observed. The sampling procedures described in the QAPP were followed during the field audit.

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SECTION 1 - INTRODUCTION

1.01 Introduction

This report discusses the results of a field and a laboratory audit performed by O'Brien & Gere as part of the Remedial Investigation (RI) of the Burgess Brothers Superfund Site, Woodford and Bennington, Vermont (Burgess Brothers Superfund Site). The audits were conducted in order to fulfill the requirements of the Quality Assurance Project Plan (QAPP) (*Quality Assurance Project Plan, Remedial Investigation - Burgess Brothers Superfund Site, Woodford and Bennington, Vermont*, O'Brien & Gere Engineers, Inc., July 1992) for the RI. The field audit was performed by Michael A. Caputo of O'Brien & Gere on May 25 & 26, 1993 during the ground water sampling program. The laboratory, OBG Laboratories, Inc. (OBG Labs) of Syracuse, New York, was audited by Michael Fifield and Jennifer F. Smith of O'Brien & Gere on June 17 & 18, 1993.

1.02 QA/QC Program

A Quality Assurance (QA) oversight function was established for this investigation to function in a team with the project management staff, as described in the project organizational chart. This structure was established to evaluate of the performance of the laboratory analyses. The QA oversight function also provided guidance for issues related to analytical methodologies which required interpretation of the QAPP.

The overall objective of the QA oversight program was to generate data of a quality sufficient to accomplish the objectives of the RI. When issues which had the potential to affect data quality had arisen, corrective actions were implemented in a timely fashion. The laboratory and field activities were conducted in accordance with the Work Plan, with minor exceptions. The issues described herein do not significantly compromise the integrity or quality of the data. The remainder of this report addresses mainly those issues which were irregular and does not discuss the majority of operations which were conducted in accordance with the Work Plan.

1.03 Laboratory Audit Objectives

OBG Labs was audited to assess the accuracy, precision, and defensibility of the analytical data for this project, as well as to evaluate whether the systems and procedures described in the QAPP were consistent with those used by the laboratory. The laboratory Quality Assurance Manual (QAM) (*Quality Assurance Manual - Analytical Services QA/QC Description of Policy and Programs*, OBG Laboratories, Inc., September 1992.) is used to define the laboratory's QA/QC program. The on-site laboratory audit evaluates whether the elements of the QAM are implemented and documented. OBG Labs' QAM and standard operating procedures (SOPs) were reviewed during the laboratory audit to evaluate whether a scientifically sound, comprehensive QA/QC program supported by a detailed record-keeping system was implemented. The following were evaluated:

- Analytical and QA/QC procedures relevant to the United States Environmental Protection Agency (U.S. EPA) Contract Laboratory Program (CLP) Target Analyte List (TAL) inorganics
- Target Compound List (TCL) semi-volatiles
- TCL volatiles
- TCL PCB/Pesticides, and
- Wet chemistry techniques for Biological Oxygen Demand (BOD) and Total Organic Carbon (TOC) methodologies.

The laboratory audit was conducted consistent with QA/QC and evaluation procedures presented in the following documents:

- *United States Environmental Protection Agency (U.S. EPA) Contract Laboratory Program (CLP), Statement of Work (SOW) for Organic Analysis ILM01.0*, Revision March 1990.
- *U.S. EPA CLP SOW for Inorganic Analysis OLM01.8*, Revision August 1991.
- *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, SW-846, 3rd Edition, U.S. EPA, September 1986.
- *Standard Methods for the Examination of Water and Wastes*, 16th Edition, U.S. EPA, 1985.

1.04 Field Audit Objectives

The purpose of the field audit was to evaluate whether the systems and procedures described in the QAPP were operational in the field and contributing to the production of accurate and defensible analytical results. A further objective was to identify potential deviations and recommend corrective actions.

SECTION 2 - AUDIT PROCEDURES

2.01 Laboratory Audit Procedures

OBG Labs' ability to provide data of a sufficient quality to meet the Data Quality Objectives (DQOs) specified in the RI Work Plan was evaluated during the on-site laboratory audit. Analyses for this audit are tabulated below:

Parameter	Analytical/Extraction	Reference
Volatile Organics	8240/5030	1
Semi-volatile Organics	8270/3550	1
PCBs/Pesticides	8080/3550/3010/3020	1
Trace Metals	6010/3050/3010/3020	1
Arsenic	7060/3050/3010/3020	1
Lead	6010/7421/3050/3010/3020	1
Selenium	7740/3050/3010/3020	1
Thallium	7841/3050/3010/3020	1
Mercury	7471/7470	1
Cyanide	9010	1
Hardness	6010/3010/3020	1
TOC	9060	1
BOD	405.1	2

Analytical Method References:
1. *Test Methods for Evaluating Solid Waste*: Physical/Chemical Methods, SW-846, 3rd Edition, U.S. EPA, September 1986.
2. *Standard Methods for the Examination of Water and Wastes*, 16th Edition, U.S. EPA, 1985.

The following elements were addressed for the SW-846 procedures and Standard Methods utilized for this investigation during the on-site laboratory audit:

- laboratory organization with respect to QA/QC responsibilities,
- laboratory participation in performance evaluation (PE) programs,
- sample management,

- instrument calibration,
- QA/QC procedures,
- data review procedures,
- analyst training,
- traceability of standards,
- corrective action procedures, and
- documentation, reporting, and record keeping.

Observations made during the laboratory review of these elements are discussed individually for each laboratory section in Section 3 of this report. Specific deviations from accepted procedures and conclusions drawn as a result of the laboratory audit are discussed in Section 5 of this report.

2.02 Field Audit Procedures

The on-site field evaluation addressed the following areas of concern:

- sampling procedures,
- decontamination of sampling and drilling equipment,
- chain-of-custody procedures,
- field SOPs, and
- field notebooks.

Observations made during the field review of the QA/QC and sampling procedures are discussed in Section 4 of this report. Specific deviations from accepted procedures and conclusions drawn as a result of the field audit are discussed in Section 5 of this report.

SECTION 3 - LABORATORY REVIEW

The OBG Labs facility, located in Syracuse, New York, has separate areas for sample receipt, inorganic sample preparation, organic sample preparation, inorganic sample analyses, semi-volatile sample analyses, and volatile sample analyses. The laboratory has sufficient bench-top and office area. The elements of the audit procedure described in Section 2 of this report are discussed in the following sections.

3.01 Laboratory Organization with Respect to QA/QC Responsibilities

The laboratory organization of key personnel and their responsibilities with respect to the laboratory QA/QC procedures for the Burgess Brothers RI are tabulated below. Overall the laboratory staff possess sufficient experience and knowledge to perform their assigned tasks. Staff members are knowledgeable with respect to laboratory SOPs and overall QA/QC protocols.

Personnel	Education	Experience	Responsibilities
Richard Allen	BS	1 yr	Organics Sample Preparation
Donald Brondou	AS	21 yrs	Wet Chemistry Supervisor
Coleen Burke	BA	4 yrs	QA Coordinator
George Crecenzi	AAS	5 yrs	Inorganics Sample Preparation
Russell Pellegrino	AAS	6 yrs	Semi-Volatiles Analyst
Monika Santucci	BS	6 yrs	Project Manager Inorganics Supervisor
Wendy Smith	HS	6 yrs	Sample Custodian
Karen Storne	BS	5 yrs	Volatiles Analyst
Cang Van Tran	BS, MS	5 yrs	Inorganics Analyst
Barbara Trimm	BS	10 yrs	GC/MS Supervisor

3.02 Laboratory Participation in Performance Evaluation (PE) Programs

OBG Labs participates in the following PE studies:

- New York State Department of Health (NYS DOH) for air emissions, potable water, wastewater and hazardous waste;
- New York State Department of Environmental Conservation - State Superfund;
- U.S. EPA water pollution and water supply studies for Pennsylvania, New Jersey, Massachusetts, Connecticut, Rhode Island, and North Carolina;
- Corps of Engineers - Project specific approval; and
- U.S. EPA - Project specific approval.

Proficiency test results are kept on file by the QA Coordinator. The actual proficiency test results were not reviewed during this laboratory audit.

Corrective action responses for test excursions are kept on file by the QA Coordinator. Corrective actions taken as the result of deficiencies in the proficiency tests were discussed with the QA Coordinator and were found to be acceptable.

3.03 Sample Management

OBG Labs' sample receipt area is well-maintained, free of solvents and chemicals, properly ventilated, and secured with locking doors. SOPs for sample management were available and were found to be complete and current. Sample containers are prepared in a separate area by adding the proper preservatives before shipment (with the exception of cyanide containers) to the sampling location. The laboratory purchases pre-cleaned and vendor-certified sample containers and does not clean or reuse sample containers.

Sample temperatures were measured using a distilled/deionized water vial provided in each cooler supplied by the laboratory. At the time of the audit, the temperature of the water vials were measured with a thermometer that was not calibrated. The uncalibrated thermometer was borrowed from the wet chemistry section, since the thermometers in sample receipt had been broken in May of 1993 and new ones had been ordered but not yet received. The date of calibration and the temperature correction factor should be documented on the thermometer so that the analyst may easily and accurately read the temperature.

The possible impact of the use of uncalibrated thermometers is that samples which did not meet temperature preservation criteria may have been received and been undetected since the calibrated thermometer was broken in May of 1993. It is doubtful, however, that the uncalibrated thermometer was sufficiently biased to allow samples to be received at temperatures outside the criteria without notice. Therefore, it was determined that the impact of this deviation on the samples was not significant enough to require immediate corrective actions or to halt analysis. To correct this deviation, the QA Coordinator will develop, document, and implement a thermometer calibration SOP. During the follow-up review to the laboratory audit, it was determined that calibrated thermometers have been received to replace the broken ones and are now in use in the sample receipt area.

After the temperature of the samples is determined, the samples were placed in a hood and the pH of non-volatile aqueous samples was measured (volatile samples are opened at the time of analysis and the pH is taken by the analyst at that time). Sample integrity was compromised by the sample custodian inserting the pH paper into the sample and thus possibly contaminating the sample. The pH of the sample should be taken by pouring a portion of the sample into a separate container and inserting the pH paper into that aliquot.

The possible impact of inserting the pH paper into the sample is the transport of contaminants from laboratory surfaces into the sample by the pH paper. If these contaminants were analytes of concern, the concentration of the analyte in the sample would be increased. It is not likely, however, that the amounts of contaminants will significantly affect the sample results. To correct this deviation, the laboratory should train individuals in sample custody on the proper pH techniques and the correct procedure should be incorporated into the SOP. This deviation was corrected after the laboratory audit date of 6/17/93. The personnel in sample custody currently pour a portion of the non-volatile aqueous samples into a disposable 15mL container in order to measure the pH of the sample. Data that may have been affected by this deviation include the following samples that were received by the laboratory prior to 6/17/93:

- TOC in 40 water and 52 soil/sediment samples collected 9/21/92 to 6/17/93;
- Metals in 31 surface soil samples collected 9/29/92 to 10/5/92;
- Metals in 30 soil boring samples collected 10/7/92 to 10/23/92, 12/16/92, 1/7/92 to 1/20/92, 1/27/93, 2/2/93, and 3/25/93;
- Metals in 10 Bend In The Road samples collected 10/1/92;
- Metals in 68 ground water samples collected 5/24/93 to 6/5/93;
- Metals in 26 surface water samples collected 9/21/93 to 9/23/93 and 4/13/93 to 4/15/93;
- Metals in 32 sediment samples collected 9/21/93 to 9/23/93 and 4/13/93 to 4/15/93;
- Metals in 3 leachate samples collected 1/28/93 to 6/4/93.

Cross contamination of samples due to contaminated pH paper was evaluated during the data validation through the review of equipment blank sample results, since these blanks were treated in the same manner as the samples. Qualification of sample results due to cross contamination from pH paper was not required.

After the pH was recorded, the samples were labeled and placed in a secured walk-in cooler. At the time of the audit, the inorganic, volatile, and semi-volatile samples were stored in the same cooler. This storage arrangement could potentially cause some cross-contamination of the volatiles samples by the non-volatile samples. It is doubtful, however, that this cross-contamination occurred since the samples are stored at 4°C and the possibility of contamination is accounted for through the use of trip blanks. However, a second cooler has been purchased and was in the process of being installed for volatile sample storage at the time of the audit. The volatiles cooler was installed by 12/31/93. Data that may have been affected by this deviation include the following samples that were received by the laboratory prior to 12/31/93:

- Volatiles in 31 Bend In The Road samples collected 11/16/93 to 12/2/93;
- Volatiles in 14 surface water samples collected 11/16/93 to 12/2/93;
- Volatiles in 3 sediment samples collected 11/16/93 to 12/2/93;
- Volatiles in 31 surface soil samples collected 9/29/92 to 10/5/92;
- Volatile analysis in 58 soil boring samples collected 10/7/92 to 10/23/92, 12/16/92, 1/7/92 to 1/20/92, 1/27/93, 2/2/93, and 3/25/93;
- Volatiles in 68 ground water samples collected 5/24/93 to 6/5/93, 6/22/93 to 7/1/93;
- Volatiles in 32 surface water samples collected 9/21/92 to 9/23/92, 4/13/92 to 4/15/92;
- Volatiles in 30 sediment samples collected 9/21/92 to 9/23/92, 4/13/92 to 4/15/92;
- Volatiles in 3 leachate samples collected 1/28/93 to 6/4/93;
- Volatiles in 6 air samples collected 10/14/92.

Cross contamination of samples due to sample storage was evaluated during the data validation through the review of trip blank sample results, since these blanks accompanied the samples from collection to analysis. Qualification of sample results due to cross contamination from sample storage was not required.

The temperature of the sample cooler was documented in a logbook and was found to be stable within the acceptable range of 3° C to 5° C. The thermometers in the coolers were calibrated against an NIST thermometer and the correction factors were entered into the logbooks.

Sample anomalies such as temperature excursions, broken bottles, incorrect pHs, or improper sample containers were documented on a case file form and the chain-of-custody. The case file forms are forwarded to the Project Manager and a copy is maintained in the project file. No sample anomaly forms were used for the Burgess Brothers project.

Laboratory sample numbers are generated by using the Laboratory Information Management System (LIMS). The LIMS generates sample bottle labels and sample schedule forms which are used to track samples within the laboratory. Internal chain of custody forms are used to document sample custody within the laboratory until the analyses are completed and the samples are disposed. The internal chain-of-custody forms were found to be detailed, legible, and adequate for maintaining sample integrity.

3.03 Instrument Calibration

Detailed instrument calibration procedures are described in the laboratory's SOPs for each analytical section. The specifics of each section's calibration procedures are as follows:

3.03.01 Inorganics Section

Calibration standards are vendor-certified and have been checked against NIST Standard Reference Materials. These standards are generally purchased in a form ready for use from a chemical supply house. Each standard bottle is labeled with the lot number and expiration date.

The inorganics preparation group uses an analytical balance that is calibration checked on a weekly basis using S class weights. The service records indicated that the balance is serviced on a six month schedule. Calibration logbooks are maintained for the balance. Inorganic preparation personnel indicated that the balance was being re-tared before each S class weight was used to check the calibration of the balance. This is an improper technique and should be discontinued. According to the laboratory SOP, the balance should be tared once at the beginning of the calibration check procedure.

The impact of this incorrect calibration check technique is the possibility of incorrect sample weights being used for analysis and thus the possibility of inaccurate sample results. However, since the final tared calibration check weight did not differ significantly from the desired sample weights, the effect of this deviation is most likely minimal. To correct this deficiency, the balance calibration procedure should be revised so that if the balance does not provide readings within the control limits during calibration checks, then the balance should be removed from use and serviced. During the laboratory follow-up review, it was observed that the proper calibration check technique is now being used.

Auto-pipetting devices were being used in the inorganics preparation group at the time of the audit. These devices were assumed by the laboratory to be accurate when received from the manufacturer. Since it cannot be assumed that the devices are accurate without some initial verification, an SOP should be developed which requires calibration of the auto-pipetting devices at a periodic interval. The minimum interval should be when they first enter into use in the laboratory and every week.

The possible result of not calibrating the auto-pipetting devices is the addition of incorrect volumes of solutions. The variation in measurement, however, is most likely minimal and would not significantly affect sample results. To correct this deviation, an SOP should be developed, documented, and implemented to address the calibration of the auto-pipetting devices.

3.03.02 Volatiles Section

Calibration standards are stored in the freezer section of a cooler in the analysis area. Cooler temperature is recorded twice per day in a temperature logbook using an NIST calibrated thermometer. A standards logbook documents the preparation date, manufacturer and lot number, and expiration date for each standard. Three sets of standards are prepared; one set is used at the time of preparation and the additional sets are used as needed until the expiration date is exceeded. Calibration standards and QA/QC check samples are labelled with the lot number and expiration date. Calibration logbooks are maintained with the initial and continuing calibration chromatographs for each of the GC/MS instruments. The instruments are calibrated following the specific method calibration procedures.

3.03.03 Semi-Volatiles Section

Calibration standards are stored in a separate cooler in the analysis area. The temperature of the cooler is recorded twice per day in a temperature logbook using an NIST calibrated thermometer. A standards logbook documents the preparation date, standard identification number, and preparation method. A number of write-overs and illegible entries were noted. The OBG Labs QAM states that errors should be crossed out with a single line, corrected, dated, initialed, and the original entry should be legible through the single line cross-out.

This documentation deviation could impact the sample results by not allowing traceability of standards. Traceability of standards provides documentation sufficient for an independent reviewer to recreate the analytical sequence and to recalculate sample results. However, since this deviation did not affect any of the standards used during the analysis of samples associated with the Burgess Brothers RI, there was no effect on the sample results. Nonetheless, an SOP should be developed, documented, and implemented by the QA Coordinator to address this documentation deficiency. During the laboratory follow-up review, it was determined that the appropriate procedure is now being used to correct errors.

Neat solutions are pure chemical solutions which are purchased from the manufacturer. These solutions are currently recorded in the standard logbooks with simply the word "neat". Neat solutions should be documented with the manufacturer name and lot number in order to provide traceability to the source of the standard. Secondary and working standards are traceable to neat solutions via the standard identification number. During the laboratory follow-up review, it was observed that neat solutions are now documented with the manufacturer name and solution lot number.

The instruments are calibrated following the specific method calibration procedures.

3.03.04 Wet Chemistry Section

The following methods were evaluated for the wet chemistry section: biochemical oxygen demand (BOD), cyanide, hardness, and total organic carbon (TOC). Single point calibrations were performed for TOC analyses. Cyanide analyses were calibrated with a five point calibration. Calcium and manganese were measured by ICP and total hardness was calculated from these measurements.

One issue noted in this section involved the calculation of BOD detection limits. For BOD analyses, a minimum depletion between the initial and final dissolved oxygen (DO) of 2 mg/L is required by the method to perform the result calculation. This requirement limits the sensitivity of the analysis to a minimum of 2 mg/L. With a maximum sample volume between 150 and 250 mL and a total analysis volume with seed and dilution water of 300 mL, the MDL would be between 3 and 5 mg/L. The BOD water blank and the water blank with seed repeatedly exceeded maximum DO criteria of 0.2mg/L and 1.0mg/L, respectively. The impact of this deviation is that the laboratory routinely reports detection limits that are not achievable with the current methodology. By using a larger sample volume and smaller volume of dilution water, low-level detections might be measured and reported as less than the detection limit under the current method. This inconsistency should be investigated by the laboratory and the appropriate corrective actions should be implemented. Corrective actions for these deviations should also be incorporated into the SOP for this method. It was observed during the laboratory follow-up review, that corrective actions have been taken for this deviation; the detection limits for BOD analysis have been raised.

Thermometers and balances used in the wet chemistry section were calibrated daily, with an NIST traceable thermometer and S class weights, respectively. The calibrations were documented in a calibration logbook. It was noted that the balances in the wet chemistry section were not level. The procedure for checking and levelling the balances should be added to the daily calibration procedure. There should also be corrective action plans in place to address balance excursions.

This balance leveling deviation could affect sample results by allowing the determination of incorrect sample weights, however, the variation in weight is most likely minimal and would not significantly affect the sample results. To correct this deviation, the balance calibration SOP should be modified to include balance leveling procedures. During the laboratory follow-up review, it was determined that the balances in the laboratory are being levelled prior to calibration.

3.04 QA/QC Procedures

Method-specific QA/QC procedures are discussed in each method SOP and overall QA/QC procedures are described in the laboratory QAM. The laboratory QA Coordinator periodically completes internal audits of each section and implements corrective actions to correct deficiencies that are noted. The specifics of each section's QA/QC procedures are as follows.

QA/QC procedures begin with training of employees at time of hire. Employee training includes SOP and QAM review and a training period with an individual with experience and knowledge of the methods. Only the inorganic section has documented training records. These training records include written tests taken by each inorganic section employee and signed documentation stating that incorrect test responses were discussed to the satisfaction of the section leader. The volatiles, semi-volatiles, and wet chemistry sections should develop similar training programs for new employees and document this program in a similar fashion.

QA/QC procedures continue with the incorporation of method-specific laboratory QC samples. These method-specific QC samples include laboratory control samples, matrix spike samples, matrix spike duplicates, preparation blanks, and ICP interference check samples. The inorganic, volatiles, semi-volatiles, and wet chemistry sections were following method-specific

QA/QC procedures as specified in the QAPP.

3.05 Data Review Procedures

Analytical results are reviewed by the analyst before being entered on the LIMS to generate a laboratory report. The laboratory reports are then reviewed by the section supervisor and the QA Coordinator. Changes made to the analytical results are documented on the LIMS with a flag next to the results to indicate that the result has been amended. Changes to the analytical results are also documented in the project file. The completed project is reviewed by the QA Coordinator and the Laboratory Project Manager before a final report is generated by the LIMS. The Laboratory Project Manager reviews the entire project file and the final report using a checklist to identify excursions from the project objectives.

3.06 Corrective Action Procedures

Corrective action procedures are described in the method SOPs and the laboratory QAM. Excursions from acceptable laboratory procedures are documented by the appropriate section supervisor and forwarded to the QA Coordinator and Laboratory Project Manager for review. These individuals determine the proper corrective action and consult with the client, if necessary. Corrective action documentation is kept in the possession of the QA Coordinator and/or Section Supervisor. A summary of corrective action procedures for each specific project are included in the case narrative of the laboratory report.

3.07 Documentation, Reporting, and Record Keeping

The LIMS used by OBG Labs is an in-house produced software system that controls sample management and produces QA/QC control charts. The system can be used to access QA/QC sample information for a sample result for quick reference.

OBG Labs uses pre-printed forms to document sample preservation excursions, internal chain-of-custody, corrective actions, and sample run logs. Reagent and standards preparation logbooks were noted to be detailed and well maintained. However some sections of the standards logbooks contained write-overs and illegible entries as noted above in section 3.03, Instrument Calibration. Supervisor and QA Coordinator review of cooler and oven temperature, standard preparation, sample preparation, balance calibration, and instrument maintenance logbooks were documented with the appropriate initials and dates of review.

3.08 Laboratory Audit Follow-Up Review

Immediately following the conclusion of the laboratory audit, the deviations presented in the preceding section were discussed with the laboratory project manager. A laboratory follow-up review was conducted to evaluate if the issues raised during the audit were addressed. The laboratory's responses to the audit issues are included in the preceding section.

SECTION 4 - FIELD REVIEW

In accordance with Section 10 of the QAPP, a field QA audit was conducted on May 25 & 26, 1993 by Michael A. Caputo of O'Brien & Gere. During this field audit, ground water sampling was being conducted. Mr. Caputo observed collection of ground water samples, decontamination of sampling equipment, and calibration of field equipment. Additionally, he reviewed record-keeping procedures, sample documentation, and shipping procedures.

The elements of the field audit procedure described in Section 2 of this report are described in the following sections.

4.01 Sampling Procedures

It was observed that the sampling procedures described in the QAPP were followed during the audit. A summary of the observed sampling procedures is as follows. Stainless steel bailers were used to purge the wells. The purged volume was recorded in the field logbooks. Temperature, pH, specific conductivity, and turbidity were recorded and the well purged until these measurements were stable to within ±10% (±0.2 pH units for pH) or until 10 volumes had been purged. Turbidity was not measured with the turbidity meter unless the ground water was observed to be close to a turbidity measurement of 100 NTUs, since the meter could measure a maximum of 100 NTUs.

The QAPP states that an oil/water interface probe would be used to detect floating products. Instead, the samplers performed a visual examination of the first bailer full of water collected from the water surface to evaluate the presence of floating products. This procedure was in place because the possible presence of volatiles within the inner-mechanisms of the interface probe could potentially contaminate the ground water samples. Since no indication of floating products was apparent, bailers were used to check for the floating products rather than potentially compromising ground water samples. The purged ground water was contained in Department of Transportation (DOT) approved drums.

Ground water samples were collected as specified in the QAPP. The physical appearance of ground water samples was recorded in the field logbooks. After the last sample was collected, the temperature, pH, specific conductivity, and dissolved oxygen (DO) were measured and recorded. The samples were preserved as specified in the QAPP and checked in the field.

QA/QC samples were collected as specified in the QAPP. Field duplicates were collected on a daily basis. Samples were split with the U.S. EPA Region I at a rate of 10% of the total number of environmental samples collected. Matrix Spike/Matrix Spike Duplicates (MS/MSDs) were collected at a rate of 5%, and Equipment Blanks were collected at a 10% frequency.

4.02 Decontamination of Sampling and Drilling Equipment

Field sampling equipment decontamination was performed as specified in the QAPP, with one exception. Store-bought deionized (DI) water was used for the first two equipment rinses and laboratory DI water for the final rinse. Inconsistent quality of the store-bought DI water could result in blank and/or sample contamination through the rinse water. This action is not a deviation from the QAPP but is noted for possible future reference should problems with the equipment blanks be encountered. Upon examination of the analytical data, no problems were discovered that could be attributed to the use of store-bought DI water.

4.03 Chain-of-Custody Procedures

Chain-of-custody procedures were followed as specified in the QAPP except for the following instance. The QAPP states that sample jars should be sealed with evidence tape; instead the coolers containing sample jars were sealed with evidence tape. It was determined, after consultation with the QA officer, that sealing the coolers with evidence tape rather than each individual sample jar would have no impact on the sample results.

4.04 Field SOPs

Field SOPs were followed as stated in section 7 of the QAPP. The QAPP states that each instrument should be calibrated at a minimum daily or once per every ten wells. The pH meter was calibrated prior to use at each well. The specific conductivity meter was calibrated twice daily. The HNU® photoionization detector was calibrated daily.

The following preservation procedures were performed as part of the field sampling program. These specific preservation procedures were not included in the QAPP, although the preservation requirements were. The preservation procedures are included below to clarify the procedures used in the field.

Preservation Verification Procedure for TAL Cyanide

1. The samples were checked for oxidizers with potassium iodide starch paper, then were checked for sulfides with lead acetate paper. A clean disposable pipette was used to transfer sample from the container to the indicator papers. If either oxidizers or sulfides were present, this was documented on the chain-of-custody.
2. If oxidizers were present, a few crystals of ascorbic acid were added to the sample container. The sample was then retested for the presence of oxidizers. This procedure was repeated until a negative response was achieved with the test paper.
3. Sodium hydroxide was added until the pH of the sample was greater than 12. After filling the sample container, a clean disposable pipette was used to transfer several drops of the sample to the wide-range litmus paper. The color scale on the litmus

paper container was used to determine the pH. This procedure was repeated until the pH was greater than 12.

Preservation Verification Procedure for TCL Volatile Organics

1. Sample containers were received from the laboratory with HCl added. An extra vial for each location was shipped from the laboratory to the field to be used as a surrogate sample for pH determination.

2. Each surrogate sample vial was filled 90% full with the appropriate sample. The vial was capped and shaken several times, the cap removed and several drops of the sample transferred to the wide-range litmus paper using a disposable pipette. If the pH was not less than 2, more HCl was added dropwise and the sample retested. When the pH was less than 2, the same volume of HCl was added to the sample vials and then samples were collected.

Preservation Verification for TAL Metals, TAL Mercury, and Hardness

1. Sample containers were received from the laboratory with HNO_3 added.

2. After filling the sample containers, the containers were capped and shaken gently several times. The caps were then removed and several drops of sample were transferred to the wide-range litmus paper using a disposable pipette. The scale on the litmus paper container was used to determine the pH.

3. If the pH was not less than 2, HNO_3 was added dropwise and the sample was retested.

4.05 Field Notebooks

It was observed that field activities were documented as specified in the QAPP. The following log sheets were kept depending on the activity:

- ground water sampling logs;
- soil boring logs;
- well development logs;
- test pit logs;
- photographic logs;
- field logbooks;
- calibration logs;

The following information was contained in these logs:

- calibration and maintenance records for field instruments;
- site identification and location;
- for each sampling pump employed:

  a. serial number of pump,

  b. sampling media,

  c. flow rate,

  d. ID number (filter cassette) or tube lot (sorbent tubes),

  e. time on, and

  f. site location,
- exact time of sample recovery;
- modifications or deviations from the sampling design;
- size, quantity and type of fill materials excavated from test pits;
- presence of obstructions to excavation;

- presence of separate phase solid or liquid landfill materials;
- presence or absence of ground water or surface waters entering test pits;
- record of blow counts for soil samples;
- classification of each soil sample including:

  a. soil type,

  b. color,

  c. percent recovery,

  d. moisture content,

  e. density,

  f. presence of staining, discoloration, solid or liquid phase materials,

  g. odor and other miscellaneous observations such as organic content and cohesiveness;
- depth of water table and depth of the well;
- volume of water in the well;
- physical appearance of the first volume of water removed from the well;
- quantity of water removed from the well;
- temperature, pH, conductivity, and turbidity of the well sample;
- physical appearance of the well sample during sampling;
- date and time of the last sample taken from a well; and
- final pH, conductivity, DO, and temperature of the ground water.

The information contained in these logs was summarized in the RI logbook.

SECTION 5 - AUDIT SUMMARY

The audits indicated that the field and laboratory activities were conducted in accordance with the Work Plan, with minor exceptions. The issues discussed in this report do not significantly compromise the integrity or quality of the data.

5.01 Laboratory Audit Summary

Several minor deviations from acceptable laboratory procedures were observed during the laboratory audit. This summary focuses on those issues which were irregular and does not discuss the majority of operations which were conducted successfully and in accordance with the Work Plan. What follows is a summary of the excursions noted during the laboratory audit and suggested corrective actions. Implementation of the suggested corrective actions will address further concerns related to these issues. The deviations are as follows:

An uncalibrated thermometer was in use in sample custody. However, it is not likely that the uncalibrated thermometer was sufficiently biased to allow samples to be received at temperatures well outside of criteria. OBG Labs should use calibrated, NIST-traceable thermometers throughout the laboratory and in sample custody.

Volatile and non-volatile samples were stored in the same cooler. The impact of this deviation is the possible cross-contamination of volatile samples by the non-volatile samples. However, since the samples remained at 4°C, it is unlikely that any contamination of the volatile samples occurred. A new cooler for volatiles was purchased and was installed by 12/31/93.

Balances in the wet chemistry section were not level. This deviation could affect sample results by allowing the determination of incorrect sample weights; however, the variation in weight is most likely minimal and would not significantly affect the sample results. OBG Labs should update the balance calibration SOP to include levelling procedures.

Auto-pipetting devices which were not calibrated were in use in the inorganics preparation group. The possible impact of this deviation is the addition of incorrect volumes of solutions. However, the variation in measurement is most likely minimal and would not significantly affect sample results. An SOP should be developed to calibrate the auto-pipetting devices in order to determine the accuracy of the delivery volume. The auto-pipetting devices should be calibrated periodically, at a minimum of when they first enter into use in the laboratory and on a weekly basis.

Sample custody personnel should measure the non-volatile aqueous sample pHs without compromising the integrity of the sample. The pH paper should not be inserted into the sample itself, but only a separate aliquot of the sample. The possible impact of this deviation is the introduction of analytes that would affect the sample analyte concentrations. However, it is not likely that a significant quantity of contamination would be introduced into the sample through this route. Individuals in sample custody should be trained in the proper pH testing technique and the correct procedure should be incorporated into the SOP. This deviation was corrected after the laboratory audit of 6/17/93.

Inorganic preparation personnel were re-taring the balance before each S class weight was used to check the calibration of the balance. The impact of this incorrect calibration technique is the possibility of incorrect sample weights being used for analysis and thus the possibility of inaccurate sample results. However, since the final tared calibration weight would probably not differ significantly from the desired sample weights, the effect of this deviation is most likely minimal. Technicians in the inorganics preparation section should be trained on proper balance calibration techniques.

The wet chemistry section was incorrectly calculating BOD reporting limits. The impact of this deviation is that the laboratory routinely reports detection limits that are not achievable with the current methodology. By using a larger sample volume and smaller volume of dilution water, low-level detections might be measured that are reported as less than the detection limit under the current method. The cause of these deviations should be investigated by the laboratory and the appropriate corrective actions should be implemented. The wet chemistry section's SOP for BOD analysis should be updated to include corrective actions for this deviation.

The laboratory should develop a specific training program for new employees and document the employees who participate in this program (with the exception of the inorganics section which currently documents its training program).

A number of write-overs and illegible entries were noted in the standard logbook in the semi-volatiles section. The deviation could impact the sample results by not allowing traceability of standards. However, since this deviation did not affect any of the standards used for the analysis of samples associated with this project, there was no effect on the sample results. Nonetheless, the QA Coordinator should develop, document, and implement an SOP to address this documentation deficiency.

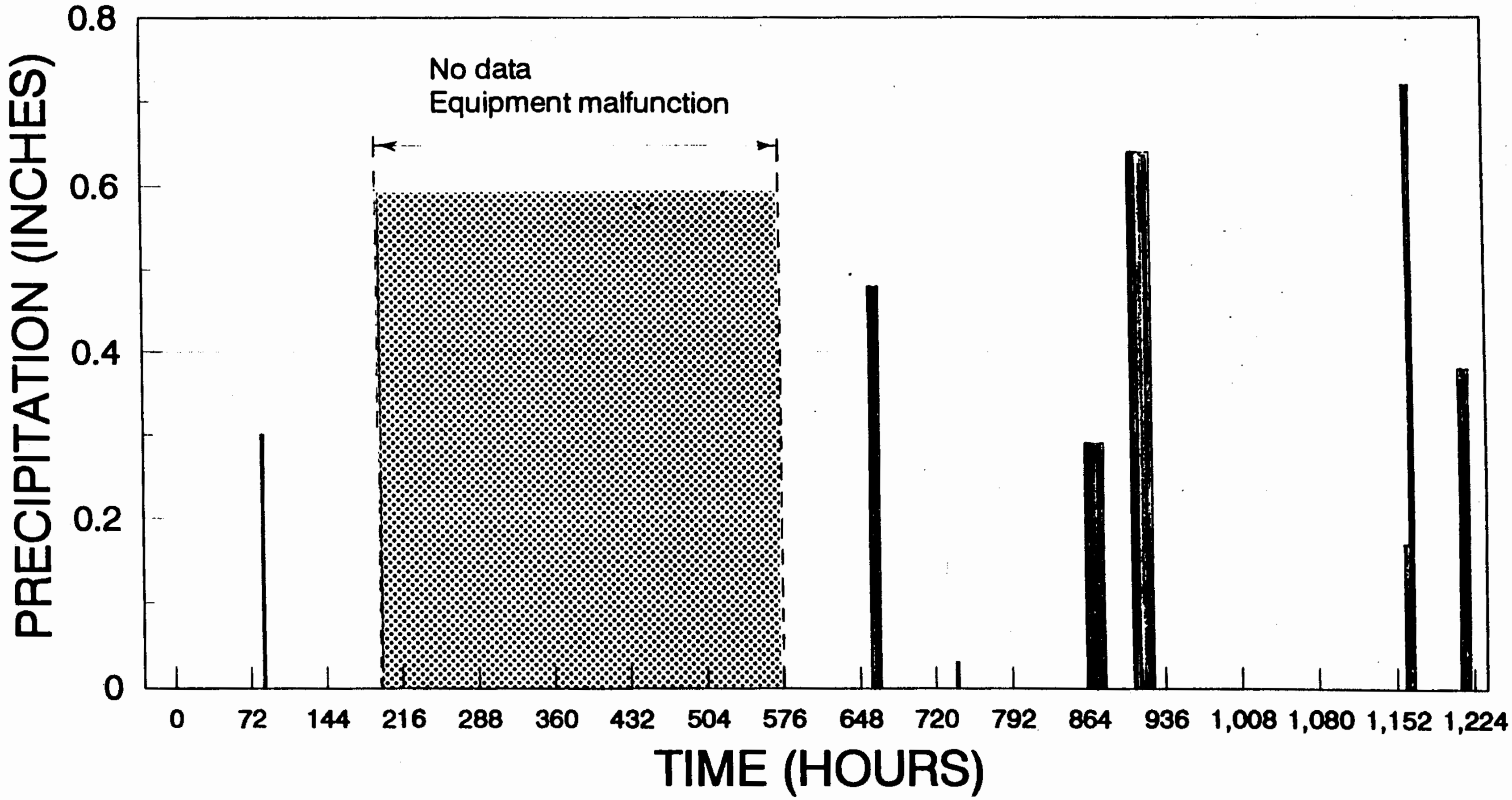
These deviations from acceptable protocols require future corrective actions, but were not deemed serious enough to halt analysis of samples or require resampling. Corrective actions to remedy these deviations will be enacted prior to the analysis of future sample from the Burgess Brothers Superfund Site.

5.02 Field Audit Summary

There were no deviations from acceptable field protocols observed during the field audit.

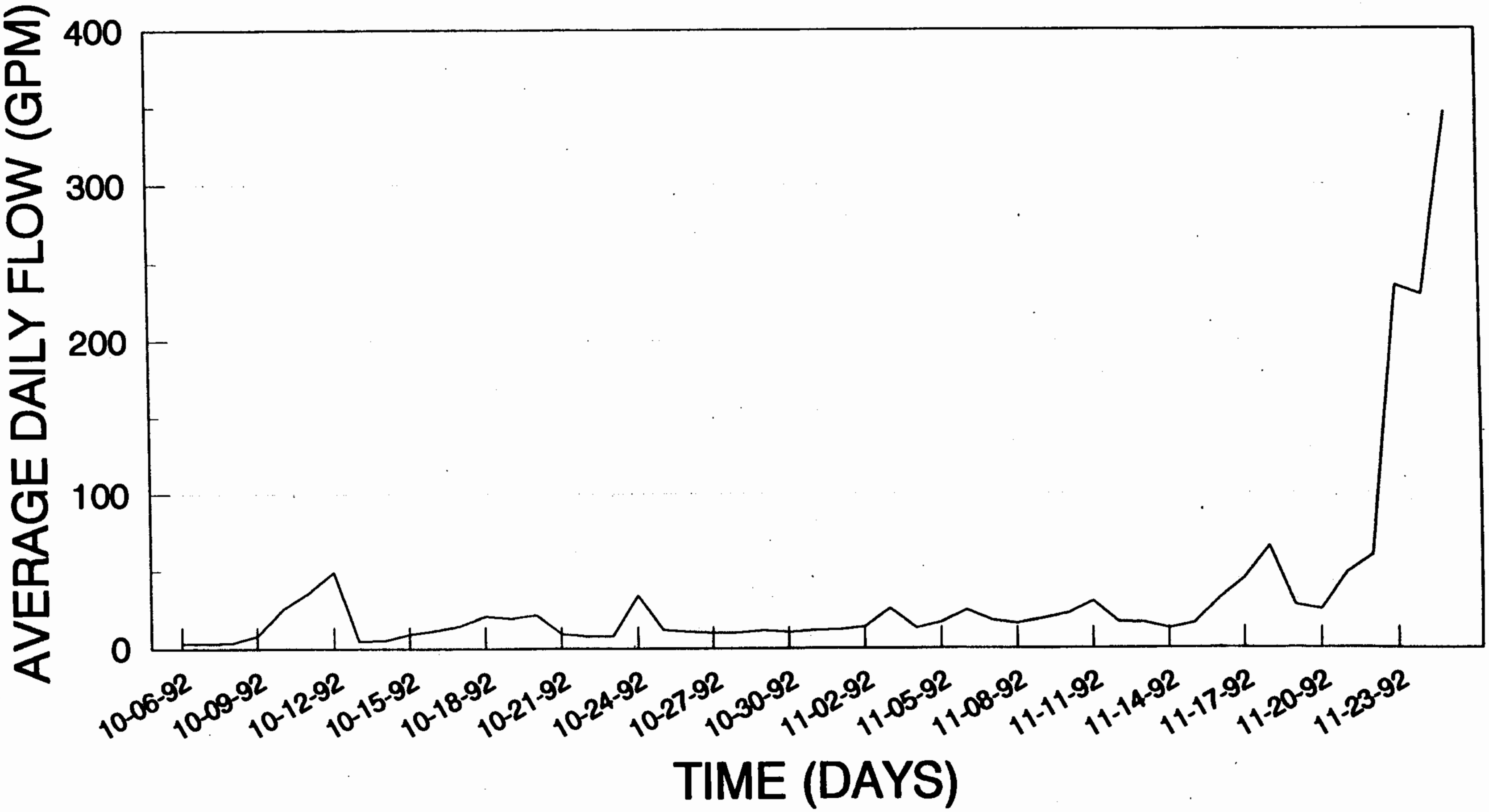
Appendix 3

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
PRECIPITATION



Low flow monitoring period October 6 through
November 25, 1992

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
STATION S-01



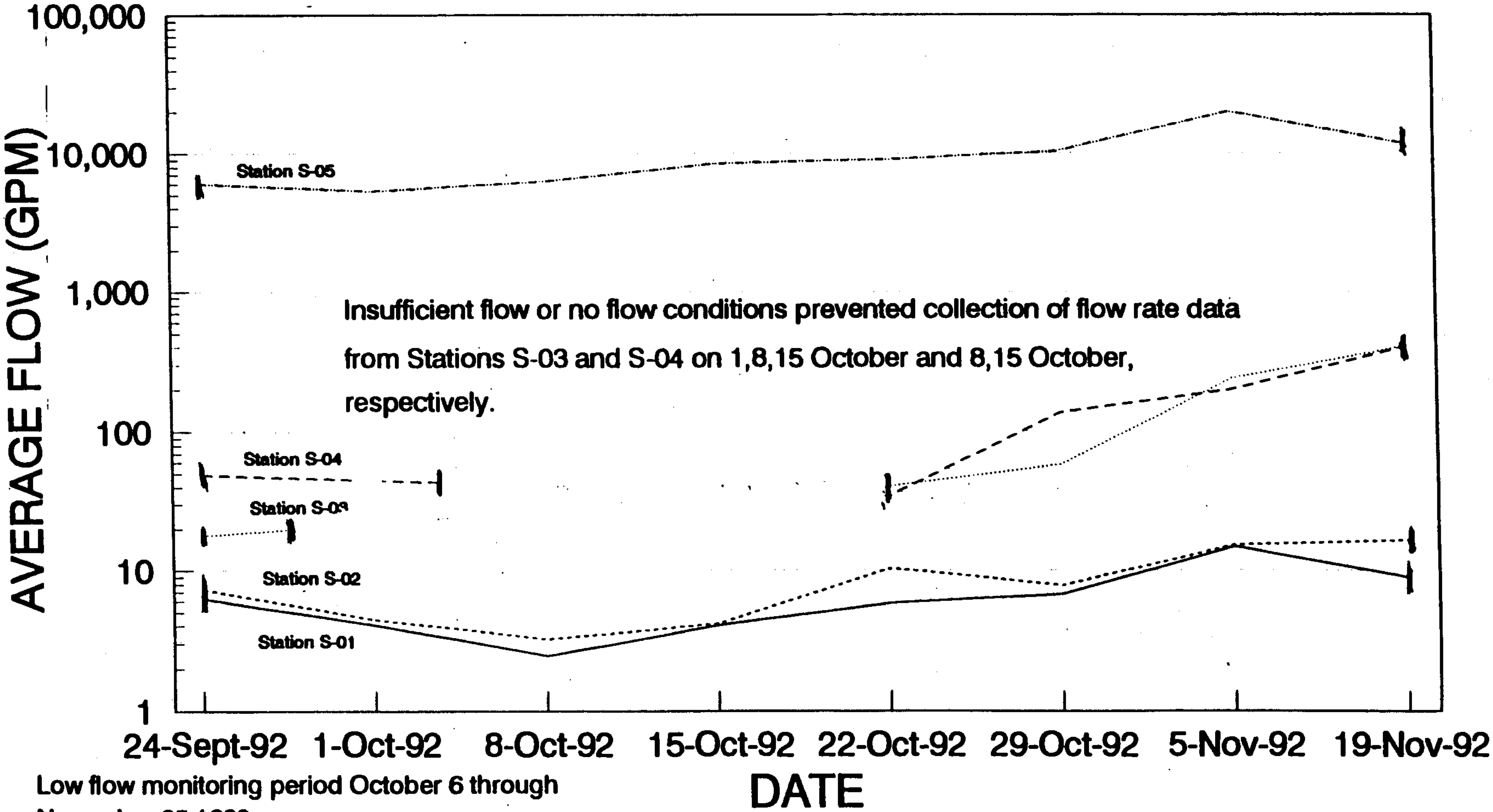
Low flow monitoring period October 6 through
November 25, 1992

Appendix 14
Precipitation Data

BURGESS BROTHERS SUPERFUND SITE

WOODFORD AND BENNINGTON, VERMONT

STREAMFLOW MONITORING

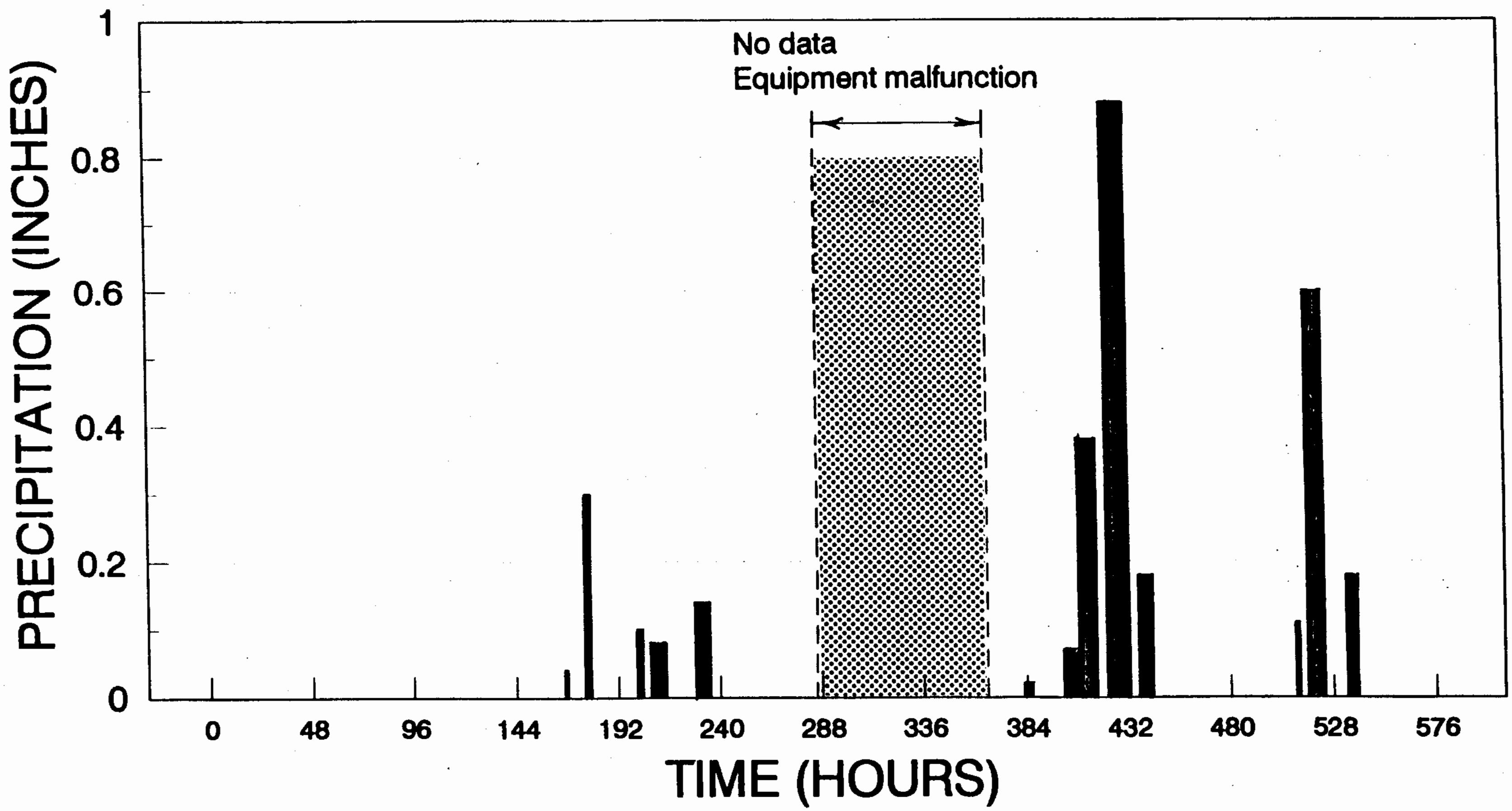


Low flow monitoring period October 6 through November 25,1992

BURGESS BROTHERS SUPERFUND SITE

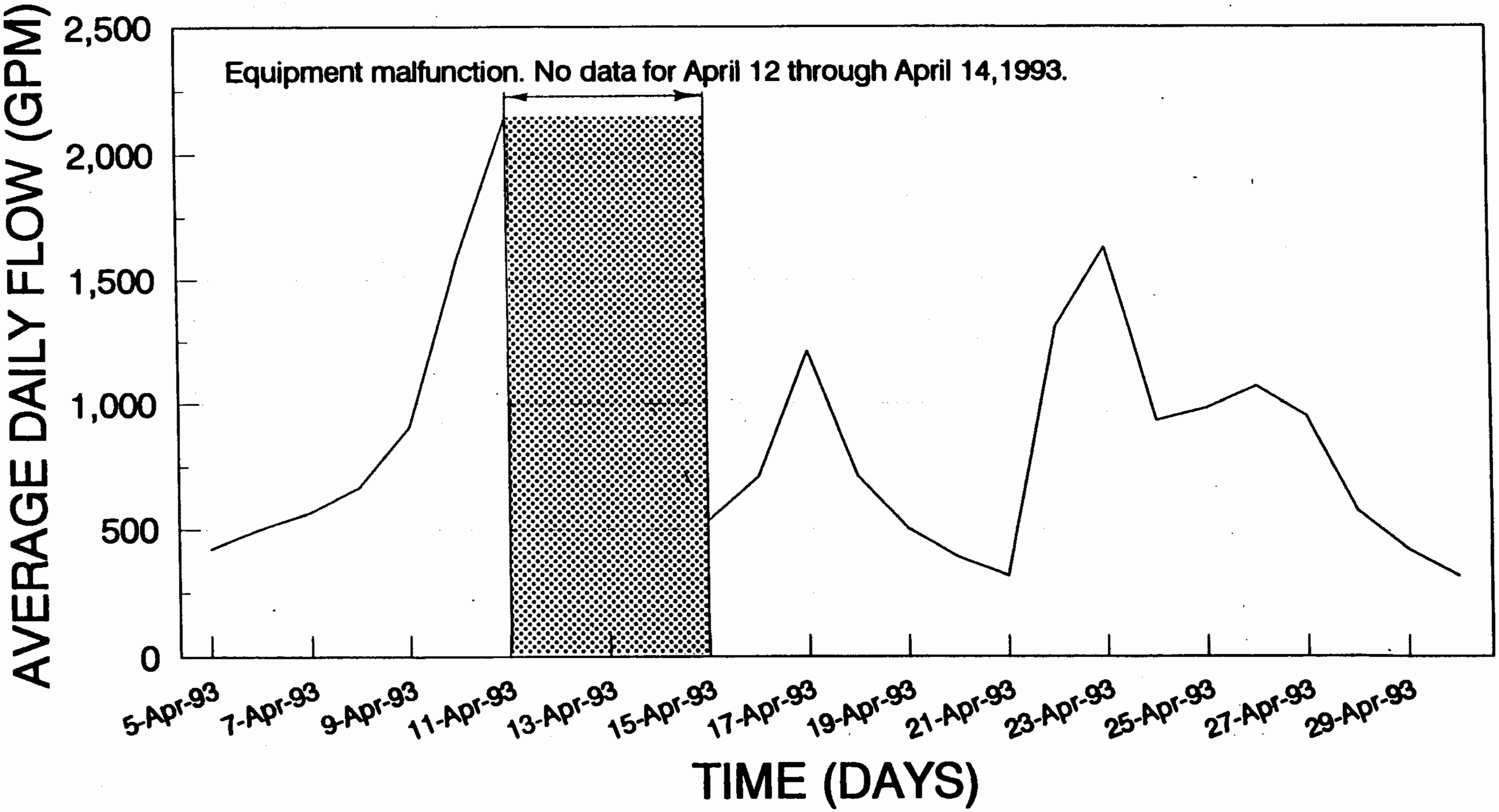
WOODFORD AND BENNINGTON, VERMONT

PRECIPITATION



High flow monitoring period April 5 through
April 30, 1993

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
STATION S-01

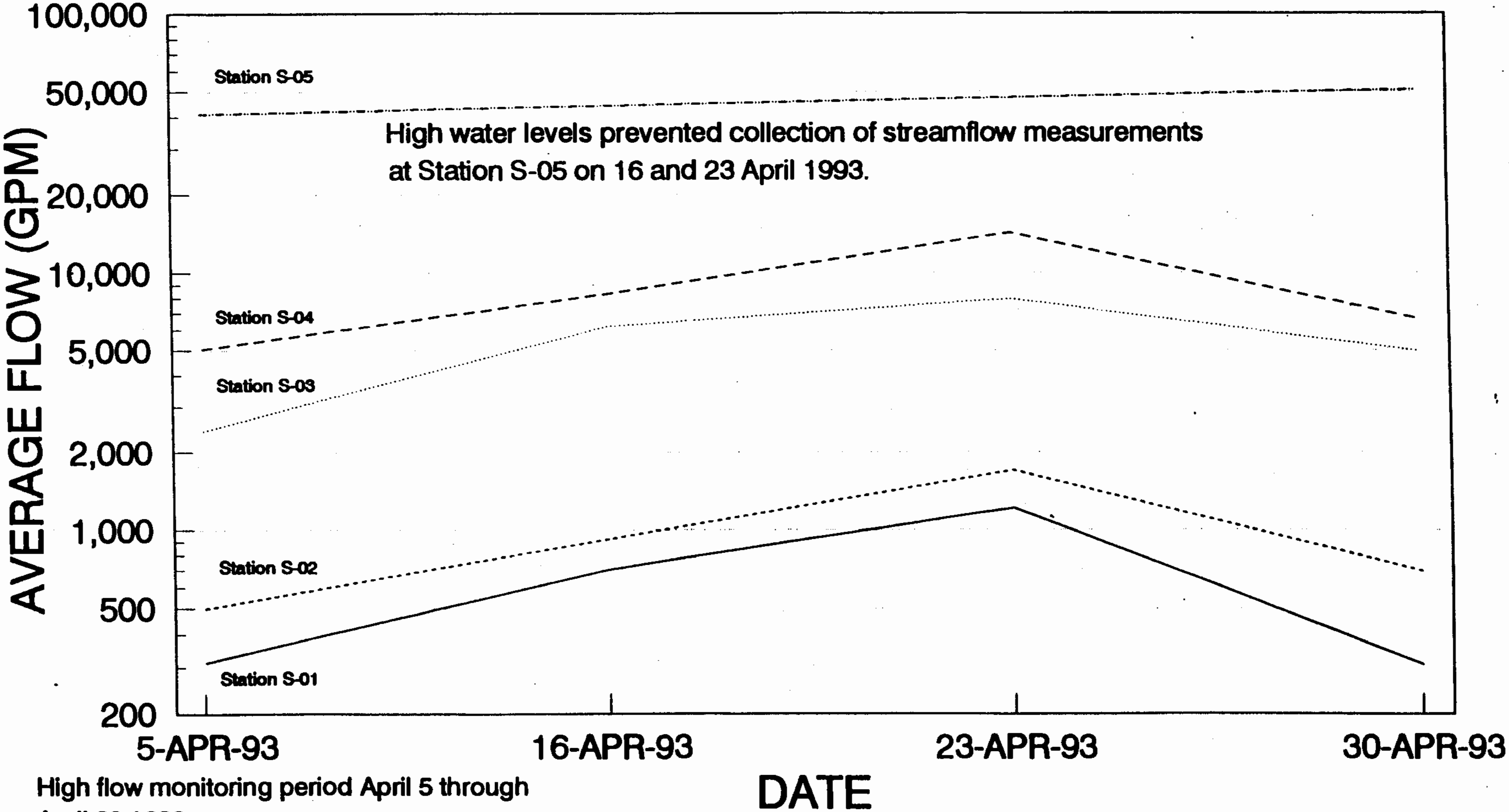


High flow monitoring period April5 through
April 30,1993

BURGESS BROTHERS SUPERFUND SITE

WOODFORD AND BENNINGTON, VERMONT

STREAMFLOW MONITORING



High flow monitoring period April 5 through April 30,1992

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NCC FORM 5443

ANNUAL CLIMATOLOGICAL SUMMARY

ENVIRONMENTAL DATA SERVICE
NATIONAL CLIMATIC CENTER
NOAA FORM 27-328 (11-74)

STATION NUMBER: 43 6500 02 POWNAL 1 NE VERMONT ELEVATION 1140 FT. ABOVE SEA-LEVEL. LAT.: 42° 47' N: LONG.: 73° 13'

DATE		TEMPERATURES (°F.)													PRECIPITATION (INCHES)									
											NUMBER OF DAYS								SNOW, SLEET			NO. OF DAYS		
YR.	MO.	MEAN MAXIMUM	MEAN MINIMUM	MEAN	DEPART. FROM NORMAL	DEGREE DAYS	HIGHEST	DATE	LOWEST	DATE	MAX. ≥ 90°	MAX. ≤ 32°	MIN. ≤ 32°	MIN. ≤ 0°	TOTAL	DEPART. FROM NORMAL	GREATEST OBSERVED DAY	DATE	TOTAL FALL	GREATEST DEPTH	DATE	≥ .10	≥ .50	≥ 1.0
80	01														.85		.68	12	2.5	3	26+	2	1	0
80	02														1.22		.75	17	7.0	7	18+	3	1	0
80	03														6.15		2.72	22	12.0	9	15	10	2	1
80	04														2.69		1.25	10	T	T	17	8	1	1
80	05														1.47		.42	14	.0	0		5	0	0
80	06														4.91		1.94	30	.0	0		8	2	2
80	07														4.26		1.20	17	.0	0		8	4	1
80	08														2.01		.57	12	.0	0		5	1	0
80	09														3.14		1.31	3	.0	0		4	2	1
80	10														2.95		.96	26	.0	0		7	2	0
80	11														2.90		.85	25	10.0	10	19	6	3	0
80	12														1.44		.36	16	12.2	8	27+	4	0	0
80	ANN.														33.99		2.72	3	43.7	10	11	70	19	6
		ANNUAL MEANS				SUM	ANNUAL EXTREMES				ANNUAL SUMS						EXTREME		SUM	EXTREME		SUMS		
		SUM	SUM	SUM	NORMAL	DEP.	DIFF.	ERROR							NORMAL	DEP.	DIFF.	ERROR						

"M": MISSING DAYS
"+" AFTER DATE ALSO OTHER DAYS
"T": TRACE

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NCC FORM 5443

ANNUAL CLIMATOLOGICAL SUMMARY

ENVIRONMENTAL DATA SERVICE
NATIONAL CLIMATIC CENTER
NOAA FORM 77-330 (11-74)

STATION NUMBER: 43 6500 02 POWNAL 1 NE VERMONT ELEVATION: 1140 FT. ABOVE SEA-LEVEL. LAT.: 42° 47' N: LONG.: 73° 13'

DATE		TEMPERATURES (°F.)										NUMBER OF DAYS				PRECIPITATION (INCHES)				SNOW, SLEET			NO. OF DAYS		
YR.	MO.	MEAN MAXIMUM	MEAN MINIMUM	MEAN	DEPART. FROM NORMAL	DEGREE DAYS	HIGHEST	DATE	LOWEST	DATE	MAX. ≥ 90°	MAX. ≤ 32°	MIN. ≤ 32°	MIN. ≤ 0°	TOTAL	DEPART. FROM NORMAL	GREATEST OBSERVED DAY	DATE	TOTAL FALL	GREATEST DEPTH	DATE	≥ .10	≥ .50	≥ 1.00
81	01														.76		.51	7	14.5	14	8+	2	1	0
81	02														6.94		1.25	12	16.0	9	26	10	7	2
81	03														.81		.27	31	3.0	6	1	3	0	0
81	04														3.13		.71	24	.0	0		8	2	0
81	05														2.89		1.05	12	.0	0		4	2	1
81	06														3.42		.73	26	.0	0		10	1	0
81	07														4.54		1.27	21	.0	0		10	2	1
81	08														1.76		.70	16	.0	0		5	1	0
81	09														4.83		1.38	9	.0	0		9	3	1
81	10														4.03		.88	24	.0	0		9	2	0
81	11														2.67		.55	21	T	T	23+	9	1	0
81	12														3.64		.87	16	29.5	22	19+	9	2	0
81	ANN.														39.42		1.38	9	63.0	21	12	88	24	5
		ANNUAL MEANS				SUM	ANNUAL EXTREMES				ANNUAL SUMS						EXTREME		SUM	EXTREME		SUMS		
		SUM	SUM	SUM	NORMAL	DEP.	DIFF.	ERROR							NORMAL	DEP.	DIFF.	ERROR						

"M" = MISSING DAYS
"+" AFTER DATE: ALSO OTHER DAYS
"T" = TRACE

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

ANNUAL CLIMATOLOGICAL SUMMARY

NATIONAL CLIMATIC DATA CENTER
FEDERAL BUILDING
ASHEVILLE, NORTH CAROLINA
28801

STATION IDENTIFICATION

43026500 POWNAL 1 NE VERMONT ELEVATION 1140 FT. ABOVE SEA LEVEL LAT. 42 47N LONG. 73 1

DATE		TEMPERATURE (°F)										NUMBER OF DAYS				PRECIPITATION (INCHES)				SNOW, SLEET			NO. OF D	
YR.	NO.	MEAN MAXIMUM	MEAN MINIMUM	MEAN	DEPART. FROM NORMAL	HEATING DEGREE DAYS	COOLING DEGREE DAYS	HIGHEST	DATE	LOWEST	DATE	MAX ≥ 90°	MAX ≤ 32°	MIN ≤ 32°	MIN ≤ 0°	TOTAL	DEPART. FROM NORMAL	GREATEST OBSERVED DAY	DATE	TOTAL FALL	MAX DEPTH	DATE	≥.10	≥.50
82	1															2.23	M	.44	16	18.0	27	24	7	0
82	2															2.03	M	.73	1	6.0	16	14*	5	2
82	3															2.23	M	.86	8	16.0	15	10*	7	1
82	4															3.67	M	.89	7	18.0	18	8*	5	4
82	5															2.26	M	.78	24	.0	0		5	1
82	6															7.20	M	1.80	6	.0	0		14	5
82	7															3.96	M	1.03	28	.0	0		6	4
82	8															.92	M	.49	26	.0	0		6	0
82	9															1.10	M	.45	24	.0	0		6	0
82	10															1.27	M	.35	9	.0	0		5	0
82	11															3.97	M	1.38	5	1.0	1	28*	6	2
82	12															1.33	M	.57	24	3.0	3	24	5	1
	ANN.															32.17	M	1.80	JUN	62.0	27	JAN	75	20

BEST COPY AVAILABLE

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* OCCURRED ON ONE OR MORE PREVIOUS DATES DURING THE MONTH.

T TRACE

V INCLUDES TOTAL FOR PREVIOUS MONTH.

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U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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STATION IDENTIFICATION

43026500 POWNAL 1 NE VERMONT ELEVATION 1140 FT. ABOVE SEA LEVEL LAT. 42 47N LONG. 73 13W

DATE		TEMPERATURE (°F)										NUMBER OF DAYS				PRECIPITATION (INCHES)				SNOW, SLEET			NO. OF DAYS		
YR.	MO.	MEAN MAXIMUM	MEAN MINIMUM	MEAN	DEPART. FROM NORMAL	HEATING DEGREE DAYS	COOLING DEGREE DAYS	HIGHEST	DATE	LOWEST	DATE	MAX ≥ 90°	MAX ≤ 32°	MIN ≤ 32°	MIN ≤ 0°	TOTAL	DEPART. FROM NORMAL	GREATEST OBSERVED DAY	DATE	TOTAL FALL	MAX DEPTH	DATE	≥.10	≥.50	≥1.0
83	1															3.72	M	1.35	24	16.0	14	20+	7	2	2
83	2															2.46	M	.75	8	13.0	11	13+	7	2	0
83	3															2.95	M	1.05	28	11.0	7	13	8	2	1
83	4															8.09	M	2.50	20	24.0	15	17	9	5	2
83	5															6.47	M	1.30	9	.0	0		13	4	2
83	6															6.32	M	3.15	17	.0	0		8	5	2
83	7															1.67	M	.48	22	.0	0		5	0	0
83	8															2.11	M	.60	12	.0	0		6	1	0
83	9															2.76	M	2.10	22	.0	0		2	1	1
83	10															2.14	M	.80	24	.0	0		5	1	0
83	11															5.36	M	1.26	25	2.0M	4	27	11	3	1
83	12															4.83	M	1.17	7	9.0	5	5	7	5	1
	ANN.															48.88	M	3.15	JUN	75.0M	15	APR	88	31	12

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STATION IDENTIFICATION

43026500 POWNAL 1 NE VERMONT ELEVATION 1140 FT. ABOVE SEA LEVEL LAT. 42 47N LONG. 73 13W

DATE		TEMPERATURE (°F)										NUMBER OF DAYS				PRECIPITATION (INCHES)				SNOW, SLEET			NO. OF DAYS		
YR.	MO.	MEAN MAXIMUM	MEAN MINIMUM	MEAN	DEPART. FROM NORMAL	HEATING DEGREE DAYS	COOLING DEGREE DAYS	HIGHEST	DATE	LOWEST	DATE	MAX ≥ 90°	MAX ≤ 32°	MIN ≤ 32°	MIN ≤ 0°	TOTAL	DEPART. FROM NORMAL	GREATEST OBSERVED DAY	DATE	TOTAL FALL	MAX DEPTH	DATE	≥.10	≥.50	≥1.0
84	1															1.66	M	.60	11	18.0	12	14	5	1	0
84	2															3.74	M	.79	6	14.0	11	9+	10	2	0
84	3															3.83	M	1.95	14	20.0	12	14	8	2	1
84	4															3.17	M	.44	17	.0T	3	1	13	0	0
84	5															10.80	M	2.82	30	.0	0		14	9	3
84	6															2.17	M	.64	25	.0	0		7	1	0
84	7															7.74	M	1.70	19	.0	0		10	5	3
84	8															3.97	M	.85	31	.0	0		8	4	0
84	9															2.28	M	.80	12	.0	0		8	1	0
84	10															3.14	M	.70	2	.0	0		8	2	0
84	11															3.54	M	1.25	12	4.0	4	14	8	1	1
84	12															2.13	M	.50	6	9.0	6	7+	6	1	0
	ANN.															48.17	M	2.82	MAY	65.0	12	MAR+	105	29	8

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43026500 POWNAL 1 NE VERMONT ELEVATION 1140 FT. ABOVE SEA LEVEL LAT. 42 47N LONG. 73 13W

DATE		TEMPERATURE (°F)										NUMBER OF DAYS				PRECIPITATION (INCHES)				SNOW, SLEET			NO. OF DAYS		
YR.	NO.	MEAN MAXIMUM	MEAN MINIMUM	MEAN	DEPART. FROM NORMAL	HEATING DEGREE DAYS	COOLING DEGREE DAYS	HIGHEST	DATE	LOWEST	DATE	MAX ≥ 90°	MAX ≤ 32°	MIN ≤ 32°	MIN ≤ 0°	TOTAL	DEPART. FROM NORMAL	GREATEST OBSERVED DAY	DATE	TOTAL FALL	MAX DEPTH	DATE	≥.10	≥.50	≥1.0
85	1															.94	M	.38	2	13.0	9	23+	4	0	0
85	2															2.52	M	1.45	13	9.0	14	10+	7	1	1
85	3															2.61	M	1.02	5	4.0	4	8+	4	3	1
85	4															2.68	M	.70	23	2.0	1	4+	7	2	0
85	5															2.95	M	.87	18	.0	0		6	3	0
85	6															4.38	M	1.28	17	.0	0		8	3	1
85	7															4.04	M	1.80	27	.0	0		6	2	2
85	8															3.88	M	.77	1	.0	0		9	3	0
85	9															2.72	M	1.53	28	.0	0		5	1	1
85	10															2.71	M	.57	6	.0	0		7	1	0
85	11															5.73	M	1.02	6	6.7	4	29	12	6	1
85	12															1.60	M	.44	14+	11.5	7	28	5	0	0
	ANN.															36.76	M	1.80	JUL	46.2	14	FEB	80	25	7

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43026500 POWNAL 1 NE VERMONT ELEVATION 1140 FT. ABOVE SEA LEVEL LAT. 42 47N LONG. 73 13W

DATE		TEMPERATURE (°F)										NUMBER OF DAYS				PRECIPITATION (INCHES)				SNOW, SLEET			NO. OF DAYS		
YR.	NO.	MEAN MAXIMUM	MEAN MINIMUM	MEAN	DEPART. FROM NORMAL	HEATING DEGREE DAYS	COOLING DEGREE DAYS	HIGHEST	DATE	LOWEST	DATE	MAX ≥ 90°	MAX ≤ 32°	MIN ≤ 32°	MIN ≤ 0°	TOTAL	DEPART. FROM NORMAL	GREATEST OBSERVED DAY	DATE	TOTAL FALL	MAX DEPTH	DATE	≥.10	≥.50	≥1.
86	1															3.36	M	1.10	27	9.0	8	7+	6	2	1
86	2															2.18	M	.65	2	11.0	8	17	5	2	0
86	3															3.99	M	2.52	15	5.0	8	10	6	1	1
86	4															1.94	M	.61	22	1.5	1	6	7	1	0
86	5															1.81	M	.64	23	.0T	0T	31+	7	1	0
86	6															6.70	M	1.58	20	.0	0		12	5	2
86	7															6.34	M	1.17	3	.0	0		11	7	2
86	8															6.43	M	1.24	8	.0	0		10	5	2
86	9															3.83	M	2.08	24	.0	0		6	1	1
86	10															3.32	M	.92	4	.0	0		7	3	0
86	11															5.07	M	1.03	9	11.5	8	19	9	5	1
86	12															3.41	M	1.44	19	15.5	8	19	5	2	1
	ANN.															48.38	M	2.52	MAR	53.5M	8	DEC+	91M	35	11

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43026500 POWNAL 1 NE VERMONT ELEVATION 1140 FT. ABOVE SEA LEVEL LAT. 42 47N LONG. 73 13W

DATE		TEMPERATURE (°F)										NUMBER OF DAYS				PRECIPITATION (INCHES)				SNOW, SLEET			NO. OF DAYS		
YR.	MO.	MEAN MAXIMUM	MEAN MINIMUM	MEAN	DEPART. FROM NORMAL	HEATING DEGREE DAYS	COOLING DEGREE DAYS	HIGHEST	DATE	LOWEST	DATE	MAX ≥ 90°	MAX ≤ 32°	MIN ≤ 32°	MIN ≤ 0°	TOTAL	DEPART. FROM NORMAL	GREATEST OBSERVED DAY	DATE	TOTAL FALL	MAX DEPTH	DATE	≥.10	≥.50	≥1.0
87	1															3.22	M	.73	3	43.0	28	25+	7	4	0
87	2															.16	M	.09	9	2.0	23	1	0	0	0
87	3															1.26	M	.50	2	.0T	19	1	3	1	0
87	4															3.37	M	1.60	5	.0T	0T	30+	8	1	1
87	5															1.36	M	.37	28	.0	0		5	0	0
87	6															3.68	M	1.15	3	.0	0		9	3	1
87	7															3.05	M	.57	3	.0	0		9	2	0
87	8															2.73	M	.65	10	.0	0		7	2	0
87	9															5.34	M	1.66	9	.0	0		9	3	3
87	10															8.23	M	3.02	5	18.0	16	5	13	3	3
87	11															2.77	M	.70	30	9.0	9	12	8	2	0
87	12															1.38	M	.36	16	10.0	4	20+	5	0	0
	ANN.															36.55	M	3.02	OCT	82.0	25	JAN	83	21	8

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DATE		TEMPERATURE (°F)														PRECIPITATION (INCHES)									
												NUMBER OF DAYS								SNOW, SLEET			NO. OF DAYS		
YR.	NO.	MEAN MAXIMUM	MEAN MINIMUM	MEAN	DEPART. FROM NORMAL	HEATING DEGREE DAYS	COOLING DEGREE DAYS	HIGHEST	DATE	LOWEST	DATE	MAX ≥ 90°	MAX ≤ 32°	MIN ≤ 32°	MIN ≤ 0°	TOTAL	DEPART. FROM NORMAL	GREATEST OBSERVED DAY	DATE	TOTAL FALL	MAX DEPTH	DATE	≥.10	≥.50	≥1.0
88	1															2.31	M	.77	26	20.5	11	27	8	1	0
88	2															3.15	M	.94	13	19.0	18	14	7	2	0
88	3															3.01	M	.56	17	13.0	8	5	8	3	0
88	4															3.44	M	1.41	29	1.0	0T	30+	7	2	1
88	5															2.98	M	.64	26	.0	0		10	2	0
88	6															2.79	M	2.20	23	.0	0		3	1	1
88	7															6.12	M	1.19	18	.0	0		12	5	2
88	8															6.14	M	1.60	30	.0	0		8	6	2
88	9															2.06	M	.91	21	.0	0		5	2	0
88	10															2.16	M	.40	22	.0T	0T	31+	10	0	0
88	11															5.96	M	1.60	2	.0	0		11	4	1
88	12															.61M	M	.32	14	8.5M	5	16+	2	0	0
	ANN.															40.70M	M	2.20	JUN	62.0M	18	FEB	91	28	7

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ANNUAL CLIMATOLOGICAL SUMMARY

NATIONAL CLIMATIC DATA CENTER
FEDERAL BUILDING
ASHEVILLE, NORTH CAROLINA
28801

STATION IDENTIFICATION

43026500 POWNAL 1 NE VERMONT ELEVATION 1142 FT. ABOVE SEA LEVEL LAT. 42 47N LONG. 73 13W

DATE		TEMPERATURE (°F)										NUMBER OF DAYS				PRECIPITATION (INCHES)				SNOW, SLEET			NO. OF DAYS		
YR.	NO.	MEAN MAXIMUM	MEAN MINIMUM	MEAN	DEPART. FROM NORMAL	HEATING DEGREE DAYS	COOLING DEGREE DAYS	HIGHEST	DATE	LOWEST	DATE	MAX ≥ 90°	MAX ≤ 32°	MIN ≤ 32°	MIN ≤ 0°	TOTAL	DEPART. FROM NORMAL	GREATEST OBSERVED DAY	DATE	TOTAL FALL	MAX DEPTH	DATE	≥.10	≥.50	≥1.0
89	1															1.05	M	.33	15	3.5	1	22+	4	0	0
89	2															2.10	M	.50	4	8.0	4	12+	9	1	0
89	3															2.51	M	.90	25	4.5	3	21	5	2	0
89	4															4.31	M	.75	7	2.0	1	14+	11	4	0
89	5															5.65	M	1.08	11	.0	0		11	4	1
89	6															6.93	M	1.08	3	.0	0		14	6	1
89	7															4.41	M	1.02	29	.0	0		7	5	1
89	8															4.14	M	1.15	12	.0	0		9	3	1
89	9															3.81	M	.77	21	.0	0		9	2	0
89	10															5.03	M	1.45	21	.0	0		6	4	2
89	11															3.94	M	.70	1	2.5	1	25+	11	3	0
89	12															.66	M	.22	16	10.5	7	31+	3	0	0
	ANN.															44.54	M	1.45	OCT	31.0	7	DEC	99	34	6

M MISSING DATA. APPEARS WITH MONTHLY DATA WHEN LESS THAN 10 DAYS ARE MISSING, AND IT APPEARS ALONE IF 10 OR MORE DAYS ARE MISSING. IT APPEARS WITH ANNUAL DATA, WHEN DERIVED FROM MONTHS WITH MISSING DATA.

+ OCCURRED ON ONE OR MORE PREVIOUS DATES DURING THE MONTH.

T TRACE

V INCLUDES TOTAL FOR PREVIOUS MONTH.

B ADJUSTED MONTHLY OR ANNUAL VALUE TOTAL CONTAINS ESTIMATED VALUE(S) FOR MISSING DATA.

A AMOUNT PRECIPITATION MAY INCLUDE PRECIPITATION THAT OCCURRED DURING THE PREVIOUS MONTHS.

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

ANNUAL CLIMATOLOGICAL SUMMARY

NATIONAL CLIMATIC DATA CENTER
FEDERAL BUILDING
ASHEVILLE, NORTH CAROLINA
28801

STATION IDENTIFICATION

43026500 POWNAL 1 NE VERMONT ELEVATION 1140 FT. ABOVE SEA LEVEL LAT. 42 47N LONG. 73 13W

DATE		TEMPERATURE (°F)														PRECIPITATION (INCHES)									
												NUMBER OF DAYS								SNOW, SLEET			NO. OF DAYS		
YR.	NO.	MEAN MAXIMUM	MEAN MINIMUM	MEAN	DEPART. FROM NORMAL	HEATING DEGREE DAYS	COOLING DEGREE DAYS	HIGHEST	DATE	LOWEST	DATE	MAX ≥ 90°	MAX ≤ 32°	MIN ≤ 32°	MIN ≤ 0°	TOTAL	DEPART. FROM NORMAL	GREATEST OBSERVED DAY	DATE	TOTAL FALL	MAX DEPTH	DATE	≥.10	≥.50	≥1.0
90	1															3.74	M	1.27	30	14.0	6	24+	7	2	2
90	2															3.54	M	1.18	16	17.0	7	26+	9	2	1
90	3															3.72	M	1.05	21	2.0	5	2+	6	3	2
90	4															4.84	M	1.67	4	.0T	0T	30+	8	3	2
90	5	M	M	M				M		M		M	M	M	M	7.32	M	1.31	14	.0	0		12	5	3
90	6	75.3	51.9	63.6		90	55	84	18	38	6+						M								
90	7	79.4	56.1	67.8		31	125	89	5	44	7	0	0	0	0	3.12	M	1.73	24	.0	0		6	1	1
90	8	77.7	56.0	66.9		29	94	87	5	42	20	0	0	0	0	9.20	M	3.70	7	.0	0		11	6	2
90	9	69.7	45.9	57.8		227	18	80	14+	33	20+	0	0	0	0	2.31	M	.80	10	.0	0		8	1	0
90	10	62.2	41.8	52.0		416	18	82	8	24	31+	0	0	7	0	4.25	M	1.67	24	.0T	0T	31+	6	4	1
90	11	48.1	30.0	39.1		771	0	71	4	17	13	0	2	19	0	3.32	M	1.82	11	.0T	0T	30+	7	1	1
90	12	41.1	22.7	31.9		1020	0	65	24	7	27	0	6	26	0	4.95	M	.85	24	9.0	4	29	13	4	0
	ANN.			M		M	M	M		M		0M	8M	52M	0M		M	3.70M	AUG	42.0M	7M	FEB	93M	32M	15

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U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

ANNUAL CLIMATOLOGICAL SUMMARY

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FEDERAL BUILDING
ASHEVILLE, NORTH CAROLINA
28801

STATION IDENTIFICATION

43026500 POWNAL 1 NE VERMONT ELEVATION 1140 FT. ABOVE SEA LEVEL LAT. 42 47N LONG. 73 13W

DATE		TEMPERATURE (°F)										NUMBER OF DAYS				PRECIPITATION (INCHES)				SNOW, SLEET			NO. OF DAYS		
YR.	NO.	MEAN MAXIMUM	MEAN MINIMUM	MEAN	DEPART. FROM NORMAL	HEATING DEGREE DAYS	COOLING DEGREE DAYS	HIGHEST	DATE	LOWEST	DATE	MAX ≥ 90°	MAX ≤ 32°	MIN ≤ 32°	MIN ≤ 0°	TOTAL	DEPART. FROM NORMAL	GREATEST OBSERVED DAY	DATE	TOTAL FALL	MAX DEPTH	DATE	≥.10	≥.50	≥1.0
91	1	29.8	12.1	21.0		1358	0	44	17	-9	22	0	19	30	5	1.72	M	.72	31	9.0	6	14+	4	1	0
91	2	36.8	18.1	27.5		1043	0	58	5	-4	17	0	10	24	4	1.59	M	.38	19	4.0	2	14	6	0	0
91	3	44.0	25.4	34.7		934	0	65	29+	14	12+	0	5	25	0	3.22	M	.62	24	6.5	4	15	8	2	0
91	4	59.6	35.9	47.8		515	4	83	8	19	1	0	0	11	0	2.62	M	.60	22	.0T	0T	30+	6	1	0
91	5	71.4	44.8	58.1		232	29	85	17	33	19	0	0	0	0	4.02	M	.98	1	.0	0		7	5	0
91	6	77.4	51.0	64.2		85	69	89	29	39	7+	0	0	0	0	4.75	M	1.45	16	.0	0		7	4	2
91	7	77.8	54.3	66.1		55	95	90	21+	43	3+	2	0	0	0	2.92	M	.99	23	.0	0		5	2	0
91	8	76.9	56.4	66.7		20	79	87	2	51	7	0	0	0	0	8.23M	M	1.77	20	.0	0		8	6	4
91	9	68.0	44.6	56.3		270	18	85	17	27	30	0	0	4	0	4.61M	M	1.39	19	.0	0		7	4	1
91	10	60.5	38.5	49.5		478	4	77	3	25	30+	0	0	10	0	5.25	M	1.28	12	.0	0		7	5	2
91	11	45.2	29.5	37.4		825	0	72	21	16	28+	0	0	21	0	4.47	M	1.93	12	4.0	4	12	3	3	2
91	12	36.6	18.5	27.6		1151	0	62	1	-1	20+	0	13	27	4	2.60	M	.57	3	10.8	4	21	8	2	0
	ANN.	57.0	35.8	46.4		6966	298	90	JUL	-9	JAN	2	47	152	13	46.00M	M	1.93	NOV	34.3	6	JAN	76	35	11

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U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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DATE		TEMPERATURE (°F)										NUMBER OF DAYS				PRECIPITATION (INCHES)				SNOW, SLEET			NO. OF DAY		
YR.	NO.	MEAN MAXIMUM	MEAN MINIMUM	MEAN	DEPART. FROM NORMAL	HEATING DEGREE DAYS	COOLING DEGREE DAYS	HIGHEST	DATE	LOWEST	DATE	MAX ≥ 90°	MAX ≤ 32°	MIN ≤ 32°	MIN ≤ 0°	TOTAL	DEPART. FROM NORMAL	GREATEST OBSERVED DAY	DATE	TOTAL FALL	MAX DEPTH	DATE	≥.10	≥.50	≥1.
92	1	31.2	12.6	21.9		1331	0	57	15	-6	19	0	14	28	4	1.77	M	1.05	24	3.5	2	28+	4	1	1
92	2	32.0	13.6	22.8		1218	0	52	20	-6	13+	0	15	27	5	1.38	M	M	M	9.5M	4	13+	5	0	0
92	3	36.4	17.7	27.1		1169	0	56	12	2	1	0	13	26	0	2.14	M	.73	27	6.5	3	23	6	2	0
92	4	51.1	31.0	41.1		711	0	73	22	21	15+	0	0	21	0	2.56	M	1.06	17	5.5	2	17	7	2	1
92	5	66.9	41.1	54.0		338	4	85	24	31	8+	0	0	2	0	3.10	M	1.83	3	.0	0		6	1	1
92	6	71.7	47.8	59.8		167	15	83	15	38	16	0	0	0	0	3.14	M	1.35	1	.0	0		6	2	1
92	7	73.6	52.6	63.1		86	34	82	1	42	2	0	0	0	0	5.56	M	1.07	16	.0	0		10	4	1
92	8	74.2	53.2	63.7		76	44	85	28	45	22+	0	0	0	0	1.53M	M	.49	29	.0	0		3	0	0
92	9	69.3	46.9	58.1		220	20	81	11	29	25+	0	0	3	0	2.94	M	1.01	23	.0	0		4	3	1
92	10	53.1	32.0	42.6		689	0	72	9	24	7	0	0	18	0	2.32	M	M	M	.0T	0T	31+	6	1	0
92	11	42.3	27.6	35.0		892	0	60	13	12	21+	0	4	21	0	4.44	M	.95	3	3.5	3	20+	11	3	0
92	12	34.6	19.3	27.0		1170	0	47	30	-1	28	0	11	27	2	3.36	M	.64	18	18.0	13	13	9	2	0
	ANN.	53.0	32.9	43.0		8067	117	85	AUG+	-6	FEB+	0	57	173	11	34.24M	M	1.83M	MAY	46.5M	13	DEC	77	21	6

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FORM E-15 (7-79)
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

OK

STATION (Climatological)	(River Station, if different)	MONTH	19
POWNAL		OCT.	93

STATE	COUNTY	RIVER
VERMONT	BENNINGTON	

TIME (local) OF OBSERVATION RIVER	TEMP.	PRECIPITATION	STANDARD TIME IN USE
	7A	7A	

TYPE OF RIVER GAGE	ELEVATION OF RIVER GAGE ZERO	FLOOD STAGE	NORMAL POOL STAGE
	Ft.	Ft.	Ft.

TEMPERATURE F. — 24 HRS. ENDING AT OBSERVATION

PRECIPITATION — 24-HR AMOUNTS / At Ob. — Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

WEATHER (Calendar Day) — Mark 'X' for all types occurring each day.

RIVER STAGE — GAGE READING AT ___ A.M.

DATE	MAX.	MIN.	AT OBSN.	Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail (Ins. and tenths)	Snow, ice pellets, hail, ice on ground (Ins.)	Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	CONDITION	GAGE READING	TENDENCY	REMARKS (Special observations, etc.)
1				0		0											
2		28	50														
3	67	44	44	.61													
4	53	37	49														
5	66	32	32	.43													
6	50	31	33	T													
7	59	31	47														
8	73	47	57														
9	78	50	54														
10	73	34	34	.16													
11	43	22	22														
12	51	22	39														
13	43	37	38	.67													
14	46	22	22														
15	49	21	41	T													
16	60	37	37	.02													
17	67	37	53														
18	66	50	50	.15													
19	57	32	32														
20	54	31	42	.15													
21	47	42	45	.27													
22	59	40	40	.35													
23	51	36	36	T													
24	51	30	42														
25	67	42	48														
26	55	36	39														
27	49	39	41	T													
28	53	41	42	.03													
29	49	31	40														
30	54	40	42														
31	42	31	32	.72	T	T	X										
SUM				3.56	T		Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds	SUM				
				Greatest													

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER: RUTH FALKNER

SUPERVISING OFFICE:

STATION INDEX NO. 43-6500-2

0R

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATION (Climatological): POWNAL
(River Station, if different):
MONTH: Nov. 19 93
STATE: VERMONT
COUNTY: BENNINGTON
RIVER:
TIME (local) OF OBSERVATION: RIVER: TEMP. 7A; PRECIPITATION 7A
STANDARD TIME IN USE:
TYPE OF RIVER GAGE:
ELEVATION OF RIVER GAGE ZERO: Ft.
FLOOD STAGE: Ft.
NORMAL POOL STAGE: Ft.

DATE	MAX.	MIN.	AT OBSN.	Rain, melted snow, etc. (ins. and hundredths)	Snow, ice pellets, hail (ins. and tenths)	Snow, ice pellets, hail, ice on ground (ins.) at Ob.
1	39	32	36	.35		0
2	37	25	25	.21	3.0	3
3	36	24	34			2
4	40	33	35	.14	0	0
5	49	35	45			
6	54	41	43	.26		
7	46	29	29	T	T	T
8	37	21	22			0
9	40	20	23			
10	48	22	33			
11	47	26	37			
12	52	35	39	.15		
13	46	22	25			
14	55	25	52	.03		
15	67	50	62	.27		
16	70	39	39			
17	47	27	28			
18	47	28	37	1.26		
19	44	26	35			
20	47	34	39	.15		
21	39	23	25	.03	T	T
22	40	25	37	T	T	T
23	53	30	31			0
24	48	29	39			
25	47	6	7	T	T	0
26	24	7	10			
27	39	10	35			
28	54	35	54	.09		
29	60	30	30	1.23		
30	39	26	28	T	T	T
31						
SUM				4.87	3.0	X

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

WEATHER (Calendar Day): Mark "X" for all types occurring each day. Fog, Ice Pellets, Glaze, Thunder, Hail, Damaging Winds. Time of observation if different from above.

RIVER STAGE: CONDITION; GAGE READING AT ___ A.M.; TENDENCY

REMARKS (Special observations, etc.)

CHECK BAR (For wire-weight) NORMAL CK. BAR: READING / DATE

CONDITION OF RIVER AT GAGE
A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER: RUTH FALKNER
SUPERVISING OFFICE:
STATION INDEX NO. 43-6500-2

KEYED BY 0073?

WS FORM E-15 (7-79)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATION (Climatological): POWNAL (River Station, if different)
MONTH: DEC. 19 93
STATE: VERMONT
COUNTY: BENNINGTON
RIVER
TIME (local) OF OBSERVATION RIVER — TEMP. 07A — PRECIPITATION 07A
STANDARD TIME IN USE
TYPE OF RIVER GAGE
ELEVATION OF RIVER GAGE ZERO Ft.
FLOOD STAGE Ft.
NORMAL POOL STAGE Ft.

CR

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	Time of observation if different from above
1	34	15	15	T	T	T	
2	38	15	29			0	
3	41	26	40	.43			
4	42	29	31	T			4A
5				*			
6				*			
7	42	30	37	V 1.17			
8	42	29	29	T	T	T	
9	35	21	21	T		0	
10	41	20	40				
11	47	39	41	.54			
12	41	11	12	.26	2.5	3	
13	21	11	13	T	T	2	
14	32	12	24			2	
15	31	23	28	T		2	
16	35	28	31	T		1	
17	31	12	12			1	
18	35	12	19			0	
19	37	17	29	.22	3.5	4	
20	34	29	34	.07	0.5	4	
21	38	31	38	.08		3	
22	45	30	32	.63	2.0	2	
23	32	23	23			2	
24	26	0	2			2	
25	22	2	13	T	T	2	
26	24	9	9	.05	2.0	4	
27	11	-5	-4	T	T	4	
28	8	-9	3			4	
29	13	-6	-6			3	
30	17	-7	14	.12	3.0	6	
31	18	4	7			5	
SUM				2.57	13.5		

Precipitation: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M. 1 2 3 4 5 6 7 8 9 10 11

WEATHER (Calendar Day): Mark "X" for all types occurring each day. Fog | Ice Pellets | Glaze | Thunder | Hail | Damaging Winds

RIVER STAGE: CONDITION | GAGE READING AT ___ A.M. | TENDENCY

REMARKS (Special observations, etc.)

Greatest — CHECK BAR (For wire-weight) NORMAL CK. BAR — READING — DATE

CONDITION OF RIVER AT GAGE
A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER: RUTH FALKNER
SUPERVISING OFFICE
STATION INDEX NO. 43-6500-2

KEYED BY 17840

W.S. FORM E-15 (7-79)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

OK

STATION (Climatological): POWNAL (River Station, if different):
MONTH: JAN. 19 94
STATE: VERMONT COUNTY: BENNINGTON RIVER:
TIME (local) OF OBSERVATION RIVER: TEMP. 7A PRECIPITATION 7A STANDARD TIME IN USE:
TYPE OF RIVER GAGE: ELEVATION OF RIVER GAGE ZERO: Ft. FLOOD STAGE: Ft. NORMAL POOL STAGE: Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)
1	26	7	22			5
2	37	22	35	T	T	3
3	37	9	10			3
4					M	M
5						
6						
7						
8						
9						
10						
11						M
12	30	-6	21	1.95	M	13
13	28	22	24	.14	2.0	14
14	33	24	30	T	T	13
15	33	-6	-6	.18	4.0	17
16	4	-23	-23	T	T	17
17	10	-25	10			17
18	35	10	16	1.38	8.0	24
19	16	-9	-8			23
20	3	-16	-14			23
21	5	-15	-8			21
22	13	-8	12			20
23	21	-7	-6	T	T	19
24	31	-6	31			18
25	34	14	15			18
26	24	-2	-2	.18	2.5	21
27	-2	-26	-25	T	T	20
28	34	-25	34	.25	2.0	21
29	54	31	31	.40		17
30	31	9	9			17
31	16	-4	-4			17
SUM				3.48		

Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

WEATHER (Calendar Day): Mark 'X' for all types occurring each day. Fog | Ice Pellets | Glaze | Thunder | Hail | Damaging Winds | Time of observation if different from above

RIVER STAGE: CONDITION | GAGE READING AT ___ A.M. | TENDENCY

REMARKS (Special observations, etc.)

CONDITION OF RIVER AT GAGE | Gravel | CHECK BAR (For wire-weight) NORMAL CK. BAR | READING | DATE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER: RUTH FALKNER

SUPERVISING OFFICE:

STATION INDEX NO. 43-6500-2

WS FORM E-15 (7-79)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

X

OR

STATION (Climatological): POWNAL (River Station, if different):
MONTH: FEB. 19 94
STATE: VERMONT
COUNTY: BENNINGTON
RIVER:
TIME (local) OF OBSERVATION RIVER: TEMP. 7A PRECIPITATION 7A
STANDARD TIME IN USE:
TYPE OF RIVER GAGE:
ELEVATION OF RIVER GAGE ZERO: Ft.
FLOOD STAGE: Ft.
NORMAL POOL STAGE: Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)
1	16	-5	-3			17
2	16	-3	-1	T	T	17
3	19	-3	-2			17
4	24	-3	11	.06	1.0	17
5	29	10	15	T	T	17
6	37	14	18			16
7	34	17	26			16
8	26	1	1	T	T	16
9	6	0	4	.38	4.5	21
10	6	-13	-12	.06	3.0	22
11	7	-16	2	T	T	22
12	18	1	9	.04	1.0	22
13	33	7	25	T	T	19
14	36	12	12	.04	1.0	19
15	21	-1	1			18
16	35	0	20			18
17	26	8	12			18
18	42	9	27			17
19	45	25	35			17
20	61	32	42			16
21	60	39	41	.08		10
22	45	30	30			9
23	32	15	16			9
24	25	15	25	.24	2.5	11
25	30	15	15	.36	2.0	12
26	20	10	10	.14	3.0	15
27	17	-5	-5	T	T	15
28	15	-6	0			14
29						
30						
31						
Sum			SUM	1.40	18.0	
				Greatest		

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M. 1 2 3 4 5 6 7 8 9 10 11 1 2 3 4 5 6 7 8 9 10 11

WEATHER (Calendar Day): Mark 'X' for all types occurring each day. Fog | Ice Pellets | Glaze | Thunder | Hail | Damaging Winds | Time of observation if different from above

RIVER STAGE: CONDITION | GAGE READING AT ___ A.M. | TENDENCY

REMARKS (Special observations, etc.)

CHECK BAR (For wire-weight) NORMAL CK. BAR | READING | DATE

CONDITION OF RIVER AT GAGE
A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER: RUTH FALKNER

SUPERVISING OFFICE:

STATION INDEX NO.: 43-6500-2

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE
WS FORM E-15 (7-79)

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

X

STATION (Climatological): POWNAL (River Station, if different)
MONTH: MAR. 19 94
STATE: VERMONT COUNTY: BENNINGTON RIVER
TIME (local) OF OBSERVATION RIVER TEMP. 7A PRECIPITATION 7A STANDARD TIME IN USE
TYPE OF RIVER GAGE ELEVATION OF RIVER GAGE ZERO Ft. FLOOD STAGE Ft. NORMAL POOL STAGE Ft.

JK

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)
1	22	0	5			13
2	27	4	5			12
3	32	4	21	.06	1.0	13
4	32	19	20	.52	2.0	20
5	37	20	29	T	T	17
6	37	13	13			16
7	43	13	31	.06	1.0	15
8	41	31	37	.47		12
9	40	20	20	T		11
10	40	19	39	.56	2.0	12
11	44	26	26	.46	T	11
12	33	13	16			11
13	35	14	29	T	T	11
14	44	29	33	.02		10
15	39	31	35	T		10
16	42	32	32	.04		8
17	33	14	14	.26	4.0	12
18	25	11	18	.05	2.0	10
19	32	18	21	.18	2.0	11
20	33	19	20	T	T	11
21	36	17	18			10
22	46	17	32	.38	1.0	10
23	39	29	32	.16	2.0	10
24	59	32	35			9
25	59	33	36			6
26	39	27	27			6
27	41	27	36			5
28	41	31	39	.45	1.0	5
29	40	32	32	T		3
30	37	26	29	.07	T	2
31	41	25	27	T	T	2
			SUM	3.44	23.0	

Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

WEATHER (Calendar Day): Mark 'X' for all types occurring each day. Fog | Ice Pellets | Glaze | Thunder | Hail | Damaging Winds | Time of observation if different from above

RIVER STAGE: CONDITION | GAGE READING AT ___ A.M. | TENDENCY

REMARKS (Special observations, etc.)

CHECK BAR (For wire-weight) NORMAL CK. BAR: READING | DATE

CONDITION OF RIVER AT GAGE
A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER: RUTH FALKNER
SUPERVISING OFFICE
STATION INDEX NO. 43-6500-2

Punched 7780n

X

WS FORM E-15 (7-70)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATION (Climatological): POWNAL (River Station, if different)
MONTH: APRIL 19 94
STATE: VERMONT
COUNTY: BENNINGTON
RIVER:
TIME (local) OF OBSERVATION RIVER: TEMP. 7A PRECIPITATION 7A
STANDARD TIME IN USE:
TYPE OF RIVER GAGE:
ELEVATION OF RIVER GAGE ZERO: Ft.
FLOOD STAGE: Ft.
NORMAL POOL STAGE: Ft.

OP

DATE	TEMPERATURE F. MAX.	MIN.	AT OBSN.	24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	47	26	30			2											
2	52	23	28			1											
3	48	28	44			T											
4	57	29	29	.20		T											
5	49	26	26														
6	60	26	46	.03													
7	52	31	33	.73													
8	33	24	25	.09	T	T											
9	46	23	35														
10	55	35	47	.03													
11	51	34	34	T													
12	54	32	32														
13	52	31	43	.71													
14	54	42	46	.76													
15	58	38	39														
16	80	38	58														
17	59	38	38	.84													
18	47	34	35	.09	T												
19	54	34	42	.04						X							
20	70	35	40	.10													
21	56	31	33														
22	48	28	29														
23	49	27	27														
24	56	27	47														
25	74	46	58														
26	67	42	42	.35													
27	60	42	49							X							
28	85	46	46	.20													
29	58	42	45	T													
30	61	40	47	.11													
31																	
SUM				4.28	T								SUM				

Precipitation: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M. 1 2 3 4 5 6 7 8 9 10 11 | 1 2 3 4 5 6 7 8 9 10 11

Weather (Calendar Day): Mark "X" for all types occurring each day.

Greatest

CHECK BAR (For wire-weight) NORMAL CK. BAR
READING | DATE

CONDITION OF RIVER AT GAGE
A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER: RUTH FALKNER

SUPERVISING OFFICE:

STATION INDEX NO. 43-6500-2

X
OR

WS FORM E-15 (7-79)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATION (Climatological): POWNAL	(River Station, if different)	MONTH: MAY	19 94
STATE: VERMONT	COUNTY: BENNINGTON	RIVER	
TIME (local) OF OBSERVATION RIVER	TEMP. 7A / PRECIPITATION 7A	STANDARD TIME IN USE	
TYPE OF RIVER GAGE	ELEVATION OF RIVER GAGE ZERO Ft. / FLOOD STAGE Ft.	NORMAL POOL STAGE Ft.	

TEMPERATURE F. — 24 HRS. ENDING AT OBSERVATION; PRECIPITATION — 24-HR AMOUNTS / At Ob.

Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved.

DATE	MAX.	MIN.	AT OBSN.	Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail (Ins. and tenths)	Snow, ice pellets, hail, ice on ground (Ins.)	WEATHER: Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE: CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	64	46	51	.66													
2	68	38	38	.12													
3	53	31	31														
4	60	31	37														
5	65	37	45														
6	66	42	44														
7	56	41	44	.09													
8	66	44	46	.82													
9	51	42	43	.17													
10	70	42	48	.05													
11	59	37	38														
12	64	37	48	.09													
13	55	35	35	.46													
14	53	34	38														
15	69	37	43														
16	74	43	50	.51													
17	53	44	44	.94													
18	52	42	47	.07													
19	59	43	44	.04													
20	55	41	41	.07													
21	68	37	39														
22	77	39	52														
23	83	52	56														
24	79	47	48	T													
25	74	48	53	.08													
26	67	53	54	13													
27	68	35	36	48													
28																	
29																	
30																	
31																	
SUM				478													
				Greatest										SUM			

CHECK BAR (For wire-weight) NORMAL CK. BAR — READING — DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER: RUTH FALKNER

SUPERVISING OFFICE

STATION INDEX NO. 43-6500-2

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

WS FORM E-15 (7-79)

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATION (Climatological): POWNAL (River Station, if different)
MONTH: JUNE 19 94
STATE: VERMONT
COUNTY: BENNINGTON
RIVER
TIME (local) OF OBSERVATION RIVER — TEMP. 7A — PRECIPITATION 7A
STANDARD TIME IN USE
TYPE OF RIVER GAGE
ELEVATION OF RIVER GAGE ZERO Ft.
FLOOD STAGE Ft.
NORMAL POOL STAGE Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	WEATHER Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	RIVER STAGE Condition	Gage Reading at A.M.	Tendency	REMARKS (Special observations, etc.)
1	81	59	60	.15												
2	75	40	42	T												
3	52	42	42	.06												
4	71	42	45													
5	77	45	51													
6	77	51	55	.05												
7	77	55	67	.07												
8	69	54	58													
9	67	41	42													
10	74	41	45													
11	74	44	51													
12	75	51	59	.52												
13	73	51	64	T						X						
14	82	63	65	1.29												
15	78	61	61	.35												
16	84	61	64													
17	86	63	63													
18	88	63	69													
19	89	67	72													
20	80	52	52													
21	81	52	61	.01												
22	70	57	59	.48												
23	77	57	59													
24	76	57	58	.03												
25	64	58	63	.27												
26	78	58	61	T												
27	80	61	62													
28	80	62	65	.12												
29	73	59	60	.06						X						
30	79	60	64	.17						X						
31																
SUM			SUM	3.63									SUM			

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M. 1 2 3 4 5 6 7 8 9 10 11 1 2 3 4 5 6 7 8 9 10 11

WEATHER (Calendar Day): Mark 'X' for all types occurring each day.

Time of observation if different from above

CHECK BAR (For wire-weight) NORMAL CK. BAR — READING — DATE

CONDITION OF RIVER AT GAGE
A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

Greatest

OBSERVER: RUTH FALKNER

SUPERVISING OFFICE

STATION INDEX NO. 43-6500-2

WS FORM E-15 (7-79)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATION (Climatological): POWNAL (River Station, if different)
MONTH: JULY 19 94
STATE: VERMONT
COUNTY: BENNINGTON
RIVER:
TIME (local) OF OBSERVATION RIVER: | TEMP. 7A | PRECIPITATION 7A
STANDARD TIME IN USE:
TYPE OF RIVER GAGE: | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

WEATHER (Calendar Day): Mark "X" for all types occurring each day.

RIVER STAGE: CONDITION | GAGE READING AT ___ A.M. | TENDENCY

REMARKS (Special observations, etc.)

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds
1	78	62	62	.31								
2	76	56	58									
3	82	56	61	.03								
4	75	49	51									
5	80	51	62									
6	80	60	71									
7	85	66	66							X		
8	88	63	64	.30								
9	87	63	69							X		
10	87	62	62	.15								
11	79	57	57	.13								
12	74	50	50									
13	79	49	68									
14	82	57	57									
15	77	57	64									
16	66	61	66	.05								
17	81	59	60									
18	78	60	64	.86								
19	73	63	66	.12								
20	83	60	60									
21	84	60	65	.05								
22	88	64	72	.02								
23	85	68	68	.43								
24	76	65	65	T								
25	83	65	65							X		
26	83	60	62	.71								
27	80	60	60	.07								
28	76	58	58	.64								
29	66	58	58	.06								
30	78	57	63	.06								
31	82	60	61	T								
Sum			SUM	399								
				Greatest								

CHECK BAR (For wire-weight) NORMAL CK. BAR
READING | DATE

CONDITION OF RIVER AT GAGE
A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER: RUTH FALKNER

SUPERVISING OFFICE:

STATION INDEX NO. 43-6500-2

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NCC FORM 3443

ANNUAL CLIMATOLOGICAL SUMMARY

ENVIRONMENTAL DATA SERVICE
NATIONAL CLIMATIC CENTER
NOAA FORM 27-320 (11-74)

VT

STATION NUMBER: 43 65[illegible]0 02 POWNAL 1 NE VERMONT ELEVATION 1140 FT. ABOVE SEA-LEVEL. LAT.: 42° 47' N; LONG.: 73° 1

DATE		TEMPERATURES (°F.)									NUMBER OF DAYS				PRECIPITATION (INCHES)				SNOW, SLEET			NO OF DAYS	
YR.	MO.	MEAN MAXIMUM	MEAN MINIMUM	MEAN	DEPART. FROM NORMAL	DEGREE DAYS	HIGHEST	DATE	LOWEST	DATE	MAX. ≥ 90°	MAX. ≤ 32°	MIN. ≤ 32°	MIN. ≤ 0°	TOTAL	DEPART. FROM NORMAL	GREATEST OBSERVED DAY	DATE	TOTAL FALL	GREAT-EST DEPTH	DATE	≥ .10	≥ .50
79	01														6.84		1.62	25	20.5	10	31+	14	5
79	02														1.89		.65	24	5.5	13	20+	6	1
79	03														3.22		.96	7	1.8	8	4+	9	2
79	04														4.18		.62	29	4.0	3	10	13	2
79	05														5.41		2.22	25	.0	0		8	4
79	06														2.54		1.68	29	.0	0		3	2
79	07														4.87		1.12	17	.0	0		8	4
79	08														3.11		.99	13	.0	0		8	1
79	09														8.73		3.72	7	.0	0		8	5
79	10														4.78		1.51	2	T	0		6	4
79	11														4.43		1.38	3				9	2
79	12														1.34		.37	25	1.5	1	17+	5	0
79	ANN.														51.34		3.72	9		13	2	97	32
		ANNUAL MEANS				SUM	ANNUAL EXTREMES				ANNUAL SUMS						EXTREME		SUM	EXTREME		SUMS	
		SUM	SUM	SUM	NORMAL	DEP.	DIFF.	ERROR							NORMAL	DEP.	DIFF.	ERROR					

"M" : MISSING DAYS
"+" AFTER DATE : ALSO OTHER DAYS
"T" : TRACE

BEST COPY AVAILABLE

Appendix 4

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT

STREAMFLOW DATA
LOW FLOW PERIOD
OCTOBER 6 – NOVEMBER 25,1992

MEASUREMENT DATE	STATION S-01 FLOW (GPM)	STATION S-02 FLOW (GPM)	STATION S-03 FLOW (GPM)	STATION S-04 FLOW (GPM)	STATION S-05 FLOW (GPM)
24-Sept-92	6.28	7.30	17.90	49.10	6036.76
1-Oct-92	4.07	4.46	(a)	44.89	5355.00
8-Oct-92	3.30 (*)	3.27	(a)	0.00 (b)	6270.00
15-Oct-92	5.52(*)	4.22	(a)	0.00 (b)	8473.00
22-Oct-92	8.30(*)	10.35	40.39	34.40	9013.00
29-Oct-92	8.37(*)	7.83	58.00	137.00	10318.60
5-Nov-92	12.65(*)	15.20	239.62	199.70	20148.00
19-Nov-92	27.34(*)	16.40	407.00	403.00	11873.79

(a) Insufficient flow to determine flow rate using available measurement devices.
(b) No visible surface flow observed.
(*) Flow collected represents average of 3 hr. data coinciding with the time of day that other surface water readings were collected at S-02 through S-05.

B:\OCTSTA.WK1

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT

STREAMFLOW DATA
HIGH FLOW PERIOD
APRIL 5 – APRIL 30,1993

MEASUREMENT DATE	STATION S–01 FLOW (GPM)	STATION S–02 FLOW (GPM)	STATION S–03 FLOW (GPM)	STATION S–04 FLOW (GPM)	STATION S–05 FLOW (GPM)
5–APR–93	416.74(*)	500.44	2423.68	5062.80	41108.34
16–APR–93	699.79(*)	926.00	6210.46	8320.85	(a)
23–APR–93	1130.99(*)	1705.00	7950.57	14304.21	(a)
30–APR–93	309.64(*)	698.37	4986.00	6660.18	50955.67

(a) Total flow depth 4.5 to 5.0 feet,1.5 to 2.0 feet above greatest flow depth measured on 30–April–93.Flow depth exeeded margin of safty for river crossing. No flow rates recorded.

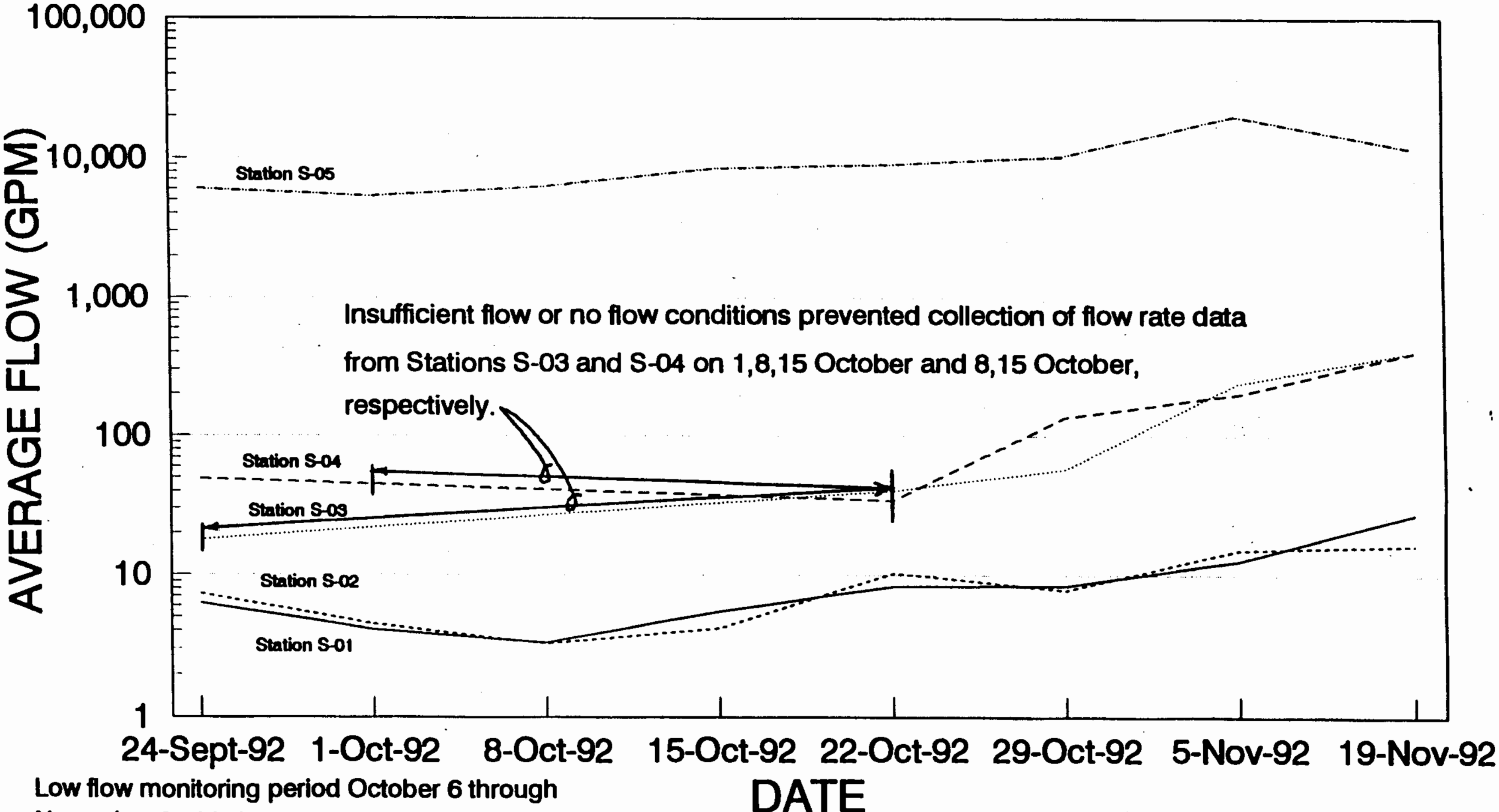
(*) Flows represent 3 hr. averages at S–01 at approximate time that readings were collected from S–02 through S–05.

B:\HIGHST.WK1

BURGESS BROTHERS SUPERFUND SITE

WOODFORD AND BENNINGTON, VERMONT

STREAMFLOW MONITORING



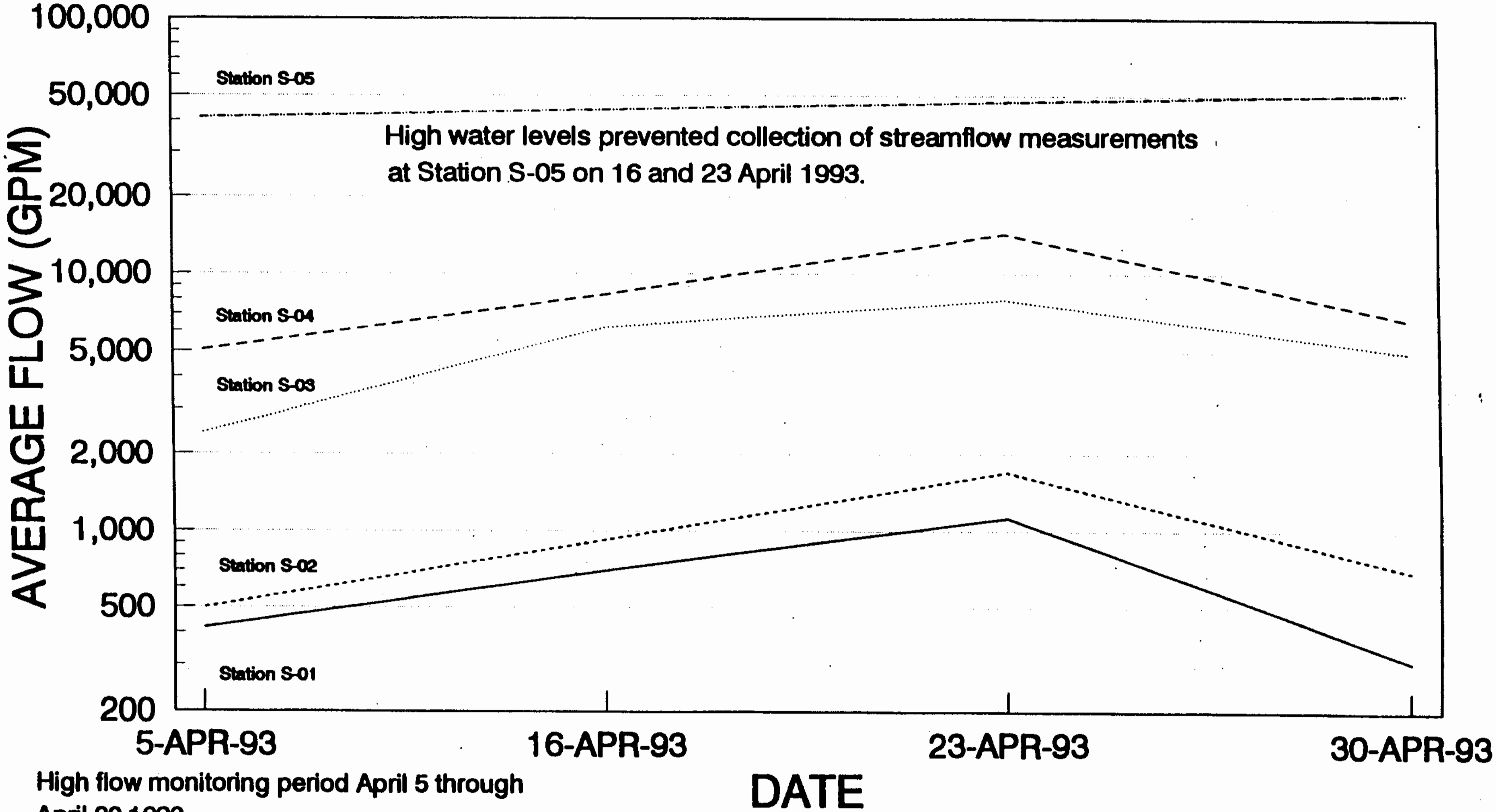
Low flow monitoring period October 6 through November 25,1992

Note: Flow data represents averages of 3 hour data coinciding with the time of day that surface water readings were collected.

BURGESS BROTHERS SUPERFUND SITE

WOODFORD AND BENNINGTON, VERMONT

STREAMFLOW MONITORING



High flow monitoring period April 5 through April 30,1992

Note: Flow data represents 3 hour averages at approximate time of day that surface water readings were collected.

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
STATION S-01
STREAMFLOW DATA
LOW FLOW PERIOD
OCTOBER 6 - NOVEMBER 25,1992

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFM)	FLOW (GPM)
921006	1.2805	0.0945	0.4300	3.22
	1.2805	0.0945	0.4300	3.22
	1.2805	0.0945	0.4300	3.22
	1.2840	0.0980	0.4705	3.52
AVERAGE DAILY FLOW			0.4401	3.29

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921007	1.2840	0.0980	0.4705	3.52
	1.2870	0.1010	0.5071	3.79
	1.2870	0.1010	0.5071	3.79
	1.2825	0.0965	0.4529	3.39
	1.2855	0.0995	0.4886	3.65
	1.2845	0.0985	0.4765	3.56
	1.2810	0.0950	0.4356	3.26
	1.2810	0.0950	0.4356	3.26
AVERAGE DAILY FLOW			0.4591	3.43

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921008	1.2835	0.0975	0.4646	3.48
	1.2840	0.0980	0.4705	3.52
	1.2870	0.1010	0.5071	3.79
	1.2815	0.0955	0.4413	3.30
	1.2875	0.1015	0.5133	3.84
	1.2875	0.1015	0.5133	3.84
	1.2870	0.1010	0.5071	3.79
	1.2870	0.1010	0.5071	3.79
AVERAGE DAILY FLOW			0.5102	3.82

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921009	1.2870	0.1010	0.5071	3.79
	1.2870	0.1010	0.5071	3.79
	1.2870	0.1010	0.5071	3.79
	1.2905	0.1045	0.5518	4.13
	1.3150	0.1290	0.9303	6.96
	1.3380	0.1520	1.3974	10.45
	1.3192	0.1332	1.0066	7.53
	1.3147	0.1287	0.9243	6.91
AVERAGE DAILY FLOW			1.0647	7.96

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
STATION S-01
STREAMFLOW DATA
LOW FLOW PERIOD
OCTOBER 6 - NOVEMBER 25,1992

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921010	1.4873	0.3013	7.6276	57.05
	1.4683	0.2823	6.4899	48.54
	1.4382	0.2522	4.9038	36.68
	1.4170	0.2310	3.9456	29.51
	1.4100	0.2240	3.6557	27.34
	1.4035	0.2175	3.3982	25.42
	1.4005	0.2145	3.2831	24.56
	1.4020	0.2160	3.3404	24.99
AVERAGE DAILY FLOW			3.4193	25.58

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921011	1.4040	0.2180	3.4176	25.56
	1.4060	0.2200	3.4959	26.15
	1.4060	0.2200	3.4959	26.15
	1.4095	0.2235	3.6355	27.19
	1.4145	0.2285	3.8405	28.73
	1.4192	0.2332	4.0380	30.20
	1.4455	0.2595	5.2652	39.38
	1.4590	0.2730	5.9708	44.66
AVERAGE DAILY FLOW			4.7786	35.74

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921012	1.4600	0.2740	6.0252	45.07
	1.4625	0.2765	6.1625	46.10
	1.4650	0.2790	6.3016	47.14
	1.4665	0.2805	6.3859	47.77
	1.4680	0.2820	6.4710	48.40
	1.4680	0.2820	6.4710	48.40
	1.4710	0.2850	6.6430	49.69
	1.4710	0.2850	6.6430	49.69
AVERAGE DAILY FLOW			6.5570	49.05

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
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STREAMFLOW DATA
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OCTOBER 6 - NOVEMBER 25,1992

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921013	1.4730	0.2870	6.7592	50.56
	1.4750	0.2890	6.8767	51.44
	1.4635	0.2775	6.2179	46.51
	1.2940	0.1080	0.5987	4.48
	1.2950	0.1090	0.6126	4.58
	1.2960	0.1100	0.6266	4.69
	1.2960	0.1100	0.6266	4.69
	1.2960	0.1100	0.6266	4.69
AVERAGE DAILY FLOW			0.6231	4.66

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921014	1.2973	0.1113	0.6456	4.83
	1.3015	0.1155	0.7072	5.29
	1.3030	0.1170	0.7302	5.46
	1.3030	0.1170	0.7302	5.46
	1.2845	0.0985	0.4765	3.56
	1.3030	0.1170	0.7302	5.46
	1.3035	0.1175	0.7380	5.52
AVERAGE DAILY FLOW			0.6687	5.00

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921015	1.3030	0.1170	0.7302	5.46
	1.3030	0.1170	0.7302	5.46
	1.3085	0.1225	0.8183	6.12
	1.3035	0.1175	0.7380	5.52
	1.3060	0.1200	0.7775	5.82
	1.3110	0.1250	0.8604	6.44
	1.3270	0.1410	1.1599	8.68
	1.3683	0.1823	2.1943	16.41
AVERAGE DAILY FLOW			1.2480	9.34

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
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DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921016	1.3515	0.1655	1.7257	12.91
	1.3503	0.1643	1.6957	12.68
	1.3518	0.1658	1.7343	12.97
	1.3505	0.1645	1.7000	12.72
	1.3440	0.1580	1.5382	11.51
	1.3420	0.1560	1.4904	11.15
	1.3420	0.1560	1.4904	11.15
	1.3473	0.1613	1.6200	12.12
AVERAGE DAILY FLOW			1.5347	11.48

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921017	1.3560	0.1700	1.8444	13.80
	1.3565	0.1705	1.8579	13.90
	1.3600	0.1740	1.9539	14.62
	1.3630	0.1770	2.0386	15.25
	1.3580	0.1720	1.8987	14.20
	1.3585	0.1725	1.9124	14.31
	1.3590	0.1730	1.9262	14.41
	1.3615	0.1755	1.9960	14.93
AVERAGE DAILY FLOW			1.9333	14.46

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921018	1.3620	0.1760	2.0101	15.04
	1.3650	0.1790	2.0962	15.68
	1.3650	0.1790	2.0962	15.68
	1.3695	0.1835	2.2293	16.68
	1.3742	0.1882	2.3736	17.75
	1.3780	0.1920	2.4942	18.66
	1.3902	0.2042	2.9048	21.73
	1.4023	0.2163	3.3500	25.06
AVERAGE DAILY FLOW			2.7806	20.80

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
STATION S-01
STREAMFLOW DATA
LOW FLOW PERIOD
OCTOBER 6 – NOVEMBER 25,1992

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921019	1.3998	0.2138	3.2579	24.37
	1.4040	0.2180	3.4176	25.56
	1.4095	0.2235	3.6355	27.19
	1.3750	0.1890	2.3987	17.94
	1.3735	0.1875	2.3518	17.59
	1.3730	0.1870	2.3362	17.48
	1.3875	0.2015	2.8116	21.03
	1.3855	0.1995	2.7429	20.52
AVERAGE DAILY FLOW			2.5606	19.15

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921020	1.3815	0.1955	2.6085	19.51
	1.3730	0.1870	2.3362	17.48
	1.3665	0.1805	2.1400	16.01
	1.3692	0.1832	2.2193	16.60
	1.3875	0.2015	2.8116	21.03
	1.3945	0.2085	3.0601	22.89
	1.3890	0.2030	2.8638	21.42
	1.3850	0.1990	2.7259	20.39
AVERAGE DAILY FLOW			2.8653	21.43

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921021	1.3840	0.1980	2.6920	20.14
	1.3830	0.1970	2.6584	19.89
	1.3860	0.2000	2.7600	20.64
	1.3735	0.1875	2.3518	17.59
	1.3390	0.1530	1.4203	10.62
	1.3330	0.1470	1.2862	9.62
	1.3290	0.1430	1.2011	8.98
	1.3255	0.1395	1.1295	8.45
AVERAGE DAILY FLOW			1.2593	9.42

BURGESS BROTHERS SUPERFUND SITE
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STREAMFLOW DATA
LOW FLOW PERIOD
OCTOBER 6 – NOVEMBER 25,1992

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921022	1.3250	0.1390	1.1195	8.37
	1.3250	0.1390	1.1195	8.37
	1.3217	0.1357	1.0541	7.88
	1.3185	0.1325	0.9941	7.44
	1.3245	0.1385	1.1095	8.30
	1.3192	0.1332	1.0066	7.53
	1.3180	0.1320	0.9849	7.37
	1.3180	0.1320	0.9849	7.37
AVERAGE DAILY FLOW			1.0215	7.64

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921023	1.3155	0.1295	0.9392	7.03
	1.3150	0.1290	0.9303	6.96
	1.3160	0.1300	0.9483	7.09
	1.3185	0.1325	0.9941	7.44
	1.3223	0.1363	1.0670	7.98
	1.3210	0.1350	1.0413	7.79
	1.3210	0.1350	1.0413	7.79
	1.3210	0.1350	1.0413	7.79
AVERAGE DAILY FLOW			1.0477	7.84

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921024	1.3210	0.1350	1.0413	7.79
	1.3230	0.1370	1.0800	8.08
	1.3275	0.1415	1.1701	8.75
	1.3325	0.1465	1.2753	9.54
	1.4087	0.2227	3.6019	26.94
	1.3953	0.2093	3.0905	23.12
	1.4747	0.2887	6.8570	51.29
	1.4333	0.2473	4.6740	34.96
AVERAGE DAILY FLOW			4.5559	34.08

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STREAMFLOW DATA
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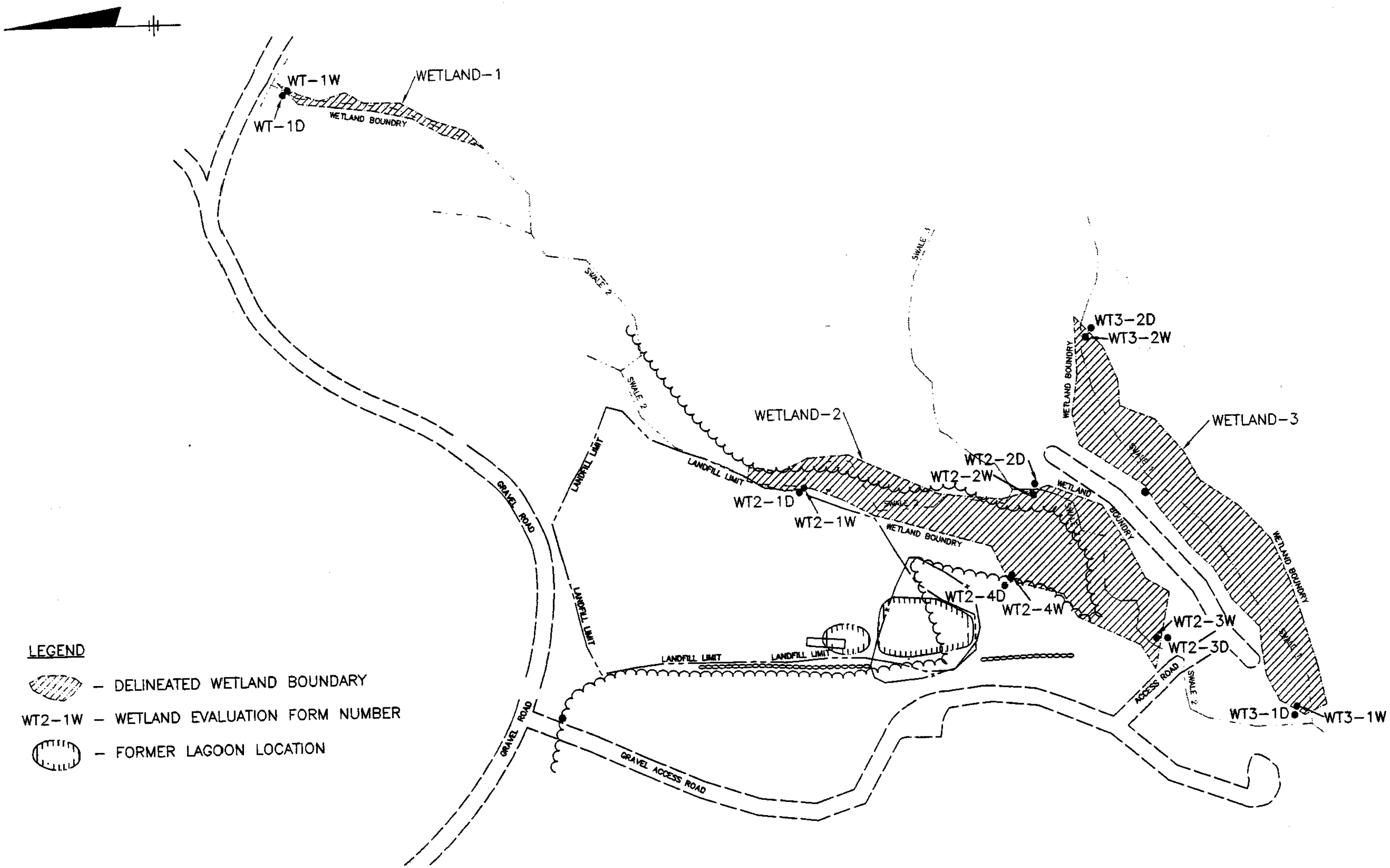
DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921025	1.3867	0.2007	2.7828	20.82
	1.3665	0.1805	2.1400	16.01
	1.3580	0.1720	1.8987	14.20
	1.3525	0.1665	1.7517	13.10
	1.3520	0.1660	1.7387	13.01
	1.3480	0.1620	1.6366	12.24
	1.3460	0.1600	1.5870	11.87
	1.3400	0.1540	1.4435	10.80
AVERAGE DAILY FLOW			1.6014	11.98

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921026	1.3375	0.1515	1.3860	10.37
	1.3355	0.1495	1.3411	10.03
	1.3365	0.1505	1.3635	10.20
	1.3335	0.1475	1.2970	9.70
	1.3400	0.1540	1.4435	10.80
	1.3400	0.1540	1.4435	10.80
	1.3390	0.1530	1.4203	10.62
	1.3375	0.1515	1.3860	10.37
AVERAGE DAILY FLOW			1.4233	10.65

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921027	1.3370	0.1510	1.3747	10.28
	1.3370	0.1510	1.3747	10.28
	1.3370	0.1510	1.3747	10.28
	1.3350	0.1490	1.3300	9.95
	1.3360	0.1500	1.3522	10.11
	1.3355	0.1495	1.3411	10.03
	1.3340	0.1480	1.3080	9.78
	1.3318	0.1458	1.2610	9.43
AVERAGE DAILY FLOW			1.3156	9.84



O'BRIEN & GERE ENGINEERS, INC.

BURGESS BROTHERS SUPERFUND SITE
REMEDIAL INVESTIGATION
WETLAND BOUNDARIES

FILE NO.	FIGURE
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DATE NOVEMBER 1995	

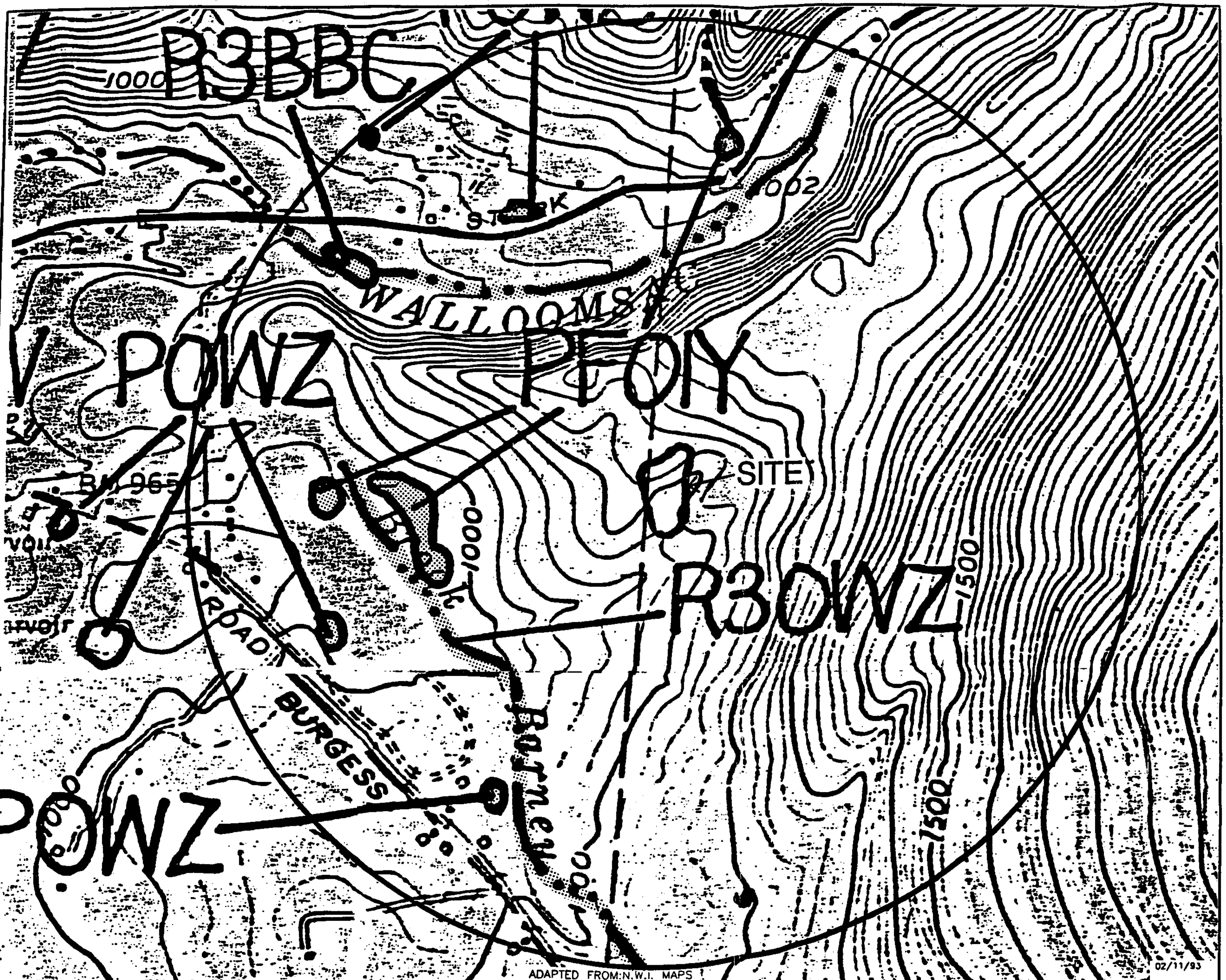

FIGURE 2

BURGESS BROTHERS SUPERFUND SIT
WOODFORD AND BENNINGTON, VERMO

LEGEND

WETLAND AREA

PF01Y NWI Wetland Classification

NATIONAL WETLAND INVENTORY MAP

600 0 600

APPROX. SCALE IN FEET

5271.001.302

O'BRIEN & GERE ENGINEERS, INC.

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
STATION S-01
STREAMFLOW DATA
LOW FLOW PERIOD
OCTOBER 6 - NOVEMBER 25,1992

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921028	1.3330	0.1470	1.2862	9.62
	1.3330	0.1470	1.2862	9.62
	1.3340	0.1480	1.3080	9.78
	1.3340	0.1480	1.3080	9.78
	1.3350	0.1490	1.3300	9.95
	1.3355	0.1495	1.3411	10.03
	1.3350	0.1490	1.3300	9.95
	1.3335	0.1475	1.2970	9.70
AVERAGE DAILY FLOW			1.3245	9.91

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
92102	1.3313	0.1453	1.2503	9.35
	1.3340	0.1480	1.3080	9.78
	1.3335	0.1475	1.2970	9.70
	1.3283	0.1423	1.1873	8.88
	1.3250	0.1390	1.1195	8.37
	1.3270	0.1410	1.1599	8.68
	1.3537	0.1677	1.7823	13.33
	1.3615	0.1755	1.9960	14.93
AVERAGE DAILY FLOW			1.5144	11.33

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921030	1.3473	0.1613	1.6200	12.12
	1.3420	0.1560	1.4904	11.15
	1.3385	0.1525	1.4088	10.54
	1.3370	0.1510	1.3747	10.28
	1.3370	0.1510	1.3747	10.28
	1.3365	0.1505	1.3635	10.20
	1.3370	0.1510	1.3747	10.28
	1.3370	0.1510	1.3747	10.28
AVERAGE DAILY FLOW			1.3719	10.26

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
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DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921031	1.3370	0.1510	1.3747	10.28
	1.3355	0.1495	1.3411	10.03
	1.3333	0.1473	1.2934	9.67
	1.3400	0.1540	1.4435	10.80
	1.3425	0.1565	1.5023	11.24
	1.3430	0.1570	1.5142	11.33
	1.3435	0.1575	1.5262	11.42
	1.3455	0.1595	1.5747	11.78
	AVERAGE DAILY FLOW		1.5293	11.44

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921101	1.3435	0.1575	1.5262	11.42
	1.3460	0.1600	1.5870	11.87
	1.3467	0.1607	1.6034	11.99
	1.3460	0.1600	1.5870	11.87
	1.3500	0.1640	1.6872	12.62
	1.3493	0.1633	1.6702	12.49
	1.3488	0.1628	1.6576	12.40
	1.3385	0.1525	1.4088	10.54
	AVERAGE DAILY FLOW		1.6060	12.01

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921102	1.3390	0.1530	1.4203	10.62
	1.3445	0.1585	1.5503	11.60
	1.3455	0.1595	1.5747	11.78
	1.3540	0.1680	1.7911	13.40
	1.3555	0.1695	1.8310	13.70
	1.3570	0.1710	1.8715	14.00
	1.3580	0.1720	1.8987	14.20
	1.3495	0.1635	1.6745	12.52
	AVERAGE DAILY FLOW		1.8189	13.61

BURGESS BROTHERS SUPERFUND SITE
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DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921103	1.3658	0.1798	2.1205	15.86
	1.3958	0.2098	3.1088	23.25
	1.4507	0.2647	5.5290	41.36
	1.4487	0.2627	5.4259	40.59
	1.4000	0.2140	3.2642	24.42
	1.3870	0.2010	2.7943	20.90
	1.4478	0.2618	5.3833	40.27
	1.3675	0.1815	2.1695	16.23
AVERAGE DAILY FLOW			3.4028	25.45

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921104	1.3570	0.1710	1.8715	14.00
	1.3548	0.1688	1.8132	13.56
	1.3502	0.1642	1.6914	12.65
	1.3530	0.1670	1.7648	13.20
	1.3525	0.1665	1.7517	13.10
	1.3535	0.1675	1.7779	13.30
	1.3520	0.1660	1.7387	13.01
	1.3530	0.1670	1.7648	13.20
AVERAGE DAILY FLOW			1.7583	13.15

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921105	1.3575	0.1715	1.8851	14.10
	1.3560	0.1700	1.8444	13.80
	1.3560	0.1700	1.8444	13.80
	1.3620	0.1760	2.0101	15.04
	1.3502	0.1642	1.6914	12.65
	1.3330	0.1470	1.2862	9.62
	1.3615	0.1755	1.9960	14.93
	1.4157	0.2297	3.8893	29.09
AVERAGE DAILY FLOW			2.2157	16.57

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
STATION S-01
STREAMFLOW DATA
LOW FLOW PERIOD
OCTOBER 6 - NOVEMBER 25,1992

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921106	1.3923	0.2063	2.9818	22.30
	1.3763	0.1903	2.4409	18.26
	1.3775	0.1915	2.4782	18.54
	1.4068	0.2208	3.5288	26.40
	1.4110	0.2250	3.6963	27.65
	1.4100	0.2240	3.6557	27.34
	1.3970	0.2110	3.1519	23.58
	1.3805	0.1945	2.5756	19.27
AVERAGE DAILY FLOW			3.2698	24.46

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
21107	1.3953	0.2093	3.0905	23.12
	1.3895	0.2035	2.8813	21.55
	1.3777	0.1917	2.4835	18.58
	1.3748	0.1888	2.3935	17.90
	1.3765	0.1905	2.4462	18.30
	1.3750	0.1890	2.3987	17.94
	1.3712	0.1852	2.2799	17.05
	1.3715	0.1855	2.2900	17.13
AVERAGE DAILY FLOW			2.3537	17.61

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921108	1.3698	0.1838	2.2394	16.75
	1.3553	0.1693	1.8266	13.66
	1.3553	0.1693	1.8266	13.66
	1.3632	0.1772	2.0433	15.28
	1.3737	0.1877	2.3570	17.63
	1.3720	0.1860	2.3054	17.24
	1.3640	0.1780	2.0672	15.46
	1.3545	0.1685	1.8043	13.50
AVERAGE DAILY FLOW			2.1335	15.96

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DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921109	1.3630	0.1770	2.0386	15.25
	1.3635	0.1775	2.0529	15.36
	1.3560	0.1700	1.8444	13.80
	1.3658	0.1798	2.1205	15.86
	1.3905	0.2045	2.9166	21.82
	1.3895	0.2035	2.8813	21.55
	1.3728	0.1868	2.3311	17.44
	1.3600	0.1740	1.9539	14.62
AVERAGE DAILY FLOW			2.5207	18.86

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921110	1.3545	0.1685	1.8043	13.50
	1.3512	0.1652	1.7171	12.84
	1.3543	0.1683	1.7999	13.46
	1.3788	0.1928	2.5212	18.86
	1.3930	0.2070	3.0058	22.48
	1.3993	0.2133	3.2390	24.23
	1.3890	0.2030	2.8638	21.42
	1.3875	0.2015	2.8116	21.03
AVERAGE DAILY FLOW			2.9801	22.29

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921111	1.4057	0.2197	3.4828	26.05
	1.4095	0.2235	3.6355	27.19
	1.4178	0.2318	3.9810	29.78
	1.4145	0.2285	3.8405	28.73
	1.4202	0.2342	4.0811	30.53
	1.4438	0.2578	5.1817	38.76
	1.4122	0.2262	3.7440	28.00
	1.3927	0.2067	2.9938	22.39
AVERAGE DAILY FLOW			4.0001	29.92

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DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921112	1.3830	0.1970	2.6584	19.89
	1.3785	0.1925	2.5104	18.78
	1.3723	0.1863	2.3156	17.32
	1.3512	0.1652	1.7171	12.84
	1.3395	0.1535	1.4319	10.71
	1.3845	0.1985	2.7089	20.26
	1.3850	0.1990	2.7259	20.39
	1.3595	0.1735	1.9401	14.51
AVERAGE DAILY FLOW			2.2017	16.47

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921113	1.3850	0.1990	2.7259	20.39
	1.4558	0.2698	5.8005	43.39
	1.4678	0.2818	6.4615	48.33
	1.3930	0.2070	3.0058	22.48
	1.3788	0.1928	2.5212	18.86
	1.3695	0.1835	2.2293	16.68
	1.3645	0.1785	2.0817	15.57
	1.3600	0.1740	1.9539	14.62
AVERAGE DAILY FLOW			2.1965	16.43

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921114	1.3548	0.1688	1.8132	13.56
	1.3518	0.1658	1.7343	12.97
	1.3482	0.1622	1.6408	12.27
	1.3500	0.1640	1.6872	12.62
	1.3510	0.1650	1.7128	12.81
	1.3525	0.1665	1.7517	13.10
	1.3505	0.1645	1.7000	12.72
	1.3478	0.1618	1.6324	12.21
AVERAGE DAILY FLOW			1.6992	12.71

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DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921115	1.3415	0.1555	1.4786	11.06
	1.3762	0.1902	2.4356	18.22
	1.3820	0.1960	2.6251	19.64
	1.3860	0.2000	2.7600	20.64
	1.3920	0.2060	2.9699	22.21
	1.2238	0.0378	0.0444	0.33
	1.3875	0.2015	2.8116	21.03
	1.3830	0.1970	2.6584	19.89
AVERAGE DAILY FLOW			2.1211	15.87

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921116	1.3778	0.1918	2.4889	18.62
	1.3775	0.1915	2.4782	18.54
	1.3805	0.1945	2.5756	19.27
	1.3773	0.1913	2.4728	18.50
	1.4077	0.2217	3.5619	26.64
	1.4350	0.2490	4.7525	35.55
	1.4313	0.2453	4.5809	34.26
	1.4220	0.2360	4.1608	31.12
AVERAGE DAILY FLOW			4.2640	31.89

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921117	1.4257	0.2397	4.3229	32.34
	1.4268	0.2408	4.3753	32.73
	1.4485	0.2625	5.4174	40.52
	1.4690	0.2830	6.5280	48.83
	1.4808	0.2948	7.2260	54.05
	1.3208	0.1348	1.0381	7.77
	1.4915	0.3055	7.8918	59.03
	1.4890	0.3030	7.7326	57.84
AVERAGE DAILY FLOW			5.9722	44.67

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DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921118	1.4930	0.3070	7.9883	59.75
	1.4930	0.3070	7.9883	59.75
	1.4930	0.3070	7.9883	59.75
	1.4950	0.3090	8.1180	60.72
	1.4995	0.3135	8.4143	62.94
	1.5037	0.3177	8.6944	65.03
	1.5080	0.3220	8.9915	67.26
	1.5057	0.3197	8.8308	66.05
AVERAGE DAILY FLOW			8.7328	65.32

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921119	1.5005	0.3145	8.4811	63.44
	1.4947	0.3087	8.0963	60.56
	1.4860	0.3000	7.5442	56.43
	1.4440	0.2580	5.1900	38.82
	1.4100	0.2240	3.6557	27.34
	1.4140	0.2280	3.8197	28.57
	1.4140	0.2280	3.8197	28.57
	1.4037	0.2177	3.4047	25.47
AVERAGE DAILY FLOW			3.6749	27.49

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921120	1.4043	0.2183	3.4306	25.66
	1.3965	0.2105	3.1334	23.44
	1.3947	0.2087	3.0662	22.93
	1.3915	0.2055	2.9521	22.08
	1.4030	0.2170	3.3789	25.27
	1.4060	0.2200	3.4959	26.15
	1.4023	0.2163	3.3532	25.08
	1.3937	0.2077	3.0298	22.66
AVERAGE DAILY FLOW			3.3144	24.79

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DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921121	1.3947	0.2087	3.0662	22.93
	1.3965	0.2105	3.1334	23.44
	1.3925	0.2065	2.9878	22.35
	1.3980	0.2120	3.1891	23.85
	1.4123	0.2263	3.7508	28.06
	1.4640	0.2780	6.2457	46.72
	1.4830	0.2970	7.3585	55.04
	1.5002	0.3142	8.4588	63.27
AVERAGE DAILY FLOW			6.4534	48.27

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921122	1.4997	0.3137	8.4254	63.02
	1.4925	0.3065	7.9561	59.51
	1.4855	0.2995	7.5130	56.20
	1.4805	0.2945	7.2058	53.90
	1.4775	0.2915	7.0251	52.55
	1.4750	0.2890	6.8767	51.44
	1.4707	0.2847	6.6238	49.55
	1.5403	0.3543	11.3997	85.27
AVERAGE DAILY FLOW			7.9813	59.70

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921123	1.5442	0.3582	11.7080	87.58
	1.8303	0.6443	50.2279	375.70
	1.8163	0.6303	47.5647	355.78
	1.7740	0.5880	40.0319	299.44
	1.7418	0.5558	34.8187	260.44
	1.7175	0.5315	31.1601	233.08
	1.7090	0.5230	29.9388	223.94
	1.7075	0.5215	29.7263	222.35
AVERAGE DAILY FLOW			31.4110	234.95

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DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921124	1.7090	0.5230	29.9388	223.94
	1.7130	0.5270	30.5099	228.21
	1.7150	0.5290	30.7979	230.37
	1.7085	0.5225	29.8679	223.41
	1.7153	0.5293	30.8460	230.73
	1.7095	0.5235	30.0099	224.47
	1.7095	0.5235	30.0099	224.47
	1.7203	0.5343	31.5737	236.17
AVERAGE DAILY FLOW			30.6099	228.96

DATE	AVE.3-HR. DEPTH	CORR.3-HR. DEPTH	FLOW (CFS)	FLOW (GPM)
921125	1.7415	0.5555	34.7670	260.06
	1.8162	0.6302	47.5335	355.55
	1.8488	0.6628	53.8807	403.03
	1.8240	0.6380	49.0124	366.61
AVERAGE DAILY FLOW			46.2984	346.31

BURGESS BROTHERS SUPERFUND SITE
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STREAMFLOW DATA
HIGH FLOW PERIOD
APRIL 5 – APRIL 30,1993

MEASUREMENT	STATION S–01	STATION S–02	STATION S–03	STATION S–04	STATION S–05
DATE	FLOW (GPM)	FLOW (GPM)	FLOW (GPM)	FLOW (GPM)	FLOW (GPM)
5–APR–93	314.16	500.44	2423.68	5062.80	41108.34
16–APR–93	704.61	926.00	6210.46	8320.85	(a)
23–APR–93	1216.24	1705.00	7950.57	14304.21	(a)
30–APR–93	308.32	698.37	4986.00	6660.18	50955.67

(a) Total flow depth 4.5 to 5.0 feet,1.5 to 2.0 feet above greatest flow depth measured on 30–April–93.Flow depth exeeded margin of safty for river crossing. No flow rates recorded.

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DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930405	1.8160	0.6300	47.5024	355.32
	1.8060	0.6200	45.6543	341.49
	1.7985	0.6125	44.2969	331.34
	1.7993	0.6133	44.4466	332.46
	1.8578	0.6718	55.7133	416.74
	1.9568	0.7708	78.3452	586.02
	1.9427	0.7567	74.8228	559.67
	1.8938	0.7078	63.4132	474.33
AVERAGE DAILY FLOW			56.7743	424.67

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930406	1.8627	0.6767	56.7127	424.21
	1.8385	0.6525	51.8215	387.63
	1.8240	0.6380	49.0124	366.61
	1.8228	0.6368	48.7904	364.95
	1.9125	0.7265	67.6418	505.96
	2.0382	0.8522	100.4735	751.54
	1.9985	0.8125	89.2714	667.75
	1.9360	0.7500	73.1986	547.53
AVERAGE DAILY FLOW			67.1153	502.02

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930407	1.9007	0.7147	64.9423	485.77
	1.8745	0.6885	59.2042	442.85
	1.8545	0.6685	55.0303	411.63
	1.8510	0.6650	54.3186	406.30
	1.9528	0.7668	77.3409	578.51
	2.0833	0.8973	114.2026	854.24
	2.0397	0.8537	100.9127	754.83
	1.9725	0.7865	82.3538	616.01
AVERAGE DAILY FLOW			76.0382	568.77

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DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930408	1.9365	0.7505	73.3196	548.43
	1.9120	0.7260	67.5264	505.10
	1.8937	0.7077	63.3762	474.05
	1.8985	0.7125	64.4551	482.12
	2.0220	0.8360	95.8125	716.68
	2.1303	0.9443	129.6168	969.53
	2.0922	0.9062	117.0110	875.24
	2.0532	0.8672	104.9168	784.78
	AVERAGE DAILY FLOW		89.5043	669.49

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930409	2.0330	0.8470	98.9695	740.29
	2.0160	0.8300	94.1162	703.99
	2.0020	0.8160	90.2282	674.91
	2.0323	0.8463	98.7764	738.85
	2.1407	0.9547	133.1628	996.06
	2.2027	1.0167	155.6516	1164.27
	2.2022	1.0162	155.4618	1162.85
	2.1732	0.9872	144.6902	1082.28
	AVERAGE DAILY FLOW		121.3821	907.94

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930410	2.1615	0.9755	140.4864	1050.84
	2.1560	0.9700	138.5302	1036.21
	2.1647	0.9787	141.6201	1059.32
	2.2140	1.0280	159.9903	1196.73
	2.3058	1.1198	197.8113	1479.63
	2.3968	1.2108	240.1042	1795.98
	2.4205	1.2345	251.9118	1884.30
	2.7113	1.5253	425.6917	3184.17
	AVERAGE DAILY FLOW		212.0182	1585.90

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DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930411	2.6047	1.4187	355.6427	2660.21
	2.4890	1.3030	288.0134	2154.34
	2.4710	1.2850	278.2469	2081.29
	2.7042	1.5182	420.7488	3147.20
	2.4760	1.2900	280.9397	2101.43
	2.4135	1.2275	248.3842	1857.91
	2.3527	1.1667	218.9670	1637.87
	2.3025	1.1165	196.3542	1468.73
AVERAGE DAILY FLOW			285.9121	2138.62

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930412	2.2605	1.0745	178.5429	1335.50
Equipment	2.2282	1.0422	165.5140	1238.04
Malfunction	2.3052	1.1192	197.5193	1477.44
	2.2523	1.0663	175.1964	1310.47
	2.2382	1.0522	169.4940	1267.82
	65.3977	64.2117	**************	33973068.35
	65.4015	64.2155	**************	33978098.35
	65.4050	64.2190	**************	33982691.35
AVERAGE DAILY FLOW			**************	12742560.92

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930413	65.4092	64.2232	**************	33988159.69
Equipment	65.4147	64.2287	**************	33995378.70
Malfunction	65.4192	64.2332	**************	34001285.85
	65.4190	64.2330	**************	34001067.05
	65.4152	64.2292	**************	33996035.02
	65.4202	64.2342	**************	34002598.63
	65.4233	64.2373	**************	34006755.97
	65.4262	64.2402	**************	34010475.96
AVERAGE DAILY FLOW			**************	34000219.61

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DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930414	65.4292	64.2432	**************	34014415.03
Equipment	65.4308	64.2448	**************	34016603.52
Malfunction	65.4332	64.2472	**************	34019667.55
	65.4355	64.2495	**************	34022731.75
	65.4367	64.2507	**************	34024263.91
	65.4367	64.2507	**************	34024263.91
AVERAGE DAILY FLOW			**************	34020324.28

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930415	1.9290	0.7430	71.5159	534.94
	1.9218	0.7358	69.8174	522.23
	1.9170	0.7310	68.6856	513.77
	1.9130	0.7270	67.7573	506.82
	1.9140	0.7280	67.9887	508.56
	1.9282	0.7422	71.3172	533.45
	1.9507	0.7647	76.8001	574.46
	1.9655	0.7795	80.5480	602.50
AVERAGE DAILY FLOW			71.8038	537.09

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930416	1.9737	0.7877	82.6571	618.27
	1.9825	0.7965	84.9750	635.61
	1.9885	0.8025	86.5714	647.55
	1.9980	0.8120	89.1353	666.73
	2.0140	0.8280	93.5547	699.79
	2.0380	0.8520	100.4248	751.18
	2.0535	0.8675	105.0168	785.53
	2.0940	0.9080	117.5990	879.64
AVERAGE DAILY FLOW			94.9918	710.54

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STATION S-01
STREAMFLOW DATA
HIGH FLOW PERIOD
APRIL 5 - APRIL 30,1993

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930417	2.3195	1.1335	203.8525	1524.82
	2.2695	1.0835	182.2747	1363.41
	2.2007	1.0147	154.8933	1158.60
	2.1583	0.9723	139.3581	1042.40
	2.2683	1.0823	181.7883	1359.78
	2.2277	1.0417	165.3172	1236.57
	2.1667	0.9807	142.3389	1064.70
	2.1215	0.9355	126.6308	947.20
AVERAGE DAILY FLOW			162.0567	1212.18

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930418	2.0898	0.9038	116.2652	869.66
	2.0635	0.8775	108.0447	808.17
	2.0472	0.8612	103.1257	771.38
	2.0235	0.8375	96.2394	719.87
	2.0033	0.8173	90.5943	677.65
	1.9880	0.8020	86.4377	646.55
	1.9725	0.7865	82.3538	616.01
	1.9560	0.7700	78.1354	584.45
AVERAGE DAILY FLOW			95.1495	711.72

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930419	1.9458	0.7598	75.6018	565.50
	1.9340	0.7480	72.7154	543.91
	1.9230	0.7370	70.0922	524.29
	1.9140	0.7280	67.9887	508.56
	1.9038	0.7178	65.6582	491.12
	1.8925	0.7065	63.1174	472.12
	1.8850	0.6990	61.4687	459.79
	1.8765	0.6905	59.6316	446.04
AVERAGE DAILY FLOW			67.0343	501.42

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
STATION S-01
STREAMFLOW DATA
HIGH FLOW PERIOD
APRIL 5 – APRIL 30,1993

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930420	1.8685	0.6825	57.9329	433.34
	1.8620	0.6760	56.5742	423.17
	1.8530	0.6670	54.7246	409.34
	1.8475	0.6615	53.6123	401.02
	1.8345	0.6485	51.0373	381.76
	1.8240	0.6380	49.0124	366.61
	1.8170	0.6310	47.6896	356.72
	1.8100	0.6240	46.3883	346.98
AVERAGE DAILY FLOW			52.1214	389.87

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930421	1.8070	0.6210	45.8372	342.86
	1.8015	0.6155	44.8370	335.38
	1.7935	0.6075	43.4056	324.67
	1.7885	0.6025	42.5250	318.09
	1.7850	0.5990	41.9150	313.52
	1.7810	0.5950	41.2242	308.36
	1.7735	0.5875	39.9475	298.81
	1.7640	0.5780	38.3647	286.97
AVERAGE DAILY FLOW			42.2570	316.08

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930422	1.7855	0.5995	42.0018	314.17
	1.9777	0.7917	83.7020	626.09
	1.9115	0.7255	67.4111	504.24
	1.9943	0.8083	88.1404	659.29
	2.1417	0.9557	133.5090	998.65
	2.0892	0.9032	116.0526	868.07
	2.4007	1.2147	241.9938	1810.11
	2.9693	1.7833	627.2018	4691.47
AVERAGE DAILY FLOW			175.0016	1309.01

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
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STREAMFLOW DATA
HIGH FLOW PERIOD
APRIL 5 – APRIL 30,1993

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930423	2.9210	1.7350	585.8862	4382.43
	2.4257	1.2397	254.5346	1903.92
	2.2978	1.1118	194.3252	1453.55
	2.2203	1.0343	162.4459	1215.10
	2.1907	1.0047	151.1350	1130.49
	2.1667	0.9807	142.3389	1064.70
	2.1433	0.9573	134.0872	1002.97
	2.0990	0.9130	119.2115	891.70
AVERAGE DAILY FLOW			217.9956	1630.61

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930424	2.0622	0.8762	107.6380	805.13
	2.0340	0.8480	99.2596	742.46
	2.0080	0.8220	91.8825	687.28
	1.9990	0.8130	89.4077	668.77
	2.0818	0.8958	113.7298	850.70
	2.2525	1.0665	175.2643	1310.98
	2.2433	1.0573	171.5522	1283.21
	2.1840	0.9980	148.6601	1111.98
AVERAGE DAILY FLOW			124.6743	932.56

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930425	2.1732	0.9872	144.6902	1082.28
	2.1818	0.9958	147.8610	1106.00
	2.1573	0.9713	139.0029	1039.74
	2.1365	0.9505	131.7261	985.31
	2.1290	0.9430	129.1634	966.14
	2.1188	0.9328	125.7375	940.52
	2.0955	0.9095	118.0813	883.25
	2.0730	0.8870	110.9689	830.05
AVERAGE DAILY FLOW			130.9039	979.16

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
STATION S-01
STREAMFLOW DATA
HIGH FLOW PERIOD
APRIL 5 - APRIL 30,1993

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930426	2.0478	0.8618	103.3238	772.86
	2.0283	0.8423	97.6227	730.22
	2.0165	0.8305	94.2568	705.04
	2.0740	0.8880	111.2794	832.37
	2.0442	0.8582	102.2370	764.73
	2.1313	0.9453	129.9575	972.08
	2.4100	1.2240	246.6315	1844.80
	2.4308	1.2448	257.1736	1923.66
AVERAGE DAILY FLOW			142.8103	1068.22

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930427	2.2940	1.1080	192.6678	1441.16
	2.1965	1.0105	153.3207	1146.84
	2.1343	0.9483	130.9827	979.75
	2.1018	0.9158	120.1311	898.58
	2.0995	0.9135	119.3735	892.91
	2.0610	0.8750	107.2829	802.48
	2.0320	0.8460	98.6800	738.13
	2.0135	0.8275	93.4147	698.74
AVERAGE DAILY FLOW			126.9817	949.82

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930428	1.9980	0.8120	89.1353	666.73
	1.9835	0.7975	85.2399	637.59
	1.9655	0.7795	80.5480	602.50
	1.9565	0.7705	78.2612	585.39
	1.9405	0.7545	74.2926	555.71
	1.9273	0.7413	71.1188	531.97
	1.9140	0.7280	67.9887	508.56
	1.9033	0.7173	65.5449	490.28
AVERAGE DAILY FLOW			76.5161	572.34

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT
STATION S-01
STREAMFLOW DATA
HIGH FLOW PERIOD
APRIL 5 - APRIL 30,1993

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930429	1.8920	0.7060	63.0066	471.29
	1.8835	0.6975	61.1421	457.34
	1.8740	0.6880	59.0976	442.05
	1.8670	0.6810	57.6176	430.98
	1.8550	0.6690	55.1325	412.39
	1.8417	0.6557	52.4475	392.31
	1.8320	0.6460	50.5507	378.12
	1.8213	0.6353	48.5059	362.82
AVERAGE DAILY FLOW			55.9376	418.41

DATE	AVE.3-HR. DEPTH	CORR.3-HR.DEPTH	FLOW (CFS)	FLOW (GPM)
930430	1.8110	0.6250	46.5729	348.37
	1.8040	0.6180	45.2900	338.77
	1.7953	0.6093	43.7311	327.11
	1.7875	0.6015	42.3502	316.78
	1.7820	0.5960	41.3963	309.64
	1.7730	0.5870	39.8633	298.18
	1.7650	0.5790	38.5295	288.20
	1.7570	0.5710	37.2227	278.43
AVERAGE DAILY FLOW			41.8695	313.18

Appendix 5

BURGESS BROTHERS SUPERFUND SITE
WETLAND DELINEATION REPORT

WOODFORD AND BENNINGTON, VERMONT

Prepared for

BURGESS BROTHERS SUPERFUND SITE
STEERING COMMITTEE

MARCH 1993

Prepared by

O'BRIEN & GERE ENGINEERS, INC.
5000 BRITTONFIELD PARKWAY
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BURGESS BROTHERS SUPERFUND SITE
WETLAND DELINEATION REPORT
WOODFORD AND BENNINGTON, VERMONT

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BURGESS BROTHERS SUPERFUND SITE
WETLAND DELINEATION REPORT

WOODFORD AND BENNINGTON, VERMONT

SECTION 1 INTRODUCTION

This report presents the results of a wetland delineation performed by O'Brien & Gere Engineers, Inc. in June, 1992 at the Burgess Brothers Superfund Site (the site) in Woodford and Bennington, Vermont. The delineation efforts resulted in the identification of three wetland areas as shown on Figure 1. The wetland/upland boundaries on the site were identified in accordance with the *Corps of Engineers Wetlands Delineation Manual* (Federal Manual) (Environmental Laboratory, 1987), which is the current federal method for identifying and delineating wetland areas. According to the manual, wetland criteria require the presence of: hydric soils, a dominance of hydrophytic vegetation, and wetland hydrology for an area to be considered a wetland.

This report presents documentation of information obtained from regulatory sources and the observed field characteristics which resulted in the delineated wetland boundaries. The report is divided into six additional sections entitled State and Federal Wetland Map Review, Hydric Soil Evaluation, Hydrophytic Vegetation Evaluation, Wetland Hydrology Evaluation, Wetland Delineation, and Conclusions. These sections are presented and discussed below.

SECTION 2 FEDERAL WETLAND MAP REVIEW

Federal wetland areas are identified and mapped by the U.S. Fish and Wildlife Service of the Department of the Interior as part of the National Wetland Inventory (NWI). The NWI is a method used to quantify waterfowl habitat in the United States. Wetland areas identified on the NWI maps do not have jurisdictional significance, however, they do provide an indication of potential federal wetland locations. Figure 2 presents the site location and wetland areas identified by the NWI. As shown on the figure, no wetland areas are present on the site. Several small palustrine or riverine wetland areas occur within 0.5 miles of the site (Figure 2).

SECTION 3 HYDRIC SOIL EVALUATION

The presence of hydric soils is one of the criteria for federal wetland identification. Soil types on the site were preliminarily evaluated through a review of the Bennington County Soil Survey (USDA, 1974). Figure 3 presents the site soils map from the Bennington County Soil Survey. According to the survey, the majority of the site is classified as "Gravel Pit", referring to soil that has been modified due to excavation or filling activities. Surrounding the site are soils belonging to Pittsfield (94c), Massena (69B), Georgia (67C) and Windsor (18D) soil series'. Based on the list of Hydric Soils in Bennington County, Vermont (SCS, 1989), no soils are considered hydric in the vicinity of the site. However, Pittsfield and Georgia soils have potential hydric inclusions (SCS,1989). Soils on the site were further evaluated by advancing test holes with a hand auger and matching the soil characteristics observed in the field with the soil series descriptions presented in the soil survey or with the list of hydric soil characteristics presented in the Federal Manual. Table 1 presents the soil types identified by the soil survey in each area and the soil type actually found in that area during field investigations. As shown on Table 1, hydric soils were present in each wetland area.

SECTION 4 HYDROPHYTIC VEGETATION EVALUATION

Each of the wetland areas was evaluated for hydrophytic vegetation by censusing the dominant plant communities and determining the wetland indicator status of the dominant plants according to the *National List of Plant Species That Occur in Wetlands: New York* (USDI, 1988). The USDI document ranks plant species on their probability of occurring in a wetland. The Federal Manual requires a wetland to contain a dominance (>50%) of vegetation which requires an abundance of water (hydrophytic). Table 2 summarizes the percentage of hydrophytic vegetation present in each location. Upon evaluation of the percentages of total hydrophytic plant species in each community, wetland areas were found to contain greater than 50% hydrophytic vegetation, and therefore, met the federal wetland vegetation criterion.

SECTION 5 WETLAND HYDROLOGY EVALUATION

Wetland hydrology was evaluated by observing signs of inundation and depth to the water table in the soil borings advanced for soil evaluations. The wetland hydrology criterion was considered satisfied when areas were inundated or saturated to within 12-inches of the surface. Table 3 summarizes the wetland hydrology indicators which were present in each location. As shown on the table, the wetland hydrology criterion was met in each of the wetland areas.

SECTION 6 WETLAND DELINEATION

Figure 1 presents the surveyed boundaries of the three wetlands identified on the Burgess Bros. Superfund Site. Potential wetland and upland areas received vegetation censuses, hydric soil evaluations and wetland hydrology assessments as discussed above. Wetlands were identified by evaluating the physical site characteristics for the federal wetland criteria. Areas which met all three of the criteria were considered wetlands and areas which did not meet all three criteria were considered uplands. Table 4 summarizes the criteria for the investigated areas. Field data sheets, required by the Federal Manual, were completed for at least one location in each wetland and adjacent upland to document the observed field characteristics. The data sheets are presented in Appendix A.

The wetland/upland boundary was established based on paired criteria evaluation sites, one on either side of the boundary. Numerous paired evaluations were performed to refine the boundary location until the entire boundary was delineated. The delineated boundary was flagged with sequentially numbered orange surveyors tape to facilitate accurate surveying.

SECTION 7 CONCLUSIONS

The wetland delineation performed at the Burgess Bros. Landfill Site in Woodford and Bennington, Vermont identified a total of three distinct wetlands. These wetlands are located northeast, south and southeast of the site (Figure 1). The wetlands were identified and delineated in accordance with current federal criteria and guidance.

LITERATURE CITED

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*, Technical Report Y-87-1. US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Soil Conservation Service (SCS). 1989. *Hydric Soils in Bennington County, Vermont*. Soil Conservation Service.

United States Department of Agriculture (USDA). 1974. *Soil Survey of Bennington County, Vermont*. Soil Conservation Service in cooperation with State Agricultural Experiment Station.

United States Department of the Interior (USDI). 1988. *National List of Plant Species That Occur in Wetlands: New York*, Biological Report. Fish and Wildlife Service in cooperation with the National and Regional Interagency Review Panels.

TABLES

TABLE 1
HYDRIC SOIL EVALUATION

LOCATION	SOIL SURVEY SOIL TYPE	FIELD SOIL TYPE	HYDRIC SOIL
Wetland 1	Pittsfield	Pittsfield hydric inclusion	Yes
	Windsor		Yes
Upland 1	Pittsfield	Windsor	No
	Windsor		No
Wetland 2	Windsor	Unidentified*	Yes
	Massena		Yes
	Georgia		Yes
Upland 2	Windsor	Windsor	No
	Massena	Pittsfield	No
	Georgia		No
Wetland 3	Pittsfield	Unidentified*	Yes
	Massena		Yes
	Georgia		Yes
Upland 3	Pittsfield	Georgia	No
	Massena		No
	Georgia		No

* Unidentified soil series with hydric characteristics.

March 12, 1993

TABLE 2
HYDROPHYTIC VEGETATION EVALUATION

LOCATION	% HYDROPHYTIC (OBL, FACW, FAC)	HYDROPHYTIC CRITERION MET
Wetland 1		
Location 1 Wetland	100	Yes
Location 1 Upland	50	No
Wetland 2		
Location 1 Wetland	57	Yes
Location 1 Upland	55	Yes
Location 2 Wetland	100	Yes
Location 2 Upland	33	No
Location 3 Wetland	100	Yes
Location 3 Upland	33	No
Location 4 Wetland	75	Yes
Location 4 Upland	33	No
Wetland 3		
Location 1 Wetland	86	Yes
Location 1 Upland	50	No
Location 2 Wetland	88	Yes
Location 2 Upland	71	Yes

TABLE 3
WETLAND HYDROLOGY EVALUATION

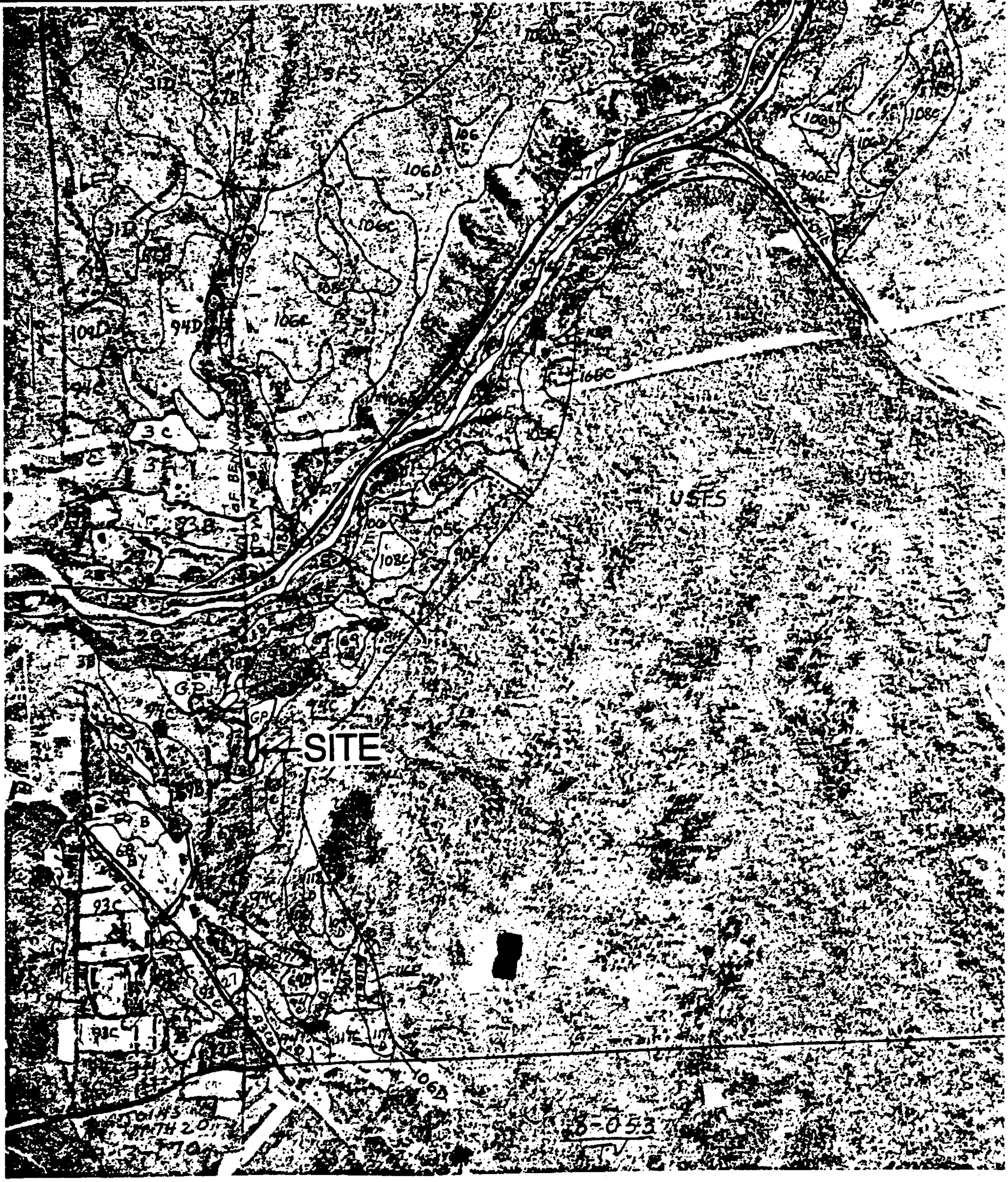
LOCATION	WETLAND HYDROLOGY CHARACTERISTICS	HYDROLOGY CRITERION MET
Wetland 1		
Location 1 Wetland	- Inundated - Soil saturated to surface	Yes
Location 1 Upland	- None	No
Wetland 2		
Location 1 Wetland	- Soil saturated to < 1" - 6.5" to standing water	Yes
Location 1 Upland	- None	No
Location 2 Wetland	- Inundated - Soil saturated to surface	Yes
Location 2 Upland	- None	No
Location 3 Wetland	- Inundated - Soil saturated to surface	Yes
Location 3 Upland	- None	No
Location 4 Wetland	- Inundated - Soil saturated to surface	Yes
Location 4 Upland	- None	No
Wetland 3		
Location 1 Wetland	- Inundated - Soil saturated to surface	Yes
Location 1 Upland	- None	No
Location 2 Wetland	- Soil saturated to 5"	Yes
Location 2 Upland	- None	No

TABLE 4
CRITERIA SUMMARY TABLE

LOCATION	HYDRIC SOIL	HYDROPHYTIC VEGETATION	WETLAND HYDROLOGY	WETLAND
Wetland 1				
Location 1 Wetland	Yes	Yes	Yes	Yes
Location 1 Upland	No	No	No	No
Wetland 2				
Location 1 Wetland	Yes	Yes	Yes	Yes
Location 1 Upland	No	Yes	No	No
Location 2 Wetland	Yes	Yes	Yes	Yes
Location 2 Upland	No	No	No	No
Location 3 Wetland	Yes	Yes	Yes	Yes
Location 3 Upland	No	No	No	No
Location 4 Wetland	Yes	Yes	Yes	Yes
Location 4 Upland	No	No	No	No
Wetland 3				
Location 1 Wetland	Yes	Yes	Yes	Yes
Location 1 Upland	No	No	No	No
Location 2 Wetland	Yes	Yes	Yes	Yes
Location 2 Upland	No	Yes	No	No

FIGURES

FIGURE 3



Woodford and Bennington, Vermont
Burgess Brothers Superfund Site

SITE SOILS MAP

1667 0 1667

Approx. Scale in Feet

Source: USDA Bennington County Soil Survey

063397

O'BRIEN&GERE

APPENDICES

APPENDIX A

FIELD DATA SHEETS

March 12, 1993

WT-1W

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: Burgess Bros. land L/R   Application Number: ________   Project Name: ________

State: VT   County: Bennington   Legal Description: Township: ____ Range: ____

Date: 6/8/92   Plot No.: WT-1W   Section: ________

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		**Herbs**	
1.		7. Jack in the Pulpit	FAC, FACW
2.		8. Royal Fern ~~Cinnamon~~, New York Fern	OBL, FAC
3.		9. Sensitive Fern	FACW
Saplings/shrubs		**Woody vines**	
4. Yellow Birch	FAC	10. American Black Currant	FAC, FACW
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 100. Other indicators: ________.

Hydrophytic vegetation: Yes ✓ No ____. Basis: >50% hydrophytic.

Soil

Series and phase: Pittsfield hydric inclusion On hydric soils list? Yes ✓; No ____.

Mottled: Yes ✓; No ____. Mottle color: 7.5YR 4/6; Matrix color: 2.5Y 3/2.

Gleyed: Yes ____ No ✓ Other indicators: sulfur odor, saturated to surface.

Hydric soils: Yes ✓ No ____; Basis: mottles, odor, low chroma, saturated.

Hydrology

Inundated: Yes ✓; No ____. Depth of standing water: 0-2".

Saturated soils: Yes ✓; No ____. Depth to saturated soil: 0.

Other indicators: ________.

Wetland hydrology: Yes ✓; No ____. Basis: inundated.

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland ✓; Nonwetland ________.

Comments:

Determined by: [signature]

WT1-D

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: Burgess Bros. landfill Application Number: ________ Project Name: ________

State: VT County: Bennington Legal Description: Township: ____ Range: ____

Date: 6/8/92 Plot No.: WT-1D Section: ________

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		**Herbs**	
1. Hemlock	FACU	7. New York Fern	FAC
2. Yellow Birch	FAC	8. Sensitive Fern	FACW
3. Beech	FACU	9. Partridge Berry	FACU
Saplings/shrubs		**Woody vines**	
4. Ash	FACU, FACW	10.	
5. Yellow Birch	FAC	11.	
6. Beech	FACU	12.	

% of species that are OBL, FACW, and/or FAC: 44. Other indicators: ________.

Hydrophytic vegetation: Yes ___ No ✓. Basis: <50% hydrophytic.

Soil

Series and phase: Windsor On hydric soils list? Yes ___; No ✓.

Mottled: Yes ___; No ✓. Mottle color: ________; Matrix color: 10YR 3/2

Gleyed: Yes ___ No ✓ Other indicators: Dry.

Hydric soils: Yes ___ No ✓; Basis: No hydric characteristics. not listed as hydric

Hydrology

Inundated: Yes ___; No ✓. Depth of standing water: ~~24"~~ 0.

Saturated soils: Yes ___; No ✓. Depth to saturated soil: >12".

Other indicators: None.

Wetland hydrology: Yes ___; No ✓. Basis: No indicators.

Atypical situation: Yes ___; No ✓.

Normal Circumstances? Yes ✓ No ___.

Wetland Determination: Wetland ________; Nonwetland ✓.

Comments:

Determined by: AE

WT2-1W

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: Burgess Bros Landfill Application Number: ______ Project Name: ______

State: VT County: Bennington Legal Description: Township: ____ Range: ____

Date: 6/8/92 Plot No.: WT2-1W Section: ______

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		**Herbs**	
1. Yellow Birch	FAC	7. Cinnamon Fern	FACW
2. Ash	FACU, FACW	8. Sedges	FACU, OBL
3.		9. Grasses	FACW, OBL
Saplings/shrubs		**Woody vines**	
4. Witch Hazel	FACU, FAC-	10.	
5. Ash	FACU, FACW	11. None	
6. Red Oak	FACU	12.	

% of species that are OBL, FACW, and/or FAC: 57. Other indicators: ______.

Hydrophytic vegetation: Yes ✓ No ____. Basis: >50% hydrophytic.

Soil

Series and phase: Unidentified On hydric soils list? Yes ____; No ____.

Mottled: Yes ____; No ✓. Mottle color: ______; Matrix color: 10YR2/1.

Gleyed: Yes ____ No ✓ Other indicators: saturated, low chroma.

Hydric soils: Yes ✓ No ____; Basis: ______.

Hydrology

Inundated: Yes ____; No ✓. Depth of standing water: <1".

Saturated soils: Yes ✓; No ____. Depth to saturated soil: <1".

Other indicators: 6.5" to standing water.

Wetland hydrology: Yes ✓; No ____. Basis: saturated soil.

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland ✓; Nonwetland ______.

Comments:

Determined by: AE

WT2- 1D

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: Burgess Bros. landfill Application Number: ______ Project Name: ______

State: ~~Conn~~ VT County: Bennington Legal Description: Township: ____ Range: ____

Date: 6/8/92 Plot No.: WT2-1D Section: ______

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		**Herbs**	
1. BEECH	FACU	7. Running Club Moss Pine	FACU UPL
2. Red Maple	FAC	8. Hair Cap Moss	FAC
3. Yellow Birch	FAC	9. Starflower / Partridgeberry / Mayflower	FAC / FACU / FAC
Saplings/shrubs		**Woody vines**	
4. Witch Hazel	FACU, FAC-	10.	
5. Red Oak	FACU	11. None	
6. Yellow Birch	FAC	12.	

% of species that are OBL, FACW, and/or FAC: 50. Other indicators: ______.

Hydrophytic vegetation: Yes ____ No ✓. Basis: no FACW or OBL.

Soil

Series and phase: Windsor On hydric soils list? Yes ____; No ✓.

Mottled: Yes ____; No ✓. Mottle color: ______; Matrix color: 10YR 4/4

Gleyed: Yes ____ No ✓ Other indicators: ______.

Hydric soils: Yes ____ No ✓; Basis: not listed as hydric, high chroma.

Hydrology

Inundated: Yes ____; No ✓. Depth of standing water: > 18".

Saturated soils: Yes ____; No ✓. Depth to saturated soil: > 18".

Other indicators: ______.

Wetland hydrology: Yes ____; No ✓. Basis: no characteristics.

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland ______; Nonwetland ✓.

Comments:

Determined by: AE

WT2-2
Wet

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: Burgess Bros. Landfill   Application Number: ________   Project Name: ________

State: VT   County: Bennington   Legal Description: Township: ____   Range: ____

Date: ________   Plot No.: WT2-2W   Section: ________

Vegetation [list the three **dominant** species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		**Herbs**	
1. Red Maple	FAC	7. Cinnamon Fern	FACW
2. Yellow Birch	FAC	8. Sedges	FAC
3. Ash	FACU, FACW	9. Goldenrod Rough-Stemmed	OBL
Saplings/shrubs		**Woody vines**	
4. Red Maple	FAC	10.	
5. Yellow Birch	FAC	11.	
6. Ash	FACU, FACW	12.	

% of species that are OBL, FACW, and/or FAC: 100. Other indicators: ________.

Hydrophytic vegetation: Yes ✓ No ____. Basis: >50% hydrophytic.

Soil

Series and phase: Unidentified   On hydric soils list? Yes ____; No ____.

Mottled: Yes ____; No ✓. Mottle color: ________; Matrix color: 5Y 4/1.

Gleyed: Yes ✓ No ____ Other indicators: saturated 7" organic.

Hydric soils: Yes ✓ No ____; Basis: saturated, low chroma.

Hydrology

Inundated: Yes ✓; No ____. Depth of standing water: 0-3".

Saturated soils: Yes ✓; No ____. Depth to saturated soil: 0-3".

Other indicators: ________.

Wetland hydrology: Yes ✓; No ____. Basis: saturated, inundated.

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland ✓; Nonwetland ________.

Comments:

Determined by: AF

WT2-2
Well #7
Dry

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: Burgess Bros. Landfill Application Number: ______ Project Name: ______

State: VT County: Bennington Legal Description: Township: ____ Range: ____

Date: 6/8/92 Plot No.: WT2-2D Section: ______

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		**Herbs**	
1. BEECH	FACU	7. Bracken Fern	FACU, FAC-
2. Yellow Birch	FAC	8. Sarsaparilla	FACU
3. W. Pine	FACU	9. Mayflower	FAC
Saplings/shrubs		**Woody vines**	
4. Witch Hazel	FACU, FAC-	10.	
5. Yellow Birch	FAC	11.	
6. Red Maple	FAC	12.	

% of species that are OBL, FACW, and/or FAC: 33. Other indicators: ______.

Hydrophytic vegetation: Yes ___ No ✓. Basis: <50% hydrophytic.

Soil

Series and phase: Pittsfield On hydric soils list? Yes ✓ (inclusions); No ___.

Mottled: Yes ___; No ✓. Mottle color: ______; Matrix color: 2.5Y5/6.

Gleyed: Yes ___ No ✓ Other indicators: Sand + fines.

Hydric soils: Yes ___ No ✓; Basis: high chroma, no mottles.

Hydrology

Inundated: Yes ___; No ✓. Depth of standing water: 0.

Saturated soils: Yes ___; No ✓. Depth to saturated soil: >18".

Other indicators: ______.

Wetland hydrology: Yes ___; No ✓. Basis: no indicators.

Atypical situation: Yes ___; No ✓.

Normal Circumstances? Yes ✓ No ___.

Wetland Determination: Wetland ______; Nonwetland ✓.

Comments:

Determined by: AF

DATA FORM 1

WETLAND DETERMINATION

WT2-3
WET

Applicant Name: Burgss Bros landfill   Application Number: ______   Project Name: ______

State: VT   County: Bennington   Legal Description: Township: ____ Range: ____

Date: 6/9/92   Plot No.: WT2-3W   Section: ______

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

	Species	Indicator Status		Species	Indicator Status
Trees			**Herbs**		
1.	Yellow Birch	FAC	7.	Sensitive Fern	FACW
2.	Red Maple	FAC	8.	Sedges	FAC
3.	Ash	FACU, FACW	9.	Rough Stemmed Goldenrod	FAC, FAC+
Saplings/shrubs			**Woody vines**		
4.	Basswood/Willow	FACW	10.		
5.	Yellow Birch	FAC	11.		
6.	Ash	FACU, FACW	12.		

% of species that are OBL, FACW, and/or FAC: 100. Other indicators: ______.
Hydrophytic vegetation: Yes ✓ No ___. Basis: >50% hydrophytic.

Soil

Series and phase: unidentified   On hydric soils list? Yes ___; No ___.
Mottled: Yes ___; No ✓. Mottle color: ______; Matrix color: 5Y 2.5/1.
Gleyed: Yes ___ No ✓ Other indicators: ______.
Hydric soils: Yes ✓ No ___; Basis: low chroma no mottles.

Hydrology

Inundated: Yes ___; No ✓. Depth of standing water: 0".
Saturated soils: Yes ✓; No ___. Depth to saturated soil: 0-3".
Other indicators: ______.
Wetland hydrology: Yes ✓; No ___. Basis: saturated.
Atypical situation: Yes ___; No ✓.
Normal Circumstances? Yes ✓ No ___.
Wetland Determination: Wetland ✓; Nonwetland ______.
Comments:

Determined by: AE

WT2-3
Dry

DATA FORM 1
WETLAND DETERMINATION

Applicant Name: Burgess Bros. landfill
Application Number: ____________
Project Name: ____________

State: VT
County: Bennington
Legal Description: Township: ____ Range: ____

Date: 6/9/92
Plot No.: WT2-3D
Section: ____________

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		**Herbs**	
1. Red Oak	FACU	7. Cinnamon Fern	FACW
2. Beech	FACU	8. Mayflower	FAC
3. Red Maple	FAC	9. Club moss	FACU
Saplings/shrubs		**Woody vines**	
4. Witch Hazel	FACU, FAC-	10.	
5. Beech	FACU	11.	
6. Aspen	FACU	12.	

% of species that are OBL, FACW, and/or FAC: 33. Other indicators: ____.
Hydrophytic vegetation: Yes ___ No ✓. Basis: <50% hydrophytic.

Soil
Series and phase: Windsor On hydric soils list? Yes ___; No ✓.
Mottled: Yes ___; No ✓. Mottle color: ______; Matrix color: 10YR 4/4.
Gleyed: Yes ___ No ✓ Other indicators: ______.
Hydric soils: Yes ___ No ✓; Basis: not listed, high chroma.

Hydrology
Inundated: Yes ___; No ✓. Depth of standing water: 0.
Saturated soils: Yes ___; No ✓. Depth to saturated soil: >18".
Other indicators: ______.
Wetland hydrology: Yes ___; No ✓. Basis: no indicators.
Atypical situation: Yes ___; No ✓.
Normal Circumstances? Yes ✓ No ___.
Wetland Determination: Wetland ______; Nonwetland ✓.
Comments:

Determined by: AE

WT2-4
Wet

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: Burgess Bros. Landfill Application Number: ____________ Project Name: ____________

State: VT County: Bennington Legal Description: Township: ____ Range: ____

Date: 6/9/92 Plot No.: WT2-4W Section: ____________

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		**Herbs**	
1. Ash	FACU, FACW	7. Sensitive Fern	FACW
2. Yellow Birch	FAC	8. Sedges	FAC
3. Elm	FAC	9. Cinnamon Fern	FACW
Saplings/shrubs		**Woody vines**	
4. Witch Hazel	FACU, FAC	10.	
5. Beech	FACU	11.	
6. Red Maple	FAC	12.	

% of species that are OBL, FACW, and/or FAC: 75. Other indicators: ________.

Hydrophytic vegetation: Yes ✓ No ___. Basis: >50% hydrophytic.

Soil

Series and phase: unidentified On hydric soils list? Yes____; No ✓.

Mottled: Yes____; No ✓. Mottle color: ________; Matrix color: 5Y 2.5/1.

Gleyed: Yes____ No ✓ Other indicators: ________.

Hydric soils: Yes ✓ No____; Basis: low chroma.

Hydrology

Inundated: Yes ✓; No ✓. Depth of standing water: 0-3".

Saturated soils: Yes ✓; No____. Depth to saturated soil: 0".

Other indicators: ________.

Wetland hydrology: Yes ✓; No____. Basis: saturated.

Atypical situation: Yes____; No ✓.

Normal Circumstances? Yes ✓ No____.

Wetland Determination: Wetland ✓; Nonwetland ________.

Comments:

Determined by: AF

WT2-4
Dry

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: Burgess Bros. Landfill
Application Number: ______
Project Name: ______

State: VT
County: Bennington
Legal Description: Township: ____ Range: ____

Date: 6/9/92
Plot No.: WT2-4D
Section: ______

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		**Herbs**	
1. White Birch	FACU, FAC+	7. Cinammon Fern	FACW
2. Beech	FACU	8. Club moss	FACU
3. Red Maple	FAC	9. Partridge berry	
Saplings/shrubs		**Woody vines**	
4. Beech	FACU	10.	
5. Witch Hazel	FACU, FAC-	11.	
6. Aspen	FACU	12.	

% of species that are OBL, FACW, and/or FAC: 33. Other indicators: ______.

Hydrophytic vegetation: Yes ___ No ✓. Basis: <50% hydrophytic.

Soil

Series and phase: Windsor On hydric soils list? Yes ____; No ✓.

Mottled: Yes ✓; No ____. Mottle color: 10YR 5/8; Matrix color: 2.5Y 4/4.

Gleyed: Yes ____ No ✓ Other indicators: ______.

Hydric soils: Yes ____ No ✓; Basis: not listed, high chroma.

Hydrology

Inundated: Yes ____; No ✓. Depth of standing water: 0.

Saturated soils: Yes ____; No ✓. Depth to saturated soil: >12".

Other indicators: ______.

Wetland hydrology: Yes ____; No ✓. Basis: ______.

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland ______; Nonwetland ✓.

Comments:

Determined by: AF

WT3-1
WET

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: Burgess Bros. Landfill   Application Number: ____________   Project Name: ____________

State: VT   County: Bennington   Legal Description: Township: ____   Range: ____

Date: 6/9/92   Plot No.: WT3-1W   Section: ____________

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		**Herbs**	
1. Yellow Birch	FAC	7. Sensitive Fern	FACW
2. Red Maple	FAC	8. Cinnamon Fern	FACW
3. Ash	FACU, FACW	9. Goldenrod	OBL
Saplings/shrubs		**Woody vines**	
4. Witch Hazel	FACU, FAC-	10.	
5. Ash	FACU, FACW	11.	
6. Red Maple	FAC	12.	

% of species that are OBL, FACW, and/or FAC: 86. Other indicators: ________.

Hydrophytic vegetation: Yes ✓ No ___. Basis: >50% hydrophytic.

Soil

Series and phase: unidentified   On hydric soils list? Yes ____; No ____.

Mottled: Yes ____; No ✓. Mottle color: ________; Matrix color: 10YR 2/1.

Gleyed: Yes ____ No ✓ Other indicators: ____________.

Hydric soils: Yes ✓ No ____; Basis: low chroma

Hydrology

Inundated: Yes ____; No ✓. Depth of standing water: 0".

Saturated soils: Yes ✓; No ____. Depth to saturated soil: 0".

Other indicators: sulfur odor.

Wetland hydrology: Yes ✓; No ____. Basis: saturated, odor.

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland ✓; Nonwetland ____________.

Comments:

Determined by: [illegible]

WT-3-1
Dry

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: Burgess Bros landfill **Application Number:** ______ **Project Name:** ______

State: VT **County:** Bennington **Legal Description:** **Township:** ____ **Range:** ____

Date: 6/9/92 **Plot No.:** WT3-1D **Section:** ______

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

	Species	Indicator Status		Species	Indicator Status
Trees			**Herbs**		
1.	Yellow Birch	FAC	7.	Partridge berry	FACU
2.	Red Maple	FAC	8.	Cinnamon Fern	FACW
3.	~~Ash~~ IRONWOOD	FAC	9.		
Saplings/shrubs			**Woody vines**		
4.	Beech	FACU	10.		
5.	Witch Hazel	FACU, FAC-	11.		
6.	Aspen	FACU	12.		

% of species that are OBL, FACW, and/or FAC: 50. Other indicators: ______.

Hydrophytic vegetation: Yes ___ No ✓. Basis: more upland than wet.

Soil

Series and phase: Georgia On hydric soils list? Yes ✓ (inclusions); No ___.

Mottled: Yes ✓; No ✓. Mottle color: 2.5Y 4/3; Matrix color: 10YR 3/3.

Gleyed: Yes ___ No ✓ Other indicators: ______.

Hydric soils: Yes ___ No ✓; Basis: high chroma.

Hydrology

Inundated: Yes ___; No ✓. Depth of standing water: ______.

Saturated soils: Yes ___; No ✓. Depth to saturated soil: >18".

Other indicators: ______.

Wetland hydrology: Yes ___; No ✓. Basis: no characteristics.

Atypical situation: Yes ___; No ✓.

Normal Circumstances? Yes ✓ No ___.

Wetland Determination: Wetland ______; Nonwetland ✓.

Comments:

Determined by: [signature]

WT3 - 2
WET

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: A. Burgess Bros. Landfill　Application Number: ____________　Project Name: Burgess Bros.

State: Vermont　County: ________　Legal Description:　Township: ____　Range: ____

Date: 6/9/92　Plot No.: WT3-2W　Section: ____________

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

	Species	Indicator Status		Species	Indicator Status
Trees			**Herbs**		
1.	Red Maple	FAC	7.	Royal Fern	OBL
2.	Yellow Birch	FAC	8.	Interrupted Fern	FAC
3.	Ash	FACU, FACW	9.	Cinnamon Fern	FAC
Saplings/shrubs			**Woody vines**		
4.	Ash	FACU, FACW	10.		
5.	Beech	FACU	11.		
6.	Yellow Birch	FAC	12.		

% of species that are OBL, FACW, and/or FAC: 88.　Other indicators: ________.

Hydrophytic vegetation: Yes ✓ No ___.　Basis: >50% hydrophytic.

Soil

Series and phase: Unidentified　On hydric soils list? Yes ___; No ___.

Mottled: Yes ___; No ✓.　Mottle color: ________; Matrix color: 10YR2/1.

Gleyed: Yes ___ No ✓　Other indicators: Saturated @ 5"

Hydric soils: Yes ✓ No ___; Basis: saturated w/i 12", low chroma.

Hydrology

Inundated: Yes ___; No ✓.　Depth of standing water: 0".

Saturated soils: Yes ✓; No ___.　Depth to saturated soil: 5".

Other indicators: ____________________.

Wetland hydrology: Yes ✓; No ___.　Basis: saturated w/i 12".

Atypical situation: Yes ___; No ✓.

Normal Circumstances? Yes ✓ No ___.

Wetland Determination: Wetland ✓; Nonwetland ________.

Comments:

Determined by: AV

WT3-2
Dry

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: Burgess Bros landfill Application Number: ____ Project Name: ____

State: VT County: Bennington Legal Description: Township: ____ Range: ____

Date: 6/9/92 Plot No.: WT3-2D Section: ____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		**Herbs**	
1. Red Maple	FAC	7. Mayflower	FAC
2. Beech	FACU	8. Cinammon Fern	FACW
3. Ash White Birch	FACU, FACW	9. ~~Royal~~ Interrupted Fern	FAC
Saplings/shrubs		**Woody vines**	
4. Red Maple	FAC	10.	
5. Red Oak	FACU	11.	
6. Ash	FACU, FACW	12.	

% of species that are OBL, FACW, and/or FAC: 71. Other indicators: ____.

Hydrophytic vegetation: Yes ✓ No ___. Basis: >50% hydrophytic.

Soil

Series and phase: Georgia On hydric soils list? Yes ✓ (inclusions); No ___.

Mottled: Yes ✓; No ___. Mottle color: 2.5Y 5/6; Matrix color: 2.5Y 4/3.

Gleyed: Yes ___ No ✓ Other indicators: ____.

Hydric soils: Yes ___ No ✓; Basis: high chroma.

Hydrology

Inundated: Yes ___; No ✓. Depth of standing water: 0.

Saturated soils: Yes ___; No ✓. Depth to saturated soil: >18".

Other indicators: ____.

Wetland hydrology: Yes ___; No ✓. Basis: no indicators.

Atypical situation: Yes ___; No ✓.

Normal Circumstances? Yes ✓ No ___.

Wetland Determination: Wetland ____; Nonwetland ✓.

Comments:

Determined by: AF

Appendix 6

Appendix

In the course of evaluating well log data that was supplied by Ms. Tammy Leno of VTDEC's Water Supply Division during the LFI, variable thicknesses of till overlying weathered to competent bedrock were indicated. This was evidenced in the well logs developed for Gorham Heights located about 0.5 to 1 mile southwest of the Site. Competent bedrock was indicated to be about 20 to 120 feet below grade in these wells. The following lists the well records for those wells located within 0.25 mile of the Site as provided to O'Brien & Gere during the LFI:

- John Williams (Burgess Road) - clay and hard pan to 22 feet, gravel and white quartz rock to 40 feet.
- F.D. Frantz (Burgess Road) - clay and hardpan to 320 feet, limestone from 320 to 370 feet.
- Mary Albrycht (Route 9) - dirt to 2 feet, granite from 2 to 323 feet.

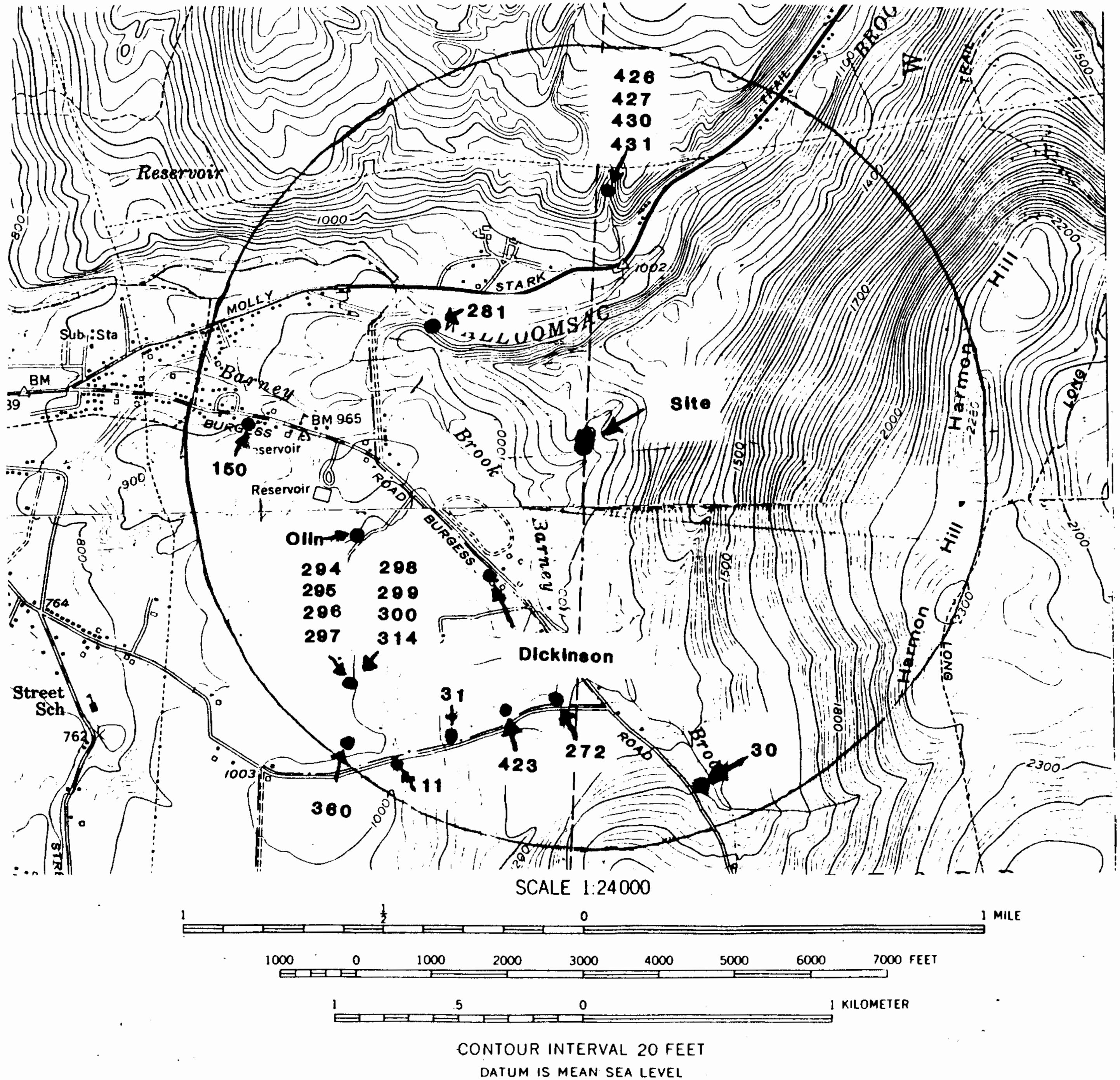
The above information was difficult to interpret due to the nature of the descriptions and language used by the drillers. As recognized by Jerris in his review of 317 well logs, interpretation of the well logs was very difficult due to the wide range of terminologies used by drillers and their informal training in geology. The above information was originally interpreted to mean that the till layer was variable in thickness and that the bedrock was decayed in some areas. In other areas, the competent bedrock surface was interpreted to lie close to the ground surface or the base of the till layer. As the course of the drilling program continued, it became evident that the ocher layer was continuous, and very thick below the till layer.

Another list of water well records was provided to O'Brien and Gere in August, 1993 and January 5, 1994 from the VTDEC Division of Water Supply. This list contained a detailed tabular summary of data that was not included in the first package obtained during the LFI. A summary of well records within 1 mile of the Site is shown on Table 1 (in the column entitled "Overburden Depth", a (-) sign indicates that depths were not provided; therefore, an estimation of the weathered bedrock thickness cannot be made in these wells), and maps showing the wells around a one-mile radius of the Site are presented in Appendix 2. The Site is located in the center of the figures in Appendix 2. The average overburden thickness as reported by drillers on these logs is 50 feet. A total of 10 of the 58 wells in the area included extended casing lengths (greater than 50 feet) to seal off deteriorated rock. This small number of wells in the group with extended lengths of casing was not indicative of a continuous layer of weathered rock 180 to 360 feet thick similar to that found at the Site.

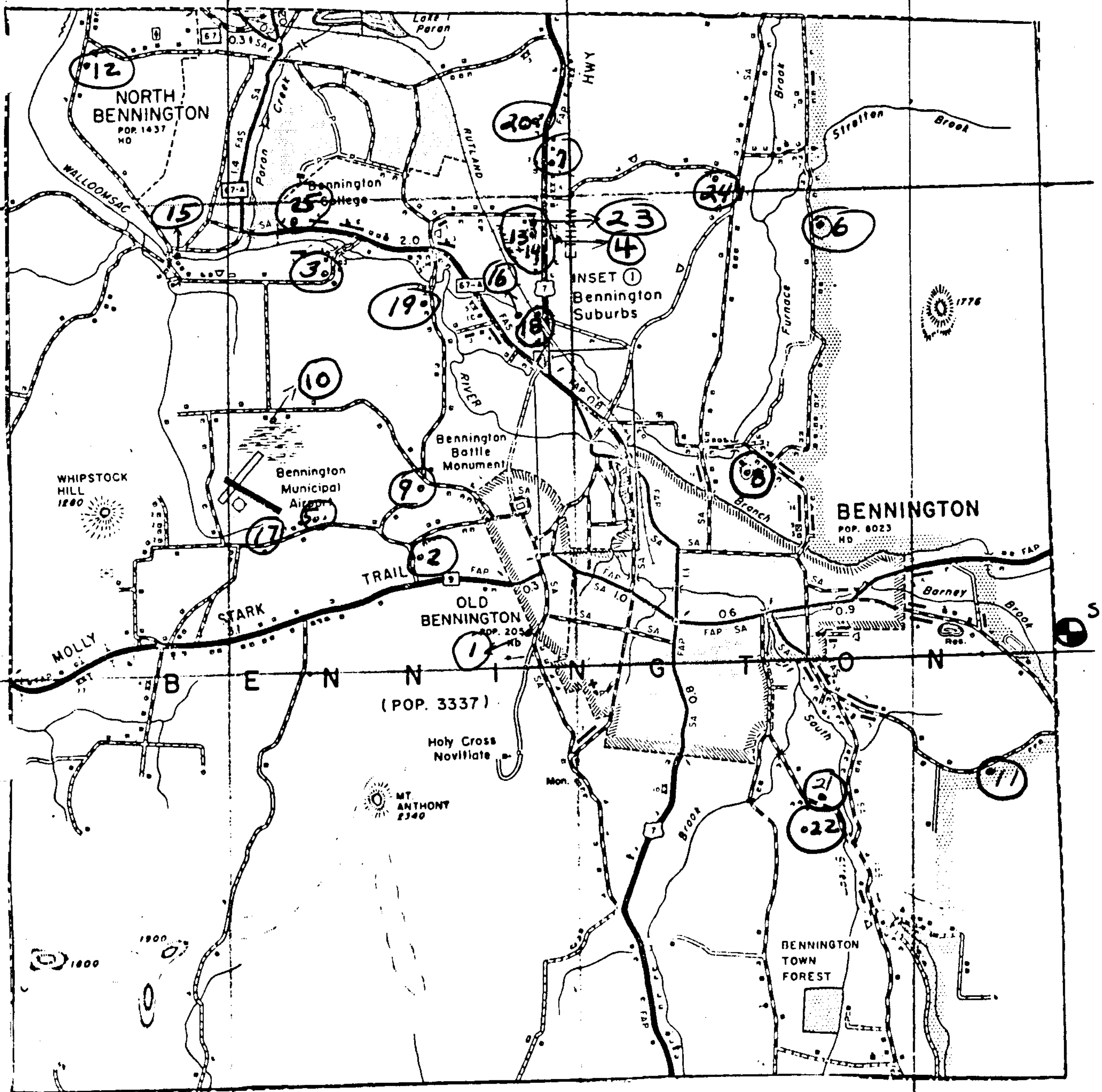
5271.001
#20

Burgess Brothers Superfund Site

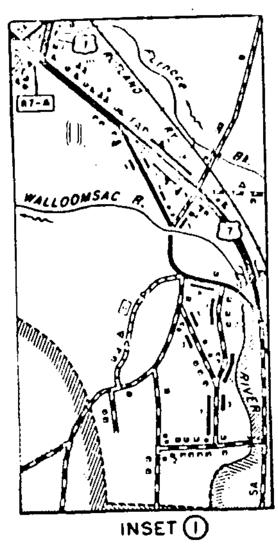
Well Locations – 1 Mile Radius



BENNINGTON WELLS 1-25

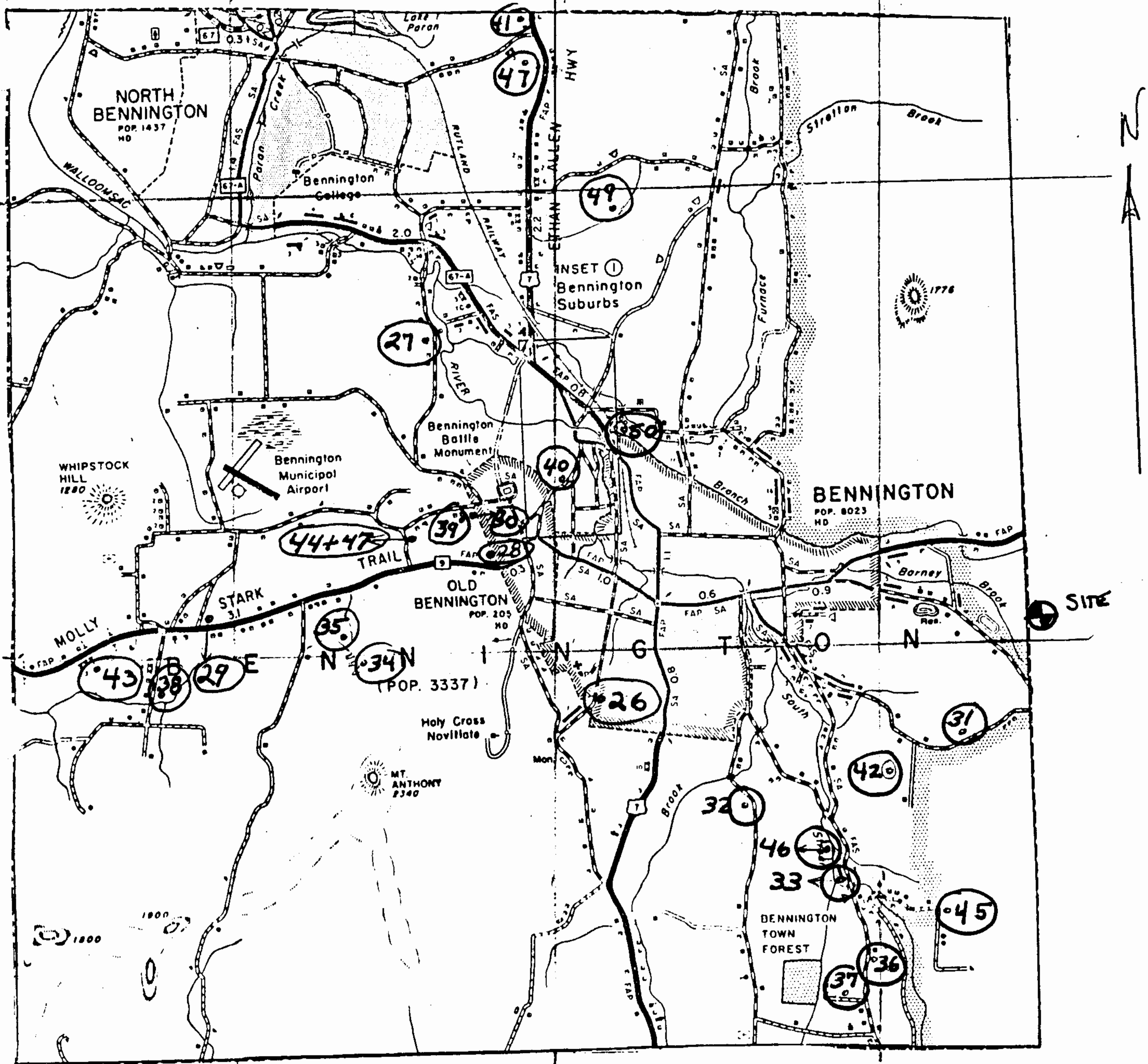


Scale 1" = 1 mile



INSET (1)
BENNINGTON SUBURBS

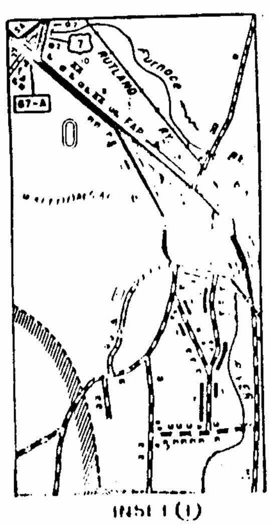
BENNINGTON WELLS 26-50



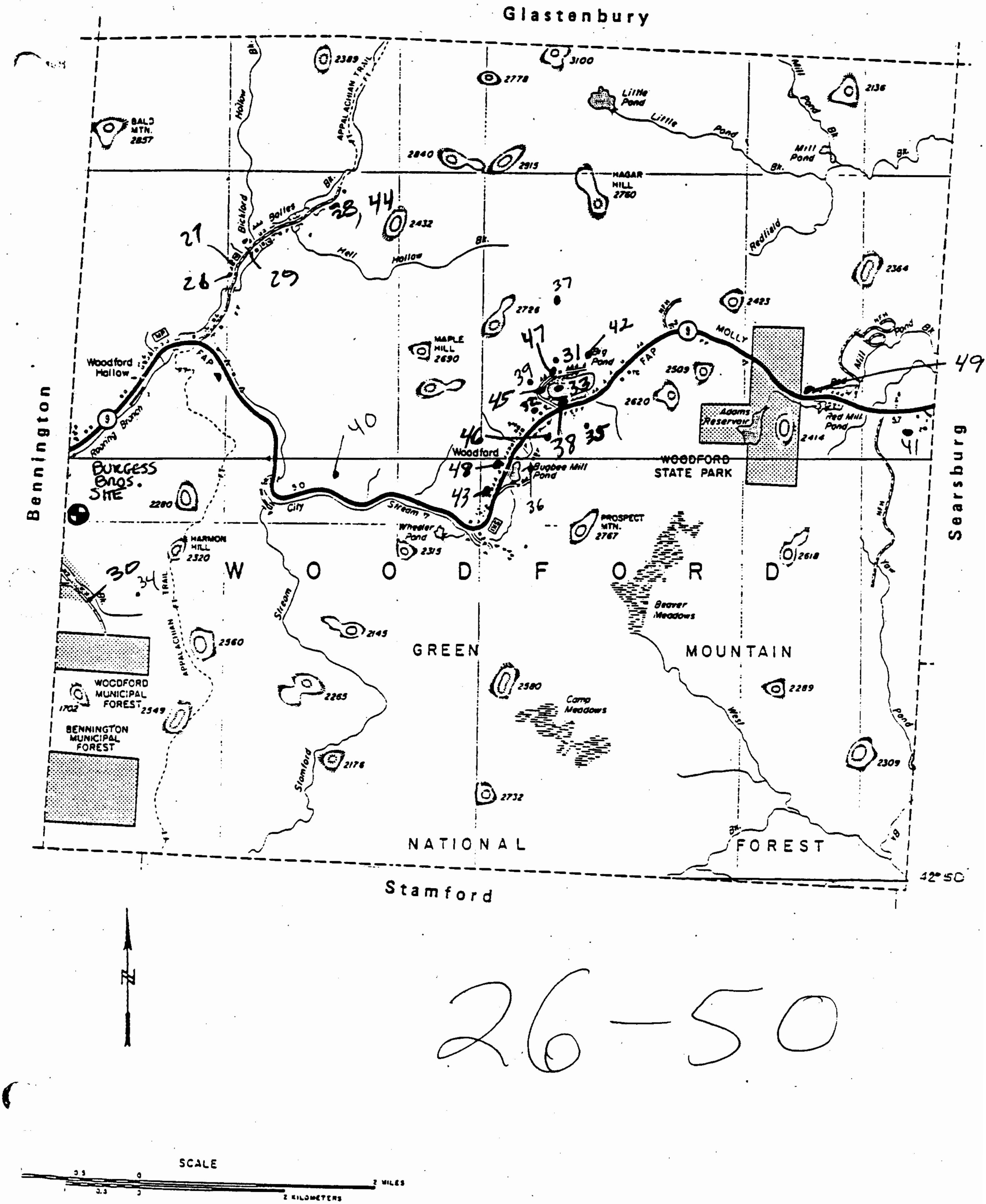
Scale 1" = 1 mile

No Location: #48

2 Locations: #47

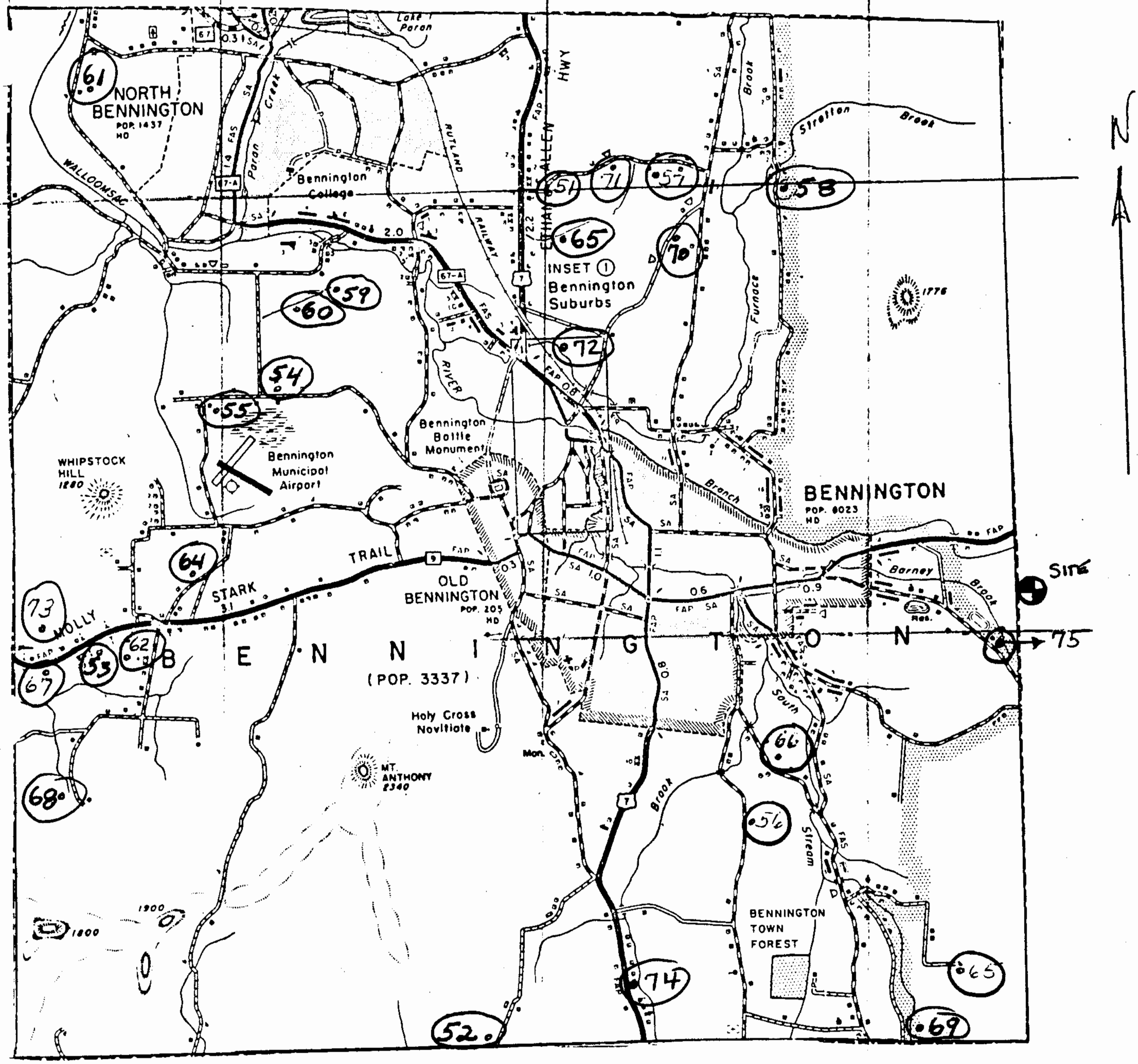


INSET (1)
BENNINGTON SUBURBS


Glastenbury
Bennington
Searsburg
Stamford
WOODFORD
GREEN MOUNTAIN NATIONAL FOREST
BALD MTN. 2857
Woodford Hollow
Roaring Branch
BURGESS BROS. SITE
HARMON HILL 2320
APPALACHIAN TRAIL
WOODFORD MUNICIPAL FOREST
BENNINGTON MUNICIPAL FOREST
MAPLE HILL 2690
HAGAR HILL 2760
Little Pond
Mill Pond
Big Pond
Woodford
Bugbee Mill Pond
Wheeler Pond
PROSPECT MTN. 2767
WOODFORD STATE PARK
Adams Reservoir
Red Mill Pond
Beaver Meadows
Camp Meadows
City Stream
Hell Hollow Bk.
Bolles Bk.
Redfield
MOLLY
42°50'
SCALE
2 MILES
2 KILOMETERS

26-50

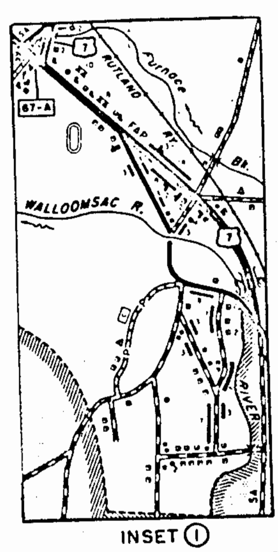
BENNINGTON WELLS 51-75



Scale 1" = 1 mile

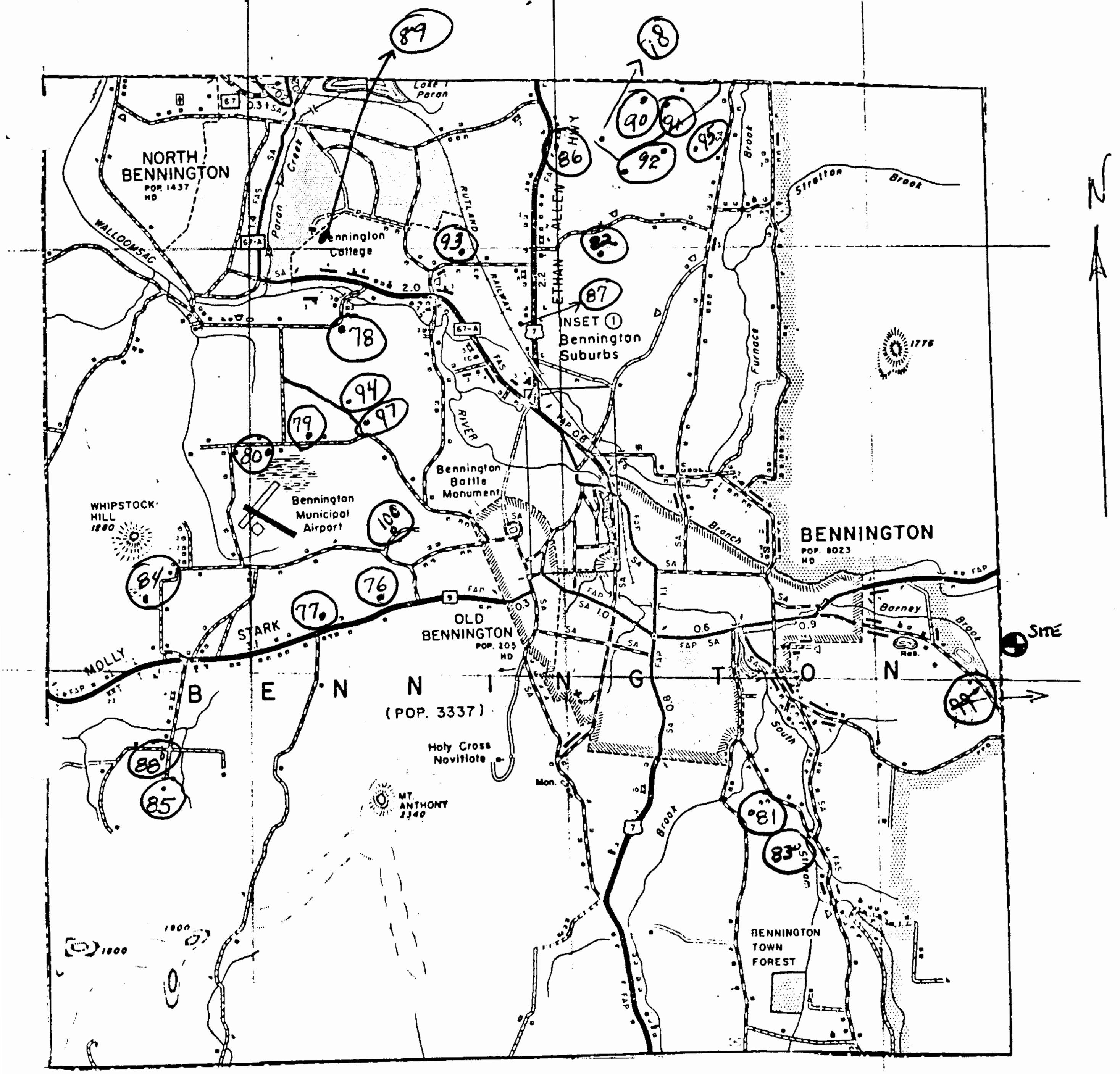
No Location: #63

2 Locations: #65

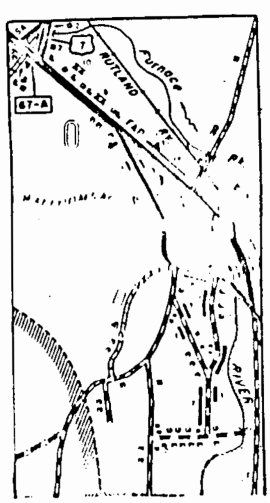


INSET ①
BENNINGTON SUBURBS

-65?

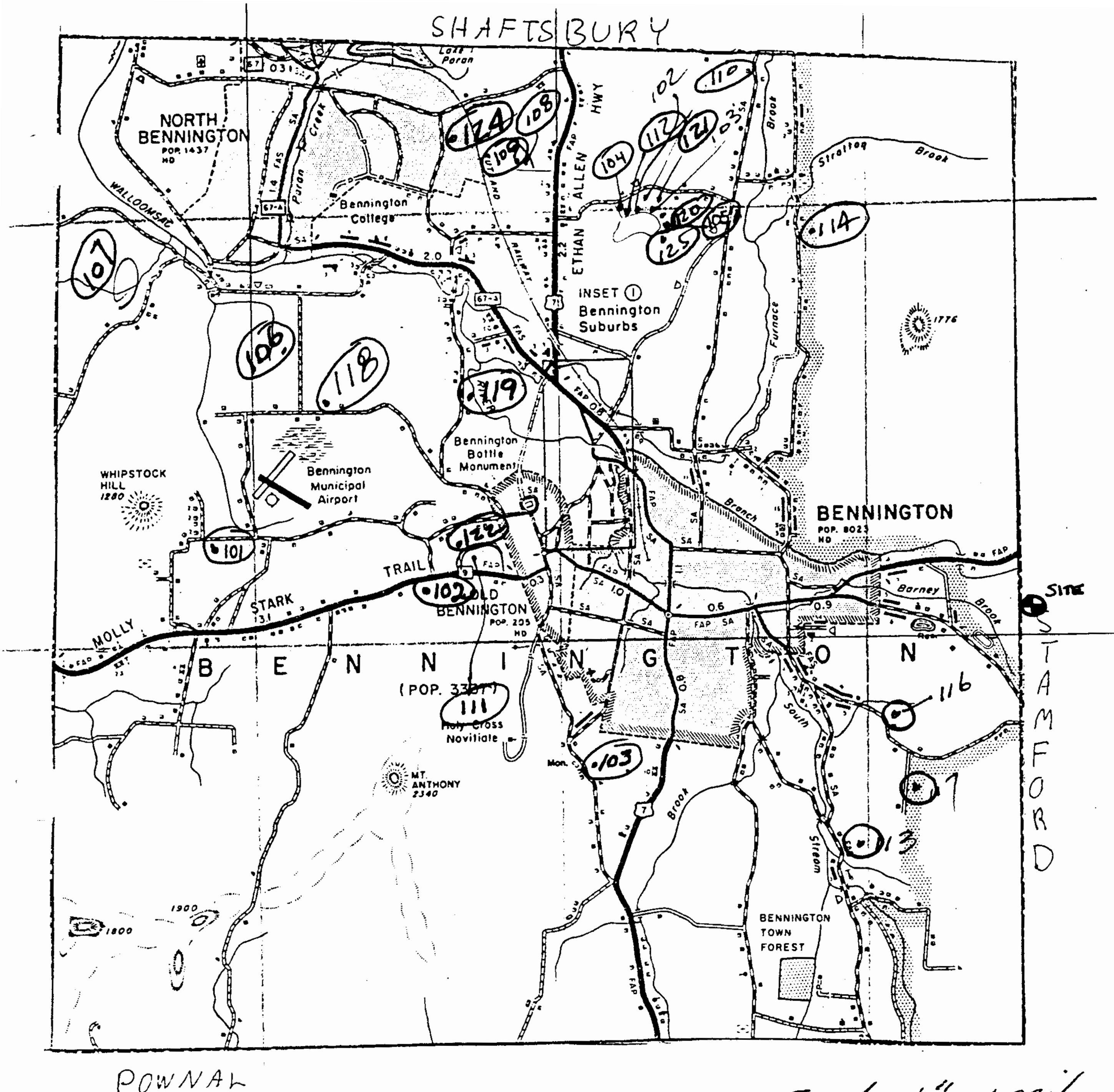


Scale 1" = 1 mile



INSET (1)
BENNINGTON SUBURBS

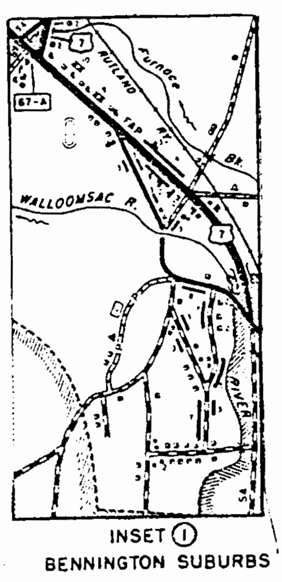
TOWN OF BENNINGTON WELLS 76 - 100



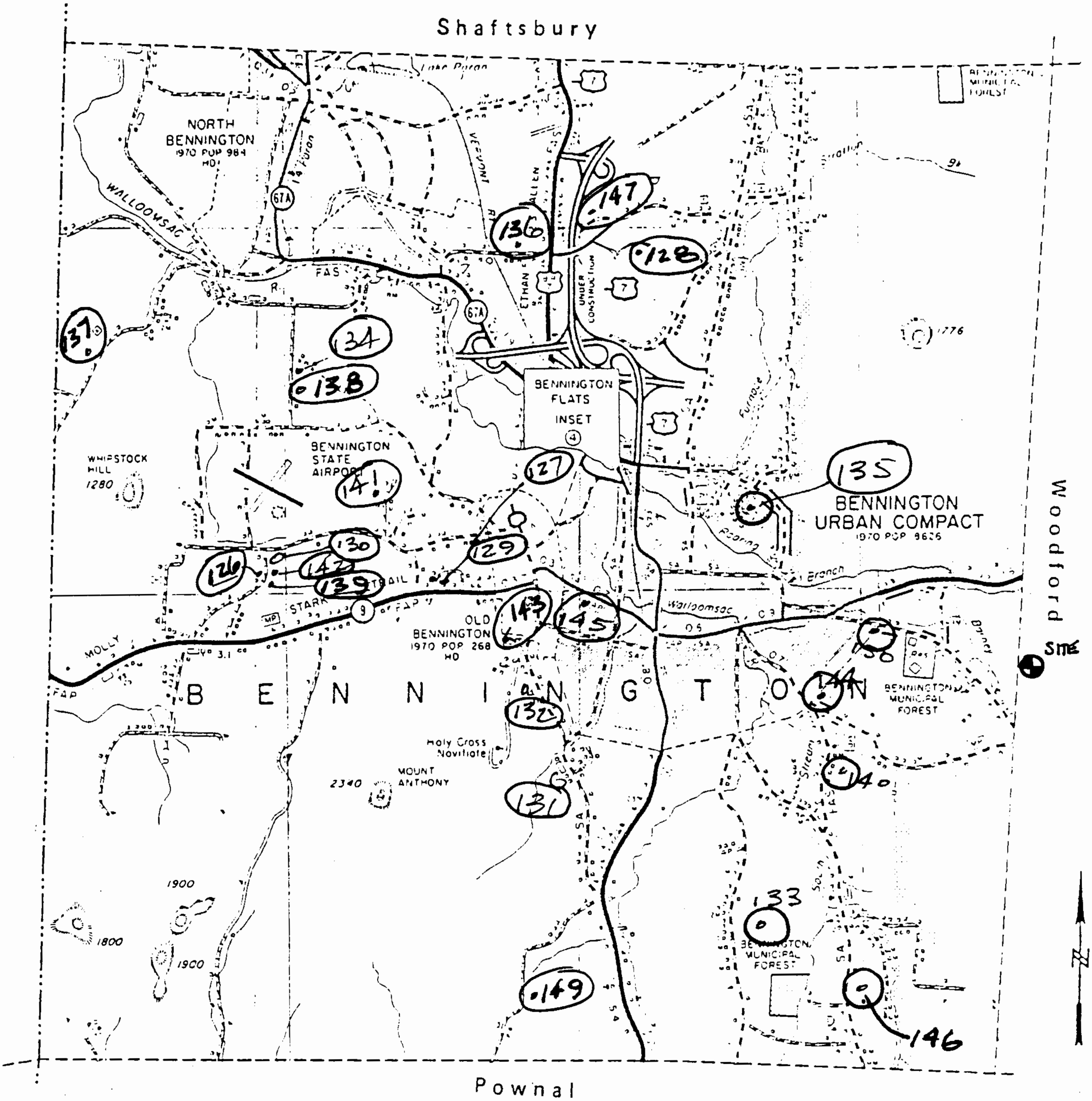
Scale 1" = 1 mile

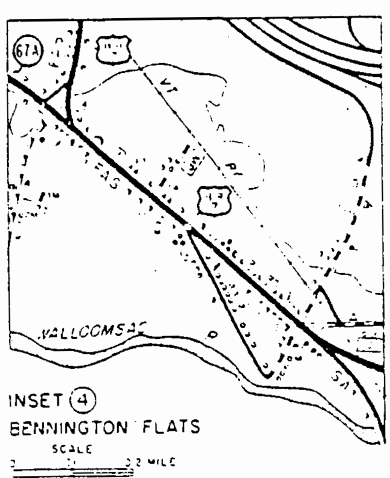
Bennington

101-125



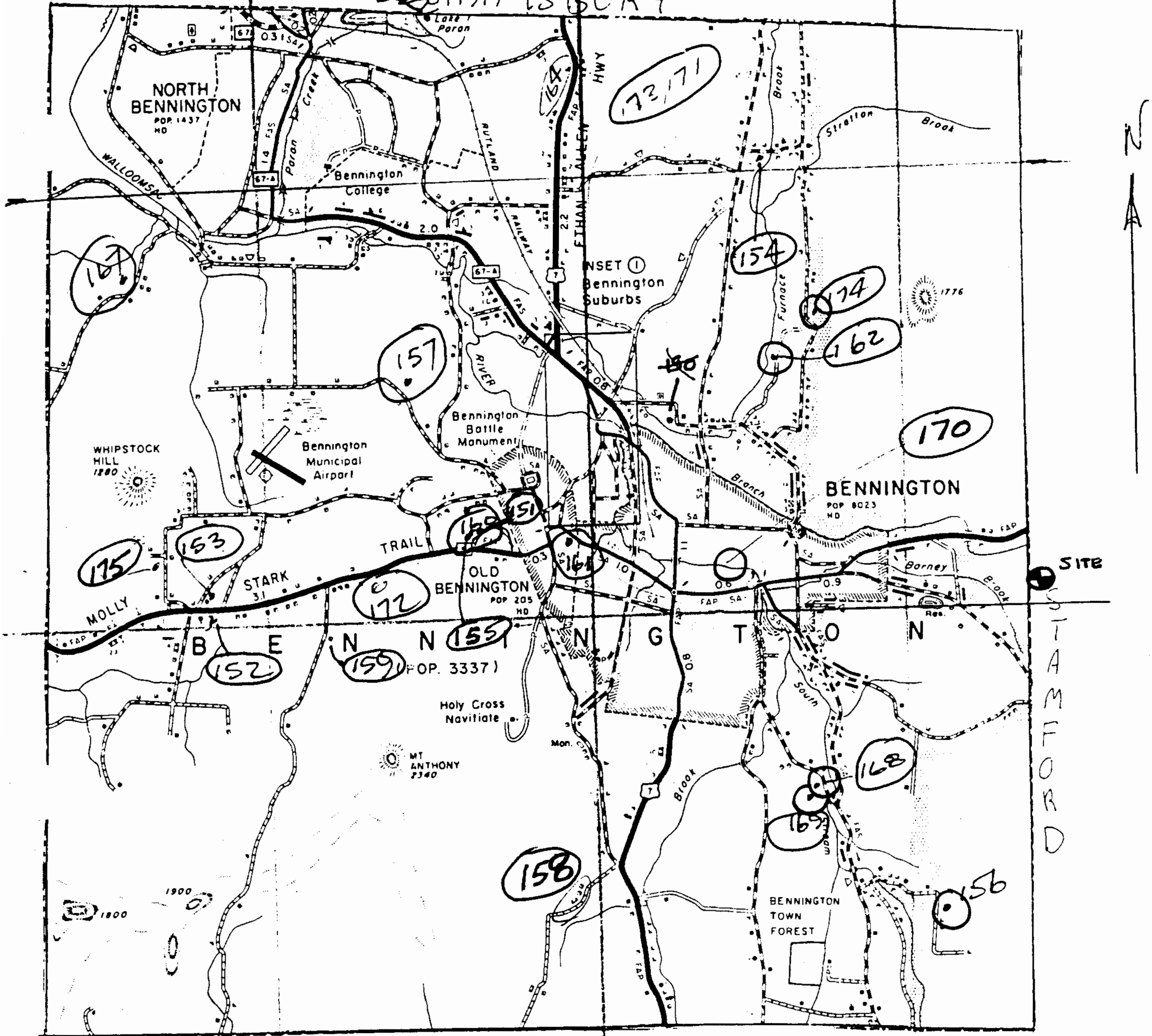
See report for map: #104, 105, 106





WELLS 126-150

SHAFTSBURY

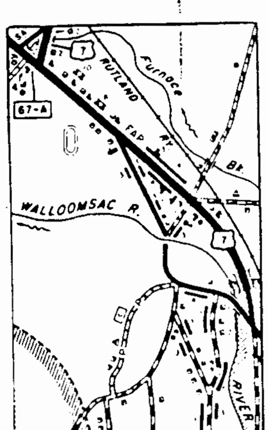


POWNAL

Scale 1" = 1 mile

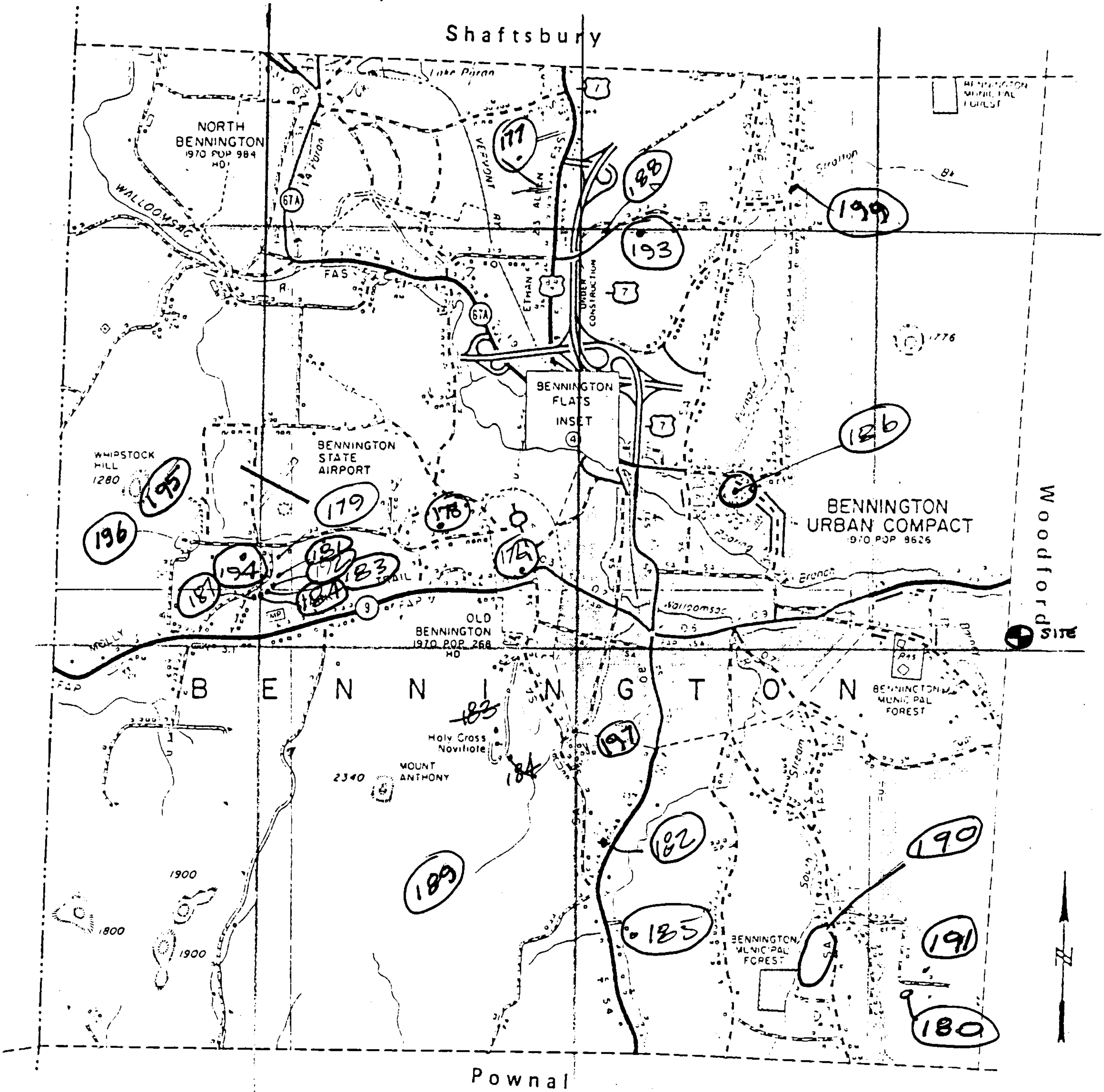
BENNINGTON

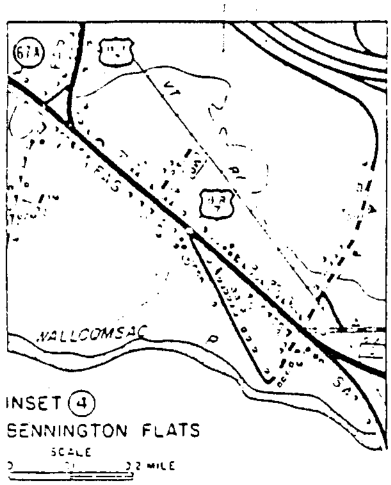
151-175



INSET 1
BENNINGTON SUBURBS

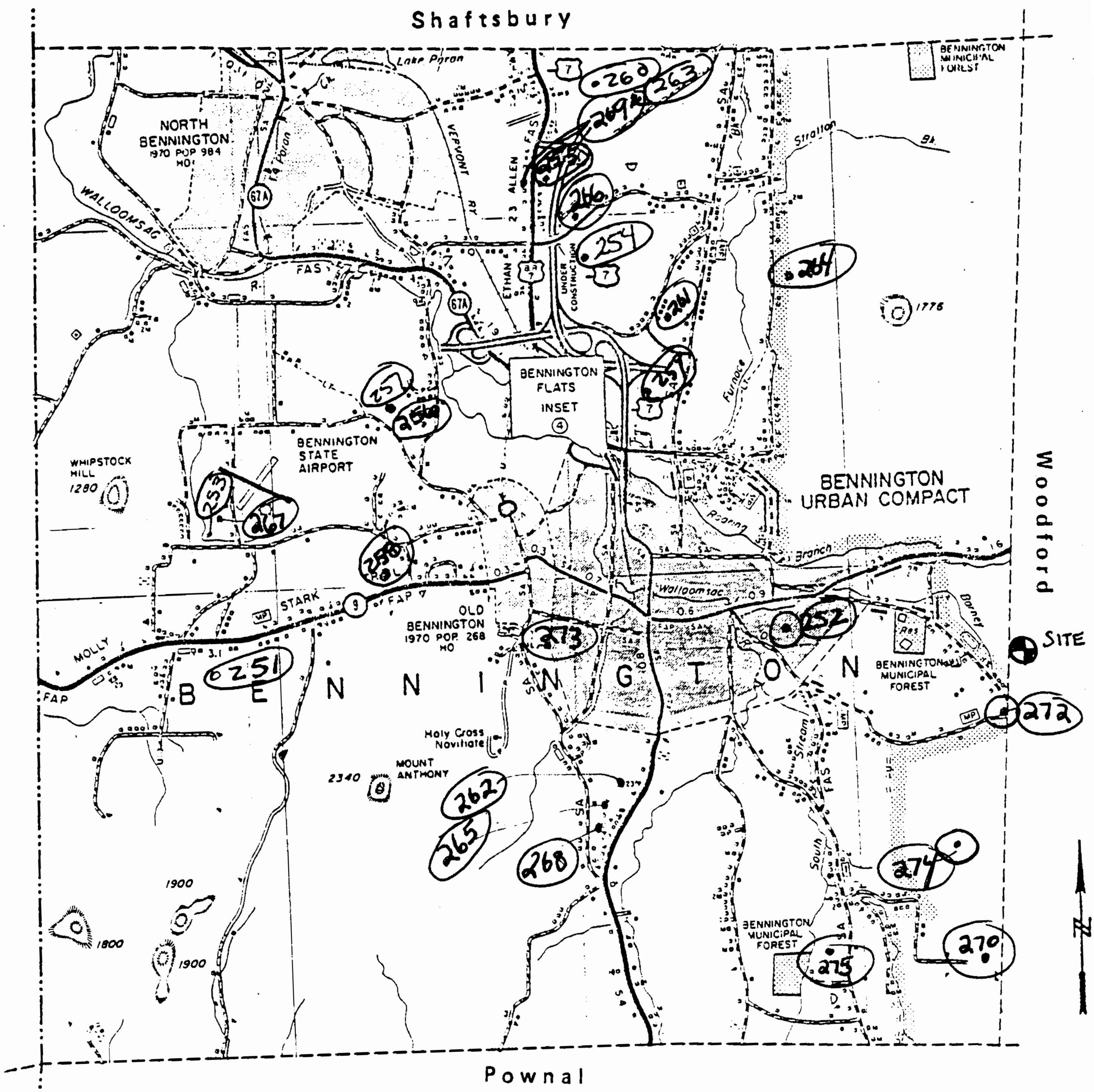
MAP PREPARED BY THE DEPARTMENT OF WATER RESOURCES FROM HIGHWAY DEPARTMENT MAP.

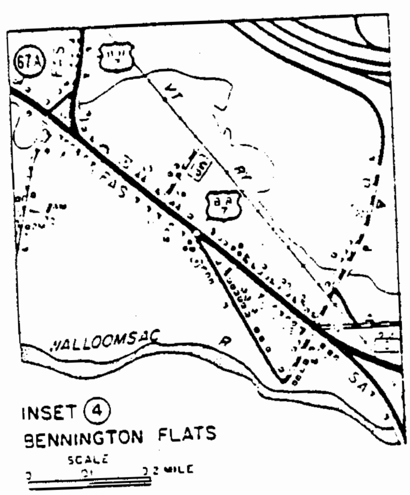




BENNINGTON
176 - 200

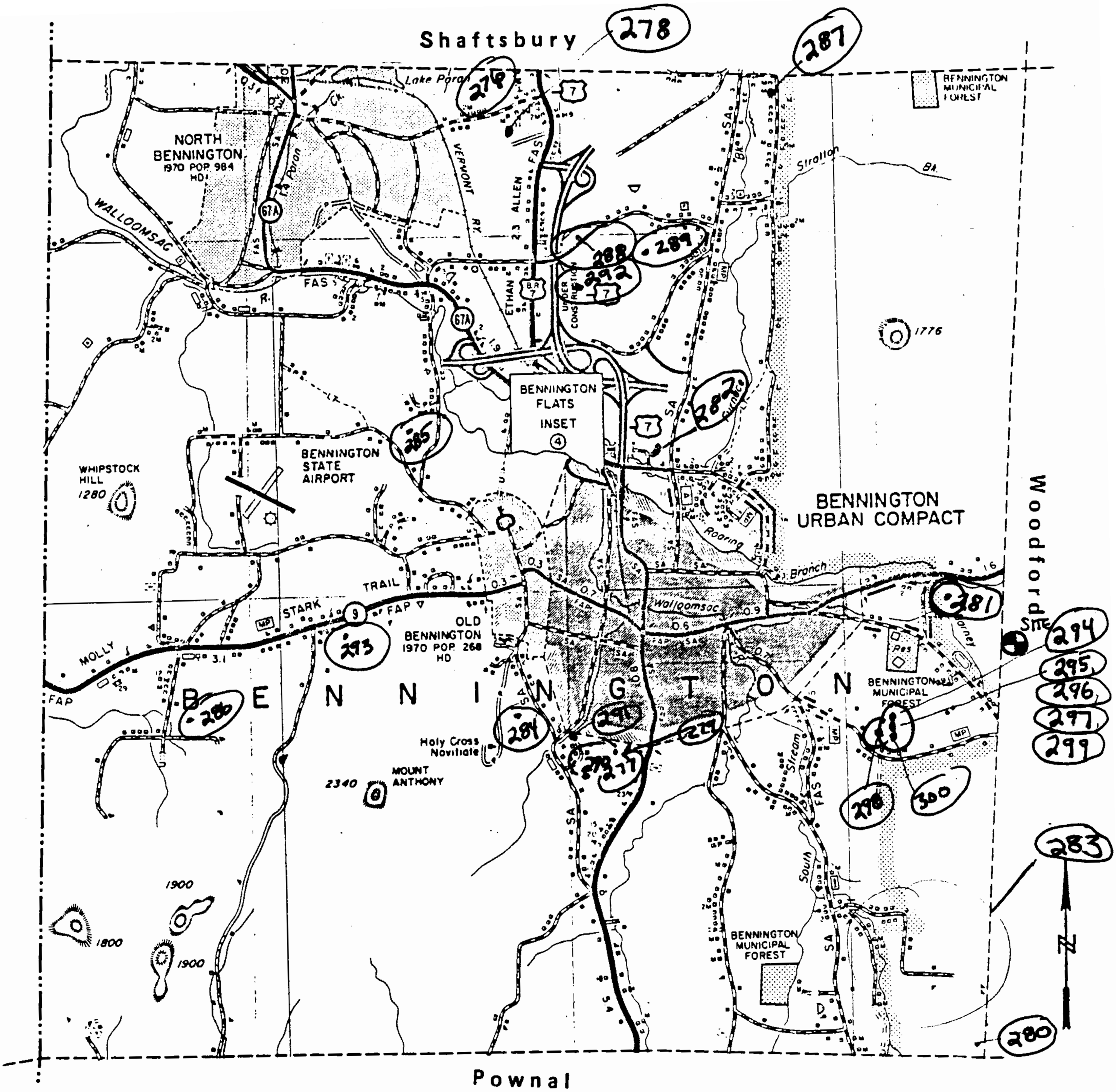
SCALE

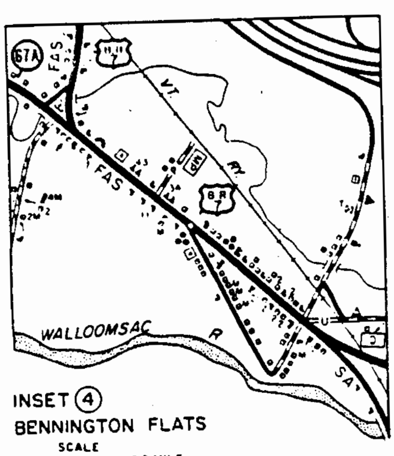




251 - 275

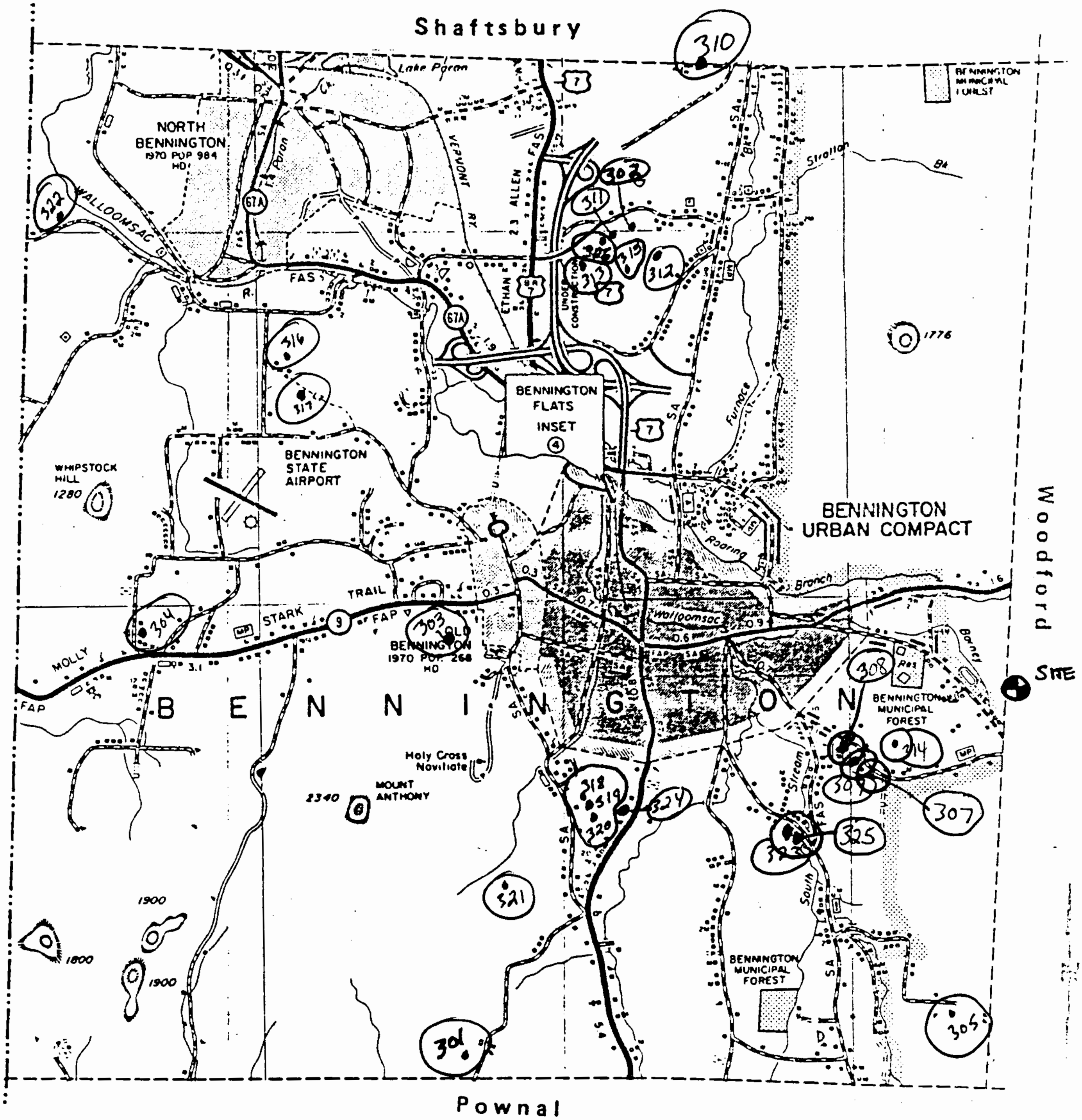
SCALE

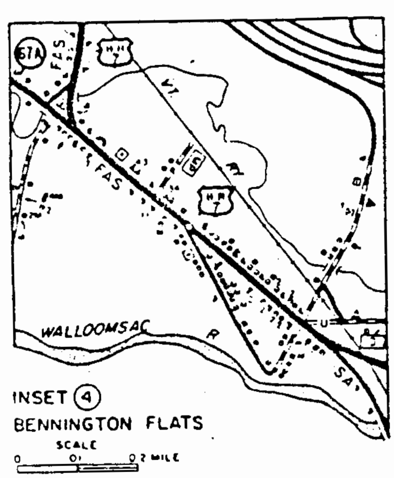




INSET 4
BENNINGTON FLATS
SCALE
0 0.1 0.2 MILE

276-300

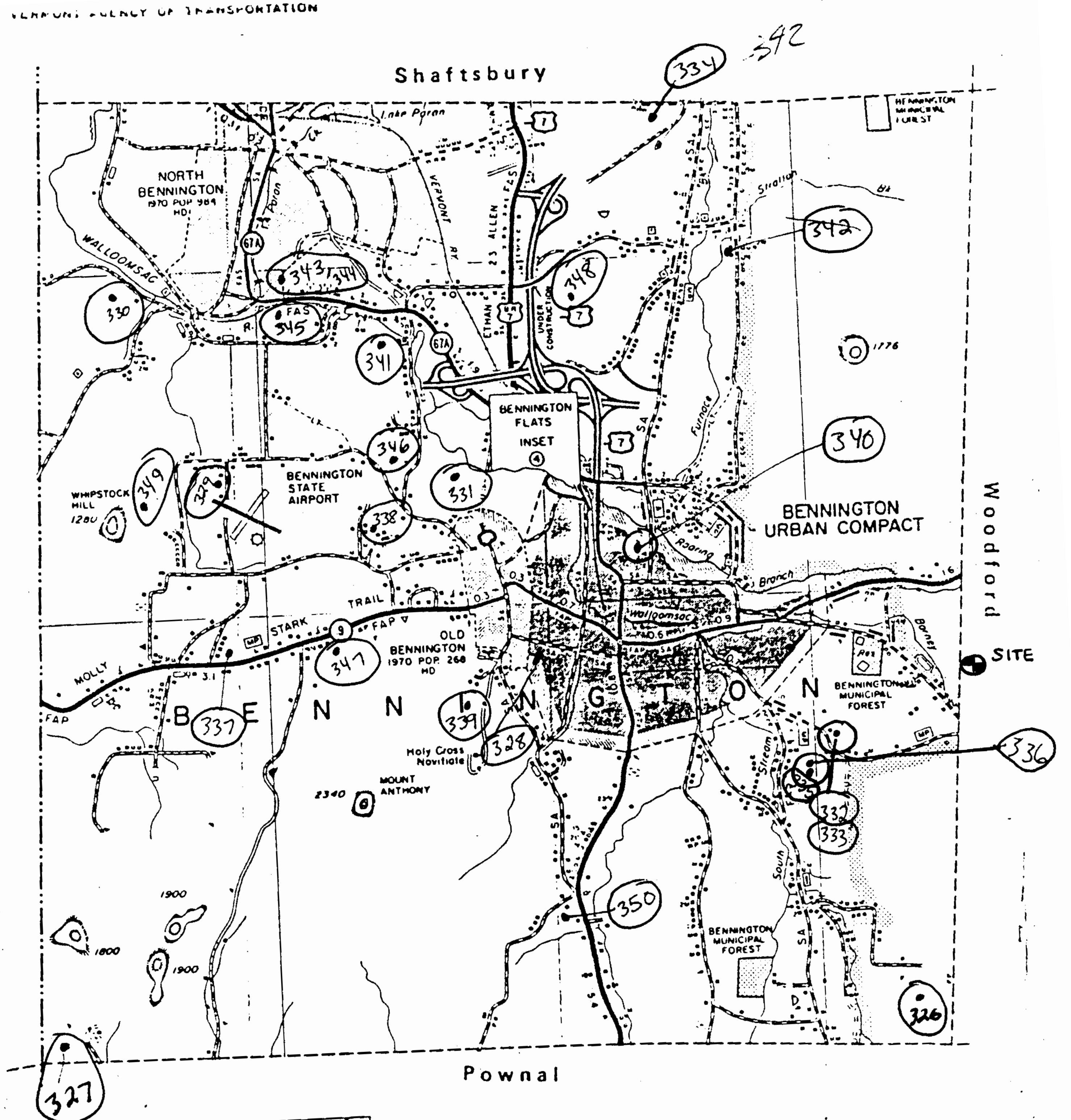


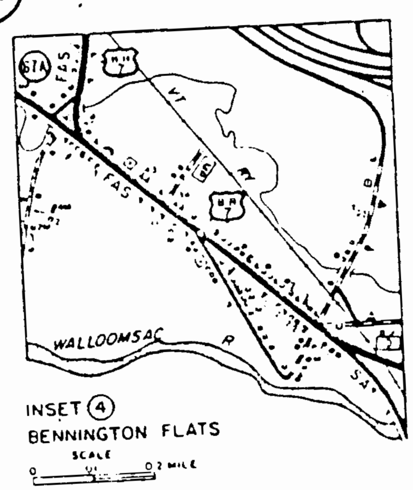


301-325

SCALE

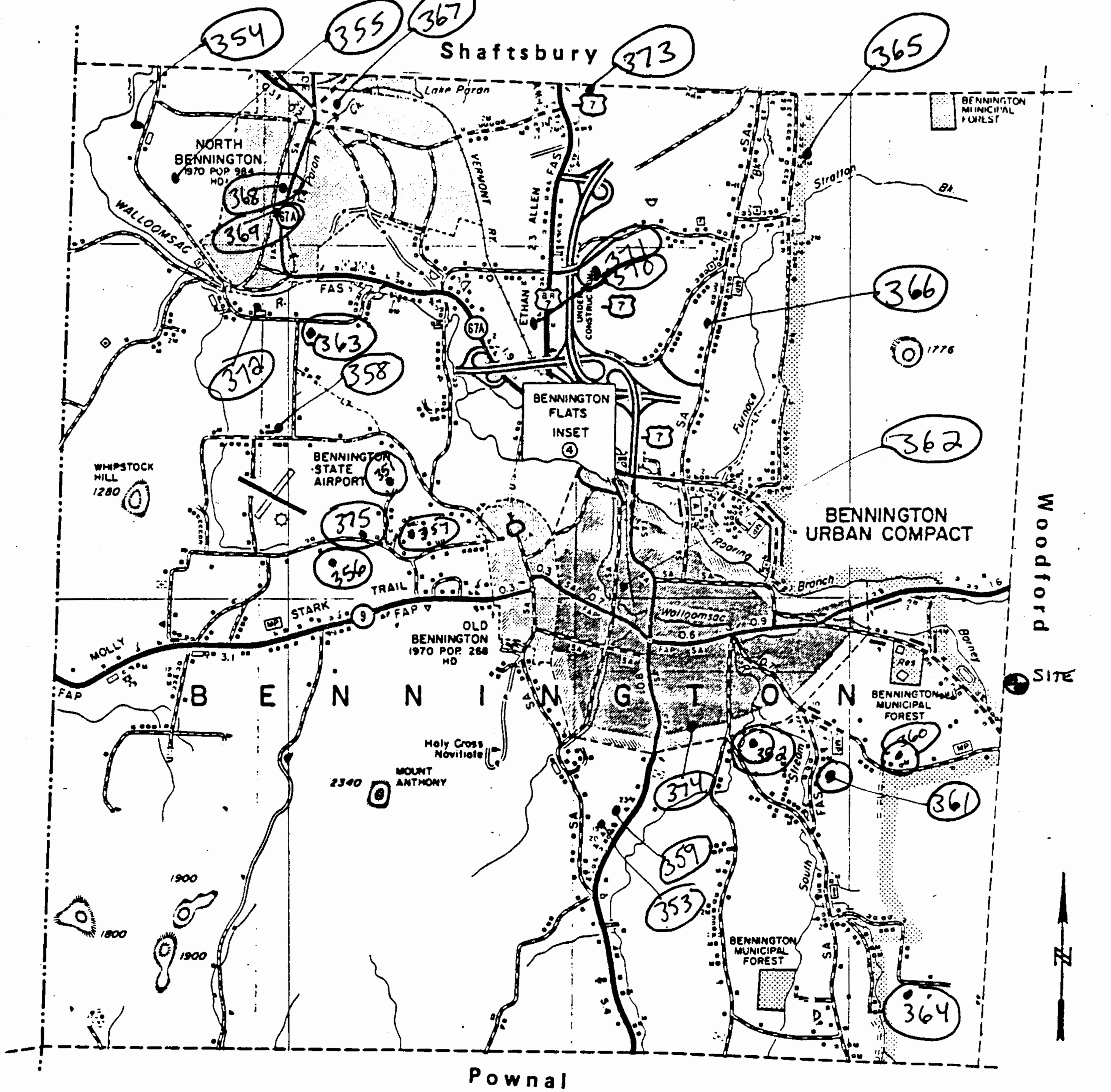
MAP SOURCE: VERMONT AGENCY OF TRANSPORTATION

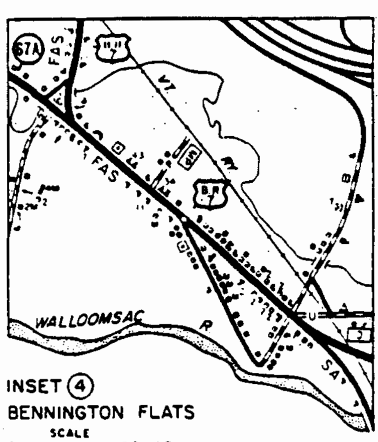




SCALE

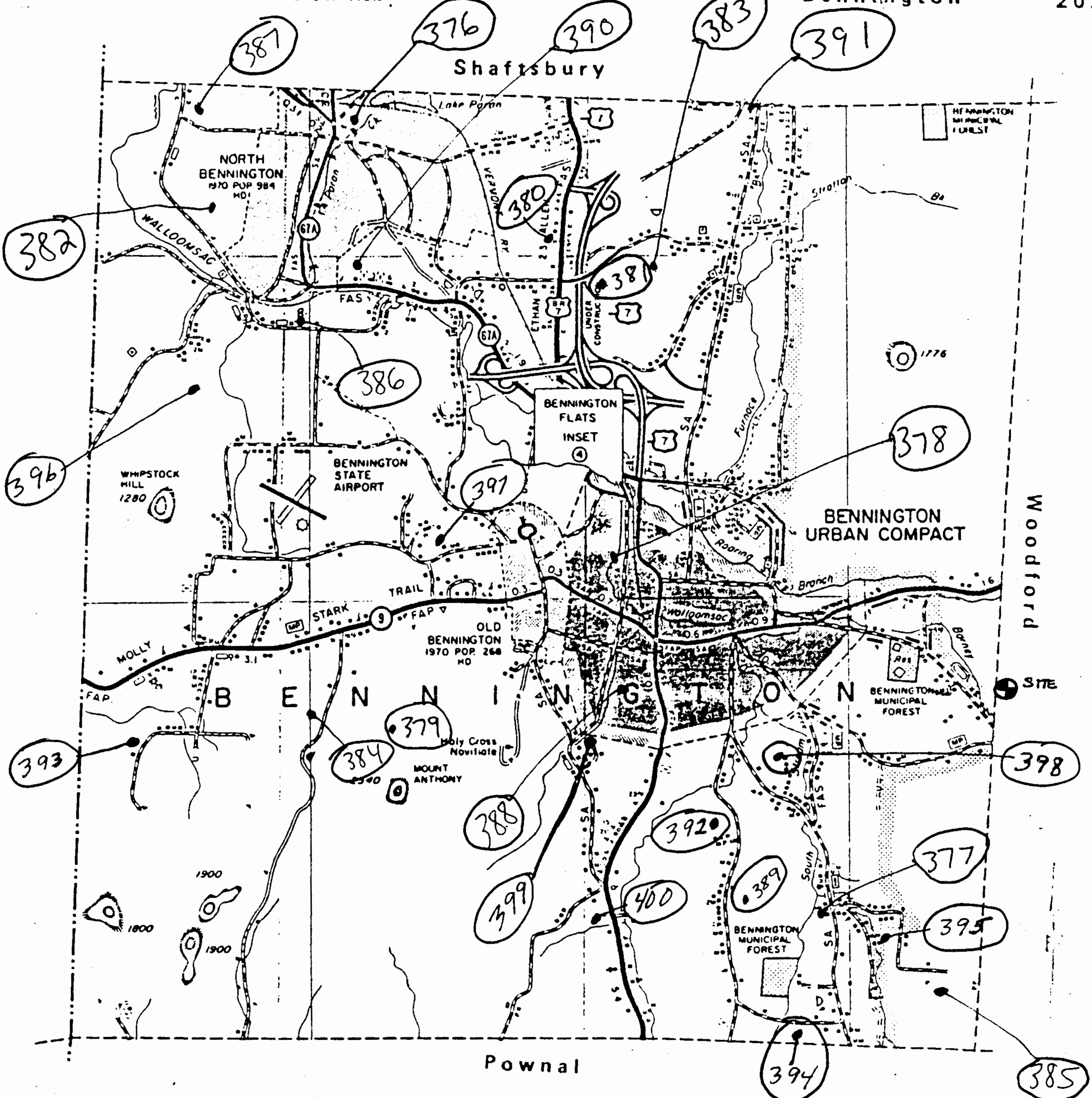
326-350

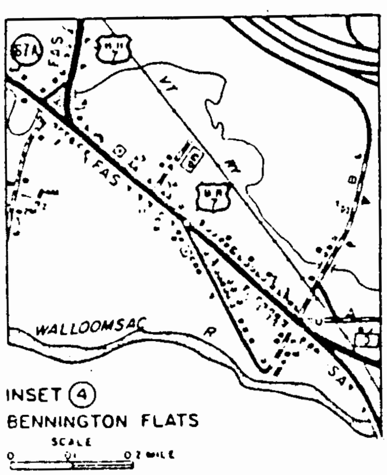




INSET 4
BENNINGTON FLATS
SCALE 0 0.1 0.2 MILE

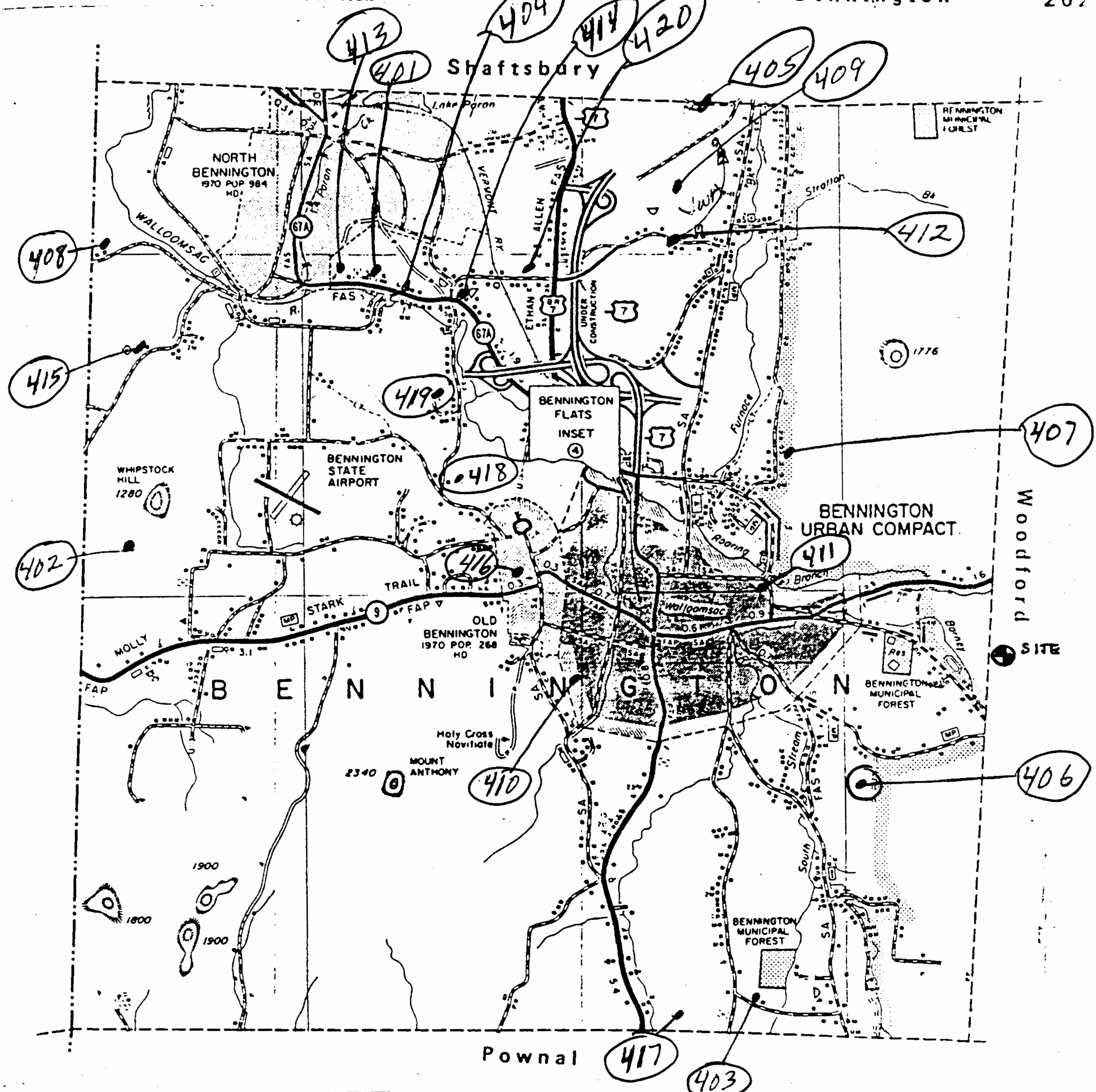
351–375

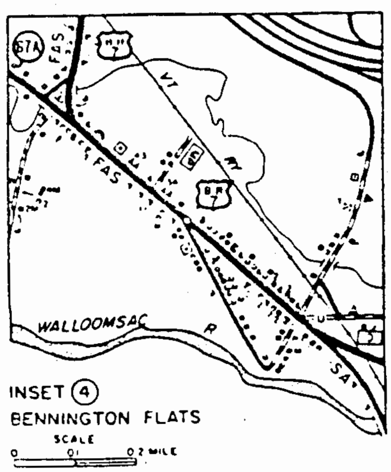




376– 400

SCALE

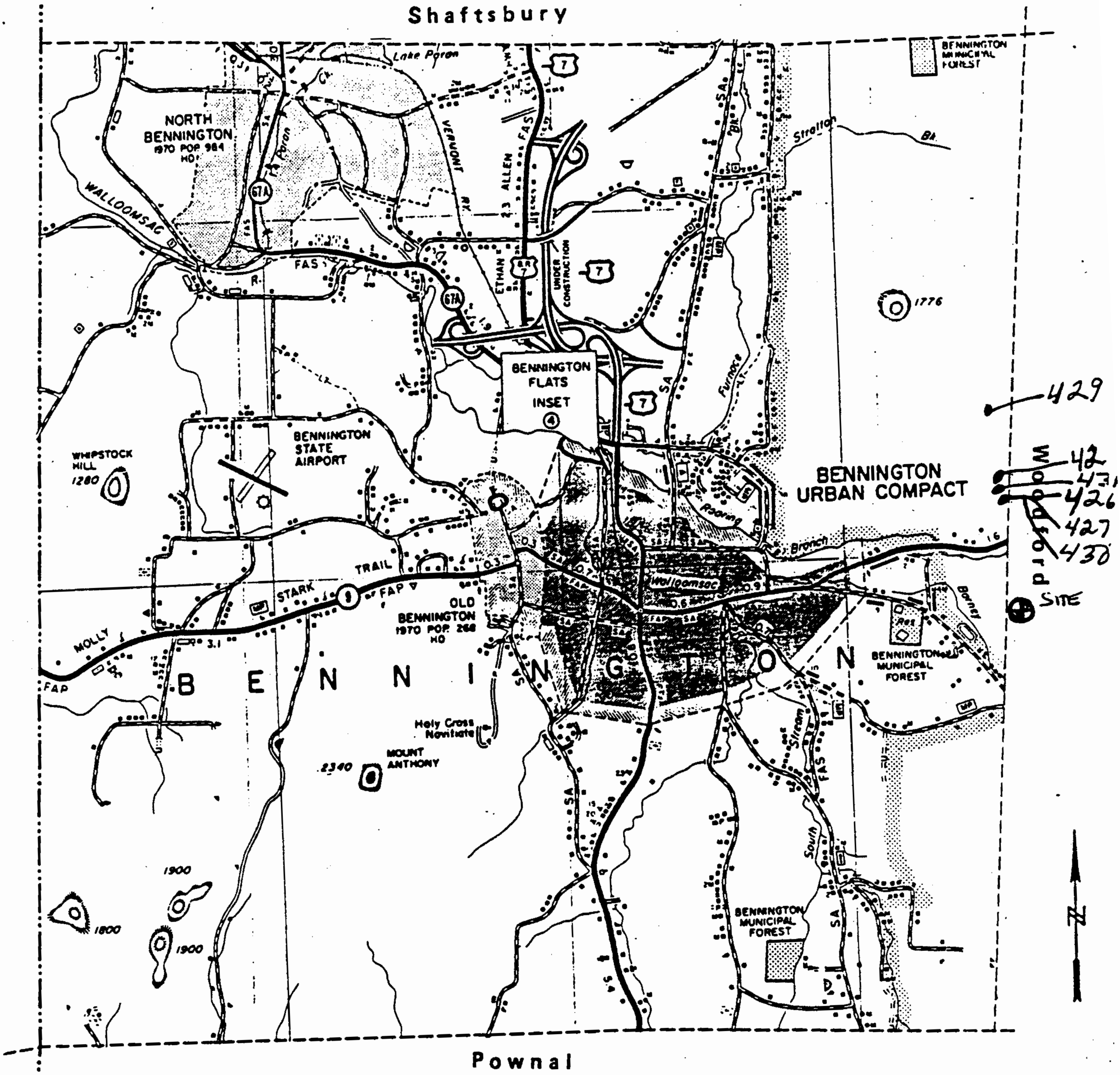


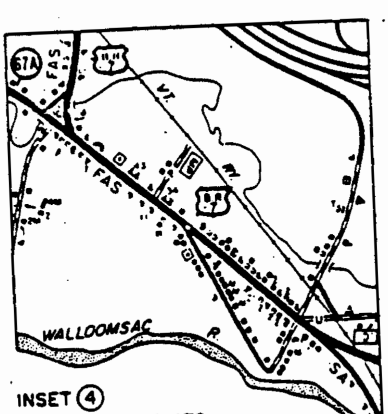


SCALE

401 – 420

SOURCE: VERMONT AGENCY OF TRANSPORTATION

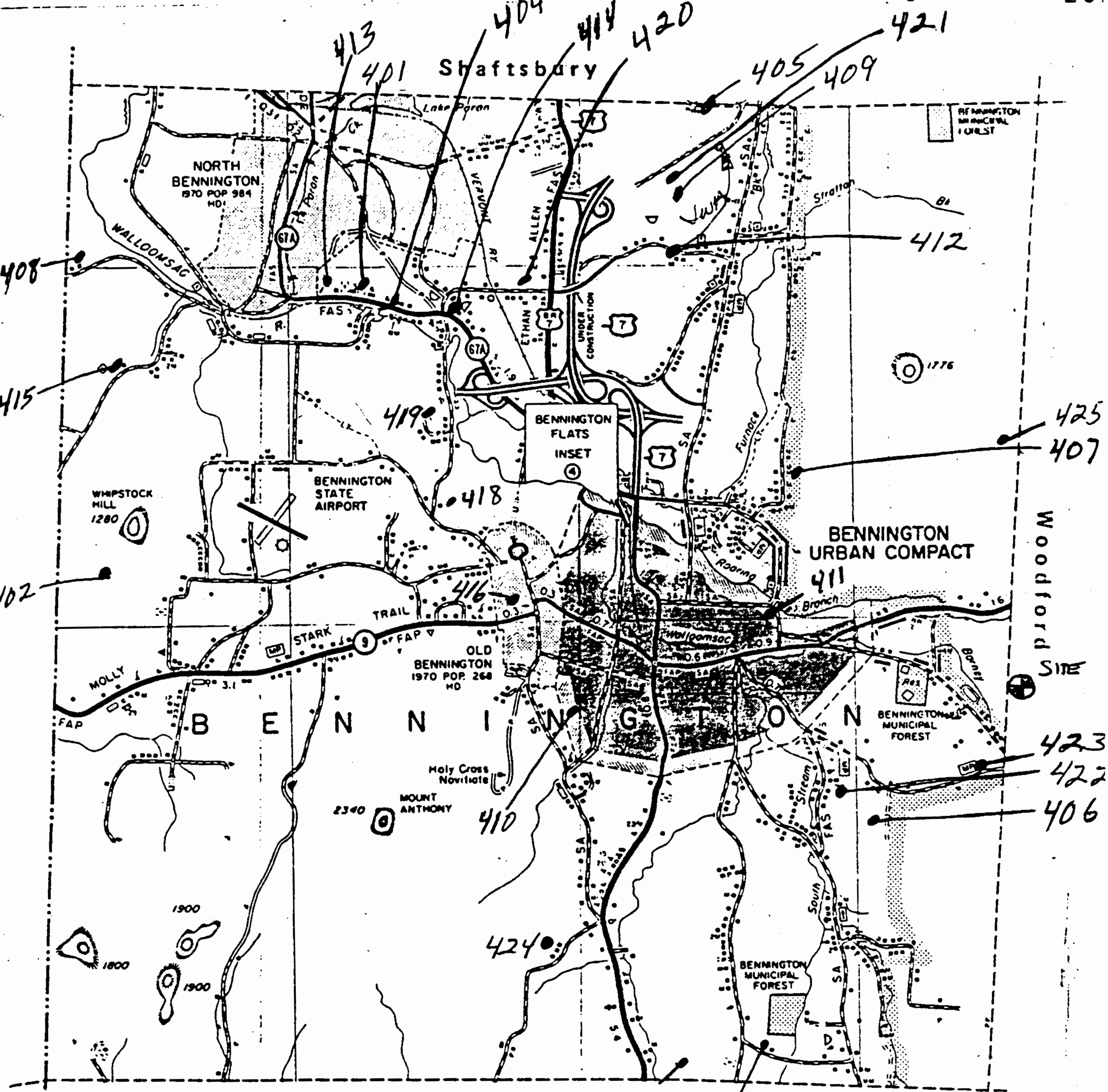




INSET 4
BENNINGTON FLATS
SCALE
0.2 MILE

Wells 426-450

SCALE


Shaftsbury
NORTH BENNINGTON 1970 POP 984 HD
WALLOOMSAC
BENNINGTON STATE AIRPORT
WHIPSTOCK HILL 1280
BENNINGTON FLATS INSET 4
BENNINGTON URBAN COMPACT
OLD BENNINGTON 1970 POP. 268 HD
MOLLY STARK TRAIL
B E N N I N G T O N
BENNINGTON MUNICIPAL FOREST
Holy Cross Novitiate
MOUNT ANTHONY 2340
Woodford
SITE
Pownal
401
402
403
404
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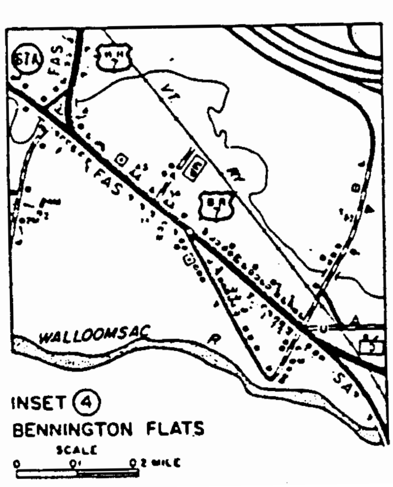

WALLOOMSAC R
INSET 4
BENNINGTON FLATS

Appendix 7

SOIL BORING LOGS

Notes:

1. The term BASAL TILL referenced in the following soil boring logs is equivalent to LODGEMENT TILL referenced in the text.

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG

LOG NUMBER: W-6/S2

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

DATE	GROUNDWATER LEVELS DEPTH	ELEV.
	6"	

FILE No.: 5271.001
DRILLING METHOD: 4 1/4" Hollow Stem Auger
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None DRIVER: Air Perc.

O'BRIEN & GERE GEOLOGIST: M. Randazzo
BORING LOCATION: Marshy area
BORING CO.: A&W Environmental Drilling
GROUND ELEVATION: 1078.26'
FOREMAN: M. Lagear
DATES: STARTED: 1/15/93 ENDED: 1/16/93

LEGEND: Grout, Sand Pack, Nat. Form. Screen —, Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0-2'	1-1-3-4	24/10	4	Med stiff, blk to d. brn, wet, organic silt, silty sand	1'	no well installed			0.0/ 0.0	
2	2'-4'	9-18-21-23	24/12	39	V. dense, tan, wet, F-C SAND, little m. pebbles, tr. silt grading into SILTY-F SAND, tf. c. sand m. gravel (KAME SAND DEPOSIT)					0.2/-	
3	4'-6'	21-26-8-6	24/0	34	V. dense, lt brn., F-M SAND, little silt, tr. c. sand, m. pebbles (KAME SAND DEPOSIT) ------------------------					-	
4	6'-8'	10-10-12-15	24/12	22	Med dense, tan, wet, f-m sand, tr. c. (KAME SAND DEPOSIT) lt. brown, wet, SILTY-F SAND ----------large boulder @ 8'-------------- auger refusal, rigmoved over 3' to south	7'				0.0/ 0.0	
5	8'-10'	10-14-14-9	24/6	28	Dense, wet, f-m sand, little c. sand Med dense, lt brn, wet F. SAND and silt well sorted (KAME SAND DEPOSIT)					0.0/-	
6	10'-12'	5-6-7-8	24/12	13	Med. dense, lt brn, wet, silty F. SAND, little m-c sand, tr. f-m pebbles (KAME SAND DEPOSIT) ------------------------	12'				0.0/-	
7	12'-14'	20-35-50/5	17/8	>100	V. dense, lt brn, wet, silty F. SAND, some f-m pebbles, tr. angular cobbles (ABLATED GLACIAL TILL)					0.0/-	
8	14'-16'	16-43-50/3	15/8	>100	V. dense, lt brn, wet silty F. SAND, some angular f-m pebbles (ABLATED GLACIAL TILL)					0.0/-	
					BOTTOM OF BORING @ 16' * Boring grouted, no well installed.						

Notes: * only one PID sample taken on samples with limited recovery.
Field testing/PID column presents soil screening results.

BB2:w6s2.wk1

O'BRIEN & GERE ENGINEERS, INC. — SOIL BORING LOG

LOG NUMBER: W7/S1
SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS	FILE No.: 5271.001
PROJECT LOCATION: Bennington/Woodford, VT	DATE: 6/21/93 DEPTH: 6.37 ELEV.: 1110.21	DRILLING METHOD: 4 1/4" Hollow Stem Auger
		SAMPLER TYPE: 2" Splitspoon
		HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: M. Randazzo	BORING LOCATION: NW of landfill	LEGEND: Grout / Sand Pack / Bentonite; Screen / Riser
BORING CO.: A&W Environmental Drilling	GROUND ELEVATION: 1116.58	
FOREMAN: P. Thornsbury	DATES: STARTED: 10/16/92 ENDED: 10/19/92	

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0'-2'	3-18-18-18	24/24	36	Dense, d. brn, damp, SILTY F. SAND, tr. c. sand, strong gasoline or diesel odors Petroleum odor	8"				1400/ 1200	
					Dense, damp, F. SANDY SILT, tr. f. pebbles (angular), strong gasoline odors (KAME SAND DEPOSIT) (Large boulder @ 3-1/2 to 4')					35/ 38	
2	5'-7'	3-2-4-12	24/2	6	Poor recovery Cutting description: d. brn, damp, F. SANDY SILT, little c. sand, f-m pebbles (KAME SAND DEPOSIT) Large boulder					0.0/ 0.0	
3	9'-11'	2-4-77-15	24/2	81	V. dense, lt brn, wet, SAND, SILT and PEBBLES in equal proportions					0.0/ 0.0	
4	11'-13'	14-14-8-13	24/24	22	Dense, lt brn, wet SAND and PEBBLES tr. c. pebbles. Increase in silt @ 12.5 to 13.0'. Deep till (KAME SAND DEPOSIT)	12'8"				0.0/ 0.0	
					Well sorted med sand (ABLATED GLACIAL TILL)						
5	13'-15'	-	24	-	(No sample taken due to running sands)						
					BOTTOM OF BORING @ 15'						

Notes: Field testing/MTIP column presents soil screening results.
Well Construction Details:
- 2" I.D. schedule 40 PVC well screen (10 slot) set at 15' (15'- 5')
- washed sand pack set from 15' to 3'.
- bentonite pellets set from 3' to 1'.
- cement grout positioned from 1' to grade.
- well finished with locking protective steel casing.
- measurements referenced from grade

w7s1.wk1

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG	LOG NUMBER: W-08/S1 SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE

'OJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	19.25	1090.85

FILE No.: 5271.001
DRILLING METHOD: 4 1/4" Hollow Stem Auger
SAMPLER TYPE: 2" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: R. MacLean
BORING CO.: A&W Environmental Drilling
FOREMAN: M. Miles

BORING LOCATION: West of landfill
GROUND ELEVATION: 1108.30
DATES: STARTED: 10/19/92 ENDED: 10/20/92

LEGEND: Grout, Sand Pack, Bentonite Seal, Screen —, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0'-2'	3-5-5-7	24/18	10	Loose, tan, dry, f. SAND, tr. silt (KAME SAND DEPOSIT)						
2	5'-7'	7-8-8-8	24/18	16	Loose, tan, dry, f. SAND, tr. silt (KAME SAND DEPOSIT)						
3	10'-12'	8-10-10-12	24/20	20	Med dense, tan, dry, f. SAND, tr. silt (KAME SAND DEPOSIT)	11 13					
4	15'-17'	9-10-14-16	24/22	24	Med dense, tan, dry, f. SAND, tr. silt (KAME SAND DEPOSIT)	15 20'					
5	20'-22'	4-20-12-12	24/18	32	Dense, tan, wet, f. SAND, some silt, tr. clay and pebbles (KAME SAND DEPOSIT or LOOSE ABLATED GLACIAL TILL)	25'					
6	25'-27'	10-38-30-10	24/10	68	V. dense, tan, wet, v. f. SAND, some silt, tr. clay and pebbles (ABLATED GLACIAL TILL)						
					BOTTOM OF BORING @ 27'						

Notes: Soil screening results presented on log W-08B.
W-08S2 not installed due to limited saturated interval at kame sand/ablated till interface.
Ground water depth taken from top of PVC water.
Well Construction Details:
- Well set at 25' below grade with 10' of 10 slot screen and 17' of riser.
- Material is 2" I.D. schedule 40 PVC.
- Measurements referenced from grade
- Washed sand positioned from 25' to 13'.
- Bentonite seal positioned from 13' to 11'.
- Remaining annulus grouted from 11' to grade.
- PVC encapsulated in 4" locking steel protective casing.

Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09/S1 SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE

'OJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	2.83	1074.01

FILE No.: 5271.001
DRILLING METHOD: 4 1/4" Hollow Stem Auger
SAMPLER TYPE: 3" Splitspoon
HAMMER: 140 lbs. FALL: 30 inches.

O'BRIEN & GERE GEOLOGIST: R. MacLean
BORING CO.: Soil Testing
FOREMAN: Mike Miles

BORING LOCATION: South of landfill
GROUND ELEVATION: 1076.84
DATES: STARTED: 10/21/92 ENDED: 10/21/92

LEGEND: Grout, Sand Pack, Pellets, Screen, Riser

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S (ppm)	FIELD TESTING PID (ppm)	RMKS*
					Soil description and PID data presented on W-09B.						
						10'					
					BOTTOM OF BORING @ 12'						

Notes: Well Construction:

- 2" I.D. schedule 40 PVC set at 10' to 2' above grade
- 10 slot screen positioned from 10' to 0'
- Sand pack set from 10' to 1'
- Bentonite seal from 1' to 0'
- Grout to grade with pad.
- PVC encapsulated with 4" locking protective steel cover.
- Measurements referenced from grade

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: SBW-10 SHEET 1 OF 1
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 11.47 ELEV.: 1120.11	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 2" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: M. Randazzo, R. MacLean BORING CO.: Soil Testing, Inc. FOREMAN: M. Lagear	BORING LOCATION: Landfill (North) GROUND ELEVATION: 1129.70 DATES: STARTED: 10/16/92 ENDED: 10/19/92	LEGEND: Grout, Sand Pack, Bentonite, Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
1	0'-2'	16-17-14-10	24/15	31	Med dense, brn, dry SILT, little f. sand and gravel, tr. clay (FILL/LOAM)					0.0/ 0.0	
2	2'-4'	38-31-40-66	24/21	71	Dense, brn, dry SILT, little f. sand and gravel, tr. clay (FILL/LOAM)	3.3'				0.0/ 0.0	
					D. brn, damp SILT, little f. sand and gravel, tr. clay	3.8'					
3	4'-6'	12-14-16-16	24/16.5	30	Med dense, lt brn, dry, f. SAND (KAME SAND DEPOSIT)					0.0/ 0.0	
4	6'-8'	16-13-14-14	24/18	27	Med dense, lt brn, dry, f. SAND (KAME SAND DEPOSIT)					0.0/ 0.0	
5	8'-10'	10-9-6-3	24/21	15	Med dense, lt brn, dry, f. SAND water @ 9.5' (KAME SAND DEPOSIT)					0.0/ 0/0	
6	10'-12'	6-8-12-12	24/18	20	Med dense, tan to brn, moist to wet, f-m SAND, little silt progressing to silty f. sand, tr. c. sand and f. gravel @ bottom 6-8" of recovery					2/-	
7	12'-14'	7-13-13-9	24/12	26	Med dense, tan to brn, wet, F. SAND and silt, tr. m-c gravel @ bottom 4" of recovery (KAME SAND DEPOSIT)	14'				1.5/-	
8	14'-16'	19-13-26-47	24/12	39	Dense, tan to brn, wet, INTERMIXED F. SAND and silt, some clay, tr. c. sand and c. gravel (ABLATED GLACIAL TILL)					1.3/-	
					BOTTOM OF BORING @ 16'						

Notes: Well Construction Details:

2" ID schedule 40 PVC well set @ 16' with 10' of 10 slot screen
2" ID schedule 40 PVC riser set from 6 to 2' above grade
Sand pack positioned from 16 to 4'
Bentonite seal positioned from 4 to 2'
Grout positioned from 2' to grade
Well encapsulated in 4" locking steel protective casing
- Ground depth taken from PVC.
- Measurements referenced from grade

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W11/S1 SHEET 1 OF 1
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 3.21 ELEV.: 1081.1	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 3" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: M. Randazzo BORING CO.: A&W Environmental Drilling FOREM J. Richardson	BORING LOCATION: Marshy area GROUND ELEVATION: 1083.60 DATES: STARTED: 1/19/93 ENDED: 1/21/93	LEGEND: Grout, Sand Pack, Bentonite, Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0'-2'	1-1-1-3	24/12	2	D. brn, damp to moist, ORGANIC SILT, little f. sand	1'				106.00/	
					D. brn, moist to wet, f-c SAND, little med pebble and silt					38.00	
2	2'-4'	8-18-12-30	24/14	30	Med dense, d. brn, wet, f-very c. SAND, little very f. to med pebbles, tr. silt (KAME SAND DEPOSIT)					250/ 125	
3	4'-6'	17-17-15-11	24/19	32	Med dense, grn gray to olive grn, wet, f-c SAND, little silt, tr. med gravel, tr. clay. Grading and laminae present. Pebbles sand, faceted brn quartzite. (KAME SAND DEPOSIT)					73/ 525	
4	6'-8'	8-12-17-18	24/14	29	Med dense, grn gray to olive grn, wet, f-c SAND, little silt, tr. med gravel, tr. clay (KAME SAND) Pebbles sand, faceted brn quartzite. Grading to bronze silt with clay, some brn clay horizons	8'				37/ 52	
5	8'-10'	17-28-18-36	24/11	46	Med dense, gold to bronze, wet, SILT and CLAY, tr. f-c gravel. Pebbles striated, faceted. Increasing gravel with depth. (ABLATED GLACIAL TILL)					560/ 720	
6	10'-12'	24-50-51-76	24/24	101	V. dense, brn to grn, damp to wet, SILT and CLAY, pebbles, tr. f-c sand. Pebbles subround, faceted, striated. Wht and gray, damp, quartzitic to 12.6'. (ABLATED GLACIAL TILL)					3.0/ 2.6	
7	12'-13.8'	47-54-87-85/.3	22/13	141	V. dense, brn to red brn, damp, SILAT and CLAY, pebbles, little f-c sand. Pebbles angular to round. Massive, matrix supported. Gray, red, wht, quartzitic pebbles (ABLATED GLACIAL TILL)					5.4/ 6.0	
					BOTTOM OF BORING @ 13.8'						

Notes: 2" ID PVC 0.010" slot screen 8.1' to 3.1
2" ID PVC 0.010" slot riser 3.1' to 1.9
Washed cilica sand placed from 8.5' to 2
Bentonite seal placed from 2' to 1
Grout placed from 1' to grade
Well encapsulated in protective locking steel casing

Field Testing/PID column presents soil screening results.

:w11s1.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W12/S1 SHEET 1 OF 1
CLIENT: BURGESS BROS. SUPERFUND SITE ROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE / DEPTH / ELEV. 6/21/93 / 2.18 / 1096.08	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 2" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: J. Jennings BORING CO.: A&W Environmental Drilling FOREMAN: M. Lagear	BORING LOCATION: Marshy area GROUND ELEVATION: 1096.40 DATES: STARTED: 1/25/93 ENDED: 1/26/93	LEGEND: Grout / Sand Pack / Bentonite; Screen --; Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS
1	0'-2'	1-4-6-8	24/6	10	Brn to blk, wet, LEAVES, SILT and V. F. SAND, tr. well rounded 3/4" stone Fluvial and (KAME SAND DEPOSIT)	0'				8.8/ 8.8	
2	2'-4'	17-25-20-22	24/12	45	Same tr. angular pebbles ----------------------------- Tan, wet, v. well sorted, F-M SAND, tr. angular white quartzite	3'9"				5.2/ 4.9	
3	4'-6'	10-16-16-21	24/18	32	----------------------------- Tan, v. well sorted, SILT, some v. f. sand, tr. gravel (KAME SAND DEPOSIT)	4'6"				0.0/ 0.0	
4	6'-8'	18-20-28-40	24/8	48						0.0/ 0.0	
					BOTTOM OF BORING @ 8'						

Notes: Well Construction:

- 2" I.D. schedule 40 PVC well screen (10 slot) set from 8' to 3'.
- 2" PVC well riser set from 3' to 2' above grade.
- Sand pack positioned from 8' to 2'.
- Bentonite pellets set from 2' to 1'.
- Grout set from 1' to grade.
- 4" locking protective well housing positioned over PVC.
- Measurements referenced from grade

Field testing/PID column presents soil screening results.

z:w12s1.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W22/S1 SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 2.72 ELEV.: 1087.91	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 2" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: J. Jennings BORING CO.: A&W Environmental Drilling FOREMAN: M. Lagear	BORING LOCATION: Marshy area GROUND ELEVATION: 1089.00 DATES: STARTED: 1/26/93 ENDED: 1/28/93	LEGEND: Grout, Sand Pack, Bentonite; Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0'-2'	2-11-1-1	24/18	13	Med dense, frozen, med brn, TOPSOIL, well rounded sand, some roots, leaves	6"			#1-	0/0	
2	2'-4'	12 - 50/4"	16/0	>100	Loose, blk, moist, V. F. SAND, some silt and roots (FLUVIAL DEPOSIT) Pushed a cobble - no representation in sample					-/-	
3	4'-6'	42-7-4-8	24/20	11	Soft, tan, wet, SILT, some f. sand, tr. angular gravel (KAME SAND DEPOSIT)				10.0/32.9		
4	6'-8'	13-11-10-19	24/18	21	Med dense, tan, wet, MED SAND, silt, little clay bands (KAME SAND DEPOSIT)				41.1/56.9		
5	8'-10'	11-37-41-61	24/16	78	Med dense, tan, damp, MED C. ANGULAR SAND, some silt (KAME SAND DEPOSIT) Dense, tan, damp and dry, SILT, v. f. sand, tr. angular stones, little angular gravel	8'6"			39.7/57		
6	10'-12'	12-80-80-70	24/18	160	V. dense, dry, same as above (ABLATED GLACIAL TILL)				10/35.2		
					BOTTOM OF BORING @ 12'						

Notes: Well Construction Details:
- 12'-9'6" Bentonite seal
- 9'6"-3' Uniform silica sand
- 3'-1' Bentonite seal
- 1'-0' Bentonite cement grout
- 9'-4' 10 slot 2" schedule 40 PVC well screen.
- 4'-2' above grade PVC well riser.
- PVC encapsulated with 4" diameter protective steel casing.
- Measurements referenced from grade

Field Testing/PID column presents soil screening results.

..w22s1.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W25/S1 SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	5.58	1083.64

FILE No.: 5271.001
DRILLING METHOD: 4 1/4" Hollow Stem Auger
SAMPLER TYPE: 2" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: R. MacLean
BORING CO.: A&W Environmental Drilling
FOREMAN: M. Miles

BORING LOCATION: West of landfill
GROUND ELEVATION: 1086.60
DATES: STARTED: 10/21/92 ENDED: 10/21/92

LEGEND: Grout; Sand Pack; Bentonite; Screen --; Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0'-2'	2-2-2-1	24/18	4	LOAM and organic SILT	2"		0.5'			
					V. loose, yellow to brn, dry, f. SAND, tr. silt (KAME SAND DEPOSIT)			1' 2'			
					Loose, blk to gray, f. SAND and SILT, tr. clay, (Iron mottling)						
2	5'-7'	13-18-11-7	24/8	29	M. dense, wet, F. SAND and SILT, tr. clay (KAME SAND DEPOSIT)	8'		10'			
3	10'-12'	14-29-75/5"	17/16	>100	V. dense, brn, wet, SILT, little clay, little c. sand, med pebbles (ABLATED GLACIAL TILL)						
					BOTTOM OF BORING @ 12' (10' - 12' description taken from W-25DI well)						

Notes: Well Construction Details:
2" ID schedule 40 PVC well set @ 10' with 8' of 10 slot screen
2" ID schedule 40 PVC riser set 2' above grade
Sand pack positioned from 10 to 1'
Bentonite seal positioned from 1 to 0.5'
Grout positioned from 0.5' to grade

-Well encapsulaed in 4" diameter steel locking proctive casing
-Measurements referenced from grade
-Field Testing/PID column presents soil screening results.

:w25s1.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-27S1/T SHEET 1 OF 2

CLIENT: Burgess Bros. Supefund Site

PROJECT LOCATION: Bennington, VT

GROUNDWATER LEVELS	DATE	DEPTH	ELEV.
T	7/05/94	13.78	1099.22
S1	7/05/94	14.07	1098.73

FILE No.: 5271.003
DRILLING METHOD: 4" Casing
SAMPLER TYPE: 3" OD Splitspoon
HAMMER: 300lb FALL: 30"

'IEN & GERE GEOLOGIST: MA Randazzo
ING CO.: Redwing Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: West Side of Landfill
GROUND ELEVATION: 1112.8/27S1, 1113.0/27T
DATES: STARTED: 6/1/94 ENDED: 6/2/94

LEGEND: Grout/Bentonite; Sand Packing; Natural Mater.; ORH; Steel

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S	PID (ppm)	S*
1	0'-2'	1-2-1-2	24"/12"	3	Very Loose, Damp, DK Brn/LT Brn, SILTY-SAND, Forest Mat(roots, leaves, pine needles)	8"				12/18	
2	2'-4'	2-1-1-1	24"/18"	2	Very Loose, Damp, LT Rusty Brn, F. Sandy-Silt	3'				0/0	
3	4'-6'	2-2-3-4	24"/24"	5	Very Loose, Damp, LT Tan, F-M SAND, Well Sorted					0/0	
4	6'-8'	7-7-8-7	24"/24"	15	Med. Dense, Damp, Lt Tan/Brn, F-M Sand with cross bedded lenses of F. Sandy-Silt					0/0	
5	8'-10	5-6-8-6	24"/24"	14	Med. Dense, Moist, Gray/Tan, F-M SAND Well sorted					0/0	
6	10'-12'	2-2-4-2	24"/20"	6		11'				4/4	
7	12'-14'	3-3-4-3	24"/24"	7	Loose, Moist to Wet, Gray/Tan, F. Sandy-Silt, Cross-bedding present					0/0	
8	14'-16'	2-3-4-3	24"/18"	7	Very Loose-Loose, Wet, Interbedding of F-M SAND & F. SANDY- SILT (KAME SAND DEPOSIT)					1/2	
9	16'-18'	1-1-1-2	24"/24"	2		17'				4/3	
10	18'-20'	WR/1-1-3	24"/24"	2	Very Loose, Wet, Gray/Brn, SILTY-F.SAND/little clay & f-cs pebbles-boulders (ABLATED GLACIAL TILL)	19'				1/1	
11	20'-22'	WR/3-3-5	24"/24"	6	Very Loose, Wet, Gray/Brown, F-M SAND/little silt/trace f-cs pebbles-boulders (ABLATED GLACIAL TILL)	20'				1/1	
12	22'-24'	7-14-16-13	24"/24"	30	Dense, Wet, Gray/Brn, SILTY-F. SAND/little clay & f-cs pebbles & cobbles (ABLATED GLACIAL TILL)					1/1	
13	24'-26'	60/3"	3"/0"	>100	Large cobble					NA	
14	25'-27'	8-11-14-22	24"/24"	25	Very Dense, Wet, Gray/Brn, SILTY- F-M SAND little cs sand, clay, f-cs pebbles, cobbles,					1/1	
15	27'-29'	18-64/4"	10"/10"	>100	(ABLATED GLACIAL TILL)						

Note: 1. Field Testing/HNu column indicates the results of the soil screening headspace analyses. Results reported in parts per million(vol./vol.).
2. Well Construction: W-27T
- 6" casing set at 19 feet below grade.
- 2" Schedule 40 PVC well set 35' with 10' of 10 slot screen
- Washed sand pack set from 35'-23' feet below grade.
- Bentonite set 23' to 21'.
- Grout postioned from 21' to grade.
3. Ground water elevation referenced from mean sea level.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-27S1/T SHEET 2 OF 2

CLIENT: Burgess Bros. Supefund Site

PROJECT LOCATION: Bennington, VT

	GROUNDWATER LEVELS DATE	DEPTH	ELEV.
T	7/05/94	13.78	1099.22
S1	7/05/94	14.07	1098.73

FILE No.: 5271.003
DRILLING METHOD: 4" Casing
SAMPLER TYPE: 3" OD Splitspoon
HAMMER: 300lb FALL: 30"

O'BRIEN & GERE GEOLOGIST: MA Randazzo
BORING CO.: Redwing Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: West Side Of Landfill
GROUND ELEVATION: 1112.8/27S1, 1113.0/27T
DATES: STARTED: 6/1/94 ENDED: 6/2/94

LEGEND: Grout/Bentonite; Sand Packing; Natural Mater.; ORH —; Steel

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	S*
16	29'-31'	11-8-10-27	24"/24"	18	Med. Dense, Wet, Same As Above					2/3	
17	31'-33'	11-23-30-48	24"/20"	53	Very Dense, Wet, Gray/Brown, SANDY-SILT/little cs sand to cs pebbles (ABLATED-BASAL GLACIAL TILL)					0/1	
18	33'-35'	25-35-40-60/4"	24"/18"	75	Transitional bone.					1/1	
					Bottom Of Boring	35'					

Note: 1. Field Testing/HNu column indicates the results of the soil screening headspace analyses. Results reported in parts per million(vol./vol.).
2. Well Construction: W-27S1
- 2" schedule 40 PVC well set at 19' with 10' of 10 slot screen
- Washed sand pack set from 19'-7' feet below grade.
- Bentonite set 5'-7'.
- Grout postioned from 5' to grade.
3. Ground water elevation not referenced from sea level.

BB3:w27s1t.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W1/S1, SBW-13 SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	8.55	1114.14

FILE No.: 5271.001
DRILLING METHOD: 4 1/4" Hollow Stem Auger
SAMPLER TYPE: 2" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: M. Randazzo
BORING CO.: A&W Environmental Drilling
FOREMAN: J. Halaburda

BORING LOCATION: NE of landfill
GROUND ELEVATION: 1120.89
DATES: STARTED: 10/7/92 ENDED: 10/8/92

LEGEND: Grout; Sand Pack; Bentonite; Screen --; Riser

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S (ppm)	FIELD TESTING PID (ppm)	RMKS*
1	0'-2'	2-4-7-10	24/17	11	Med dense, lt brn to tan, F-M SAND, well sorted	1'				0.00/ 0.00	
2	2'-4'	10-12-14-16	24/15	26	Med dense, lt brn to tan, F-M SAND, well sorted (KAME SAND DEPOSIT)	3'				0.0/ 0.0	
3	4'-6'	12-13-14-12	24/24	27	Med dense, lt brn, moist, F-M SAND, well sorted (KAME SAND DEPOSIT)	4'				0.0/-	
4	6'-8'	10-22-12-7	24/24	34	Med dense, lt brn, moist, F-M SAND, well sorted					0.0/-	
5	8'-10'	1-6-11-35	24/17	17	Med dense, brn, wet, F-M SAND, tr. f-m gravel, no visual signs of contamination (KAME SAND DEPOSIT)	9'6"				1.2/ 1.3	
6	10-12'	14-36-25-25	24/15	61	V. dense, brn to tan, wet, F-M SAND, little f-c gravel, tr. cobbles (ABLATED GLACIAL TILL)					0.4/ 0.5	
					BOTTOM OF BORING @ 12'						

Notes: Well Contruction Details:
2" I.D. Schedule 40 PVC well set @ 12' with 8' screen (20 slot) 12-4' screen.
No. 2 sand (12'-3'). Bent (3-1'). Grout (1-0'). 4" locking steel protective casing.
Measurements referenced from grade.
Ground water depth taken from top of PVC.
Field Testing/PID column presents soil screening results.

...:sbw13.wk1

O'BRIEN & GERE ENGINEERS, INC. — SOIL BORING LOG — LOG NUMBER: SBW-14

SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE

'OJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93		

FILE No.: 5271.001
DRILLING METHOD: 4 1/4" Hollow Stem Auger
SAMPLER TYPE: 2" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: M. Randazzo
BORING CO.: A&W Environmental Drilling
FOREMAN: P. Thornsbury

BORING LOCATION: In landfill
GROUND ELEVATION: 1109.77
DATES: STARTED: 10/15/92 ENDED: 10/15/92

LEGEND: Grout, Bentonite, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0'-2'	1-2-4-4	24/3	6	D. Brn, damp, SILTY-F. SAND, tr. vegetation	6"	no well installed			6.9/-	
					Loose, lt tan to brn, damp, SAND, little silt (KAME SAND DEPOSIT)						
2	2'-4'	4-4-4-4	24/24	8	Loose, lt tan to brn, damp, SAND, little silt (KAME SAND DEPOSIT)					0.1/ 12.6 0.1/ 8.2	
3	4'-6'	2-3-3-2	24/19	6	Loose, lt tan to brn, damp, SAND, little silt (KAME SAND DEPOSIT)					13.7/ 6.4	
4	6'-8'	3-3-4-3	24/20	7	Loose, lt tan to brn, damp, SAND, little silt (KAME SAND DEPOSIT)					53.5/ 31.5	
5	8'-10'	3-2-2-1	24/24	4	Loose, lt tan to brn, damp, SAND, little silt (KAME SAND DEPOSIT)					90.3/ 105	
6	10'-12'	3-5-7-10	24/24	12	Loose, lt tan to brn, damp, SAND, little silt, pieces of roots (KAME SAND DEPOSIT)	11'				34.2/ 97.9	
					Med dense, lt tan to brn, damp, SAND, little silt, tr. c. pebbles						
7	12'-14'	7-12-14-15	24/24	26	Med dense, lt tan to brn, damp, MED SAND, tr. silt (ABLATED GLACIAL TILL)					125/ 146	
					BOTTOM OF BORING @ 14'						

Notes: Background 0.2ppm.
Boring from 14'-11' with bentonite and 11' to ground surface with grout.
Field Testing/PID column presents soil screening results.

..:sbw14.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: SBW-15 SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE
OJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	DRY	

FILE No.: 5271.001
DRILLING METHOD: 4 1/4" Hollow Stem Auger
SAMPLER TYPE: 3" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: M. Randazzo
BORING CO.: Soil Testing, Inc.
FOREMAN: M. Miles

BORING LOCATION: Former Lagoon Pit
GROUND ELEVATION: 1099.30
DATES: STARTED: 10/23/92 ENDED: 10/23/92

LEGEND: Grout, Sand Pack, Bentonite, Screen, Riser

No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
					D. brn, VEGETATION						
1	0'-2'	1-1-1-1	24/18	2	Loose, tan to gray, moist, f-m SAND (two thin layers of silty-clay-sludge), strong solvent odor					2500/ 2500	
2	2'-4'	2-2-2-2	24/24	4	Loose, tan to gray, moist, f-m SAND (occasional 2" layers of silty-clay) (FILL)					2500/ 2500	
3	4'-6'	3-1-1-1	24/24	2	Loose, tan to gray, moist, f-m SAND (occasional 2" layers of silty-clay) (FILL)	5'				2500/ 2500	
					Loose, lt red, moist to wet, med SAND (FILL)	5'3"					
					Soft, gray, moist to wet, SILTY CLAY (FILL)	5'9"					
					Loose, d. blk, moist, Fibrous Vegetation MATTER	5'11"					
4	6'-8'	3-3-7-19	24/24	10	Loose, tan to brn, moist to wet, med SAND (FILL)	6'4"				2500/ 2500	
					Soft, gry to brn, moist to wet, SILTY CLAY (FILL)	7'					
					Loose, brn, damp, f-m SAND, well sorted						
5	8'-10'	13-11-14-15	24/24	25	(KAME SAND DEPOSIT)					2500/ 2500	
					BOTTOM OF BORING @ 10'						

Notes: Boring completed within former lagoon pit.
Field Testing/MTIP column presents soil screening results.
Well Construction Details:
- 2" I.D. schedule 40 PVC diameter set at 7' below grade (fbg) using 5' of 20 slot screen (7'-2').
- washed sand pack positioned from 7' to 1 1/2' fbg.
- bentonite pellets set from 1 1/2' to 1/2 fbg.
- grout positioned 1/2' to grade.
- well finished with locking protective steel casing.
- measurements referenced from grade

.sbw15.wk1

O'BRIEN & GERE ENGINEERS, INC. | SOIL BORING LOG | LOG NUMBER: SBW-16

SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE

ROJECT LOCATION: Bennington/Woodford, VT

DATE	GROUNDWATER LEVELS DEPTH	ELEV.

FILE No.: 5271.001
DRILLING METHOD: 4 1/4" Hollow Stem Auger
SAMPLER TYPE: 2" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: M. Randazzo
BORING CO.: A&W Environmental Drilling
FOREMAN: J. Halaburda

BORING LOCATION: In landfill
GROUND ELEVATION: 1113.60
DATES: STARTED: 10/8/92 ENDED: 10/8/92

LEGEND: Grout, Bentonite, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0'-2'	5-10-7-7	24/20	17	Med dense, d. brn, damp, f. SANDY SILT, vegetative matter (FILL)	6"				0.0/ 0.2	
					Lt brn, f-m SAND, tr. c. sand, f. pebbles (FILL)	10"					
					Brn to gray, F-M SAND, compressed newspaper, tr. c. sand and f. pebble (FILL)	2'					
2	2'-4'	6-4-6-11	24/20	10	Loose, brn to gray, f-m SAND, compressed newspaper, tr. c. sand and f. pebbles (FILL)					4.2/ 2.8	
3	4'-6'	6-5-5-9	24/19	10	Loose, brn to gray, F-M SAND, compressed newspapers (FILL)					4.6/ 3.5	
4	6'-8'	15-26-35-25	24/17	61	V. dense, d. brn, f-m SAND, little silt (FILL)	7'				1.9/ 1.2	
					Dense, lt brn, stratified F. SAND, little silt, (KAME SAND DEPOSIT)						
5	8'-10'	9-16-20-17	24/19	36	Dense, lt brn, stratified F. SAND, little silt, (KAME SAND DEPOSIT)					0.2/ 0.3	
					BOTTOM OF BORING @ 10'						

Note: Boring grouted with bentonite/grout.
Field Testing/PID column presents soil screening results.

..sbw16.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: SBW-17 SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 10/9/92 DEPTH ELEV.	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 2" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: M. Randazzo BORING CO.: A&W Environmental Drilling FOREMAN: J. Halaburda	BORING LOCATION: North side of landfill GROUND ELEVATION: 1115.85 DATES: STARTED: 10/9/92 ENDED: 10/9/92	LEGEND: Grout / Pellets / Nat. Form.; Screen / Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0'-2'	3-7-80/3"	17/15	>100	Dense, d. brn, damp, silty-f. SAND, tr. vegetation (FILL) -------- (Refusal: boulder or wood) --------	17" 2'				0.0/ 0.0	
2	2'-4'	9-8-6-9	24/23	14	Med dense, d. brn, damp, F-M SAND, some newspapers, little silt (FILL) -------- compressed newspapers --------	3'6" 4'				0.0/ 0.1	
3	4'-6'	8-6-6-6	24/20	12	Med dense, d. brn, damp, f-m SAND, tr. silt, interlayering of compressed newspapers 2"-3" thick (FILL)					0.7/ 0.9	
4	6'-8'	5-5-5-8	24/14	10	Med dense, d. brn, damp, f-m SAND, tr. silt, interlayering of compressed newspapers 2"-3" thick (FILL)					0.7/ 0.8	
5	8'-10'	14-14-17-22	24/20	31	Med dense, d. brn, damp, f-m SAND, tr. silt, interlayering of compressed newspapers 2"-3" thick (FILL) --------	10'				1.1/ 2.1	
6	10'-12'	5-7-7-10	24/20	14	Med dense, d. brn, F. SAND & SILT, tr. vegetation -------- Med dense to dense, damp, F-M SAND, tr. c. sandy-f. pebbles (KAME SAND DEPOSIT)	10'6"				0.0/ 0.0	
7	12'-14'	10-16-18-22	24/20	34	Med dense to dense, damp, F-M SAND, tr. c. sandy-f. pebbles (KAME SAND DEPOSIT)					0.0/ 0.0	
					BOTTOM OF BORING @ 14'						

Notes: Boring grouted with bentonite chips at base followed by cement/bentonite grout.
No saturation found at bottom of boring.
Field Testing/PID column presents soil screening results.
Measurements referenced from grade

.:sbw17.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: SBW-18 (1) SHEET 1 OF 1
CLIENT: BURGESS BROS. SUPERFUND SITE ROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE / DEPTH / ELEV.	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 2" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: M. Randazzo BORING CO.: A&W Environmental Drilling FOREMAN: Phil Thornsburg	BORING LOCATION: In former lagoon GROUND ELEVATION: 1111.60 DATES: STARTED: 10/14/92 ENDED: 10/14/92	LEGEND: Grout / Bentonite / Nat. Form. / Screen / Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
1	0'-2'	25 - 50/3	18/9	>100	TOPSOIL, vegetation ------------------------------ V. dense, lt brn, dry, SILT, some f. sand, tr. f. pebbles, organics, strong paint odor, pink liquid paste-like material	2"				1015/-	
					BOTTOM OF BORING @ 2' [Refusal @ 2', boring moved 5'. See log for SBW-18(2)]						

Notes Background 1-3ppm.
94ppm air concentraion PID during sample @ 0'-2'; however, reading not sustained.
Hit steel material - auger refusal, pulled off hole.
Back filled with bentonite and moved ahead approx. 5'.
Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG

LOG NUMBER: SBW-18 A

SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS: DATE | DEPTH | ELEV.

FILE No.: 5271.001

DRILLING METHOD: Hollow Stem Auger/ODEX 6-5/8"

SAMPLER TYPE: 2" Splitspoon

HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: S. Ferrara

BORING CO.: A&W Environmental Drilling

FOREMAN: P. Thornsbury

BORING LOCATION: In former lagoon

GROUND ELEVATION: 1111.60

DATES: STARTED: 10/14/92 ENDED: 10/14/92

LEGEND: Grout, Pellets, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0'-2'	3-8-17-17	24/18	25	TOPSOIL, vegetation	.3'				15/ 16.3	
					Med dense, lt brn, dry, f. SAND, some silt, tr. med pebbles, organics, small piece of hard fibrous material, hard red material in end of spoon						
2	2'-4'	7-8-8-6	24/16	16	Med dense, lt brn, dry, F. SAND, some silt, tr. med pebbles (FILL)					66.8/ 63.5	
3	4'-6'	4-8-6-8	24/15	14	Lt brn, dry, F. SAND, some silt, tr. med pebbles (FILL)					90.3/ 98.5	
4	6'-8'	3-8-21-26	24/13	29	Med dense, d. brn, damp, very f. SAND and SILT, slight blk stain throughout sample (FILL)	7'10"				154/ 189	
					D. Blk, damp, F. SANDY SILT (FILL)	8'					
5	8'-10'	8-2-21-24	24/18	23	Med dense, tan, damp to moist, SILTY-F. SAND, tr. glass, (FILL)	10'				530/ 330	
6	10'-12'	10-15-16-15	24/20	31	Dense, tan, damp, F-M SAND, tr. silt (KAME SAND DEPOSIT)					406/ 470	
7	12'-14'	18-18-14-15	24/22	32	Dense, tan, damp, F-M SAND, tr. silt (KAME SAND DEPOSIT)					310/ 270	
					BOTTOM OF BORING @ 14'						

Notes Field testing/PID column presents soil screening results.
Boring back filled with bentonite chips followed by cement/bentonite grout.
No saturation evident in bottom of boring.

_63:sbw18.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: SBW-19 SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE 'OJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE / DEPTH / ELEV.	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 3" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: M. Randazzo BORING CO.: A&W Environmental Drilling FOREMAN: J. Halaburda	BORING LOCATION: In landfill GROUND ELEVATION: 1114.67 DATES: STARTED: 10/8/92 ENDED: 10/8/92	LEGEND: Grout / Bentonite / Nat. Form. — Screen / Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0'-2'	7-8-8-8	24/20	16	Med dense, brn, damp, F-M SAND, pieces of paper at tip (FILL)		no well installed			0.0/ 0.0	
2	2'-4'	10-8-6-6	24/24	14	Med dense, brn, damp, M. SAND, compressed paper at end of spoon (FILL)					0.0/ 0.0	
3	4'-6'	5-5-7-11	24/21	12	Med dense, brn, damp, M. SAND, compressed paper at end of spoon (FILL)	5'3"				24/ 21	
					compressed newspapers	5'9"					
4	6'-8'	17-22-14-16	24/22	36	Dense, lt blk to blk, damp, f-m SAND, tr. charred fragments of wood, odorous matter (decaying odor) (FILL)					27/ 26	
5	8'-10'	10-6-9-20	24/20	15	Med dense, lt blk to blk, damp, f-m SAND, tr. charred fragments of wood, odorous matter (decaying odor) (FILL)	9'				6.1/ 5.1	
					Med dense, brn - tan, damp F-M SAND, well sorted						
6	10'-12'	14-21-25-30	24/22	46	Dense, brn to tan, damp, f-m SAND, well sorted (KAME SAND DEPOSIT)					0.0/ 0.0	
					BOTTOM OF BORING @ 12'						

Notes: Boring back grouted with bentonite chips at bottom followed by cement/bentonite grout.
No saturation evident at bottom of boring.
Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: SBW-20 SHEET 1 OF 2
CLIENT: BURGESS BROS. SUPERFUND SITE 'OJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 — DEPTH: 17.0' DRY — ELEV.:	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 2" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: M. Randazzo BORING CO.: A&W Environmental Drilling FOREMAN: P. Thornsbury	BORING LOCATION: In landfill GROUND ELEVATION: 1112.20 DATES: STARTED: 10/15/92 ENDED: 10/16/92	LEGEND: Grout, Sand Pack, Bentonite, Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
					VEGETATION, grass @ surface						
1	0'-2'	3-4-7-11	24/24	11	Med dense, brn to gray, damp, silty SAND, little vegetation - - - - - - - - - - - - - - - - Med dense, tan to brn, damp, sandy SILT, tr. f-c pebbles (FILL)	4"				0.5/ 0.6	
2	2'-4'	8-12-12-50	24/24	24	Med dense, tan to brn, damp, SANDY SILT, tr. f-c pebbles (FILL) - - - - - - - - - - - - - - - - Loose to med dense, tan, damp silty SAND, tr. f. pebbles	3'				0.0/ 0.0	
3	4'-6'	10-21-15-10	24/18	36	----------------Boulder @ 4'---------------- Dense, tan, damp, f-m SAND, tr. silt - - - - - - - - - - - - - - - - Dense, d. brn, damp, sandy SILT, little f. pebbles, piece of concrete	4'6"				0.0/ 0.0	
4	6'-8'	8-7-6-6	24/18	13	Med dense, d. brn, damp, sandy SILT, little f. pebbles, piece concrete -------Boulder or hard surface @ 6'6"--------------					0.9/ 0.5	
5	8'-10'	7-6-6-8	24/15	12	Med dense, brn to tan, damp, sandy SILT (FILL)					0.0/-	
6	10'-12'	14-8-9-24	24/12	17	Med dense, brn to tan, damp, sandy SILT (FILL)					1.0/-	
7	12'-14'	14-9-11-13	24/8	20	Med dense, brn to tan, damp, WOOD FRAGMENTS with paint on one side & a layer of compressed newspaper 3" thick (12'6"-12'5") (FILL)					8.0/ 8.9	
8	14'-16'	50-50/3	24/6	>100	V. dense, brn, damp, silty SAND, tr. small wood fragments (FILL)					2.2/ 4.3	

Notes: Well Construction Details:
- 2" I.D. Stainless steel well set @ 18 fbg.
- 20 slot stainless screen set from 18'-8'.
- Stainless steel riser set from 8' to 2' above grade.
- Sand pack positioned from 18'3" to 6'.

Field Testing/PID column presents soil screening results.
- Bentonite pellets set from 4' to 6'.
- Grout set from 4' to grade.
- 4" locking protective steel casing set over well.
- Measurements referenced from grade

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: SBW-20 SHEET 2 OF 2

CLIENT: BURGESS BROS. SUPERFUND SITE
PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	17.0' DRY	

FILE No.: 5271.001
DRILLING METHOD: 4 1/4" Hollow Stem Auger
SAMPLER TYPE: 2" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: M. Randazzo
BORING CO.: A&W Environmental Drilling
FOREMAN: P. Thornsbury

BORING LOCATION: In landfill
GROUND ELEVATION: 1112.20
DATES: STARTED: 10/15/92 ENDED: 10/16/92

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
9	16'-18'	6-5-2-4	24/24	7	Dense, brn to very dark, moist SILT, little c. sand, tr. gravel (FILL) Saturation @ 17'	18'				3.0/2.8	
10	18'-20'	19-21-50-50/2	24/18	71	V. dense, d. brn and blk, wet silty SAND, tr. f. pebbles and vegetation (KAME SAND DEPOSIT) V. dense, d. brn - gray, wet sandy PEBBLES, little silt (KAME SAND DEPOSIT)	19'6" 20'3"				3.5/3.7	
11	20'-22'	14-19-24-28	24/24	43	Dense, gray, wet, f-m SAND, tr. pebbles (KAME SAND DEPOSIT)					18.2/10	
					BOTTOM OF BORING @ 22'						

Notes:

Saturation observed at base of fill material.
Field Testing/PID column presents soil screening results.

.sbw20-2.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: SBW-21 SHEET 1 OF 2
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 17.26 ELEV.: 1096.5	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 2" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: Sue Ferrara BORING CO.: A&W Environmental Drilling FOREMAN: Phil Thornsburg	BORING LOCATION: In landfill GROUND ELEVATION: 1111.70 DATES: STARTED: 10/15/92 ENDED: 10/16/92	LEGEND: Grout, Sand Pack, Bentonite, Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0'-2'	18-18-15-18	24/21	33	TOPSOIL, vegetation	0.3'				0.0/0.0	
					Med dense, lt to d. brn, dry, SILT, some f. sand, little f-m gravel, large piece of wood	1.5'					
					Cinders, ash, glass						
2	2'-4'	9-66	12/6	-	Dense, d. brn, dry, F. SAND, some silt, little f. gravel, little ash, piece of wood Encountered spoon refusal @ 3'. Drilled to 4' (SAND FILL)					1/1	
3	4'-6'	14-10-8-10	24/3	18	Med dense, d. brn, dry, f. SAND, some silt, little gravel (FILL)					0.0/ 0.0	
4	6'-8'	19-50/1"	7/4	>100	Dense, d. brn, dry, f. SAND, some silt, little gravel (FILL)					0.0/ 0.0	
5	8'-10'	50/0	24/0	>100	Drilled from 8-10' in hard material (No Recovery) (Object in landfill material)					-/-	
6	10'-12'	24-18-18-15	24/0	36	(No Recovery)					-/-	
7	12'-14'	12-11-4-50/5	24/6	15	Med dense, brn, dry, f. SAND, some silt, little gravel (FILL)					4/3	
8	14'-16'	50/0	6/0	0	No Recovery Boulders @ 14'					-/-	
9	16'-18'	-	-	-	Drilled to 18' - No Recovery Saturation @ 18'					-/-	

NOTES: MTIP column represents results of headspace analysis on soil samples.
Well Construction:

a.) 2" I.D. stainless steel screen set from 18' to 8'.
b.) 2" I.D. stainless steel riser set from 8' to 2' above grade.
c.) bentonite pellets set from 4'-6' & 22'-18'3".
d.) sand pack set from 18'3" to 6'.
e.) grout set from 4' to grade.
f.) 4" locking protective steel casing set over well
g.) measurements referenced from grade

.sbw21.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: SBW-21 SHEET 2 OF 2

CLIENT: BURGESS BROS. SUPERFUND SITE OJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE 6/21/93 DEPTH 17.26 ELEV. 1096.5	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 2" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: Sue Ferrara BORING CO.: A&W Environmental Drilling FOREMAN: Phil Thornsburg	BORING LOCATION: In landfill GROUND ELEVATION: 1111.70 DATES: STARTED: 10/15/92 ENDED: 10/16/92	LEGEND: Grout, Sand Pack, Bentonite, Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
10	18'-20'	15-25-55-35	24/22	80	Dense, brn, wet, f. SAND, little silt, tr. c. gravel (KAME SAND DEPOSIT)	18'				48/36	
11	20'-22'	-	24/15	-	Dense, brn, wet, f. SAND, little silt, tr. c. gravel (KAME SAND DEPOSIT)					2.6/2.4	
					BOTTOM OF BORING @ 22'						

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: SBW-22 SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
	4-5'	

FILE No.: 5271.003
DRILLING METHOD: 4 1/4" Hollow Stem Augers
SAMPLER TYPE: 3" ID Splitspoon
HAMMER: 300lb FALL: 30"

O'BRIEN & GERE GEOLOGIST: MA Randazzo
BORING CO.: A & W Environmental Drilling
FOREMAN: Phillip Thornsbury

BORING LOCATION: 160' N-NE of W-07
GROUND ELEVATION: 1118.4'
DATES: STARTED: 4/11/94 ENDED: 4/11/94

LEGEND: Grout/Bentonite; Sand Packing; Natural Mater.; ORH —; Steel

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	S*
1	0'-2'	6-9-18-30	24"/12"	27	Medium Dense, DK Brown, Moist-Wet, F.SAND/ little silt/trace small cobbles, No odors					11.3/-	
2	2'-4'	39-24-18-8	24"/12"	42	Very Dense, Lt BRN, Damp-Moist, F-M SAND/ little silt/trace cs sand to large cobbles					10.6/-	
3	4'-6'	6-10-8-7	24"/18"	26	Medium Dense, LT BRN, Wet, F-M SAND/little silt /trce cs sand to large cobbles (KAME SAND DEPOSIT)					9.0/9.4	
					--	5'6"					
					Med. Dense, Lt Brn, Wet, F-M SAND, Well Sorted						
					------------Bottom Of Exploration---------------	6'					

Note: 1. Field Testing/HNu column indicates the results of the soil screening headspace analyses. Results reported in parts per million (vol./vol.).
2. Soil samples submitted from 0'-2' and 4'-6' intervals.
3. Ground elvation relative to mean sea level.

..sbw22.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: SBW-23 SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
	4-5'	

FILE No.: 5271.003
DRILLING METHOD: 4 1/4" Hollow Stem Augers
SAMPLER TYPE: 3" ID Splitspoon
HAMMER: 300lb FALL: 30"

O'BRIEN & GERE GEOLOGIST: MA Randazzo
BORING CO.: A & W Environmental Drilling
FOREMAN: Phillip Thornsbury

BORING LOCATION: Within 15 feet of W-07DI
GROUND ELEVATION: 1116.9'
DATES: STARTED: 4/11/94 ENDED: 4/11/94

LEGEND: Grout/Bentonite, Sand Packing, Natural Mater. ORH —, Steel

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	S*
1	0'-2'	6-11-17-38(*)	24"/17"	28	Very Dense, DK Brown, Damp, SILTY-F. SAND/					90/280	
					- - - - - - - - - - - - - -	12"					
					Very Dense, DK Brown, Damp, F.SANDY-SILT, Cobbles noticed during drilling						
2	2'-4'	12-6/4"	10"/8"	<100						24/-	
					- - - - - - - - - - - - - -	2'10"					
					Refusal at 2' 10" large cobble or boulder						
3	4'-6'	15-12-14-8	24"/18"	26	Med. Dense, Lt Brown, Damp, F. SAND/little silt/ trace med-cs sand v.f. to medium pebbles (KAME SAND DEPOSIT)					0.8/14.4	
4	6'-8'	2-8-15/0"	12"/8"	>100	Refusal at 7', Very Dense, Gry/Brn, Moist-Wet, F. Sand/little silt/trace m-cs sand					19.2/-	
					------------Bottom Of Exploration---------------	7'					

Note: 1. Field Testing/HNu column indicates the results of the soil screening headspace analyses. Results reported in parts per million(vol./vol.).
2. (*) = 140 lb hammer used for this sample only.
3. Strong petroleum odors noticed at 0'-4' and to a lesser extent at depth.
4. Soil samples submitted to lab at 0'-2' and 6'-7' intervals.
5. Blind duplicate taken at 6'-7' interval.
6. Ground elevation referenced from mean sea level.

..:sbw23.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: SBW-24 SHEET 1 OF 1
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE / DEPTH / ELEV. DEPTH: 2-3'	FILE No.: 5271.003 DRILLING METHOD: 4 1/4" Hollow Stem Augers SAMPLER TYPE: 3" ID Splitspoon HAMMER: 300lb FALL: 30"
O'BRIEN & GERE GEOLOGIST: MA Randazzo BORING CO.: A & W Environmental Drilling FOREMAN: Phillip Thornsbury	BORING LOCATION: 120' N-NW of W-07 GROUND ELEVATION: 1116.9 DATES: STARTED: 4/12/94 ENDED: 4/12/94	LEGEND: Grout/Bentonite; Sand Packing; Natural Mater.; ORH --; Steel

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	S*
1	0'-2'	3-3-7-4	24"/24"	10	Medium Dense, DK Brown, Moist, F.SAND-SILT					11.5/	
					with vegetation, No obvious petroleum odors					12	
					--	8"					
					Lt Brn, Moist, well sorted, F. SAND, MED. Dense,						
2	2'-4'	4-5-7-4	24"/24"	12	Lt BRN, Moist-Wet, Well Sorted FINE SAND					9.8/	
					with stringers of Medium sand (KAME SAND DEPOSIT)					10.4	
					------------Bottom Of Exploration---------------	4'					
										-	

Note: 1. Field Testing/HNu column indicates the results of the soil screening headspace analyses. Results reported in parts per million (vol./vol.).
2. Soil samples submitted from 0'-2' and 2'-4' intervals.
3. Ground elevation relative to mean sea level.

_ _:sbw24.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: SB-25 SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE

ROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
	2-3'	

FILE No.: 5271.003
DRILLING METHOD: 4 1/4" Hollow Stem Augers
SAMPLER TYPE: 3" ID Splitspoon
HAMMER: 300lb FALL: 30"

O'BRIEN & GERE GEOLOGIST: MA Randazzo
BORING CO.: A & W Environmental Drilling
FOREMAN: Phillip Thornsbury

BORING LOCATION: ~80' north of SB-23
GROUND ELEVATION: 1117.0'
DATES: STARTED: 4/12/94 ENDED: 4/12/94

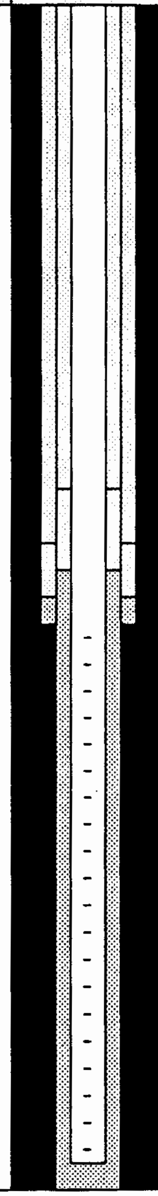
LEGEND: Grout/Bentonite, Sand Packing, Natural Mater. ORH — Steel

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	HNU (ppm)	S*
1	0'-2'	1-5-6-5	24"/18"	11	Medium Dense, DK Brown, Moist, SILTY-F.SAND					9.2/	
					---	6"				10.4	
					Med. Dense, DK Brn/Tan, Moist, Well Sorted						
					F-M SAND, Cross-Bedding present						
2	2'-4'	4-6-12-8	24"/12"	18	MED. Dense, Lt BRN/Tan, Wet, Well Sorted					8.8/	
					FINE - MEDIUM SAND					8.2	
					---	3'6"					
					Med. Dense, Lt Brn, Wet, F.SAND/some						
					medium sand and silt/trace cs sand-cs pebbles						
					------------Bottom Of Exploration------------	4'					

Note: 1. Field Testing/HNu column indicates the results of the soil screening headspace analyses. Results reported in parts per million (vol./vol.).
2. Soil samples submitted from 0'-2' and 2'-4' intervals.
3. Ground elevations relative to mean sea level.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-TP-12 SHEET 1 OF 1

CLIENT: Burgess Bros. Supefund Site PROJECT LOCATION: Bennington, VT	GROUNDWATER LEVELS DATE: 7/05/94 DEPTH: 21.11 ELEV.: 1090.09	FILE No.: 5271.003 DRILLING METHOD: 4" Casing SAMPLER TYPE: 3" OD Splitspoon HAMMER: 300lb FALL: 30"
IEN & GERE GEOLOGIST: MA Randazzo ING CO.: Redwing Environmental Drilling FOREMAN: John Haliberta	BORING LOCATION: Northeast Corner/Upgradient GROUND ELEVATION: 1111.2 DATES: STARTED: 6/7/94 ENDED: 6/7/94	LEGEND: Grout/Bentonite — ORH — Sand Packing — Steel Natural Mater.

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	S*
	0'-18'6"				See test pit log TP-12 for soil description						
					FILL						
					-- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --	10'					
					(KAME SAND DEPOSIT)						
1	18'6"-20'6"	2-3-5-7	24"/12"	8						84/320	
					Loose, Moist, Tan/Gray, F-M Sand, Well Sorted						
2	20'6"-22'6"	7-7-7-7	24"/18"	14						480/360	
					(KAME SAND DEPOSIT) Med. Dense, Wet, Tan/Gray, F. Sand, Well Sorted, Petroleum Odor						
3	22'6"-24'6"	6-8-7-4	24"/13"	15	Med. Dense, Wet, Tan/Gray, F. Sand/little silt, Stratified, Well Sorted					250/260	
					(KAME SAND DEPOSIT)						
4	24'6'-26'6"	6-4-3-4	24"/17"	7	Loose, Wet, Tan/Gray, F. Sand/little silt, Stratified, Well sorted					110/55	
					-- -- -- -- -- -- -- -- Glacial Till -- -- -- -- -- -- -- --	26'4"					
5	26'6"-28'6"	2-3-10-4	24"/23"	13	Med. Dense, Wet, Gray, Silty-F. Sand/little clay/ trace f-cs pebbles & cobbles (ABLATED GLACIAL TILL)					5/6.5	
					Bottom Of Boring	28'6"					

Note:
1. Field Testing/HNu column indicates the results of the soil screening headspace analyses. Results reported in parts per million(vol./vol.).
2. Well Construction:
   - 6" casing set at 18 feet below grade.
   - 2" stainless steel well set at 28'6" with 10' of 10 slot screen
   - Washed sand pack set from 28'6"-15'6" feet below grade.
   - Bentonite set 17 to 15 fbg outside 6" and 15'6"-13'6" outside 2" casing.
   - Grout positioned from 13'6" to grade outside 6" and 13'6" outside 2" casing.
3. Ground water elevation referenced from sea level.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-3T SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE

'OJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	1.08	1080.50

FILE No.: 5271.001
DRILLING METHOD: 4 1/4" Hollow Stem Auger/Casin
SAMPLER TYPE: 3" Splitspoon
HAMMER: 140 lbs. FALL: 30 inches.

O'BRIEN & GERE GEOLOGIST: R. Stromberg, M. Randazzo
BORING CO.: A&W Environmental Drilling
FOREMAN: J. Richardson, M.Lagear

BORING LOCATION: Marshy area
GROUND ELEVATION: 1079.81
DATES: STARTED: 1/7/93 ENDED: 1/14/93

LEGEND: Grout; Sand Pack; Pellets; Screen —; Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0'-2'	0-1-3-4	24/18	4	Loose to dense, brn, wet, organic SILT, roots and organic material	2'				13.2/ 3.2	
2	2'-4'	10-20-26-15	24/12	46	Dense, lt gray to tan, wet SILTY-FINE SAND, tr. organic material (KAME SAND DEPOSIT)					34.8/ 50.2	
3	4'-6'	1-21-16-8	24/3	37	Dense, lt Gray, wet, F. SANDY SILT (KAME SAND DEPOSIT)					9.1/ 0.0	
4	6'-8'	2-3-24-28	24/12	27	Dense, lt brn, wet, F. SANDY-SILT, little f. gravel (subangular) (KAME SAND DEPOSIT)	8'				52/ 49	
5	8'-10'	8-18-10-13	24/16	28	Dense, lt brn, wet f. SANDY-SILT, little f. subangular gravel (KAME SAND DEPOSIT, ABLATED GLACIAL TILL)					91/ 62	
6	10'-12'	5-3-18-16	24/18	21	Med dense, lt brn, wet f. SANDY-SILT, little f sub-angular gravel (KAME SAND DEPOSIT, ABLATED GLACIAL TILL)					149/-	
7	12'-14'	12-34-50/4"	16/12	>100	V. dense, brn to gray, brn, moist, F. SANDY-SILT, little clay, tr. f-c gravel (ABLATED GLACIAL TILL)	12'				56/ 59	
8	14'-16'	40-45-27-31	24/6	72	V. dense, brn to gray, brn, moist, FINE SANDY-SILT, little clay, tr. f-c gravel (ABLATED GLACIAL TILL)					9.1/-	
9	16'-18'	24-95	12/6	>100	V. dense, brn to gray, brn, moist, FINE SANDY-SILT, little clay, tr. f-c gravel (ABLATED GLACIAL TILL)					10/-	
10	18'-20'	100	0/0	>100	Auger refusal @ 20'						
11	20'-22'	6-3-21-120/1"	19/12	24	V. dense, brn, wet, m-c SAND, some silt, tr. f-c gravel Splitspoon refusal @ 21.7' 21.5'-22.5' boulder					7/- 10/-	
12	27.5	50/NP	0/0	-	Sample requested by O'Brien & Gere @ 25'. Due to extremely dense drilling conditions, driller indicated sampling not feasible. (Till contains frequent boulders in this interval.) Split spoon attempted @ 27.5'. No penetration.						
					BOTTOM OF BORING @ 28' (Auger used to 20'6". Spun steel casing used to 21.5' with 5/3/4" roller bit. Roller bit to 28'.)						

Notes: Well Construction:

- 2" I.D. schedule 40 PVC set at 27' to 2' above grade
- 10 slot screen positioned from 27' to 17'
- Sand pack set from 28' to 14.7'
- Bentonite seal from 14.7' to 12'
- Grout to grade with pad.
- PVC encapsulated with 4" locking protective steel cover.
- Measurements referenced from grade

Field Testing/PID column presents soil screening results.

:w3t.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-4T SHEET 1 OF 1
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE DEPTH ELEV.	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 3" I.D., 2' Splitspoon HAMMER: 140# FALL: 30"
O'BRIEN & GERE GEOLOGIST: MA Randazzo BORING CO.: Soil Testing Inc. FOREMAN: M. Mulhurne	BORING LOCATION: South of Landfill/Marsh GROUND ELEVATION: DATES: STARTED: 3/24/94 ENDED: 3/25/94	LEGEND: Grout/Bent. Screen — Sand Pack Riser Nat. Form.

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
	0'-14'				See boring log W-4B(1)						
1	14'-16'	13-32-63-50/5"	24"/18"	95	Very Dense, Wet, Gray/Tan, F. SANDY-SILT, Well Sorted, Boulder at 15' 10" (ABLATED GLACIAL TILL)					43/37	
2	19'-21'	89-108-30-50/5	22"/12"	>100	Very Dense, Wet, Brown/Green, F.SANDY-SILT/ little clay and cs sand-cs gravel/trace pebbles and cobbles(VOC & TOC samples taken at this interval, which include Blind Dup. and MS/MSD) Boulder at 22'					16/18	
3	24'-26'	-	-	-	Obvious boulders, augers grinding.						
					Very Dense, Wet, Brown/Tan, SANDY-SILT-COBBLES-BOULDERS (ABLATED GLACIAL TILL)						
4	30'-32'	-	-	-	Obvious boulders, augers grinding.						
					Bottom Of Exploration	32'					
					Well Construction Details: - 10' 10 slot screen set from 28.5 to 18.5 feet below grade. - 20.5' of PVC riser set from 18.5' to 2 feet above grade. - Sandpack positioned from 28.5' to 17' below grade. - Bentonite seal positioned from 17' to 14 feet below grade. - Grout positioned from 14' to grade. - 6" low carbon steel casing positioned from 14 feet to 2 feet above grade - Well encapsulated in locking steel well housing						

Note: Ambient air 0.0ppm (background level).
No vertical permeability sample secured due to poor recovery and disturbance to samples.
Interval sample 14'-16' submitted to geotechnical analysis.
VOC and TOC sample taken from 19'-21'.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-22T SHEET 1 OF 1
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 7/05/94 DEPTH: -0.45' ELEV.: 1088.15	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 3" I.D., 2' Splitspoon HAMMER: 140# FALL: 30"
O'BRIEN & GERE GEOLOGIST: MA Randazzo BORING CO.: Soil Testing Inc. FOREMAN: M. Mulhurne	BORING LOCATION: East of Landfill/Marsh GROUND ELEVATION: 1087.7' DATES: STARTED: 3/23/94 ENDED: 3/23/94	LEGEND: Grout/Bent. Sand Pack Nat. Form. Screen — Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S	PID (ppm)	RMKS*
	0'-12'				See boring log W-22/S1						
1	12'-14'	50/1"	1"/0"	>100	Very Dense, Boulder						
2	17'-19'	40-75-175	18"/5"	>100	Very Dense, Wet, Gray/Green, SANDY-SILT/(ABLATED GLACIAL TILL) pebbles/cobbles/boulders Very difficult and slow drilling at this point. A VOC and TOC sample taken at this interval.					9.0/-	
3	22'-24'	81-31-118-163	24"/14"	>100	Very Dense, Moist, Gray-Brown, SILTY-F.SAND/ little med. sand to f.-cs. pebbles and cobbles Vertical Permeability and Geotech Samples Taken Boulder at 25 feet					10/-	
4	28'-30'	150/5"	5"/2"	>100	Very Dense, Wet, Gray/Brown, F-CS SAND/some silt-cobbles-boulders (ABLATED GLACIAL TILL)					7.0/-	
					Bottom Of Exploration	30'					

Well Construction Details:
- 10' 10 slot well screen 30'-20 feet below grade.
- 20' Sch. 40 PVC 20'-0 feet below grade
- Sandpack placed from 30'-17 feet below grade
- Bentonite seal place from 17'-15 feet below grade
- Grout placed from 15'- Grade
- 6" steel casing set from 2' above grade to 14' below grade
- Well encapsulated in locking steel casing

Note: Ambient air 0.0ppm (background level).
Vertical permeability and geotechnical samples taken at 22'-24'.
A VOC and TOC sample taken at 17'-19'.
Ground elevation relative to mean sea level.

:w22t.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W23T SHEET 1 OF 1
CLIENT: BURGESS BROS. SUPERFUND SITE OJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE 6/21/93 · DEPTH 2.45 · ELEV. 1097.29	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 3" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: J. Jennings BORING CO.: A&W Environmental Drilling FOREMAN: M. Lagear	BORING LOCATION: Hillside area GROUND ELEVATION: 1098.80 DATES: STARTED: 1/29/93 ENDED:2/1/93	LEGEND: Grout, Sand Pack, Bentonite, Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0'-2'	1-2-12-15	24/18	14	Loose, d. brn to blk, damp SILT and f. sand (topsoil), little roots and vegetation	6"				0.0/ 0.0	
					Same brn, more f. sand, no vegetation						
2	2'-4'	12-14-19-43	24/24	33	loose, brn, wet, SILT					0.0/ 0.0	
					Dense, brn, wet, f-c ANGULAR SAND, little silt, no bedding (ABLATED GLACIAL TILL)						
3	10'-12'	3-7-10-12	24/24	17	Med dense, brn, wet F. SAND, some silt, tr. angular pebbles (ABLATED GLACIAL TILL)	11'6"				0.0/ 0.0	
					V. soft, golden brn, wet, SILT	11'9"					
					Med dense, brn, wet, f. SAND, some silt, tr. angular pebbles (ABLATED GLACIAL TILL)						
					BOTTOM OF BORING @ 12'						

Notes: Well Construction Details:
12'-9' Bensonite seal
9'-2' Uniform silica sand, 8.1'-3.1' 2" I.D. schedule 40 PVC 10 slot well screen.
2" I.D. schedule 40 PVC riser, 3.1 to 1.9' above ground.
2'-1' Bentonite seal 1'-0' cement bentonite grout.
Well encapsulated in 4" locking protective steel casing

Weather 12 - 20 degrees F to 30 degrees below zero windchill.

Field testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W24T SHEET 1 OF 1
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 2.62 ELEV.: 1088.39	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 1-3/8" I.D. Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: P. Gottler, J. Jennings BORING CO.: A&W Environmental Drilling FOREMAN: M. Lagear	BORING LOCATION: Hillside Boring GROUND ELEVATION: 1089.11 DATES: STARTED: 2/1/93 ENDED: 2/3/93	LEGEND: Grout, Sand Pack, Bentonite, Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0-2	2-28-50/.2	14/5	>100	V. dense, moist d. brn to blk organic rich SAND and PEBBLES, some silt, tr. clay. Pebbles well rounded, sand f-c massive. (Mostly tan to lt brn, f-m sand, little gravel) (ABLATED GLACIAL TILL)	HNU 0.0 in auger @ 5.0'				0.0/-	
2	5-7	6-18-21-27	24/13	39	Dense, brn to lt brn, damp to moist, f-m SAND and PEBBLES, some silt, tr. clay. Massive. Pebbles angular sand, facets observed. (ABLATED GLACIAL TILL)					0.0/ 0.0	
3	10-12	6-6-8-15	24/14	14	Med dense, lt brn, wet, f-c SAND and PEBBLES, some silt, little clay. Massive, matrix supported. (ABLATED GLACIAL TILL)	0.0ppm in augers				0.0/ 0.0	
4	15-17	119/6	6/4	>100	V. dense, lt brn, dry to wet SAND, some pebbles, little silt, little clay, massive matrix supported. Pebbles subround to subangular, facets and striations observed. (ABLATED GLACIAL TILL)	0.0ppm in augers				0.0/ 0.0	
					BOTTOM OF BORING @ 17'						

Notes: Well Construction Details:
- 2" I.D. schedule 40 PVC 0.010" slot screen 15.8-5.8.
- 2" I.D. schedule 40 PVC flush threaded riser 5.8 to +2.0'.
- Sand pack 16.0 to 4.0'.
- Bentonite seal 4.0 to 2.0'.
- Cement/grout 2.0 to 1.0'
- Cement pad 1.0 to grade
- Well completed with 4" locking protective casing.
- Measurement referenced from grade

Field Testing/PID column presents soil screening results.

..:w24t.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-26T SHEET 1 OF 2

CLIENT: Burgess Bros. Supefund Site	GROUNDWATER LEVELS			FILE No.: 5271.003
	DATE	DEPTH	ELEV.	DRILLING METHOD: 4 1/4" HSA
PROJECT LOCATION: Bennington, VT	7/05/94	11.93	1079.37	SAMPLER TYPE: 3" OD Splitspoon
				HAMMER: 300lb FALL: 30"
'EN & GERE GEOLOGIST: MA Randazzo	BORING LOCATION: South West of Landfill			LEGEND: Grout/Bentonite; ORH —
NG CO.: Redwing Environmental Drilling	GROUND ELEVATION: 1091.3			Sand Packing; Steel
FOREMAN: John Haliberta	DATES: STARTED: 6/3/94	ENDED: 6/6/94		Natural Mater.

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	S*
1	0'-2'	1-3-1-2	24"/15"	4	Very Loose, Damp, DK Brn, Vegetation &					26/12.5	
					F.SANDY-SILT-- -- -- -- -- -- -- -- -- --	4"					
					V. Loose, Damp, Brn, F. SANDY-SILT						
2	2'-4'	4-8-9-12	24"/20"	17	-- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --	12"				0.1/2.8	
					Med. Dense, Damp, LT Brown, F. SAND/little silt,						
					Well sorted, stratified						
3	4'-6'	6-8-10-30	24"/18"	18	-- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --	4'6"				0.6/2.5	
					Med. Dense, Damp, Lt Brn, Well sorted, (KAME SAND DEPOSIT						
					-- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --	5'6"					
4	6'-8'	22-15-60/1"	13"/13"	100						3.8/2	
					Very Dense, Damp, Lt Brn, F. Sand/little silt-clay-						
					f-cs pebbles-cobbles-boulders (ABLATED GLACIAL TILL)						
5	8'-10	5-9-7-10	24"/16"	16	-- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --	7'				1.3/1.3	
					V. Dense, Moist, Lt Tan/Brn, F-M SAND/little f-cs						
					pebbles-boulders						
6	10'-12'	3-16-8-6	24"/12"	24	M. Dense, Moist, Lt Brn/Tan, F-M SAND/little					0.5/0.4	
					f- cs pebbles -cobbles						
7	12'-14'	22-23-12-10	24"/7"	35	Poor Recovery					0.3/0.5	
8	14'-16'	7-6-60/4"	24"/15"	>100	Very Dense, Wet, Lt Brn/Tan, F-M Sand/little silt					0.5/0.2	
					trace f-cs pebbles - cobbles - boulders						
					Gravel subangular, No stratification						
	16'6"-16'11"	65/5"	5"/0"	>100	No Recovery, Tried to auger past but broke auger,					-	
					11 1/2' of augers left in borehole, Crew moves upgrad-						
					ient 10' and grouts borehole						
10	18'-20'	10-20-25-23	24"/22"	45	Dense, Wet, Dk Gray, F-M SANDY-SILT/little f-cs					1.2/1.2	
					pebbles-cobbles-boulders (ABLATED GLACIAL TILL)						
11	20'-22'	21-44-24-17	24"/12"	68	-- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --	20'				1.2/0.5	
					V. Dense, Wet, Lt Brn-Gray, F. SANDY-SILT/						
12	22'-24'	17-17-50-29	24"/17"	67	little f-cs pebbles-cobbles (BASAL GLACIAL TILL)					2.2/2.0	
					V. Dense, Wet, Lt Brn-Gray, SAA						
13	24'-26'	13-20-28-34	24"/15"	48	Dense, Wet, Lt BRN-GRAY, F. SANDY-SILT/					0.9/0.4	
					little f-cs pebbles & cobbles (BASAL GLACIAL TILL)						
14	26'-28'	18-37-33-48	24"/24"	70	M. Dense, Moist to Wet, Lt Brn, F. SANDY-					0.4/1.2	
					SILT/little f-cs pebbles, subangular to angular						
					grains						
15	28'-30'	19-21-60-44	24"/19"	81	V. Dense, Moist, Brn, F. SANDY-SILT/trace					0.4/0.6	
					pebbles-cobbles (BASAL GLACIAL TILL)						

Note: 1. Field Testing/HNu column indicates the results of the soil screening headspace analyses.
Results reported in parts per million(vol./vol.).

2. Well Construction:

- 2" Schedule 40 PVC well set 20' with 10' of 10 slot screen
- Washed sand pack set from 8'-20' feet below grade.
- Bentonite set 6'-8'.
- Grout postioned from 6' to grade.

BB3:w26t.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-26T SHEET 2 OF 2

CLIENT: Burgess Bros. Supefund Site PROJECT LOCATION: Bennington, VT	GROUNDWATER LEVELS DATE: 7/05/94 — DEPTH: 11.93 — ELEV.: 1079.37	FILE No.: 5271.003 DRILLING METHOD: 4 1/4" HSA SAMPLER TYPE: 3" OD Splitspoon HAMMER: 300lb FALL: 30"
IEN & GERE GEOLOGIST: MA Randazzo BORING CO.: Redwing Environmental Drilling FOREMAN: John Haliberta	BORING LOCATION: West Side Of Landfill GROUND ELEVATION: 1091.3 DATES: STARTED: 6/3/94 ENDED: 6/6/94	LEGEND: Grout/Bentonite — ORH — Sand Packing — Steel Natural Mater.

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S	PID (ppm)	S*
16	30'-32'	10-26-27-35	24"/18"	53	V. Dense, Moist, Brn, SILT/little f. sand - f-cs pebbles-cobbles/trace clay					0/2.1	
17	31'-33'	56-60/2"	8"/8"	>100	Many Cobbles and Boulders, Poor Recovery					1.5/-	
18	33'-35'	22-52-23-60	24"/24"	75	Very Dense,, F. SANDY-SILT/little M. Sand - F-cs pebbles-cobbles-clay (BASAL GLACIAL TILL)					4.4/3.7	
					Bottom Of Boring	36'					

Note:
1. Field Testing/HNu column indicates the results of the soil screening headspace analyses. Results reported in parts per million(vol./vol.).
2. 11.5' of augers left in boring No. 1, boring No. 2 completed to depth.
3. Borings grouted to grade and well installed 8' upgradient.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-27S1/T SHEET 1 OF 2

CLIENT: Burgess Bros. Supefund Site	GROUNDWATER LEVELS				FILE No.: 5271.003
		DATE	DEPTH	ELEV.	DRILLING METHOD: 4" Casing
PROJECT LOCATION: Bennington, VT	T	7/05/94	13.78	1099.22	SAMPLER TYPE: 3" OD Splitspoon
	S1	7/05/94	14.07	1098.73	HAMMER: 300lb FALL: 30"

IEN & GERE GEOLOGIST: MA Randazzo	BORING LOCATION: West Side of Landfill	LEGEND: Grout/Bentonite ORH —
ING CO.: Redwing Environmental Drilling	GROUND ELEVATION: 1112.8/27S1, 1113.0/27T	Sand Packing Steel
FOREMAN: John Haliberta	DATES: STARTED: 6/1/94 ENDED: 6/2/94	Natural Mater.

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	S*
1	0'-2'	1-2-1-2	24"/12"	3	Very Loose, Damp, DK Brn/LT Brn, SILTY-SAND, Forest Mat(roots, leaves, pine needles)	8"				12/18	
2	2'-4'	2-1-1-1	24"/18"	2	Very Loose, Damp, LT Rusty Brn, F. Sandy-Silt	3'				0/0	
3	4'-6'	2-2-3-4	24"/24"	5	Very Loose, Damp, LT Tan, F-M SAND, Well Sorted					0/0	
4	6'-8'	7-7-8-7	24"/24"	15	Med. Dense, Damp, Lt Tan/Brn, F-M Sand with cross bedded lenses of F. Sandy-Silt					0/0	
5	8'-10	5-6-8-6	24"/24"	14	Med. Dense, Moist, Gray/Tan, F-M SAND Well sorted					0/0	
6	10'-12'	2-2-4-2	24"/20"	6		11'				4/4	
7	12'-14'	3-3-4-3	24"/24"	7	Loose, Moist to Wet, Gray/Tan, F. Sandy-Silt, Cross-bedding present					0/0	
8	14'-16'	2-3-4-3	24"/18"	7	Very Loose-Loose, Wet, Interbedding of F-M SAND & F. SANDY- SILT (KAME SAND DEPOSIT)					1/2	
9	16'-18'	1-1-1-2	24"/24"	2		17'				4/3	
10	18'-20'	WR/1-1-3	24"/24"	2	Very Loose, Wet, Gray/Brn, SILTY-F.SAND/little clay & f-cs pebbles-boulders (ABLATED GLACIAL TILL)	19'				1/1	
11	20'-22'	WR/3-3-5	24"/24"	6	Very Loose, Wet, Gray/Brown, F-M SAND/little silt/trace f-cs pebbles-boulders (ABLATED GLACIAL TILL)	20'				1/1	
12	22'-24'	7-14-16-13	24"/24"	30	Dense, Wet, Gray/Brn, SILTY-F. SAND/little clay & f-cs pebbles & cobbles (ABLATED GLACIAL TILL)					1/1	
13	24'-26'	60/3"	3"/0"	>100	Large cobble					NA	
14	25'-27'	8-11-14-22	24"/24"	25	Very Dense, Wet, Gray/Brn, SILTY- F-M SAND little cs sand, clay, f-cs pebbles, cobbles,					1/1	
15	27'-29'	18-64/4"	10"/10"	>100	(ABLATED GLACIAL TILL)						

Note: 1. Field Testing/HNu column indicates the results of the soil screening headspace analyses. Results reported in parts per million(vol./vol.).

2. Well Construction: W-27T
- 6" casing set at 19 feet below grade.
- 2" Schedule 40 PVC well set 35' with 10' of 10 slot screen
- Washed sand pack set from 35'-23' feet below grade.
- Bentonite set 23' to 21'.
- Grout postioned from 21' to grade.

3. Ground water elevation referenced from mean sea level.

BB3:w27s1t.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-27S1/T
		SHEET 2 OF 2

CLIENT: Burgess Bros. Supefund Site

PROJECT LOCATION: Bennington, VT

	GROUNDWATER LEVELS		
	DATE	DEPTH	ELEV.
T	7/05/94	13.78	1099.22
S1	7/05/94	14.07	1098.73

FILE No.: 5271.003
DRILLING METHOD: 4" Casing
SAMPLER TYPE: 3" OD Splitspoon
HAMMER: 300lb FALL: 30"

IEN & GERE GEOLOGIST: MA Randazzo
BORING CO.: Redwing Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: West Side Of Landfill
GROUND ELEVATION: 1112.8/27S1, 1113.0/27T
DATES: STARTED: 6/1/94 ENDED: 6/2/94

LEGEND: Grout/Bentonite — ORH —
Sand Packing — Steel
Natural Mater.

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S	PID (ppm)	S*
16	29'-31'	11-8-10-27	24"/24"	18	Med. Dense, Wet, Same As Above					2/3	
17	31'-33'	11-23-30-48	24"/20"	53	Very Dense, Wet, Gray/Brown, SANDY-SILT/little cs sand to cs pebbles (ABLATED-BASAL GLACIAL TILL)					0/1	
18	33'-35'	25-35-40-60/4"	24"/18"	75	Transitional bone.					1/1	
					Bottom Of Boring	35'					

Note: 1. Field Testing/HNu column indicates the results of the soil screening headspace analyses. Results reported in parts per million(vol./vol.).
2. Well Construction: W-27S1
- 2" schedule 40 PVC well set at 19' with 10' of 10 slot screen
- Washed sand pack set from 19'-7' feet below grade.
- Bentonite set 5'-7'.
- Grout postioned from 5' to grade.
3. Ground water elevation not referenced from sea level.

BB3:w27s1t.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-04SI SHEET 1 OF 1

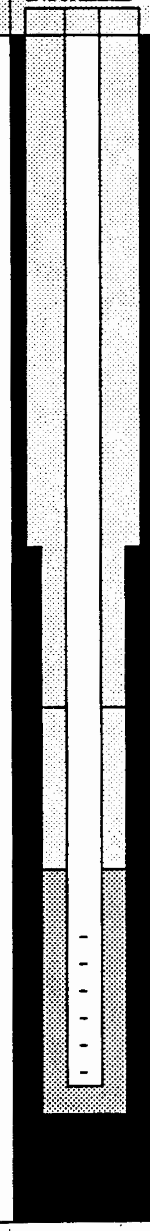
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 8.02 ELEV.: 1077.23	FILE No.: 5271.001 DRILLING METHOD: Odex/4" Casing Adv. SAMPLER TYPE: No sampling performed HAMMER: None FALL: None DRIVER:

O'BRIEN & GERE GEOLOGIST: John Jennings
BORING CO.: A&W Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: Southeast
GROUND ELEVATION: 1088.93
DATES: STARTED: 5/7/93 ENDED: 5/12/93

LEGEND: Grout/Bentonite; Sand Pack; Nat. Form.; Screen —; Riser

SAMPLE No.	SAMPLE DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S (ppm)	FIELD TESTING PID (ppm)	RMKS*
					See boring log W-04B for subsurface descriptions						
					Bottom of 6" ODEX casing at 70.5'	70.5'					
					Bentonite/Grout Interface	87'					
					Bentonite/Sand pack Interface	96'					
					Top of Screen	100'					
					Bottom of Screen	110'					
					Bottom of Boring	112'					



Notes: Depth to ground water measured from top of PVC.
Well Construction:
- 2" I.D. PVC schedule 40 well set at 110'.
- 10' of 10 slot screen set from 110' to 100'.
- Washed silica sand positioned from 112'-96'.
- Bentonite positioned from 96'-87'.
- Grout positioned from 87' to grade.
- 6" ODEX casing set from 70.5' to grade.
- Depth measurements referenced from grade.
- Well encapsulated in locking steel casing.

BB2:w-04si.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-07SI SHEET 1 OF 1

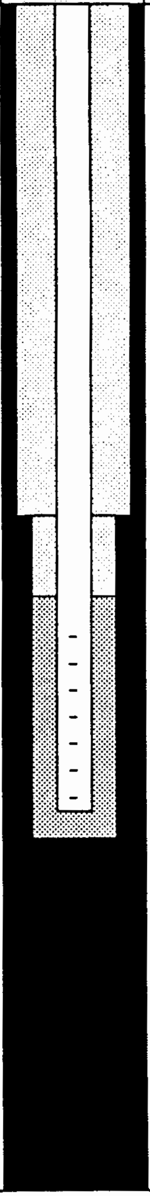
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 49.2 ELEV.: 1070.2	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger/Odex SAMPLER TYPE: None HAMMER:None FALL:None DRIVER:Air Perc.

O'BRIEN & GERE GEOLOGIST: John Jennings
BORING CO.: A&W Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: North of landfill
GROUND ELEVATION: 1116.9
DATES: STARTED: 4/16/93 ENDED: 4/28/93

LEGEND: Grout/Bent. Sand Pack Nat. Form. Screen Riser

SAMPLE No.	SAMPLE DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
					See boring log W-07B/DI for subsurface descriptions						
					Bottom of 6" ODEX steel casing Grout/Bentonite Interface at 102'.	102'					
					Bentonite/Sand pack Interface at 105'.	105'					
					Top of Screen set at 107'.	107'					
					Bottom of well set at 117'.	117'					



Notes: Depth of ground water taken from top of PVC.
Well Construction:
- 2" I.D. schedule 40 PVC well screen (10 slot) set from 117' to 107'.
- Washed silica sand position from 119' to 105'.
- Bentonite seal set from 105' to 102'.
- Grout set from 102' to grade.
- Well encapsulated with a 6" locking protective steel well housing.
- Measurements taken from grade.

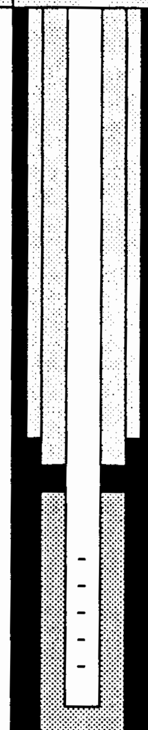
BB2:w-07si.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-08/SI SHEET 1 OF 1
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 — DEPTH: 36.45 — ELEV.: 1074.62	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger/Odex SAMPLER TYPE: 3" I.D., 2' Splitspoon HAMMER:None FALL:None DRIVER:Air Perc.

O'BRIEN & GERE GEOLOGIST: M. Randazzo — BORING LOCATION: West of Lagoon
BORING CO.: A&W Environmental Drilling — GROUND ELEVATION: 1109.91
FOREMAN: M. Legare — DATES: STARTED: 4/27/93 — ENDED: 4/29/93

LEGEND: Grout, Sand Pack, Nat. Form/Bent., Screen, Riser

SAMPLE No.	SAMPLE DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
					See boring log W-08B for soil boring descriptions.						
					See boring log W-08B for soil boring descriptions.	115'					
						118'					
						120'					
						130'					
						132'					
					See boring log W-08B for soil boring descriptions.						



Notes: Ground water depth taken from PVC.
Well Construction Details
- 2" I.D. schedule 40 PUC well screen set from 130'-120'.
- washed silica sand positioned from 132'-118'.
- bentonite seal set from 118'-115'.
- grout positioned from 115'-grade.
- measurements taken from grade.
- 6" ODEX casing set at 105'.

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG	LOG NUMBER: W-09SI SHEET 1 of 1

CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE 6/21/93 DEPTH 8.30' ELEV. 1077.1	FILE No.: 5271.001 DRILLING METHOD: Odex/4" Casing Advancement SAMPLER TYPE: 3" I.D., 2' Splitspoon HAMMER: None FALL: None DRIVER: Air Perc.

O'BRIEN & GERE GEOLOGIST: S. Mogilinicki
BORING CO.: A&W Environmental Drilling
FOREMAN: B. Follett
BORING LOCATION: SW of Landfill
GROUND ELEVATION: 1076.81
DATES: STARTED: 5/5/93 ENDED: 5/7/93
LEGEND: Grout/Bent. Sand Pack Nat. Form. Screen — Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
					See Boring W-09B for description of earth materials.						
					See Boring W-09B for description of earth materials.						
					See Boring W-09B for description of earth materials.						
					Bentonite/Grout interface	87'					
					Bottom of 6" ODEX casing	89'					
					Bentonite/Sand pack interface	96'					
					Top of screen	98'					
					Bottom of screen	108'					
					Bottom of Boring 110'						

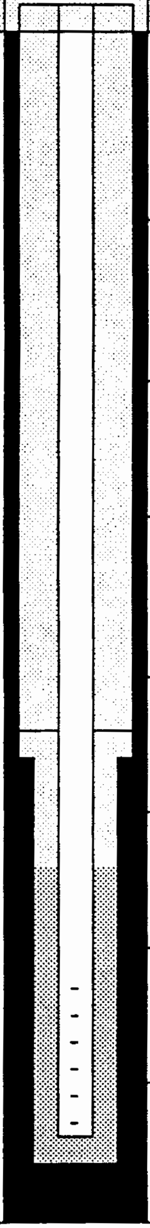
NOTES: Well Construction Details
Well set at 108'.
10 slot screen set 108'-98'.
Washed silican sand pack 110'-96'.
Bentonite seal 96'-87'.
Grout 87' - grade
2" I.D. schedule 40 PVC well set at 108'
6" ODEX casing set 0'-89'.
Well set 2' above grade with a locking protective steel casing.
Measurements referenced from grade

BB2:w-09si.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-25SI SHEET 1 OF 1

CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 15.55 ELEV.: 1074.99	FILE No.: 5271.001 DRILLING METHOD: ODEX/4" casing advanc. SAMPLER TYPE: No samples HAMMER: None FALL: None DRIVER: Air Perc.
O'BRIEN & GERE GEOLOGIST: Chris Rook BORING CO.: A&W Environmental Drilling FOREMAN: Phil Thornsburg	BORING LOCATION: South of landfill GROUND ELEVATION: 1088.88 DATES: STARTED: 4/8/93 ENDED: 4/13/93	LEGEND: Grout; Sand Pack; Nat. Form.; Screen; Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
					See boring log W-25DI for subsurface description.						
					Bentonite/Grout Interface	100'					
					Bottom of 6" Casing.	102'					
					Bentonite/Sand pack Interface	116'					
					Top of screen	118'					
					Bottom of well.	128'					
					Bottom of boring	129'					



Notes: Groundwater level measured from top of PVC.
Well Construction:
- Well set at 128'.
- 2" I.D. schedule 40 PVC well screen (10 slot) set from 128' to 118'.
- Washed silica sand from 129' to 116'.
- Bentonite seal positioned from 116' to 100'.
- Grout positioned from 100' to grade.
- Well encapsulated with 6" locking protective well housing.
- Depth measurements referenced from grade.

BB3:w25si.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-01DI SHEET 1 OF 2
CLIENT: Burgess Bros. Supefund Site PROJECT LOCATION: Bennington, VT	GROUNDWATER LEVELS DATE 7/05/94 · DEPTH 66.96 · ELEV. 1081.54	FILE No.: 5271.003 DRILLING METHOD: OX 6" Casing/4" Casing Rol. Bit SAMPLER TYPE: 3" Splitspoon HAMMER: 300lb FALL: 30"
'IEN & GERE GEOLOGIST: MA Randazzo NG CO.: Redwing Environmental Drilling FOREMAN: John Haliberta	BORING LOCATION: Northeast Corner/Upgradient GROUND ELEVATION: 1148.5 DATES: STARTED: 5/18/94 ENDED: 5/31/94	LEGEND: Grout/Bentonite · ORH — Sand Packing · Steel Natural Mater.

SAMPLE No.	SAMPLE DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	S*
					See Boring Log W-01 & W-01B For Subsurface Descripion from 0' to 120'.						
					(BASAL GLACIAL TILL)						
					------------------------------	112'					
					(WEATHERED SCHIST)						
1	120-122'	44-67/6"	12"/12"	>100	Very Dense, Brown/White, Foliated Schist with Kaolin laminae, Bedding vertical, Texture is clay-like, Extremely Weathered, No water yield					0/0	
2	125-127'	22-29-50/4"	16"/16"	>100	observed					0/0	
3	130-132'	45-60-60/5"	17"/12"	>100	Very Dense, Brown/White, Foliated Schist with Kaolin laminae, Bedding vertical, Texture is clay-like					2/2	
4	135-137'	23-48-62/3"	15"/15"	>100						7.5/7	
5	140-142'	41-60/5"	11"/11"	>100						7/7	
6	145-147'	28-54-60/3"	15"/15"	>100	Very Dense, Brown/White, Foliated Schist with Kaolin laminae, Bedding vertical, Texture is clay-like (WEATHERED SCHIST)					7/7.8	
7	150-152'	50-60/3"	9"/9"	>100						0.5/3	
8	155-157'	23-60/5"	11"/11"	>100						8.8/7.5	
9	160-162'	55-60/3"	9"/9"	>100	Very Dense, Brown/White, Foliated Schist with Kaolin laminae, Bedding vertical, Texture is clay-like					7/7	
10	165-167'	40-60/3"	9"/9"	>100						7/7.5	

Note: 1. Field Testing/HNu column indicates the results of the soil screening headspace analyses. Results reported in parts per million(vol./vol.).
2. Well Construction:
- 6" casing set at 118 feet below grade.
- 2" Sch. 40 PVC well set at 234'6" with 25' of 10 slot screen
- Washed sand pack set from 235'6" to 207 feet below grade.
- Bentonite set 207 to 204 fbg.
- Grout postioned from 204' to grade.

3. Ground water elevation referenced from sea level.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-01DI SHEET 2 OF 2
CLIENT: Burgess Bros. Supefund Site PROJECT LOCATION: Bennington, VT	GROUNDWATER LEVELS DATE: 7/05/94 DEPTH: 66.96 ELEV.: 1081.54	FILE No.: 5271.003 DRILLING METHOD: OX 6" Casing/4" Cas. Rol. Bit SAMPLER TYPE: Splitspoon HAMMER: 300lb FALL: 30"
EN & GERE GEOLOGIST: MA Randazzo NG CO.: Redwing Environmental Drilling FOREMAN: John Haliberta	BORING LOCATION: Northeast Corner/Upgradient GROUND ELEVATION: 1148.5 DATES: STARTED: 5/18/94 ENDED: 5/31/94	LEGEND: Grout/Bentonite, Sand Packing, Natural Mater. ORH — Steel

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S	PID (ppm)	S*
11	170-172'	40-75/5"	11"/11"	>100	(WEATHERED SCHIST)					7/7	
					Very Dense, Dry, Foliated Schists, Bedding						
12	175-177'	21-48-60/3"	15"/15"	>100	is vertical, Brown/White, Kaolin laminae abundant, Texture clay-like (WEATHERED SCHIST)					7/7.5	
13	180-182'	53-60/4"	10"/10"	>100						10/8	
14	185-187'	60/4"	4"/4"	>100						8.8/-	
15	190-192'	36-43-53-60/4"	22"/22"	96	Very Dense, Dry, Foliated Schists, Bedding is vertical, Brown/White, Kaolin laminae abundant, Texture clay-like (WEATHERED SCHIST)					8/8.4	
16	195-197'	20-25-44-66	24"/18"	69						7/6.8	
17	200-202'	8-13-20-26	24"/24"	33						8/8	
18	205-207'	10-18-30-38	24"/24"	48	Very Dense, Dry, Foliated Schists, Bedding is vertical, Brown/White, Kaolin laminae abundant, Texture clay-like (WEATHERED SCHIST)					9/8.5	
	210-212'	11-13-28-43	24"/24"	41						7/8.5	
20	215-217'	4-6-11-10	24"/24"	17	Very Soft and Moist in comparison to above, Some water yield possible (WEATHERED SCHIST)					6.8/7	
21	220-222'	24-52-60/3"	15"/15"	>100	Very Dense, Dry, Foliated Schists, Bedding is vertical, Brown/White, Kaolin laminae abundant, Texture clay-like (WEATHERED SCHIST)					8.2/8.6	
22	225-227'	60/5"	5"/5"	>100						-	
23	230-232'	60/3"	3"/3"	>100		230'6"				-	
24	233'6"-235'6"		24"/24"	-	Top Of Competent Bedrock Cored 2' with core barrel, One fracture observed with iron staining, White, Massive Quartzite					-	
					Bottom Of Boring	235'6"					

Note: 1. Field Testing/HNu column indicates the results of the soil screening headspace analyses. Results reported in parts per million(vol./vol.).

2. Well Construction:
- 6" casing set at 118 feet below grade.
- 2" Sch. 40 PVC well set at 234'6" with 25' of 10 slot screen
- Washed sand pack set from 235'6" to 207 feet below grade.
- Bentonite set 207 to 204 fbg.
- Grout postioned from 204' to grade.

3. Ground water elevation referenced from sea level.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-04DI SHEET 1 OF 1

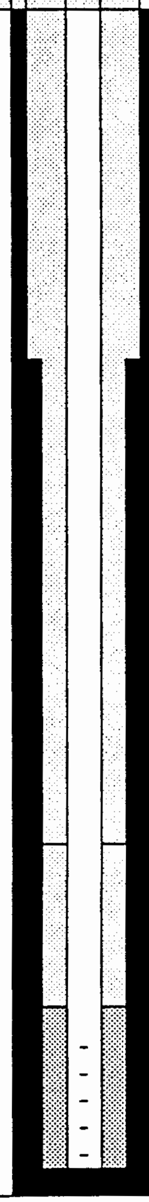
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 4.56 ELEV.: 1081.06	FILE No.: 5271.001 DRILLING METHOD: Odex 14" Casing Advancement SAMPLER TYPE: No sampling done. HAMMER:None FALL:None DRIVER:Air Perc.

O'BRIEN & GERE GEOLOGIST: John Jennings
BORING CO.: A&W Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: Southeast of landfill
GROUND ELEVATION: 1084.09
DATES: STARTED: 5/7/93 ENDED: 5/11/93

LEGEND: Grout/Bent; Sand Pack; Nat. Form.; Screen; Riser

SAMPLE No.	SAMPLE DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
					See boring log W-04B for subsurface descriptions.						
					Bottom of 6" casing.	65.5'					
					Bentonite/Grout Interface	132'					
					Bentonite/Sand pack Interface	143'					
					Top of Screen	145'					
					Bottom of Well	155'					



Notes: Depth to groundwater taken from top of PVC.
Well Constructions:
- 2" I.D. PVC schedule 40 well set at 155'.
- 10' of 10 slot screen set from 155' to 145'.
- Washed silica sand positioned from 157'-143'.
- Bentonite positioned from 143'-132'.
- Grout positioned from 132' -0'.
- 6" ODEX casing set from 65.5 to grade.
- Depth measurements referenced from grade.
- Well encapsolated in locking steel casing.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-07B/W-07DI
		SHEET 1 OF 6 (Boring Abandoned)

CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS			FILE No.: 5271.001
	DATE	DEPTH	ELEV.	DRILLING METHOD: 4" Casing Advancement
PROJECT LOCATION: Bennington/Woodford, VT	7/7/93	218.44	899.89	SAMPLER TYPE: 2" and 3" Splitspoon
				HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: R. Stromberg
BORING CO.: McKenna Well Drilling
FOREMAN: Bruce Follet

BORING LOCATION: NW of Landfill
GROUND ELEVATION: 1116.62
DATES: STARTED: 12/16/92 ENDED: 12/29/92

LEGEND: Grout; Sand Pack; Nat. form.; Screen; Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
					No samples from 0-33' because hole already sampled in W7B (A) which was grouted due to loss of auger See logs for W7/S1 and W7B (A) for description of soils from 0'-30' **TOP OF BORING**						
10	33'-35'	Pneumatic Hammer	24/12	-	V. dense, brn, moist to damp F. SAND and SILT, little c. sand, pebbles (BASAL GLACIAL TILL)					0.0/0.0	
11	37'-39'	Pneumatic Hammer	24/24	-	V. dense, brn, moist to damp F. SAND and SILT, little c. sand, pebbles, clay (BASAL GLACIAL TILL)					6/9	
12	41'-43'	Pneumatic Hammer	24/18	-	V. dense, brn, moist to damp F. SAND and SILT, little c. sand, pebbles, little clay (BASAL GLACIAL TILL)					10/15 0.0/-	
13	45'-47'	Pneumatic Hammer	24/0		No recovery			4" casing			
14	49'-51'	Pneumatic Hammer			V. dense, brn, moist to damp, F. SAND and SILT, little c. sand, pebbles (BASAL GLACIAL TILL) boulder @ 51-52'					1.0/ 3.0	
15	53'-55'	Pneumatic Hammer			Brn, moist to damp, silty F. SAND, some f-cs pebbles, cobbles, little clay.					12.0/-	
16	57'-59'	Pneumatic Hammer			Brn, wet, F. SANDY SILT, some f-cs pebbles, weathered quartzite					0.0/-	
					BOTTOM OF BORING @ 95' Boulder @ 61'-70' See next Log		Collapsed borehole 95'-80'				

Notes: Refusal with ODEX bit @ 61'. Couldn't penetrate to take sample. Drilled with roller bit in weathered rock to 70'. Casing seated @ 61'. Rock consists of weathered quartzite. Set 4" casing to 70' with grout. Drilled with roller bit from 70'-87'. Bit wore down. Had to cease drilling and replace bit. Weathered quartzite bedrock with occasional seams that could be unstable. Yield @ 87' <3 GPM.

Drilled to 95' and cuttings became more clayey and gravelly. Hole began to collapse and couldn't drill further without mud. Decided that glacial till was encountered again. Boring grouted from (+/-) 75' to grade.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-07B/W-07DI SHEET 2 OF 6

CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS			FILE No.: 5271.001
	DATE	DEPTH	ELEV.	DRILLING METHOD: Odex
PROJECT LOCATION: Bennington/Woodford, VT	7/7/93	218.44	899.89	SAMPLER TYPE: 2' long, 3" Splitspoons
				HAMMER: NA FALL: NA

O'BRIEN & GERE GEOLOGIST: T. Hayes, S. Lyons	BORING LOCATION: NW of landfill	LEGEND: Grout; Sand Pack; Nat. Form.; Screen —; Riser
BORING CO.: A&W Environmental Drilling	GROUND ELEVATION: 1116.62	
FOREMAN: P. Gottler	DATES: STARTED: 12/16/92 ENDED: 4/8/93	

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
17	69'-71.2'	-	14/1		V. dense, d. brn to gold brn, PEBBLES and F-M SAND, some silt, tr. clay. PEBBLES angular to subrounded, quartzitic, faceted and striated. Sand f-c, mostly quartz. Massive.					0.0/-	
18	71.2'-75.4'	-	17/2.4		V. dense, brn, PEBBLES and sand, little to some silt, tr. clay. Massive, matrix supported. (BASAL GLACIAL TILL)					0.0/1.0	
	78.4		5/0		No Recovery. Retry.						
	78.6		7/0		No Recovery. Drill to 80'.						
19	80'-82'		24/14		V. dense, d. brn to brn, PEBBLES and f-m sand, little silt, tr. clay. Pebbles f-c subrounded to subangular, faceted and striated quartzitic with A-axis tending to horizontal. Sand f-c, quartzitic. Massive, matrix supported (almost clast supported).					0.0/0.0	
20	84'-86'		24/14		V. dense, brn to d. brn, PEBBLES and f-m sand, little silt, tr. clay. PEBBLES f-c angular to subrounded quartzitic, faceted and striated. (BASAL GLACIAL TILL)					0.0/0.0	
21	88'-90'		24/12		V dense, brn-d red brn, wet to damp, f-c PEBBLES, some f. sand, some silt, little clay. Pebbles subangular to subround, quartzitic, approx 50% faceted and striated. Sand fine with a little coarse and medium. Massive, matrix supported. A-axis random.					0.0/0.0	
22	92'-94'	-	24/8	-	V. dense, brn to lt brn, wet to damp, PEBBLES, some f-c sand, some silt, little clay. Pebbles, cobble to fine, subangular to subround, quartzitic with facets and striations. Sand f-c; clay gray to orange, appears oxidized. Weathered rock fragments.	W7B (3)				0.0/0.0	
23	96'-98'	-	24/6	-	V. dense, red, wht to brn, wet to damp, PEBBLES, little f-c sand, little silt, little clay. Fine pebbles, quartzitic, subangular to subround. Massive. (BASAL GLACIAL TILL)	Began Boring now called W-07DI		6" ODEX casing		0.0/0.0	
24	100'-102'	-	24/19	-	V. dense, brn-d. brn, damp to moist, PEBBLES with sand, silt and clay in equal proportions. Pebbles subangular to subround.			2"PVC casing		0.0/0.0	

Notes: New borehole started just south using 6" ODEX casing advancement system.
Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-07B/W-07DI SHEET 3 OF 6
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE 7/7/93 DEPTH 218.44 ELEV. 899.89	FILE No.: 5271.001 DRILLING METHOD: Hollow Stem Auger/Odex SAMPLER TYPE: 2' long, 3" Splitspoons HAMMER: NA FALL: NA
O'BRIEN & GERE GEOLOGIST: T. Hayes, S. Lyons BORING CO.: A&W Environmental Drilling FOREMAN: P. Gottler	BORING LOCATION: NW of landfill GROUND ELEVATION: 1116.62 DATES: STARTED: 12/16/92 ENDED: 4/8/93	LEGEND: Grout / Sand Pack / Nat. Form. — Screen / Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
25	104'-106'	-	24/16	-	V. dense, brn-d. brn, PEBBLES, with f-m sand, silt, and clay in approximately equal proportions. PEBBLES round to subangular with an increased number of gray dolostone(?) facets and striae common to gray pebbles. Preferred A-axis orientation as above. Massive, matrix supported.					0.0/0.0	
26	108'-110'	-	24/12	-	V. dense, orange brn to brn, damp to wet, F-Cs PEBBLES and silt, some clay, tr. f-c sand. Pebbles round to angular quartzite, dolostone and hematite. Massive, damp to wet. (BASAL GLACIAL TILL)					0.0/0.0	
27	112'-114'	-	24/16	-	V. dense, orange brn to tan orange, damp to wet, F-Cs Pebbles, some silt, some clay, little f-c sand. Pebbles f-c round to angular gray dolostone, wht to tan quartzite. Clay tan to orange to brn.	115'				0.0/0.0	
28	116'-118'	-	24/20	-	Dense, gray, lt gray and wht, damp to wet, m-c SAND, little f. pebbles, tr. silt. Pebbles moderately well to well rounded. (GLACIO FLUVIAL)	117.2'				0.0/0.0	
					Dense, gold and lt brn, damp to wet, CLAY and silt, wht kaolin veins, tr angular lt gray massive quartz pebbles. Laminated across spoon at top of spoon, perpendicular to horizon at bottom of spoon. Some red to red brn (iron rich horizons), gray, clay (WEATHERED SCHIST)						
29	120'-124'	-	48/43	-	V. dense, brn, lt brn, d. red-brn, gray, lt gray, blue gray, pink, blk, and wht, dry to damp, CLAY, some silt, little pebbles, tr. f-c sand. Laminated consistently down-spoon. Laminations irregular, usually wavy. Pebbles, angular lt gray massive quartz or gray phyllitic chips that appear to float in clay matrix. (WEATHERED SCHIST)					0.0/0.0	
30	126'-131'	-	60/47	-	V. dense, brn, red and gray, damp to wet, CLAY some silt, little pebbles. Laminated horizontally. Pebbles angular massive quartz. A few wht kaolin veins. (WEATHERED SCHIST)					0.0/0.0	
31	133'-136'	-	36/35	-	V. dense, gray and red, CLAY, some silt little angular lt gray quartzite pebbles, tr. f-c quartzitic sand. Horizontally laminated. Veins/laminae of wht kaolin. (WEATHERED SCHIST)					0.0/0.0	

Notes: Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-07B/W-07DI SHEET 4 OF 6

CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS			FILE No.: 5271.001
	DATE	DEPTH	ELEV.	DRILLING METHOD: 4" Casing Adv. System/ODEX
OJECT LOCATION: Bennington/Woodford, VT	7/7/93	218.44	899.89	SAMPLER TYPE: 2' long, 3" Splitspoons
				HAMMER: NA FALL: NA

O'B & G GEOLOGIST: B. Follet, T. Hayes, R. Stromberg	BORING LOCATION: NW of Landfill	LEGEND: Grout / Screen
BORING CO.: A&W Environmental Drilling	GROUND ELEVATION: 1116.62	Sand Pack / Riser
FOREMAN: P. Gottler, S. Winters	DATES: STARTED: 12/16/92 ENDED: 4/8/93	Nat. Form.

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	R M K S*
32	138'-140'	-	24/20	-	V. dense, brn, lt brn, gray, wht, red CLAY and SILT, little pebbles, tr. f-c sand. Laminated horizontally at top of spoon and dips ~45° at bottom of spoon					0.0/0.0	
33	142'-144'	-	24/23	-	V. dense, gry, blue gray, brn, red-brn, dry, CLAY and silt, tr. f-c sand and f. lt gray angular schist and pebbles. Laminated horizontally with occasional deformed laminae. Traces of yellow massive clay.					0.0/0.0	
34	146'-148'	-	24/20	-	V. dense, tan, lt brn, red, off-wht, CLAY and silt, little f-c sand, tr f. angular gravel. Laminated Horizontally.	146'6"				0.0/0.0	
					V. dense, brn to d. brn, wht, moist to wet, SILT and clay, kaolin veins and masses. Laminated horizontally						
35	150'-152'	-	24/24	-	V. dense, lt brn, damp to wet, f. grained quartz SAND, moderately silica cemented, laminated horizontally. (SAND LAYER)	149'6"				0.2/0.1	
					V. dense, brn, lt grn, gray, dry to moist, CLAY and silt, some f. quartz pebbles, tr. f-c sand. Pebbles angular. Laminated horizontally. casing broke at 153'.	150'6" 153'					
36	158'-160'	-	24/24	-	V. dense, brn, wht, gray, dry to moist, SILT and CLAY, little f-c sand, tr. f. quartz pebbles. Gray clay laminae look like schist with blk prismatic crystals (staurolite?). Laminated vertical toward top of spoon, changing to horizontal at bottom.					0.1/0.0	
37	162'-162.5'	0.5/15 min	6/6	-	V. stiff, orange brn, damp, CLAYEY SILT, SILTY CLAY, horizontal bands of wht kaolinite bedding (WEATHERED SCHIST)					0.1/-	
38	166'-166.8'	.8 for 20 min	9.5/0	-	Splitspoon lost in hole. borehole advanced from 167 to 178 feet.			2" PVC casing			
39	167'-170'			-	Orange to red SILTY CLAY (WEATHERED SCHIST)					1/0.0	
40	178'--178.4'	.4 for 12 min		-	V. stiff, bluish wht, SILTY CLAY, vertically bedded with quartzitic pebbles. Lower bands are of kaolinite and quartz.						
41	182'-182'6"	0.6 for 15 min.		-							

Notes: - Borehole excavated with 4" casing advancement system below 153 feet.
- Bottom of 6" ODEX casing 153 feet.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-07B/W-07DI SHEET 5 OF 6

CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS			FILE No.: 5271.001
	DATE	DEPTH	ELEV.	DRILLING METHOD: Hollow Stem Auger/Odex
PROJECT LOCATION: Bennington/Woodford, VT	7/7/93	218.44	899.89	SAMPLER TYPE: 2" and 3" splitspoon
				HAMMER:None FALL:None DRIVER:Air Perc.

O'BRIEN & GERE GEOLOGIST: R. Stromberg — BORING LOCATION: West of landfill — LEGEND: Grout/Bentonite; Screen --
BORING CO.: A&W Environmental Drilling — GROUND ELEVATION: 1116.62 — Sand Pack; Riser
FOREMAN: S. Winters — DATES: STARTED: 12/16/92 ENDED: 12/29/92 — Nat. Form.

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
42	184'-186.6"		6/6		Dk brn, lt brn, white,dry, foliated weathered phyllite (WEATHERED SCHIST)					0.0/ 0.0	
43	188'-188'6"		6/1		Lt gray-brown, dry-damp, 40° from horizontal quartzite (WEATHERED SCHIST)					-	
44	192'-192'8"		8/8		D, brn with streaks of wht (kaolin), damp, SILT bedding parallel to spoon					0.8/ 3.8	
45	196'-196'5"		5/6		Lt brn, wht, damp, streaks of SILT, bedding parallel to spoon.					0.0/ 0.0	
46	199'-201'		24/24		D brn, damp, SILT, some f-c sand, tr. f. gravel, tr. clay, Mottled rock bedded appearance (WEATHERED SCHIST)					0.0/ 0.0	
47	203'-204'		12/8		D brn, damp, SILT, some f-c sand, tr. clay, tr. f. pebbles, v. little white mottling.					0.0/ 0.0	
48	206'-206'6"		6/0		No Recovery					-/-	
49	210'-210'6"		6/6		Lt brn, damp, SILT, little f-c sand, tr. f. pebbles, tr. clay. Blk foliation					0.0/ 0.0	
50	214'-214'6"		6/6		Lt brn, damp, SILT, little f-c sand, tr. f. pebbles, tr. clay. Blk and wht foliation (WEATHERED SCHIST)					0.0/ 0.0	
51	218'-218'6"		6/6		Lt brn, damp, SILT, little f-c sand, tr. clay, wht foliations perpendicular to spoon. (WEATHERED SCHIST)					4/3.5	
52	222'-222'6"		6/4		Lt brn, damp, SILT, little f. sand, tr. clay, tr. f. pebbles, wht foliations					1.0/ 0.8	
53	228'-229'		24/24		lt brn, damp, SILT, little f-c sand, tr. clay no foliations					2.0/ 1.8	
54	230'-230'6"		6/6		Lt brn, damp, SILT, little f-c sand, tr. clay					0.6/ 0.0	
55	234'-234'6"		6/0		No Recovery					-	

Notes: Well Construction Details:
- 2" schedule 40 PVC screen (10 slot) set from 236' to 226'.
- 2" schedule 40 PVC riser set from 226' to 2' above grade.
- Washed silica sand installed from 238' to 224'
- Bentonite seal set from 224' to 220' below grade (fbg).
- Grout installed from 220' to 0 fbg.
- Well finished with locking protective casing.

- Measurement referenced from grade

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-07B/W-07DI SHEET 6 OF 6

CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS			FILE No.: 5271.001
	DATE	DEPTH	ELEV.	DRILLING METHOD: Hollow Stem Auger/Odex
PROJECT LOCATION: Bennington/Woodford, VT	7/7/93	218.44	899.89	SAMPLER TYPE: 2" and 3" splitspoon
				HAMMER:None FALL:None DRIVER:Air Perc.

O'BRIEN & GERE GEOLOGIST: R. Stromberg — BORING LOCATION: West of landfill — LEGEND: Grout/Bent; Screen
BORING CO.: A&W Environmental Drilling — GROUND ELEVATION: 1116.62 — Sand Pack; Riser
FOREMAN: S. Winters — DATES: STARTED: 12/16/92 ENDED: 12/29/92 — Nat. Form.

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
56	236.6"-237'		6/6		Lt brn, damp, SILT, tr. f-c sand, tr. clay, blk, gray and white foliations					0.0/0.0	
57	239-239.6"		6/11		Lt brn, damp, SILT, tr. f-c sand, tr clay, blk, gray and wht foliations (WEATHERED SCHIST)					0.0/0.0	
58	241.6" 242'		6/6		Lt brn, damp, SILT, tr. f-c sand, tr. clay, blk, gry and wht foliations					0.0/0.0	
59	244'-244.6"		6/6		Lt brn, damp, SILT, tr. f-c sand, tr. clay, blk, gry and wht foliations					0.0/0.0	
60	246.6"-247'		6/0		No Recovery					-/-	
61	250'-250.6"		6/4		Lt brn, damp, SILT, tr. f-c sand, tr. clay, blk, gry and wht foliations					0.0/0.0	
62	254'-254.6"		6/5		Lt brn, damp, SILT, tr. f-c sand, tr. clay, blk, gry and wht foliations (WEATHERED SCHIST)					0.0/0.0	
63	258'-258.6"		6/6		Lt brn, damp, SILT, tr. f-c sand, tr. clay, blk, gry and wht foliations					0.0/0.0	
64	260'-262.6"		6/6		Lt brn, damp, SILT, tr. f-c sand, tr. clay, blk, gry and wht foliations					-/-	
65	262'-262.6"		6/6		Lt brn, damp, SILT, tr. f-c sand, tr. clay, bedding folliated (WEATHERED SCHIST)					0.0/0.0	
66	264-266		-		Borehole collapsed, no sample recovered. Bottom of Exploration					-/-	

Notes: Borehole tremie grouted from 262' to 241', followed by bentonite to 238'.

BB2:w7b7di-6.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W25DI SHEET 1 OF 4

CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 18' ELEV.: 1072.03	FILE No.: 5271.001 DRILLING METHOD: ODEX SAMPLER TYPE: 2" Splitspoon or 4" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: M. Randazzo BORING CO.: A&W Environmental Drilling FOREMAN: P. Emmons	BORING LOCATION: South of landfill GROUND ELEVATION: 1088.38 DATES: STARTED: 2/24/93 ENDED: 4/16/93	LEGEND: Grout, Sand Pack, Nat. Form. — Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	REMKS*
	0'-30'				See Boring Log W-25B (1) (Abandoned)						
1	30'-38.5'	50/1	60/57	>100	V. dense, lt brn, damp, silty-f. SAND, little f. pebbles, cobbles, tr. boulders. No bedding planes, poorly sorted. Grains angular to subangular. Low plasticity.					0.0/ 0.0	
2	38.5'-44'	50/5	30/30	>100	V. dense, lt brn, damp SILTY, little f. sand and c. cobbles, tr. clay, low plasticity (BASAL GLACIAL TILL)					0.0/ 0.0	
3	44'-50'	50 - 50/1	36/32	>100	V. dense, lt brn, damp, silty-f. SAND, little c. sand to c. pebbles, tr. f-c cobbles, clay. No stratification, poorly sorted. Grains angular to subangular (BASAL GLACIAL TILL)					0.0/ 0.0	
4	50'-55'	60/2	24/24	>100	V. dense, lt brn, damp, silty-f. SAND, little f-c cobbles, tr. c. sand to c. pebbles. Grain angular to subangular. No plasticity.					0.0/ 0.0	
5	55'-59'	50/2	18/16	>100	V. dense, lt brn, damp, f. sandy SILT, tr. c. sand to c. cobbles. Poorly sorted. Grains angular to subangular.					0.0/ 0.0	
6	59'-64'	50/2	36/32	>100	V. dense, lt brn, damp, silty-f. SAND, little c. sand to c. pebbles, tr. clay, c. cobbles. Poorly sorted. (BASAL GLACIAL TILL)					0.0/ 0.0	
7	64'-69'	60/3.5	18/12	>100	V. dense, lt brn, damp, silty-f. SAND, little c. sand to f. pebbles, tr. clay, cobbles. Low plasticity. (BASAL GLACIAL TILL)					0.0/ 0.0	
8	69'-75'	50/3	36/30	>100	V. dense, lt brn, damp, f. sandy SILT, little c. sand to c. pebbles, tr. clay. Low plasticity. Poorly sorted. Grains subangular.			6" ODEX Casing 2" PVC Casing		0.0/ 0.0	

Notes: - Field Testing/PID column presents the results of the soil headspace screening results.
- 6" ODEX steel casing set to a depth of 133', boring continued using water rotary method.

bo2:w25di.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W25DI
		SHEET 2 OF 4

CLIENT: BURGESS BROS. SUPERFUND SITE

ROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	18'	1072.03

FILE No.: 5271.001
DRILLING METHOD: ODEX 4" Casing Advancement
SAMPLER TYPE: 2" Splitspoon or 4" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: M. Randazzo, D. Skapiak
BORING CO.: A&W Environmental Drilling
FOREMAN: P. Emmons

BORING LOCATION: South of landfill
GROUND ELEVATION: 1088.38
DATES: STARTED: 2/24/93 ENDED: 4/16/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
9	75'-80	60/3	24/20	>100	V. dense, lt brn, damp, silty-f. SAND, little c. sand to f. pebbles, tr. coarse cobbles to fine boulders, clay (BASAL GLACIAL TILL)					0.0/ 0.0	
10	80'-88'	50/3	54/54	>100	Top 4'4" Brn-orange brn, moist, f. SAND, some silt, little round to subround gravel (BASAL GLACIAL TILL) (TOP of WEATHERED SCHIST) ---------- Bottom 8" Gray to brn, moist, CLAY, little silt, very plastic, tr. gravel	84'				0.0/ 0.0	
11	88'-94'	50/4	33/33	>100	CLAY texture with bands of m-c sand near top of sand. Highly folded bedding planes. Weathered schist as noted in other borings. Sandstone layer near top of spoon which appeared to be of limited thicknesses (1/2") but permeable. Weathered schist consists of bands of white, d. brn, lt brn, pink, damp (WEATHERED SCHIST)					0.0/ 0.0	
12	94'-101'		36/36		---------- Wht, damp-moist, loosely cemented SANDSTONE: mottled brn m-c grains. No significant water bearing zone (WEATHERED SCHIST)	95'8"				0.0/ 0.0	
13	101'-104'		30/30		---------- D. brn and wht, damp, CLAY texture, moderate plasticity, foliated weathered schist, foliation parallel to spoon.	98.5'				0.0/ 0.0	
14	104'-109'		30/30		Weathered rock, ocher with possible parent material, gneiss or schist, select grains of feldspar, mica, quartz, biotite, garnet, sand-silt-clay grain size (WEATHERED SCHIST)					0.0/ 0.0	
15	109'-111.25'		30/30		Weathered rock, massive quartzite near top, then ocher layered with wht, red, blk, grains of feldspar, hornblonde, quartz, foliation present, silt-clay size grains in ocher.					0.0/ 0.0	
16	114'-118'		0/0		No Penetration					-/-	
17	118'-119		6/6		Weathered rock, possible parent schist, relict grains of quartz and hornblonde, sand size grains, foliation present					0.0/ 0.0	

BB2:w25di.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W25DI
		SHEET 3 OF 4

CLIENT: BURGESS BROS. SUPERFUND SITE

JECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	18'	1072.03

FILE No.: 5271.001
DRILLING METHOD: ODEX/Water Rotary
SAMPLER TYPE: 2" Splitspoon or 4" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: D. Skapiak
BORING CO.: A&W Environmental Drilling
FOREMAN: P. Emmons

BORING LOCATION: South of landfill
GROUND ELEVATION: 1088.38
DATES: STARTED: 2/24/93 ENDED: 4/16/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
18	119'-123'		6/6		Weathered rock possible parent schist as above, broken wht, blk, tan, red moist to dry, foliation present (WEATHERED SCHIST)					0.0/ 0.0	
19	123'-124'		0/0		No Penetration - No Recovery					-/-	
20	124'-129'		18/24		Weathered rock - quartz (massive), some pieces 1-2cm intact, others sand size, iron staining, also brn ocher crystals or pyrite and hornblonde (WEATHERED SCHIST)	124'				0.0/ 0.0	
21	129'-134'		0/0		No Penetration (Cuttings were quartzite for this section) Bottom of 6" casing			2" PVC casing 133' bottom of		-/-	
22	134'-140'		22/24		Wht, weathered massive quartzite, iron staining, some interlayers of brn silt size ocher - possible parent phyllite (WEATHERED SCHIST)			6" casing		0.0/ 0.0	
23	140'-143'		0/0		No Penetration (Cuttings being returned: quartzite, with iron staining)					-/-	
24	143'-148'		0/0		No Penetration (Cuttings as above)					-/-	
25	148'-153'		0/0		No Penetration (Cuttings as above)					-/-	
26	153'-158'		22/22		Weathered rock, possible parent quartz schist, relict grains of quartz, hornblende with much iron staining (WEATHERED SCHIST)					0.0/ 0.0	

Notes: Borehole excavated using the water rotary method (5.75" bit) below 133'. (Bottom of Casing)
4" casing advancement system positioned in borehole at 201'to set well materials.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W25DI SHEET 4 OF 4

CLIENT: BURGESS BROS. SUPERFUND SITE

OJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	18'	1072.03

FILE No.: 5271.001
DRILLING METHOD: Water Rotary / 4" Casing Adv.
SAMPLER TYPE: 2" Splitspoon or 4" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: D. Skapiak
BORING CO.: A&W Environmental Drilling
FOREMAN: P. Emmons

BORING LOCATION: West of landfill
GROUND ELEVATION: 1088.38
DATES: STARTED: 2/24/93 ENDED: 4/16/93

LEGEND: Grout/Bent. — Sand Pack — Nat Form. — Screen — Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
27	158'-160'		0/0		No Penetration					-/-	
28	160'-167'		12/12	-	Wht quartzite, brn (WEATHERED SCHIST)	167'				-/0.0	
29	167'-172'		7/7	-	Blk, wht, gray, quartzite, (WEATHERED SCHIST)					-/0.0	
30	172'-181'		12/12	-	Brn, tan, foliated, quartzite, silt and clay size grains, inclusive of quartzite, (WEATHERED SCHIST)					0.0/ 0.0	
31	181'-186'		12/12	-	Drilled to 181' due to hardness of sample above Pull down pressure >9000 lbs. Brn, wht, foliated, relect, quartzite, (WEATHERED SCHIST)	185'				0.0/ 0.0	
32	186'-191'		6/6	-						0/-	
33	191'-201'		0/0	-	Penetration Brn, quartzite, (WEATHERED SCHIST)					-/-	
34	201'-201'3"		3/3		No penetration					-/-	
35	201'			-	Weathered quartz with iron staining (WEATHERED SCHIST)	201'				0.0/ 0.0	
					Bottom of Boring						

Notes:
- 2" schedule 40 PVC well set at 201' below grade using the 4" casing advancement system.
- 10' of 10 slot screen set from 201' to 191'.

Well Constr Detail
- Washed silica set from 201' to 189'.
- Bentonite seal positioned from 189' to 158'
- Grout positioned from 158' to 133' followed by bentonite chips to 50' below grade. The secondary bentonite seal was placed due to the loss of grout in the borehole.
- The remaining annulus was grouted to grade.
- The well was encapsulated in a 6" locking protective steel casing.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-01B SHEET 1 OF 15

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	55.15	1068.41

FILE No.: 5271.001
DRILLING METHOD: ODEX
SAMPLER TYPE: 3" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: T. Finch, M. Randazzo
BORING CO.: A&W Environmental Drilling
FOREMAN: J. Richardson

BORING LOCATION: 6' North of W1
GROUND ELEVATION: 1121.00
DATES: STARTED: 1/26/93 ENDED: 3/31/93

LEGEND: Grout — Screen; Sand Pack — Riser; Nat. Form.

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
	0'-12'				See Boring Log W1/S1 (SBW-13)						
1	12'-14'	50/5	5/2	>100	V. dense, lt tan, wet, silty-c. SAND, little clay (ABLATED GLACIAL TILL) Very Little Recovery ---------- Very bouldery	12.5'			0.0	0.0/-	
2	14'-16'	50/5	5/0	>100	No Recovery					-	
3	16'-18'	27-56-50/4	16/15	>100	V. dense, lt brn, damp, silty-f. SAND, little c. sand and cobbles. Difficult augering (BASAL GLACIAL TILL)					0.1/ 0.4	
4	18'-20'	34-51/4	10/10	>100	V. dense, lt brn, moist, SILT, some f. sand, little pebbles (BASAL GLACIAL TILL)					0.0/ 0.0	
5	20'-22'	51/4	4/4	>100	V. dense, lt brn, moist, SILT, little f. sand, some cobbles (BASAL GLACIAL TILL)					0.0/-	
6	22'-24'	51/4	4/4	>100	V. dense, lt brn, moist, SILT, little f. sand, some pebbles and cobbles (BASAL GLACIAL TILL)					0.0/ 0.0	
7	24'-26'	51/5	5/3	>100	V. dense, lt brn, moist, SILT, some f. sand (BASAL GLACIAL TILL) ---------- Augered through rock (BOULDER)					0.0/ 0.0	
8	27'-28'	53/3	3/2	>100	---------- V. dense, lt brn, moist, SILT, little f. sand, some pebbles and cobbles ----------	27' 28'		4" casing 6" casing		0.0/-	
9	29'-30'	45-51/2	8/4	>100	Augered through rock (BOULDER) ----------	29'				0.0/ 6.9	

Note: *Condensation appears to be giving false reading.
- Initial hole excavated with 4 1/4" HSA to 76'6" and grouted.
- Water depth taken from top of protective casing.
- Secondary hole excavated with 6" Odex casing advancement to 146'6", followed by watet rotary to 240', followed by 4" casing advancement to 289 feet below grade.
- Field Testing/PID column presents soil screening results.

BB2:w01b.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-01B SHEET 2 OF 15
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 55.15 ELEV.: 1068.41	FILE No.: 5271.001 DRILLING METHOD: Hollow Stem Auger/ODEX SAMPLER TYPE: 3" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: T. Finch, M. Randazzo BORING CO.: A&W Environmental Drilling FOREMAN: J. Richardson	BORING LOCATION: 6' North of W1 GROUND ELEVATION: 1121.00 DATES: STARTED: 1/26/93 ENDED: 3/31/93	LEGEND: Grout; Sand Pack; Nat. Form.; Screen —; Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
10	30'-32'	11 - 50/4	10/8	>100	V. dense, lt brn, damp, SILT, little sand, some pebbles (BASAL GLACIAL TILL)					0.0/ 0.0	
11	32'-34'	21-21-33-62	24/16	54	V. dense, lt brn, damp, SILT, little sand, little cobbles (BASAL GLACIAL TILL)					0.0/ 0.0	
12	34'-36'	15-20-29-36	24/16	49	V. dense, lt brn, damp, SILT, little sand, little cobbles (BASAL GLACIAL TILL)					0.0/ 0.0	
13	36'-38'	9-13-21-23	24/18	34	V. dense, lt brn, damp, SILT, little sand, little cobbles (BASAL GLACIAL TILL)					5.1/ 3.6	
14	38'-40'	6-17-31-44	24/12	48	V. dense,lt brn, damp, SILT, little sand, little cobbles (BASAL GLACIAL TILL)					4.1/ 4.1	
15	40'-42'	20-33-45-46	24/16	78	V. dense, lt brn, damp, SILT, little sand, little cobbles (BASAL GLACIAL TILL)					3.0/ 3.7	
16	42'-44'	13-30-33-50	24/22	63	V. dense, lt brn, damp, SILT, some sand, some pebbles, little cobbles (BASAL GLACIAL TILL)					3.1/ 3.2	
17	44'-46'	29-52-66-40	24/20	118	V. dense, lt brn, damp, SILT, some sand, some pebbles, little cobbles (BASAL GLACIAL TILL)			4" casing	6" casing	2.0/ 2.5	

- Field Testing/PID column presents soil screening results

Bbz:w01b.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-01B SHEET 3 OF 15

CLIENT: BURGESS BROS. SUPERFUND SITE 'OJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 55.15 ELEV.: 1068.41	FILE No.: 5271.001 DRILLING METHOD: Hollow Stem Auger/ODEX SAMPLER TYPE: 3" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: T. Finch, M. Randazzo BORING CO.: A&W Environmental Drilling FOREMAN: J. Richardson	BORING LOCATION: 6' North of W1 GROUND ELEVATION: 1121.00 DATES: STARTED: 1/26/93 ENDED: 3/31/93	LEGEND: Grout, Sand Pack, Nat. Form.; Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
18	46'-48'	13-34-65/3	15/6	>100	Lt brn, damp, SILT, some sand, some pebbles, little cobbles ------------------------------	48'				1.8/ 1.6	
19	48'-50'	18-85-50/3	15/6	>100	Augered through rock (BOULDER) ------------------------------ Lt brn, damp, SILT, some f. sand, little pebbles, cobbles (BASAL GLACIAL TILL)	49				0.0/ 0.0	
20	50'-52'	32-51-60-65/3	21/16	>100	Lt brn, damp, SILT, some f. sand, some pebbles, cobbles (BASAL GLACIAL TILL)					0.0/ 0.0	
21	52'-54'	90 - 50/2	8/3	>100	Lt brn, damp, SILT, some f. sand, more pebbles, cobbles (BASAL GLACIAL TILL)					0.0/ 0.0	
22	54'-56'	34 - 80/5	11/8	>100	V. dense, lt brn, moist, SILT, little sand, little pebbles and cobbles (BASAL GLACIAL TILL)					0.0/ 0.0	
23	56'-58'	6-40-60/3	15/4	>100	V. dense, lt to med brn, damp, SAND, little pebbles and cobbles (BASAL GLACIAL TILL)					0.0/ 0.0	
24	58'-60'	52-60/3	9/6	>100	V. dense, med brn, damp, SILT, little sand, little pebbles and cobbles (BASAL GLACIAL TILL)					0.0/ 0.0	
25	60'-62'	17-60/3	9/4	>100	V. dense, med brn, damp, SILT, little sand, little pebbles and cobbles (BASAL GLACIAL TILL)					0.0/ 0.0	
26	62'-64'	2-4-27-31	24/4	31	Dense, med brn, damp, SILT, little sand, some pebbles and cobbles (BASAL GLACIAL TILL)					0.0/ 0.0	

- Field Testing/PID column presents soil screening results

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-01B SHEET 4 OF 15

CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS			FILE No.: 5271.001
	DATE	DEPTH	ELEV.	DRILLING METHOD: Hollow Stem Auger/ODEX
OJECT LOCATION: Bennington/Woodford, VT	6/21/93	55.15	1068.41	SAMPLER TYPE: 3" Splitspoon
				HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: M. Randazzo, J. Jennings	BORING LOCATION: 6' North of W1	LEGEND: Grout; Screen —
BORING CO.: A&W Environmental Drilling	GROUND ELEVATION: 1121.00	Sand Pack; Riser
FOREMAN: J. Richardson, A. DeLong, S. Winters	DATES: STARTED: 1/26/93 ENDED: 3/31/93	Nat. Form.

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	MTIP (ppm)	RMKS*
27	64'-66'	20-27-60/1	13/6	>100	V. dense, med brn, damp, SILT, little sand, some pebbles and cobbles					0.0/ 0.0	
28	66'-68'	60/0	6/NR	>100	No Recovery (BASAL GLACIAL TILL)					-/-	
29	68'-70'	33-46-60/3	15/6	>100	V. dense, med brn, damp, SILT, little sand, little pebbles and cobbles (BASAL GLACIAL TILL)					0.0/ 0.0	
30	70'-72'	16-16-60/3	15/4	>100	V. dense, med brn, damp, SILT, little sand, some pebbles and cobbles (BASAL GLACIAL TILL)					0.0/ 0.0	
31	72'-74'	7-42-32-60/4	22/6	74	V. dense, med brn, damp, SILT, little sand, some pebbles and cobbles (BASAL GLACIAL TILL)					0.0/ 0.0	
32	74'-76'	36-60/2	8/0	>100	No Recovery					-/-	
33	76.5'-81.5'	15-31-60/3	15/4	>100	V. dense, med brn, SILT, little sand, little pebbles and cobbles, very poorly sorted, little clay (BASAL GLACIAL TILL)					0.0/ 0.0	
34	81.5'-86.5'	50/3	3/0	>100	Wht, QUARTZITE, boulder, 1/8" laminae, weathered, little orange iron staining					No Recovery	

Notes: NR = No Recovery
- Field Testing/PID column presents soil screening results.

BB2:w01b.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-01B SHEET 5 OF 15

CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS			FILE No.: 5271.001
	DATE	DEPTH	ELEV.	DRILLING METHOD: ODEX
ROJECT LOCATION: Bennington/Woodford, VT	6/21/93	55.15	1068.41	SAMPLER TYPE: 3" Splitspoon
				HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: J. Jennings — BORING LOCATION: 6' North of W1 — LEGEND: Grout, Screen

BORING CO.: A&W Environmental Drilling — GROUND ELEVATION: 1121.00 — Sand Pack, Riser

FOREMAN: S. Winters — DATES: STARTED: 1/26/93 ENDED: 3/31/93 — Nat. Form.

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
35	83'-85'9"	50/0	36/16	>100	V. dense, brn, damp, SILT, little f. sand. some weathered wht to tan quartzite cobbles, possibly fragments of overlying boulder					0.0/ 0.0	
36	86'-89'	50/1	16/9	>100	V. dense, brn, damp, SILT, no gravel. Tr. highly angular c. sand, kaolinite (soft, wht, greasy), chip in nose of spoon (SILT) Extremely dense, brn, damp, silt, tr. f-v. cs., v. angular pebbles	87'4"				0.0/ 0.0	
					Boulder >3" diameter						
					Refusal; advancement to 89'bg.	89'					
37	89'-93'	102/6 50/0	12/12	>100	V. dense, brn, moist, f. SAND, some silt, tr. rounded f-cs pebbles	89'6"				0.0/ 0.0	
					V. dense, golden brn, dry SILT, little f. sand, little subangular f. prov. cs pebbles	89'10"					
					Extremely dense, d. brn to gray, angular MED. PEBBLES gravel, some blk angular f. pebbles, little d. brn silt, tr. f. sand (BASAL GLACIAL TILL)	90'6"					
					Refusal @ 91'6". Drilled through white quartzite boulder 91'-93'	91'6" 93'					
38	93'-97.5'	50/4	60/48	>100	M. dense, brn, wet, f-c SAND, little silt, coarser to 94'	94'				0.0/ 0.0	
					Med dense, coarse, subangular f. PEBBLES, some cs pebbles brn med. sand, tr. brn silt, matrix grading to f. sand @ 94'9"	94'9"					
					Dense, brn, wet, f. SAND, little silt, no gravel, grading to silt @ 95'6" (BASAL GLACIAL TILL)	95'6"					
					V. stiff, brn, moist SILT	97'6"					

- Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W1B SHEET 6 OF 15

CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS			FILE No.: 5271.001
	DATE	DEPTH	ELEV.	DRILLING METHOD: ODEX
ROJECT LOCATION: Bennington/Woodford, VT	6/21/93	55.15	1068.41	SAMPLER TYPE: 3" Splitspoon
				HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: J. Jennings	BORING LOCATION: 6' North of W1	LEGEND: Grout	Screen —
BORING CO.: A&W Environmental Drilling	GROUND ELEVATION: 1121.00	Sand Pack	Riser
FOREMAN: S. Winters	DATES: STARTED: 1/26/93 ENDED: 3/31/93	Nat. Form.	

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL 0/00	H/S (ppm)	PID (ppm)	RMKS
39	98'-103'	50/5	60/36	>100	Dense, d. brn, wet, f-c SAND, subrounded, tr. subangular gravel	97'6"					
					Med dense, orange, wet, f-m subangular SAND, well sorted, 3" wht quartzite cobble in top of spoon	98'					
					(TOP OF WEATHERED SCHIST)	103'					
40	103'-106'				Friable, orange, wet, silica cemented SAND No sample taken from 103'-106' due to heaving sand						
	106'-111'	76/6	6/0	>100	No recovery					-/-	
41	111'-116'		60/52		Semi competent, orange, wet, subrounded SAND - F-PEBBLES, tr. med hematite, nodules and grains appear elongated, (WEATHERED SCHIST) No obvious fractures or folding. Yield test 2.5GPM 110.5'-116'					0.0/ 0.0	
42	116'-121'		60/60		Med dense, orange, wet SAND tr. iron silica cemented sandstone gravel 3/4" and smaller					0.0/ 0.0	
					Increase in SILT (30%), some orange to brn clay	119'					
					Increase in kaolin nearly vertical, tr. (<5%) pink orthoclase laminae parallelling kaolin	119'9"					
					Extremely fine, moist SAND, some brn clay, silt and wht kaolin	120'6"					
43	122'-126'		48/44		V. dense, golden and d. brn, f. SAND, some brn clay, silt and wht kaolin (laminated with tr. of pink orthoclase), tr. iron rich silica cemented brn to blk fine pebbles. Minor perpendicular folding in kaolin/orthoclase laminae. Trend still dominantly vertical to spoon. (WEATHERED SCHIST)					0.0/ 0.0	

- Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-01B SHEET 7 OF 15

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	55.15	1068.41

FILE No.: 5271.001
DRILLING METHOD: ODEX
SAMPLER TYPE: 3" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: J. Jennings
BORING CO.: A&W Environmental Drilling
FOREMAN: S. Winters

BORING LOCATION: 6' North of W1/S1
GROUND ELEVATION: 1121.00
DATES: STARTED: 1/26/93 ENDED: 3/31/93

LEGEND: Grout; Sand Pack; Nat. Form.; Screen --; Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL 0/00	H/S (ppm)	PID (ppm)	RMKS*
44	126'-131'		56/56		No sand. No gravel. Hard, golden brn, dry, CLAY and SILT, some kaolin, pink orthoclase, wht to blue gray laminae, fractures predating weathering appear about 60° from parallel to spoon. Kaolin and orthoclase folded with limbs of fold running perpendicular to length of spoon. (WEATHERED SCHIST)	128'				0.0/ 0.0	
45	131'-136'		60/60		Hard, brn, dry, CLAY, some wht kaolinite, little rose orthoclase, "A" folds in spoon (WEATHERED SCHIST)					0.0/ 0.0	
46	136'-141'		60/60		V. stiff, wht, damp, KAOLINITE, some rose orthoclase, little golden brn clay Stiff, wht, moist, KAOLINITE, some golden brn clay, little rose orthoclase parallel to length of spoon (WEATHERED SCHIST)					0.0/ 0.0	
47	141'-146'		60/60		V. stiff, wht, dry, KAOLINITE and rose orthoclase, some golden brn clay, tr. reddish brn isometric mineral (garnets?) Stiff, wht, wet KAOLINITE Splitspoon refusal @ 144'11" Split ODEX casing @ 146'bg					0.0/ 0.0	
48	150'-152'		8/8		V. stiff, wht, damp, KAOLINITE and rose orthoclase, little clay and silt, tr. wht quartzine gravel (WEATHERED SCHIST) Splitspoon refusal; overdrilled to 152'					0.0/ 0.0	
49	152'-155'		18/18		V. stiff, golden brn, damp CLAY and SILT, some kaolin, tr. pink orthoclase, highly deformed "A" vertical folds, limbs parallel to length of spoon (WEATHERED SCHIST) Splitspoon refusal; overdrill to 155'					0.0/ 0.0	

Notes:
- No samples taken from 146' to 150' due to broken casing.
- Field Testing/PID column presents soil screeing results.

BB2:w01b.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-01B SHEET 8 OF 15

CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS			FILE No.: 5271.001
	DATE	DEPTH	ELEV.	DRILLING METHOD: Water Rotary
PROJECT LOCATION: Bennington/Woodford, VT	6/21/93	55.15	1068.41	SAMPLER TYPE: 3" Splitspoon
				HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: J. Jennings	BORING LOCATION: 1121.00	LEGEND: Grout	Screen
BORING CO.: A&W Environmental Drilling	GROUND ELEVATION: 6' North of W1	Sand Pack	Riser
FOREMAN: S. Winters, B. Follet	DATES: STARTED: 1/26/93 ENDED: 3/31/93	Nat. Form.	

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
50	155'-158'		13/13		Hard, golden, brn, damp, CLAY and SILT, some greasy wht laminae (kaolin), vertically plunging folds, tr. pink laminae (WEATHERED SCHIST)	155'9"				0.0/ 0.0	
					Hard, wht, damp, KAOLIN, massive, tr. pink orthoclase laminae 70° from horizontal	156'1"					
					Hard, wht, damp, KAOLIN, massive, some pink orthoclase laminae, little dk brn to blk laminae, possible hematite, 70° to nearly vertical (WEATHERED SCHIST)	158'					
					Hard, golden brn, damp, CLAY and SILT, some greasy wht kaolin laminae, tigher "A" folds Spoon refusal; overdrill to 160' for next sample						
51	160'-163'		10/8		Hard, golden brn, dry, SILTY CLAY, little wht kaolin laminae, not clearly laminated as above. Salt and pepper appearance with dk brn silt, (WEATHERED SCHIST) Splitspoon refusal @ 160'10" Advancement of water rotary to 163' Extremely hard material	163'				0.0/ 0.0	
52	163'-166'		6/0		Extremely hard 163'-163'4"	163'4"				-/-	
					No Recovery Splitspoon refusal @ 163'6" Water Rotary Advancement 163'6" to 166'	166'					
53	166'-170'		5/5		Extremely hard, golden brn SILT, blk bands (<1/16"), tr. greasy wht kaolin, no visible folds (WEATHERED SCHIST) Splitspoon refusal @ 166'5" 166' to 166'4" interval took 153 seconds; 166'4" to 166'5" took 1061 seconds. Water Rotary Advancement to 170'bg	170'				0.0/ 0.0	

Note: - Water rotary initiated @ 146.5'.
- Field Testing/PID column presents soil screening results.

BB2:w01b.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-01B SHEET 9 OF 15
CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS: DATE 6/21/93, DEPTH 55.15, ELEV. 1068.41	FILE No.: 5271.001
PROJECT LOCATION: Bennington/Woodford, VT		DRILLING METHOD: Water Rotary
		SAMPLER TYPE: 3" Splitspoon
		HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: J. Jennings	BORING LOCATION: 6' North of W1	LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser
BORING CO.: A&W Environmental Drilling	GROUND ELEVATION: 1121.00	
FOREMAN: S. Winters, B. Follet	DATES: STARTED: 1/26/93 ENDED: 3/31/93	

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S (ppm)	FIELD TESTING PID (ppm)	RMKS*
54	170'-173'		6/6		Extremely hard, golden brn, dry SILT, banded with d. brn and blk laminae. Bands nearly vertical in spoon (85° from horizontal). Bands' thicknesses are from 1/12" to 1/32" Splitspoon refusal @ 170'6" due to extreme hardness (WEATHERED SCHIST)					0.0/ 0.0	
55	173'-176'		6/0		No Recovery Extremely hard material Splitspoon refusal @ 173'6"					-/-	
56	176'-179'		8/6		This interval was driven over 40 minutes, and only 8" of advancement was possible due to extremely hard bedrock. (WEATHERED SCHIST) 176'-176'8": Extremely hard, golden brn, dry SILT, tr. (1/16") d. brn to blk bands, tr. wht kaolin laminae, <5% pink orthoclase laminae bearing rectangular d. reddish brn crystals.					0.0/ 0.0	
57	179'-182'		6/0		No Recovery Splitspoon refusal @ 179'6" Weathered rock remains extremely hard.					-/-	
58	182'-185'		8/7		Extremely hard, golden brn, dry, SILT, little greasy wht kaolin laminae, pink orthoclase laminae (<1/18"). Laminae are to the length of the spoon.					0.0/ 0.0	
59	185'-187'6"		6/0		No Recovery Splitspoon refusal @ 185'6" Weathered rock remains extremely hard. ------------------------------						
60	187'6"-190'		7/4		Hard, grayish pink, damp, lens Extremely hard, golden brn and dk brn, damp, SILT laminae 3/8" vertical in spoon alternating with little kaolin (WEATHERED SCHIST) ------------------------------	188'1"				0.0/ 0.0	

- Field Testing/PID column presents soil screening results.

BB2:w01b.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-01B SHEET 10 OF 15
CLIENT: BURGESS BROS. SUPERFUND SITE OJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 55.15 ELEV.: 1068.41	FILE No.: 5271.001 DRILLING METHOD: Water Rotary SAMPLER TYPE: 3" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: C. O'Dell BORING CO.: A&W Environmental Drilling FOREMAN: B. Follet	BORING LOCATION: 6' North of W1 GROUND ELEVATION: 1121.00 DATES: STARTED: 1/26/93 ENDED: 3/31/93	LEGEND: Grout — Screen Sand Pack — Riser Nat. Form.

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
61	190'1"-190'8"		7/7		Extremely hard, golden brn and d. brn, damp, SILT laminae, some wht kaolin, tr. wht quartzite pebbles, 1 piece of wht quartz sandwiched between 2 layers of gray phyllite schist These lenses or pockets of gravel appear to be a little softer than the overlying material. However, they remain extremely hard overall, (WEATHERED SCHIST)	190'1"				0.0/ 0.0	
62	192'8"-193'		4/3		Extremely dense, golden brn and dk brn, SILT laminae, some wht kaolin, tr. pink orthoclase All fines. No sand, no gravel					0.0/ 0.0	
63	193'-195'		0/0		Splitspoon refusal @ 193'					-/-	
64	195'-197'6"		3/3		Extremely hard, d. brn and lt brn SILT laminae (WEATHERED SCHIST)					0.0/ 0.0	
65	197'6"-199'10"		4/0		No Recovery Weathered rock remains extremely hard Splitspoon refusal @ 197'10"					-/-	
6	199'10"-202'2"		4/0		No Recovery Weathered rock remains extremely hard Splitspoon refusal @ 200'2"					-/-	
67	202'2"-204'5"		36/0		No Recovery Weathered rock remains extremely hard Splitspoon refusal @ 202'5"					-/-	
68	204'5"-206'8"		3/0		No Recovery Weathered rock remains extremely hard Splitspoon refusal @ 204'8"					-/-	
69	206'8"-209'4"		3/3		Extremely hard, moist, dk brn, lt brn, SILT laminae, little gray to wht kaolin laminae. Laminae vertical to spoon					0.0/-	

Notes: - NA = Quantity of sample limited only one headspace analysis performed.
- Field Testing/PID column presents soil screening results.

BB2:w01b.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-01B SHEET 11 OF 15

CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS			FILE No.: 5271.001
	DATE	DEPTH	ELEV.	DRILLING METHOD: Water Rotary
'OJECT LOCATION: Bennington/Woodford, VT	6/21/93	55.15	1068.41	SAMPLER TYPE: 3" Splitspoon
				HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: C. O'Dell
BORING CO.: A&W Environmental Drilling
FOREMAN: B. Follet

BORING LOCATION: 6' North of W1
GROUND ELEVATION: 1121.00
DATES: STARTED: 1/26/93 ENDED: 3/31/93

LEGEND: Grout — Screen; Sand Pack — Riser; Nat. Form.

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	R M K S*
70	209'4"- 211'9"		5/3		Extremely hard, moist, dk to lt brn SILT laminae, little f. pebbles, tr. clay, tr. gray to wht kaolin laminae. Laminae at 45° to spoon.					0.0/ 0.0	
71	211'9"- 214'1"		4/0		No Recovery Weathered rock remains extremely hard Splitspoon refusal @ 212'1'					-/-	
72	214'1"- 216'4"		3/0		No Recovery Weathered rock remains extremely hard Splitspoon refusal @ 214'4"					0.0/NA	
73	216'4"- 218'7"		3/3		Extremely hard, dry, lt brn, golden brn SILT mottling, little f. pebbles, little wht to gray kaolin mottling					0.0/NA	
74	218'7"- 220'11"		4/3		Extremely hard, dry, dk brn to lt brn, SILT mottling, little wht kaolin mottling, little f.- cs pebbles					0.0/NA	
75	220'11"- 223'4"		5/3		Extremely hard, dry, rust to lt brn, SILT mottling, little f. –cs pebbles, little wht mottling					0.0/NA	
76	223'4"- 225'7"		3/3		Hard, lt to dark rust, dry, SILT laminae, little f. sand, little wht laminae, tr. clay					0.0/ 0.0	
77	225'7"- 227'10"		3/3		Extremely hard, dk brn, lt brn, SILT laminae, tr. wht laminae					0.0/NA	
78	227'10"- 230'4"		4/0		No Recovery Weathered rock remains extremely hard					-/-	
79	230'4"- 233'8"		4/0		No Recovery Weathered rock remains extremely hard	228'4"				-/-	
80	232'8"- 235'2"		6/3		Hard, brn to gray, damp, f–c SAND, some f. pebbles, tr. silt, tr. clay (WEATHERD SCHIST)	233'2"				0.0/ 0.0	
81	235'2"- 237'5"		3/0		No Recovery	235'5"				-/-	

Notes: - NA = Quantity of sample limited only one headspace analysis performed.
- Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-01B SHEET 12 OF 15
CLIENT: BURGESS BROS. SUPERFUND SITE ROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE 6/21/93 — DEPTH 55.15 — ELEV. 1068.41	FILE No.: 5271.001 DRILLING METHOD: Water Rotary/4" casing adv SAMPLER TYPE: 3" Splitspoon HAMMER: 140 lbs FALL: 30"
O'B&G GEOLOGIST: C. O'Dell, M. Randazzo, A. Crabb BORING CO.: A&W Environmental Drilling FOREMAN: B. Follet, J. Haliberta	BORING LOCATION: 6' North of W1 GROUND ELEVATION: 1121.00 DATES: STARTED: 1/26/93 ENDED: 3/31/93	LEGEND: Grout — Screen Sand Pack — Riser Nat. Form.

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S (ppm)	FIELD TESTING PID (ppm)	R M K S*
82	237'5"-29'7"		2/2		Extremely hard, d. brn to lt brn, dry, SILT laminae, some wht laminae (weathered rock), tr. clay, tr. f. pebbles.					0.0/ 0.0	
83	239'9"-240'1"		4/3		Extremely hard, d. brn, lt brn, dry, SILT laminae, wht laminae, tr. clay, kaolin					0.0/ 0.0	
84	240'1"-242'	60-5.5	5.5/5	>100	V. Dense, lt brn to tan, slightly moist, CLAY, tr silt					0.3/ 0.6	
85	242'-244'	45/6 - 50/3	9/0	>100	No Recovery					0.3/-	
86	244'-246'	50/4	4/1	>100	V. Dense, lt brn, orange, slightly moist, CLAY, tr silt					0.4/ 0.4	
87	246'-248'	50/6 - 50/2	8/3	>100	V. Dense, lt brn, orange, slightly moist, CLAY,					0.2/ 0.2	
88	248'-250'	50/6 - 50/2	8/3	>100	V. Dense, lt brn, orange, slightly moist, CLAY, (WEATHERED SCHIST)					0.1/ 0.1	
19	250'-252'	40/6 - 50/2	8/2	>100	V. Dense, lt brn, orange, slightly moist, CLAY,					0.2/ 0.2	
90	252'-254'	50/6 - 50/1	7/6	>100	V. Dense, lt brn, orange, slightly moist, CLAY,					0.2/ 0.4	
91	254'-256'	33/6 - 50/1	7/1	>100	V. Dense, d. brn and slightly moist on outside, orange and drier on inside, CLAY, pink rock chips inside					0.2/ 0.4	
92	256'-258'	50/3	3/3	>100	V. Dense, lt brn and d. brn, dry, CLAY,					0.6/ 0.6	
93	258'-260'	47/6 - 50/1	7/6	>100	V. Dense, brn with red lines, dry, CLAY,					1.2/ 1.2	
94	260'-262'	50/6 - 50/1	7/6	>100	V. Dense, brn with red vertical layers and pink layers, dry, CLAY					1.4/ 1.4	
95	262'-264'	50/6 - 50/1	7/5	>100	V. Dense, brn to red, dry, CLAY, (WEATHERED SCHIST)					1.4/ 1.4	

Notes: - Air rig taken off hole @ 240 fbg and replaced with B-61 and 4" casing advancement system.
- Field Testing/PID column presents soil screeing results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-01B SHEET 13 OF 15

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	55.15	1068.41

FILE No.: 5271.001
DRILLING METHOD: 4" Casing Advancement
SAMPLER TYPE: 3" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: M. Randazzo, A. Crabb
BORING CO.: A&W Environmental Drilling
FOREMAN: J. Haliberta

BORING LOCATION: 6' North of W1
GROUND ELEVATION: 1121.00
DATES: STARTED: 1/26/93 ENDED: 3/31/93

LEGEND: Grout, Sand Pack, Nat. form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
96	264'-266'	50 - 50/4	10/6	>100	Brn, blk, wht, damp, SILTY CLAY, f-m sand, (WEATHERED SCHIST)					0.7/ 0.7	
97	266'-268'	50 - 50/3	9/5.5	>100	Dense, brn, damp, SILTY CLAY, f-m sand, (WEATHERED SCHIST)					0.6/ 0.6	
98	268'-270'	45 - 50/3	9/6	>100	Dense, red, brn, orange, moist, CLAY, f-m sand, (WEATHERED SCHIST)					0.4/ 0.4	
99	270'-272'	25 - 50/2	8/4	>100	Dense, red, brn, orange, moist, CLAY, f-m sand (WEATHERED SCHIST)					0.4/ 0.4	
100	272'-274'	50/5	5/0.5	>100	Dense, red, brn, orange, moist, CLAY, little f-m sand					0.3/ 0.3	
101	274'-276'	50/4	4/2	>100	Dense, lt brn, dry, CLAY, little f-m sand, (WEATHERED SCHIST)					0.3/ 0.3	
102	276'-278'	100/3	3/1	>100	Dense, red to brn, moist, CLAY, little f-m sand Sample lost due to broken jar					-/-	
103	278'-280'	50 - 10	5/3	>100	Dense, red to brn, blk, dry, CLAY, little f-m sand, (WEATHERED SCHIST)					0.3/ 0.3	
104	280'-282'	63/5	5/4	>100	Dense, red to brn with pink chips, dry, CLAY, some f-m sand, (WEATHERED SCHIST)					0.3/ 0.3	
105	282'-284'	50 - 15/1	5/1	>100	Dense, lt brn, red with pink chips, dry, CLAY, f-m sand (WEATHERED SCHIST)					0.4/ 0.4	
106	284'-286'	65/6	6/6	>100	Appears to be collapsed sand/gravel from upper layers Top of Competent Bedrock	284' 285'				0.4/ 0.4	
107	286'-288'	50/1	1/0	>100	No Recovery					-/-	
108	288'-290'	50/1	1/0.5	>100	Dense, brn to orange, wet, quartzite little hematite, (COMPETENT BEDROCK)					0.3/ 0.3	

- 4" casing grouted in at 289 feet below grade.
- Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-01B (2) SHEET 14 OF 15

CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 55.15 ELEV.: 1068.41	FILE No.: 5271.001 DRILLING METHOD: NX core Barrel SAMPLER TYPE: Core HAMMER: None FALL: None DRIVER: Air Perc.
O'BRIEN & GERE GEOLOGIST: Paul Gottler BORING CO.: A&W Environmental Drilling FOREMAN: J. Haliberta, S. Lyons	BORING LOCATION: 6' North o GROUND ELEVATION: 1121.00 DATES: STARTED: 3/29/93 ENDED: 3/31/93	LEGEND: Grout, Sand Pack, Nat. Form. Screen — Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	RQD	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
	289'-291.2		2.2/1.6	0%	light brown, light grey quartzite with vertical and horizontal fractures. Moderate to low grade metamorphism. Quartz grains appear moderately well rounded light grey. A trace of hematite that forms as crossbeds running parallel to horizon. (COMPETENT BEDROCK)						
	291.2-294.2		3.0/3.6	20%	as above with horizontal fractures more common.						
	294.2-295.2		1.0/1.0	40%	as above.			Open rock hole			

Notes:
- RQD - Rock Quality Designation
- 4" steel casing grouted in at 289'.
- Rock cored with NX size core barrel to confirm competent bedrock (289' to 295').
- Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-01B (2) SHEET 15 OF 15
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE 6/21/93 DEPTH 55.15 ELEV. 1068.41	FILE No.: 5271.001 DRILLING METHOD: NX Core Barrel SAMPLER TYPE: Core HAMMER: None FALL: None DRIVER: Air Perc.
O'BRIEN & GERE GEOLOGIST: P. Rotond BORING CO.: A&W Environmental Drilling FOREMAN: John Halliberta	BORING LOCATION: 6' North of W1 GROUND ELEVATION: 1121.00 DATES: STARTED: 3/29/93 ENDED: 3/31/93	LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
	302'				White-grey white quartzite to qtz arenite, hard, crystalline texture, possible fractures @ 308' approx. 8 min/ft penetration rate (COMPETENT BEDROCK)						
	312				@ 312' 14 1/2 min/ft						
	316				@ 316' replace tri-cone bit (30-40 min/ft)						
	322				approx 15'/foot penet. rate Quartzite (322') @ 323' 19'/ft						
	329				6 1/2 min/ft penet. rate						
	330				9 min/ft						
	331				15 min/ft						
	332										
	336				11-12 min/ft						
					TD = 340' (BOTTOM OF BORING)			Open rock hole			

Notes:
- Entire section consists of white-gray quartzite, hard, with few fractures or zones of weakness.
- Open rock hole (3 7/8") from 295.2 to 340 feet.
- Field Testing/PID column presents soil screening results.

BB2:w01b-15.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-04B(AB) SHEET 1 OF 1
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE DEPTH ELEV. No Well Set	FILE No.: 5271.001 DRILLING METHOD: 4" casing advancement SAMPLER TYPE: 2" and 3" Splitspoons HAMMER: 140 lbs FALL: 30"
EN & GERE GEOLOGIST: R. Stromberg, M. Randazzo NG CO.: A&W Environmental Drilling FOREMAN: J. Richardson, M. Lagear	BORING LOCATION: Marshy area GROUND ELEVATION: 1078.50 DATES: STARTED: 12/16/92 ENDED:	LEGEND: Grout / Sand Pack / Nat. Form. — Screen / Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
1	0-3'	WOH/12"-1-1-2-6	36/6	1	D. brn organic SILT (MUCK) SILTY F. SAND (not enough volume for PID test)	1'				-	
2	3'-5'	15-25-18-20	24/12	43	V. dense, grayish brn, wet silty f. SAND, little gravel (KAME SAND DEPOSIT)					22/-	
3	5'-7'	7-23-14-16	24/12	37	V. dense, grayish brn, wet, silty f. SAND, little gravel (KAME SAND DEPOSIT)					28/ 26	
4	7'-9'	11-31-12-12	24/12	43	V. dense, grayish brn, wet, silty f. SAND, little gravel (KAME SAND DEPOSIT) (1 PID test only)					32/-	
5	9'-11'	10-15-19-22	24/14	34	Dense, grayish brn, wet silty f. SAND, some large gravel (KAME SAND DEPOSIT)	12'				32/ 35	
6	11'-13'	30-32-70-3"	15/15	>100	Dense, grayish brn, wet to moist, silty f. SAND, gravel and c. sand embedded, little clay (ABLATED GLACIAL TILL)	15'				37/ 33	
7	15'-17'	38-43-53-36	24/24	96	Dense, grayish brn, wet to moist, dense silty f. SAND, gravel and c. sand embedded, little clay (BASAL GLACIAL TILL)						
8	20'-22'	100/NP	0.0	>100	No sample recovered from drilling, just slough Drilled through quartzite boulder from 20 to 22.5'. Couldn't advance 6" casing past boulder. Running sand from 22.5 to 25'. Used revert to stabilize hole.	4" casing set to 26'					
9	25'-26.1'	25-16-35-80/1"	19/5	>100	V. Dense, grayish brown, wet, F-M SAND, little silt, c. sand, tr. f-c gravel. (BASAL GLACIAL TILL)		No well set, just 4" casing			0.0/-	
10	30'-30.3'	100/3"	3"/0	>100	No recovery on sample @ 30-30.0' Hit boulder @ 26.5 roller bitted 26.5 to 30'. Had to remove bit due to clogging @ 30'.					-	
11	35'	No sample attempted (too dense)			No sample attempt @ 35' due to dense bouldery till. Observed cuttings to consist of clay, sand, f. gravel with feldspar and quartz (BASAL GLACIAL TILL)					-	
12	40'	100/0	0/0	>100	Attempted sample @ 40'. No penetration @ 100 blows. Pack of boulders in this interval. (BASAL GLACIAL TILL) BOTTOM OF BORING @ 58'					-	

Notes:
- Set 4" diameter steel casing to 26'. Grouted boring from 58' to grade and grouted 4" casing in place.
- 4" casing was left in the event the hole could be redrilled later as a contingent till well casing cut flush to grade at end of drilling program.
- Hit boulder @ 46'. Penetration rate: 1'= 20 min 46'-52'; 1'=2 min 52'-58'.
- No sample attempted from 45'-58' due to extremely difficult drilling. Cuttings observed to consist of mixed sand, silt and gravel or pulverized till and boulders. Decided that ATV rig could not penetrate materials effectively past this depth.
- Field Testing/PID column presents soil screening results.

B...04b-1.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-04B SHEET 1 OF 13
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 16.15 ELEV.: 1069.74	FILE No.: 5271.001 DRILLING METHOD: Odex/4" Casing Adv. SAMPLER TYPE: 3" I.D., 2' Splitspoon HAMMER:None FALL:None DRIVER:Air Perc.
O'BRIEN & GERE GEOLOGIST: John Jennings BORING CO.: A&W Environmental Drilling FOREMAN: B. Follett	BORING LOCATION: East of Marshy Area GROUND ELEVATION: 1083.93 DATES: STARTED: 3/22/93 ENDED: 5/5/93	LEGEND: Grout / Sand Pack / Nat. Form. — Screen / Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
1	0-2				Very loose, black, damp, fine sand silt and roots (topsoil/pen) some decating organic matter (leaves and twigs). Medium pense, black and reddish brown, damp fine sand, silt and some clay.						
2	2-4	14-21-17-81	24/20	38	Dense, gray to tan, moist, fine sand trace coarse well sorted white grey sand lenses, trace roots (KAME SAND DEPOSIT) Very stiff, black, damp silt and clay band 1/4" thick @ 38" dense, greyish tan, moist, fine sand and silt.					0.0/ 0.0	
3	4-6	16-28-28-29	24/18	46	Saturated during drilling @ 4'11", course angular gravel from 5'3" to 5'5" Dense, brown saturated medium sand with some to little silt, no roots, no gravel.					0.0/ 0.0	
4	6-8	6-8-10-8	24/12	18	Loose, brown, saturated, medium sand with a 2" band of reddish orange (iron stained) over a white quartzite cobble (3") (KAME SAND DEPOSIT) Loose greyish brown, saturated fine sand and silt trace <5% angular gravel.					0.0/ 0.0	
5	8-10	3-4-6-9	24/4	10	Loose, greyish brown saturated fine sand and silt trace sub angular gravel					0.0/ 0.0	
6	10-12	4-5-5-8	24/16	10	Loose brown saturated fine sand and silt no visible laminae and no gravel					0.0/ 0.0	
7	12-14	8-9-15-7	24/14	22	Loose brown saturated fine sand and silt well sorted no structures (KAME SAND DEPOSIT) COBBLE/BOULDER 13'6"	13'6"		3" casing		0.0/ 0.0	
8	14-16	25-28-29-30	24/0	37	Medium stiff, brown grey, moist silt and clay laminae >1/32" trace subrounded fine gravel No recovery @ 14-16' (ABLATED GLACIAL TILL)			4" casing 6" casing		-/-	

Notes: - Depth to ground water from top of inner casing.
- 6", 4" & 3" casing set within this interval.
- Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-04B SHEET 2 OF 13

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	16.15	1069.74

FILE No.: 5271.001
DRILLING METHOD: 4" casing advancement/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None DRIVER: Air Perc.

O'BRIEN & GERE GEOLOGIST: John Jennings
BORING CO.: A&W Environmental Drilling
FOREMAN: B. Follett

BORING LOCATION: East of Marshy Area
GROUND ELEVATION: 1083.93
DATES: STARTED: 3/22/93 ENDED: 5/5/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
9	16-18	7-7-4-3	24/20	11	Loose, brown, saturated medium sand with trace 1/2" subrounded stones (no predominant orientation) and little rounded fine gravel (ABLATED GLACIAL TILL)					1/-	
10	18-20	7-12-11-16	24/4	23	Loose, brown, saturated fine sand and silt with trace cobbles, stones and fine gravel * poor recovery due to cobbles					0.0/-	
11	20-22	41 61 for 4"	10/10	>100	---------- (BASAL GLACIAL TILL) Hard, brown, damp, silt, little angular gravel and stones massive course materials supported in silt matrix. Splitspoon refusal @ 20'10" advancing to 22 fbg	20'6"					
12	22-24	>50 for 5"	5/5	>100	Hard, brown, damp, silt, little angular fine pebbles massive support Splitspoon refusal @ 22'5" odexing to 26'bg (BASAL GLACIAL TILL)					0.0/-	
13	24-26	44 >50 for 4"	10/10	>100	Hard, brown, damp silt little subangular gravel traces subrounded coarse sand (matrix supported) Splitspoon refusal @ 24'10" odexing to 26'bg					0.0/ 0.0	
14	26-31	25-30 >50 for 3"	15/8	>100	Hard, brown, moist SILT little subangular pebbles trace subrounded coarse sand			3" casing 4" casing 6" casing		0.0/-	

- Depth to ground water from top of inner casing.
- 6", 4" & 3" casing set within this interval.
- Field Testing/PID column presents soil screening results.

* Erroneous reading due to humidity in sampling jar.

BB3:w04b-3.wk1

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG	LOG NUMBER W-04B SHEET 3 OF 13
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT GROUNDWATER LEVELS: DATE 6/21/93, DEPTH 16.15, ELEV. 1069.74	FILE No.: 5271.001 DRILLING METHOD: 4" casing advancement/Odex SAMPLER TYPE: 3" I.D., 2' Splitspoon HAMMER:None FALL:None DRIVER:Air Perc.
O'BRIEN & GERE GEOLOGIST: John Jennings BORING CO.: A&W Environmental Drilling FOREMAN: B. Follett BORING LOCATION: East of Marshy Area GROUND ELEVATION: 1083.93 DATES: STARTED: 3/22/93 ENDED: 5/5/93	LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S	PID (ppm)	RMKS*
					(BASAL GLACIAL TILL) Splitspoon refusal @ 27'3" bg odexing to 31'bg Material is extrememly dense						
15	31-36	63 for 6"	6/1	>100	Hard, white quartz boulder Splitspoon refusal at 31'6" odexing to 136'bg 3/24/93					-/-	
16	36-41	>50 for 3" Air Hammer refusal at 36'6"	6/4	>100	Hard, brown, damp SILT with some very fine sand supports subangular fine pebbles angular cobbles Cobble (orange quartzite) @ 36'6" Odex advanced to 41'bg (BASAL GLACIAL TILL) Splitspoon refusal @ 36'3" Airbit advanced 36'5" to 36'6"			3" casing 4" casing 6" casing		0.0/-	

- Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-04B SHEET 4 OF 13
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 16.15 ELEV.: 1069.74	FILE No.: 5271.001 DRILLING METHOD: 4" casing advancement/Roller B SAMPLER TYPE: 2" and 3" Splitspoons HAMMER: 140 lbs FALL: 30"
'RIEN & GERE GEOLOGIST: J. Jennings BORING CO.: A&W Environmental Drilling FOREMAN: B. Follet	BORING LOCATION: East of Marshy Area GROUND ELEVATION: 1083.93 DATES: STARTED: 3/22/93 ENDED: 5/5/93	LEGEND: Grout, Sand Pack, Nat. Form.; Screen —, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	R M K S*
17	41'-46'	45-50-50/3	15/12	>100	Hard, brn, damp, SILT with c. sand (angular), tr. subangular pebbles. "A" faceted. Split-spoon refusal @ 42'3". ODEX casing advanced to 46'bg. (BASAL GLACIAL TILL)					0.0/ 0.0	
18	46'-51'	25-45-50/3	15/10	>100	Hard, brn, dry, SILT (massive) with little suspended c. sand, tr. pebbles. Splitspoon refusal @ 47'3". ODEX casing advanced to 51'bg. (BASAL GLACIAL TILL)					0.0/ 0.0	
19	51'-56'	20 - 50/4	10/6	>100	Hard, brn, dry, SILT, little subangular c. sand, tr. little cobble angular quartzite, tr. subangular gravel. Splitspoon refusal @ 51'10" Likely boulders evidenced by extremely rough ODEX casing advancement (wht quartzite cuttings) (BASAL GLACIAL TILL)	56'				0.0/ 0.0	
20	56'-61'	8-40-50/2	14/12	>100	Hard, brn, damp, SILT, some v. f. sand, tr. subangular c. sand and med pebbles (TOP OF WEATHERED SCHIST)	57'2"				0.0/ 0.0	
					Hard, olive, brn, SILT laminae Splitspoon refusal @ 57'2" ODEX advanced to 61'bg (Cutting fluids have an orange to brn tint.) Orange CLAY, tr. kaolin in ODEX bit after removal Top of the ocher between 57'2" and 61'bg, changing to 5' spoon at 61'bg. (WEATHERED SCHIST)						
21	61'-66'		48/48		Hard, orange to brn, damp, SILTY CLAY (the ocher formation). Top of weathered rock between 57'6" and 61'. Tr. wht to gray kaolin stringers, no laminae. Fracture crossing @ 30° angle. hard, brn, moist SILT, little angular sand and gravel (~2" wide) Hard, orange to brn, weathered rock. SILTY CLAY little greasy wht kaolin stringers. Splitspoon refusal @ 65'. ODEX driven to 66'bg					0.0/ 0.0	

Note: - Air bit hammer used below 61'.
- Field Tesing/PID column presents soil screenig results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-04B SHEET 5 OF 13

CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS			FILE No.: 5271.001
	DATE	DEPTH	ELEV.	DRILLING METHOD: 4" casing advancement/Roller I
PROJECT LOCATION: Bennington/Woodford, VT	6/21/93	16.15	1069.93	SAMPLER TYPE: 2" and 3" Splitspoons
				HAMMER: Air bit FALL: N/A

BRIEN & GERE GEOLOGIST: J. Jennings
BORING CO.: A&W Environmental Drilling
FOREMAN: B. Follet

BORING LOCATION: East of Marshy Area
GROUND ELEVATION: 1083.93
DATES: STARTED: 3/22/93 ENDED: 5/5/93

LEGEND: Grout; Sand Pack; Nat. Form.; Screen; Riser

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S	FIELD TESTING PID (ppm)	RMKS*
22	66'-71'	20-5-50/3	15/15		Hard, orange to brn, damp, SILTY CLAY, some gray kaolin, tr. greasy wht kaolin, tr. (<1%) pink orthoclase. SILTY CLAY and kaolin interbedded and heavily folded. The limbs are 15° from vertical. (WEATHERED SCHIST) Splitspoon refusal @ 67'3" (Hydraulic hammer) ODEX casing advanced to 71'bg.					0.0/ 0.0	
23	71'-76'	No blows collected Air Hammer used	24/24		Iron-rich MUDSTONE laminated with wht quartz and rose orthoclase gravel. Several fractures observed, some of which were filled with mudstone gravel. From 71'1": Hard orangy brn to brn SILTY CLAY (weathered rock), some wht kaolin laminae, little greasy wht kaolin. Kaolin bearing areas at 71'3" appear to be boudinage ODEX advancement to 76'bg, (WEATHERED SCHIST)					0.0/ 0.0	
24	76'-81'		24/24		Hard, gray and whitish gray KAOLIN, little brn silty clay laminae 1/8". Tr. gray phyllitic schist fragments less than 1%. Tr. (<.001%) rectangular reddish brn minerals (hematite? garnet?). Laminae are nearly vertical to 77'6". At 77'6" a fault is visible. The fault is underlain by hard, brn silty clay laminated and folded with grayish wht kaolin. ODEX casing advanced to 81' bg, (WEATHERED SCHIST)					0.0/ 0.0	
25	81'-85'		24/20		Hard, brownish wht, dry, KAOLIN laminated with little brn silty clay. Limbs of folds nearly vertical. Fault observed @ 81'3" (1st 3" of spoon). Splitspoon refusal @ 82'10", (WEATHERED SCHIST) ODEX casing advanced to 86'bg.					0.0/ 0.0	
26	85'-91'	core rate 15 min/7"	7		Hard, d. brn, damp, SILTY TO FINE, SANDY CLAY, some d. rose orthoclase, little d. brn and blk pebbles, tr. (<1%) greasy grayish wht kaolin. This material is coarser than above (81') Splitspoon refusal @ 86'7" ODEX to 91'bg, (WEATHERED SCHIST)					0.0/ 0.0	

- Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-04B SHEET 6 OF 13
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 16.15 ELEV.: 1069.74	FILE No.: 5271.001 DRILLING METHOD: 4" casing advancement/Roller SAMPLER TYPE: 2" and 3" Splitspoons HAMMER: Air bit FALL: N/A
BRIEN & GERE GEOLOGIST: J. Jennings BORING CO.: A&W Environmental Drilling FOREMAN: B. Follet	BORING LOCATION: East of Marshy Area GROUND ELEVATION: 1083.93 DATES: STARTED: 3/22/93 ENDED: 5/5/93	LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S	FIELD TESTING PID (ppm)	R M K S*
27	91'-96'		24/24		Hard, d. brn, damp, SILTY CLAY, laminated with gray kaolin (weathered phyllite schist) and little greasy gray to wht kaolin. Faulted 91'3" - V. dense, golden brn, damp, med SAND, some orange to brn silt Silica cemented or iron cemented quartzite Fragment matrix as above (D. brn cutting fluids) ODEX advancement to 96' (WEATHERED SCHIST)	93'				0.0/ 0.0	
28	96'-101'		24/22		V. dense, golden brn, moist, m-c SAND. No evidence of cementation. Tr. blk f. sand foliation parallel to the length of spoon 97'6": Same as above, wet ODEX advancement to 101'					0.0/ 0.0	
29	101'-106'		24/24		V. dense, d. brn and orange brn, m-c SAND, tr. silica cemented or iron cemented sandstone			3" casing 4" casing bottom of 6" casing		0.0/ 0.0	
30	106'-111'		24/24		V. dense, orange to brn and d. brn, moist, m-c SAND, little silica or iron cemented sandstone gravel and stones. Quartzite grains are preferentially integrated and bear blk organic (natural) stains. Tr. grayish wht to wht kaolin laminae running parallel to length of spoon. Water rotary advanced to 111'bg. RPM = 160; Down pressure 1200 lbs. (WEATHERED SCHIST)	107'6"				0.0/ 0.0	
31	111'-116'		12/10		Hard, rigid, brn, damp to dry, SILTY CLAY, little wht kaolin, no stones or gravel sandstone. Kaolin is not laminated until 111'9". Laminations at that depth were nearly horizontal in spoon. (WEATHERED SCHIST) Water rotary advanced to 116'bg. RPM = 160; Down pressure 1300 lbs.			3" casing 4" casing		0.0/ 0.0	

Notes: - Prior to advancing the ODEX casing below 101', a field test was performed. The sand unit is producing ~1.5 to 1.75gpm.
- Yield test @ 101': 3.5GPM.
- 6", 4", 3" casing extends to 103 feet, followed by 4" & 3" casing below.
- Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-04B SHEET 7 OF 13
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 16.15 ELEV.: 1069.74	FILE No.: 5271.001 DRILLING METHOD: 4" casing advancement SAMPLER TYPE: 2" and 3" Splitspoons HAMMER: Air bit FALL: N/A
BRIEN & GERE GEOLOGIST: J. Jennings BORING CO.: A&W Environmental Drilling FOREMAN: B. Follet, S. Winters	BORING LOCATION: East of Marshy Area GROUND ELEVATION: 1083.93 DATES: STARTED: 3/22/93 ENDED: 5/5/93	LEGEND: Grout, Sand Pack, Nat. Form.; Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
32	116'-121'		12/12		Hard, brn and blk, damp to dry, SILTY CLAY laminae (horizontal in spoon), probably a weathered phyllitic schist, little interbedded grayish wht kaolin Hard, brn, damp to dry, SILT, little brn clay (<1%), wht laminated kaolin Water rotary advanced to 121'bg RPM =160; Down pressure 1300 lbs.					0.0/ 0.0	
33	121'-126'		14/12		Hard, brn, damp to dry, SILTY CLAY, wht kaolin, little brn med grained silica cemented Low grade quartzite. ½" laminae vertical in spoon Splitspoon refusal @ 122'2" Water rotary advancement to 126'bg (WEATHERED SCHIST)					0.0/ 0.0	
34	126'-131'		24/24		Hard, brn, damp, SILTY CLAY, wht kaolin, little brn med grained silica cemented sandstone gravel and stones 3/4" band nearly vertical in spoon (WEATHERED SCHIST) Water rotary advancement to 121'bg					0.0/ 0.0	
35	131'-136'		12/10		Hard, brn, dry, SILTY CLAY, wht kaolin laminae. V. thin (1/16"). Still vertical in spoon. Splitspoon refusal @ 132' Water rotary to 136' RPM = 160; Down pressure 1400 lbs.					0.0/ 0.0	
36	136'-141'		12/4		Hard, brn, dry, SILTY CLAY, wht kaolin laminae. V. thin (1/16"). Still vertical in spoon. Poor recovery due to density of weathered rock. Splitspoon refusal @ 137' Water rotary advanced to 141' RPM = 160; Down pressure 1400 lbs.					0.0/ 0.0	
37	141'-146'		15/15		Hard, d. brn, dry, CLAYEY SILT (weathered phyllitic schist), tr. (1/32") f. kaolin laminae. Vertical in spoon. Splitspoon refusal @ 142'3" Water rotary advancement to 146' Due to cohesiveness of weathered bedrock, rotary bit became plugged during advancement @ 143'6" RPM = 160; Down pressure 1600 lbs.					0.0/ 0.0	

Notes: - 4" & 3" casing set in this interval
- Field Testing/PID column presents soil screening results.

BB3:w04b-1.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-04B SHEET 8 OF 13
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 16.15 ELEV.: 1069.74	FILE No.: 5271.001 DRILLING METHOD: 4" casing advancement SAMPLER TYPE: 2" and 3" Splitspoons HAMMER: Air bit FALL: N/A
BRIEN & GERE GEOLOGIST: J. Jenninga BORING CO.: A&W Environmental Drilling FOREMAN: B. Follet	BORING LOCATION: East of Marshy Area GROUND ELEVATION: 1089.93 DATES: STARTED: 3/22/93 ENDED: 5/5/93	LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	R M K S*
38	146'-151'		14/8		Hard, d. brn and blk, CLAYEY SILT and wht kaolin laminae ¼" now perpendicular in spoon. A fault or fracture must be present between 142'3" and 146'. Splitspoon refusal @ 147'2" Water rotary advanced to 151'bg					0.0/ 0.0	
39	151'-156'		10/10		V. dense, d. brn, moist, f-m SAND, subrounded, some brn silt, tr. sandstone (fine grained brn) (WEATHERED SCHIST) ------------------------------ Hard, gray, dry, SILTY CLAY (massive), thin lamina of grayish wht kaolin horizontally across nose of spoon, vertically varigated with tr. (>1%) golden brn silt Splitspoon refusal @ 151'8" Water rotary advancement to 156'bg RPM = 160; Down pressure 1700 lbs.	151'8"				0.0/ 0.0	
40	156'-161'		9/9		Hard, wht, damp, KAOLIN, some brn silty clay laminae 1/16" thick, tr. (>1%) red orthoclase laminae, tr. (>.5%) deep red weathered garnets (WEATHERED SCHIST)					0.0/ 0.0	
41	161'-166'		6/2		V. hard, brn, dry, SILTY CLAY, wht kaolin laminae (>1/8"), some smokey wht quartz, little (>1/8") pink orthoclase lamina. The quartz was in a 3/8-½" band. Bands and laminae horizontal in spoon. Splitspoon refusal @ 161'6" [Extremely hard material] Water rotary advancement to 166'bg. RPM = 160; Down pressure 1700 lbs.					0.0/ 0.0	
42	166'-171'		4/4		V. hard, wht, dry, KAOLIN and blk to v. d. brn SILT (gneiss fabric). 1/16" lamina, no quartz, little reddish brn silty clay in nose of spoon. Laminae vertical in spoon. Splitspoon refusal @ 166'4" The air hammer was run for an extended period of time in an attempt to collect a larger sample. As usual, little to no advancement occurred after first 4 minutes of hammering. Water rotary advancement to 171'bg.					0.0/ 0.0	
43	171'-176'		4/4		V. hard, wht, dry, KAOLIN, some d. brn to blk silt (gneiss fabric), little red silty clay laminae. Water rotary to 176' (WEATHERED SCHIST)					0.0/ 0.0	

- Field Tesing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-04B SHEET 9 OF 13
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 16.15 ELEV.: 1069.74	FILE No.: 5271.001 DRILLING METHOD: 4" casing advancement SAMPLER TYPE: 2" and 3" Splitspoons HAMMER: Air bit FALL: N/A
BRIEN & GERE GEOLOGIST: J. Jennings, S. Mogilinicki BORING CO.: A&W Environmental Drilling FOREMAN: B. Follet, C. Cook	BORING LOCATION: East of Marshy Area GROUND ELEVATION: 1083.93 DATES: STARTED: 3/22/93 ENDED: 5/5/93	LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
44	176'-181'		15/		Hard, vertically bedded, alternating layers of wht, dry, KAOLIN, little blk silt and orange to brn, dry, silty clay V. inconsistent thicknesses of the bands, uneven layering generally trending to vertical					0.0/ 0.0	
45	181'-186'		4/3		V. hard, d. brn, dry, CLAYEY SILT laminae (1/8") interbedded with greasy, wht kaolin laminae (1/8"), tr. pink orthoclase (<1%) Splitspoon refusal @ 181'4" Water rotary advancement to 185'bg RPM = 160; Down pressure 1800 lbs.					3.8/ 0.0	
46	186'-191'		5/4		Hard, wht, dry, KAOLIN laminae (1/8"), highly deformed (folded) interlayered with v. d. brn silt laminae, little sections appear dioritic (weathered diorite), one 3/8" piece of unweathered diorite gravel was observed in one of the laminae, tr. (>1%) if smokey wht quartz was also observed. Splitspoon refusal @ 186'5" Water rotary advancement to 191'					0/0	
47	191'-196'		7/16		Alternating bands of hard, wht, red, tan, dry, KAOLIN/orange-brn, blk, SILTY CLAY. Extremely folded layering tending to horizontal.					0/0	
48	196'-201'		7/7		Brn to orange-brn, moist, CLAY, some silt alternating with bands of wht clay					0/0	
49	201'-206'		6/6		Brn, wet, CLAY, some silt alternating with bands of blue and bluish wht clay (Contained mostly wash)					0/0	
50	206'-211'				Water rotary advancement to 211'bg RPM = 160; 2200 lbs.						
51	211'-216'		5/5		Hard, reddish brn to d. brn, damp, SILTY CLAY laminae interbedded with little brn-red isometric mineral lamina (1/10"), tr. (one 3/8") kaolin lamina. All laminae nearly vertical in spoon. Splitspoon refusal @ 211'5" RPM = 160; Down pressure 2200 lbs. Water rotary to 216'					0.2/ 0.0	

Notes: - Field Tesing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-04B SHEET 10 OF 13

CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS			FILE No.: 5271.001 DRILLING METHOD: 4" casing adv./NQ sampling sy SAMPLER TYPE: 2" and 3" Splitspoons HAMMER: Air bit FALL: N/A
	DATE	DEPTH	ELEV.	
	6/21/93	16.15	1069.74	

O'BRIEN & GERE GEOLOGIST: J. Jennings
BORING CO.: A&W Environmental Drilling
FOREMAN: B. Follet, T. Hayes

BORING LOCATION: East of Marshy Area
GROUND ELEVATION: 1083.93
DATES: STARTED: 3/22/93 ENDED: 5/5/93

LEGEND: Grout; Sand Pack; Nat. Form.; Screen; Riser

SAMPLE					SAMPLE	STRATUM		FIELD TESTING			R
No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	DESCRIPTION	CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S	PID (ppm)	MKS*
52	216'-221'		5/5		Hard, d. gray, damp, (weathered phyllite schist) SILTY CLAY lamina (1/8") Splitspoon refusal @ 216'5" Water rotary advancement to 121'bg RPM = 160; Down pressure 2300 lbs.					0.2/ 0.0	
53	221'-226'		4/4		Hard, golden brn, dry, SILTY CLAY 3/8" lamina interbedded with v. thin (1/10") wht lamina. One 3/4" x 1/8" x ½" wht v. f. quartzite fragment found parallel to one of the kaolin laminae. Laminae were predominantly horizontal in spoon. Splitspoon refusal @ 221'4" Water rotary advancement to 126'bg RPM = 160 (WEATHERED SCHIST)					0.2/ 0.0	
54	226'-231'		2/2		Hard, golden brn, dry SILTY CLAY interbedded with some lt gray kaolin laminae (1/8"). Laminae vertical in spoon Splitspoon refusal @ 226'2" Water rotary advancement to 231'bg RPM = 160; Down pressure 2400 lbs.			3" casing		0.0/ 0.0	
55	231'-235.5'		2/2		Hard, brn, damp, SILTY CLAY, little lt gray kaolin laminae vertical in spoon. Splitspoon refusal @ 231'2" Water rotary advancement to 236' RPM = 160; Down pressure 2500 lbs.			4" casing			
56	235.5'-240'	50/3	3/3	>100	Orange brown silt dry, some white kaolin clay, vertical bedding, little mafic mtl.					0/-	
57	240'-245	50/4	4/4	>100	Orange or black white, brown silt, dry to moist some clay (white) vertical bedding, FeO3 staining little mafic mtl.					40/-	
58	245'-250'	50/2	2/2	>100	Gray white kaolin clay with fractured quartz intermixed, little orange staining					10/-	
59	250'-254'	50/2	2/2	>100	Red brown silt , moist, some from sand					20/-	
60	254'-259'	50/4	4/4	>100	Red brown silt little f-sand and r. m-quartz gravel, vertical bedding sapprolite, damp					28/-	
61	259'-264	50/4	4/4	>100	Red brown to yellow brown silt, little f-sand and r. mafic mtl., vertical bedding, dry					18/-	
62	264'-269	50/6	0/0	>100	no recovery					-	
63	269'-274'	50/4	4/4	>100	Brown f-sand and r. silt, damp					24/-	
64	274'-279'	50/3	3/3	>100	Brown f-sand and r. silt, damp					32/-	
65	279'	50/3	3/3	>100	Brown yellow silt and r. f-sand some asst. mofic mtl., damp			3" casing			
66	279'-283'				NQ sampling systems is binding, no sample recovery or circulation. Crew pulls NQ casing and reams hole with tricone scrabble bit to remove unconsolidated material.						

Notes: - 4" casing advancement system extends to 279 feet followed by 3" NQ sampling system.
- Field Testing/PID column presents soil screening results.
- *Elevated readings due to humidity in soil sampling jars.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-04B SHEET 11 OF 13
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE 6/21/93 DEPTH 16.15 ELEV. 1069.74	FILE No.: 5271.001 DRILLING METHOD: Odex/NQ sampling system SAMPLER TYPE: 3" I.D., 2' Splitspoon HAMMER:None FALL:None DRIVER:Air Perc.
O'BRIEN & GERE GEOLOGIST: John Knox BORING CO.: A&W Environmental Drilling FOREMAN: John Haliberta	BORING LOCATION: East of Marshy Area GROUND ELEVATION: 1083.93 DATES: STARTED: 3/22/93 ENDED: 5/5/93	LEGEND: Grout, Sand Pack, Nat. Form.; Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S	PID (ppm)	RMKS*
67	283'-306'				At 283' crew put NQ sampling system back in the hole, unconsolidated deposits encountered to 306'. Crew observes fine sand circulating out of the bore hole. Sampling is continued at 306'.					-	
68	306'-311'		60/18		Fractured dark colored sandstone large grained dry to damp.					0.0/-	
69	311'-316'		60/0		no recovery change basket					-	
70	316'-321'		60/18		Dark colored quartzite, dry					0.0/-	
71	321'-326'		60/6		Dark colored quartzite grading into white kaoline clay, damp					0.0/-	
72	326'-331		60/5		white, gray, decomposed schist interbedded with decomposed dark brown quartzite damp					0.0/-	
73	331'-336'		60/0		no recovery basket jammed with sandstone, damp					-	
74	336'-341'		60/36		white gray silty clay to dark brown f-sand decomposed schist and white kaolin clay, damp (WEATHERED SCHIST)					0.0/ 0.0	
75	341'-346'		60/24		brown to black decomposed schist interbedded with white clay and f-sand beds, vertical bedding, damp					0.0/ 0.0	
76	346'-351'		60/48		white and brown decomposed schist, some mafic mtls and little felsic mtl, damp					0.0/ 0.0	
77	351'-356'		60/36		gray-brown, decomposed schist, vertical bedding, quartz, frgs. in end of barrel, damp					0.0/ 0.0	
78	356'-361'		60/39		White gray to brown decomposed schist with alternating layers of kaolin clay (dry to damp)			3" casing			

Notes – Field Testing/PID column presents soil screening results.

BB3:w04b-5.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-04B SHEET 12 OF 13

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	16.15	1069.74

FILE No.: 5271.001
DRILLING METHOD: 3" NQ sampling/AV core barrel
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None DRIVER: Air Perc.

O'BRIEN & GERE GEOLOGIST: John Knox
BORING CO.: A&W Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: East of Marshy Area
GROUND ELEVATION: 1083.93
DATES: STARTED: 3/22/93 ENDED: 5/5/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
79	361'-366'		60/48		Same as above, more maphic and felsic mtl. dry to damp					0.0/ 0.0	
80	366'-371'		60/39		red, brown, white alt. decomposed schist , damp					0.0/ 0.0	
81	371'-376'		60/39		same as above					0.0/ 0.0	
82	376'-381'		60/18		same as above					0.0/-	
83	381'-386'		60/30		same as above					0.0/-	
84	386'-391'		60/48		red brown and white decomposed schist , vertical bedding, chunk of quartzite in white clay in tip of barrel. damp					0.0/ 0.0	
85	391'-396'		60/54		black brown decomposed schist very dense, interbedded with quartz frgs. and kaolin beds, damp					0.0/ 0.0	
86	396-401'		60/60		black brown decomposed schist with frgs. gray schist with layers of quartz grains and clay (red & white) grading to a white gray clay in bottom 1' of barrell, dry.					0.0/ 0.0	
87	401'-406'		60/60		black, brown, decomposed schist with rx. frgs. rust pockets interbedded bottom 3" brown white with pink layers clayey silt, very hard, dry					0.0/ 0.0	
88	406'-411'		60/60		tan brown to white clayey silt with layers of white clay and quartz grains. dry, (WEATHERED SCHIST)			3" casing		0.0/ 0.0	
89	411'-416'		60/36		-- (COMPENTENT BEDROCK)	412'				0.0/ 0.0	
90	426'-439.8'				competent quartz SS/white to pink, very fine grained massive quartz SS trace mica's and little solution weathering as evidence by pitting and a small cavities observed at 426.8' and 431.2 pitted areas horizontal across the core. Some higher angular fractures (70 - 85° from horz) are also present.			Open rock hole			

- 3" NQ casing extends to 426 feet
- Open rock hole below

BB3:w04b-6.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-04B SHEET 13 OF 13

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	16.15	1069.74

FILE No.: 5271.001
DRILLING METHOD: AV core barrel
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None DRIVER: Air Perc.

O'BRIEN & GERE GEOLOGIST: John Jennings
BORING CO.: A&W Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: East of Marshy Area
GROUND ELEVATION: 1083.93
DATES: STARTED: 3/22/93 ENDED: 5/5/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
91	439.8'- 444.5'				Light gray quartzite trace 3/8" subrounded smokey quartz grains. multiple fractures are still present. fractures are nearly vertical at 443.1 to 443.7 (COMPETENT BEDROCK)						
92	444.5'- 463'				pink quartzite no visible grains. Nearly vertical fractures are still present. orange ferric was also observed alon many of the fractures. Iron staining along the fractures changes from orange to black (454.1-456)						
93	463'-470.1'				pink quartz cemented SS some very fine grains are still visible. horizontal alternate with 2" bands of quartz cemented SS trace to no porrosity. trace to no vertical fractures from 463' to 466.7'. vertical fractures return at 466.7'. at 468.3' a grey quartz SS has been faulted beside the pink quartz SS. (COMPETENT BEDROCK)						
94	470.1'- 470.7'				470.1' - 470.7' smokey white recrystalized quartz. 470.7' - 471.2' pink sillca cemented SS very fine grained.						
95	470.7'- 475'				470.7' - 475' highly fractured pink to tan quartzite. fractures appear horizontal and vertical. open rock hole @ 476'	476'					

- Open rock hole cored with AV core barrel (2" diameter) from 426 to 476 feet below grade.
- Field Testing/PID column presents soil screening results.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W7B (1) SHEET 1 OF 1 (Boring Abandoned)

CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 10/21/92 DEPTH: 6' ELEV.:	FILE No.: 5271.001 DRILLING METHOD: Hollow Stem Auger/Odex SAMPLER TYPE: 2" and 3" Splitspoons HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: M. Randazzo BORING CO.: A&W Environmental Drilling FOREMAN: P. Thornsbury	BORING LOCATION: NW of landfill GROUND ELEVATION: approx. 1115 DATES: STARTED: 10/20/92 ENDED: 10/21/92	LEGEND: Grout, Sand Pack, Nat. Form.; Screen —, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	MTIP (ppm)	RMKS*
	0'-5'				Augered to 5fbg (see W7/S1 log)						
1	5'-7'	8-10-15-15	24/18	25	Med dense, lt brn, wet, F. SANDY SILT, little m-c sand and cobbles, tr. f-c gravel (KAME SAND DEPOSIT)					2.7/ 25.2	
2	7'-9'	13-9-26-13	24/11	35	Dense, lt brn, wet, med SAND, little silt, tr. c. sand and f-c gravel (KAME SAND DEPOSIT)					1.7/ 16.2	
3	9'-11'	9-10-16-12	24/12	26	Med dense, tan to brn, wet, m-v.c. Sand and Gravel, tr. silt, f. sand (grains angular to subangular) (KAME SAND DEPOSIT)					2.4/ 17.5	
4	11'-13'	6-15-11-13	24/18	26	Med dense, tan to brn, wet, m-v.c. Sand and Gravel, tr. silt, f. sand (grains angular to subangular)---------- Med dense, brn, wet, silty f. sand, tr. c. sand ----------	12'6" 13'6"				NPID	
5	13'-15'	26-42-64-65	24/16	106	V dense, brn-tan, wet, f sand, little silt, well sorted (ABLATED GLACIAL TILL)---------- V.dense, lt brn, damp, silt, tr. c. sand, m. gravel	14'6"				NPID	
6	15'-16'	44'-100/5"	11/10	>100	V. dense, F. SANDY SILT, tr. med sand, med gravel, clay, c. gravel, cobbles (ABLATED GLACIAL TILL)					NPID	
7	20'-22'	94/5"	5/4	>100	V. dense, brn, damp SILT, some f. sand, little f-c gravel, tr. cobble (ABLATED GLACIAL TILL)--- (Great difficulty in augering) ----------	23'				NPID	
8	25'-27'	16-45-48-100	24/24	93	V. dense, SILTY F.SAND, little c. sand, c. gravel and cobbles (ABLATED GLACIAL TILL)						
9	27'-29'	100/2"	24/2	100	---------- Hard surface (Possible boulder)	27'2" 30'2"				NPID NPID	
					Auger refusal (3' for 20 min.)						
					BOTTOM OF BORING @ 30.1' Snapped off 5' lower section of auger in hole. Back grouted boring to grade. Decided to mobilize larger ODEX rig to boring location.						

Notes:
- No PID tests collected in this interval due to heavy rain and moisture which precluded accurate measuring. = NPID
- fbg = feet below grade.
- Boring grouted from 0 to 20 fbg.
- Field testing/PID column presents soil screening results

BB2:w7b1.wk1

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG

LOG NUMBER: W-08B
SHEET 1 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE ROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 42.30 ELEV.: 1068.27	FILE No.: 5271.001 DRILLING METHOD: Hollow Stem Auger/ODEX SAMPLER TYPE: 2" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: M. Randazzo BORING CO.: A&W Environmental Drilling FOREMAN: Phil Thornsburg	BORING LOCATION: West of landfill GROUND ELEVATION: 1109.51 DATES: STARTED: 1/6/93 ENDED: 4/23/93	LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL 0/00	H/S (ppm)	PID (ppm)	RMKS*
1	0'-2'	3-3-5-5	24/14 6-3/8"	8	D. Brn, damp, vegetation, silty f. sand Lt brn to rust, damp, SANDY SILT, little vegetation Loose, tan, damp to dry, F. SAND, well sorted, stratified (KAME SAND DEPOSIT)	2" 6"	No well installed			5.0/ 5.4	
2	2'-4'	8-7-9-11	24/19 1-3/8"	16	Loose, tan, damp to dry, F. SAND, well sorted, stratified					5.0/ 5.0	
3	4'-6'	9-14-14-14	24/18 3"	28	Med dense, tan, damp f. sand, intermittent lenses (1/4") of silt (KAME SAND DEPOSIT)					-	
4	6'-8'	9-9-9-10	24/22 1-3/8"	18	Med dense, tan, damp f. sand, intermittent lenses (1/4") of silt (KAME SAND DEPOSIT)					5.0/ 5.0	
5	8'-10'	9-10-8-8	24/23 1-3/8"	18	Med dense, tan, damp f. sand, intermittent lenses (1/4") of silt (KAME SAND DEPOSIT)					4.6/ 4.6	
6	10'-12'	7-5-15-20	24/15 1-3/8"	20	Med dense, tan, damp f. sand, intermittent lenses (1/4") of silt (KAME SAND DEPOSIT)					-	
7	12'-14'	7-12-11-11	24/19	23	Med dense, tan, damp f. sand, intermittent lenses (1/4") of silt (KAME SAND DEPOSIT)					4.6/ 4.6	
8	14'-16'	6-6-6-7	24/24	12	Med dense, tan, damp f. sand, intermittent lenses (1/4") of silt (KAME SAND DEPOSIT)					5.0/ 5.0	
9	16'-18'	6-5-3-6	24/13	8	Med dense, tan, damp f. sand, intermittent lenses (1/4") of silt (KAME SAND DEPOSIT) wet @ 17'					5.0/ 5.0	
10	18'-20'	6-5-8-6	24/24	13	Med dense, tan, damp f. sand, intermittent lenses (1/4") of silt (KAME SAND DEPOSIT)	20'				4.6/ 4.8	
11	20'-22'	37-51-12-47	24/24	63	V.dense, Brn, wet, SILTY SAND, tr. clay, c. sand, c. pebbles (angular to subangular grains) (ABLATED GLACIAL TILL)					5.0/ 5.0	
12	22'-24'	6-5-7-6	24/24 1-3/8"	12	Difficulty augering V.dense, Brn, wet, SILTY SAND, tr. clay, c. sand, c. pebbles (angular to subangular grains) (ABLATED GLACIAL TILL					4.6/ 4.6	
13	24'-26'	40-15-7-8	24/8	22	Difficulty augering Brn, wet, SILTY SAND, tr. clay, c. sand, c. pebbles (angular to subangular grains) (ABLATED GLACIAL TILL)			3"casing		4.6- 4.6	
14	26'-28'	40-58-20-21	24/14	78	V. dense, brn to tan, damp to wet, sandy SILT, little c. sand, med pebbles			4"casing		4.6/ 4.6	
15	28'-30'	23-28-29-58	24/8	57	V. dense, brn to tan, damp to wet, sandy SILT, some silt, c. sand and pebbles (ABLATED GLACIAL TILL)	30'		6' ODEX casing		4.6/ 4.6	

Notes: PID = Soil screening headspace results
Geotech samples taken 4'-6' and 18'-22'
TOC sample taken @ 18'-20'

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG

LOG NUMBER: W-08B

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	42.3	1068.27

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/ODEX
SAMPLER TYPE: 3" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: Paul Gottler
BORING CO.: A&W Environmental Drilling
FOREMAN: Phil Thornsbury

BORING LOCATION: West of landfill
GROUND ELEVATION: 1109.51
DATES: STARTED: 1/6/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S (ppm)	FIELD TESTING PID (ppm)	R M K S*
16	30'-32'	38-61-22-12	24/16	83	V. dense, brn, moist to wet, SILT, little f. sand and clay, tr. c. sand, med pebbles, grains observed to be subangular (BASAL GLACIAL TILL)					0.5/ 0.5	
17	32'-34'	14-44-120-114	24/24	>100	V. dense, brn, damp, SILT, little f. sand, tr. clay and c. sand, med pebbles (BASAL GLACIAL TILL)					0.5/ 0.4	
18	34'-36'	38-54-28-34	24/24	82	V. dense, brn, damp, SILT, little f. sand, tr. clay and c. sand, med pebbles (BASAL GLACIAL TILL)	36'				0.4/ 0.4	
					Brn. Wet, clayey silt						
19	36'-38'	53-60-27-33	24/16	87	V. dense, gray to brn, wet, M-C SAND, little med pebbles to large cobbles (BASAL GLACIAL TILL)	36'4" / 38'				0.4/-	
20	38'-40'	28-26-14-49	24/10	40	Dense, tan to brn, wet, F. SANDY SILT, little med sand, tr. c. sand, med pebbles (BASAL GLACIAL TILL)	40'				0.4/ 0.4	
21	40'-42'	71-54-225-80	24/18	>100	V. dense, brn, damp, SILTY F. SAND, tr. c. sand, c pebbles (BASAL GLACIAL TILL)			3"casing		0.4/ 0.4	
22	42'-44'	34-78-97/3"	15/10	>100	V. dense, brn, damp, SILTY F. SAND, tr. c. sand, c pebbles (BASAL GLACIAL TILL)			4"casing		0.4/ 0.4	
23	44'-46'	40-140/6"	12/12	>100	V. dense, brn, damp SILT, little clay, f-c sand, f-c pebbles, tr. cobbles	45'		6"ODEX casing		0.4/ 0.3	
					Spoon refusal @ 45' Boulder 45' - 48'	48'					

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG

LOG NUMBER: W-08B

CLIENT: BURGESS BROS. SUPERFUND SITE

OJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	42.30	1068.27

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/ODEX
SAMPLER TYPE: 3" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: Paul Gottler
BORING CO.: A&W Environmental Drilling
FOREMAN: Phil Thornsbury/Steve Winter

BORING LOCATION: West of landfill
GROUND ELEVATION: 1109.51
DATES: STARTED: 1/6/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
24	49'-51'	30-29-50-25	24/20	79	V. dense, brn, damp SILT, little clay, f-c sand, f-c pebbles, tr. cobbles (BASAL GLACIAL TILL)					0.3/ 0.3	
25	51'-53'	14-77-100/4"	16/4	>100	V. dense, BOULDERS. Drilled to 54'. (BASAL GLACIAL TILL)					0.3/-	
26	54'-56'	42-46-100/4"	16/9	>100	V. dense, brn, wet, SILT, little clay, f. sand, tr. pebbles and cobbles (BASAL GLACIAL TILL)					0.6/-	
27	59'-60'4"	100/5"	5/2	>100	Boulder	61'6"				0.6/-	
					(Drilled through boulders)	62'6"					
					Boulder						
28	64'-64'9"	100-100/3"	9/4	>100	V. dense, brn, wet, PEBBLES, c. sand, tr. silty clay					0.3/-	
29	69-70'6"	154-139-184	18/10	>100	V. dense, brn, moist, silty f. SAND, little med sand, tr. c. sand to c. pebbles, cobbles, clay (BASAL GLACIAL TILL)			3"casing		0.2/ 0.2	
30	71'-73'		24/19		Dense, brn to lt brn, wet, SILT and gravel, some clay, some sand. Massive matrix supported. Gravel wht to red quartzite, some blk to d. gray marble, quartzize angular. Striated and faceted. F-c sand mostly c. granules. Gray and red color (BASAL GLACIAL TILL)			4"casing		0.1/ 0.2	
31	73'-75'		24/22		Dense, Brn to lt brn, GRAVEL and silt, clay and f-c sand. Gravel as above, A-Axis tend toward vertical on subrounded gravel. Some quartzitic gravel subround (BASAL GLACIAL TILL)			6"ODEX casing		0.1/ 0.1	

NOTES: Hollow stem auger refusal at 70.5 feet, boring grouted and 2nd boring initiated with 6" ODEX casing advancement system.

BB2:w08b-1.wk1

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG	LOG NUMBER: W-08B SHEET 4 OF 22
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT GROUNDWATER LEVELS — DATE: 6/21/93 DEPTH: 42.30 ELEV.: 1068.27	FILE No.: 5271.001 DRILLING METHOD: Hollow Stem Auger/ODEX SAMPLER TYPE: 3" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: P. Gottler BORING CO.: A&W Environmental Drilling FOREMAN: S. Winter BORING LOCATION: West of landfill GROUND ELEVATION: 1109.5 DATES: STARTED: 1/6/93 ENDED: 4/23/93	LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL 0/00	H/S (ppm)	PID (ppm)	RMKS*
32	75'-77'		24/17		Dense, moist to wet, GRAVEL and silt, some clay, some f-c sand. Pebbles mostly c., some cobbles, quartzitic. Massive, matrix supported. (BASAL GLACIAL TILL)					0.2/ 0.4	
33	77'-79'		24/20		Dense, wet SILT and gravel, some clay, some c. sand granules, little f-m sand. Pebbles finer than above. Massive, matrix supported. (BASAL GLACIAL TILL)					0/0	
34	79'-81'		24/19		Dense, wet SILT and pebbles, some clay, some c. sand granules, tr. f-m sand. Pebbles subround to angular quartzite and marble. A-axis tend to vertical. Massive, matrix supported. (BASAL GLACIAL TILL)					0.2/ 0.4	
35	81'-83'		24/13		Dense, damp to moist silt, some gravel, some clay, little sand pebbles mostly c. granules. Massive, matrix supported (BASAL GLACIAL TILL)					0.4/ 0.7	
35	83'-85'		24/14		Dense, lt brn to brn, SILT and pebbles, some c. sand granules, little clay, tr. f-m sand. Massive, matrix supported. Pebbles angular to subround quartzite with lesser amounts of blk to d. gray subrounded and striated marble. A-axis tends toward vertical-flow till.					0/0.3	0.0
36	85'-87'		24/16		Dense, brn to lt brn SILT and GRAVEL, some sand, little clay. Gravel as above, some marble well rounded, blade shapes predominate. Massive, matrix supported. Flow till.			3"casing		.7/1.4	0.3
37	87'-89'		1.2/1.2		V. dense, off-wht quartzite (boulder) gravel in tip. Drilling rate increased at 87.7' (through boulder)			4"casing		NR	0.3
38	89'-91'		24/14		Dense, brn to d. brn, moist to damp, f-m SAND and Pebbles, some clay, little z. pebbles angular to round, faceted and striated, quartzite and marble. Quartzite also striated and faceted. A-axis of pebbles random. Some smokey quartz gravel. Massive, matrix supported. (BASAL GLACIAL TILL)			6"ODEX casing		.3/.5	0.3

Note:

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG	LOG NUMBER: W-08B SHEET 5 OF 22
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT GROUNDWATER LEVELS: DATE 6/21/93, DEPTH 42.30, ELEV. 1068.27	FILE No.: 5271.001 DRILLING METHOD: Hollow Stem Auger/ODEX SAMPLER TYPE: 3" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: P. Gottler, J. Jennings BORING CO.: A&W Environmental Drilling FOREMAN: S. Winter, A. DeLong BORING LOCATION: West of landfill on sand road GROUND ELEVATION: 1109.51 DATES: STARTED: 1/6/93 ENDED: 4/23/93	LEGEND: Grout, Sand Pack, Nat. Form.; Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
39	91'-93'		24/17		Dense, brn to d. brn, wet to moist, SAND and pebbles, some silt, tr. clay. More sand than above, mostly f-m. pebbles as above. (Hole was dry during the driving of 91'-93' spoon.) Massive, matrix supported diamicton. A-axis random, lodgement till.			0.1	0.4		0.0
40	93'-95'	40-150/3	9/6	>100	V. dense, brn, damp to moist, SILT, some f. sand, tr. stone and cobbles, tr. clay					0.0/ 0.0	
41	95'-97'	19 - 50/3	9/9	>100	V. dense, brn, damp to moist, SILT, some f. sand, tr. stone and cobbles, tr. clay (BASAL GLACIAL TILL)					0.0/ 0.0	
42	97'-99'		18/12		V. dense, brn, damp to moist, SILT, some f. sand, tr. stone and cobbles, tr. clay Increase in stones, little to some stones (A-axis) (TOP OF WEATHERED SCHIST)	99'				0.0/ 0.0	
43	99'-101'	14-23-50-56	24/20	73	Ocher, v. stiff, rust brn, dry, CLAY, no stone Stiff, gray, wet, v. f. SAND and SILT, tr. angular pebbles Ocher	99'9" 100'3"	orange cuttings with tip of ODEX			0.0/ 0.0	
44	101'-103'	11-33-42-44	24/18	75	Weathered phyllitic schist bedrock			3"casing		0.0/ 0.0	
45	103'-105'	19-33-41-54	24/24	74	Weathered phyllitic schist bedrock			4"casing		0.0/ 0.0	
46	105'-107'	11-20-35-61	24/24	55	Stiff, grayish wht, dry, weathered gneiss running parallel to length of splitspoon, some soft brn dry clay. Several pre-replacement fractures (pre-clay) Weathered phyllitic schist			6"ODEX casing		0.0/ 0.0	

Notes: Hydraulic hammer with 14016 weight used.

bbz:w08b-1.wk1

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG

LOG NUMBER: W-08B

SHEET 6 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

'OJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
1/26/93	42.30	1068.27

FILE No.: 5271.001

DRILLING METHOD: Hollow Stem Auger/ODEX

SAMPLER TYPE: 3" Splitspoon

HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: P. Jennings, P. Gottler

BORING CO.: A&W Environmental Drilling

FOREMAN: A. DeLong

BORING LOCATION: West of landfill

GROUND ELEVATION:

DATES: STARTED: 1/6/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form, Screen, Riser

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S	FIELD TESTING PID (ppm)	RMKS*
47	107'-109'	16-38-56-72	24/22	94	V. stiff, gray wht, damp WEATHERED GNEISS, (30° off parallel) and (increase) soft brn clay, tr. wht quartz. (WEATHERED SCHIST)					0.0/ 0.0	
48	109'-111'	10-34-50-67	24/18	84	V. stiff, pink and wht (orthoclase) laminations in brn CLAY in soft brn clay. (No gray) V.stiff, wht, dry, KAOLINITE laminated with some red to pink to orange orthoclase (No clay) Little brn to blk mica					0.0/ 0.0	
49	111'-113'	19-44-47-77	22/18	91	Stiff, brn, dry CLAY, tr. kaolinite laminae					0.0/ 0.0	
50	113'-116'	50/2 pneumatic hammer	36/36	>100	Stiff, brn, damp, CLAY, little wht kaolinite laminae, tr. pink orthoclase	115'				0.0/ 0.0	
					3" x 4" wht oxidized quartzite fragment, red laminae 1/16" thick, some re-crystallization	115'3"					
					Stiff, brn, damp, CLAY, little wht kaolinite						
51	116'-121'	50/1 pneumatic hammer	54/54	>100	Stiff, brn, damp, CLAY, some wht kaolinite laminae [Still heavily deformed 3' folds with limbs running perpendicular to length of spoon]	118'9"		3"casing 4"casing		0.0/ 0.0	
					Med dense, pink and tan, moist, highly weathered, QUARTZITE and orthoclase	119'10"		6" ODEX casing			
					Stiff, brn, damp, CLAY, some wht kaolinite laminations, tr. pink orthoclase laminae PNEUMATIC HAMMER REFUSAL @ 120'6"	120'6"					
					Med dense, brn, damp, f. SAND						

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG			LOG NUMBER: W-08B SHEET 7 OF 22
CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS		FILE No.: 5271.001
	DATE: 6/21/93	DEPTH: 42.30 ELEV.: 1068.27	DRILLING METHOD: Hollow Stem Auger/ODEX
OJECT LOCATION: Bennington/Woodford, VT			SAMPLER TYPE: 3" Splitspoon
			HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: P. Gottler, S. Mogilinicki	BORING LOCATION: West of landfill		LEGEND: Grout, Sand Pack, Nat. Form.; Screen, Riser
BORING CO.: A&W Environmental Drilling	GROUND ELEVATION: 1109.51		
FOREMAN: A. DeLong/J. Haliberta	DATES: STARTED: 1/6/93 ENDED: 4/23/93		

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL 0/00	FIELD TESTING H/S	FIELD TESTING PID	RMKS*
52	121'-126'	50/1	1/0		Stiff, brn, damp, CLAY, some wht kaolinite, tr. laminae, tr. f. brn sand laminae						
					Med dense, brn, wet m. SAND interfolded (bedded), soft, brn, moist CLAY	122'6"		6"ODEX Casing			
					1" band of coarse angular wht quartzitic @ 122'6" AND 122'9"						
					Loose, orange to brn wet, med SAND, some GRAVEL	123'6"					
					Soft, orange to brn, damp, CLAY, tr. kaolinite laminae	124'				0/0	
					Med dense, orange to brn, med damp SAND Med dense, orange to brn, damp, med SAND, brn clay, some wht kaolinite laminations	125'3"					
					Med dense, orange to brn, damp, med SAND	126'6"					
54	126'-131'	52/2 pneumatic airbit hammer	54/54		V. dense, orange to brn, stained, moist, med grained wht SILICA, cemented sandstone (FRAGILE)	131'				0/0	
55	132'-134'		10/10		Brn, wet, CLAY, bands of wht clay, tr. laminations blk silt					0/0	
56	134'-136'		10/10		Mostly brn, some wht, pink, blk, wet (in bands), CLAY					0/0	
57	136'-138'		10/10		Brn, wet, CLAY, bands of wht clay			3"casing		0/0	
58	138'-140'		12/10		Brn, wet, CLAY, bands of wht clay (WEAHTERED SCHIST)			46"casing		0/0	

bnz:w08b-2.wk1

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG

LOG NUMBER: W-08B
SHEET 8 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE
PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
1/26/93	42.3	1068.27

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/ODEX
SAMPLER TYPE: 3" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: S. Mogilinicki
BORING CO.: A&W Environmental Drilling
FOREMAN: J. Haliberta

BORING LOCATION: West of landfill
GROUND ELEVATION: 1109.51
DATES: STARTED: 1/16/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
59	140'-142'		12/10		Brn, wet, CLAY, bands of wht clay, tr. laminations of blk silt					0/0	
60	142'-144'		12/7		Wht and brn, wet, CLAY, tr. pink clay					0/0	
61	144'-146'		12/0		No Recovery					-/-	
62	146'-148'		12/8		Brn and wht, tr. blk, moist, CLAY (in bands)					0/0	
63	148'-150'		10/5		Brn, moist, SILT and CLAY, wht bands of clay, near vertical orientation, tr. blk grains					0/0	
64	150'-152'		12/7		Brn, moist, SILT and CLAY, wht bands of clay, near vertical orientation, tr. blk grains					0/0	
65	152'-154'		12/8		Brn, moist, SILT and CLAY, wht bands of clay, tr. blk silt			3"casing		0/0	
66	154'-156'		12/12		Top 8": Brn, wet, SILT and CLAY, bands wht clay, tr. blk grains Bottom 4": Weathered rock of granitic/gneissic origin, gravel-size clear quartz fragments, bands brn and wht CLAY and SILT			4"casing 6" ODEX		0/0	
67	156'-158'		12/10		Brn and blue to gray, wet, SILT and CLAY, tr. near vertical bands wht clay			casing		0/0	

BBZ:w08b-2.wk1

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG

LOG NUMBER: W-08B

CLIENT: BURGESS BROS. SUPERFUND SITE

ROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	42.30	1068.27

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/ODEX
SAMPLER TYPE: 3" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: S. Mogilinicki
BORING CO.: A&W Environmental Drilling
FOREMAN: J. Haliberta

BORING LOCATION: West of landfill
GROUND ELEVATION: 1109.51
DATES: STARTED: 1/6/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S (ppm)	FIELD TESTING PID (ppm)	RMKS*
68	158'-160'		12/12		Brn, wet, SILT and CLAY, tr. wht bands clay, tr. blk silt					0/0	
69	160'-162'		12/8		Brn, wet, SILT and CLAY, wht bands clay, tr. blk silt, tr. red to brn laminations					0/0	
70	162'-164'		12/8		Brn, wet, SILT and CLAY, wht bands clay, tr. blk silt (WEATHERED SCHIST)					0/0	
71	164'-166'		12/6		Orange to brn, brn and wht, wet, CLAY, a weathered granitic/gneissic rock (Clay colored in bands)					1/0	
72	166'-168'		12/8		Brn and wht, wet, plastic and CLAY (Clay colored in bands)					0/0	
73	168'-170'		12/8		Brn and wht, wet, plastic CLAY (Clay colored in bands)					0/0	
74	170'-172'		12/8		Brn and wht (in bands), wet, CLAY, some f. gravel size clear quartz fragments, (WEATHERED SCHIST)				3"casing	3/0	
75	172'-174'		12/6		Brn, wet, SILT, some f-m sand, bands of wht clay				4"casing	0/0	
76	174'-176'		12/6		Brn, wet, SILT and CLAY, bands of wht clay					0/3	

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG

LOG NUMBER: W-08B

CLIENT: BURGESS BROS. SUPERFUND SITE

ROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	40.23	1068.27

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/ODEX
SAMPLER TYPE: 3" Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: S. Mogilinicki
BORING CO.: A&W Environmental Drilling
FOREMAN: J. Haliberta

BORING LOCATION: West of landfill
GROUND ELEVATION: 1109.51
DATES: STARTED: 1/6/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL 0/00	H/S (ppm)	PID (ppm)	RMKS*
77	176'-178'		12/6		Brn, wet, SILT and CLAY, bands of wht clay, some quartz, gravel size fragments					0/0	0
78	178'-180'		12/5		Brn, wet, SILT and CLAY, bands of wht clay					0.5/0	0
79	180'-182'		10/5		Brn, wet, SILT and CLAY, bands of wht clay (WEATHERED SCHIST)					1/0	0
80	182'-184'		12/4		Brn, wet, SILT and CLAY					0/0	0
81	184'-186'		12/4		Brn, wet, SILT and CLAY, bands of wht clay, little blk silt					0/0	0
82	186'-188'		10/4		Brn, wet, SILT and CLAY, bands of wht clay, little blk silt					0/0	0
83	188'-190'		10/4		Brn, wet, SILT and CLAY, bands of wht clay, little blk silt					0/0	0
84	190'-192'		10/4		Brn, wet, SILT and CLAY, bands wht clay (WEATHERED SCHIST)			3"casing 4"casing		0/0	0

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG	LOG NUMBER W-08B SHEET 11 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	42.30	1068.27

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 2" splitspoon
HAMMER: None FALL: None DRIVER: Air Perc.

O'BRIEN & GERE GEOLOGIST: V. Burrows
BORING CO.: A&W Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: West of landfill
GROUND ELEVATION: 1109.51
DATES: STARTED: 1/6/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form. — Screen, Riser

SAMPLE No.	SAMPLE DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
85	192'-194'		0/0		No recovery, all gravel wash and gravel fragments.					-/-	
86	194'-196'		9/6		Medium to high plasticity, brown to light gray, wet, silty clay. Clay exhibits gray and brown banding.					8/-	
87	196'-198'		5/5		Tan to off-white silty clay of medium plasticity, wet, clay appears to be a schist. (?) (WEATHERED SCHIST)					7/-	
88	198'-200'		3/3		Same as above grading to damp.					5/-	
89	200'-202'		11/6		Medium to light brown, damp to wet, very fine sandy silt, trace gray clay (Saprolite) intermixed within silt matrix.					35/-	
90	202'-204'		10/4		Medium brown, wet, SILT with a trace of fine sand, trace clay.					9/-	
91	204'-206'		7/3		Brown to light brown-orange to gray, wet, alternating SILT to sand to clay.					12/-	
92	206'-208'		7/3		Same as above except damp to very moist.					5/-	
93	208'-210'		6/4		Tan to off-white with orange mottling, dry, silty clay of medium plasticity. (Clay appears to be a saprolite.			3"casing		9/-	
94	210'-212'		11/2		Same as above.			4"casing		25/-	
95	212'-214'		7/0		No Recovery			6"ODEX casing		-/-	
96	214'-216'		7/6		Same as 208'-210' recovery. Saprolite					-/-	

Notes: PID = Humidity observed in headspace jar. Elevated headspace readings are likely due to humidity in jar.

O'BRIEN & GERE ENGINEERS, INC. SOIL BORING LOG	LOG NUMBER W-08B SHEET 12 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	42.30	1068.27

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 2" splitspoon
HAMMER: None FALL: None DRIVER: Air Perc.

O'BRIEN & GERE GEOLOGIST: V. Burrows
BORING CO.: A&W Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: West of landfill
GROUND ELEVATION: 1109.51
DATES: STARTED: 1/6/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form. Screen --, Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
97	216'-218'		7/7		Brown, damp to moist, SILT with infrequent white, silty CLAY lenses, trace fine sand.					12/-	
98	218'-220'		3/7		Off-white to gray, dry silty CLAY of medium to high plasticity. Appears to be a schist saprolite. (WEATHERED SCHIST)					11/-	
99	220'-222'		8/4		Same as above - schist saprolite.					7/-	
100	222'-224'		12/6		Off white, dry silty CLAY of low to medium plasticity, with intermitent brown SILT lenses. Appears to be schist saprolite					9/-	
101	224'-226'		13/3		Brown to light brown, orange to gray, dry to very moist, alternating SILT to fine SAND to CLAY.					4/-	
102	226'-228'		7/3		Same as above.					4/-	
103	228'-230'		6/2		Brown to light brown to light gray, moist silty fine SAND with silty CLAY layers intermixed.					15/-	
104	230'-232'		7/3		Light gray, dry, silty CLAY of high plasticity. (WEATHERED SCHIST)			3"casing		9/-	
105	232'-234'		7/0		No recovery.			4"casing		-/-	
106	234'-236		12/4		Tan brown to off white, damp to dry, silty fine SAND to SILT with alternating frequeent layers of gray silty CLAY.			6"ODEX casing		8/-	
107	236'-238'		12/3		Tan brown, damp to moist, silty fine SAND to SILT grading into white to gray silty CLAY. (WEATHERED SCHIST)					10/-	

Notes:

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-08B SHEET 13 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 42.30 ELEV.: 1068.27	FILE No.: 5271.001 DRILLING METHOD: Hollow Stem Auger/Odex SAMPLER TYPE: 2" splitspoon HAMMER:None FALL:None DRIVER:Air Perc.

O'BRIEN & GERE GEOLOGIST: V. Burrows | BORING LOCATION: West of landfill | LEGEND: Grout, Sand Pack, Nat. Form. | Screen —, Riser
BORING CO.: A&W Environmental Drilling | GROUND ELEVATION: 1109.51
FOREMAN: John Haliberta | DATES: STARTED: 1/6/93 ENDED: 4/23/93

SAMPLE No.	SAMPLE DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
108	238'-240'		5/2		Same as above.					10/-	
109	240'-242'		7/3		Light gray to offwhite, dry, silty CLAY of high plasticity, trace fine sand.					10/-	
110	242'-244'		6/0		No recovery.					-/-	
111	244'-246'		6/4		Light to dark brown, damp to wet(?), SILT trace fine sand with intermixed layers of gray to off-white silty CLAY with quartz.					12/-	
112	246'-248'		8/4		Light gray to off-white, dry, silty CLAY of high plasticity, bands of brown silt.					12/-	
113	248'-250'		7/5		Same as above. (END OF DAY 4/6/93) 4/7/93					10/-	
114	250'-252'		7/4		Light gray to tan brown, dry, silty CLAY of high plasticity, grading randomly into SILT, some fine sand, trace clay.					14/-	
115	252'-254'		9/6		Yellow-brown to medium brown with gray mottling, dry, SILT, trace, fine sand, occasional gray silty CLAY lenses. (WEATHERED SCHIST)			3"casing		7/-	
116	254'-256'		6/4		Same as above.			4"casing		12/-	
117	256'-258'		11/7		Yellow brown to brown to light gray very moist, intermittently banded clayey SILT to silty CLAY. Banding neglecting color, brown banding is predominantly silt and clayey silt, the gray banding is silty CLAY.			6"ODEX casing		-/-	

Notes:

BB2:w08b-5.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-08B SHEET 14 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS DATE	DEPTH	ELEV.
6/21/93	42.30	1068.27

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 2" splitspoon
HAMMER: None FALL: None DRIVER: Air Perc.

O'BRIEN & GERE GEOLOGIST: V. Burrows
BORING CO.: A&W Environmental Drilling
FOREMAN: John Haliberts

BORING LOCATION: West of landfill
GROUND ELEVATION: 1109.51
DATES: STARTED: 1/6/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form. Screen —, Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
118	258'-260'		-		Running sands encountered when attempting to advance hole to 258'. Advance hole to 260', flush hole advance casing to seal off running sand zone.					-/-	
119	260'-262'		15/2		Brown to yellow brown, grading to gray moist, intermittently banded clayey SILT to silty CLAY.					7/-	
120	262'-264'		7/4		Medium brown, moist to wet, sandy SILT trace clay. Seperate gray silty clay lenses through out the sample.					18/-	
121	264'-266'		8/0		No recovery: ALL WASH					-/-	
122	266'-268'		11/6		White to off white, to yellow brown, clayey SILT to silty CLAY. Some exhibits schist-like layering of brn silt to gray clay. Sample is dry to moist Quartz fragments & hornblende present throughout sample as subrounded and sub-angular fragments. (WEATHERED SCHIST)					7/-	
123	268'-270'		7/6		Same as above.					7/-	
124	270'-272'		8/6		Brown to yellow brown to off white to gray dry, alternating bands of SILT, clayey SILT and silty CLAY. Numerous quartz and un-identified mofic granules, sub-rounded to subangular.					11/-	
125	272'-274'		8/6		Same as above except band widths are thicker, approaching 3cm.			3"casing		9/-	
126	274'-276'		8/0		No Recovery. All gravel like wash.			4"casing		-/-	
127	276'-278'		9/5		Brown to yellow brown to off white to gray, dry, alternating bands of SILT, clayey SILT and silty CLAY. Quartz and mafic granules subangular and subrounded within schist-like bands. (WEATHERED SCHIST)			6"ODEX casing		11/-	

Notes:

BB2:w08b-6.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-08B SHEET 15 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	42.30	1068.27

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 2" splitspoon
HAMMER: None FALL: None DRIVER: Air Perc.

O'BRIEN & GERE GEOLOGIST: V. Burrows
BORING CO.: A&W Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: West of landfill
GROUND ELEVATION: 1109.51
DATES: STARTED: 1/6/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen —, Riser

SAMPLE No.	SAMPLE DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S (ppm)	FIELD TESTING PID (ppm)	RMKS*
128	278'-280'		9/0		No Recovery					-/-	
129	280'-282'		8/3		Light to yellow brown to off white to gray, dry alternating bands of SILT, clayey SILT and silty CLAY. Essentially same as above but more sandy.					11/-	
130	282'-284'		11/6		Light gray, moist, silty CLAY of high plasticity there is yellow-brown mottling through out the sample.					11/-	
131	284'-286'		10/4		Yellow-brown to off white, sandy SILT to SILT to silty CLAY. Sample is banded as above, some qtz and mafic granules.					12/-	
132	286'-288'		11/3		Same as above.					7/-	
133	288'-290'		8/2		Yellow brown to off white, moist, sandy SILT to silty CLAY. Sample does not exhibit cleat banding and appears to be a heterogeneous mix.					2/-	
134	290'-292'		8/2		Same as above.					3.5/-	
136	292'-294'		12/4		Gray to off white with yellow brown mottling, silty CLAY of medium to high plasticity, some silt. Sample has quartz, feldspar, and mafic granules.			3"casing		8/-	
137	294'-296'		6/3		Light grey to tourquoise to off white to brown, silty CLAY with intermittent layers of fine to medium SAND, little SILT, trace clay. There are occasional layers of silt, numerous granules, graphite.			4"casing		3/-	
138	296'-298'		6/3		Light gray to off white to red to brown silty CLAY, dry of high plasticity, with intermittent layers of dark brown fine to medium sand. Granules ubiguitous.			6"ODEX casing		6/-	
139	298'-300'		6/3		Brown to dark brown, wet, Clayey fine to course SAND, little silt.					6/-	

Notes: 4" casing advancement system terminated at 308 feet.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-08B SHEET 16 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS DATE	DEPTH	ELEV.
6/21/93	42.30	1068.27

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 2" splitspoon
HAMMER: None FALL: None DRIVER: Air Perc.

O'BRIEN & GERE GEOLOGIST: V. Burrows
BORING CO.: A&W Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: West of landfill
GROUND ELEVATION: 1109.51
DATES: STARTED: 1/6/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form. — Screen: —, Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
140	308'-310'		24/24		Yellow-brown with off-white to gray mottling, dry, clayey SILT to silty CLAY of high plasticity. At 308'8" there is a 3cm thick quartz band of approximate 40 degree orientation. There are intermittent laminae of gray clay also at approx. 40 degrees. Sample has 10-20% quartz and miscellaneous mafic granules that are subangular to subrounded. Granules range from coarse sand to medium gravel in size. Oxidation evident throughout sample.					9/8	
141	310'-313		36/24		Brown to blue-gray with off white mottling very moist, to wet, silty CLAY to clayey SILT, grading at 310.5' into a clayey Fine to coarse sand and trace of fine gravel. Sample grades at 312 feet into clayey SILT with numerous blue gray clay lenses. Orientation of lenses is random. Granules present as above.					6/7	
142	313'-318'		60/34		Gray-blue to off white, moist, silty CLAY of high plasticity, banded, grading at 313.6' into a yellow brown, wet, clayey fine to coarse sand little fine gravel. Sand has remnant orthoclase and remnant calcite. Sample grades @ 318' into a banded, clayey SILT to silt some sand, banding, orientation is random.					4/4	
143	318'-323'		60/42		Yellow brown to brown, very moist, silty CLAY of high plasticity, little fine to coarse sand. Sample exhibits pink and white mottling, resultant from orthoclase, calcite and quartz, Weathering biotite and muscovite flakes present along with a dark blue (garnet) weathered mineral feldspathic layers most prevalent from 320.3' to tip of recovery quartz granules present as angular shades up to the medium gravel size. The entire sample exhibits schist like banding.		'3"casing '4"casing '6"ODEX casing			4/6.5	

Notes: No sample recovery from 300' - 308'.
No sampling system used from 308 to 398 feet.

O'BRIEN & GERE ENGINEERS, INC. — **SOIL BORING LOG** — **LOG NUMBER W-08B**

SHEET 17 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	42.30	1068.27

FILE No.: 5271.001

DRILLING METHOD: Hollow Stem Auger/Odex

SAMPLER TYPE: 2" splitspoon

HAMMER: None FALL: None DRIVER: Air Perc.

O'BRIEN & GERE GEOLOGIST: V. Burrows

BORING CO.: A&W Environmental Drilling

FOREMAN: John Haliberta

BORING LOCATION: West of landfill

GROUND ELEVATION: 1109.51

DATES: STARTED: 1/6/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form. Screen — Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS
144	323'-328'		60/48		Yellow brown to brown with pink, white, and gray mottling, very moist, silty CLAY of high plasticity, little fine to course sand, little fine pebbles. Colors reflect mineralology: pink is feldspar, white is quartz and calcite, gray is muscovite and some biotite. Heavy feldspathic banding from 324'-325.3' Red like lenses present especially near 323.3' depth. Sample exhibits schistose banding.					0/-	
145	328'-333'		60/42		Brown to yellow brown, with gray and pink mottling, very moist, silty CLAY with high plasticity, some fine to course sand. At 329.2' there is a 2" thick weathered shale or shale phyllite. Sample exhibits weathered orthoclase layers and calcite especially at 330.5' layering appears laminar. Sample has quartz and miscellaneous mafic granules up to fine to medium gravel size, subangular.					8/7	
146	333'-338'		60/12		Same as above except there is more pronounced quartz and orthoclase banding appears almost organic.					4/-	
147	338'-343'		60/0		No Recovery.					-/-	
148	343'-348'		60/60		Brown to yellow brown, very moist, with pink and medium gray to tourquoise mottling silty CLAY of high plasticity, some fine to course sand. Sample has 10-25% weathered quartz and orthoclase (calcite) fragments. There are minerals intermitted lenses of phyllite and other mafic mineralogies. Granules angular to subangular.					0/0	
149	348'-353'		60/12		Pink-brown, very moist, silty CLAY of high plasticity. Some f-c sand. Sample has numerous bands of feldspar, mica, quartz and calcite. Granules are subangular. (Sample appears to have saprolite-schistose-like banding.			3"casing 4"casing 6"ODEX		0/0	

Notes:

BB2:w08b-9.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-08B
		SHEET 18 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	42.30	1068.27

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 2" splitspoon
HAMMER: None FALL: None DRIVER: Air Perc.

O'BRIEN & GERE GEOLOGIST: V. Burrows
BORING CO.: A&W Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: West of landfill
GROUND ELEVATION: 1109.51
DATES: STARTED: 1/6/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form. Screen — Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
150	353'-358'		60/36		Pink-brown to white, very moist, silty CLAY of high plasticity, some fine to course sand, sample is composed predominantly of weathered orthoclase, feldspar, quartz, calcite or kaolin, mica and associated phyllite. Granules are angular to subangular occasional coarse pebbles size quartz.					2/0	
151	358-363'		60/48		Pink-brown to white to red, very moist, silty CLAY of high plasticity, some fine to course sand. Sample is weathered feldspars, quartz, kaolin and mica. Quartz fragments range up to the course pebbles size and are subangular.					0/0	
152	363'-368'		60/60		Same as above grading at 366.4' into a yellow to brown-yellow, dry, SILT, clay. There are remnant calcite stringes present. Silt diccers from above in that there are no sand or gravel present.					0/0 3/4 0/0	
153	368'-373'		60/60		Yellow-brown, damp, SILT, little clay, grading at 368.8' into yellow brown, dry, SILT, trace clay with orthoclase (weathered) layers at 370.' At 372.5', sample grades into a white clay, very moist, high plasticity. Clay could be kaolintic.					0/0 3/4 0/0	
154	373'-378'		60/32		White, very moist, CLAY of high plasticity some fine to coarse sand, trace silt, grading from 371.5' to 375.2' into a yellow brown, dry to moist SILT, little clay. The white silty clay may be a totally weathered feldspar or kaolinite, sand fraction is mostly quartz.					0/0	
155	378'-383'		60/60		Orange-brown, dry, clayey SILT to SILT with intermixed quartz layers, trace fine to course SAND, grading at 382.8' into white moist, CLAY of high plasiticity. Exhibits intermittent dark brown banding and another quartz fragment layers. No orientation pattern present in the layering.			3"casing 4"casing 6"ODEX casing		0/0 3/4 0/0	
156	383'				COMPETENT BEDROCK at 383'.	383'					

Notes:

BB2:w08b-10.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-08B SHEET 19 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 42.30 ELEV.: 1068.27	FILE No.: 5271.001 DRILLING METHOD: Hollow Stem Auger/Odex SAMPLER TYPE: 2" splitspoon HAMMER:None FALL:None DRIVER:Air Perc.
O'BRIEN & GERE GEOLOGIST: V. Burrows BORING CO.: A&W Environmental Drilling FOREMAN: John Haliberta	BORING LOCATION: West of landfill GROUND ELEVATION: 1109.51 DATES: STARTED: 1/6/93 ENDED: 4/23/93	LEGEND: Grout, Sand Pack, Nat. Form.; Screen, Riser

SAMPLE No.	SAMPLE DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
157	383'				White to gray-white quartzite massive and resistant, weathered zone at 383.5'						
158	384'				Gray white quartzite, becoming friable at 384.4' with numerous fracture planes oriented at roughly 45 degrees.						
159	385'				Gray white quartzite exhibiting fractures at 385.1', 385.5', 385.6', 385.9' and 386.0'. Massive and resistant between fractures. At fractures very weathered. Suspect calcite veins at fracture.						
160	386'				Gray white quartzite, semi-competant between fractures. Fractures numerous from 386.0 to 386.4'Fractures are along kaoline or calcite veins. Fracture orientation ranges from horizontal to 45 degrees.						
161	387'				Gray white quartzite, friable very fractured. Fracture planes mostly horizontal and apparently not along calcite or kaolin veins. Sample breaks easily if material is quartzite and is pulverized.						
162	388'				White gray to gray, fine grained quartzite, minerals, mica, flakes, friable, grading at 388.5 into quartzite. Quartzite is massive and competent.						
163	389'				Quartzite grading into fine grained sandstone at 389.1' material becomes competent quartzite at 389.3'.						
164	390'				Quartzite, fractured vertically and horizontally.			3"casing			
165	391'				Quartzite, vertical and horizontal fracturing from 391.3 to 391.7'.			4"casing			
166	392'				Quartzite fractured at vertical and horizontal orientations, vertical fracture present but cemented.			6"ODEX casing			

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-08B SHEET 20 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS DATE	DEPTH	ELEV.
6/21/93	42.30	1068.27

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 2" splitspoon
HAMMER: None FALL: None DRIVER: Air Perc.

O'BRIEN & GERE GEOLOGIST: V. Burrows
BORING CO.: A&W Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: West of landfill
GROUND ELEVATION: 1109.51
DATES: STARTED: 1/6/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form. — Screen: —, Riser

No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (feet)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
167	393'				White to clear, competent quartzite fine to medium grained, mafics through out, horizontal fractures at 393.4 and 393.8'.						
168	394'				White to clear, competent quartzite, fine to medium grained, mafics throughout, horizontal fractures at 394.1, 394.3, 394.7, and vertical fracture (cemented) from 394.5						
169	395'				White to clear, competent quartzite, fine to medium grained, fractured both vertically and horizontally. mafics dominant along fractures.						
170	396'				White to clear, massive quartzite, fine to medium grained. One horizontal fracture at 396.8'.						
171	397'				White to clear, competent quartzite, fine to medium grained fractures at 397.25, 397.5, both horizontal.			3"casing			
172	398'				END OF NQ SAMPLING. Grout cement casing in hole from 398' to grade. AV CORING STARTED						
173	398'-407.5'		9.5/9.5		Light gray to off white massive quartzite, with light brown to pink mottling, mafic speckles ubiquitous at approx. 5-10% of matrix. The 9.5 length exhibits numerous fractures; however, the coring process may be responsible for most of the fractures. Solution weathering evident.						
174	407.5'-414'		6.5/6.5		Light gray to pink, to off white, fine to medium grained, massive quartzite, mafic mineralogy "speckles" diminishing to <3-5% of matrix. Sample exhibits fracturing, some attributable to the coring process. Sample is pitted frequently (solution weathering) Natural fracture intensity increases from 413-414'.			open rock hole			

Notes: Rock cored with AV core barrel from 398' to 448'.

BB2:w08b-12.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-08B SHEET 21 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 42.30 ELEV.: 1068.27	FILE No.: 5271.001 DRILLING METHOD: Hollow Stem Auger/Odex SAMPLER TYPE: 2" splitspoon HAMMER:None FALL:None DRIVER:Air Perc.
O'BRIEN & GERE GEOLOGIST: V. Burrows BORING CO.: A&W Environmental Drilling FOREMAN: John Haliberta	BORING LOCATION: West of landfill GROUND ELEVATION: 1109.51 DATES: STARTED: 1/6/93 ENDED: 1/23/93	LEGEND: Grout, Sand Pack, Nat. Form.; Screen —, Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
175	414'–419'				Milky white to light gray, quartzite, with planes of weakness dipping approx. 60 degrees, orange-brown staining on some surfaces.						
176	419'–422'				Milky white to light grey, quartzite, planes 60 degree to 80 degree dip; orange-brown to red-brown staining, dark grey staining.						
177	422'–424'				Milky white, quartzite, red-brown staining, planes 60 degree dip.						
178	424'–428'8"				Milky white quartzite, red staining						
179	428'8"–430'2"				Off white , milky quartzite, plane 60 degree dip.						
180	430'2"–433'				Off white, milky, quartzite planes, 45 degree – 60 degree dip, trace black flecks, orange to red brown staining						
181	433' 435'2"				Off white, milky to pale pink, quartzite planes 45 - 60 degree dip, trace black flecks, orange to red-brown staining, dark band at approx. 434'.						
182	435'2"–437'				Off white, milky to pale pink, quartized, plane 60–80 degree dip.						
183	437'–439'3"				Off white, milky to pale pink, quartzite planes 60 - 80 degree dip, red staining.						
184	439'3"–442'6"				Top 8" are light gray, stained red, quartzite, white flecks. remeinder is pale pink quartzite, coarse grained.						
185	442'6"–443'9"				Pale pink quartzite, planes 80 degree dip, coarse grained			open rock hole			
186	443'9"–445				Pale pink quartzite, some gray color, planes drop 80 degrees, coarse grained.						

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O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER W-08B SHEET 22 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS DATE	DEPTH	ELEV.
6/21/93	42.30	1068.27

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 2" splitspoon
HAMMER: None FALL: None DRIVER: Air Perc.

O'BRIEN & GERE GEOLOGIST: V. Burrows
BORING CO.: A&W Environmental Drilling
FOREMAN: John Haliberta

BORING LOCATION: West of landfill
GROUND ELEVATION: 1109.51
DATES: STARTED: 1/6/93 ENDED: 4/23/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
187	445'-448'				pale pink quartzite, some gray color, approx. 80 degrees, coarse grained	448'		open rock hole			
188	448'				BOTTOM OF THE BORING @ 448'						

Notes: Well encapsulated at grade with 6" diameter steel locking protective casing.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 1 OF 22
CLIENT: BURGESS BROS. SUPERFUND SITE ROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 9.32 ELEV.: 1069.33	FILE No.: 5271.001 DRILLING METHOD: Odex SAMPLER TYPE: 3" I.D., 2' Splitspoon HAMMER: None FALL: None DRIVER: Air Perc.
O'BRIEN & GERE GEOLOGIST: S. Mogilinicki BORING CO.: A&W Environmental Drilling FOREMAN: B. Follett	BORING LOCATION: SW of landfill GROUND ELEVATION: 1077.10 DATES: STARTED: 1/4/93 ENDED: 3/29/93	LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
1	0'-2'	1-1-7-20		8	(road gravel)	1'					
	2'-4'	11-10-10-9		20	Boulder, quartzite rock	4'				-	
2	4'-6'	NA No blows collected Air hammer used	24/3		Brn, wet F. SAND, some silt, little gravel, tr. blk mineral (KAME SAND DEPOSIT)					0/0	
3	6'-8'		24/6		Brn, wet F. SAND, some silt, some gravel (KAME SAND DEPOSIT)					0/0	
4	8'-10'		24/6		Brn, wet F. SAND, some gravel, some silt (KAME SAND DEPOSIT)	10'				0/0	
5	10'-12'	10-27-36-12 (W9/S1)	24/0	63	No Recovery					-	
6	12'-14'	NA No blows collected Air Hammer used	18/6		Dense, brn, wet SILT, some gravel, little f. sand, tr. blk minerals (ABLATED GLACIAL TILL)					0/0	
7	14'-16'		24/24		Dense, brn, wet SILT, some gravel, little f. sand (GLACIAL TILL)					0/0	
8	16'-18'		24/4		Dense, brn, wet F. SAND, some gravel, little silt, little flecks blk mineral (ABLATED GLACIAL TILL)	18'				1/1	
9	18'-20'		14/2		Gray to white, wet, subround to round GRAVEL, quartzose (ABLATED GLACIAL TILL)					0/0	
10	20'-22'		24/1		Gray to white, wet, subround to round GRAVEL, quartz (ABLATED GLACIAL TILL)	22'				0/0	
11	22'-24'		24/12		Brn, wet SILT, little f. sand, some quartz gravel (ABLATED GLACIAL TILL)					0.2/0	
12	24'-26'		24/6		Brn, wet SILT and F. SAND, some quartz gravel (BASAL GLACIAL TILL)					1/1	
13	26'-28'		24/4		Brn, wet SILT, little f. sand, some quartz gravel (BASAL GLACIAL TILL)					0.6/0.3	
14	28'-30'		24/6		Brn, wet SILT, little f. sand, some quartz gravel (BASAL GLACIAL TILL)			3" casing 4" casing 6" casing		0.3/0.3	

Note: Ambient air 0.0ppm (background level).
* From top of inner steel casing.
6", 4" and 3" casing installed in this interval.

_:w09b.wk1

O'BRIEN & GERE ENGINEERS, INC. — **SOIL BORING LOG** — **LOG NUMBER: W-09B**

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None DRIVER: Yes

O'BRIEN & GERE GEOLOGIST: S. Mogilinicki
BORING CO.: A&W Environmental Drilling
FOREMAN: B. Follett

BORING LOCATION: SW of landfill
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen —, Riser

Sample No.	Sample Depth	Driver Blows	Penetration/Recovery (inches)	"N" Value	Sample Description	Stratum Change Depth	Equipment Installed	SAL 0/00	H/S	PID (ppm)	RMKS*
15	30'-32'	NA	24/6		Brn, wet SILT, little f. sand, some quartz gravel (BASAL GLACIAL TILL)					0.2/0.2	
16	32'-34'	No blows collected Air Hammer used	24/12		Brn, wet SILT and F. SAND, some quartz gravel (BASAL GLACIAL TILL)					0.2/0.0	
17	34'-36'		24/8		Brn, wet SILT, little f. sand, some quartz gravel (BASAL GLACIAL TILL)					0.1/0.3	
18	36'-38'		24/12		Brn, wet SILT, little f. sand, little quartz gravel (BASAL GLACIAL TILL)					0.2/0.1	
19	38'-40'		24/6		Brn, wet SILT, F. SAND and angular quartz, little silt, GRAVEL (BASAL GLACIAL TILL)					0.3/0.2	
20	40'-42'		24/6		Brn, wet SILT, F. SAND and quartz, tr. silt, GRAVEL (BASAL GLACIAL TILL)					0.2/0.2	
21	42'-44'		24/6		Brn, wet SILT, little f. sand, some quartz gravel (BASAL GLACIAL TILL)					0.3/0.1	
22	44'-46'		24/6		Brn, wet SILT, little f. sand, little quartz gravel (BASAL GLACIAL TILL)					0.2/0.4	
23	46'-48'		24/8		Brn, wet SILT, little f. sand, some quartz gravel (BASAL GLACIAL TILL)					0.6/0.2	
24	48'-50'		24/8		Brn, wet SILT, little f. sand, little quartz gravel (BASAL GLACIAL TILL)					0.2/0.1	
25	50'-52'		24/0		No recovery					-/-	
26	52'-54'		24/8		Brn, wet F. SAND, little angular quartz gravel, little silt (BASAL GLACIAL TILL)					0.2/0.0	
27	54'-56'		24/12		Brn, wet SILT, little f. sand, some quartz gravel (BASAL GLACIAL TILL)	56'				0.2/0.1	
28	56'-58'		24/4		Brn and gray quartz GRAVEL, little sand (BASAL GLACIAL TILL)					0/0	

Note: Ambient air 0.0ppm (background level).
* From top of inner steel casing.
6", 4", and 3" casing installed in this interval.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 3 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

'OJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None DRIVER: Yes

O'BRIEN & GERE GEOLOGIST: S. Mogilinicki
BORING CO.: A&W Environmental Drilling
FOREMAN: B. Follett

BORING LOCATION: SW of landfill
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout / Sand Pack / Nat. Form. — Screen / Riser

SAMPLE No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	REMKS*
29	58'-60'	NA	24/8		Brn, wet SILT, little f. sand, little quartz gravel (BASAL GLACIAL TILL)					0.2/0.3	
30	60'-62'	No blows collected Air Hammer used	24/6		Brn, wet SILT, little f. sand, some quartz gravel (BASAL GLACIAL TILL)					0.2/0.4	
31	62'-64'		24/2		Brn, wet SILT, little f. sand, some quartz gravel (BASAL GLACIAL TILL)					0/0	
32	64'-66'		24/0		(No recovery) pink quartzite chips recovered before collecting spoon					-/-	
33	66'-68'		24/8		Brn, wet SILT, little f. sand, some quartz gravel (BASAL GLACIAL TILL)					0/0	
34	68'-70'		24/6		Brn, wet SILT, little f. sand, some quartz gravel (BASAL GLACIAL TILL)					1/1	
35	70'-72'		24/6		Brn, wet SILT, little f. sand, little quartz gravel tr. blk mineral in silt, (BASAL GLACIAL TILL)					0/0	
36	72'-74'		24/6		Brn, wet SILT, little f. sand, some quartz gravel, tr. blk mineral in silt (BASAL GLACIAL TILL)					0.1/0	
37	74'-76'		24/20		Brn, wet SILT, little f. sand, little quartz gravel (BASAL GLACIAL TILL)					0/0	
38	76'-78'		24/20		Brn, wet SILT, little f. sand, little gravel (BASAL GLACIAL TILL)	78'				0/0	
39	78'-80'		24/24		Stiff, white and brn, moist, foliated clay in layers 1/8 to 1/4" thick (Weathered rock or boulder) (WEATHERED SCHIST)	80'				0/0	
40	80'-82'		24/8		Brn, wet SILT, little f. sand, some quartz gravel (BASAL GLACIAL TILL)					0/0	
41	82'-84'		24/4		Brn, wet SILT, little f. sand, some quartz gravel (BASAL GLACIAL TILL) (Top of Weathered Bedrock)	84'				0/0	
42	84'-86'		24/24		Stiff, white and brn, moist, foliated clay in layers (WEATHERED SCHIST)					1.2/1	
43	86'-88'		24/24		Weathering is complete. Occasional layers of kaolin with black manganese streaks					1/1	

Note: Ambient air 0.0ppm (background level).
* From top of inner steel casing.
6", 4" and 3" casing installed in this interval.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 4 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE
ROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None DRIVER: Yes

O'BRIEN & GERE GEOLOGIST: S. Mogilinicki
BORING CO.: A&W Environmental Drilling
FOREMAN: B. Follett

BORING LOCATION: SW of landfill
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout / Sand Pack / Nat. Form. / Screen / Riser

SAMPLE No.	SAMPLE DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S	FIELD TESTING PID (ppm)	R M K S*
44	88'-90'	NA	24/24		SILT and CLAY. Weathering is complete. Occasional layers of kaolin with black manganese streaks					0/0	
45	90'-92'	No blows collected Air Hammer used	24/24		SILT and CLAY. Weathering is complete. Occasional layers of kaolin with black manganese streaks	92'				0/0	
46	92'-94'		0/0		(drive casing; no sample) Material became loose.					0/0	
47	94'-96'		no data		Orange brown, wet, medium to fine SAND, subrounded. Loose and uncemented, possibly (WEATHERED SCHIST)	5-10 Gpm water yield				1.5/1.2	
48	96'-104'				No sample (see fieldbook #3)					-/-	
	104'-106'		24/24		Orange to brn, wet, rounded, quartz, m-c SAND, little f. pebbles with 2" thick silt and clay, gray layers	5-10 Gpm water yield				9.0/8.0	
49	106'-108'		24/0		(No recovery)					-/-	
50	108'-110'		24/24		Orange to brn, wet, f-c quartz, SAND	5-10 Gpm water yield				8.0/8.2	
51	110'-112'		24/24		Orange to brn, brn to white banding, wet, f-m SAND and CLAY layers. Layers are 1/2 to 2" thick and are foliated showing relict bedding	110'				0/-	
52	112'-114'		24/18		Orange to brn, brn to white, f-m SAND and CLAY, with foliation. (WEATHERED SCHIST)					0/-	
53	114'-116'		24/24		Orange to brn, brn to white, wet, f-m SAND and CLAY, with foliation	116'				0/-	
54	116'-118'		24/24		Brn and white and lt blue, moist CLAY, foliated with layers occuring at high and low angles					0/-	
55	118'-120'		24/24		Brn and white and lt blue, moist CLAY, foliated (WEATHERED SCHIST)					0/-	
56	120'-122'		24/24		Brn and white and lt blue, moist CLAY, foliated (WEATHERED SCHIST)					0/-	

Note: Ambient air 0.0ppm (background level).
* From top of inner steel casing.
6", 4" and 3" casing installed in this interval.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 5 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS	FILE No.: 5271.001
ROJECT LOCATION: Bennington/Woodford, VT	DATE 6/21/93 DEPTH 9.32 ELEV. 1069.33	DRILLING METHOD: Hollow Stem Auger/Odex
		SAMPLER TYPE: 3" I.D., 2' Splitspoon
		HAMMER: None FALL: None DRIVER: Yes

O'BRIEN & GERE GEOLOGIST: S. Mogilinicki
BORING CO.: A&W Environmental Drilling
FOREMAN: B. Follett

BORING LOCATION: SW of landfill
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout; Sand Pack; Nat. Form.; Screen; Riser

SAMPLE No.	SAMPLE DEPTH	SAMPLE DRIVER BLOWS	SAMPLE PENETRATION RECOVERY (inches)	SAMPLE "N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S	FIELD TESTING PID (ppm)	RMKS*
57	122'-124'	NA	24/24		Brn and white and lt blue, moist CLAY, foliated (WEATHERED SCHIST)					0/-	
58	124'-126'	No samples collected Air Hammer used	24/18		Top 6" Gray, wet SILT; mid 6" wet, brn SILT; bottom 6" Brn and white, moist CLAY, foliated relict bedrock; top 6" Brn & white & blue, moist					0/-	
59	126'-128'		24/12		CLAY, foliation; bottom 6" Brn, wet SILT (WEATHERED SCHIST)					1/-	
60	128'-130'		24/24		top 12" Brn & wht & blue, moist CLAY, foliation; bottom 12" Brn, wet SILT with white bands of clay (WEATHERED SCHIST)					0/-	
61	130'-132'		24/18		Brn, moist SILT with white bands of clay (WEATHERED SCHIST)					0/-	
62	132'-134'		24/24		Brn, moist SILT with white bands of CLAY (WEATHERED SCHIST)					0/-	
63	134'-136'		24/24		Brn, moist SILT with white bands of CLAY (WEATHERED SCHIST)					0.2/-	
64	136'-138'		24/18		Orange to brn and brn, wet discontinuous bands of SILT and CLAY, with pieces of white limestone (or dolomite)	138'				0/-	
65	138'		6/6		Off-wht to gray, wet chips of limestone (or dolomite), little silt, little clay (WEATHERED DOLOMITE or LIMESTONE)					-	
66	138.5'-143.5'				Off-wht to gray limestone (or dolomite) (WEATHERED SCHIST)					-	
	143.5'-146'				No Sample	146'				-	
	146'-148'		24/18		Brn to wht, pink, orange wet CLAY, complex banding (WEATHERED SCHIST)					0/-	
67	148'-150'		24/18		Brn and wht and blue, wet CLAY, foliation					0.5/-	

Notes: Ambient air 0.0ppm (background level).
One jar headspace reading due to low sample recovery.
* From top of inner steel casing.
6", 4" and 3" casing installed in this interval.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 6 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None DRIVER: Yes

O'BRIEN & GERE GEOLOGIST: S. Mogilinicki
BORING CO.: A&W Environmental Drilling
FOREMAN: B. Follett

BORING LOCATION: SW of landfill
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout, Sand Pack, Nat. Form.; Screen —, Riser

No.	DEPTH	DRIVER BLOWS	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S	PID (ppm)	RMKS*
68	150'-152'	NA No blows collected	2.0/1.2		Dense, rust, white, gray and yellow, wet to dry, SILT and CLAY interbedded with lt gray, v. f. weathered sand laminae and d. gray weathered slate or phyllite containing horizons of wht kaolin					0.0/ 0.0	
69	152'-154'	Air Hammer used	2.0/1.4		Dense, rust orange, wht, lt brn and gray, moist to dry SILT and CLAY, little f. sand, tr. f. pebbles. Laminated parallel to horizontal for 1st ft, perpendicular to horizontal @ 153' to bottom of bedding spoon @ 153.9'. Bottom of spoon parallel to horizontal. (WEATHERED SCHIST)					0.1/ 0.1	
70	154'-156'		2.0/1.7	-	v. dense, red to brn, brn, gray, white laminated CLAY, little silt, tr. f. gravel (WEATHERED SCHIST) Brn to red, moist layer 154.0' to 154.6' laminated. 154.6' to 156' white gray, blk layer with brn laminae across spoon. 155.2' to 156' brn layer as above with deformed beds and weathered blades of feldspar, lt gray, f. quartz angular gravel.					0.1/ 0.0	
71	156'-158'		2.0/1.9	-	dense, brn, lt brn, red brn, white, gray CLAY, little dry to damp silt. laminations parallel and perpendicular to horizon. (WEATHERED SCHIST)					0.1/ 0.0	
72	158'-160'		2.0/1.8	-	dense, brn to lt brn, red brn, gray and d. gray CLAY, some silt, little f. angular quartz, tr. f-c angular quartz sand. Quartz is massive (no angular quartz grains visible with hand lens). Quartz horizons wet. Clay horizons damp to moist. Laminations parallel and perpendicular to horizon. Some wht f. sand quartz in clay matrix.					0.0/ 0.0	
73	160'-162'		2.0/1,8	-	Dense, brn, lt brn, red brn, white, gray and yellow CLAY, little silt, little angular f-m quartz gravel, little to tr. damp to wet f-c angular quartz sand Water at quartz rich horizons. Laminations parallel and perpendicular to horizon.					0.0/ 0.0	

Notes: Ambient air 0.0ppm (background level).
* From top of steel casing.
6", 4" and 3" casing installed in this interval.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 7 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE
ROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER:None FALL:None AIR HAMMER:Yes

O'BRIEN & GERE GEOLOGIST: P. Gottler
BORING CO.: A&W Environmental Drilling
FOREMAN: B. Follett

BORING LOCATION: 200' SSE of exclusion zone
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout; Sand Pack; Nat. Form.; Screen; Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
74	162'-164'	NA No blows collected Air Hammer used	2.0/1.2	-	V. dense, brn, lt brn, CLAY, some silt, little damp f-m quartz gravel, some wht horizons that look like weathered mica, 2 quartz-rich horizons @ 163.5 and 163.8'.					0.0/ 0.1	
75	164'-166'		2.0/1.8	-	V. dense, brn, lt brn, orange brn CLAY, some silt, tr. f. pebbles, tr. f-c sand. Sand and pebbles is lt gray angular quartz. Brn clay laminated with lighter colored brn, brn to tan horizons. Some lt gray to green gray clay horizons that appear to be weathered schist. (WEATHERED SCHIST)					0.1/ 0.0	
76	166'-168'		2.0/2.0	-	V. dense, brn, d. brn, orange brn CLAY, little silt, tr. lt gray, f-m, angular quartz pebbles, tr. dry to damp f-c quartz sand, deformed bed, predominantly horizontal. Gray phylite schist fragments in brn clay matrix. Also f. sand in same brn clay matrix (WEATHERED SCHIST)					0.0/ 0.0	
77	168'-170'		2.0/1.8	-	V. dense, brn, lt brn CLAY, little silt, laminated across the spoon with white laminations that include blk to gray and green weathered crystals and schist fragments as above. Laminate horizontal to top of spoon, bend to vertical.					0.0/ 0.0	

Notes: Ambient air 0.0ppm (background level).
* From top of inner steel casing.
6", 4" and 3" casing installed in this interval.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 8 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: 140 lb. FALL: None

O'BRIEN & GERE GEOLOGIST: M. Randazzo, P. Gottler
BORING CO.: A&W Environmental Drilling
FOREMAN: B. Follett

BORING LOCATION: 200' SSE of exclusion zone
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
78	170'-172'	NA No blows collected Air Hammer used	24/24	-	Brn, damp CLAY, but only moderately cohesive, obvious bedding planes, (WEATHERED SCHIST) ----- Gray, damp CLAY parts are less weathered - more silica content ----- same as 170'-170'6"	170.5 170.7'				0.0/ 0.0	
79	172'-174'		2.0/2.0		v. dense, brn to lt brn CLAY, some silt, laminated across spoon, bending to sides of spoon. Pyrite, hematite modules noted in lt gray horizons which are approx. 0.7' apart. (WEATHERED SCHIST)					0.1/ 0.0	
80	174'-176'		2.0/1.8		V. dense, brn, orange brn, d. brn & lt brn CLAY, little silt, tr. m. sand. Laminated across spoon with a few deformed vertical laminations. Also some lt red to pink horizons. One med sand lamina @ 174.6' (WEATHERED SCHIST)					0.0/ 0.0	
81	176'-178'		2.0/2.0		Dense, brn, d. brn, lt brn, gray, green gray, dry to wet, laminated CLAY, little z. Wet @ bottom of spoon. Laminate vertical and horizontal					0.0/ 0.0	
82	178'-180'		2.0/1.8	-	Dense, brn, tan, d. brn, orange brn, gray, lt gray and wht, laminated CLAY, silt and sand, tr. f. gravel. Material wet to moist, coarse laminae appear to have more water. Gravel fine, angular. Sand f-m, rounded to subrounded. Laminae across top of spoon, perpendicular @ bottom of spoon. A few green to gray weathered schist laminae.					0.0/ 0.0	
83	180'-182'		1.4/1.2	-	V. dense, brn, red brn, tan, gray, green gray, CLAY and SILT, some f-m sand, tr. f. gravel. Laminated across and along spoon. Wet to moist to v. dense gray-green gray clay, some silt. Laminations run across spoon, material looks like weathered gneiss. Sharp contact @ 181'					0.0/ 0.0	
84	182'-185'	26-50/3" (Down hole hammer used)	8/8	>100	Wet to moist, clay texture, (WEATHERED SCHIST)						

Notes: Ambient air 0.0ppm (background level).
* 180' = maximum depth of 6" casing.
4" and 3" steel casing installed in this interval.

BB2:w09b.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 9 OF 22
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 9.32 ELEV.: 1069.33	FILE No.: 5271.001 DRILLING METHOD: Hollow Stem Auger/Odex SAMPLER TYPE: 3" I.D., 2' Splitspoon HAMMER: None FALL: None
O'BRIEN & GERE GEOLOGIST: S. Mogilinicki BORING CO.: A&W Environmental Drilling FOREMAN: P. Thornsbury	BORING LOCATION: 200' SSE of exclusion zone GROUND ELEVATION: 1077.10 DATES: STARTED: 1/4/93 ENDED: 3/29/93	LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
85	185'-187'	50/3"	3/2	>100	Moist, CLAY, (WEATHERED SCHIST)					0.0/-	
86	187'-189'	50/4"	4/1	>100	Blue and wht, moist, CLAY, foliated in bands					0.0/-	
87	189'-191'	50/3"	3/0	>100	No Recovery					-/-	
88	191'-193'	50/6" - 50/1"	7/5	>100	Brn, moist, CLAY with wht streaks					0.0/-	
89	193'-195'	50/4"	4/4	>100	Brn, moist, CLAY with wht streaks (WEATHERED SCHIST)					0.0/-	
90	195'-197'	39-50/1"	7/0	>100	No Recovery	197'				-/-	
91	197'-199'	50/4"	4/4	>100	Gray, dry, weathered phyllitic ROCK	199'				0.0/-	
92	199'-201'	55/6"	6/1	>100	Brn, wet, f. SAND, some silt (SANDY LAYER)					0.0/-	
93	201'-203'	21 - 50/4"	10/4	>100	Brn, wet, m-c SAND, some silt (WEATHERED SANDSTONE)	203'				0.0/-	
94	203'-205'	39 - 50/2"	8/3	>100	Gray, moist, weathered phyllitic ROCK					0.0/-	
95	205'-207'	25-50/3	9/6	>100	Brn, moist, CLAY with wht streaks (kaolin?), little silt					0.0/-	

Notes: Ambient air 0.0ppm (background level).
One jar headspace reading due to low sample recovery.
* 180 - maximum penetration of 6" steel casing.
4" and 3' steel casing installed in this interval.

BBZ:w09b.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 10 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None

O'BRIEN & GERE GEOLOGIST: S. Mogilinicki
BORING CO.: A&W Environmental Drilling
FOREMAN: P. Thornsbury

BORING LOCATION: 200' SSE of exclusion zone
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout; Sand Pack; Nat. Form.; Screen; Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	REMARKS
96	207'-209'	50/6 - 50/2	8/7	>100	Blue gray, wht, orange brn, dry, foliated CLAY, little silt	209'				0.0/-	
97	209'-211'	38-50/4	10/6	>100	Wet, m-c grained SAND, little silt	211'				0.0/-	
98	211'-213'	50/4	4/3	>100	Blue-gray, wht, moist, foliated, CLAY, little sand, tr. angular pebbles-sized quartz fragments					0.0/-	
99	213'-215'	50/4	4/4	>100	Blue-gray, wht, moist, foliated, CLAY, little sand, tr. angular pebble-sized quartz fragments					0.0/-	
100	215'-217'	41-50/2	8/8	>100	Blue-gray, wht, moist, foliated, CLAY, little sand, tr. angular gravel-sized quartz fragments					0.0/-	
101	217'-219'	35-50/3	9/0	>100	No Recovery (WEATHERED SCHIST)					0.0/-	
102	219'-221'	50/4	4/4	>100	Orange-brn, blue-gray, wet, CLAY and SILT					0.0/-	
103	221'-223'	50/6-50/3	9/9	>100	Orange-brn, wet, SILT, tr. wht clay streaks, little grains blk silt, tr. fragments hard gray silt					0.0/-	
104	223'-225'	50/6	6/4	>100	Brn to orange, moist, SILT, tr. wht clay streaks					0.0/-	
105	225'-227'	38-50/2	8/6	>100	Wht and gray bands, orange to brn staining, moist, tr. pink, CLAY, some silt (WEATHERED SCHIST)					0.0/-	
106	227'-229'	36-50/2	8/4	>100	Wht and gray bands, orange to brn staining, moist, CLAY, some silt					0.0/-	

Notes: Ambient air 0.0ppm (background level).
One jar headspace reading due to low sample recovery.
* 180 = maximum penetratin of 6" steel casing.
4" and 3" steel casing installed in this interval.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 11 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

ROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None

O'BRIEN & GERE GEOLOGIST: P. Gottler
BORING CO.: A&W Environmental Drilling
FOREMAN: P. Thornsbury, D. Sylvia

BORING LOCATION: 200' SSE of exclusion zone
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	REMKS*
107	231'-233'	33 - 50/.3	10/8	>100	V. dense, lt brn, brn, gray, CLAY and silt, some f. sand, tr. f. gravel. Laminated ~ 45° down from horizontal. Pebbles mostly off-wht angular quartz with some green gray phyllite/schist	233'				0.0/0.0	
108	233'-235'	26 - 50/.3	10/0	>100	No Recovery (material up casing includes mostly lt brn clay and silt with green gray phyllite and schist)					-/-	
109	235'-237	35 - 50/.2	8/0	>100	No Recovery (material up casing includes mostly lt brn clay and silt with green gray phyllite and schist) (POSSIBLE SANDY LAYER)					-/-	
110	237'-239'	40 - 50/.3	10/0	>100	No Recovery (Resample with 3" O.D. spoon f. quartz and phyllitic gravel) (WEATHERED SANDSTONE)					-/-	
111	239'-241'	50/.4	5/4	>100	V. dense, lt brn, gray, brn and blk, damp to moist, f. SAND, silt and clay, tr. f. gravel. Laminations dipping ~ 45° down from horizontal. Gray clay veins contain schistosic sheen and traces of deep red garnet and blk mica. Mica also appears as lineated mineral in weathered zone.					0.0/0.0	
112	241'-243'	50/5	5/0.0	>100	No Recovery (SANDY LOAM)						
113	243'-245'	60/6	6/5	>100	V. dense, lt brn, tan, f-m SAND, little silt, tr. clay. Laminated ~ 10° off horizontal. Sand moderately well sorted, subround to angular. Blk micaceous laminae and gray clay laminae also present.	245'				0.1/-	
114	245'-247'	90/5	5/4	>100	V. dense, off-wht to yellow, damp to moist, massive CLAY with sharp contact. V. dense brn to lt brn f-m sand, gray clay veins laminated across spoon. Sand grains subrounded to subangular.					0.1/-	
115	247'-249'	65/4	4/0	>100	No Recovery						

Notes: Ambient air 0.0ppm (background level).
One jar headspace reading due to low sample recovery.
* 180 = maximum penetration of 6" steel casing.
4" and 3" steel casing installed in this interval.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B
		SHEET 12 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None

O'BRIEN & GERE GEOLOGIST: P. Gottler
BORING CO.: A&W Environmental Drilling
FOREMAN: P. Thornsbury, D. Sylvia

BORING LOCATION: 200' SSE of exclusion zone
GROUND ELEVATION:
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout / Sand Pack / Nat. Form. / Screen / Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
116	249'-251'	55/6	6/2	>100	V. dense, brn to lt brn, moist to wet, f-m SAND, little clay, tr. silt. Laminated horizontally clay lt brn with some lt gray veins of weathered schist. (SANDY LAYER)	249'				0.0/0.0	
117	251'-253'	90/5	5/2	>100	V. dense, lt brn to orange brn, wet to damp, f-m SAND and silt, little clay. Laminated vertically. Gray clay veins running parallel to horizontal. (WEATHERED SANDSTONE)					0.0/0.0	
118	253'-255'	77/6	6/2	>100	V. dense, orange-brn to brn, moist to wet, f-m SAND, little silt, tr. clay. Some blk mica laminae, some gray phyllitic veins. No apparent trend to laminae orientation. (SANDY LOAM)					0.0/0.0	
119	255'-257'	100/5	6/2	>100	V. dense, orange-brn to d. brn-gray, wet to moist, f. SAND, some silt, tr. lt brn and gray clay. Laminated, dipping ~30° from horizontal. Sand rounded to subangular, lt gray, d. red, pink, blk quartz. Gray clay as in veins					0.0/0.0	
120	257'-259'	100/6	6/2	>100	V. dense, orange to brn, d. brn, gray, wet to moist, f-m SAND, some silt, tr. wht to yellow clay in matrix, gray clay as in veins. Sand rounded to subangular quartz. Driller noted change @ 258'.	259'				0.0/0.0	
121	259'-261'	26 - 50/5	11/10	>100	V. dense, brn-d. brn to gray-pink, wet to damp CLAY, tr. c. sand. Laminated perpendicular to horizon. Sand is d. red garnet in gray to lt gray clay matrix. (WEATHERED SCHIST)					0.0/0.0	
122	261'-263'	25 - 50/4	10/8	>100	V. dense, gray, lt gray, red, brn and wht, damp to wet, CLAY, f. gravel size garnet hopper crystals. Laminae horizontal at top of spoon (red and gray) and vertical (wht and brn) at bottom. Sharp contact.					0.0/0.0	
123	263'-265'	8 - 50/5	11/8	>100	V. dense, brn and wht, damp to wet, CLAY, some silt, tr. c. sand. Laminations horizontal to top, vertical to bottom of spoon.					0.0/0.0	
124	265'-267'	14 - 50/5	11/11	>100	Soft-v. dense, brn-wht to red-pink, moist to wet, CLAY, little silt, tr. sand sized garnet crystals. Laminated perpendicular to horizon. (WEATHERED SCHIST)					0.0/0.0	

Notes: Ambient air 0.0ppm (background level).
* 180 = maximum penetration of 6" casing.
4" and 3" steel casing installed in this interval.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 13 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE
ROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None

O'BRIEN & GERE GEOLOGIST: P. Gottler
BORING CO.: A&W Environmental Drilling
FOREMAN: P. Thornsbury, D. Sylvia

BORING LOCATION: 200' SSE of exclusion zone
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL 0/00	H/S	PID (ppm)	RMKS*
125	267'-269'	25 - 50/5	11/11	>100	V. dense, brn and wht, moist to wet, CLAY with thin red laminae in wht horizons. Tr. silt in brn laminae. Laminations perpendicular to horizontal. Tr. garnet. (WEATHERED SCHIST)					0.0/0.0	
126	269'-271'	23 - 50/5	11/11	>100	V. dense, off-wht to lt gray, moist to wet, CLAY with thin laminae of red clay. Laminations running perpendicular to horizontal. Deep red garnet crystals common ≤1mm diameter.					0.0/0.0	
127	271'-273'	8-24-50/6	18/16	>100	Soft to v. dense, brn and wht, moist to wet, CLAY, tr. silt. Laminated perpendicular to horizontal. Some wht kaolin masses (not laminae), some gray clay laminae that looks like weathered phyllite, few garnet crystals.					0.0/0.0	
128	273'-275'	18 - 50/5	11/8	>100	V. dense, brn-d. brn to red-brn to lt gray-wht, moist to wet, CLAY, little silt, little angular lt gray quartz gravel, tr. f-c angular quartz sand. Gravel angular and present as a single horizon. Laminated perpendicularly.					0.0/0.0	
129	275'-277'	18 - 50/6	12/12	>100	V. dense, d. brn, blk, red-brn, gray, lt gray, wht damp to wet, laminated CLAY, little silt, tr. angular lt gray quartz gravel, tr. f-c angular quartz sand. Laminations perpendicular to horizontal. Some laminae deformed. Gneissic gravel, quartz, feldspar, (WEATHERED SCHIST)					0.0/0.0	
130	277'-279'	31?? - 50/5	11/10	>100	V. dense, blk, wht, pink, d. gray-blue gray, damp to wet, horizontally laminated CLAY, little silt, little massive lt gray quartz from 2 separate veins, tr. f-c sand at veins. Also, pyrite cube observed in wht clay.					0.0/0.0	
131	279'-281'	31 - 50/4	10/8	>100	V. dense, orange-brn, d. red-brn, wht and gray moist to wet, CLAY, little silt, little lt gray angular f-c quartz gravel, tr. angular f-c quartz gravel. Laminated horizontally 2 quartz veins.					0.0/0.0	
132	281'-283'	8 - 50/5	11/11	>100	V. dense, orange-brn, brn, wht, gray, moist to wet, CLAY, little silt. Laminated horizontally >50 laminations per 0.1'.					0.0/0.0	

Notes: Ambient air 0.0ppm (background level).
* 180 = maximum penetration of 6" casing.
4" and 3" steel casing installed in this interval.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B
		SHEET 14 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None

O'BRIEN & GERE GEOLOGIST: P. Gottler
BORING CO.: A&W Environmental Drilling
FOREMAN: P. Thornsbury, D. Sylvia

BORING LOCATION: 200' SSE of exclusion zone
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen —, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
133	283'-285'	17 - 50/6	12/12	>100	V. dense, red to pink, lt gray to wht, moist to wet, CLAY, tr. c. sand sized garnet crystals. Laminated horizontally. V. dense, brn to d. brn and blk, damp to wet, CLAY and SILT. Laminated horizontally. Sharp contact. V. dense, lt brn, gray, wht, damp to wet, CLAY, little silt. Laminated horizontally.					0.0/0.0	
134	285'-287'	11 - 50/6	12/12	>100	V. dense, brn, gray, wht, damp to wet, CLAY and silt, little lt gray angular quartz gravel, tr. angular f-c quartz sand. Laminated ~ horizontal, quartz veins running vertical.					0.0/0.0	
135	287'-289'	32 - 50/4	10/10	>100	V. dense, off-wht, red, brn, d. brn, yellow, damp to wet, CLAY, little silt, little f-c lt brn gravel, tr. lt gray quartz gravel. Garnet crystals present. Laminated horizontally, deformed laminae. (WEATHERED SCHIST)					0.0/0.0	
136	287'-289'	33 - 50/5	11/10	>100	V. dense, brn and wht, red, damp to wet, CLAY laminae, little angular lt gray quartz gravel, tr. f-c angular quartz sand. Laminated horizontally. Wet at quartz veins, clay damp.					0.0/0.0	
37	291'-293'	28 - 50/5	11/10	>100	V. dense, brn and wht, d. red to brn, CLAY and silt, little gravel, tr. f-c sand. Laminated horizontally, >30/0.1'. Gravel angular chips of quartz arenite, f. rounded grains. (WEATHERED SCHIST)					0.0/0.0	
138	293'-295'	30 - 50/2	8/8	>100	V. dense, d. brn, wht, lt gray, damp to wet, CLAY, some silt, little angular gravel, tr. f-c sand. Laminated horizontally with >30 laminations per 0.1'. (Mostly d. brn clay laminae alternating with wht laminae [kaolin?]. Occasional competent laminae [quartz?], lt gray that is massive. The quartz-rich horizons are broken up and are wet, contain some f-c quartz sand. There are usually wht kaolin laminae adjacent to quartz. Some of these wht laminae are within massive quartz horizons.)					0.0/0.0	
139	295'-297'	20 - 50/4	10/8	>100	V. dense, d. brn, wht and gray, moist to wet, CLAY, little silt, little f. angular lt gray quartz gravel as a single horizon, tr. f-c quartz sand at same horizon. Laminated ~ horizontal. V. dense, gray, red, brn, moist to wet, CLAY, tr. silt, tr. f. quartz gravel. Laminated ~ horizontal.					0.0/0.0	

Notes: Ambient air 0.0ppm (background level).
* 180 = maximum penetration of 6" steel casing.
4" and 3" steel casing installed in this interval.

DBZ:w09b.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 15 OF 22
CLIENT: BURGESS BROS. SUPERFUND SITE ROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE 6/21/93 DEPTH 9.32 ELEV. 1069.33	FILE No.: 5271.001 DRILLING METHOD: Hollow Stem Auger/Odex SAMPLER TYPE: 3" I.D., 2' Splitspoon HAMMER: None FALL: None
O'BRIEN & GERE GEOLOGIST: P. Gottler BORING CO.: A&W Environmental Drilling FOREMAN: P. Thornsbury, D. Sylvia	BORING LOCATION: 200' SSE of exclusion zone GROUND ELEVATION: 1077.10 DATES: STARTED: 1/4/93 ENDED: 3/29/93	LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
140	297'-299'	28 - 50/5	11/8	>100	V. dense, d. brn, blk, tan, wht, moist to wet, CLAY, little angular quartz gravel, little silt, tr. f-c quartz sand. Garnet cubes, blk veins of iron-rich precipitate. Laminated horizontally >20/.1'. Blk vein material is hematite.					0.0/0.0	
141	299'-301'	18 - 50/5	11/11	>100	V. dense, d. brn, wht, bronze, gray, blue-gray, red, blk, silver, damp to wet, CLAY and silt, tr. angular lt gray quartz gravel, tr. f-c sand. Weathered phyllite lens, bronze silt horizon and red clay with garnet horizon. Laminated horizontally.					0.0/0.0	
142	301'-303'	30 - 50/5	11/10	>100	V. dense, brn, d. brn, wht, damp to wet, CLAY and silt. Laminated horizontally, >30 laminae per 0.1'. V. dense, wht, brn, yellow, damp to wet, CLAY and silt. Horizontally laminted.					0.0/0.0	
143	303'-305'	20 - 50/5	11/4	>100	V. dense, off-wht, yellow, red, lt brn, damp to wet, CLAY, tr. c. sand sized blk cubic crystals. Laminated horizontally. Off-wht to yellow laminations weathered mica. >50 laminae per 0.1'.					0.0/0.0	
144	305'-307'	22 - 50/5	11/7	>100	V. dense, off-wht, lt gray, yellow, red, brn, dry to moist, CLAY, tr. silt. Horizontally laminated with >30 laminae per 0.1'. Cubic and sometimes tabular d. red to blk crystals of c. sand size still present. Oxidization can sometimes be seen on crystal faces. Increasing brn laminae toward bottom of spoon.					0.0/0.0	
145	307'-309'	50/6	6/6	>100	V. dense, gray and wht, moist to wet, CLAY, some silt. Laminated horizontally with >30 laminae per 0.1'. Little f-c wht quartz sand with brn staining. (WEATHERED SCHIST)					0.0/0.0	
146	309'-311'	50/5	5/2	>100	v. dense, brn, wht, red, d. brn, CLAY and silt, tr. f. quartz gravel. Laminated horizontally.					0.0/0.0	
147	311'-313'	38 - 50/5	11/6	>100	V. dense, wht, brn, d. brn, tr. red, moist to wet, CLAY and silt, tr. f-c quartz sand. Laminated horizontally. Laminated, wht massive clay kaolin toward bottom of spoon.					0.0/0.0	

Notes: Ambient air 0.0ppm (background level).
* 180 = maximum penetration of 6" steel casing.
4" and 3" steel casing installed in this interval.

BB2:w09b.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 16 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE	GROUNDWATER LEVELS			FILE No.: 5271.001
	DATE	DEPTH	ELEV.	DRILLING METHOD: Hollow Stem Auger/Odex
PROJECT LOCATION: Bennington/Woodford, VT	6/21/93	9.32	1069.33	SAMPLER TYPE: 3" I.D., 2' Splitspoon
				HAMMER: None FALL: None

O'BRIEN & GERE GEOLOGIST: P. Gottler	BORING LOCATION: 200' SSE of exclusion zone	LEGEND: Grout / Sand Pack / Nat. Form. — Screen / Riser
BORING CO.: A&W Environmental Drilling	GROUND ELEVATION: 1077.10	
FOREMAN: P. Thornsbury, D. Sylvia	DATES: STARTED: 1/4/93 ENDED: 3/29/93	

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S	FIELD TESTING PID (ppm)	REMARKS*
148	313'-315'	50/5	5/4	>100	V. dense, gray and wht to off-wht, moist to wet, CLAY and silt, gravel chunks of wheathered phyllite. Horizontally laminated. >30 laminae per 0.1'. Some orange brn clay veins, tr. wht to bone quartz, f-c sand laminae/veins.					0.0/0.0	
149	315'-317'	28 - 50/5	11/8	>100	V. dense, gold, d. brn, lt brn, blue gray, damp to wet, CLAY and silt, little angular deep red gravel, tr. angular f-c sand. Horizontally laminated. Gold silt zones, gravel iron-rich horizons. (WEATHERED SCHIST)					0.0/0.0	
150	317'-319'	50/5	5/4	>100	V. dense, brn, d. brn, lt brn, off-wht, blue gray, CLAY and silt, tr. f-c sand. Vertically laminated. Sand/blk crystals hematite.					0.0/0.0	
151	319'-321'	50/6	6/4	>100	V. dense, brn, d. brn, blk, lt gray, CLAY and silt, tr. gravel and f-c sand. Laminated running ~45° from horizontal. Gravel angular, f. iron-rich, blk to d. brn quartz. Sand also brn to d. brn quartzite. Lt gray clay laminae appears to have micaceous character.	321'				0.0/0.0	
152	321'-323'	50/6	6/5	>100	V. dense, lt brn, gold, wet, f. SAND interlaminated with wht clay, little silt in f. sand laminae. Laminae ~ horizontal. V. dense, red brn, wet m. SAND, little silt. (WEATHERED SCHIST)	323'				0.0/0.0	
153	323'-325'	22 - 50/5	11/8	>100	V. dense, lt brn, wht, wet, CLAY, tr. silt. Laminated horizontally. Tr. sand sized d. red to blk garnet crystals. (WEATHERED SCHIST)					0.0/0.0	
154	325'-327'	50/6	6/4	>100	V. dense to med dense, lt gray, wet, vertically laminated CLAY (weathered schist-phyllite), orange brn, f-m sand, little silt, tr. clay. Sand quartz subrounded to subangular. (WEATHERED SCHIST)	327'				0.0/0.0	
155	327'-329'	50/6	6/5	>100	V. dense, brn, orange brn, gold, wet, f-m SAND, some silt, tr. clay. Laminated horizontally. Few silt laminae.					0.0/0.0	

Notes: Ambient air 0.0ppm (background level).
* 180 = maximum penetration of 6" casing.
4" and 3" steel casing installed in this interval.

bb2:w09b.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B
		SHEET 17 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None

O'BRIEN & GERE GEOLOGIST: P. Gottler, M. Randazzo
BORING CO.: A&W Environmental Drilling
FOREMAN: P. Thornsbury, D. Sylvia

BORING LOCATION: 200' SSE of exclusion zone
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)
156	329'-331'	50/6	6/4	>100	V. dense, orange to brn, brn, lt brn, wet, f-m SAND, some silt, tr. clay. Laminated horizontally, bedded. Sand subround quartz.					0.0/0.0
157	331'-333'	50/5	5/3	>100	V. dense, orange brn, brn, lt brn, wet, f-m SAND, little silt, tr. brn clay. Horizontal brading/laminae. (WEATHERED SCHIST)					0.0/0.0
158	333'-335'	28 - 50/6	12/11	>100	V. dense, brn, wht, orange-brn, wet, m. SAND, little f. sand, tr. silt, tr. clay. Some gravel sized chunks of silica cemented sand. Horizontal bedding.					0.0/0.0
159	335'-337'	50/5	5/4	>100	V. dense, d. brn, brn, lt brn, wet, f-m quartz SAND, little silt, tr. clay. Laminated vertically. Quartz sand subround to subangular.					0.0/0.0
160	337'-338'	36 - 50/8	12/6	>100	Loosely cemented, brn with streaks of wht (not kaolin), moist to wet, SANDSTONE, med SAND, tr. silt and f. sand, no stratification noticed. Only 1 headspace performed due to poor recovery.					0.0/-
161	339'-339.9'	30 - 50/5	11/1	>100	Loosely cemented, d. brn to wht, moist to wet, SANDSTONE. Bedding planes parallel to spoon. (WEATHERED SCHIST)					0.0/-
162	341'-342.8'	35-23-50/3	15/10	>100	Brn to lt brn to wht, wet, SAND, tr. silt, f. sand (WEATHERED SCHIST) Lt brn, wet, SAND and SILT, tr. med sand.					0.0/-
163	341'-346'	core rate 2 1/2 - 3 min/ft	60/0	-	No Recovery ---	346'				-/-
164	346'-348'	core rate 1' for 2 min	24/4	-	Brn to wht, damp, clayey SILT, little f. sand, weathered foliated schist with streaks of kaolin, pieces of quartzite sandstone noticed @ top of sample.					0.0/-

Notes: Ambient air readings 0.0ppm (background level).
Single jar headspace reading due to low recovery.
From 341' on, used 5' core barrel with NQ system.
* 180 = maximum penetration of 6" steel casing.
4" and 3" steel casing installed in this interval.

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 18 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE
ROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS

DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None

O'BRIEN & GERE GEOLOGIST: M. Randazzo
BORING CO.: A&W Environmental Drilling
FOREMAN: P. Thornsbury

BORING LOCATION: 200' SSE of exclusion zone
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S	FIELD TESTING PID (ppm)
165	348'-350'	core rate 1' for 4 1/2 min	24/7	-	D. brn to wht, damp, CLAY, little silt texture. (WEATHERED SCHIST)					0.0/-
166	350'-351'	-	12/12	-						0.0/-
167	351'-353'	core rate 1'/2m 50 sec 1'/3m 10 sec	24/7	-	Brn to wht, damp, CLAY, little silt, moderate plasticity (WEATHER SCHIST)					0.0/-
168	353'-355'	core rate 1'/2min 40 sec 1'/2min 30 sec	24/4	-	Brn to wht, damp, CLAY, little silt, moderate plasticity (WEATHERED SCHIST)					0.0/-
169	355'-357'	core rate 1'/2min	24/0	-	No Recovery					-/-
170	357'-359'		24/3	-	Brn to wht, damp, CLAY, little silt (WEATHERED SCHIST)					0.0/-
171	359'-361'		24/0	-	No Recovery	361'				-/-
172	361'-363'	core rate 4 min/1' 6 min/1'	24/0		Loose, quartz SAND in clayey material, quartz round to subangular. (WEATHERED SANDSTONE)					-/-
173	363'-366'	core rate 4 min/1' 5 min/1' 5 min/1'	36/0		Loose, quartz SAND based on return of cuttings					-/-

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B
		SHEET 19 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE
ROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 1-3/8" I.D. Splitspoon
HAMMER: 140 lbs FALL: 30"

O'BRIEN & GERE GEOLOGIST: M. Randazzo
BORING CO.: A&W Environmental Drilling
FOREMAN: P. Thornsbury

BORING LOCATION: 200' SSE of exclusion zone
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout / Sand Pack / Nat. Form. — Screen / Riser

No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	SAL. 0/00	H/S	PID (ppm)	RMKS*
174	366'-369.5'	core rate 6 min/1' 7 min/1' 7 min/1' ??/.5'	42/0	-	Loose, quartz SAND	369.5'				0/0	
175	369.5'-371'	core rate 3 min/1' 1 min/0.5'	18/12	-	Soft, orange, brn and wht, wet interbedded silty CLAY and kaolin beds, some quartz					0/0	
176	371'-376'	core rate 4 min/1'	60/6	-	Soft, orange to brn, wet, silty CLAY, kaolin lenses					0/0	
177	376'-378'	core rate 4 min/1'	24/3	-	Wht to gray, damp, clayey SILT, high plasticity, streaks of brn (primarily kaolin) (WEATHERED SCHIST)					0.0/-	
178	378'-380'	core rate 2 min/1' 2 min/1'	24/19	-	Lt brn to d. brn to wht, moist, silty CLAY, tr. m-c sand, moderate plasticity, some crystal grains visible, (WEATHERED SCHIST)					0/0	
179	380'-382'	core rate 2 min/1' 2 min/1'	24/8	-	Lt brn, tr. wht, moist, silty CLAY, med sand, some crystal grains					0.0/-	
180	382'-384'	core rate 3 min/1' 3 min/1'	24/14	-	Lt brn, moist, tr. wht to gray to reddish, CLAY, some small stones, m-c pebbles					0/0	
181	384'-386'	core rate 3 min/1' 3 min/1'	24/21	-	Lt brn, tr. wht, SILT and CLAY, some d. gray, moist, some med pebbles and small stones (WEATHERED SCHIST)					0/0	
182	386'-388'	core rate 3 min/1' 6 min/1'	24/19	-	Brn to red to wht, dry to moist, SILT, weathered rock, clay size particles near end of sample. Weathered quartzine siltstone					0/0	

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 20 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE: 6/21/93 DEPTH: 9.32 ELEV.: 1069.33	FILE No.: 5271.001 DRILLING METHOD: Hollow Stem Auger/Odex SAMPLER TYPE: 3" I.D., 2' Splitspoon HAMMER: None FALL: None
O'BRIEN & GERE GEOLOGIST: P. Gottler, Deanna Skapiak BORING CO.: A&W Environmental Drilling FOREMAN: P. Thornsbury	BORING LOCATION: 200' SSE of exclusion zone GROUND ELEVATION: DATES: STARTED: 1/4/93 ENDED: 3/29/93	LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S	FIELD TESTING PID (ppm)	RMKS*
183	388'-391'	core rate 3 min/1' 4 min/1' 4 min/1'	26/36	-	Ocher, dry to moist, weathered rock quartz, iron stained, SANDSTONE and conglomerate, gravel to clay size possible through sandstone to conglomerate. Possible manganese oxide.					0/0	
184	391'-393.5'	core rate 3 min/1'	30/28	-	Red to brn, moist to dry, weathered ROCK, possible parent sandstone, several thin zones blk, natural organic, wht mineral deposit (calcite) (WEATHERED SCHIST)					0/0	
185	393.5'-396'	core rate 4 min/1'	30/30	-	Red to brn, moist to dry, weathered ROCK, some blk natural organic, some wht mineral deposits					0/0	
186	396'-398.5'	core rate 2 min/1'	30/28	-	Red to brn, dry to moist, weathered ROCK, some wht med to small gravel, quartz particles. Small stones broken.					0/0	
187	398.5'-401'	core rate 2 min/1'	30/30	-	Lt brn, dry to moist, tr. wht med sand, some grains, crystals (WEATHERED SCHIST)					0/0	
188	401'-403.5'	core rate 2 min/1'	30/29	-	Wht, reddish brn, moist to dry, med to small GRAVEL, wht mixed quartz grains, weathered sandstone, iron staining, undercomposed crystal, weathered wht material					0/0	
189	403'-405.5'	core rate 1 min/5" 5 min/1' 7 min/1'	30/8	-	Wht, moderately weathered quartz conglomerate. sandstone pebbles within the conglomerate	405.5'				0.0/-	
190	405.5'-406'	core rate 3 min/6"	30/6	-	Well cemented quartz/sandstone (WEATHERED SCHIST)					0/0	
191	406'-410.5'	core rate 6 min/1' 7 min/1' 7 min/1' 7 min/1'	54/56	-	Well cemented, wht quartz SANDSTONE, quartz cement. Rock is fresh to dry slightly weathered. (COMPETENT BEDROCK)					0/0	

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 21 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE

PROJECT LOCATION: Bennington/Woodford, VT

GROUNDWATER LEVELS		
DATE	DEPTH	ELEV.
6/21/93	9.32	1069.33

FILE No.: 5271.001
DRILLING METHOD: Hollow Stem Auger/Odex
SAMPLER TYPE: 3" I.D., 2' Splitspoon
HAMMER: None FALL: None

O'BRIEN & GERE GEOLOGIST: D. Skapiak
BORING CO.: A&W Environmental Drilling
FOREMAN: P. Thornsbury

BORING LOCATION: 200' SSE of exclusion zone
GROUND ELEVATION: 1077.10
DATES: STARTED: 1/4/93 ENDED: 3/29/93

LEGEND: Grout, Sand Pack, Nat. Form., Screen, Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S	PID (ppm)	RMKS*
192	410.5'-412.5	core rate 6 min/1' 12 min/1'	60/24	-	Well cemented, wht quartz SANDSTONE, quartz cement						
193	412.5'-415.5'	core rate 8 min/1' 8 min/1' 8 min/1'	60/32	-	Well cemented, wht quartz SANDSTONE, quartz cement (COMPETANT BEDROCK)						
194	416'-418.5'		30/24		Wht to gray, quartz cemented quartz SANDSTONE, v. small number of d. minerals. Many leached producing secondary porosity, fractures, some calcite or gypsum						
195	418.5'-419.5'		12/6		Wht to gray, quartz cemented quartz SANDSTONE, v. small number of d. minerals. Many leached producing secondary porosity, fractures, some calcite or gypsum						
196	419.5'-421'		18/6		Wht to gray, quartz cemented quartz SANDSTONE, v. small number of d. minerals. Many leached producing secondary porosity, fractures, some calcite or gypsum, extremely broken fragments, much secondary porosity						
197	421'-424.5'		42/3		Wht to gray, quartz cemented quartz SANDSTONE, v. smsll number of d. minerals. Many leached producing secondary porosity, fractures, some calcite or gypsum, extremely broken fragments, much secondary porosity						
198	424.5'-428.5'		48/3		Gray, quartz cemented quartz SANDSTONE, some secondary cement by calcite, much secondary porosity, vertical fractures (COMPETANT BEDROCK)						
199	428.5'-436.5		96/8		Gray, quartz cemented quartz SANDSTONE, slightly more calcite cement, much secondary porosity due to removal of d. mineral, some thin calcite filled veins						

-ob2:w09b.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W-09B SHEET 22 OF 22

CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE / DEPTH / ELEV. 6/21/93 / 9.32 / 1069.33	FILE No.: 5271.001 DRILLING METHOD: Hollow Stem Auger/Odex SAMPLER TYPE: 3" I.D., 2' Splitspoon HAMMER: None FALL: None
O'BRIEN & GERE GEOLOGIST: D. Skipiak BORING CO.: A&W Environmental Drilling FOREMAN: P. Thornsbury	BORING LOCATION: 200' SSE of exclusion zone GROUND ELEVATION: 1077.10 DATES: STARTED: 1/4/93 ENDED: 3/29/93	LEGEND: Grout / Screen Sand Pack / Riser Nat. Form.

SAMPLE No.	SAMPLE DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	FIELD TESTING H/S	FIELD TESTING PID (ppm)	RMKS*
200	436.5'-440.5'		48/4	-	Gray, quartz cemented quartz, secondary porosity, grains identifiable as above for upper 2½'. Lower 1½': interlayered, quartz but alternating finer grained - higher mineralization with other less oxydized and less well cemented						
201	440.5'-444.5'		0/6		(Lost core after run due to worn core lifter - recovered .5 after return down hole to try to pick up core) Material recovered @ .5' same as above but highly broken (COMPETANT BEDROCK)						
202	444.5'-446'		18/18		Gray, quartz cemented quartz SANDSTONE or quartzite, little secondary porosity from decomposed grains, little evidence of calcite secondary cement, several vertical fractures						
203	446'-448.7'		32/31		Gray to rust, quartz cemented quartz SANDSTONE/ quartzite, secondary porosity due to decomposed grains not evident, little evidence of calcite secondary cement, several vertical fractures						
204	448.7'-451.5'		2.5		Quartz gray cemented quartz SS, top 2' vertical fracture, some lessaging bonding, bottom 1' highly fractured						
205	451.5-453		1		Gray, quarts cemented quartz SS highly fragmented multiple cross cutting fractures evident						
206	453-458.7		5		Gray quartz cemented quartz SS, multiple vertical fractures some lessaging bonding						
207	458.7'-459.7'		1		Gray quartz cemented quartz SS, largest piece 2-3", crosscutting vertical fractures.						
208	459.7'-462		2.5		Gray quartz cemented qurtz SS, some Fe staining a few pyritexyls identified, several vertical fractures (60')						
209	462'-466'		3.5		Gray quartz cemented quartz SS, multiple vertical fractures BOTTOM OF BORING						

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W25B (1) SHEET 1 OF 2 (Boring Abandoned)
CLIENT: BURGESS BROS. SUPERFUND SITE PROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE / DEPTH / ELEV. approx. 3.00	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 2" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: M. Randazzo BORING CO.: A&W Environmental Drilling FOREMAN: P. Thornsbury	BORING LOCATION: South of landfill GROUND ELEVATION: approx. 1088.38 DATES: STARTED: 1/12/93 ENDED: 1/15/93	LEGEND: Grout / Sand Pack / Nat. Form. / Screen / Riser

SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
	0'-2'				(see log for boring W25/S1) Lt blk, F. SAND, some silt						
1	2'-4'	8-22-32-43	24/24	54	V. Dense, d. brn to lt brn, damp to wet, F. SAND, some silt grading to silty f. sand					0.1/ 0.1	
2	4'-6'	16-18-20-22	24/10	38	Dense, tan-lt brn, wet, med SAND, little silt, tr. cobbles grading to silty f. sand. This texture sequence is repeated a number of times in spoon. (KAME SAND DEPOSIT)					0.8/ 0.8	
3	6'-8'	14-19-17-8	24/16	36	Dense, tan-lt brn, wet, med SAND, little silt, tr. cobbles grading to silty f. sand. This texture sequence is repeated a number of times in spoon. (KAME SAND DEPOSIT)	8'				1.1/ 1.5	
4	8'-10'	3-7-5-5	24/20	12	Med dense, brn, wet, SILT, little clay, c. sand to med pebbles, not as well sorted as above (ABLATED GLACIAL TILL)					0.3/ 0.3	
5	10'-12'	14-29-75/5	17/16	>100	Dense, brn, wet, SILT, little clay, c. sand to med pebbles Splitspoon refusal - large cobble	11'6"				0.2/ 0.2	
6	13'-15'	4-10-13-15	24/14	23	Med dense, brn, wet, SILT, little clay, c. sand to med pebbles (ABLATED GLACIAL TILL)					0.2/ 0.2	
7	15'-17'	13-13-16-14	24/8	29	Med dense, brn, wet, SILT, little clay, c. sand to med pebbles (ABLATED GLACIAL TILL)	17'				0.2/ 0.2	
8	17'-19'	70-55-24-44	24/18	79	V. Dense, brn, damp TILL: F. SANDY SILT, little c. sand, c. pebbles, cobbles (BASAL GLACIAL TILL)					0.2/ 0.1	

Field testing/PID column presents soil screening results.

...2:w25b1.wk1

O'BRIEN & GERE ENGINEERS, INC.	SOIL BORING LOG	LOG NUMBER: W25B (1) SHEET 2 OF 2 (Boring Abandoned)
CLIENT: BURGESS BROS. SUPERFUND SITE 'ROJECT LOCATION: Bennington/Woodford, VT	GROUNDWATER LEVELS DATE / DEPTH / ELEV. approx. 3.00	FILE No.: 5271.001 DRILLING METHOD: 4 1/4" Hollow Stem Auger SAMPLER TYPE: 2" Splitspoon HAMMER: 140 lbs FALL: 30"
O'BRIEN & GERE GEOLOGIST: M. Randazzo BORING CO.: A&W Environmental Drilling FOREMAN: P. Thornsbury	BORING LOCATION: South of landfill GROUND ELEVATION: approx. 1088.38 DATES: STARTED: 1/12/93 ENDED: 1/15/93	LEGEND: Grout / Sand Pack / Nat. Form. / Screen / Riser

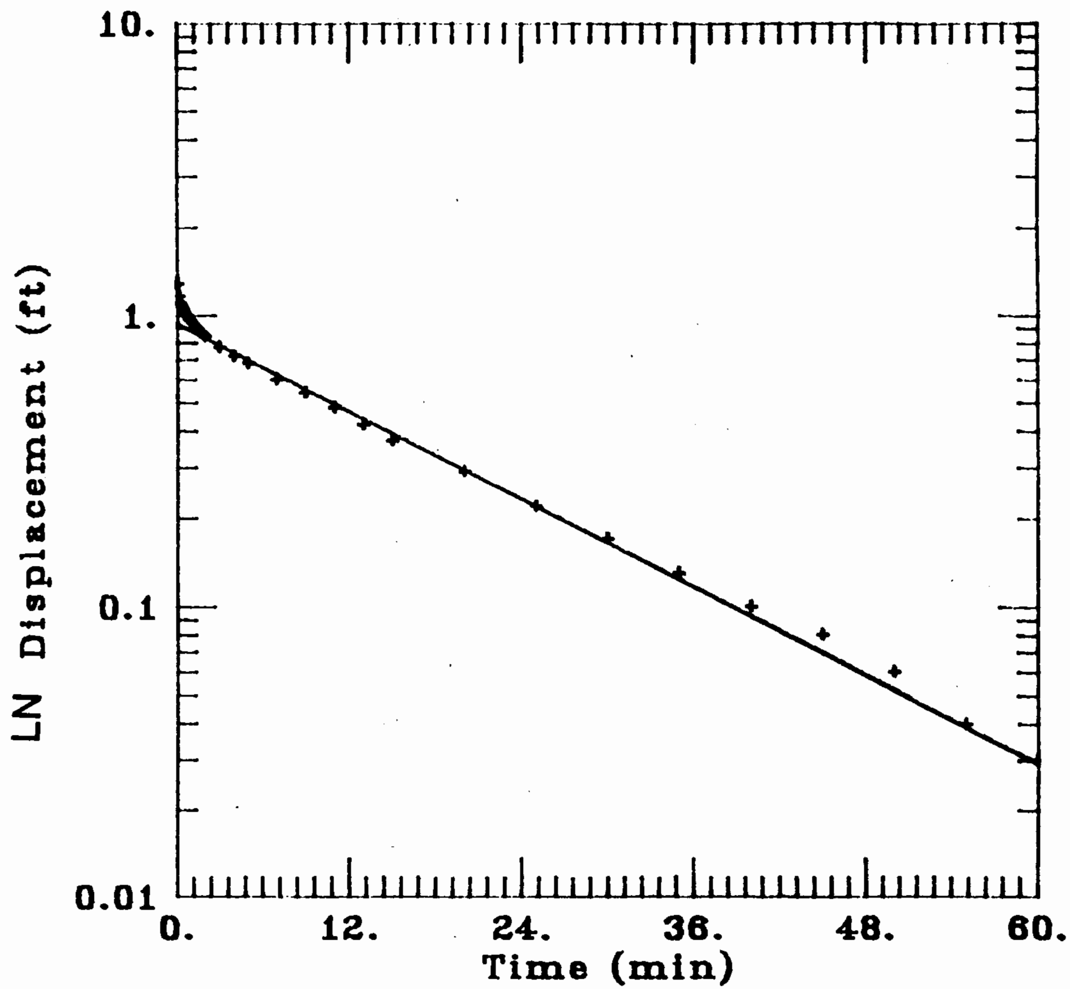
SAMPLE No.	DEPTH	BLOWS /6"	PENETRATION RECOVERY (inches)	"N" VALUE	SAMPLE DESCRIPTION	STRATUM CHANGE DEPTH	EQUIPMENT INSTALLED	FIELD TESTING SAL. 0/00	H/S (ppm)	PID (ppm)	RMKS*
9	20'-22'	88-90-68	24/20	>100	V. dense, brn, damp, f. SILT sandy, little c. sand, c. pebbles, cobbles (BASAL GLACIAL TILL) (Boulder 22'6"-23'6")					2.1/ 1.3	
10	25'-27'	16-68-45-100/3-1/2"	21/21	>100	V. dense, brn, moist, f-m SILT sandy, little c. sand to c. pebbles, tr. clay (BASAL GLACIAL TILL) Frequent boulders and cobbles from 26.5'-29'					1.9/ 0.9	
					BOTTOM OF BORING @ 29' (See Next Log)						

Notes:
- Boulder encountered @ 26'6", crew augered to 29', never fully penetrating boulder.
- Crew then pulled augers and placed 6" steel casing in the borehole. Unfortunately, deflection of the steel casing off a boulder caused it to be set at an angle not suitable for water rotary method.
- Boring was grouted inside steel casing with tremie pipe.
- Field Testing/PID column presents soil screening results.

Appendix 8

OBRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON VT.

K-TEST W-01-S1



DATA SET:
A:\w-01.dat
03/30/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

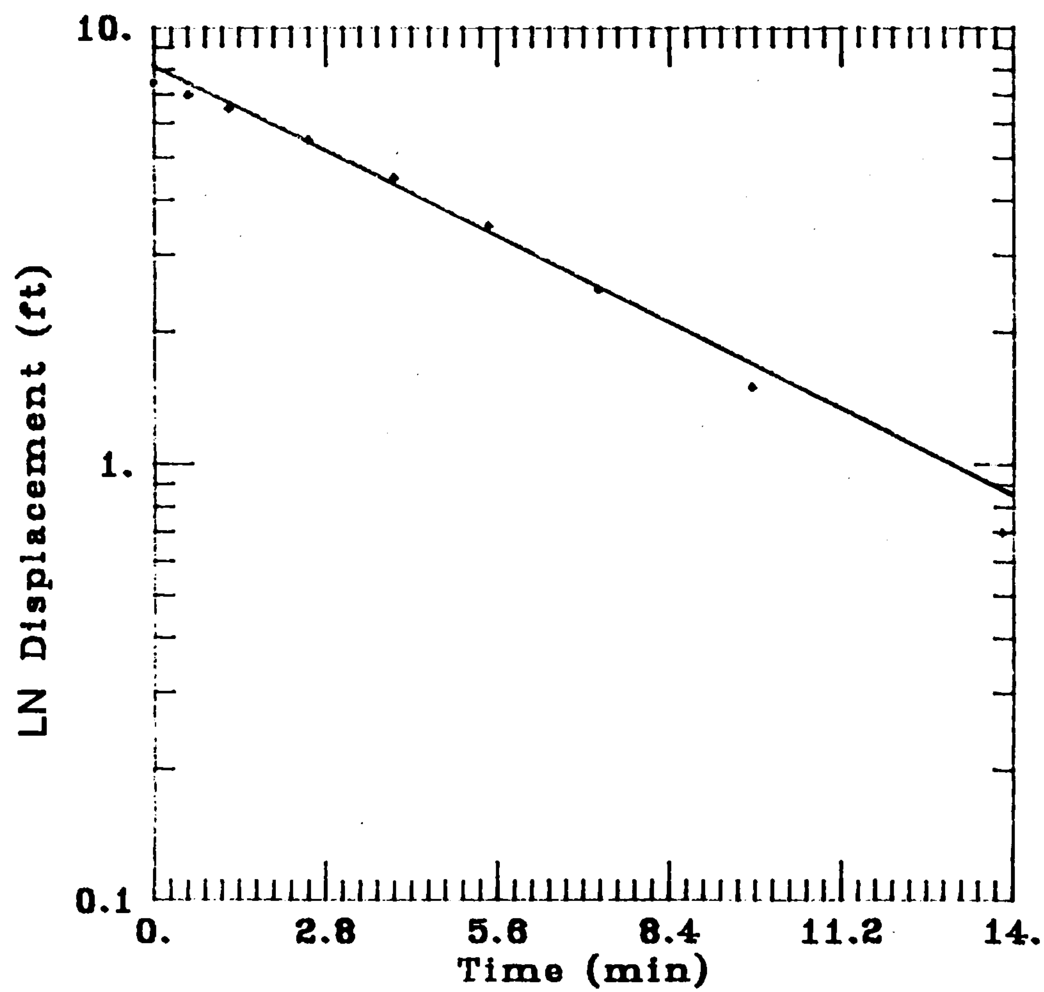
TEST DATE:
3/25/93

OBS. WELL:
W-01-S1

ESTIMATED PARAMETERS:
K = 6.1733E-05 ft/min
y0 = 0.9253 ft

TEST DATA:
H0 = 1.28 ft
rc = 0.083 ft
rw = 0.365 ft
L = 5. ft
b = 2.81 ft
H = 2.81 ft

MW-1 K-TEST



DATA SET:
a: mw-1.dat
08/02/93

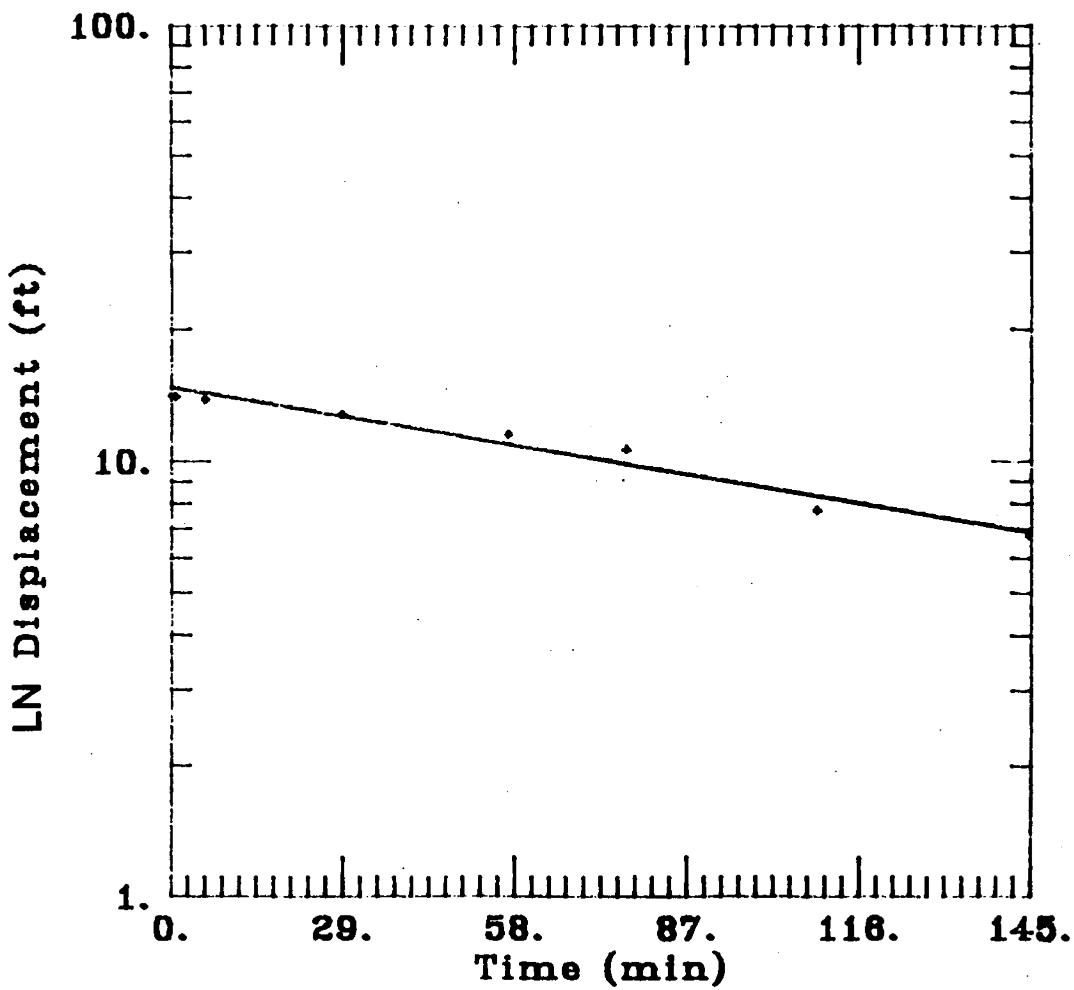
AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 0.0001007 ft/min
y0 = 8.156 ft

TEST DATA:
H0 = 7.5 ft
rc = 0.083 ft
rw = 0.33 ft
L = 15. ft
b = 11. ft
H = 11. ft

MW-2 SLUG TEST



DATA SET:
A: MW-2.DAT
08/02/93

AQUIFER TYPE:
Unconfined

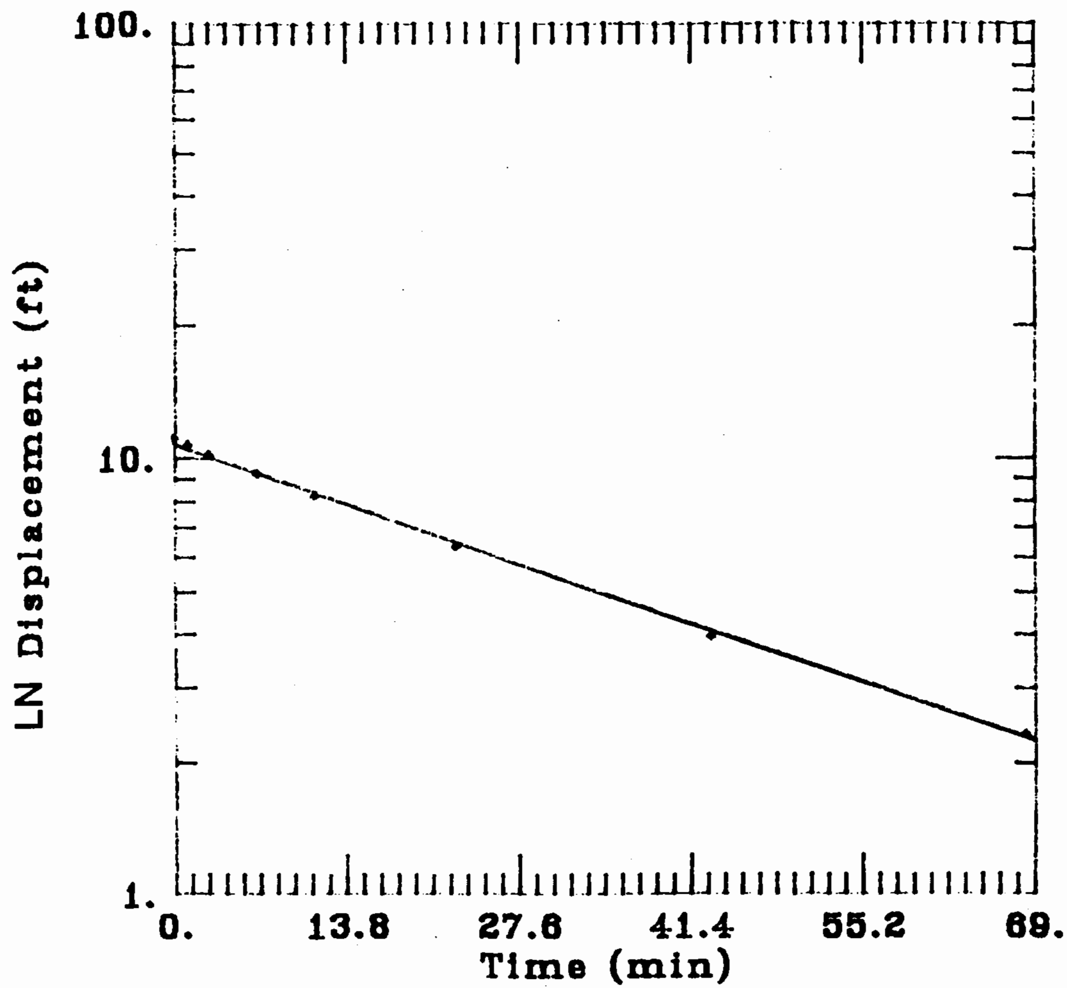
SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 5.3997E-06 ft/min
y0 = 14.72 ft

TEST DATA:
H0 = 14.19 ft
rc = 0.083 ft
rw = 0.33 ft
L = 10. ft
b = 19.36 ft
H = 19.36 ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

MW-3 SLUG TEST



DATA SET:
A: MW-3.DAT
08/04/93

AQUIFER TYPE:
Unconfined

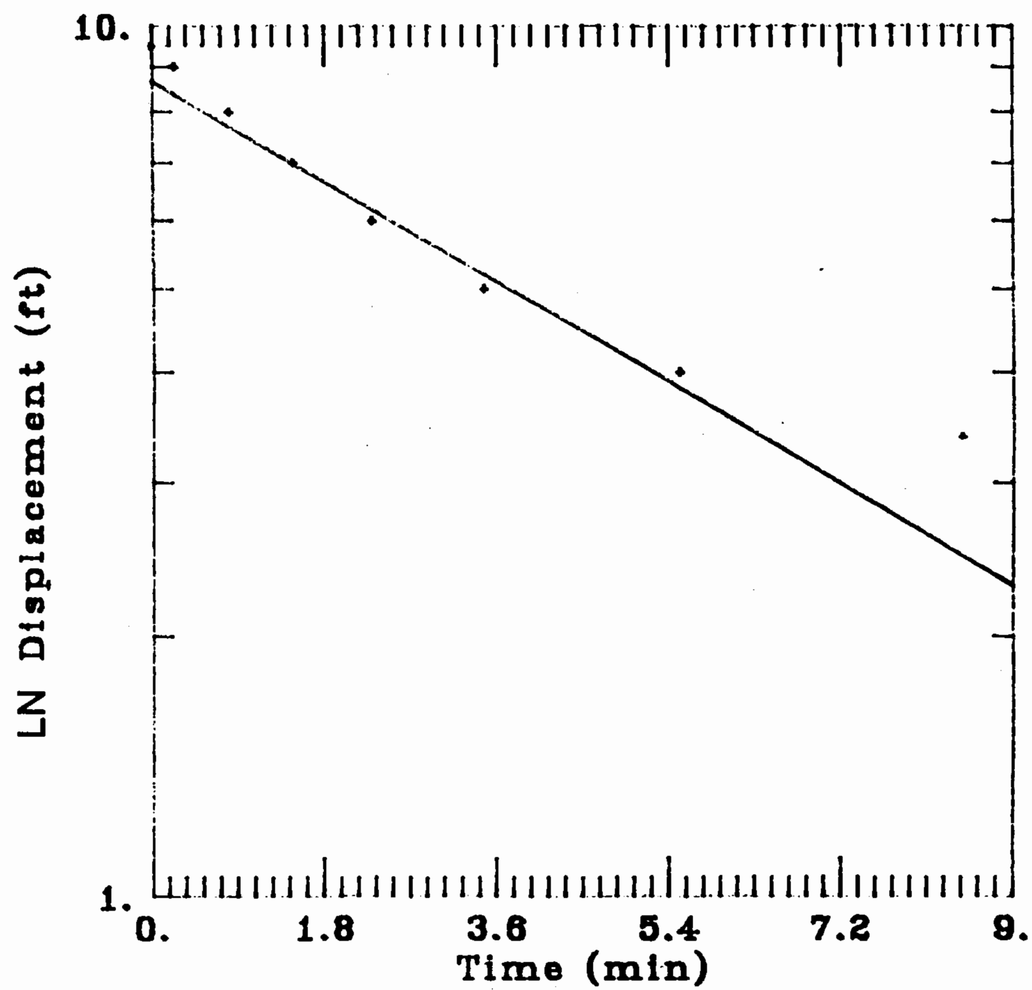
SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 2.7815E-05 ft/min
y0 = 10.73 ft

TEST DATA:
H0 = 11.1 ft
rc = 0.083 ft
rw = 0.167 ft
L = 10. ft
b = 20. ft
H = 20. ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

MW-5 SLUG TEST



DATA SET:
A: MW-5.DAT
08/04/93

AQUIFER TYPE:
Unconfined

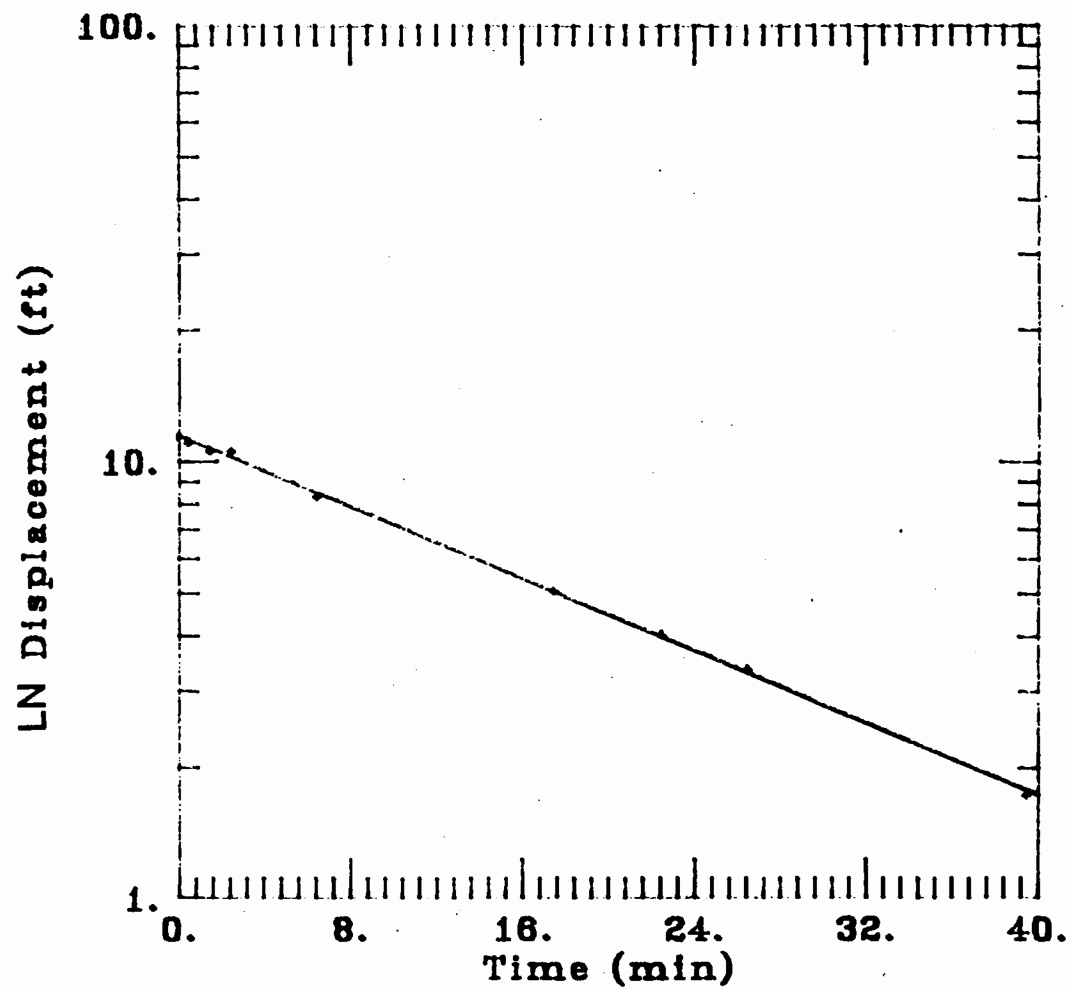
SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 0.0001283 ft/min
y0 = 8.664 ft

TEST DATA:
H0 = 9.5 ft
rc = 0.083 ft
rw = 0.33 ft
L = 10. ft
b = 20. ft
H = 16. ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

MW-4D SLUG TEST



DATA SET:
A: MW-4D.DAT
08/04/93

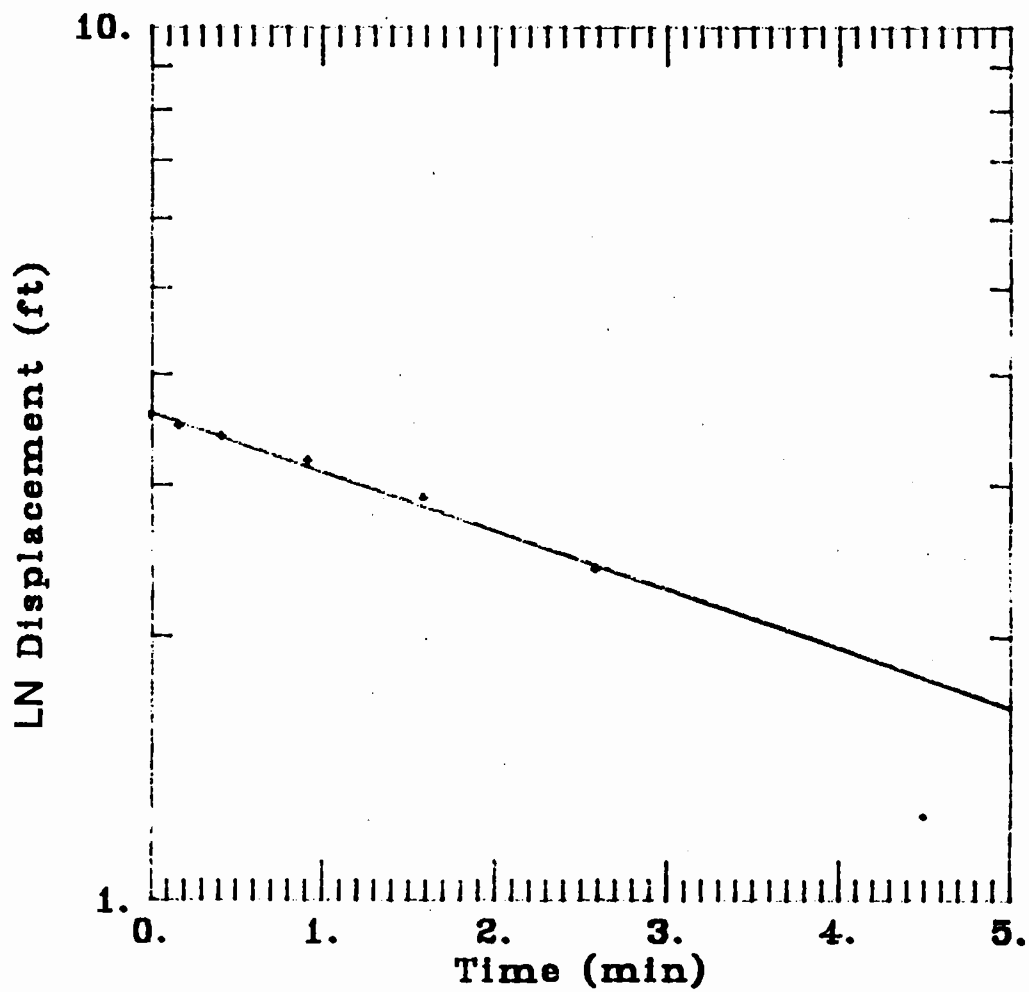
AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 7.3174E-05 ft/min
y0 = 11.5 ft

TEST DATA:
H0 = 11.38 ft
rc = 0.083 ft
rw = 0.33 ft
L = 5. ft
b = 20. ft
H = 18. ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

MW-6S SLUG TEST



DATA SET:
A: MW-6S.DAT
08/04/93

AQUIFER TYPE:
Unconfined

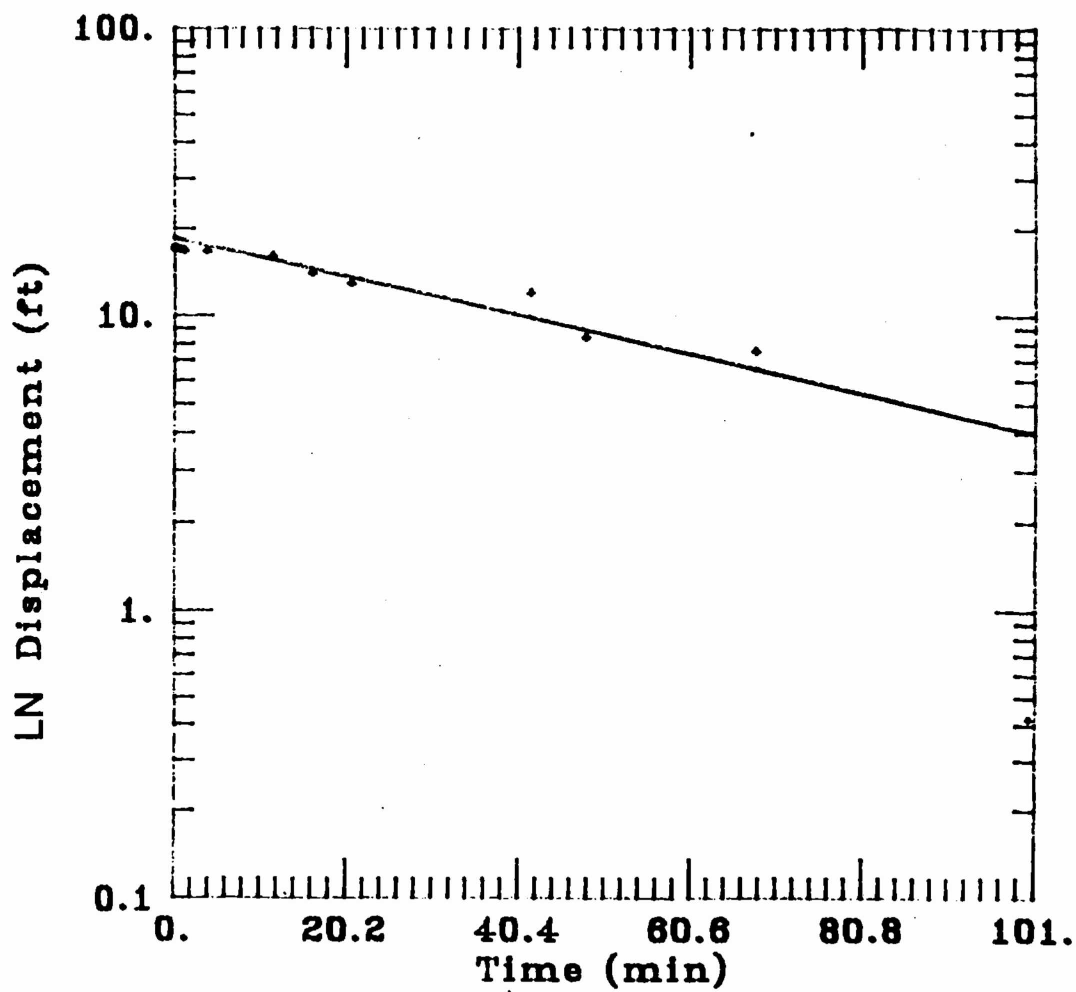
SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 0.0001826 ft/min
y0 = 3.623 ft

TEST DATA:
H0 = 3.6 ft
rc = 0.083 ft
rw = 0.33 ft
L = 5. ft
b = 20. ft
H = 6. ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC
Project No.: 5271.001	Location: BENNINGTON, VT.

MW-6D SLUG TEST



DATA SET:
A: MW-6D.DAT
08/04/93

AQUIFER TYPE:
Unconfined

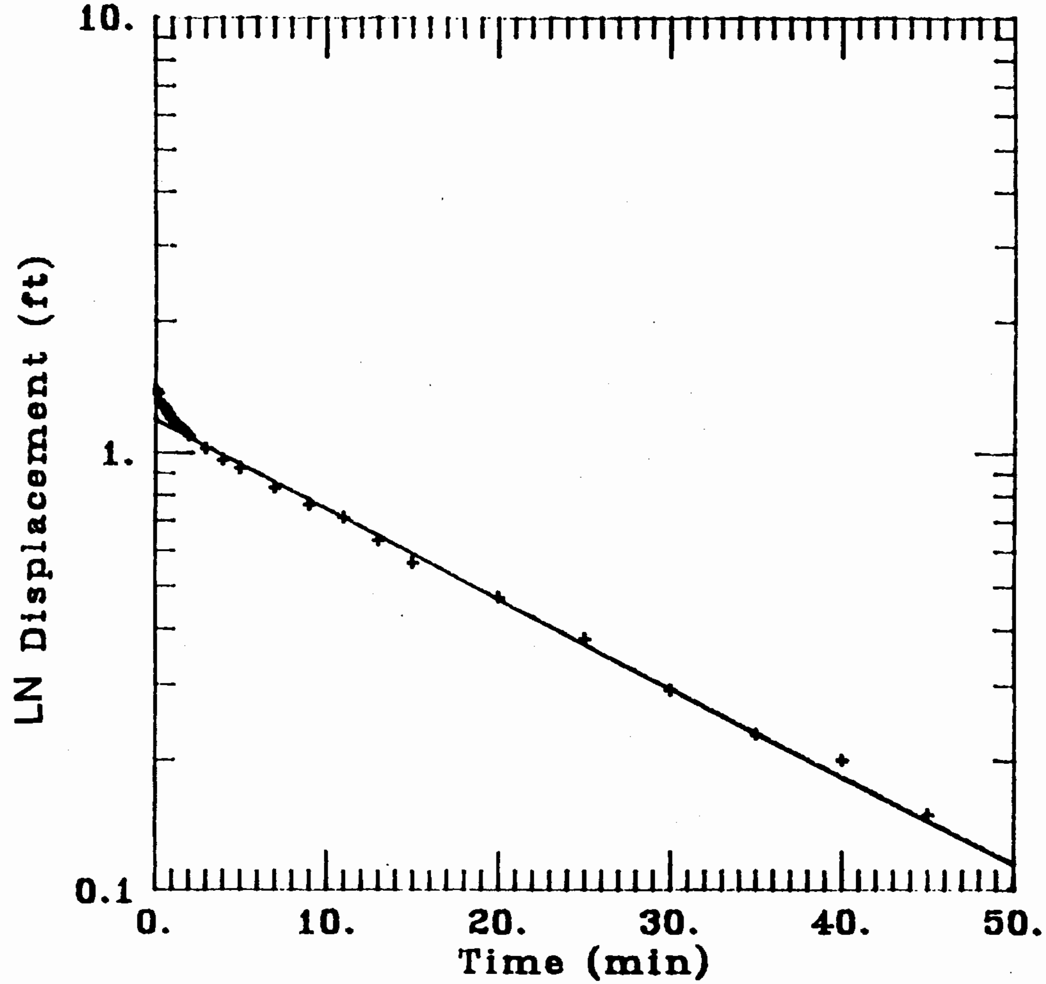
SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 2.3553E-05 ft/min
y0 = 18.55 ft

TEST DATA:
H0 = 17.1 ft
rc = 0.083 ft
rw = 0.33 ft
L = 5. ft
b = 20. ft
H = 18. ft

OBRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

K–TEST 7–S1



DATA SET:
A:\7-S1.DAT
03/30/93

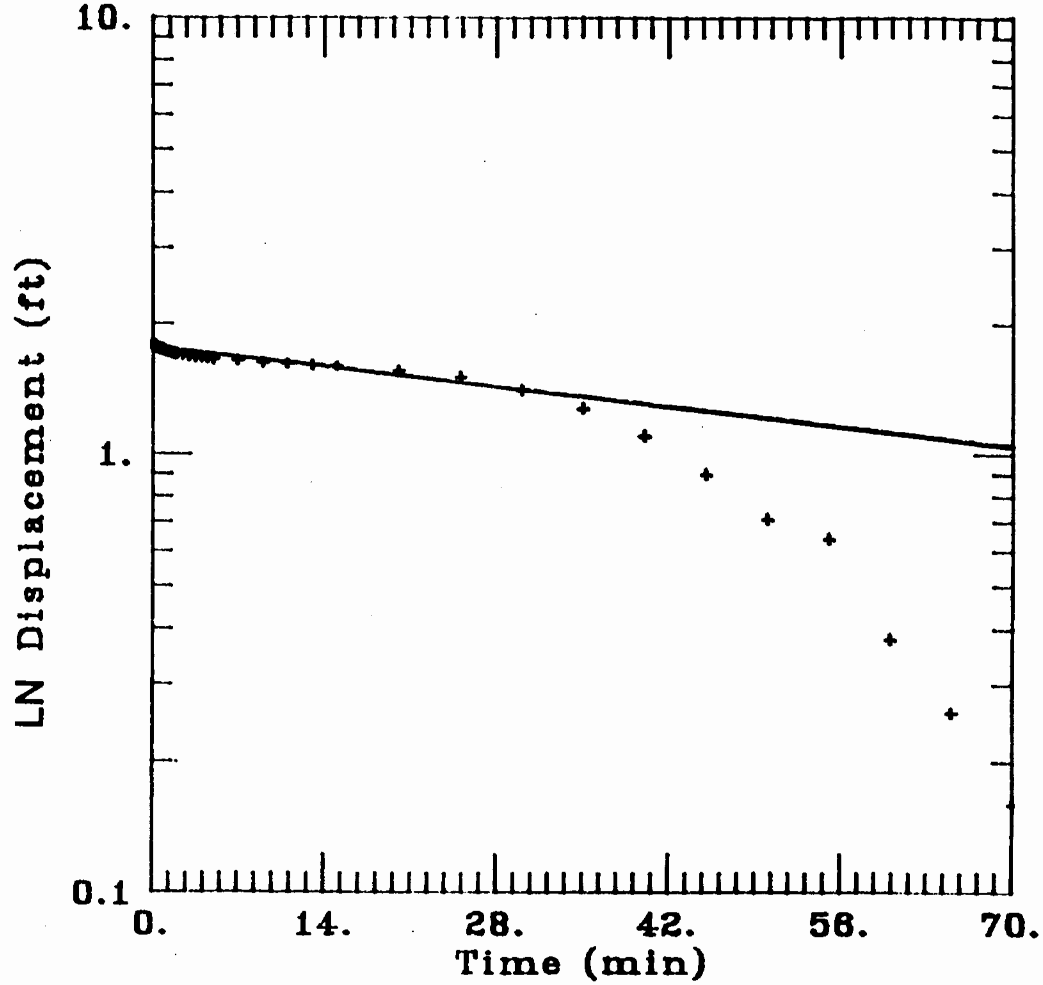
AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
3/25/93

ESTIMATED PARAMETERS:
K = 6.2211E-05 ft/min
y0 = 1.183 ft

TEST DATA:
H0 = 1.38 ft
rc = 0.083 ft
rw = 0.365 ft
L = 5. ft
b = 5.27 ft
H = 5.27 ft

OBRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

K-TEST W-08-S1



DATA SET:
A:\W-08-S1.DAT
03/30/93

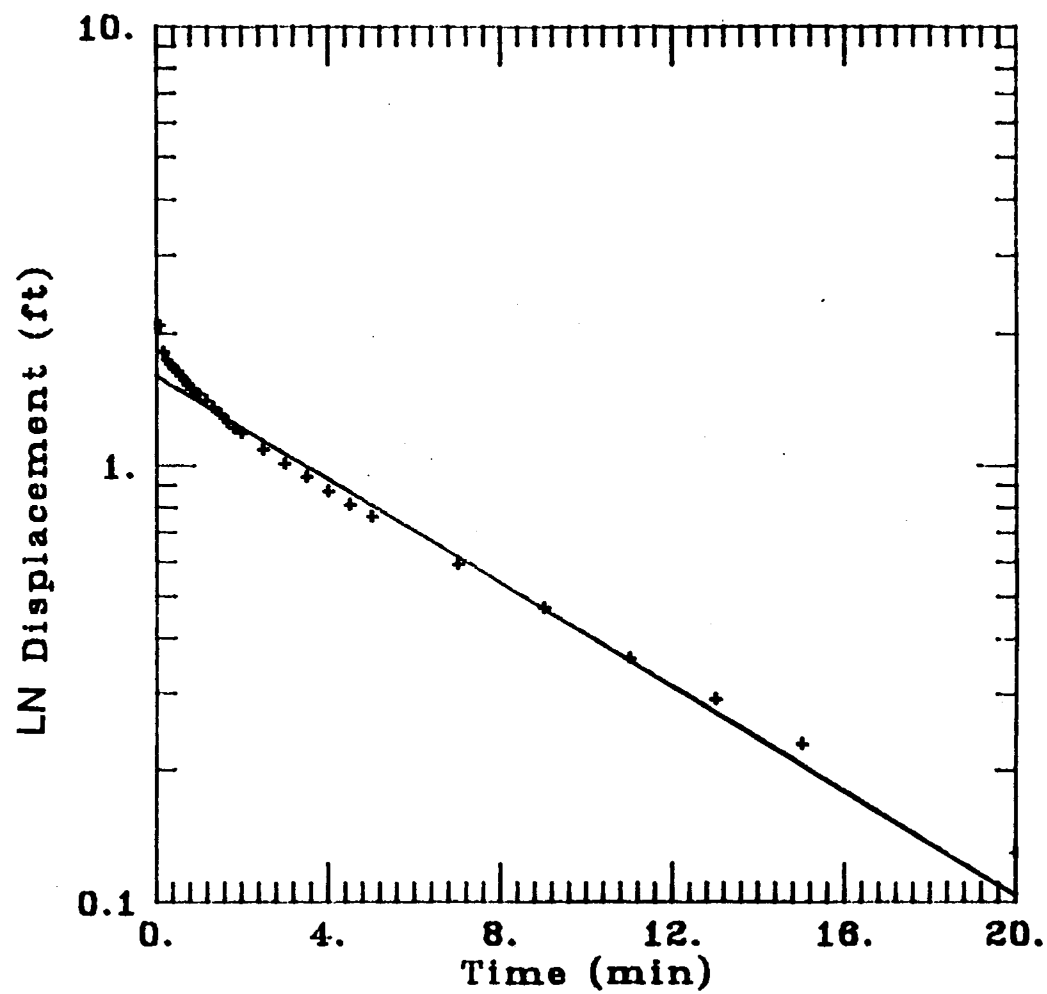
AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
3/26/93

ESTIMATED PARAMETERS:
K = 9.9746E-06 ft/min
y0 = 1.755 ft

TEST DATA:
H0 = 1.78 ft
rc = 0.083 ft
rw = 0.365 ft
L = 5. ft
b = 5.22 ft
H = 5.22 ft

OBRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

K-TEST W-09-S1



DATA SET:
A:\W-09-S1.DAT
03/30/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

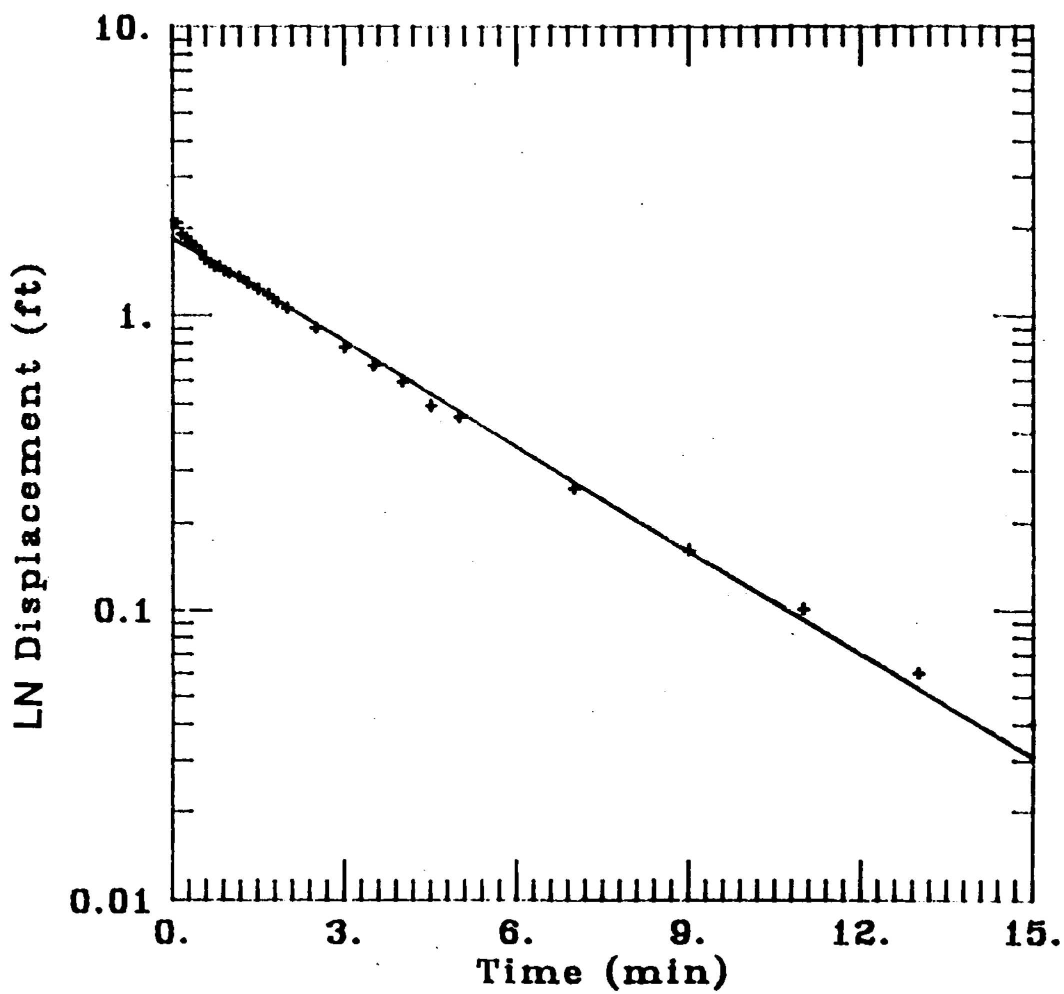
TEST DATE:
3/26/93

ESTIMATED PARAMETERS:
K = 0.0002013 ft/min
y0 = 1.596 ft

TEST DATA:
H0 = 2.09 ft
rc = 0.083 ft
rw = 0.365 ft
L = 5. ft
b = 7.54 ft
H = 7.54 ft

OBRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

K-TEST W-11-S1



DATA SET:
A:\W-11-S1.DAT
03/30/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

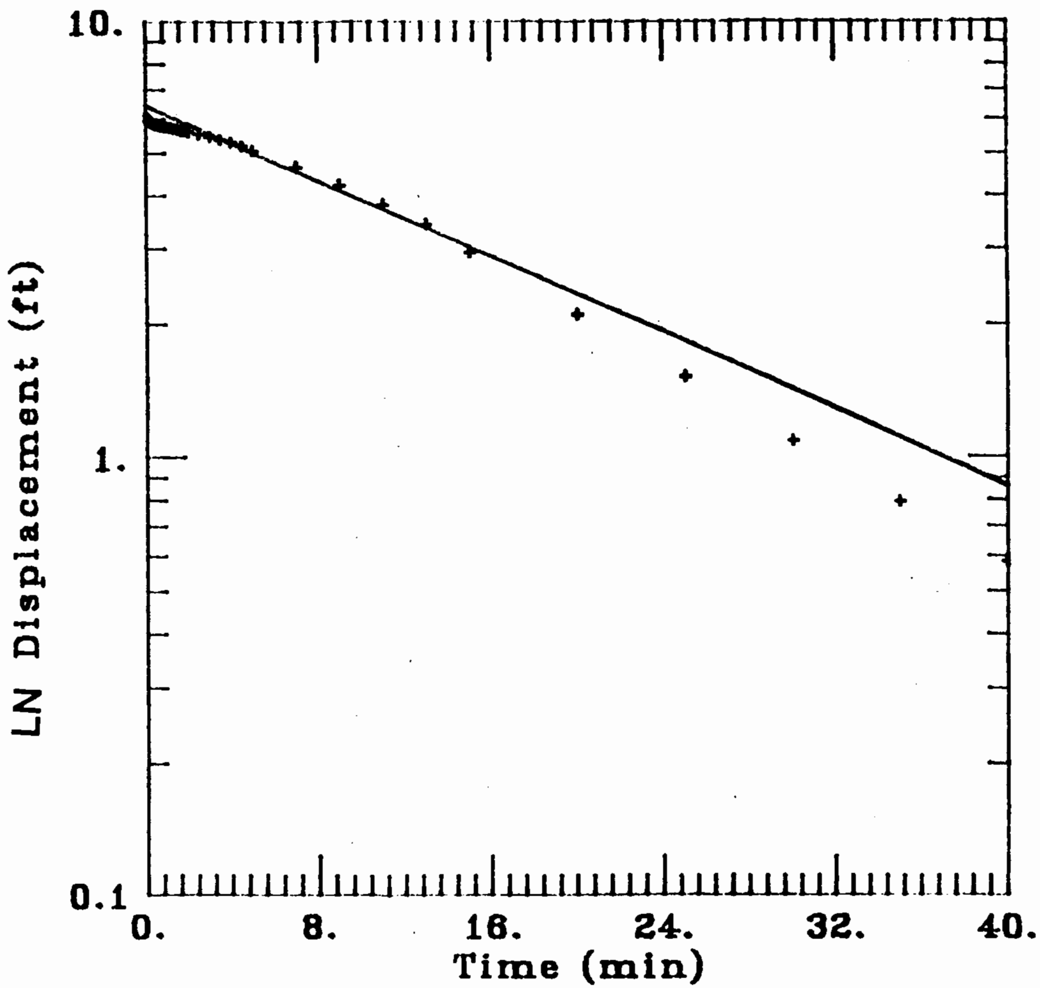
TEST DATE:
3/26/93

ESTIMATED PARAMETERS:
K = 0.0003869 ft/min
y0 = 1.821 ft

TEST DATA:
H0 = 2.07 ft
rc = 0.083 ft
rw = 0.365 ft
L = 5. ft
b = 6.62 ft
H = 6.62 ft

OBRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

K-TEST W-12-S1



DATA SET:
A:\W-12.DAT
03/30/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

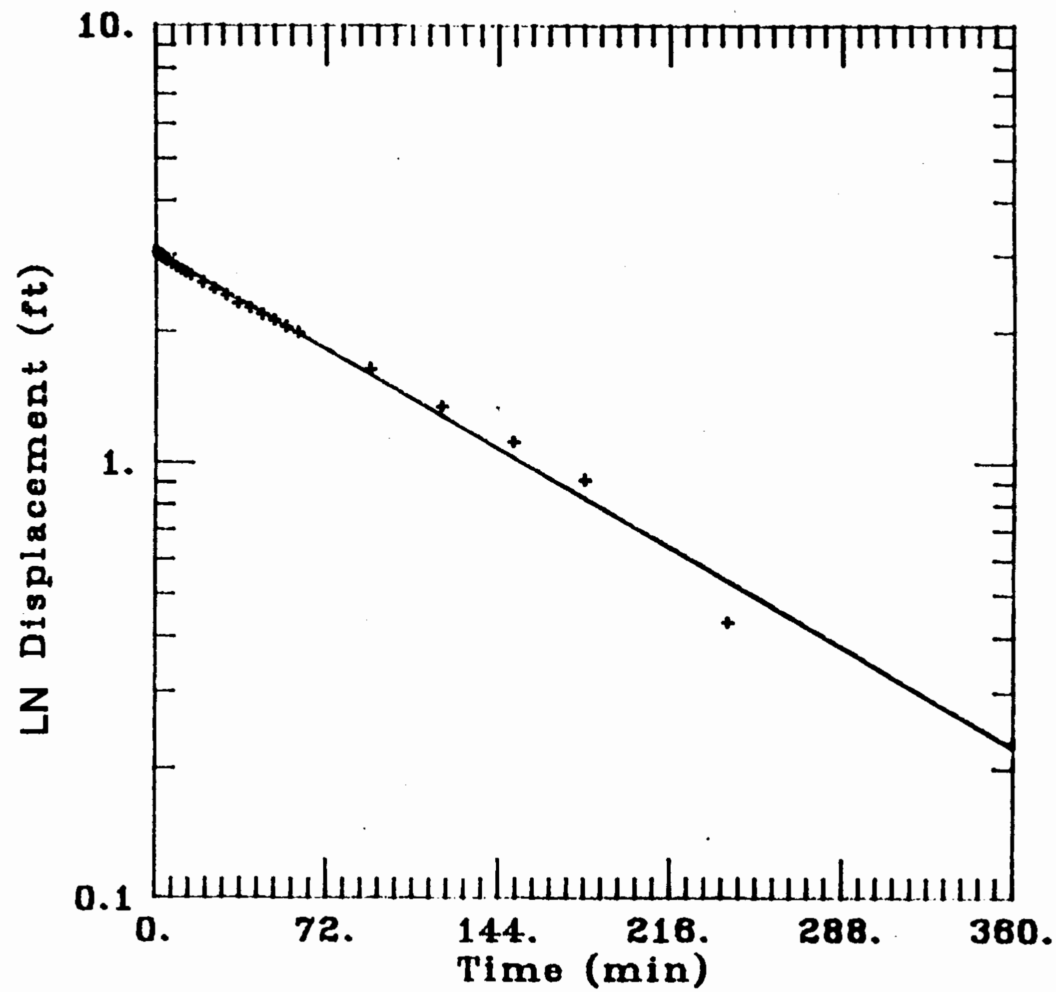
TEST DATE:
3/25/93

ESTIMATED PARAMETERS:
K = 7.1633E-05 ft/min
y0 = 6.409 ft

TEST DATA:
H0 = 6.02 ft
rc = 0.083 ft
rw = 0.365 ft
L = 5. ft
b = 6.67 ft
H = 6.67 ft

OBRIEN & GERE ENGINEERS	Client: **BURGESS BROS. INC.**
Project No.: 5271.001	Location: **BENNINGTON, VT.**

K-TEST W-22-S1



DATA SET:
A:\W-22-S1.DAT
03/30/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

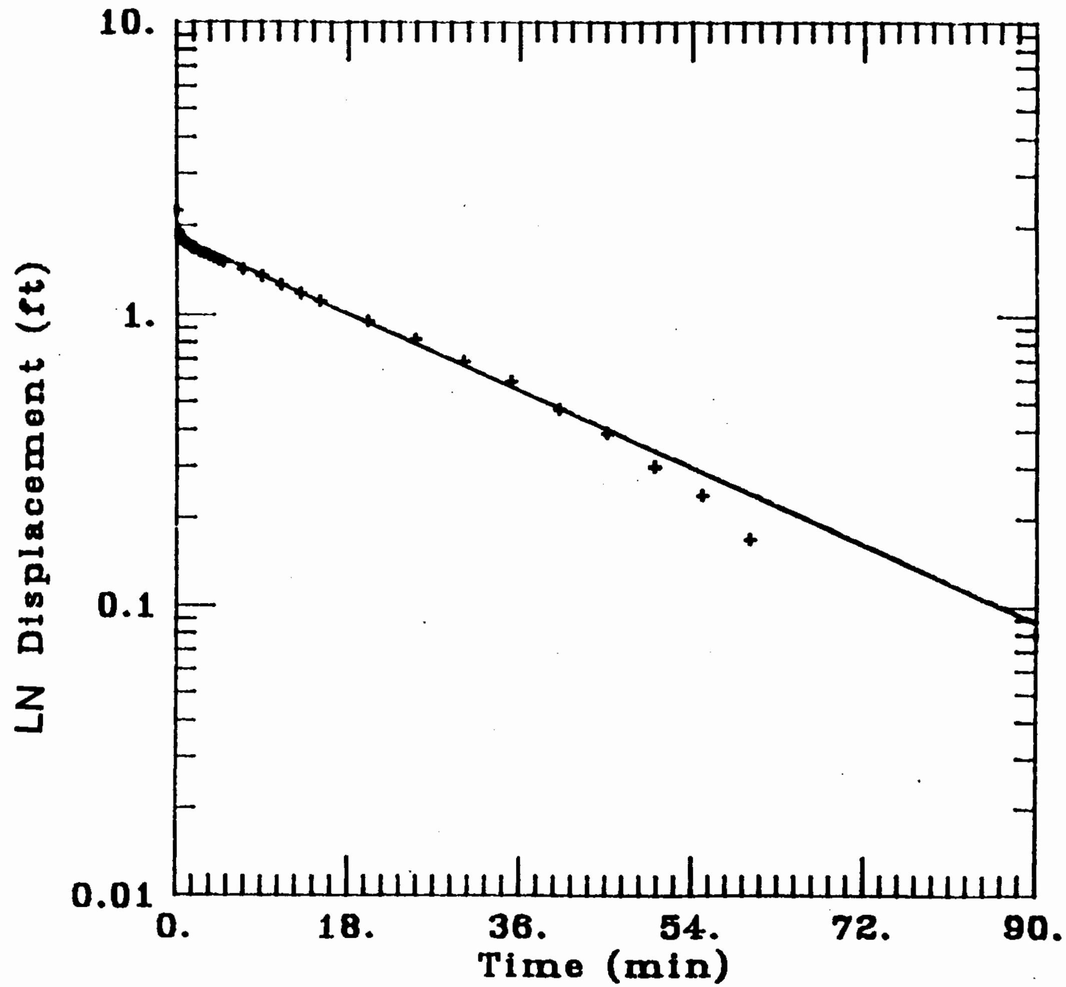
TEST DATE:
3/26/93

ESTIMATED PARAMETERS:
K = 1.0859E-05 ft/min
y0 = 3.03 ft

TEST DATA:
H0 = 3.06 ft
rc = 0.083 ft
rw = 0.365 ft
L = 5. ft
b = 8.14 ft
H = 8.14 ft

OBRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

K-TEST W-25-S1



DATA SET:
A:\W-25-S1.DAT
03/30/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

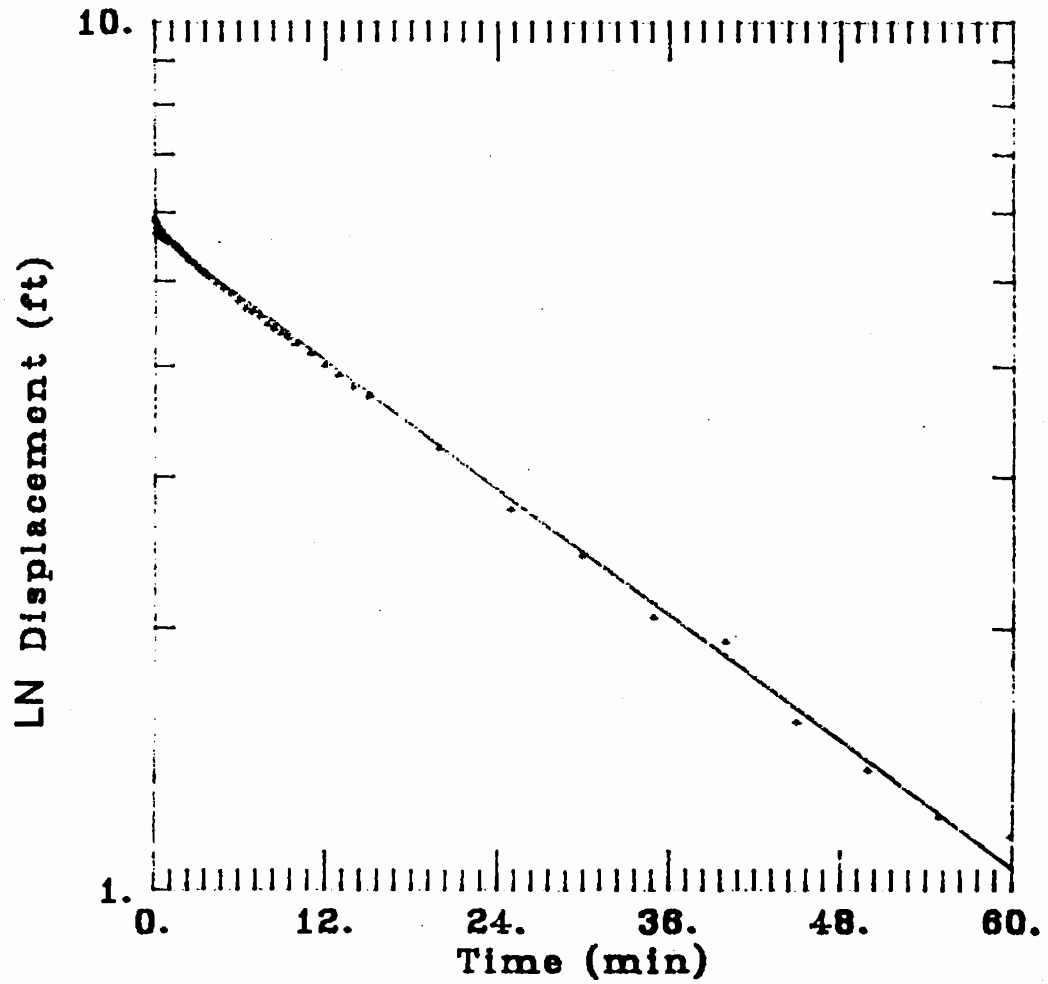
TEST DATE:
3/26/93

ESTIMATED PARAMETERS:
K = 4.7493E-05 ft/min
y0 = 1.825 ft

TEST DATA:
H0 = 2.25 ft
rc = 0.083 ft
rw = 0.365 ft
L = 5. ft
b = 6.4 ft
H = 6.4 ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS.INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

W-03T SLUG TEST



DATA SET:
A: W-03T.DAT
08/04/93

AQUIFER TYPE:
Unconfined

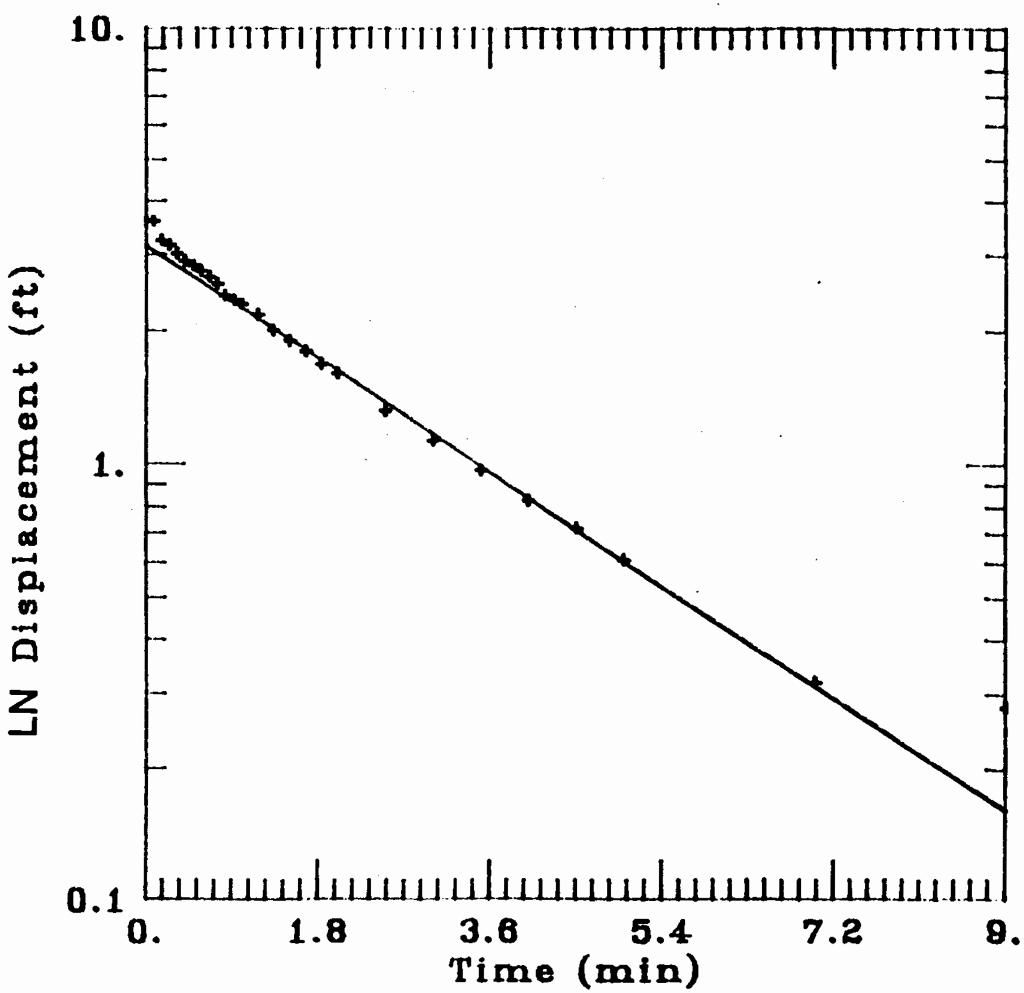
SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 3.013E-05 ft/min
y0 = 5.665 ft

TEST DATA:
H0 = 5.9 ft
rc = 0.083 ft
rw = 0.33 ft
L = 10. ft
b = 25. ft
H = 25. ft

OBRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

K–TEST 23–T



DATA SET:
A:\23-T.DAT
03/30/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

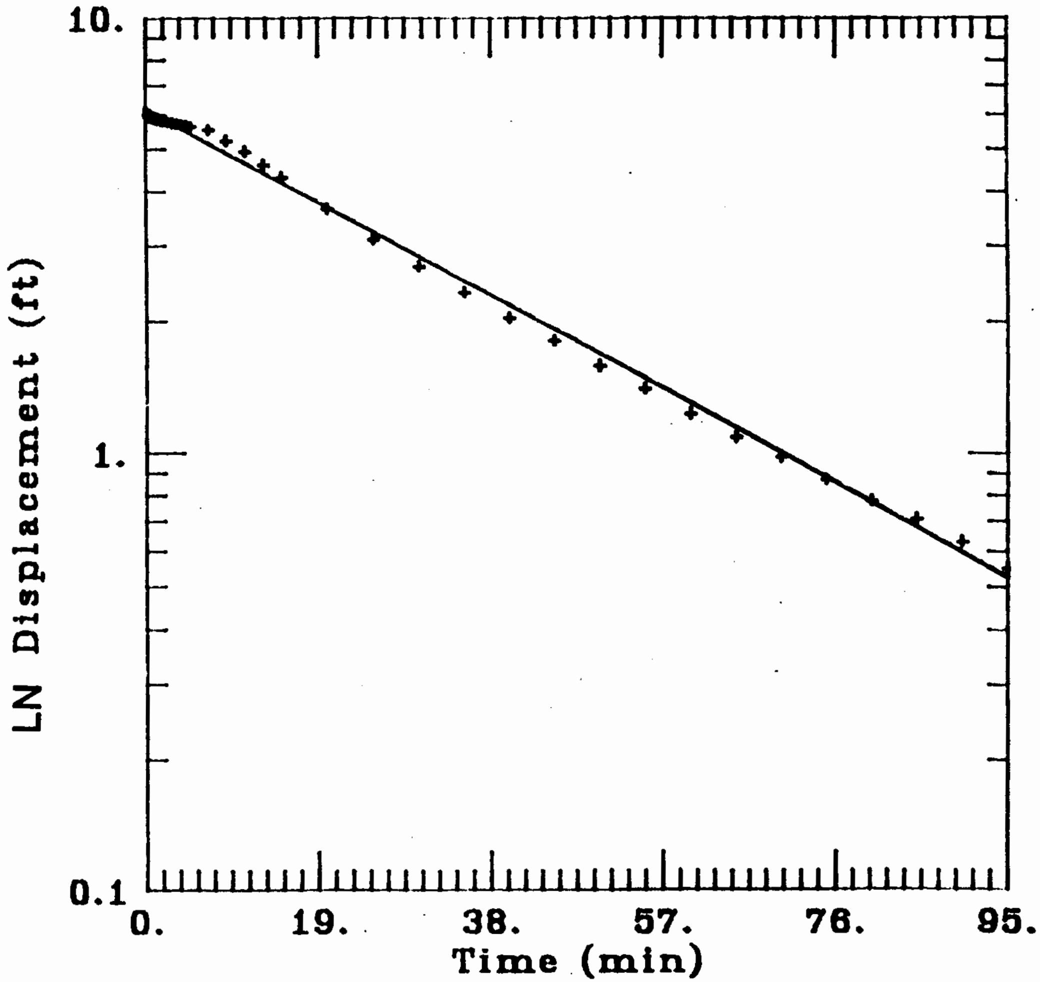
TEST DATE:
3/27/93

ESTIMATED PARAMETERS:
K = 0.0004849 ft/min
y0 = 3.124 ft

TEST DATA:
H0 = 3.6 ft
rc = 0.083 ft
rw = 0.365 ft
L = 5. ft
b = 7.52 ft
H = 7.52 ft

OBRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

K-TEST 24-T



DATA SET:
A:\24-T.DAT
03/30/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

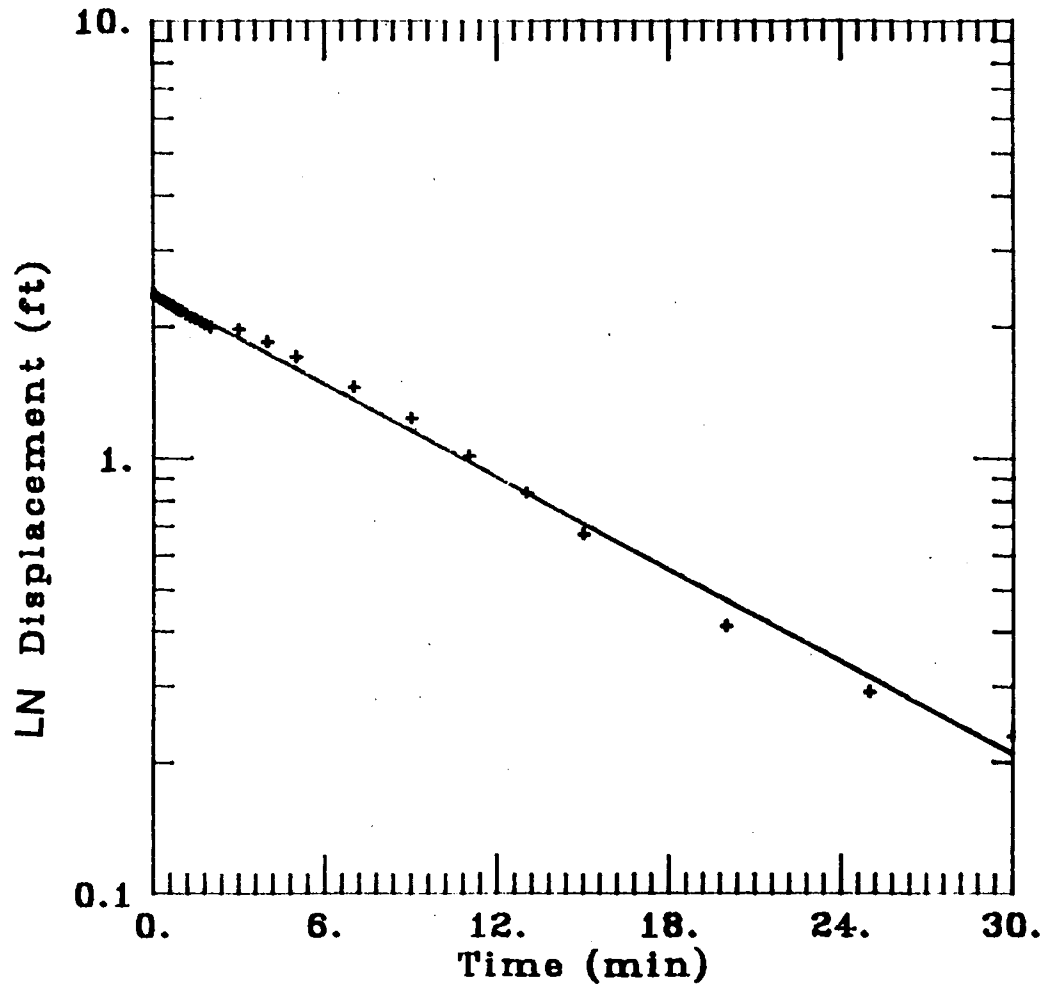
TEST DATE:
3/27/93

ESTIMATED PARAMETERS:
K = 4.368E-05 ft/min
y0 = 6.142 ft

TEST DATA:
H0 = 6.07 ft
rc = 0.083 ft
rw = 0.365 ft
L = 5. ft
b = 13.54 ft
H = 13.54 ft

OBRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

K-TEST SBW-10



DATA SET:
A:\SBW-10.DAT
03/30/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

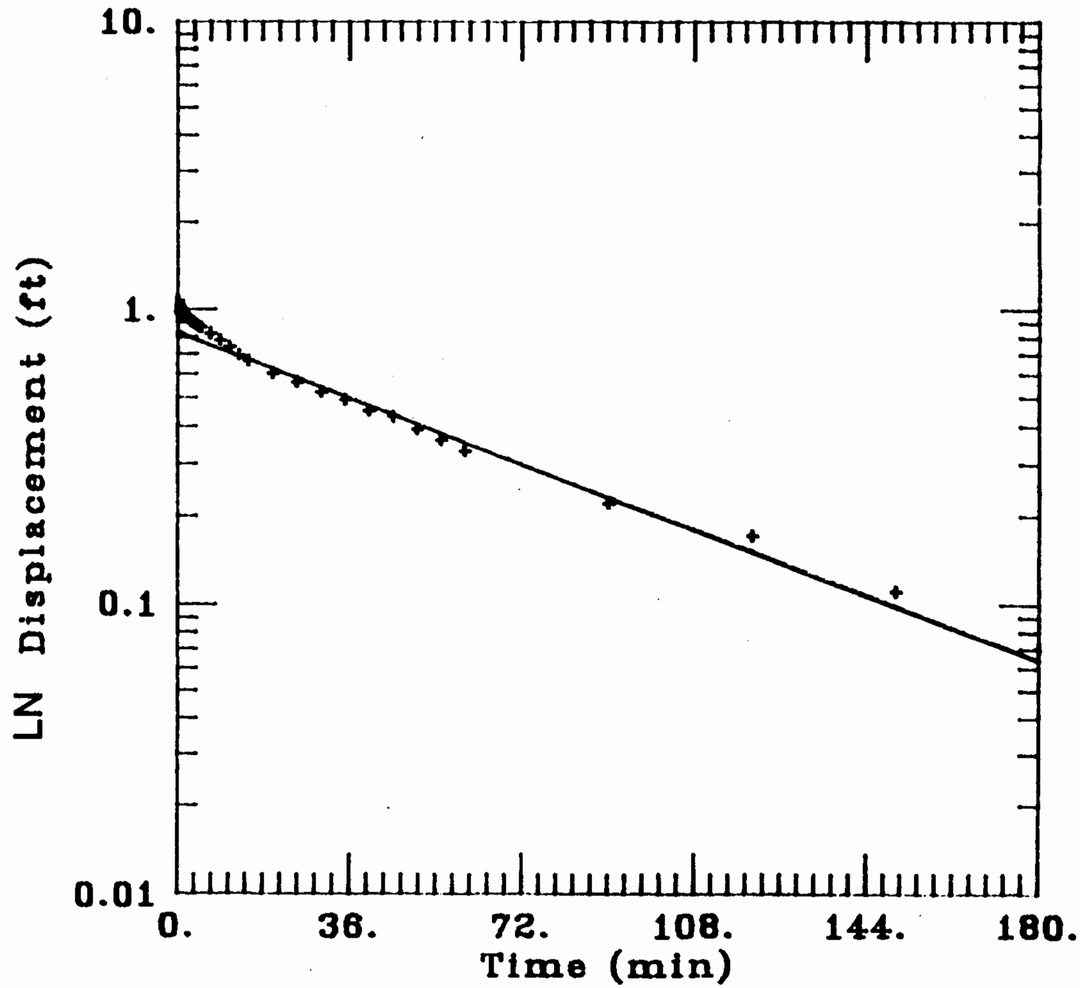
TEST DATE:
3/25/93

ESTIMATED PARAMETERS:
K = 8.167E-05 ft/min
y0 = 2.383 ft

TEST DATA:
H0 = 2.37 ft
rc = 0.083 ft
rw = 0.365 ft
L = 5. ft
b = 2.43 ft
H = 2.43 ft

OBRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

K–TEST SB–21



DATA SET:
A:\SB-21.DAT
03/30/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
3/26/93

ESTIMATED PARAMETERS:
K = 1.5231E-05 ft/min
y0 = 0.8216 ft

TEST DATA:
H0 = 1.06 ft
rc = 0.083 ft
rw = 0.365 ft
L = 5. ft
b = 2.81 ft
H = 2.81 ft

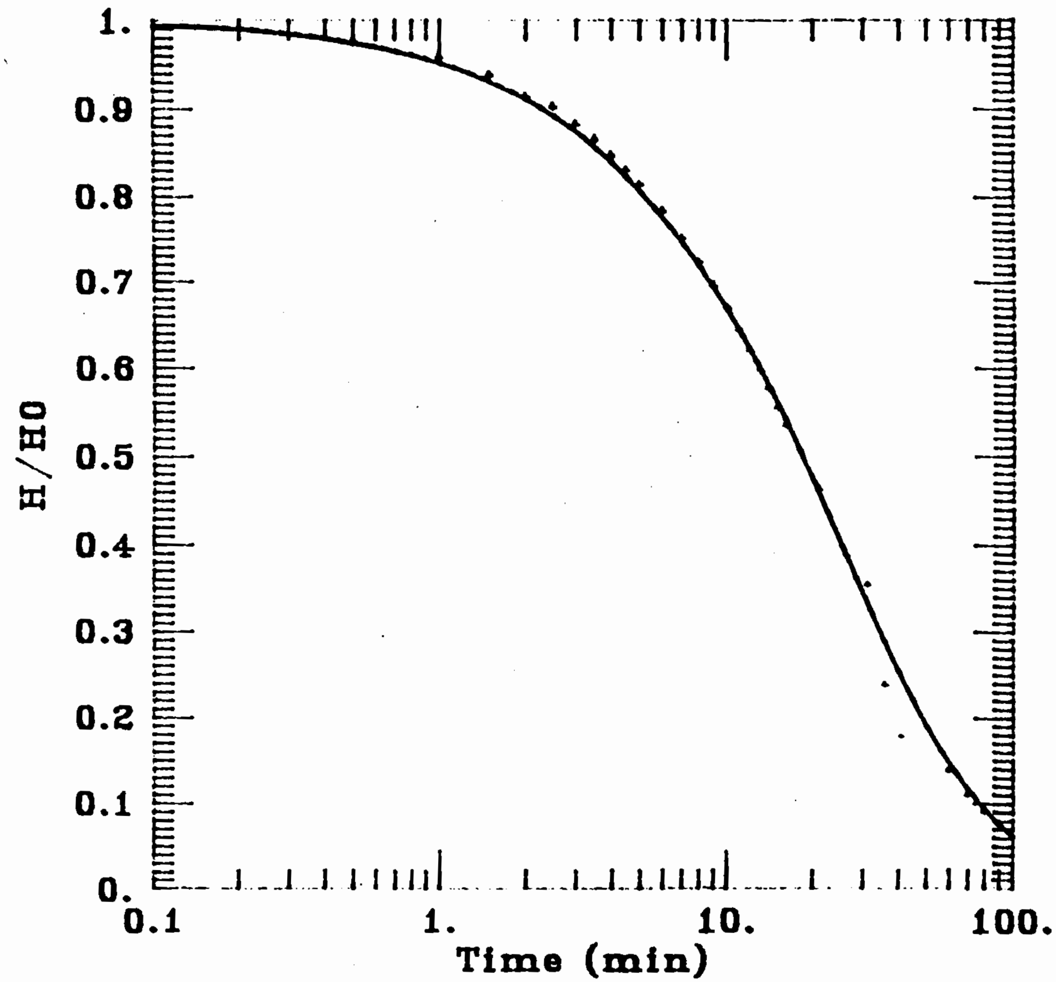
O'BRIEN & GERE ENGINEERS

Project No.: 5271.001

Client: BURGESS BROS. INC.

Location: BENNINGTON, VT.

W-04SI SLUG TEST



DATA SET:
A: W-04SI.DAT
08/04/93

AQUIFER TYPE:
Confined

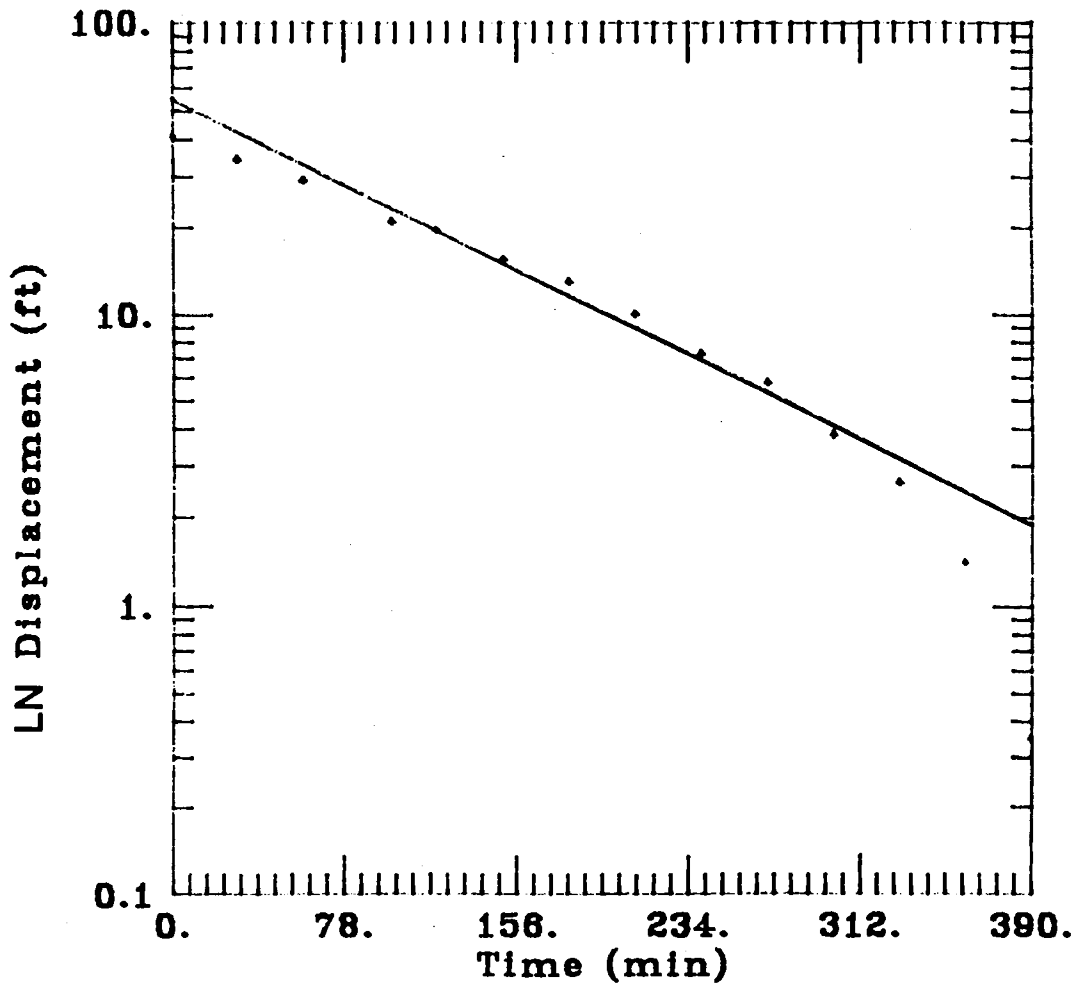
SOLUTION METHOD:
Cooper et al.

ESTIMATED PARAMETERS:
T = 0.00309 ft^2/min
S = 1.E-05

TEST DATA:
H0 = 37.43 ft
rc = 0.161 ft
rw = 0.167 ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

W-07SI SLUG TEST



DATA SET:
A: W-07SI.DAT
08/03/93

AQUIFER TYPE:
Unconfined

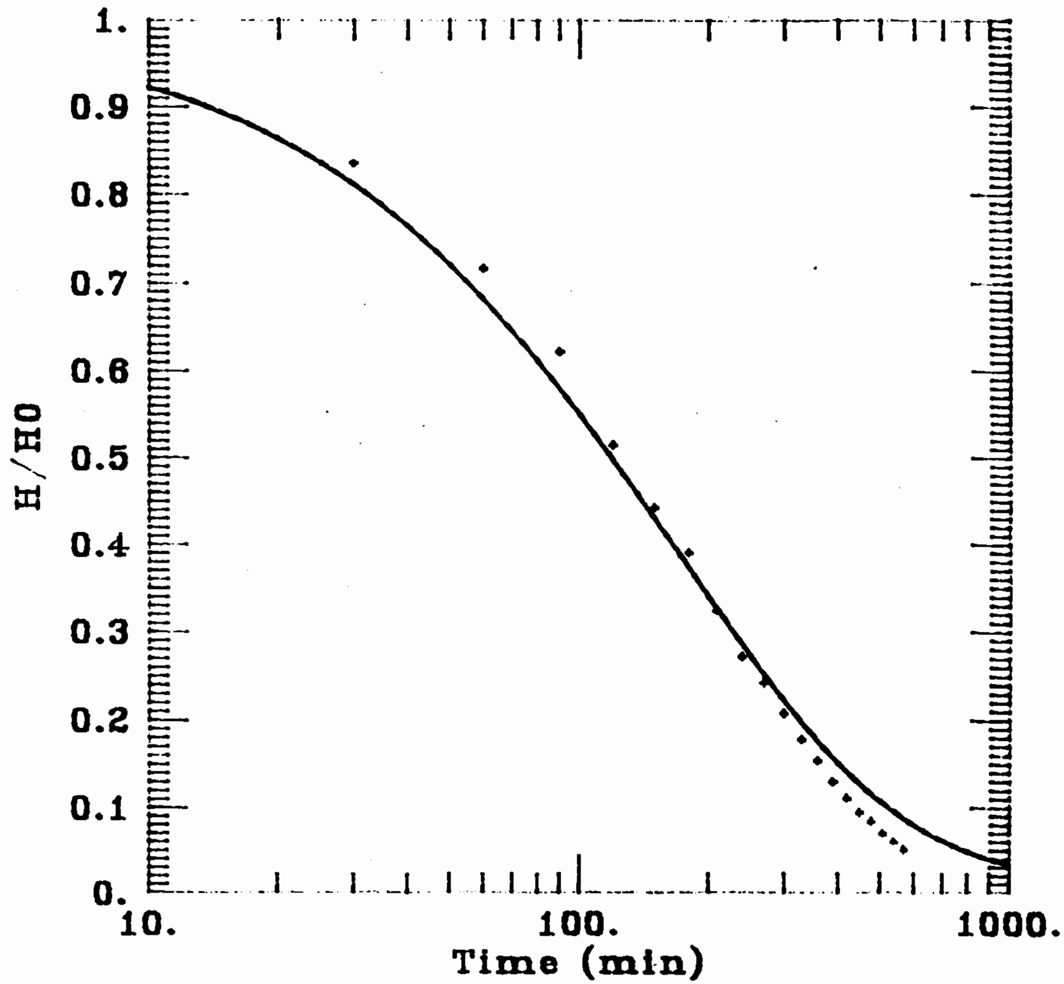
SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 5.1345E-05 ft/min
y0 = 54.78 ft

TEST DATA:
H0 = 41.32 ft
rc = 0.167 ft
rw = 0.167 ft
L = 10. ft
b = 63.4 ft
H = 63.4 ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS.INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

W-08SI SLUG TEST



DATA SET:
A: W-08SI.DAT
08/04/93

AQUIFER TYPE:
Confined

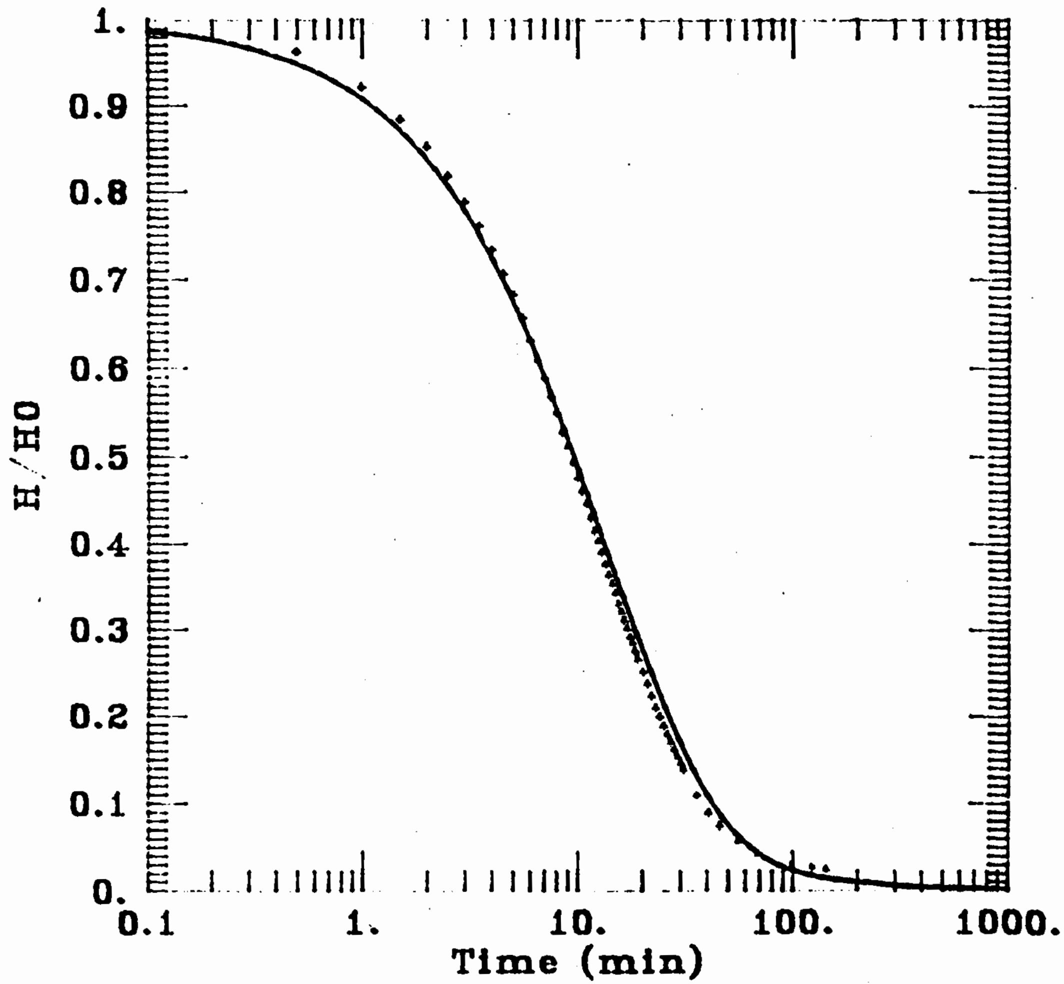
SOLUTION METHOD:
Cooper et al.

ESTIMATED PARAMETERS:
T = 0.0003827 ft^2/min
S = 9.604E-05

TEST DATA:
H0 = 73.8 ft
rc = 0.161 ft
rw = 0.167 ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

W-09SI SLUG TEST



DATA SET:
A: W-09SI.DAT
08/04/93

AQUIFER TYPE:
Confined
SOLUTION METHOD:
Cooper et al.

ESTIMATED PARAMETERS:
T = 0.004746 ft^2/min
S = 9.703E-05

TEST DATA:
HO = 74. ft
rc = 0.161 ft
rw = 0.167 ft

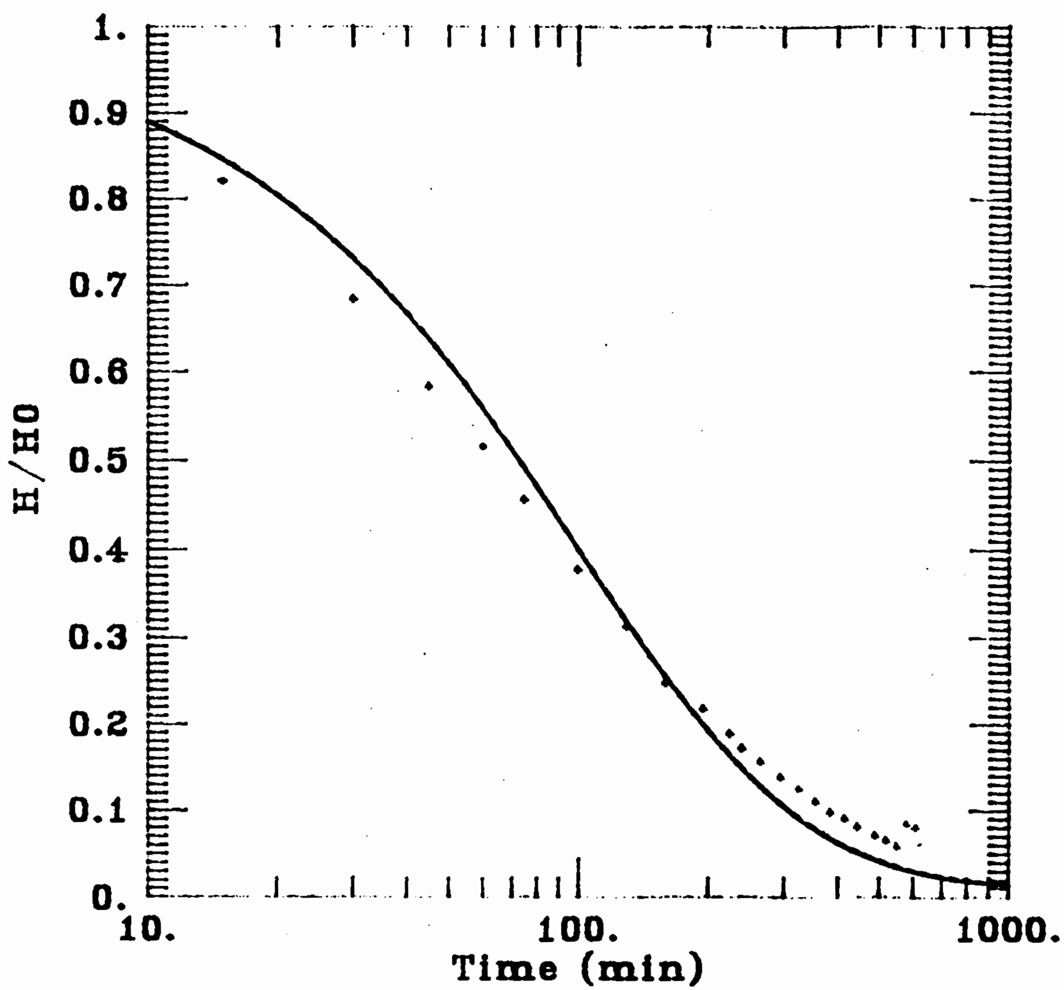
O'BRIEN & GERE ENGINEERS

Project No.: 5271.001

Client: BURGESS BROS. INC.

Location: BENNINGTON, VT.

W-25SI SLUG TEST



DATA SET:
A: W-25SI.DAT
08/03/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

ESTIMATED PARAMETERS:
T = 0.0008147 ft^2/min
S = 1.425E-05

TEST DATA:
HO = 32.22 ft
rc = 0.167 ft
rw = 0.167 ft

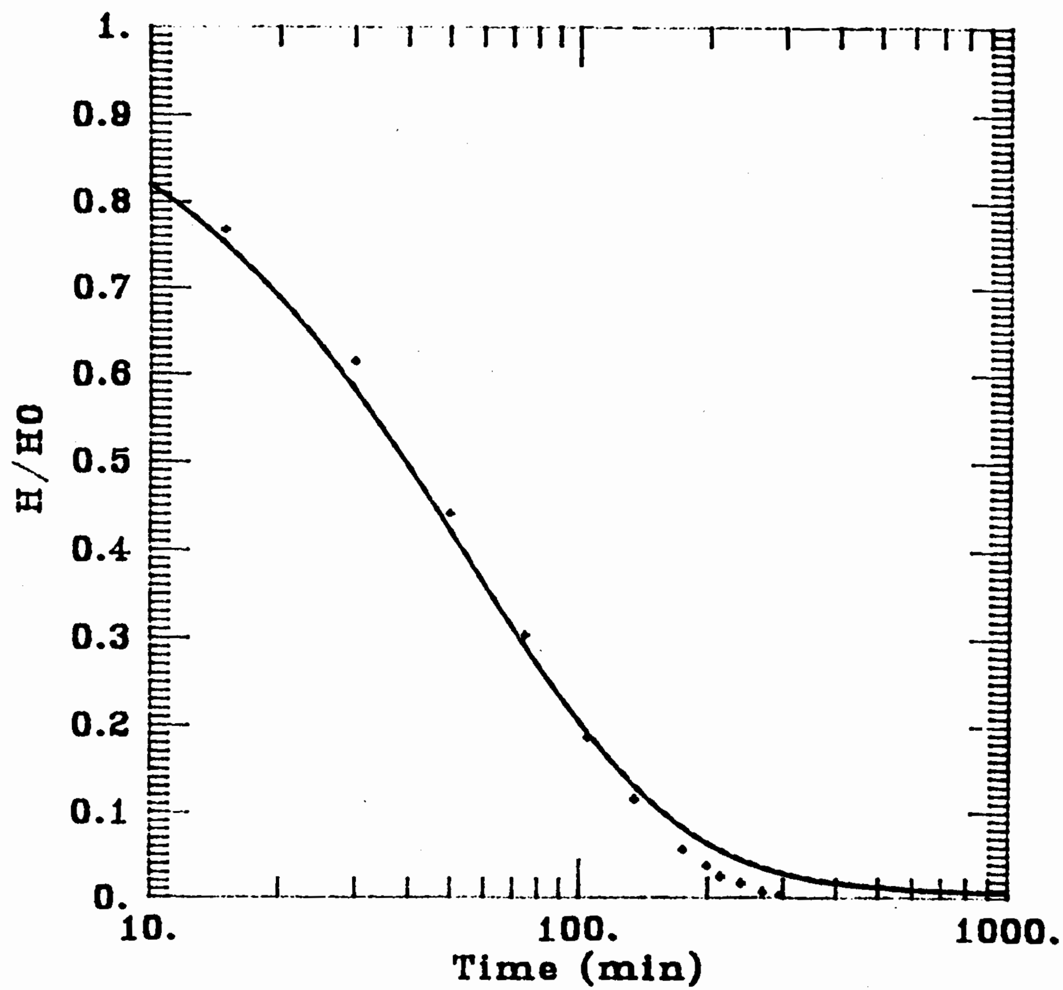
O'BRIEN & GERE ENGINEERS

Project No.: 5271.001

Client: BURGESS BROS. INC.

Location: BENNINGTON, VT.

W-25DI SLUG TEST



DATA SET:
A: W-25DI.DAT
08/04/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

ESTIMATED PARAMETERS:
T = 0.001778 ft^2/min
S = 6.561E-07

TEST DATA:
HO = 95.85 ft
rc = 0.161 ft
rw = 0.167 ft

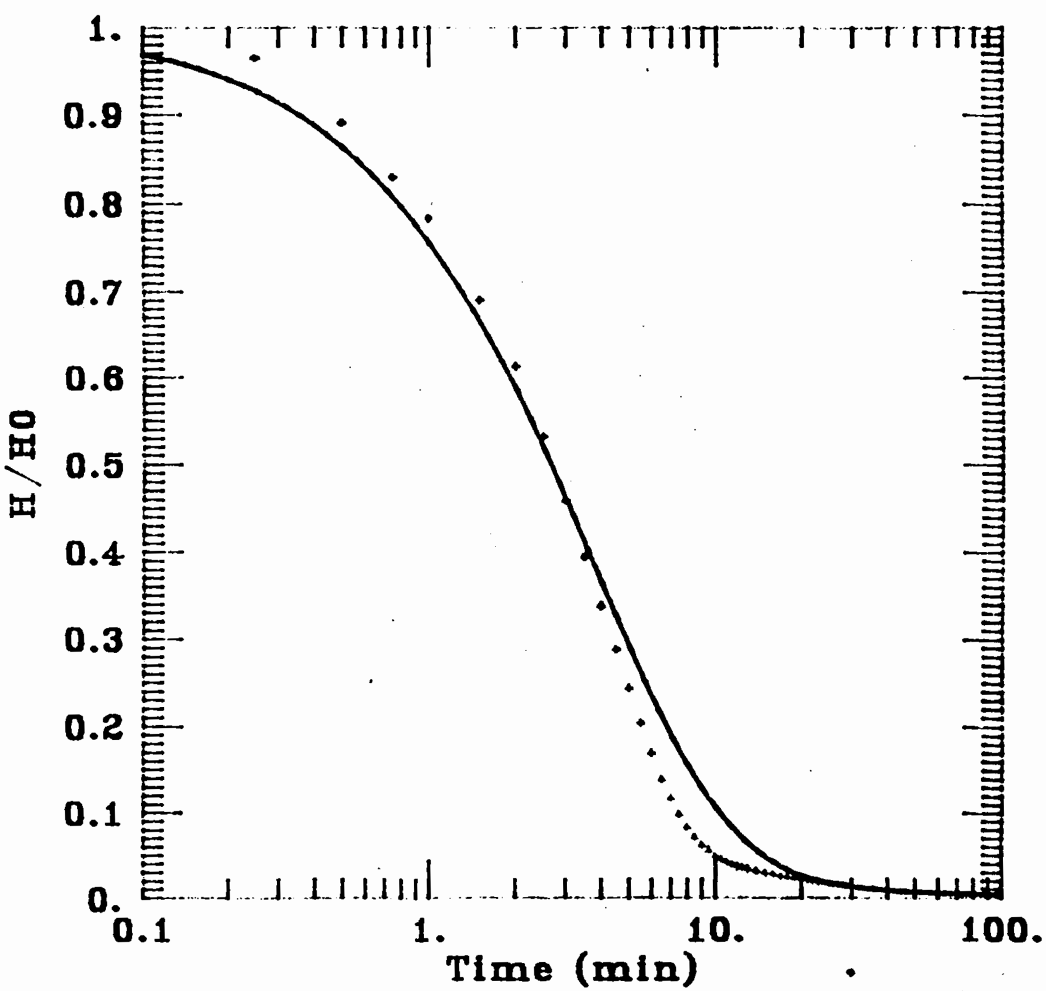
O'BRIEN & GERE ENGINEERS

Project No.: 5271.001

Client: BURGESS BROS. INC.

Location: BENNINGTON, VT.

W-01B SLUG TEST



DATA SET:
A:W-01B.DAT
08/04/93

AQUIFER TYPE:
Confined

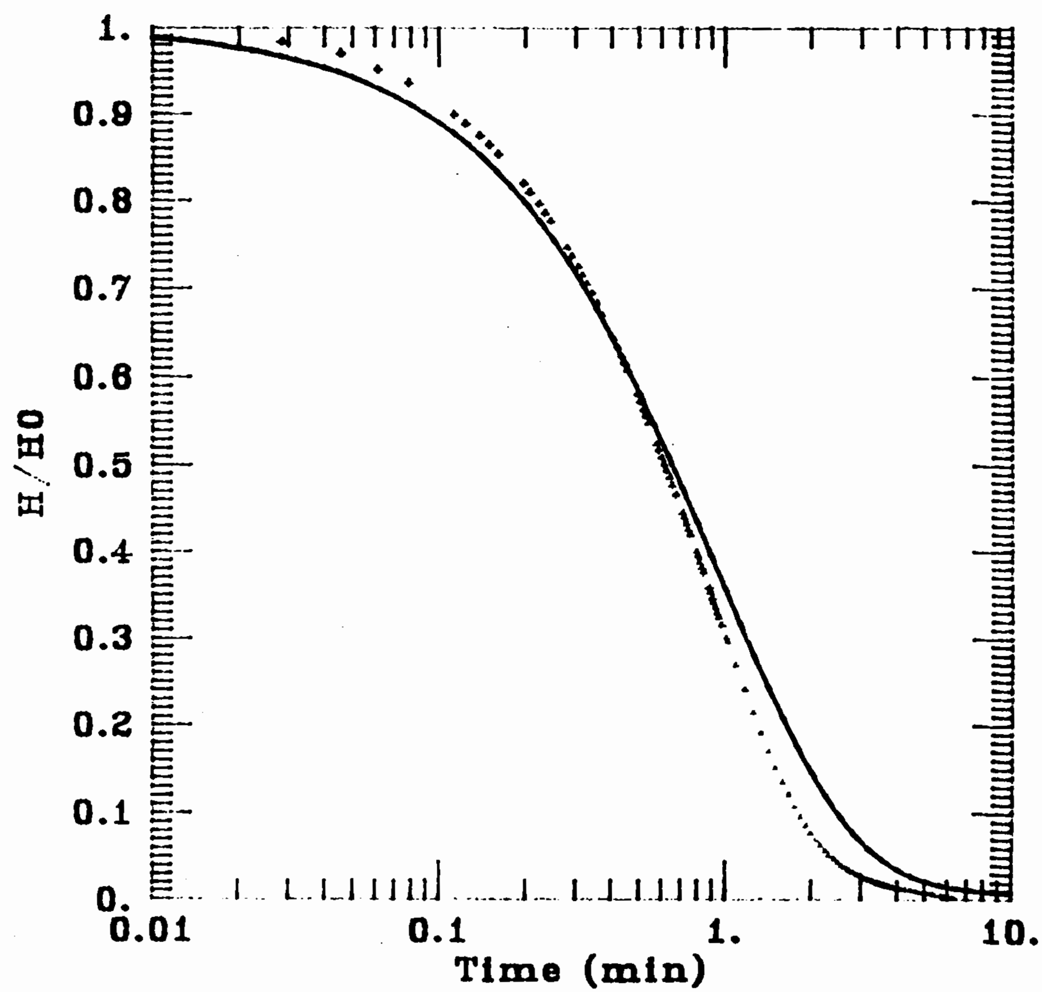
SOLUTION METHOD:
Cooper et al.

ESTIMATED PARAMETERS:
T = 0.01609 ft^2/min
S = 9.1267E-08

TEST DATA:
H0 = 44.91 ft
rc = 0.118 ft
rw = 0.118 ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

W-04B SLUG TEST



DATA SET:
A: W-04BAQ.DAT
08/04/93

AQUIFER TYPE:
Confined

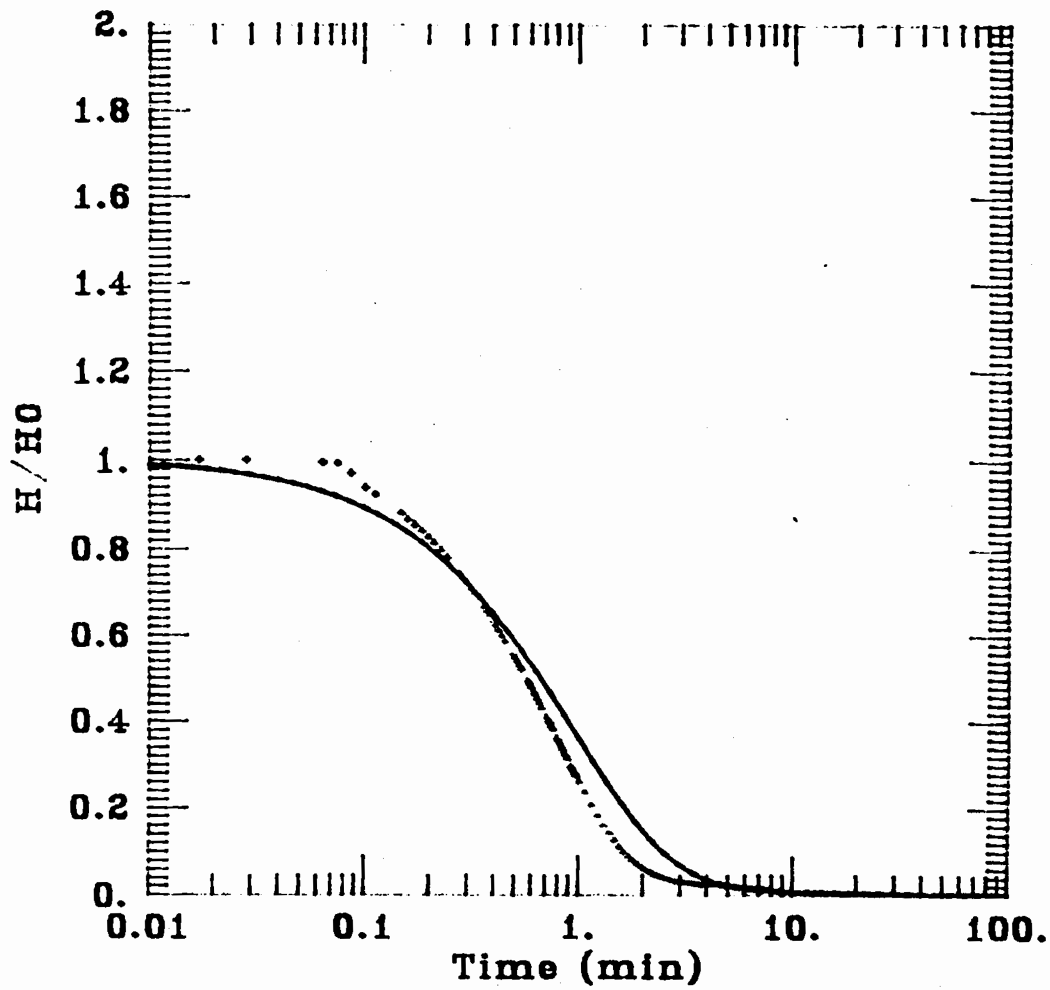
SOLUTION METHOD:
Cooper et al.

ESTIMATED PARAMETERS:
T = 0.08265 ft^2/min
S = 1.E-09

TEST DATA:
H0 = 16.02 ft
rc = 0.118 ft
rw = 0.118 ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC.
Project No.: 5271.001	Location: BENNINGTON, VT.

W-08B SLUG TEST



DATA SET:
A: W-08BAQ.DAT
08/04/93

AQUIFER TYPE:
Confined

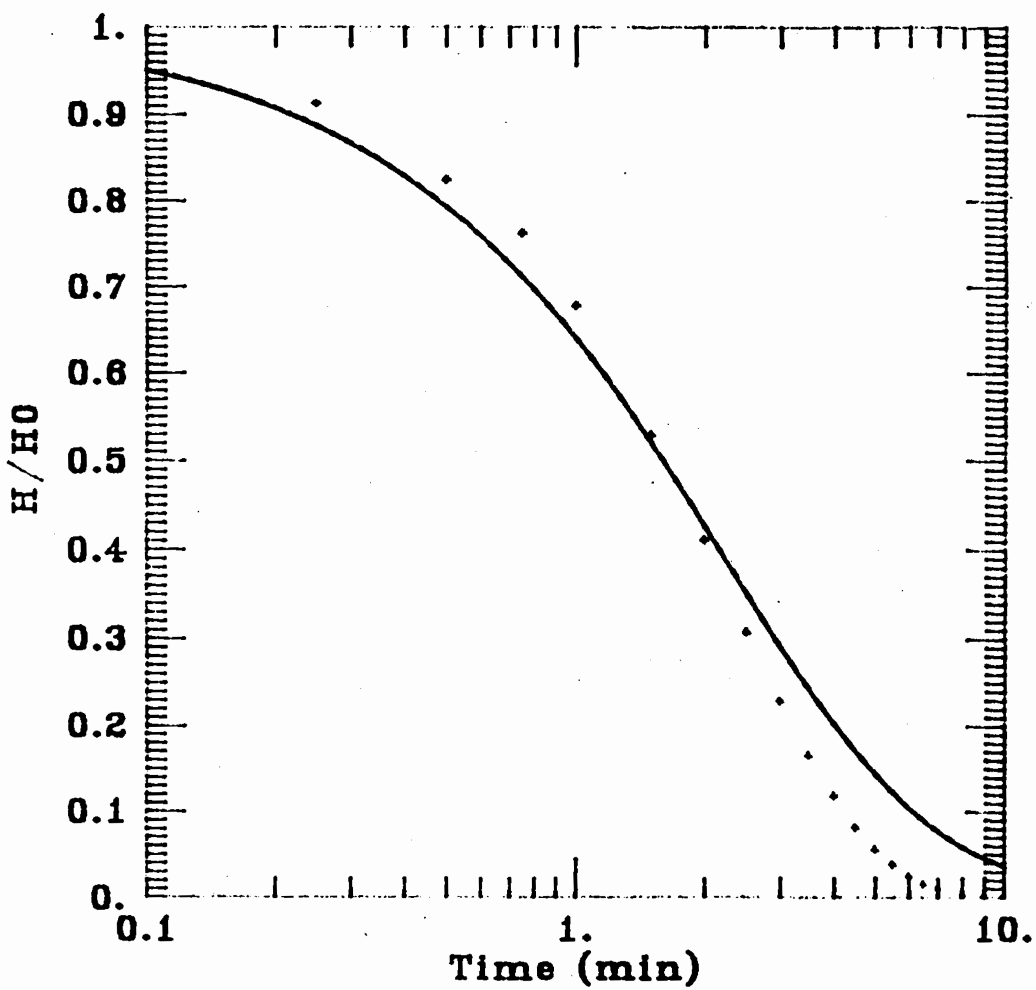
SOLUTION METHOD:
Cooper et al.

ESTIMATED PARAMETERS:
T = 0.1013 ft^2/min
S = 1.E-10

TEST DATA:
HO = 12.83 ft
rc = 0.125 ft
rw = 0.125 ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. INC
Project No.: 5271.001	Location: BENNINGTON, VT.

W–09B SLUG TEST



DATA SET:
A: W-09B.DAT
08/04/93

AQUIFER TYPE:
Confined

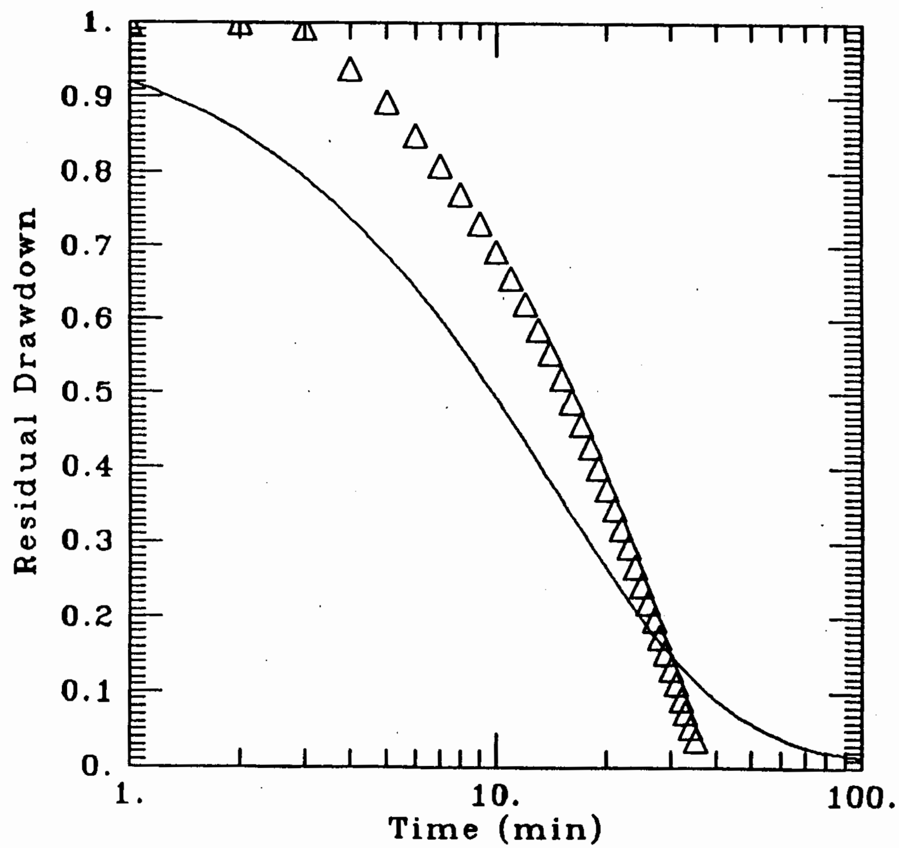
SOLUTION METHOD:
Cooper et al.

ESTIMATED PARAMETERS:
T = 0.03044 ft^2/min
S = 8.8228E-09

TEST DATA:
HO = 42.39 ft
rc = 0.118 ft
rw = 0.118 ft

O'BRIEN & GERE ENGINEERS, INC.	Client: BURGESS BROS. STEERING COM.
Project No.: 5271.003	Location: BENNINGTON, VT

W-01DI SLUG TEST



DATA SET:
W-01DI.dat
08/15/94

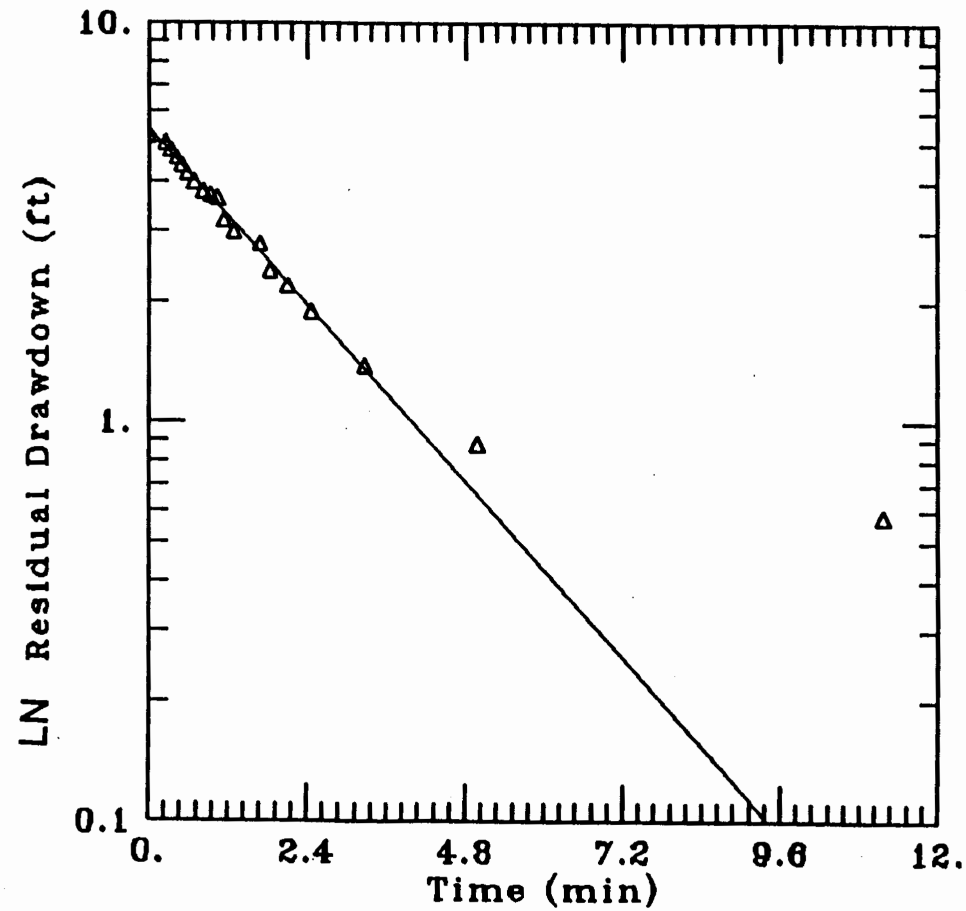
AQUIFER TYPE:
Confined
SOLUTION METHOD:
Cooper et al.
TEST DATE:
06/17/94
OBS. WELL:
W-01DI

ESTIMATED PARAMETERS:
T = 0.00219 ft^2/min
S = 1.E-08

TEST DATA:
H0 = 14.07 ft
rc = 0.083 ft
rw = 0.21 ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. STEERING COM.
Project No.: 5271.003	Location: BENNINGTON, VT

W-TP-12 SLUG TEST



DATA SET:
b:bbwtp12.dat
07/05/94

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
06/09/94

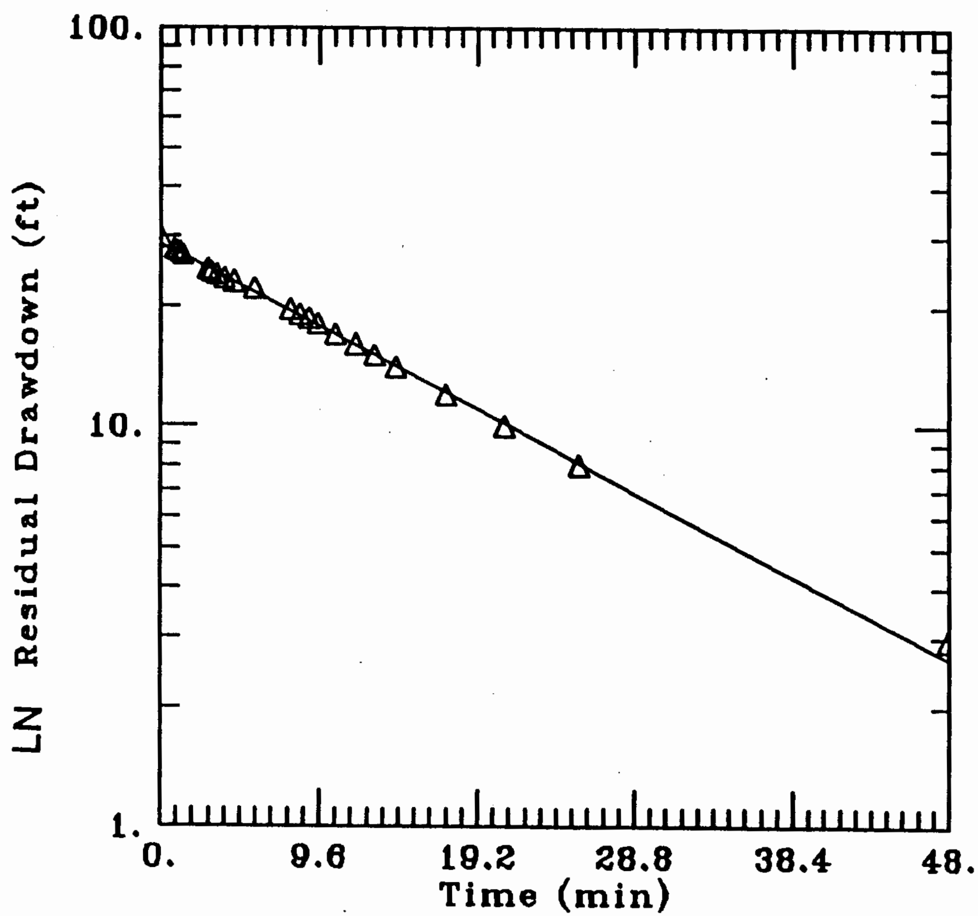
OBS. WELL:
W-TP-12

ESTIMATED PARAMETERS:
K = 0.0003805 ft/min
y0 = 5.415 ft

TEST DATA:
H0 = 5.18 ft
rc = 0.083 ft
rw = 0.33 ft
L = 7.88 ft
b = 15. ft
H = 7.88 ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. STEERING COM.
Project No.: 5271.003	Location: BENNINGTON, VT

W-04T SLUG TEST



DATA SET:
b:bbw4t.dat
07/06/94

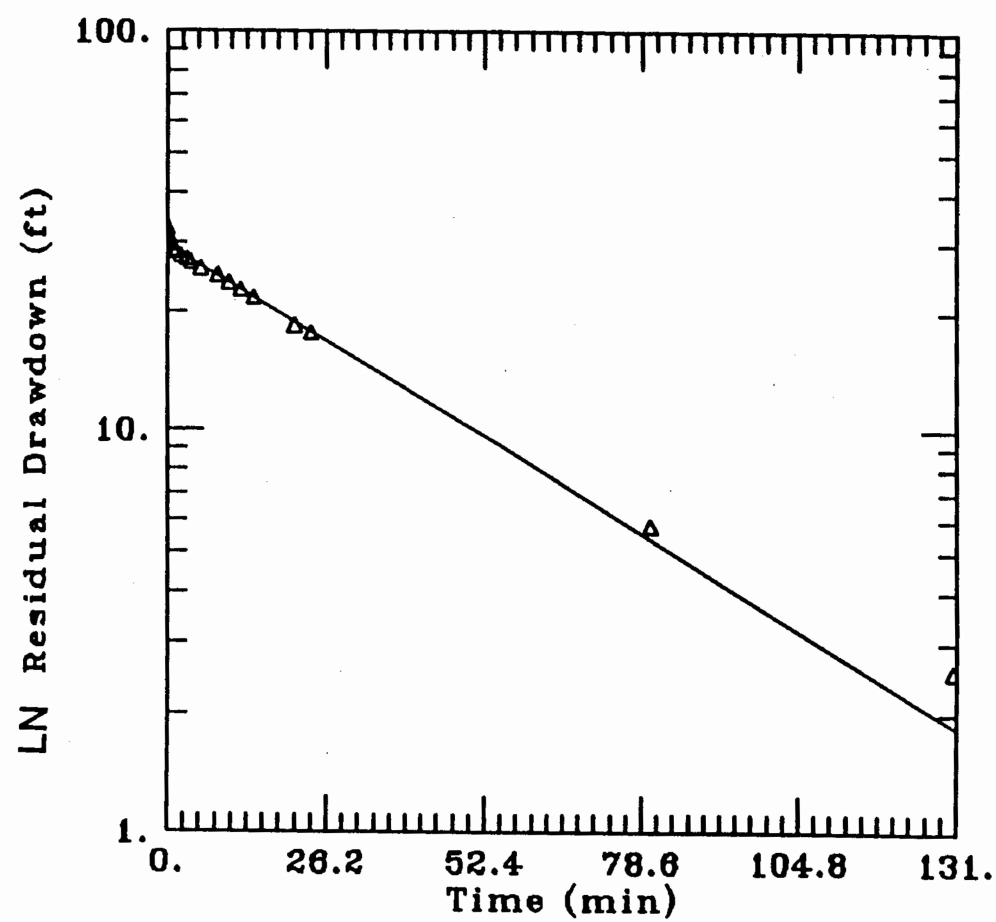
AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
06/09/94
OBS. WELL:
W-04T

ESTIMATED PARAMETERS:
K = 5.551E-05 ft/min
y0 = 28.71 ft

TEST DATA:
H0 = 29.7 ft
rc = 0.083 ft
rw = 0.33 ft
L = 10. ft
b = 30. ft
H = 30. ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. STEERING COM.
Project No.: 5271.003	Location: BENNINGTON, VT

W-22T SLUG TEST



DATA SET:
B:BBW22T.DAT
07/05/94

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
06/09/94

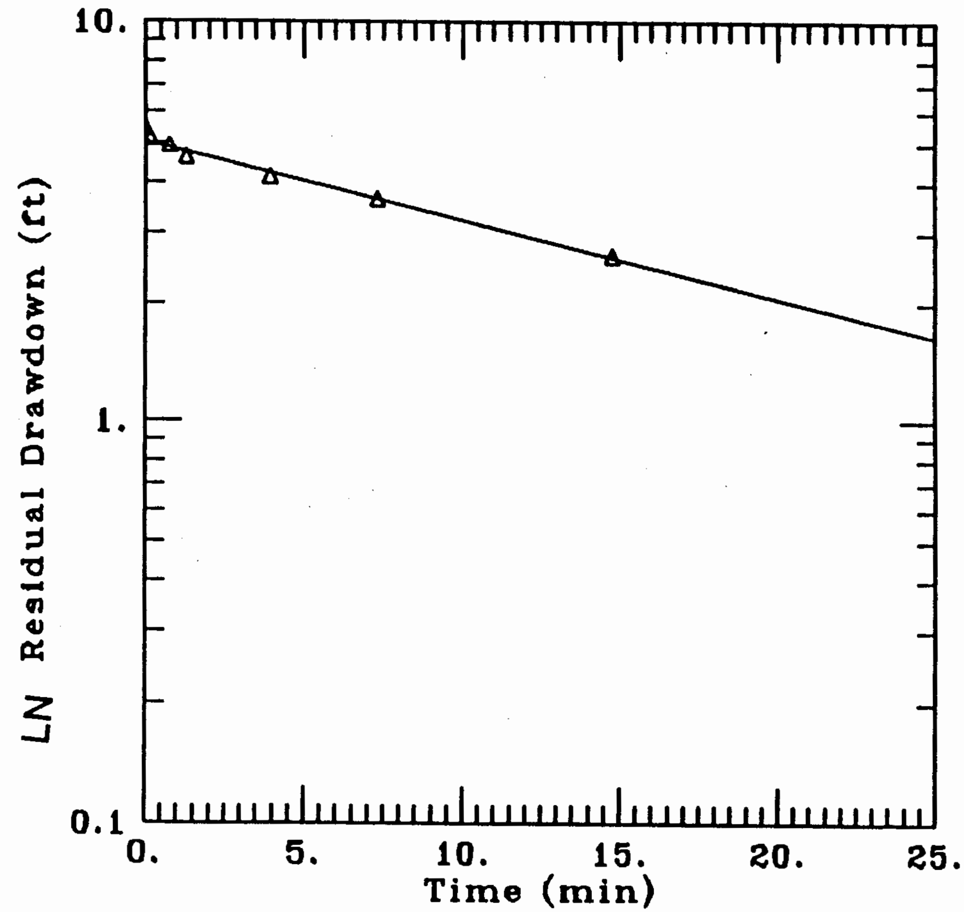
OBS. WELL:
W-22T

ESTIMATED PARAMETERS:
K = 2.3943E-05 ft/min
y0 = 29.33 ft

TEST DATA:
H0 = 32.67 ft
rc = 0.083 ft
rw = 0.33 ft
L = 10. ft
b = 32.67 ft
H = 32.67 ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. STEERING COM.
Project No.: 5271.003	Location: BENNINGTON, VT

W-26T SLUG TEST



DATA SET:
B:BBW26T.DAT
07/05/94

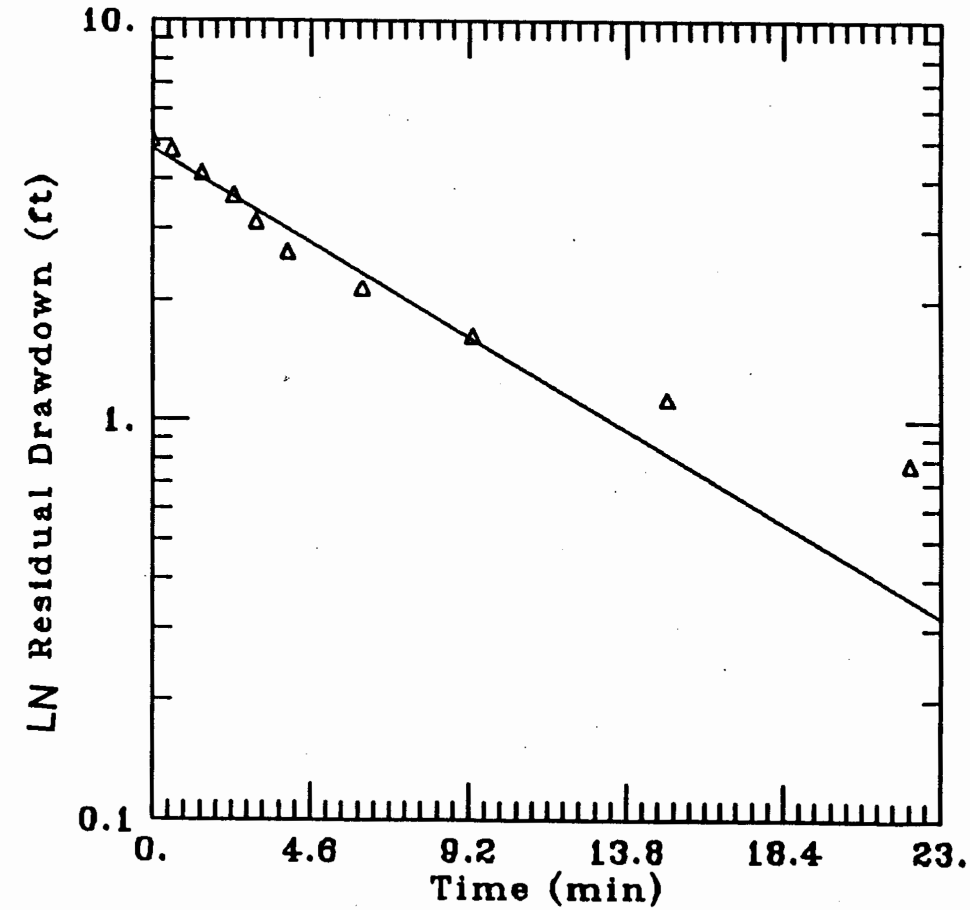
AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
06/09/94
OBS. WELL:
W-26T

ESTIMATED PARAMETERS:
K = 4.2737E-05 ft/min
y0 = 5.038 ft

TEST DATA:
H0 = 5.43 ft
rc = 0.083 ft
rw = 0.33 ft
L = 9. ft
b = 9. ft
H = 9. ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. STEERING COM.
Project No.: 5271.003	Location: BENNINGTON, VT

W-27S1 SLUG TEST



DATA SET:
b:bbW27S1.dat
07/05/94

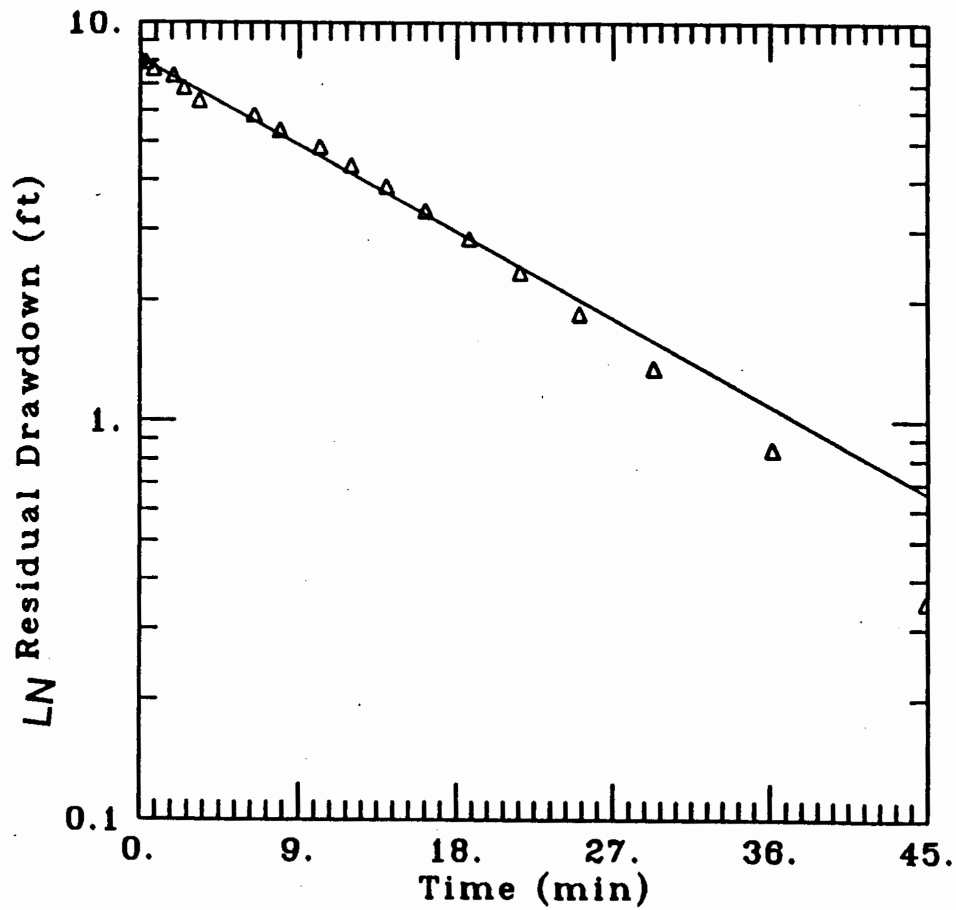
AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
06/09/94
OBS. WELL:
W-27S1

ESTIMATED PARAMETERS:
K = 0.0001186 ft/min
y0 = 4.756 ft

TEST DATA:
H0 = 5.03 ft
rc = 0.083 ft
rw = 0.33 ft
L = 6. ft
b = 20. ft
H = 5.74 ft

O'BRIEN & GERE ENGINEERS	Client: BURGESS BROS. STEERING COM.
Project No.: 5271.003	Location: BENNINGTON, VT

W-27T SLUG TEST



DATA SET:
bb27t.dat
07/05/94

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
06/07/94
OBS. WELL:
W-27T

ESTIMATED PARAMETERS:
K = 5.2013E-05 ft/min
y0 = 8.084 ft

TEST DATA:
H0 = 8.1 ft
rc = 0.083 ft
rw = 0.33 ft
L = 10. ft
b = 20. ft
H = 18.85 ft

Appendix 9

DRAFT

WET ANALYSIS

Burgess Brothers Superfund Site
Woodford and Bennington, Vermont

BURGESS BROTHERS SUPERFUND SITE
STEERING COMMITTEE

SEPTEMBER 1993

O'Brien & Gere Engineers, Inc.
5000 Brittonfield Parkway
Syracuse, New York 13221

Draft Wet Analysis Report

Burgess Brothers Superfund Site
Woodford and Bennington, Vermont

Table of Contents

SECTION 1. INTRODUCTION

1.01. Introduction

In accordance with the RI Work Plan, the functions and values of the wetland potentially impacted by the Burgess Brothers Superfund Site were evaluated using the Wetland Evaluation Technique (WET) developed by Adamus et al. (1987). Wetland functions are the physical, chemical, and biological processes or attributes of a wetland without regard to their importance to society while wetland values are the wetland processes or attributes that are valuable or beneficial to society (Adamus et al., 1987).

WET is a computer program, sponsored by the US Army Corps of Engineers, which evaluates wetland functions and values by characterizing the wetland in terms of predictors. Predictors are variables which represent physical, chemical, and biological characteristics of the wetland and vicinity. Responses to questions concerning the predictors are evaluated by the program using a series of interpretation keys that reflect the relationship between predictors and wetland values. The output of the program is a qualitative probability rating of HIGH, MODERATE, or LOW to each function and value in terms of social significance, effectiveness, and/or opportunity, which is in turn evaluated by the reviewing ecologist for accuracy and likelihood. Social significance evaluates the value of a wetland to society in terms of its special designations, potential economic value, and strategic location. Effectiveness assesses the capability of a wetland to perform a function based on its physical, chemical, or biological characteristics. Opportunity assesses the opportunity of a wetland to perform a function to its level of capability. The functions and values of wetlands that are evaluated in WET are the following:

- Ground water recharge
- Ground water discharge
- Floodflow alteration
- Sediment stabilization
- Sediment/toxicant retention
- Nutrient removal/transformation
- Production export
- Wildlife diversity/abundance
- Aquatic diversity/abundance
- Recreation
- Uniqueness/heritage

In accordance with the WET methodology, several preparatory tasks were performed prior to responding to the program questions. These tasks are identified and discussed in the following sections.

SECTION 2. WETLAND FUNCTION AND VALUE EVALUATION

2.01 Evaluation Type

Wetland functions and values are evaluated in terms of social significance, effectiveness and opportunity, which, in turn, can each be evaluated at different levels. Higher levels of evaluation are based on more detailed, sometimes long-term, data to increase the confidence in the results. A Level One social significance evaluation is performed based on researched information. A Level Two evaluation refines the Level One values based on the relationship with all other wetlands in a selected area. A Level One social significance assessment was conducted for the Burgess Brothers Superfund Site because it was judged to be adequate to evaluate the social significance of site wetlands.

Effectiveness and opportunity can be evaluated at three levels. A Level One assessment is performed based on researched information, Level Two is performed with the incorporation of data collected during a site visit. Level Three requires the collection of detailed (and in some cases long term) physical, chemical, and biological monitoring data from the site. According to the WET Manual, a Level Two effectiveness and opportunity assessment provides an acceptable balance between time, information available, and confidence desired for most wetland evaluation situations. Therefore, a Level Two effectiveness and opportunity evaluation was interpreted to be sufficient and was performed for the Burgess Brothers Superfund Site.

2.02 Time Context

WET can be applied to either preimpact, current, or predicted conditions in the wetland being evaluated. The WET analysis for the Burgess Brothers Superfund Site was performed using current conditions to determine the quality of the wetlands for evaluation by U.S. EPA of potential landfill-related impacts, if any.

2.03 Seasonal Context

WET can be used to evaluate wetland functions and values for average, dry, or wet hydrologic conditions. Average conditions were used in the analysis for the Burgess Brothers Superfund Site because the intermittent nature of the channel hydraulics in the wetland results in wetland conditions ranging between no flow and high channel flow with saturated soils. Average conditions are present in the wetland for the majority of the year when channel flow is present and soils are saturated to the surface outside of the main channel of the wetland.

2.04 Delineation of Evaluation Areas

Evaluation areas that must be delineated for the WET analysis consist of the Assessment Area, the

Input Zone, the watershed of the Assessment Area, the Service Area of the Assessment Area, and the watershed of the Service Area. Each of the evaluation areas are presented on Figure WET-1 and discussed below.

The Assessment Area is the area that will be assessed for functions and values. The Assessment Area for this analysis is considered to be the wetland area immediately downgradient of the former lagoon area of the Burgess Brothers Superfund Site. The Assessment Area is a palustrine, non-fringe, wetland area on either side of a drainage channel flowing from northeast to southwest, just east and south of the former lagoon area. This area was selected as the Assessment Area because it is the closest wetland to the former lagoon area and could potentially be impacted by leachate and runoff.

The Input Zone is the area surrounding the Assessment Area that may contribute sediments, nutrients, or contaminants to the Assessment Area. The Input Zone, by definition, consists of the area 300 ft upslope of the Assessment Area and 100 ft upstream of any tributaries for each 10 ft of tributary width. Areas 300 ft upslope of the included tributaries are also included in the Input Zone. The Assessment Area receives landfill leachate and ground water discharge from the landfill as well as surface runoff from sand and topsoil mining areas in the Input Zone north of the Assessment Area.

<u>2.05 Delineation of the Watershed</u>

The watershed of the Assessment Area includes the area upslope of the Assessment Area from which water flows into the Assessment Area, or until a dam is reached, including the watersheds of hydraulically connected contiguous wetland areas. The watershed of the Assessment Area (including the tributary watersheds), as delineated by an O'Brien & Gere geologist, totals approximately 32 acres. Figure WET-1 presents the Assessment Area watershed boundaries.

2.06 Identification of Service Area and Delineation of Service Area Watershed

A service area is defined as the point to which the Assessment Area functions and values are delivered. Barney Brook was identified as the only service area for the Assessment Area of the Burgess Brothers Superfund Site analysis because the Assessment Area is in the watershed of the brook and the Assessment Area outlet discharges to a drainage swale that is tributary to the brook.

The watershed of Barney Brook includes the source areas for waters that reach the brook as surface runoff or channel flow. The watershed for Barney Brook was calculated to cover approximately 1,700 acres (almost three square miles).

2.07 Definition of Locality and Region

Wetlands are assessed in the context of larger surrounding areas such as a locality and, on a larger scale, a region. The watershed of Barney Brook was considered the locality for this analysis and the State of Vermont was considered the region. It accordance with the WET methodology, wetlands in the vicinity of the Assessment Area were identified based on National Wetland Inventory (NWI) Map interpretation. However, the Assessment Area, and other similar wetlands in the vicinity, do not appear on the NWI Map as they were probably not discernible from areal photographs. Therefore, evaluations based on numbers of wetlands in a locality may not be representative of actual wetland presence.

2.08 Program Rankings

The WET analysis was performed using the geographic areas presented above and incorporating additional cultural, physical, and biological information obtained from several local and state agencies. Answers to approximately 81 questions, related to social significance, effectiveness, and opportunity were entered in to the WET program which calculated a ranking for each of the functions and values of the Assessment Area. Table WET-1 presents the results of the WET analysis. The output of the program was evaluated by an ecologist for accuracy and validity by comparing the program results with a field experience based expectation of the results. In addition, the questions used by the program in the interpretation keys for a function or value were reviewed to evaluate the reasons behind the conclusions of the program. The criteria evaluation sheets are presented in Appendix WET-A. The basis for the program rankings are discussed in the following sections for each function and value. The discussions focus on responses to specific questions which drove the concluded ranking. It should be noted that not all functions are evaluated for social significance, effectiveness, and opportunity.

2.08.1 Ground Water Recharge

Social Significance: **MODERATE**
Effectiveness: **LOW**

Ground water recharge is defined as the movement (usually downward) of surface water into the water table (Adamus et al., 1991). A MODERATE probability rating was assigned for social significance because of the lack of important aquifers such as sole source aquifers or Class II (Special) Ground Waters (Garrity, 1993), and the limited use of site ground water by area residents within a 1 mile radius. Most residents are supplied with municipal water (OBG, 1992). The MODERATE, as opposed to LOW, ranking results from the relative scarcity of wetlands in the watershed. Approximately 15 acres of NWI wetlands are present within the 1717 acre Barney Brook watershed (0.87%). This amount exceeded the annual loss rate of wetlands in the State of Vermont (0.09%)(Sorenson, 1993).

A LOW ranking was applied for ground water recharge effectiveness because of the low permeability and impeding layers present in soils of the Assessment Area (OBG, 1992). The low permeabilities minimize infiltration of surface water, draining from higher elevations, into the ground water table.

2.08.2 Ground Water Discharge

Social Significance: HIGH
Effectiveness: LOW

Ground water discharge is defined as the movement (usually laterally or upward) of ground water into surface water (Adamus et al., 1991). Discharge is a function of ground water flow rates, storage capacity, and evapotranspiration rates. The Assessment Area received a HIGH probability rating for ground water discharge because it discharges to Barney Brook and because the Assessment Area is one of relatively few wetlands in the Barney Brook watershed. Discharges to Barney Brook are socially significant because they maintain water levels that support fish populations which are harvested by anglers. Barney Brook is seasonally dry at some locations which impacts supportable fish populations (Snow, 1993).

The effectiveness of the Assessment Area was considered to be LOW because ground water recharge was not HIGH and the Assessment Area is not a permanently flooded area. LOW is the resulting default value when the criteria for MODERATE and HIGH are not met.

2.08.3 Floodflow Alteration

Social Significance: HIGH
Effectiveness: HIGH
Opportunity: HIGH

Floodflow alteration is defined as the process by which peak flows from run-off, surface flow, ground water flow and discharge, and precipitation enter a wetland and are stored or delayed from downslope migration (Adamus et al., 1991). The HIGH rating for social significance results from the presence of Barney Brook and commercial and private residences downstream of the Assessment Area which could be affected by a flood. In addition, since there are few wetlands in the Barney Brook watershed, each wetland is important in controlling floodwaters.

The effectiveness of the Assessment Area for floodflow alteration is HIGH because the outlet of the Assessment Area is not permanent. An intermittent outlet allows water to remain in the Assessment Area until the holding capacity is exceeded and water is released downstream.

Opportunity was also ranked HIGH because the Assessment Area is a small part of the watershed and there are no larger wetlands upgradient of the Assessment Area in the watershed that could assist in retaining floodwaters. Therefore, floodwaters from upgradient areas in the watershed would funnel into the Assessment Area and provide the opportunity to retain water.

2.08.4 Sediment Stabilization

Social Significance: LOW
Effectiveness: LOW

Sediment stabilization consists of shoreline anchoring (the stabilization of soil at the water's edge or in shallow water by plants) and the dissipation of erosive forces (the lessening of energy associated with currents, ice, water level fluctuations, or ground water flow) (Adamus et al., 1991). The social significance of the Assessment Area to sediment stabilization is LOW because the Assessment Area and downgradient areas are not situated in erosion-prone urban areas (Kimberly, 1993) and the Assessment Area is not the only palustrine wetland in the watershed. According to the model, the fact that the State of Vermont is losing wetlands for a variety of reasons at a rate (approximately 0.09% per year [Sorenson, 1993]) much lower than the national average (0.42% per year [Adamus et al., 1987]) also indicates that wetland loss is not a problem in the State. Vermont is approaching the national goal of 0% per year wetland loss. Therefore, the amount of wetlands lost due to sediment deposition in the state is likely a small percentage of the combined wetlands lost in the state and is not likely to be significant.

The effectiveness of the Assessment Area for sediment stabilization was also LOW, primarily due to the lack of vegetation and rubble in the main channel of the Assessment Area which would assist in the stabilization of sediments.

2.08.5 Sediment/Toxicant Retention

Social Significance:	**HIGH**
Effectiveness:	**LOW**
Opportunity:	**HIGH**

Sediment/toxicant retention is the process by which suspended solids, and chemical contaminants adsorbed to the solids, are retained and deposited within a wetland (Adamus et al., 1991). Sediment/toxicant retention was rated HIGH for social significance because of the historical detections of toxicants in the drainage swale of the Assessment Area. Certain compound concentrations may exceed ambient water quality criteria established under the Clean Water Act (Table [RI Surface Water Data]). In addition, there are few wetlands in the Barney Brook watershed that could assist in the toxicant retention.

The effectiveness evaluation for sediment/toxicant retention did not meet the criteria for HIGH or MODERATE, resulting in the default ranking of LOW. Characteristics that would make the Assessment Area effective at retaining toxicants/sediments include the dispersion of incoming water over a wide, densely vegetated area. Surface water in the Assessment Area is primarily through a non-vegetated channel.

The opportunity for the Assessment Area to retain sediments/toxicants is ranked HIGH because of the presence of toxicants in the surface water of the Assessment Area and the presence of sand pits upgradient in the watershed. The Burgess Brothers business actively uses an area upgradient of the Assessment Area for sand and topsoil mining which could contribute sediments to the Assessment Area during rainfall events.

2.08.6 Nutrient Removal/Transformation

Social Significance:	MODERATE
Effectiveness:	LOW
Opportunity:	HIGH

Nutrient removal/transformation includes: the storage of nutrients within the sediment or plant substrate; the transformation of inorganic nutrients to their organic forms; and the transformation and subsequent removal of nitrogen as a gas (Adamus et al., 1991). The social significance of the Assessment Area for nutrient removal/transformation was ranked MODERATE because of the limited uses of surface waters of the Assessment Area and Barney Brook. A LOW ranking did not result because of the few wetlands in the watershed.

The effectiveness of the nutrient removal/transformation of the Assessment Area is considered LOW because the peak annual flow velocity exceeds 1.5 ft/sec and the substrate is a mineral soil. The fast movement of the water through an inorganic medium minimizes the ability to remove or transform nutrients.

The opportunity for the Assessment Area to remove/transform nutrients was ranked HIGH because of the presence of the landfill upgradient of the Assessment Area which is contributing nutrients to the Assessment Area.

2.08.7 Production Export

Effectiveness: MODERATE

Production Export is defined as the flushing of large amounts of organic material (specifically carbon from net annual primary and secondary productivity) from the wetland to downstream or adjacent deeper waters (Adamus et al., 1991). Effectiveness of the Assessment Area for production export was ranked the default value of MODERATE because the HIGH and LOW criteria were not met. The effectiveness was not LOW because the Assessment Area has an outlet which could transport organic material downstream. HIGH rankings result for marine, estuarine, and riverine systems or palustrine systems with an abundance of submerged vegetation in an area of high rainfall and high erosion rates.

2.08.8 Wildlife Diversity/Abundance

Social Significance: LOW

Wildlife diversity/abundance is the support of a notably great on-site diversity and/or abundance of wetland-dependent birds (Adamus et al., 1991). The social significance of the Assessment Area to wildlife was ranked LOW because there are no rare, threatened, or endangered plant or animal species present on the site (Marshall, 1992) and the site is not commercially used for consumptive or non-consumptive wildlife uses. In addition, no suitable habitat exists in the Assessment Area for waterfowl.

2.08.9 Wildlife Diversity/Abundance Breeding

Effectiveness: **LOW**

Wildlife diversity/abundance breeding is related to the habitat quality of the Assessment Area for nesting sites. The effectiveness of the Assessment Area for bird nesting sites was ranked LOW because of its small size, shallow water depth, and amount of human disturbance. The Assessment Area is less than 5 acres in size and maximum water depth is less than 3 feet making the Assessment Area unattractive to waterfowl. The active sand and topsoil mining activities performed by humans adjacent to the Assessment Area create daily disturbances to birds seeking nesting sites.

2.08.10 Wildlife Diversity/Abundance Migration

Effectiveness: **LOW**

Wildlife diversity/abundance migration is related to the ability of the Assessment Area to provide resting and feeding habitat for migratory birds. The effectiveness of the Assessment Area at providing these functions was ranked LOW because the Assessment Area is not part of a riverine or estuarine system preferred by migratory waterfowl.

2.08.11 Wildlife Diversity/Abundance Wintering

Effectiveness: **LOW**

Wildlife diversity/abundance wintering relates to the ability of the Assessment Area to provide habitat for overwintering waterfowl. Effectiveness was ranked LOW for wintering habitat because the Assessment Area freezes in the winter, providing no open water habitat for overwintering waterfowl.

2.08.12 Aquatic Diversity/Abundance

Social Significance:	LOW
Effectiveness:	LOW

Aquatic diversity/abundance is the support of a notably great on-site diversity and/or abundance of fish or invertebrates that are mainly confined to the water and saturated soils (Adamus et al., 1991). The social significance of the aquatic diversity/abundance of the Assessment Area was ranked LOW because there are no protected fish species and the Assessment Area does not support a commercial fishery. In addition the Assessment Area is not located in an urban area nor is it the only wetland of this type in the watershed.

Effectiveness of the Assessment Area at supporting aquatic diversity/abundance was ranked LOW because of the small size of the Assessment Area and because there is not year round surface water flow through the Assessment Area. In addition, surface water quality in the Assessment Area may have been affected by landfill contaminants.

2.08.13 Uniqueness/Heritage

Social Significance: LOW

Uniqueness/heritage includes use of wetlands for "aesthetic enjoyment, nature study, education, scientific research, open space, preservation of rare or endemic species, protection of archaeologically or geologically unique features, maintenance of historic sites, and an infinite number of other mostly intangible uses" (Adamus et al., 1991). The uniqueness/heritage social significance of the Assessment Area is ranked LOW because the Assessment Area 1) does not contain rare, threatened, or endangered species; 2) is not managed for low intensity recreation (park, refuge, landmark); 3) is not listed as a historical/archaeological site; 4) is not unusual or rare for the region; is not the only palustrine wetland in the watershed; 5) is not located in an urban area; and 6) is not located in a state that is losing wetlands at a rate higher than the national average.

2.08.14 Recreation

Social Significance: LOW

Recreation includes both consumptive (sport fishing, food gathering, hunting) and nonconsumptive (swimming, canoeing, kayaking, birding) forms of recreation that are water dependent and occur in either an incidental or obligatory manner in wetlands (Adamus et al., 1987). The social significance of the Assessment Area to recreation was ranked LOW because the Assessment Area is not used for recreational activities which are otherwise locally deficient and the Assessment Area is not a major public access point to a recreational waterway.

SECTION 3. DISCUSSION

3.0 Discussion

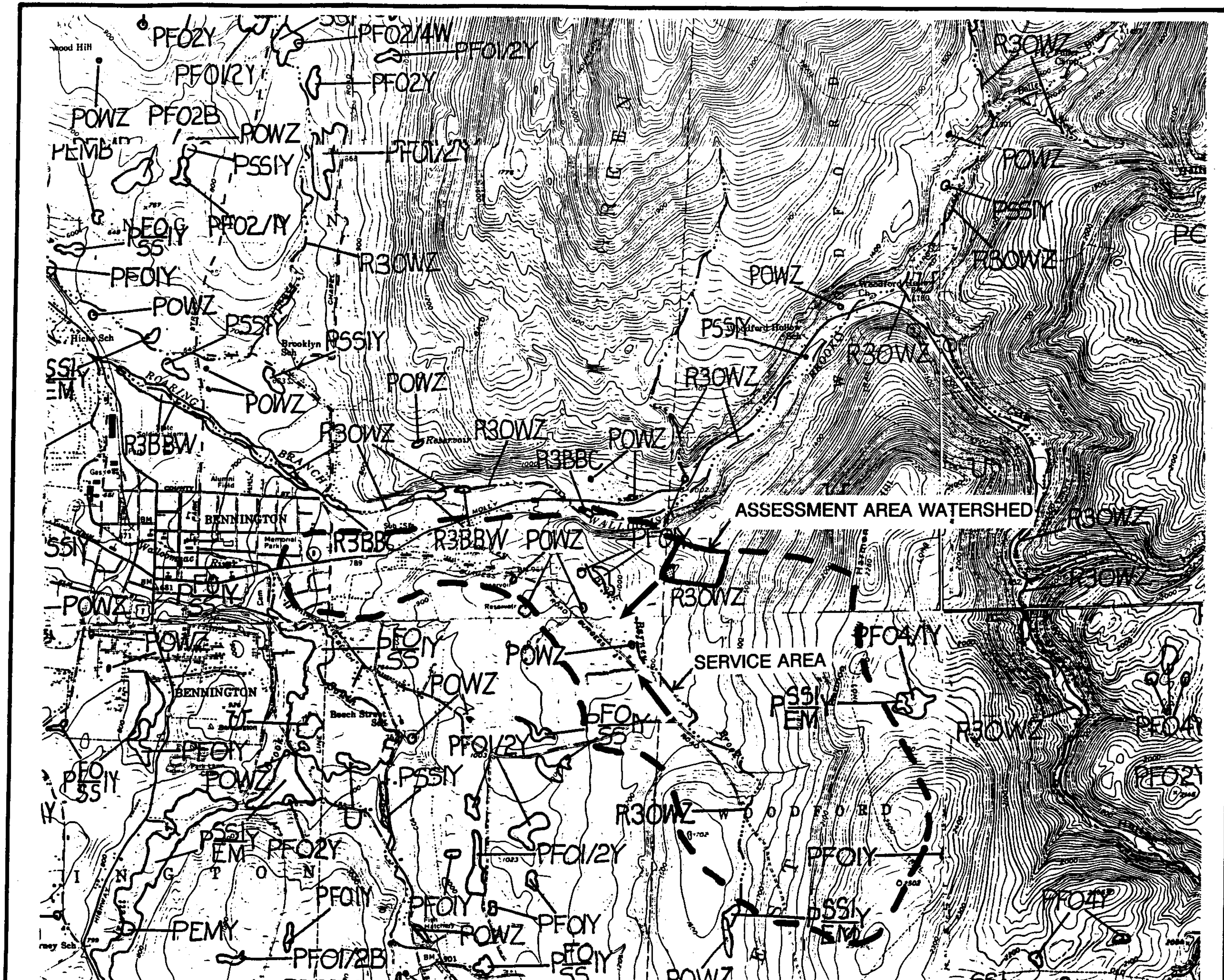
The Assessment Area is a forested palustrine wetland located in a flat area along a relatively steep, southwest facing hillside. Seasonal runoff from higher elevations runs into the Assessment Area from two main tributaries, which in turn have several smaller tributaries. The watershed of the Assessment Area includes a former waste disposal lagoon, a landfill, and a sand and topsoil mining area in an area with an otherwise low erosion potential. The Assessment Area is characterized by semi-permanently flooded mineral soils with an unvegetated, narrow, shallow main channel through which the majority of water flows as it travels down the hillside to its confluence with Barney Brook. Barney Brook is a relatively small brook that is stocked with trout by the state for recreational fishing. Barney Brook is not a permanent stream, but dries up in places during dry seasons making natural fish propagation difficult.

The WET analysis was performed to evaluate the functions and values of the Assessment Area to make a judgement of its overall quality. The quality of a wetland is based on the functions and values it provides to society and the environment. The results of the WET analysis are presented on Table WET-1. Based on the results and interpretation of the WET analysis, the overall quality of the Assessment Area is not high. This is primarily due to several physical factors controlling the hydrologic system. The first, and probably most important factor impacting the quality of the Assessment Area is lack of sufficient water. Water flow into the Assessment Area is intermittent; resulting in periods of no flow and potentially long periods of dry soil conditions. Although dry periods increase the organic production of the wetland, they also eliminate aquatic habitat necessary to support waterfowl and aquatic organisms which would raise the quality of the Assessment Area. In addition, during dry periods the Assessment Area can not supply water to Barney Brook to maintain the water depth required to support resident fish populations. The steep slope on which the Assessment Area is located also affects the duration of water in the Assessment Area, limiting the opportunity for water to infiltrate, disperse, or deposit. A second factor which impacts the quality of the Assessment Area is the lack of aquatic vegetation in the main routes of water travel. Vegetation in the main channel would slow water flow rates and provide a greater opportunity to retain nutrients and sediments and also provide a higher quality aquatic habitat for wildlife.

Based on the conditions discussed above, the WET analysis results are consistent with those expected from the physical characteristics of the site. The Assessment Area proved to be poor at effectively performing socially significant functions. Ground water discharge is important to the social significance function for its support of fish populations, but the Assessment Area does not provide much ground water to the brook. The retention of sediments/toxicants is also important for social significance to maintain water quality in downstream fish habitats, but due to the lack of channel vegetation, steep grades causing fast water flows, and the inorganic soil substrate, effective retention does not occur. The alteration of floodflows are significant to residences and businesses downstream of the Assessment Area. The results of the WET analysis for the effectiveness of the Assessment Area at floodflow alteration, which it ranked HIGH, is inconsistent with what would be expected based upon the steep slopes and channelized flow which are likely to transmit water downstream with little impedence. However, the WET program considers a semi-permanent outlet as a mechanism to retain water in the Assessment Area until its capacity is reached. In this case, the outlet of the Assessment Area is only intermittent in response to the intermittent flows in the inlet. It is not likely that much water storage occurs in the Assessment Area.

The opportunity for the Assessment Area to alter floodflow, retain sediments/toxicants, and remove/transform nutrients was considered HIGH. This high ranking is warranted due to the limited number of wetlands to assist in retaining floodwaters, potential landfill inputs, and inputs from upgradient sand and topsoil mines, respectively. However, toxicant and nutrient retention effectiveness was ranked LOW, due to the short duration of water in the Assessment Area and lack of vegetation in the main channel to assist in the retention. However, intermittently saturated portions of the Assessment Area contain organic soils and dense vegetation. These areas, when saturated by landfill leachate, high ground water, or stream overflow, would be effective at retaining nutrients and toxicants.

In conclusion, the palustrine wetland downgradient of the former lagoon area of the Burgess Brothers Superfund Site has the opportunity to provide functions that are important to society but is not very effective at performing these functions due to intermittent flows and steep slopes. Overall, the WET analysis concluded that the wetland is not important as a wildlife habitat nor does it provide any unique services for society.



SOURCE: NATIONAL WETLAND INVENTORY POWNAL, STAMFORD, BENNINGTON, AND WOODFORD QUADRANGLES.

FIGURE WET-1

BURGESS BROTHERS SUPERFUND SITE
WOODFORD AND BENNINGTON, VERMONT

LEGEND

BARNEY BROOK WATERSHED

NWI WETLAND

ASSESSMENT AREA

SURFACE WATER FLOW DIRECTION

NWI/WATERSHED MAP

2500 0 2500

APPROX. SCALE IN FEET

5271.001.302

O'BRIEN & GERE ENGINEERS, INC.

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TABLES

TABLE WET-1

****

Summary of Evaluation Results for "BURGESS"

****

	Social Significance	Effectiveness	Opportunity
Ground Water Recharge	M	L	*
Ground Water Discharge	H	L	*
Floodflow Alteration	H	H	H
Sediment Stabilization	L	L	*
Sediment/Toxicant Retention	H	L	H
Nutrient Removal/Transformation	M	L	H
Production Export	*	M	*
Wildlife Diversity/Abundance	L	*	*
Wildlife D/A Breeding	*	L	*
Wildlife D/A Migration	*	L	*
Wildlife D/A Wintering	*	L	*
Aquatic Diversity/Abundance	L	L	*
Uniqueness/Heritage	L	*	*
Recreation	L	*	*

Note: "H" = High, "M" = Moderate, "L" = Low, "U" = Uncertain, and "*"'s identify conditions where functions and values are not evaluated.

FIGURES

APPENDICES

APPENDIX A

WET ANALYSIS RESULTS

FORM A: SITE DOCUMENTATION (Page 1 of 2)

Part 1 - Background Information

Evaluation Site: Burgess Brothers Wetland Area Date: 2/93

Site Location (Section, Range, and Township): Bennington and Woodford Counties, Vermont

Has the evaluator taken a training course in WET Version 2.0? YES

Agencies/Experts Contacted: Vermont Wetlands, Fish and Wildlife, Historian, SCS

Circle the assessment levels to be completed? SS-1 SS-2 E/O-1&2 E/O-3 HS

Is the wetland tidal or nontidal? If the wetland is nontidal, indicate the month(s) that represent wet, dry, and average conditions, or if only average annual condition will be used, give rationale. Also, indicate if the previous 12 months of precipitation has been above, below, or near normal.
Average conditions will be used because hydrology of channel is intermittent and average conditions are representative of the entire year.

Is this evaluation an estimate of past conditions or a prediction of future conditions? (If answer is yes, explain nature and source of predictive data.)
NO

Will alternative ratings be used to evaluate any of the functions or values (if yes, explain)? NO

Part 2 - Identification and Delineation of Evaluation Areas

Sketch a map on the following page, or attach a suitable map (photocopy of topgraphic map) that shows the following information: (Figure)

- -- Boundaries of the AA, IA, and IZ, and the location of service areas.
- -- Watershed boundaries of AA, and service areas.
- -- Extent of surface water in the AA during the wet and dry seasons.
- -- Open water (channels and pools) within and adjacent to the AA.
- -- Normal direction of channel or tidal flow
- -- Normal direction of wind-driven waves or current.
- -- Impact area(s).
- -- Scale of distance and north compass direction.

Explain the procedures used to identify or delineate the AA, IA, IZ, service areas, and the watersheds of these areas if they differed from the guidelines outlined in Section 2.7. Same

-- Continued --

FORM A: SITE DOCUMENTATION (Page 2 of 2)

Part 2 (Cont.)

Estimate the extent of the following areas:

Assessment Area = 2 acres
Impact Area = ______ acres (only if applicable)
Watershed of AA = 34 acres/ .05 miles^2 (acres x 0.0016 = miles)
Wetlands in AA = 2 acres
Wetlands in the watershed of closest service area = 15 acres
Wetlands and deepwater in the watershed of closest service area = 15 acres

How were locality and region defined for this evaluation?
locality = Barney Brook Watershed
Region = State of Vermont

Sketch of Evaluation Areas (or attach map):

FORM B: EVALUATION ANSWER SHEET

Evaluation Site: Burgess Brothers Wetland Area

SOCIAL SIGNIFICANCE EVALUATION - LEVEL 1

3.1.1 "Red Flags"

					Comments/Assumptions
s1.	Y	N	U		VDFW, 1992a, 1992b
s2.	Y	N	U		Owned by Burgess Bros.
s3.	Y	N	U		
s4.	Y	N	U	(PFO)	Not rare wetland type
s5.	Y	N	U		NWI map
s6.	Y	N	U		Not managed by Burgess

3.1.2 On-site Social Significance

					Comments/Assumptions
s7.	Y	N	U	I	freshwater
s8.	Y	N	U	I	adjacent haz waste site topographically higher

3.1.3 Off-site Social Significance

					Comments
s9.	Y	N	U	I	Barney Brook - fishing
s10.	Y	N	U		Landfill related compounds in channel
s11.	Y	N	U		No targeted improvements
s12.	Y	N	U		AA surface water not for drinking
s13.	Y	N	U		AA is intermittent
s14.	Y	N	U		No swimming
s15.	Y	N	U	I	No RTE species
s16.	Y	N	U	I	few wells, low yield
s17.	Y	N	U	I	VDFW, 1993
s18.	Y	N	U	I	NWI Map
s19.	Y	N	U		(SCS, 1992) no waves
s20.	Y	N	U		No RTE, recreational fishing only

				Comments
s21.	Y	N	U	VDFW, 1992 a+b
s22.	Y	N	U	I Narrow channel flow normal PFO vegetation
s23.	Y	N	U	
s24.	Y	N	U	USGS Map
s25.	Y	N	U	No research
s26.	Y	N	U	No, landfill and mining
s27.	Y	N	U	much similar covertype available
s28.	Y	N	U	USGS
s29.	Y	N	U	USGS
s30.	Y	N	U	Vermont Wetlands Division
s31.	Y	N	U	.09 state .87 AA/watershed

SOCIAL SIGNIFICANCE EVALUATION - LEVEL 2

Context Region (Circle one)

Standard Density Circle
Locality
Hydrologic Unit

Question #

Comments/Assumptions

1	Y	N
2	Y	N
3	Y	N
4	Y	N

FORM B (Cont.)

Evaluation Site: Burgess Bros.

EFFECTIVENESS/OPPORTUNITY EVALUATION - LEVEL 1 (OFFICE)

Q.#	$\bar{X}$	W	D	COMMENTS/ASSUMPTIONS
1.1	Y N			Figure 6
1.2	Y N			Figure 7, 1
1.3	Y N			Estimate based on climate
Wetland Size 2.1.1	Y N	4.3 x 2000 x 10' ÷ 43.560 = 2		acres Barney Brook + Site (2) = 4
2.1.2	Y N			
2.1.3	Y N			
2.2.1	Y N I	Aerial Photo		
2.2.2	Y N I			
3.1	Y N	VWI Map		
3.2	Y N	4 acres / 4.2		
3.3	Y N	4/4.1		
4.1	Y N	VDFW, 1993		
4.2A	Y N	2.68 sq mi, USGS		
4.2B	Y N			
4.2C	Y N			
4.2D	Y N			
5.1.1		Y N		.11% NWI 2/1717
5.1.2		Y N		
5.2		Y N		.87% NWI 15/1717
6.1	Y N	100/100 USGS		
6.2	Y N	LFI Report Pg AP-5		
7	Y N I	question 41 was answered		
8.1	Y N			
8.2	Y N	Site visit		
8.3	Y N			
8.4	Y N			
9.1		Y N		(a) is true
9.2		Y N I		no sheetflow
9.3		Y N I		upstream watershed
10A	Y N			
10B	Y N	RI Report		
10C	Y N			
10D	Y N			
10E	Y N			
10F	Y N			

Evaluation Site: Burgess Bros.

WETLAND CONDITION

Q.#	$\bar{X}$	W	D	COMMENTS/ASSUMPTIONS
11	Y N	Y N	Y N	non-fringe wetland
12A	Y N	Y N	Y N	
12Aa	Y N	Y N	Y N	
12Ab	Y N	Y N	Y N	
12Ac	Y N	Y N	Y N	
12Ad	Y N	Y N	Y N	site visit
12Ae	Y N	Y N	Y N	
12B	Y N	Y N	Y N	
12Ba	Y N	Y N	Y N	
12Bb	Y N	Y N	Y N	
12Bc	Y N	Y N	Y N	
12Bd	Y N	Y N	Y N	
12Be	Y N	Y N	Y N	
12C	Y N	Y N	Y N	
12Ca	Y N	Y N	Y N	
12Cb	Y N	Y N	Y N	
12Cc	Y N	Y N	Y N	
12Cd	Y N	Y N	Y N	
12D	Y N	Y N	Y N	
12Da	Y N	Y N	Y N	
12Db	Y N	Y N	Y N	
12E	Y N	Y N	Y N	
13A	Y N	Y N	Y N	
13Aa	Y N	Y N	Y N	
13Ab	Y N	Y N	Y N	site visit
13Ac	Y N	Y N	Y N	
13Ad	Y N	Y N	Y N	
13Ae	Y N	Y N	Y N	
13B	Y N	Y N	Y N	
13Ba	Y N	Y N	Y N	
13Bb	Y N	Y N	Y N	
13Bc	Y N	Y N	Y N	
13Bd	Y N	Y N	Y N	
13Be	Y N	Y N	Y N	
13C	Y N	Y N	Y N	
13Ca	Y N	Y N	Y N	
13Cb	Y N	Y N	Y N	
13Cc	Y N	Y N	Y N	
13Cd	Y N	Y N	Y N	
13D	Y N	Y N	Y N	
13Da	Y N	Y N	Y N	
13Db	Y N	Y N	Y N	
13E	Y N	Y N	Y N	

Evaluation Site: Burgess Bros.

WETLAND CONDITION

Q.#	$\bar{X}$	W	D	COMMENTS/ASSUMPTIONS
14.1	Y N	Y N	Y N	USGS, site visit
14.2	Y N	Y N	Y N	
15.1A	Y N I			
15.1B	Y N I	Site visit		
15.1C	Y N I			
15.2	Y N I	channelized flow		
16A	Y N	Y N	Y N	site visit
16B	Y N	Y N	Y N	
16C	Y N	Y N	Y N	
17	Y N	1-10 acres with similar vegetation		
18	Y N I	RI Report		
19.1A	Y N I	primarily zone A		
19.1B	Y N I	sufficient veg, no waves		
19.2	Y N I			
19.3	Y N I			
20.1	Y N I	Site visit		
~~20.2~~	Y N I	Question deleted		
21A	Y N	USGS, aerial photo		
21B	Y N			
21C	Y N			
21D	Y N			
21E	Y N			
22.1.1	Y N	channel, inlet + outlet		
22.1.2	Y N I	RI Report		
22.2	Y N			
22.3	Y N I	Aerial photo		
23	Y N	Site visit		
24.1	Y N I			
24.2	Y N I	a-F b-T		
24.3	Y N I	SCS (RGS)		
24.4	Y N I	SCS (RGS)		
24.5	Y N	SCS (RGS)		
25.1	Y N	22 acres of site		
25.2A	Y N I			
25.2B	Y N I			
25.3	Y N			

FORM B (Cont.)

Evaluation Site: Burgess Bros.

WETLAND CONDITION

COMMENTS/ASSUMPTIONS

Q.#	$\bar{X}$	W	D
26.1	Y N	Landfill inputs	
26.2	Y N I		
26.3	Y N I	Leachate is channel flow	
27.1	Y N	landfill leachate	
27.2	Y N I		
27.3	Y N I	leachate is channel flow	

EFFFECTIVENESS/OPPORTUNITY EVALUATION - LEVEL 2 (FIELD)

WETLAND CONDITION

COMMENTS/ASSUMPTIONS

Q.#	$\bar{X}$	W	D	COMMENTS/ASSUMPTIONS
28	Y N			
29.1	Y N			
29.2	Y N			
30.	Y N	Y N	Y N	active adjacent landfill < 3' water
31.1	Y N	Y N	Y N	
31.2	Y N	Y N	Y N	
31.3	Y N	Y N	Y N	
31.4	Y N I	Y N I	Y N I	submerged veg absent
31.5	Y N	Y N	Y N	
31.6A	Y N	Y N	Y N	Zone B absent
31.6B	Y N	Y N	Y N	
31.6C	Y N	Y N	Y N	
31.6D	Y N	Y N	Y N	
31.6E	Y N	Y N	Y N	
32A	Y N			
32B	Y N			
32C	Y N			
32D	Y N			
32E	Y N			
32F	Y N			
32G	Y N			
32H	Y N			
32I	Y N			
32J	Y N			
32K	Y N			

Evaluation Site: Burgess Bros.

WETLAND CONDITION

Q.#	$\bar{X}$	W	D	COMMENTS/ASSUMPTIONS
33A	Y N			
33B	Y N			
33C	Y N			
33D	Y N			
33E	Y N			
33F	Y N			
33G	Y N			
33H	Y N			
33I	Y N			
33J	Y N			
33K	Y N			
34.1	Y N			
34.2	Y N			
34.3.1	Y N			
34.3.2	Y N I			34.3.1 is N
35.1	Y N I			Zone A primarily hydrophytic plants
35.2	Y N I			channels full, sw present, insufficient info
36.1.1	Y N	Y N	Y N	
36.1.2	Y N	Y N	Y N	<500'
36.2.1	Y N	Y N	Y N	Zone B absent
36.2.2	Y N	Y N	Y N	
36.2.3	Y N	Y N	Y N	
~~37~~	Y N			Question deleted
38.1	Y N			
38.2	Y N			
38.3	Y N			
38.4	Y N			
38.5	Y N			
38.6	Y N			No evergreen forest
38.7	Y N			
38.8	Y N I			Not Southwest Riparian wetland
39	Y N			<100 acres, trees >10" DBH, fruits
40.1	Y N I			Sampling data, RI Report
40.2	Y N I			
41.1		Y N I		
41.2		Y N I		estimate based on 1 ft/sec non-peak flow

FORM B (Cont.)

Evaluation Site: Burgess Bros.

WETLAND CONDITION

COMMENTS/ASSUMPTIONS

Q.#	$\bar{X}$	W	D
42.1.1	Y N I	Y N I	Y N I
42.1.2	Y N I	Y N I	Y N I
42.1.3	Y N I	Y N I	Y N I
42.2.1	Y N I	Y N I	Y N I
42.2.2	Y N I	Y N I	Y N I
42.2.3	Y N I	Y N I	Y N I
43A	Y N	Y N	Y N
43B	Y N	Y N	Y N
43C	Y N	Y N	Y N
43D	Y N	Y N	Y N
43E	Y N	Y N	Y N
43F	Y N	Y N	Y N
43G	Y N	Y N	Y N
43H	Y N	Y N	Y N
43I	Y N	Y N	Y N
44A	Y N	Y N	Y N
44B	Y N	Y N	Y N
44C	Y N	Y N	Y N
44D	Y N	Y N	Y N
44E	Y N	Y N	Y N
44F	Y N	Y N	Y N
44G	Y N	Y N	Y N
44H	Y N	Y N	Y N
44I	Y N	Y N	Y N
45A	Y N		
45B	Y N		
45C	Y N		
45D	Y N		
45E	Y N		
45F	Y N		
45G	Y N		
46A	Y N	Y N	Y N
46B	Y N	Y N	Y N
46C	Y N	Y N	Y N
47A	Y N		
47B	Y N		
47C	Y N		

FORM B (Cont.)

Evaluation Site: Burgess Bros.

WETLAND CONDITION — COMMENTS/ASSUMPTIONS

Q.#	$\bar{X}$	W	D
48A	Y N I	Y N I	Y N I
48B	Y N I	Y N I	Y N I
48C	Y N I	Y N I	Y N I
48D	Y N I	Y N I	Y N I
48E	Y N I	Y N I	Y N I
48F	Y N I	Y N I	Y N I
49.1.1	Y N I	Y N I	Y N I
49.1.2	Y N I	Y N I	Y N I
49.2	Y N I	Y N I	Y N I
49.3	Y N I	Y N I	Y N I
50.	Y N	Y N	Y N

EFFECTIVENESS/OPPORTUNITY EVALUATION - LEVEL 3 (DETAILED DATA)

WETLAND CONDITION — COMMENTS/ASSUMPTIONS

Q.#	$\bar{X}$	W	D
51.1	Y N U		
51.2	Y N U		
52.1	Y N I U		
52.2	Y N I U		
53.1	Y N I U		
53.2	Y N I U		
54	Y N U	Y N U	Y N U
55.1	Y N U		
55.2	Y N U		
55.3	Y N U		
55.4	Y N U		
56.1	Y N I U		
56.2	Y N I U		
57.1	Y N U		
57.2	Y N U		
58.	Y N U		

FORM B (Cont.)

Evaluation Site: Burgess Bros.

WETLAND CONDITION **COMMENTS/ASSUMPTIONS**

Q.#	$\bar{X}$	W	D
59.1	Y N I U		
59.2	Y N I U		
60	Y N U		
61	Y N I U		
62	Y N U		
63.1	Y N I U		
63.2	Y N I U		
64		Y N I U	

FORM C: SUPPLEMENTARY OBSERVATIONS

Evaluation Site: Burgess Bros

Indicate the species, species groups, and activities that are actually observed, reliably reported, or known to occur at the AA on a regular basis.

FISH SPECIES GROUPS*	OBSERVED/REPORTED
1. Warmwater Group	Y or N
2. Coldwater Group	Y or N
3. Northern Lake Group	Y or N
4. Coldwater Riverine Group	Y or N

FISH SPECIES	OBSERVED/REPORTED
Minnow	Y or N
	Y or N
	Y or N

WATERFOWL SPECIES GROUPS**	NESTING	MIGRATING	WINTERING
1. Prairie Dabblers	Y or N	Y or N	Y or N
2. Black Duck	Y or N	Y or N	Y or N
3. Wood Duck	Y or N	Y or N	Y or N
4. Common and Red-Breasted Mergansers	Y or N	Y or N	Y or N
5. Hooded Merganser	Y or N	Y or N	Y or N
6. Canvasback, Redhead, Ruddy Duck	Y or N	Y or N	Y or N
7. Ring-necked Duck	Y or N	Y or N	Y or N
8. Greater and Lesser Scaup	Y or N	Y or N	Y or N
9. Common Goldeneye	Y or N	Y or N	Y or N
10. Bufflehead	Y or N	Y or N	Y or N
11. Whistling Ducks	Y or N	Y or N	Y or N
12. Inland Geese	Y or N	Y or N	Y or N
13. Tundra Swan	Y or N	Y or N	Y or N
14. Brant	Y or N	Y or N	Y or N

(OBSERVED/REPORTED applies to Nesting, Migrating and Wintering columns.)

BIRD SPECIES	OBSERVED/REPORTED
(See Table EA-)	Y or N
	Y or N
	Y or N

RECREATIONAL ACTIVITIES

Hiking
Birdwatching
Photography
Swimming
Sailing
Power Boating
Canoeing
Kayaking
Snowmobiling
Skiing
Snowshoeing
Ice Skating
Research
Educational Fieldtrips
Horseback Riding

CONSUMPTIVE ACTIVITIES

Agriculture
Hunting
Fur Harvesting
Timber Harvest
Commercial/Sport Fishing
Natural Food Gathering
Peat Harvesting
Water Supply

* Fish species groups are explained on page 138
** Waterfowl species groups are explained on page 1647

FORM D: EVALUATION SUMMARY SHEET

Evaluation Site: Burgess Bros.

Wetland Functions and Values

	Social Significance	Effectiveness	Opportunity
Ground Water Recharge	M	L	*
Ground Water Discharge	H	L	*
Floodflow Alteration	H	H	H
Sediment Stabilization	L	L	*
Sediment/Toxicant Retention	H	L	H
Nutrient Removal/Transform.	M	L	H
Production Export	*	M	*
Wildlife Diversity/Abundance**	L	*	*
Breeding	*	L	*
Migration	*	L	*
Wintering	*	L	*
Aquatic Diversity/Abundance	L	L	*
Uniqueness/Heritage	L	*	*
Recreation	L	*	*

Habitat Suitability Evaluation

Fish Species Groups:

________ Group __ ________ Group __ ________ Group __

Waterfowl Species Groups:

	Breeding	Migration	Wintering
Group ________			
Group ________			
Group ________			
Group ________			

Fish, Invertebrate, and Bird Species:

Levels of assessment completed: S-1 S-2 E/O-1 E/O-2 E/O-3 HS

Evaluation is for the: AA IA (Note: if the evaluation is for an IA, documentation of the AA evaluation must be presented with this evaluation).

Is there any evidence that suggests ratings contrary to the above (explain)? Floodflow alteration effectiveness likely to be low because of channel flow

Were alternative sources used for any of the ratings above (explain)? NO

The loss rate for Vermont (identify locality/region) between 1992 and 1993 for all (identify wetland type) was 200 or .09% (acres/year or % loss).

* WET does not evaluate this function or value in these terms.

** Wildlife Diversity/Abundance assesses only wetland-dependent birds. Other wildlife (e.g., game mammals) should be evaluated using other methods.

****

Summary of Evaluation Results for "BURGESS"

****

	Social Significance	Effectiveness	Opportunity
Ground Water Recharge	M	L	*
Ground Water Discharge	H	L	*
Floodflow Alteration	H	H	H
Sediment Stabilization	L	L	*
Sediment/Toxicant Retention	H	L	H
Nutrient Removal/Transformation	M	L	H
Production Export	*	M	*
Wildlife Diversity/Abundance	L	*	*
Wildlife D/A Breeding	*	L	*
Wildlife D/A Migration	*	L	*
Wildlife D/A Wintering	*	L	*
Aquatic Diversity/Abundance	L	L	*
Uniqueness/Heritage	L	*	*
Recreation	L	*	*

Note: "H" = High, "M" = Moderate, "L" = Low, "U" = Uncertain, and "*"'s identify conditions where functions and values are not evaluated.

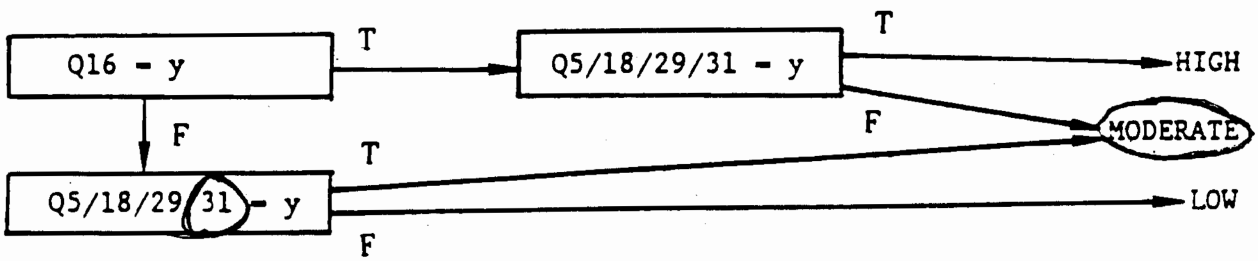
3.2 Social Significance Evaluation - Level 1 Interpretation

This section outlines the procedure for interpreting the responses to questions in the first level of the social significance evaluation and assigning probability ratings of HIGH, MODERATE, or LOW to functions and values in terms of social significance.

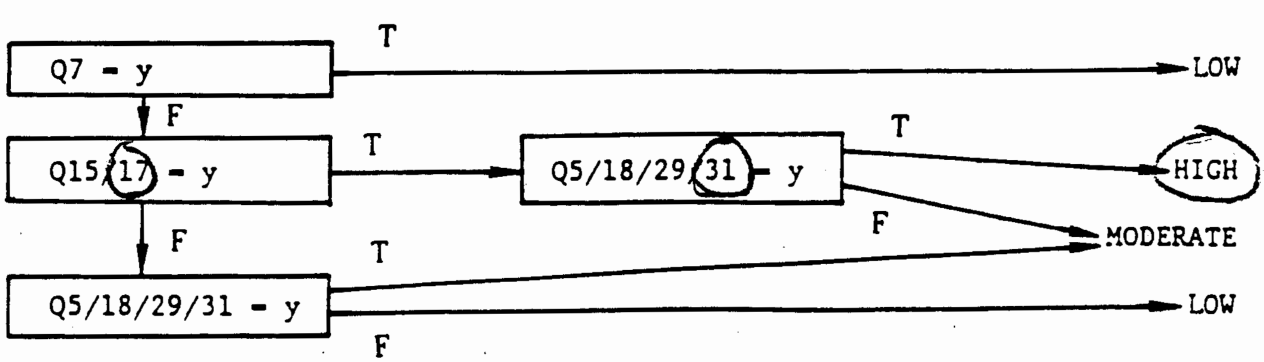
Place Form B and the Social Significance Keys in front of you. Note that there is an separate key for each of the functions and values to be evaluated. Each key consists of a series of boxes. Within each box are coded references to a single question, or group of questions from the Level 1 assessment. Each coded reference is followed by a specified answer of "y" (yes) or "n" (no). Within the boxes, "/" should be read as "or". For example, in the ground water recharge key the first box contains the statement "Q16/17 - y." This translates into, "Were Questions 16 or 17 answered yes?" A true (T) and false (F) arrow emerges from each box. Follow the true arrow if the conditions specified are met, and follow the false arrow if the conditions specified are not met. Proceed through the key from box to box until a HIGH, MODERATE, LOW, or UNCERTAIN probability rating is specified. Then proceed to next key until all function and values have been assigned a probability rating for social significance. Record the probability ratings for each of the functions and values in the Social Significance column of Form D.

Social Significance Keys

Ground Water Recharge

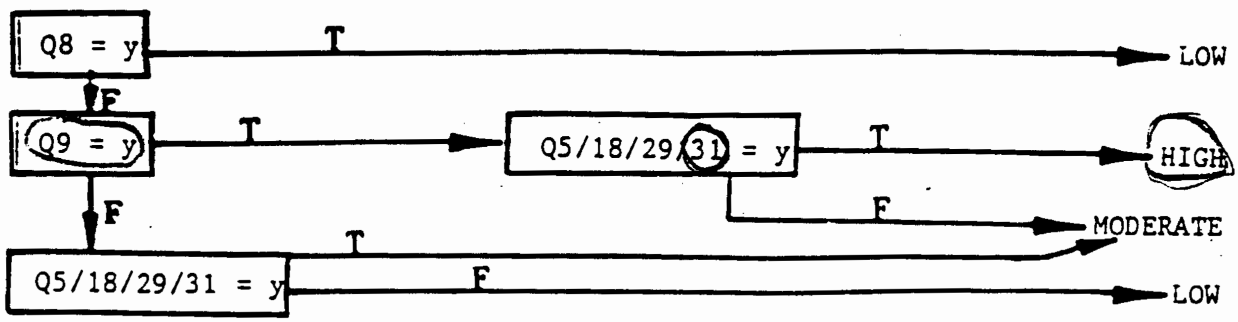


Ground Water Discharge

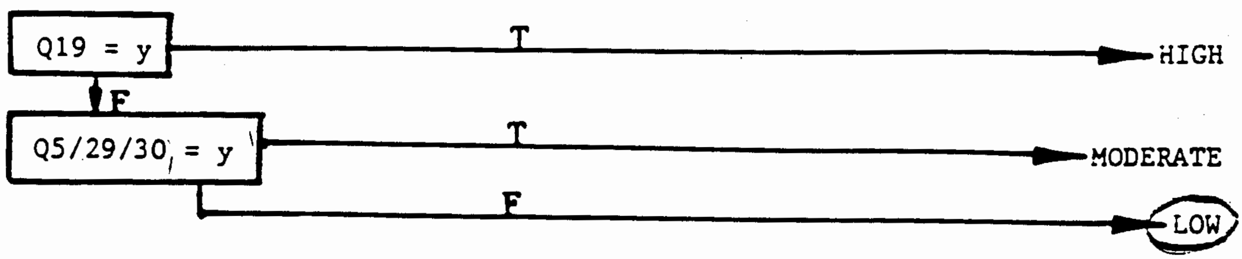


Social Significance Keys (Cont.)

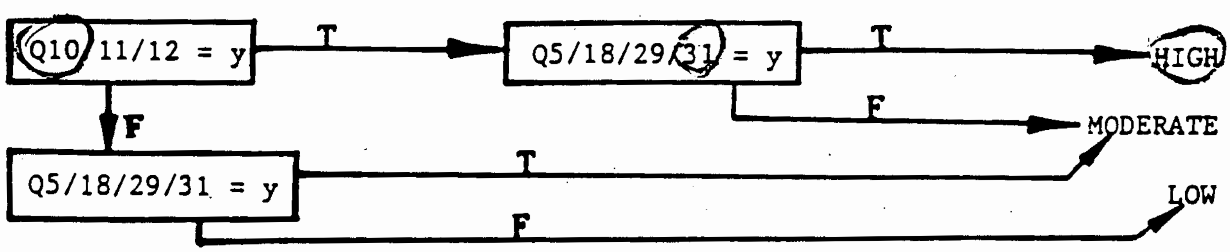
Floodflow Alteration



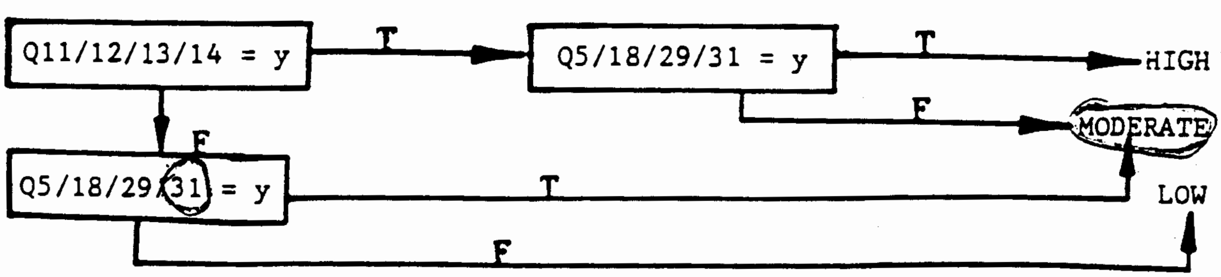
Sediment Stabilization



Sediment/Toxic Retention

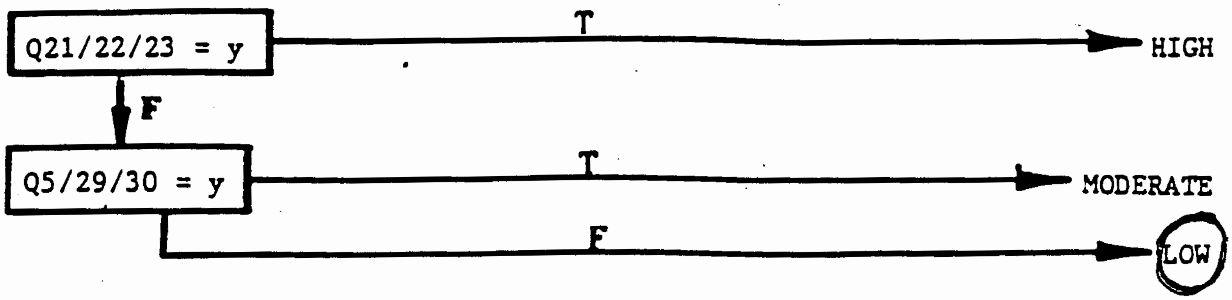


Nutrient Removal/Transformation

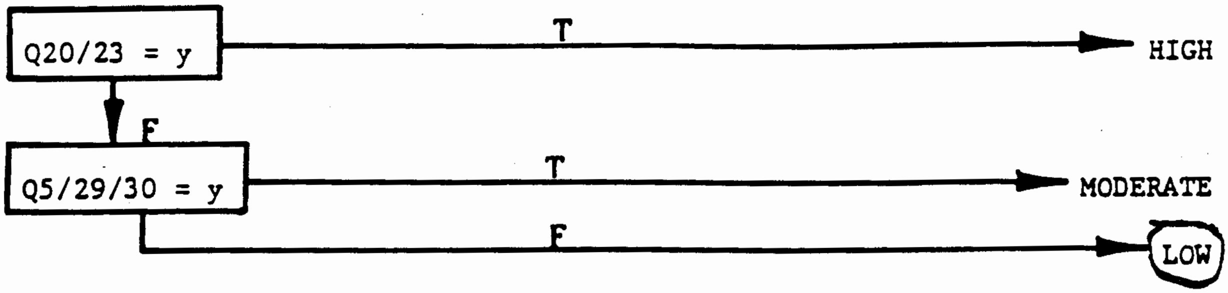


Social Significance Keys (Cont.)

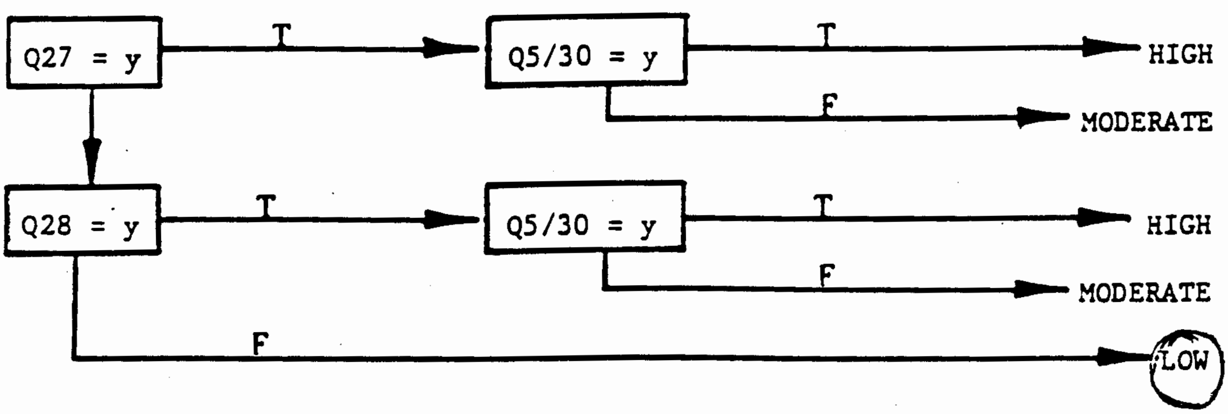
Wildlife Diversity/Abundance



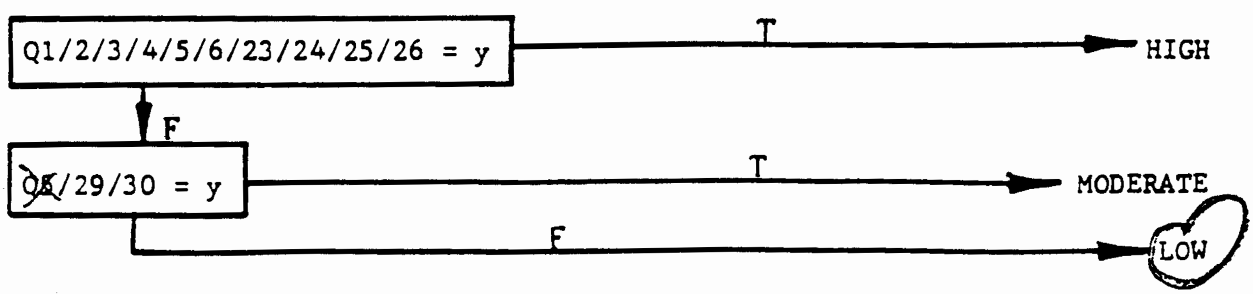
Aquatic Diversity/Abundance



Recreation



Uniqueness/Heritage



Ground Water Recharge - Effectiveness: Criteria/Answer Comparison for "BURGESS"

1: Criteria = A

Criteria A: [(10D=y / 10E=y / 10F=y) / (8.1=n + 8.3=y)]
Results: n n n n n

LOW 2: Criteria = A

Criteria A: [24.3=y / 34.2=y / 60=y / 23=y]
Results: y n u n

HIGH 1: Criteria = A

Criteria A: [54=y]
Results: u

HIGH 2: Criteria = A + B + C

Criteria A: [1.1=y]
Results: n
Criteria B: [(33A=n) / (63.2=y) / (8.1=y + 8.3=n + 11=n)]
Results: n u n n n
Criteria C: [(6.1=y) / (24.4=y) / (21B=y) / (34.3.1=y) / (59.2=y)]
Results n y n n u

H 3: Criteria = A + (at least two from B) + C

Criteria A: [(63.2=y + 59.2=y) / (8.1=y + 8.3=n + 11=n)]
Results: u u n n n
Criteria B: [(32A=n) + (6.1=y) + (21B=y / 24.4=y / 34.3.1=y) + (24.5=y) +
Results: n n n y n n
(35.1=y / 35.2=y)]
y n
Criteria C: [62=y]
Results: u

HIGH 4: Criteria = A + B

Criteria A: [(32A=n) + (6.1=y) + (21B=y / 24.4=y / 34.3.1=y) + (24.5=y) +
Results: n n n y n n
(35.1=y / 35.2=y)]
y n
Criteria B: [62=y]
Results: u

UNCERTAIN: Default result when none of the criteria above are met.

Ground Water Discharge - Effectiveness: Criteria/Answer Comparison for "BURGESS"

LOW 1: Criteria = A

Criteria A: Ground Water Recharge is rated H
Results: L

LOW 2: Criteria = A

Criteria A: [54 = y]
Results: u

HIGH 1: Criteria = (A / B / C / (any two of D)) + E

Criteria A: [(1.1=y) + (5.1.1=n) + (21B=n) + (59.2=n) + (63.2=n) + (23=n) +
Results: n y n u u n
(32A=y / 32B=y / 32E=y / 32H=y / 32I=y / 32J=y)]
n n n n n n
Criteria B: [(1.1=n) + (5.1.2=y) + (21B=n) + (59.2=n) + (63.2=n) + (23=n) +
Results: n y n u u n
(32A=y / 32B=y / 32E=y / 32H=y / 32I=y / 32J=y)]
n n n n n n
Criteria C: [(35.1=n)+(35.2=n)] OR
Results: y n
Criteria D: [(34.2=y) / (59.1=y) / (12Cd=y) / (6.1=n + 6.2=y) / (60=y) /
Results: n u n n n u
(8.1=n + 8.2=n + 8.3=y + 9.3=n)]
n y n n
Criteria E: [(34.2=y) / (59.1=y) / (12Cd=y) / (6.1=n + 6.2=y) / (60=y) /
Results: n u n n n u
(8.1=n + 8.2=n + 8.3=y + 9.3=n)]
n y n n

MODERATE 1: Criteria = (A / B / C / (any two in D)) / E

Criteria A: [(1.1=y) + (5.1.1=n) + (21B=n) + (59.2=n) + (63.2=n) + (23=n) +
Results: n y n u u n
(32A=y / 32B=y / 32E=y / 32H=y / 32I=y / 32J=y)]
n n n n n n
Criteria B: [(1.1=n) + (5.1.2=y) + (21B=n) + (59.2=n) + (63.2=n) + (23=n) +
Results: n y n u u n
(32A=y / 32B=y / 32E=y / 32H=y / 32I=y / 32J=y)]
n n n n n n

Ground Water Discharge continued on next page.....

Ground Water Discharge - Effectiveness: Criteria/Answer Comparison for "BURGESS"

MODERATE 1: continued

```
Criteria C: [(35.1=n) + (35.2=n)]
Results:          y          n
Criteria D: [(34.2=y) / (59.1=y) / (12Cd=y) / (6.1=n + 6.2=y) / (60=y) /
Results:          n         u          n         n        n        u
            (8.1=n + 8.2=n + 8.3=y + 9.3=n)]
                 n       y       n       n
Criteria E: [(34.2=y) / (59.1=y) / (12Cd=y) / (6.1=n + 6.2=y) / (60=y) /
Results:          n         u          n         n        n        u
            (8.1=n + 8.2=n + 8.3=y + 9.3=n)]
                 n       y       n       n
```

LOW: Default result when none of the criteria above are met.

Floodflow Alteration - Effectiveness: Criteria/Answer Comparison for "BURGESS"

LOW 1: Criteria = A

Criteria A: [10D=y / 10E=y / 10F=y]
Results: n n n

HIGH 1: Criteria = A

Criteria A: [(8.3=n + 23=n) / (9.2=y / 63.1=y) / (2.1.2=y + 31.3=n + 9.1=y) /
Results: n n n u n n y
(2.1.3=y + 31.5=y + 23=n)]
n y n

HIGH 2: Criteria = A / B

Criteria A: [(2.1.1=n) + (35.1=y) + (24.3=n) + (32A=n / 32E=y / 34.3.1=y) + (23=n)]
Results: y y y n n n n
Criteria B: [(2.1.3=y) + (24.3=n) + ((1.1=y) / ((22.1.1=y) + (31.6D=y / 31.6E=y) +
Results: n y n y n n
(12A=y / 12B=y) + (15.1A=y / 15.2=y))) + (23=n)]
y y y n n

LOW 2: Criteria = A + B

Criteria A: [22.1.1=y]
Results: y
Criteria B: [(12A=n + 12B=n) + (31.6A=y / 31.6E=y) + (15.2=n)]
Results: y y y n n

LOW 3: Criteria = A + B

Criteria A: [22.1.1=y]
Results: y
Criteria B: [(32A=y) + (2.1.3=n) + (11=y / (9.1=n + 9.2=n)) + (1.1=n / 2.1.1=y)]
Results: n n n y n n y

MODERATE: Default result when none of the criteria above are met.

Floodflow Alteration - Opportunity: Criteria/Answer Comparison for "BURGESS"

LOW 1: Criteria = A

Criteria A: [10D=y + 10E=y + 10F=y]
Results: n n n

LOW 2: Criteria = A

Criteria A: [(5.1.2=y) + (21A=y) + (5.2=y) + (24.4=y)]
Results: n y n y

HIGH 1: Criteria = A

Criteria A: [(5.2=n / 5.1.2=n) + (21B=y / 24.4=y)]
Results: n n n y

MODERATE: Default result when none of the criteria above are met.

Sediment Stabilization - Effectiveness: Criteria/Answer Comparison for "BURGESS"

LOW 1: Criteria = A

Criteria A:	[(22.1.1=n) +	(25.3=n) +	(19.1A=y)]
Results:	y	n	i

LOW 2: Criteria = A

Criteria A:	[(31.6A=y) +	(12C=n) +	(45F=n)]
Results:	y	n	n

HIGH 1: Criteria = A + B

Criteria A:	[(25.3=y) /	(19.1B=y) /	(31.1=n) /	(23=y) /	(7=n) /	(41.2=y) /	(22.3=y) /	(34.2=y)]
Results:	n	n	y	n	i	y	n	n

Criteria B:	[(45F=y) /	(19.2=y) /	(36.1.1=n) /	(12A=y) /	(12B=y) /	(15.2=y)]
Results:	n	n	y	y	y	n

LOW 3: Criteria = A

Criteria A:	[(45F=n) +	(19.2=n) +	(36.1.1=y) +	(12A=n) +	(12B=n) +	(15.2=n)]
Results:	n	n	y	y	y	n

ERATE: Default result when none of the criteria above are met.

Sediment Toxicant Retention - Effectiveness: Criteria/Answer Comparison for "BURGESS"

```
HIGH 1:  Criteria = A

   Criteria A: [(9.2=y) / (8.3=n + 8.4=n) / ((36.1.2=y) + (22.3=n / 64=n))]
   Results:          n        n       y             n         n      u

LOW 1:  Criteria = A

   Criteria A: [((19.1A=n) + (43A=y/43B=y/43C=y/43D=y/43E=y) + (31.4=n) + (31.6A=y)) /
   Results:             i         y     n     n     n     n          i          y
               (19.1B=y) / (28=y) / (7=n / 41.2=y)]
                     n        n       i        y

HIGH 2:  Criteria = A + (B / C)

   Criteria A: [(7=y) / (41.1=y) / (42.1.1=y)]
   Results:          i         n            y
   Criteria B: [34.3.1=y]
   Results:            n
   Criteria C: [(22.3=n) + (31.6A=n) + (12A=y / 12B=y / 12Da=y) + (22.2=y / 19.2=y)]
   Results:          n           y          y       y        n          n        n

MODERATE 1:  Criteria = A + (B / C)

   Criteria A: [(7=y / 41.1=y / 31.1=n) + (45E=n + 45F=n + 45G=n)]
   Results:          i       n        y          n       n       n
   Criteria B: [(13A=y / 13B=y / 13Da=y) + ((36.1.1=n + 25.2A=y) /
   Results:            y       y        n              n         n
               (36.2.1=n + 25.2B=y + 7=y + 9.1=y))]
                     n         y     i       y
   Criteria C: [(9.1=y) + (10D=y / 10E=y) + ((48B=y) / ((1.2=y) +
   Results:            y        n       n          n           n
               (13A=y / 13B=y / 13Da=y)))]
                    y       y        n

MODERATE 2:  Criteria A / B

   Criteria A: [(31.4=y) + (10D=y) / 10E=y / 10F=y) + (48B=y)]
   Results:              i         n        n       n        n
   Criteria B: [(10C=y / 10D=y) + (35.1=y) + (15.2=y / 31.4=y) +
   Results:            n       n          y          n        i
               (9.1=y / 31.1=n / (49.1.2=y + 49.1.1=y))]
                    y        y          n          n
```

LOW: Default result when none of the criteria above are met.

Sediment Toxicant Retention - Opportunity: Criteria/Answer Comparison for "BURGESS"

HIGH 1: Criteria = A

Criteria A: [(55.1=n) / (25.1=y) / (25.3=y) / (27.1=y)]
Results: u y n y

MODERATE 1: Criteria = A

Criteria A: [(21A=n / 1.2=y) + (5.1.1=y) + (5.2=n + 34.2=n)
Results: y n y n n

MODERATE 2: Criteria = A + B

Criteria A: [8.1=y]
Results: n
Criteria B: [(21A=n) / (1.2=y) / (5.1.1=y) / (5.2=n + 34.2=n)]
Results: y n y n n

LOW/UNCERTAIN: Default result when none of the criteria above are met.

Nutrient R/T - Effectiveness: Criteria/Answer Comparison for "BURGESS"

```
HIGH 1:  Criteria = A

   Criteria A:  [(9.2=y) / (8.3=n + 8.4=n)]
   Results:           n         n       y

LOW 1:  Criteria = A

   Criteria A: [(28=y) / (12E=y) / (7=n / 41.2=y)]
   Results:          n         n       i       y

HIGH 2:  Criteria = most of A - E

   Criteria A: [(7=y) / (41.1=y) / (12A=y / 12B=y / 12Cb=y / 12Da=y)]
   Results:         i          n         y       y        n        n
   Criteria B: [(24.1=y / 24.2=y) + (56.1=n)]
   Results:            i        n         u
   Criteria C: [(12Aa=n + 12Ba=n) + (23=n) + (17=y)]
   Results:           n        n        n        n
   Criteria D: [(36.1.2=y + 26.2=y) / ((36.2.3=y) + (26.3=y) + (9.1=y / 9.2=y) +
   Results:             n        n             n          y         y       n
               (7=y / 41.1=y))]
                  i        n
   Criteria E: [33A=y / 33E=y / 33J=y / 33K=y]
   Results:          n       n       n       n

MODERATE 1:  Criteria = (A / B / C) + D

   Criteria A: [(24.1=y / 24.2=y) + (56.1=n)]
   Results:            i        n         u
   Criteria B: [(36.1.2=y + 26.2=y) / ((36.2.3=y) + (26.3=y) + (9.1=y / 9.2=y) +
   Results:             n        n             n          y         y       n
               (7=y / 41.1=y))]
                  i        n
   Criteria C: [33A=y / 33E=y / 33J=y / 33K=y]
   Results:          n       n       n       n
   Criteria D: [36.1.1=n + 36.2.1=n]
   Results:            n          n

LOW:  Default result when none of the criteria above are met.
```

Nutrient R/T - Opportunity: Criteria/Answer Comparison for "BURGESS"

HIGH 1: Criteria = A

Criteria A: [26.1=y]
Result: y

MODERATE 1: Criteria = A + B + C

Criteria A: [(1.2=y) / (21A=n)]
Result: n y
Criteria B: [(5.1.2=n) + (4.2C=y / 4.2D=y)]
Results: n n n
Criteria C: [5.2=n]
Results: n

MODERATE 2: Criteria = (A / B / C) + D

Criteria A: [(1.2=y) / (21A=n)]
Result: n y
Criteria B: [(5.1.2=n) + (4.2C=y / 4.2D=y)]
Results: n n n
Criteria C: [5.2=n]
Results: n
Criteria D: [8.1=y]
Results: n

LOW: Default result when none of the criteria above are met.

Production Export - Effectiveness: Criteria/Answer Comparison for "BURGESS"

LOW 1: Criteria = A

Criteria A: [8.3=n + 8.4=n]
Results: n y

HIGH 1: Criteria = A + B

Criteria A: [(10C=y / 10D=y) + (4.2A=n)]
Results: n n n
Criteria B: [(10F=y) + (57.2=y / 51.1=n)]
Results: n u u

HIGH 2: Criteria = A + B + C

Criteria A: [(10C=y / 10D=y)
Results: n n
Criteria B: [(31.4=y / 36.1.1=n) + (4.2A=n + 4.2B=n) + (57.1=n)]
Results: i n n y u
Criteria C: [(12E=n / 47B=n / 45D=n) / (7=y / 41.2=n / 19.1B=n) /
Results: n n n i y n
(15.2=y / 28=n / 4.2A=n) / (12C=y + 13C=y + 13D=y) / (55.2=y) / (34.1=n)]
n n n n n n u n

H 3: Criteria A + B + C

Criteria A: [10E=y / 10F=y]
Results: n n
Criteria B: [(36.1.1=n) + (31.2=y/1.2=y) + (57.1=n) + (51.2=y)]
Results: n n n u u
Criteria C: [(12E=n / 47B=n / 45D=n) / (7=y / 41.2=n / 19.1B=n) /
Results: n n n i y n
(15.2=y / 28=n / 4.2A=n) / (12C=y + 13C=y + 13D=y) /
n n n n n n
(55.2=y) / (34.1=n)]
u n

Production Export - Effectiveness continued on next page.....

Production Export - Effectiveness: Criteria/Answer Comparison for "BURGESS"

```
HIGH 4:  Criteria = A + B + C

   Criteria A: [(10A=y) + (5.1.2=y)]
   Results:          n          n
   Criteria B: [(36.1.1=n) + (31.2=y / 1.2=y / (35.1=y + 2.1.2=n)) +
   Results:             n         n      n        y        n
               (57.1=n / 56:1=n / 56.2=y) + (51.2=y) + (47B=n) + (12A=n + 12B=n)]
                     u       u       u         u         n         y       y
   Criteria C: [(12E=n / 47B=n / 45D=n) / (7=y / 41.2=n / 19.1B=n) /
   Results:          n      n      n       i       y        n
               (15.2=y / 28=n / 4.2A=n) / (12C=y + 13C=y + 13D=y) /
                     n      n        n         n       n       n
               (55.2=y) / (34.1=n)]
                     u          n

HIGH 5:  Criteria = A + B + C

   Criteria A: [(10B=y) + (5.1.2=y)]
   Results:          y          n
   Criteria B: [(36.1.1=n) + (31.2=y / 1.2=y / 35.1=y) +
   Results:             n         n      n        y
               (57.1=n / 56.1=n) + (51.2=y) + (11=y / 22.1.1=y)]
                     u       u         u         n          y
   Criteria C: [(12E=n / 47B=n / 45D=n) / (7=y / 41.2=n / 19.1B=n) /
   Results:          n      n      n       i       y        n
               (15.2=y / 28=n / 4.2A=n) / (12C=y + 13C=y + 13D=y) /
                     n      n        n         n       n       n
               (55.2=y) / (34.1=n)]
                     u          n

MODERATE:  Default result when none of the criteria above are met.
```

Aquatic D/A - Effectiveness: Criteria/Answer Comparison for "BURGESS"

LOW 1: Criteria = (A / B / C / D / E / F) + G

Criteria A: [(21B=y / 27.1=y) + (2.1.2=n) + (8.3=n / 61=y)]
Results: n y n n u
Criteria B: [48F=y / 56.1=y / 57.1=y]
Results: n u u
Criteria C: [(10E=y / 10F=y) + (12C=n) + (45F=y / 45G=y)]
Result n n n n n
Criteria D: [(10A=y / 10B=y / 10C=y) + (13C=n) + (31.6A=y / 31.6E=y) +
Results: n y n n y n
(33A=n + 33B=n)]
n n
Criteria E: [(10A=y / 10B=y) + ((23=y + (33A=n + 33B=n + 33C=n + 36D=n)) /
Results: n y n n n y n
(28=y) / (47B=y) / (25.3=y) / (48C=y / 48D=y / 48E=y / 48F=y))]
n n n n n n n
Criteria F: [(10E=y) + (31.6E=y) + (32K=y)]
Results: n n n
Criteria G: [53.2=y]
Result: u

HIGH 1: Criteria = A + most of B, C, D, E, F, G and H

Criteria A: [10A=y]
Results: n
Criteria B: [(8.1=y + 8.3=y) / (11=y)]
Results: n n n
Criteria C: [(2.1.2=y) + ((1.3=n) / ((4.2C=y / 4.2D=y) + (35.1=y)))]
Results: n y n n y
Criteria D: [(13C=y) / (45D=n) / (49.2=y)]
Results: n n y
Criteria E: [33A=y / 33B=y / 33H=y]
Results: n n n
Criteria F: [(31.2=y) + (17=y / 46C=y)]
Results: n n n
Criteria G: [(40.1=n) + (56.2=y / 57.1=n)]
Results: y u u
Criteria H: [34.1=n + 61=n]
Results n u

Aquatic D/A - Effectiveness continued on next page.....

Aquatic D/A - Effectiveness: Criteria/Answer Comparison for "BURGESS"

HIGH 2: Criteria = A + most of B C D E F G H I and J

Criteria A: [10B=y + 33E=n]
Results: n n
Criteria B: [(8.1=y + 8.3=y) / (11=y)]
Results: n n n
Criteria C: [(2.1.3=y) + ((1.3=n) / ((4.2C=y / 4.2D=y) + (35.1=y)))]
Results: n y n n y
Criteria D: [(13C=y) / (45D=n) / (49.2=y)]
Results: n n y
Criteria E: [33A=y / 33B=y / 33H=y]
Results: n n n
Criteria F: [(31.2=y) + (17=y / 46C=y)]
Results: n n n
Criteria G: [(40.1=n) + (56.2=y / 57.1=n)]
Results: y u u
Criteria H: [34.1=n + 61=n]
Results n u
Criteria I: [31.6C=y]
Results: n
Criteria J: [25.1=n]
Results: y

¬H 3: Criteria = A + most of B

Criteria A: [10E=y]
Results: n
Criteria B: [(31.6C=y) + (1.2=y / 5.2=y) + (15.1C=y / 15.2=y / 16B=y / 16C=y) +
Results: n n n n n y n
(34.1=n + 33K=n + 61=n) + (57.1=n)]
n n u u

HIGH 4: Criteria = A + B

Criteria A: [10F=y]
Results: n
Criteria B: [(32K=n) + (31.2=y + 46C=y) + (45D=n)]
Results: n n n n

Aquatic D/A - Effectiveness continued on next page.....

Aquatic D/A - Effectiveness: Criteria/Answer Comparison for "BURGESS"

HIGH 5: Criteria = A + (B/C) + most of D E F G H

Criteria A: [(10C-y) + (23=n) + (7=y / 41.2=n)]
Results: n n i y
Criteria B: [(34.1=n) / ((35.1=y) + (33A=y) + (32D=y) + (40.2=y))]
Results: n y n n n
Criteria C: [(35.2=n) + (40.2=n) + (31.2=y)]
Results: n n n
Criteria D: [20.1=y]
Result: y
Criteria E: [(15.2=y) / (13C=y) / (49.2=y)]
Results: n n y
Criteria F: [(4.2A=n + 4.2B=n) / (49.1.1=y)]
Results: n y n
Criteria G: [(52.1=y) / (49.1.2=y)]
Result: u n
Criteria H: [(25.1=n) / (55.2=n)]
Result: y u

MODERATE: Default result when none of the criteria above are met.

Wildlife D/A Breeding - Effectiveness: Criteria/Answer Comparison for "BURGESS"

LOW 1: Criteria = A / B / C / D / E / F

Criteria A: [(2.1.1=y / 2.2.1=y) + (30=y / 21B=y)]
Results: y n y n
Criteria B: [(2.1.1=y / 2.2.1=y) + (8.3=n) + (27.1=y) + (3.3=n)]
Results: y n n y y
Criteria C: [(28=y) / (48E=y) / (48F=y)]
Results: n n n
Criteria D: [(10D=y / 10E=y / 10F=y) + (19.1B=y / 23=y / 38.3=n)]
Results: n n n n n n
Criteria E: [(45E=y) / (45F=y) / (45G=y)]
Results: n n n
Criteria F: [(15.1A=y) + (16A=y) + (17=n) + (31.6A=y / 31.6E=y)]
Results: y n n y n

HIGH 1: Criteria = A + B + C

Criteria A: [(1.1=y) + (10A=y)]
Results: n n
Criteria B: [(2.1.1=n) + (3.2=y / 3.3=y) + (31.2=y) + (38.7=y)]
Results: y n y n y
Criteria C: [(14.1=y) / (15.1A=n) / (16C=n) / (17=y)]
Results: n y n n
GH 2: Criteria = A + B + C

Criteria A: [(1.1=y) + (10B=y)]
Results: n y
Criteria B: [(2.1.1=n) + (31.6E= n) + (33A=y / 33B=y / 38.7=y)]
Results: y n n n y
Criteria C: [(15.1C=y / 16C=y / 17=y) + (20.1=y / 36.1.1=n / 38.8=y)]
n n n y n i

HIGH 3: Criteria = A + B + C

Criteria A: [(1.1=y) + (10C=y)]
Results: n n
Criteria B: [(2.1.1=n) + (4.2A=n) + (31.1=y) + (14.1=y / 15.1A=n / 16C=n / 17=y)]
Results: y n y n y n n
Criteria C: [(20.1=y / 38.8=y) + (7=y / 41.2=n)]
Results: y i i y

LOW 2: Criteria = A

Criteria A: [(1.1=y) + (10A=n + 10B=n + 10C=n)]
Results: n n y n

Wildlife D/A Breeding continued on next page......

Wildlife D/A Breeding - Effectiveness: Criteria/Answer Comparison for "BURGESS"

HIGH 4: Criteria = A + ((B + most of C) / (D + C) / (E + F))

Criteria A: [(1.1=n) + (10B=y)]
Results: n y
Criteria B: [2.1.1=n]
Results: y
Criteria C: [(15.1C=y / 16C=y) + (17=y) + (18=y) + (3.2=y / 3.3=y) + (39=y)]
Results: n n n y n y y
Criteria D: [2.1.1=y / 2.2.1=y]
Results: y n
Criteria E: [2.1.2=y / 2.2.2=y]
Results: n y
Criteria F: [(15.1C=y / 16C=y) / (17=y) / (18=y) / (3.2=y / 3.3=y) / (39=y)]
Results: n n n y n y y

HIGH 5: Criteria = A + ((B + most of C) / (D + C) / (E + F))

Criteria A: [(1.1=n) + (10A=y)]
Results: n n
Criteria B: [(31.2=y) + (2.1.1=n)]
Results: n y
Criteria C: [(15.1C=y / 16C=y) + (17=y) + (18=y) + (3.2=y / 3.3=y) + (39=y)]
Results: n n n y n y y
Criteria D: [2.1.1=y / 2.2.1=y]
Results: y n
Criteria E: [2.1.2=y / 2.2.2=y]
Results: n y
Criteria F: [(15.1C=y / 16C=y) / (17=y) / (18=y) / (3.2=y / 3.3=y) / (39=y)]
Results: n n n y n y y

LOW 3: Criteria = A

Criteria A: [(1.1=n) + (10D=y / 10F=y)]
Results: n n n

LOW 4: Criteria = A

Criteria A: [(10C=n) / (36.1.1=y) / (20.1=n) + (10E=n)]
Results: n n y n

MODERATE: Default result when none of the criteria above are met.

Wildlife D/A Migration - Effectiveness: Criteria/Answer Comparison for "BURGESS"

LOW 1: Criteria = A / B / C

Criteria A: [(2.1.1=y) + (8.3=n) + (21B=y)]
Results: y n n
Criteria B: [(21B=y) + (30=y) + (2.2.1=y) + (12A=n) + (12B=n)]
Results: n y n y y
Criteria C: [(15.1A=y + 16A=y + 17=n) / (31.6A=y / 31.6E=y)]
Results: y n n y n
Criteria D: [(10C=n + 10e=n) / (36.1.1=y + 10e=n) / (20.1=n + 10e=n)]
n n n n y n

HIGH 1: Criteria = A

Criteria A: [(38.5=y) + (2.1.1=n) + (3.2=y / 3.3=y / 4.1=y)]
Results: n y n y n

HIGH 2: Criteria = A

Criteria A: [(1.1=n) + (2.1.1=n + 2.2.1=n) +
Results: n y n
(38.3=y / 32H=y / 4.1=y / 12A=y / 12B=y)]
n n n y y

HIGH 3: Criteria = A + most of B C D E F G H I J

Criteria A: [(2.1.1=n) / (3.2=y) / (3.3=y) / (4.1=y)]
Results: y n y n
Criteria B: [31.6C=y]
Results: n
Criteria C: [(21C=y) / (50=y) / (39=y)]
Results: n n y
Criteria D: [17=y]
Results: n
Criteria E: [(16C=y) / (18=y) / (15.1C=y) / (15.2=y)]
Results: n y n n
Criteria F: [(28=n) + (23=n) + (34.1=n)]
Results: n n n]
Criteria G: [(30=n) + (19.1A=y)]
Results: y i
Criteria H: [2.1.3=y]
Results: n
Criteria I: [47B=n]
Results: n
Criteria J: [(45E=n) + (45F=n) + (45G=n)]
Results: n n n

MODERATE: Default result when none of the criteria above are met.

Wildlife D/A Wintering - Effectiveness: Criteria/Answer Comparison for "BURGESS"

LOW 1: Criteria = (A / B / C /D) + E

Criteria A: [1.3=y]
Results: y
Criteria B: [(2.1.1=y) + (8.3=n) + (21B=y / 19.1B=y)]
Results: y n n n
Criteria C: [(21B=y) + (30=y) + (2.1.1=y) + (12A=n) + (12B=n)]
Results: n y y y y
Criteria D: [(15.1A=y + 16A=y + 17=n) + (31.6A=y / 31.6E=y)]
Results: y n n y n
Criteria E: [(38.6=n) + (12Ab=n / 12Bb=n)]
Results: n n n

HIGH 1: Criteria = A

Criteria A: [(1.1=n) + (2.1.1=n + 2.2.1=n) +
Results: n y n
(38.3=y / 32H=y / 4.1=y / 12A=y / 12B=y)]
n n n y y

HIGH 2: Criteria = A + (most of B C D E F G H I J) + K

Criteria A: [(2.1.1=n) / (3.2=y) / (3.3=y) / (4.1=y)]
Results: y n y n
Criteria B: [31.6C=y]
Results: n
Criteria C: [(21C=y) / (50=y) / (39=y)]
Results: n n y
Criteria D: [17=y]
Results: n
Criteria E: [(16C=y) / (18=y) / (15.1C=y) / (15.2=y)]
Results: n y n n
Criteria F: [(28=n) + (23=n) + (34.1=n)]
Results: n n n]
Criteria G: [30=n]
Results: y
Criteria H: [2.1.3=y]
Results: n
Criteria I: [47B=n]
Results: n
Criteria J: [(45E=n) + (45F=n) + (45G=n)]
Results: n n n
Criteria K: [(19.1A=y) / (38.6=y) / (32H=y) / (12Bc=y)]
Results: i n n n

MODERATE: Default result when none of the criteria above are met.

Appendix 10

Revised 05/96

WELL NUMBER	STATE NORTH	STATE EAST	LATITUDE	LONGITUDE	GND ELEV	TOP ELEV	PVC ELEV
ACB-1A	138754.29	325660.36	42-52-44	73-09-01			
ACB-2A	138734.60	325726.91	42-52-44	73-09-01			
AS-01	138364.74	325693.95	42-52-40	73-09-01			
AS-02	137886.55	325879.96	42-52-35	73-08-58			
AS-03	138616.65	325705.92	42-52-43	73-09-01			
AS-04	138216.71	326052.53	42-52-39	73-08-56			
AS-05	139017.99	326089.16	42-52-47	73-08-56			
BRP-01	139089.41	325050.63	42-52-47	73-09-10			
BRP-02	139066.15	325044.73	42-52-47	73-09-10			
BRP-03	139070.48	325093.41	42-52-47	73-09-09			
BRP-04	139051.69	325073.16	42-52-47	73-09-09			
BRP-05	139044.64	325129.56	42-52-47	73-09-09			
BRP-06	139031.32	325119.70	42-52-47	73-09-09			
BRP-07	139024.50	325174.43	42-52-47	73-09-08			
BRP-08	139001.00	325166.91	42-52-46	73-09-08			
BRP-09	138998.94	325225.15	42-52-46	73-09-07			
BRP-10	138971.24	325207.92	42-52-46	73-09-08			
LS-01	138588.90	325880.95	42-52-42	73-08-58			
LS-02	138390.82	325797.33	42-52-40	73-09-00			
LS-03	138194.91	325683.36	42-52-38	73-09-01			
P-01	138105.30	325639.39	42-52-38	73-09-02			
P-02	138222.43	325805.74	42-52-39	73-08-59			
P-03	138328.90	325793.07	42-52-40	73-09-00			
S-02 @ WEIR	137736.76	324766.21	42-52-34	73-09-13			
S-03 @ WEIR	137640.06	324790.22	42-52-33	73-09-13			
SB-22	138956.61	325729.06	42-52-46	73-09-01	1118.4		
SB-23	138826.95	325644.23	42-52-45	73-09-02	1116.9		
SB-24	138883.30	325561.36	42-52-45	73-09-03	1116.9		
SB-25	138903.52	325658.12	42-52-45	73-09-02	1117.0		
SBW-10	138838.69	325830.37	42-52-45	73-08-59	1129.7	1131.91	1131.58
SBW-14	138338.91	325659.15	42-52-40	73-09-01	1109.7		
SBW-15	138303.41	325677.39	42-52-40	73-09-01	1099.3	1101.30	1100.93
SBW-17	138586.66	325772.31	42-52-42	73-09-00	1115.85		
SBW-18	138377.03	325672.54	42-52-40	73-09-01	1111.60		
SBW-19	138602.12	325677.74	42-52-42	73-09-01	1114.67		
SBW-20	138448.09	325731.54	42-52-41	73-09-00	1112.2	1114.65	1114.35
SBW-21	138541.63	325803.40	42-52-42	73-09-00	1111.7	1113.67	1113.41
SG-01	137904.71	325671.52	42-52-36	73-09-01			
SG-02	138082.92	325855.43	42-52-37	73-08-59			
SG-03	137909.18	325822.72	42-52-36	73-08-59			
SG-04	138102.96	325948.72	42-52-38	73-08-58			

WELL NUMBER	STATE NORTH	STATE EAST	LATITUDE	LONGITUDE	GND ELEV	TOP ELEV	PVC ELEV
SG-05	138102.54	326053.96	42-52-38	73-08-56			
SG-06	137880.87	326030.41	42-52-35	73-08-56			
SG-07	138007.77	326077.41	42-52-37	73-08-56			
SG-08	138016.38	326249.94	42-52-37	73-08-53			
SG-09	137887.66	326174.80	42-52-35	73-08-54			
SG-12	138922.01	325676.35	42-52-46	73-09-01			
SG-13	139019.21	325690.93	42-52-47	73-09-01			
SG-14	139019.55	325741.33	42-52-47	73-09-00			
SG-15	138925.28	325728.95	42-52-46	73-09-01			
SG-17	138733.13	325762.83	42-52-44	73-09-00			
SG-19	138922.38	325827.98	42-52-46	73-08-59			
SG-20	139018.58	325790.80	42-52-47	73-09-00			
SP-03	138319.73	325693.61	42-52-40	73-09-01			
SP-05	138448.26	325786.49	42-52-41	73-09-00			
SP-07	138268.83	325747.82	42-52-39	73-09-00			
SP-08	138225.82	325698.83	42-52-39	73-09-01			
SP-09	138194.59	325728.86	42-52-38	73-09-00			
SP-10	138240.26	325757.23	42-52-39	73-09-00			
SP-11	138315.78	325767.33	42-52-40	73-09-00			
SP-12	138408.03	325833.89	42-52-41	73-08-59			
SP-13	138501.31	325839.47	42-52-42	73-08-59			
SP-14	138325.69	325711.13	42-52-40	73-09-01			
SP-15	138621.55	325866.28	42-52-43	73-08-59			
SP-16	138207.28	325818.46	42-52-39	73-08-59			
SP-17	138770.41	326351.03	42-52-44	73-08-52			
SP-18	138463.70	326482.75	42-52-41	73-08-50			
SP-19	137935.84	326191.54	42-52-36	73-08-54			
SP-21	137897.90	325965.24	42-52-36	73-08-57			
SP-22	138253.37	325690.08	42-52-39	73-09-01			
SP-23	138172.38	325658.78	42-52-38	73-09-01			
SP-24	138144.52	325694.09	42-52-38	73-09-01			
SP-25	138122.94	325626.31	42-52-38	73-09-02			
SP-26	138100.52	325646.63	42-52-38	73-09-02			
SP-27	138087.07	325560.37	42-52-37	73-09-03			
SP-28	138038.60	325606.24	42-52-37	73-09-02			
SP-29	138016.89	325549.09	42-52-37	73-09-03			
SP-30	138000.69	325590.39	42-52-37	73-09-02			
SV-02	138361.88	325674.62	42-52-40	73-09-01			
SV-17	138348.66	325753.56	42-52-40	73-09-00			
SW-01A	138627.59	326059.48	42-52-43	73-08-56			
SW-01B	138307.48	325861.14	42-52-40	73-08-59			

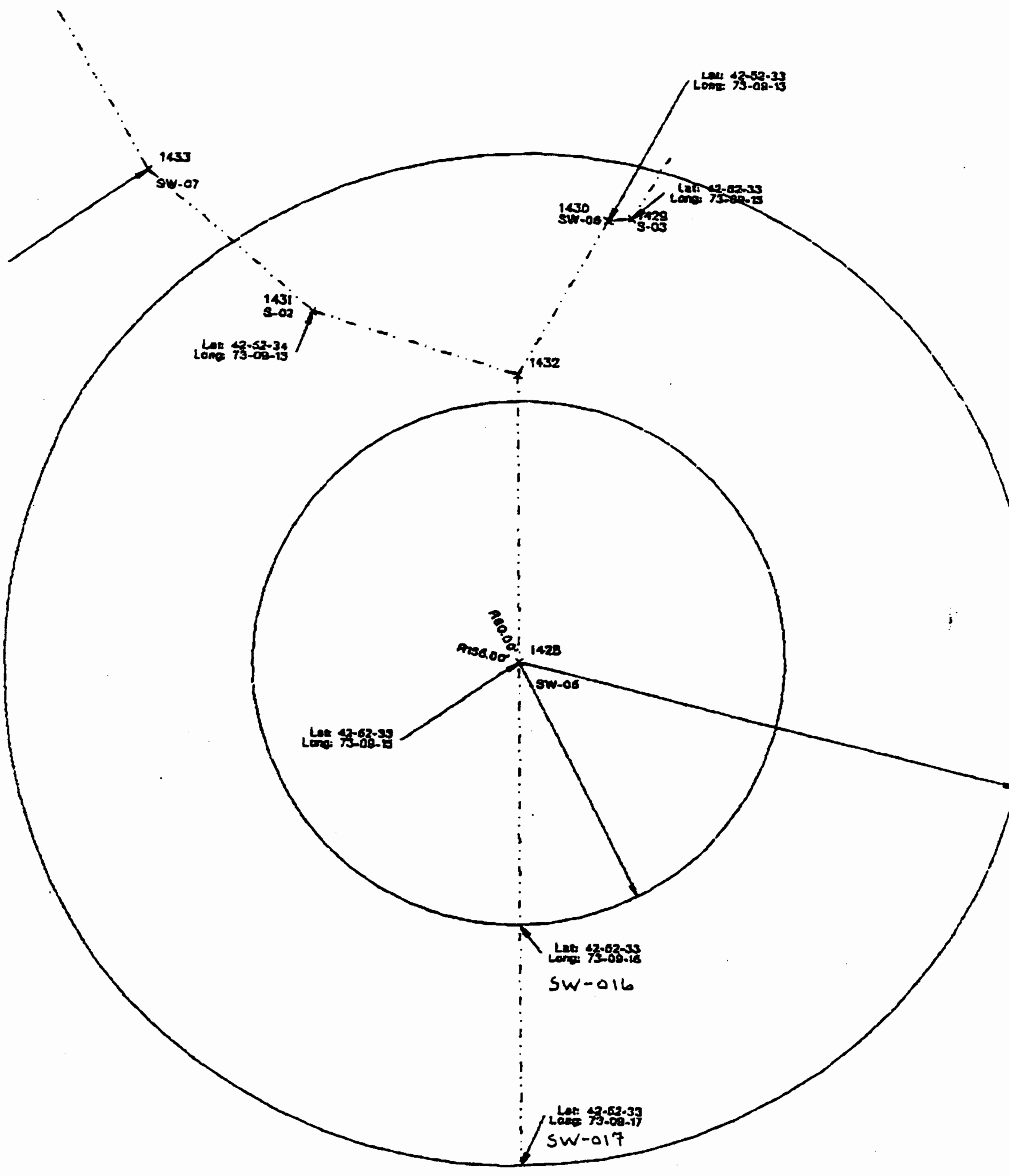
WELL NUMBER	STATE NORTH	STATE EAST	LATITUDE	LONGITUDE	GND ELEV	TOP ELEV	PVC ELE
SW-02	138183.18	325759.11	42-52-38	73-09-00			
SW-03	138082.21	325582.16	42-52-37	73-09-02			
SW-04	137887.32	325186.97	42-52-35	73-09-08			
SW-05	137678.17	324656.49	42-52-33	73-09-15			
SW-06	137647.31	324789.88	42-52-33	73-09-13			
SW-07	137784.22	324811.09	42-52-34	73-09-13			
SW-08	138639.63	325969.12	42-52-43	73-08-57			
SW-09	138328.93	325793.20	42-52-40	73-09-00			
SW-10	138464.06	325822.32	42-52-41	73-08-59			
SW-11	138253.92	325798.52	42-52-39	73-09-00			
SW-12	138168.95	325710.62	42-52-38	73-09-01			
SW-13	137971.87	325604.05	42-52-36	73-09-02			
SW-14	138030.83	325566.52	42-52-37	73-09-03			
SW-15	137964.93	325494.83	42-52-36	73-09-04			
TP-01	138709.85	325886.43	42-52-44	73-08-58			
TP-02	138672.17	325756.93	42-52-43	73-09-00			
TP-06	138823.31	325657.08	42-52-45	73-09-02			
TP-07	138565.95	325810.82	42-52-42	73-08-59			
TP-08	138523.49	325772.21	42-52-42	73-09-00			
TP-09	138409.80	325717.71	42-52-41	73-09-01			
TP-10	138423.48	325697.27	42-52-41	73-09-01			
TP-11	138398.71	325680.90	42-52-40	73-09-01			
TP-12	138363.55	325680.29	42-52-40	73-09-01			
TP-13	138861.82	325810.45	42-52-43	73-08-59			
TP-14	138588.36	325816.92	42-52-42	73-08-59			
TP-15	138526.19	325695.93	42-52-42	73-09-01			
TP-16	138544.55	325688.76	42-52-42	73-09-01			
TP-17	138578.28	325696.25	42-52-42	73-09-01			
TP-18	138652.81	325872.89	42-52-43	73-08-59			
TP-19	138548.19	325711.84	42-52-42	73-09-01			
TP-20	138598.65	325701.26	42-52-42	73-09-01			
TP-??	138745.07	325688.68	42-52-44	73-09-01			
TP-??	138597.66	325680.89	42-52-42	73-09-01			
TP-??	138481.14	325676.35	42-52-41	73-09-01			
W01	138963.47	326110.44	42-52-46	73-08-55	1148.0	1150.20	
W01-B	138757.97	325896.26	42-52-44	73-08-58	1121.0	1123.56	1123.06
W01-DI	138968.47	326105.50	42-52-46	73-08-56	1148.5	1150.51	1150.25
W01-S1	138748.40	325897.81	42-52-44	73-08-58	1120.9	1122.93	1122.69
W02	138249.02	325725.84	42-52-39	73-09-01	1182.2	1084.27	1083.79
W03	138191.28	325748.71	42-52-38	73-09-00	1079.3	1082.01	1081.81
W03-T	138202.10	325744.19	42-52-39	73-09-00	1079.8	1081.74	1081.58

WELL NUMBER	STATE NORTH	STATE EAST	LATITUDE	LONGITUDE	GND ELEV	TOP ELEV	PVC ELEV
W04-B	138121.14	325744.95	42-52-38	73-09-00	1083.9	1086.19	1085.89
W04-B (AB)	138173.47	325699.07	42-52-38	73-09-01	1079.1		
W04-D	138187.69	325688.92	42-52-38	73-09-01	1079.0	1081.25	1081.01
W04-DI	138125.76	325753.54	42-52-38	73-09-00	1084.1	1086.12	1085.62
W04-S	138180.26	325698.15	42-52-38	73-09-01	1078.5	1079.38	1079.18
W04-SI	138118.89	325751.91	42-52-38	73-09-00	1083.9	1086.06	1085.52
W04-T	138183.59	325692.46	42-52-38	73-09-01	1079.0	1080.68	1080.35
W05	138228.44	325794.22	42-52-39	73-09-00	1080.8	1083.18	1080.01
W06-D	138112.31	325701.43	42-52-38	73-09-01	1078.7	1080.92	1080.43
W06-S	138117.59	325703.93	42-52-38	73-09-01	1078.3	1079.51	1079.40
W07-B	138800.22	325637.48	42-52-44	73-09-02	1115.4		
W07-DI	138814.07	325655.64	42-52-45	73-09-02	1116.6	1118.33	1117.87
W07-S1	138804.75	325657.43	42-52-44	73-09-02	1116.6	1117.74	1117.48
W07-SI	138789.63	325649.05	42-52-44	73-09-02	1116.9	1118.49	1118.48
W08-B	138354.85	325592.34	42-52-40	73-09-02	1109.5	1110.72	1110.57
W08-S1	138340.81	325605.30	42-52-40	73-09-02	1108.3	1110.38	1110.10
W08-SI	138351.06	325604.25	42-52-40	73-09-02	1109.9	1111.07	1111.07
W09-B	138048.27	325526.67	42-52-37	73-09-03	1076.8	1079.09	1078.65
W09-S1	138025.20	325539.98	42-52-37	73-09-03	1076.8	1079.35	1078.95
W09-SI	138031.68	325532.43	42-52-37	73-09-03	1077.1	1078.94	1078.83
W11-S1	138310.24	325786.95	42-52-40	73-09-00	1083.6	1085.19	1085.01
W12-S1	138585.83	325885.70	42-52-42	73-08-58	1096.4	1098.30	1098.26
W22-S1	138430.56	325818.98	42-52-41	73-08-59	1089.0	1090.97	1090.63
W22-T	138424.26	325822.84	42-52-41	73-08-59	1087.7	1090.20	1089.91
W23-T	138120.21	326007.48	42-52-38	73-08-57	1098.8	1099.74	1099.57
W24-T	137889.57	325742.92	42-52-35	73-09-00	1089.1	1091.15	1091.01
W25-DI	138212.85	325615.68	42-52-39	73-09-02	1088.4	1090.71	1091.24
W25-S1	138195.84	325613.98	42-52-38	73-09-02	1086.6	1089.32	1089.22
W25-SI	138213.30	325611.24	42-52-39	73-09-02	1088.9	1090.88	1090.54
W26-T	138244.33	325415.68	42-52-39	73-09-05	1091.3	1093.77	1093.65
W27-S1	138520.32	325643.18	42-52-42	73-09-02	1112.8	1114.71	1114.41
W27-T	138528.08	325643.93	42-52-42	73-09-02	1113.0	1115.00	1114.75
WTP12	138355.92	325685.45	42-52-40	73-09-01	1111.2	1112.95	1112.62

Notes

1. W-01 is an existing well (installed by others) with a depressed PVC casing which is not used for elevation monitoring.

2. W-04 B(AB) and W-07 B are wells which were started but not completed as monitoring wells.


1433
SW-07
Lat: 42-52-33
Long: 73-09-13
1430
SW-06
1429
S-03
Lat: 42-52-33
Long: 73-09-15
1431
S-02
Lat: 42-52-34
Long: 73-09-13
1432
R60.00'
R136.00'
1428
SW-05
Lat: 42-52-33
Long: 73-09-15
Lat: 42-52-33
Long: 73-09-16
SW-016
Lat: 42-52-33
Long: 73-09-17
SW-017