REPORT

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Summer 2001 Soil/Sediment Sampling Validation Report Operable Unit 1

Sullivan's Ledge Superfund Site

December 2001

O'BRIEN & GERE ENGINEERS, INC.

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Sullivan's Ledge Superfund Site

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Vice President

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O'BRIEN & GERE ENGINEERS, INC.

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1. Introduction

Data validation was performed for sediment and soil samples collected from the Sullivan Ledge Superfund Site in New Bedford, Massachusetts. Sample collection activities were conducted by Harding Lawson Associates (HLA) occurred on June 26 and 27, 2001. 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 analytical methods, it applies to all aspects of the process and especially to the samples, their measurement, and the actual data generated. Accordingly, this report outlines excursions from the applicable quality control outlined in the following documents:

- *Construction Phase Environmental Monitoring Plan, Sullivan Ledge Site, New Bedford, Massachusetts*, (O'Brien & Gere, April 1998). It should be noted that this plan was prepared for Phase I activities.

- *Construction Phase Environmental Monitoring Plan, Sullivan Ledge Site, New Bedford, Massachusetts*, (O'Brien & Gere, June 1999). It should be noted that this plan was prepared for Phase II and III activities and is substantially equivalent to the Phase I Plan.

- *Test Methods for Evaluating Solid Wastes: Physical and Chemical Methods, SW-846, Final Update III*, (USEPA, December 1996).

- *Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses*, (USEPA Region I, December 1996).

- *USEPA Region I Laboratory Data Validation Functional Guidelines for Evaluation of Organic Analyses*, (USEPA Region I, November 1988).

- *USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A),* 540/1-89/002 (USEPA, revised 1992).

The following sections of this document address distinct aspects of the validation process. Section 2 lists 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 and summarized on Table I, presented in Appendix A. Table I also summarizes the samples collected for this

investigation by the date of sample collection, field sample identification documented on the chain of custody record, and laboratory sample identification.

Data usability with respect to the intended purposes of the data is discussed in Section 5 and summarized on Table II, presented in Appendix A.

2. Analytical methods

Sediment samples were analyzed for PCBs, TCO, and percent solids. Soil samples were analyzed for PCBs and percent solids. In addition, five sediment samples were analyzed for polyaromatic hydrocarbons (PAHs) and metals. Laboratory analyses were performed by Groundwater Analytical located in Buzzards Bay, Massachusetts. In accordance with the Construction Phase Environmental Monitoring Plans, the USEPA methods summarized in Table 2.1 were used by the laboratories for sample analysis:

Table 2.1. Analytical methods.

Parameter	Analytical Method
PCBs	SW3550A/SW8082
TCO	ASTM D2974-87
PAHs (17 target)	SW3550A/SW8270C
Target Analyte List Metals	SW6010B
Mercury	SW7471A
Percent Solids	SM 2540-G

Notes:
ASTM - American Standard for Testing Materials.
SW- *Test Methods for Evaluating Solid Wastes, Physical and Chemical Methods* (USEPA 1996),
SM- *Standard Methods for the Examination of Water and Wastewater, 18th Edition*, APHA, AWWA, WPCF, 1992.

Source: O'Brien & Gere Engineers.

Analytical results for these analyses are presented on Table I in Appendix A. The letters found immediately to the right of individual sample results serve to qualify the sample data. When the data validation process identified more than one quality control deficiency, the qualifier added to the sample result represents the cumulative effect of the individual QC excursions. Consistent with the listed guidance document, the following qualifiers may have been used during the data validation:

U Indicates that the compound was analyzed for, but was not detected. The quantitation limit is presented and adjusted for dilution. This qualifier is also used when the quantitation limit is raised due to presence of blank contamination.

J Indicates that the detected sample result should be considered approximate. This qualifier is used when the data validation process identifies a deficiency in the data generation process. Additionally, this qualifier is used when analytes or compounds are detected at concentrations above the method detection limit (MDL) but below the laboratory method reporting limit (MRL). Results below the MRL should be considered approximate since method accuracy and precision are not defined for these concentration levels.

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 was rejected due to a major deficiency in the data generation procedure. The data should not be used for qualitative or quantitative purposes.

3. Data validation protocols

The data were validated in accordance with Section 3.8 of the USEPA approved Construction Phase Environmental Monitoring Plans (April and June 1999) which is equivalent to USEPA's Region I Tier III validation. Quality control data were evaluated based on accuracy and precision criteria specified in Table 3.1 presented in Section 3 of the Construction Phase Environmental Monitoring Plans (April 1998 and June 1999). The following are method specific QA/QC parameters used in the Tier III validation of sample data generated for this investigation:

TCO analyses

- Holding times and sample preservation
- Blank analysis
- Laboratory duplicate analysis
- Field duplicate analysis
- LCS analysis
- Analyte quantitation (10% frequency)
- Documentation completeness
- Overall data assessment

PCB analyses

- Holding times and sample preservation
- Initial and continuing calibration
- Retention time windows
- Blank analysis
- Surrogate recovery
- Matrix spike/laboratory duplicate analysis
- Field duplicate analysis
- Laboratory control sample (LCS) analysis
- System performance
- Target compound identification and quantitation (10% frequency)
- Confirmation analyses
- Percent solids
- Documentation completeness
- Overall data assessment

PAH analyses

- Holding times and sample preservation
- GC/MS tuning
- Initial and continuing calibration
- Blank analysis

- Surrogate recovery
- MS/MSD analysis
- Field duplicate analysis
- LCS analysis
- System performance
- Target compound identification and quantitation (10% frequency)
- Percent solids
- Documentation completeness
- Overall data assessment

Metal analyses

- Holding times and sample preservation
- Initial and continuing calibration
- ICP interference check sample and serial dilution analyses
- Blank analysis
- MS/MSD analysis
- Field duplicate analysis
- LCS analysis
- System performance
- Target compound identification and quantitation (10% frequency)
- Percent solids
- Documentation completeness
- Overall data assessment

In accordance with the Construction Phase Environmental Monitoring Plans, quality control data analyzed to assess accuracy and precision were evaluated utilizing control limits as follows:

- MS/MSD, LCS, laboratory duplicate, and PAH surrogate data were assessed utilizing laboratory control limits;

- Surrogate recoveries for PCB analyses were assessed utilizing established percent recovery limits of 30% to 150%.

- Field duplicate analyses were assessed utilizing established relative percent difference (RPD) limit of less than 75% for sample results greater than two times the reporting limit.

Based on guidance provided in EPA Region I's validation guidelines (USEPA Region I, November 1988), analytical data were qualified in the following manner when laboratory or established control limits were not met:

- If percent recoveries were less than control limits but greater than ten percent, non-detected and detected results were approximated (UJ, J).

- If percent recoveries were greater than control limits, detected results were approximated (J).
- If percent recoveries were less than ten percent, detected results were approximated (J) and non-detected results were rejected (R).
- If relative percent differences (RPDs) for MSDs and field duplicates were outside of control limits, detected results greater than the reporting limit were approximated.

It should be noted that qualification of data for MS/MSD analyses was performed only when both MS and MSD percent recoveries were outside of laboratory control limits. Qualification of data was not performed if MS/MSD or surrogate recoveries were outside of laboratory control limits due to sample dilution.

4. Data quality evaluation

This section summarizes the QA/QC parameters that met validation criteria and describes qualifications performed on sample data when QA/QC criteria were not met. Samples that required qualification are identified in the following sections by the sample location documented on the field chain of custody record followed by laboratory sample identification presented in parenthesis.

Table I, included in Appendix A, summarizes the data with the recommended validation actions for the samples collected for this investigation. This table also summarizes the samples chosen for field duplicate, laboratory MS/MSDs and duplicate analyses. QC sample collection activities met frequency requirements for sample collection activities conducted in 2001 with one exception. The field duplicate and the rinse blank were not submitted for PAH, metals, and TCO analyses.

Field and laboratory custody records were reviewed and found to be accurate and complete.

4.1. TCO analyses

General comments. The field duplicate and the rinse blank were not submitted for TCO analyses. Representative LCSs were not available for TCO analyses. The laboratories verified the analytical balance on a daily basis with ASTM Class 1 weights. This fulfills the LCS requirement. In addition, Groundwater Analytical analyzed aqueous LCSs that met recovery limits of 80% to 120%.

The following QA/QC parameters met validation criteria:

- Holding times and sample preservation
- Blank analysis
- Laboratory duplicate analysis (laboratory control limits were RPD <20%)
- Analyte quantitation (10% frequency)
- Documentation completeness

Overall data assessment. TCO analyses were performed in accordance with Monitoring Plans and ASTM method requirements. TCO data are usable for qualitative and quantitative purposes without further qualification.

4.2. PCB analyses

General comments. As seen historically at the site, PCB Aroclor 1254 was detected during this investigation. In accordance with the Construction Phase Environmental Monitoring Plans, the laboratory performed a six point initial calibration curve for this Aroclor and for Aroclors 1016/1260. Initial calibration was then verified with continuing calibration standards containing these aroclors. Method blanks and LCSs were extracted and analyzed with each sample preparation batch. LCSs were spiked with Aroclor 1254 at approximately 170 ug/kg. Matrix spikes were spiked with Aroclors 1016/1260 at approximately 170 ug/kg. Two surrogate compounds were utilized by the laboratories, decachlorobiphenyl (DCB) and tetrachloro-m-xylene (TCMX) which were spiked at 6.7 ug/Kg . Samples, blanks, and laboratory quality control samples underwent sulfuric acid and copper cleanup prior to analysis.

Evaluation of relative percent difference (RPD) for field duplicate analysis was not performed since PCBs were not detected in field duplicate pairs collected from location MHP-CS-062601-ESW-N.

The following QA/QC parameters met validation criteria:

- Sample preservation
- Initial and continuing calibration
- Retention time windows
- Blank analysis
- Surrogate recovery
- Matrix spike/laboratory duplicate analysis
- Field duplicate analysis
- Laboratory control sample (LCS) analysis
- System performance
- Target compound identification and quantitation (10% frequency)
- Confirmation analyses
- Percent solids
- Documentation completeness

Holding times. The extraction holding time requirement was exceeded by seven days for the rinse blank collected on June 28, 2001. Therefore, the nondetected results were qualified as approximate in the rinse blank.

Overall data assessment. PCB analyses were performed in accordance with the Construction Phase Environmental Monitoring Plans and method requirements. For the majority of the samples, five peaks were used for quantitation of a PCB Aroclor. In some instances when co-eluting interferences were suspected, the laboratory used four peaks instead of five for quantitation. Based on the review of the raw data (100% was reviewed for identification), the laboratory performed identification and quantitation in accordance with the method

requirements. PCB data are usable for qualitative and quantitative purposes. Nondetected results were qualified as approximate in the rinse blank based on an excursion from holding time requirement.

4.3. PAH analyses

General comments. PAH analyses were performed on five sediment samples. The field duplicate and the rinse blank were not submitted for PAH analyses. MS/MSD analyses were not performed due to limited sample amount. LCS was extracted and analyzed with the samples. The LCS was spiked with two representative PAH compounds, acenaphthene and pyrene.

The following QA/QC parameters met validation criteria:

- Holding times and sample preservation
- GC/MS tuning
- Initial calibration
- Blank analysis
- Surrogate recovery
- LCS analysis
- System performance
- Target compound identification and quantitation (10% frequency)
- Percent solids
- Documentation completeness

Continuing calibration. Data validation criteria for percent difference (%D<25%) was not meet for acenphthylene (%D=34.6%) in calibration standard analyzed on July 2, 2001 at 11:54. Therefore, detected and nondetected results for this compounds were qualified as approximate (J or UJ) in the following associated samples: MHP-CS-062601-DivSwale-1 and MHP-CS-062601-Sed-B-8.

Overall data assessment. PAH analyses were performed in accordance with method requirements. Based on a minor excursion from continuing calibration requirements, acenaphthylene results were qualified as approximate in two sediment samples. In addition, results that were reported at concentrations above the laboratory method detection limit but below the laboratory reporting limit were qualified as approximate (J) in sample MHP-CS-062601-DivSwale-1.

4.4 Metal analyses

General comments. Metal analyses were performed on five sediment samples. The field duplicate and the rinse blank were not submitted for metal analyses.

The following QA/QC parameters met validation criteria:

- Holding times and sample preservation
- Initial and continuing calibration
- ICP interference check sample analyses
- Blank analysis
- LCS analysis
- System performance
- Target compound identification and quantitation (10% frequency)
- Percent solids
- Documentation completeness

ICP serial dilution analysis. Serial dilution analysis was not performed as recommended in USEPA method 6010B. Qualification of data was not performed since matrix spike recoveries and interference check sample recoveries were within control limits.

MS/MSD analysis. MS/MSD analysis was performed on sample MHP-CS-062701-Unstream-9 for USEPA 6010B. Laboratory batch MS/MSD was reported for mercury analysis. Percent recovery criteria of 75% to 125% were met. RPD control limits of <20% were not met in several instances. The laboratory re-digested and reanalyzed the MS/MSD with similar results. The laboratory case nonconformance report noted that the sample consisted of coarse materials with many pebbles. Table 4-1 is a summary of the data qualified.

Table 4-1. ***Qualification of metals data; MS/MSD RPD excursions.***

MS/MSD ID	Analyte	RPD	Action	Samples Affected
MHP-CS-062701-Unstream-9	aluminum	69%	J	MHP-CS-062601-DivSwale-1 MHP-CS-062601-Sed B-8 MHP-CS-067201-Unstream-1 MHP-CS-067201-Unstream-5 MHP-CS-067201-Unstream-9
	calcium	39%	J	
	iron	57%	J	
	magnesium	80%	J	
	manganese	50%	J	
	potassium	51%	J	

Overall data assessment. The laboratory performed metal analyses in accordance with method requirements. Detected results were qualified as approximate for six metals based on excursions from RPD criteria.

5. Data usability

Data validation was performed for sediment and soil samples collected from the Sullivan Ledge Superfund Site in New Bedford, Massachusetts. Soil and sediment samples were validated for polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), metals, percent solids, and total combustible carbon (TCO) in accordance with Quality Assurance Project Plan (QAPP) presented in Section 3 of the United Stated Environmental Protection Agency (USEPA) approved *Construction Phase Environmental Monitoring Plans,* O'Brien & Gere, April 1998 and June 1999 (Construction Phase Environmental Monitoring Plans). This section summarizes the adherence of the analytical data to the data quality objectives (DQOs) established in the QAPP for precision, accuracy, representativeness, comparability, completeness, and sensitivity. A detailed discussion of the analytes and samples that were qualified is presented in Section 4. Summary tables of validated sample results with data validation qualifiers have been provided in Appendix A, Table I. A summary of qualifications performed and their impact on data usability is presented in Appendix A, Table II.

Data quality objectives were evaluated using percent usability defined as the percentage of sample results that are usable for qualitative and quantitative purposes. Approximation of data results when minor deficiencies in the data generation process occur. Approximation of a data point indicates uncertainty in the reported concentration of the analyte, but not its identity. Although data that are rejected are generally considered unusable for qualitative and quantitative purposes based on certain deficiencies in the data generation process, in some instances, rejected data may be used if the overall data quality objectives are met. Analytical data that were qualified as approximated or rejected were evaluated to determine if the data met the data quality objectives established for this project.

Precision was assessed from laboratory MSD, laboratory duplicate, and field duplicate analyses. Data usability with respect to precision was calculated as 100%. Detected results were qualified as approximate for aluminum, calcium, iron, magnesium, manganese, and potassium based on minor excursions from MSD RPD requirements.

Accuracy was assessed from calibration, surrogate recovery, MS/MSD, LCS, and internal standard results. Data usability with respect to accuracy was calculated as 100%. Minor excursions from continuing calibration requirements resulted in approximation of results for the PAH compound, acenaphthylene, in two samples.

Representativeness was assessed from holding times, sample preservation, blank analysis, target compound identification and quantitation, confirmation analyses, percent solids content, sampling and analytical methodologies used. Data usability with respect to representativeness was calculated as 100%. Nondetected results for PCB Aroclors were qualified as approximate in the rinse blank collected on June 28, 2001, since this sample was extracted over holding time requirements.

Comparability is a qualitative measure, therefore, usability calculations were not performed. Comparability requirements were met. Standard analytical methods, reporting units, reference materials, and data deliverables were specified in the Construction Phase Environmental Monitoring Plans that were adhered to by Groundwater Analytical.

Data completeness was calculated as 100%.

Sensitivity requirements were met. Calculated laboratory reporting limits for total PCBs and reduced PCBs were below the required soil and sediment action levels specified in the Construction Phase Environmental Monitoring Plans. Individual PCB aroclor reporting limits specified for soil and sediment samples in the Metcalf & Eddy Memorandum dated April 10, 1998 were also met.

APPENDICES

Table I - Validated results and recommendations
Table II – Overall evaluation of data

Table I: Validated Results and Recommendations

Field ID Lab ID Analyte	Units	MHP-CS-062601-DivSwale-1 42396-01		MHP-CS-062601-DivSwale-2 42396-02		MHP-CS-062601-DivSwale-3 42396-03		MHP-CS-062601-DivSwale-4 42396-04		MHP-CS-062601-DivSwale-Hath 42396-05	
PCB-1016	ug/Kg	80	U	80	U	80	U	80	U	80	U
PCB-1221	ug/Kg	80	U	80	U	80	U	80	U	80	U
PCB-1232	ug/Kg	80	U	80	U	80	U	80	U	80	U
PCB-1242	ug/Kg	80	U	80	U	80	U	80	U	80	U
PCB-1248	ug/Kg	80	U	80	U	80	U	80	U	80	U
PCB-1254	ug/Kg	150		100		80	U	80	U	210	
PCB-1260	ug/Kg	80	U	80	U	80	U	80	U	80	U
Reduced PCB	ugPCB/gC	3.6		4.8		5.7	U	5.7	U	30	
TCO	%	4.2		2.1		1.4		1.4		0.71	
Percent Solids	%	63		86		88		85		84	
Naphthalene	ug/Kg	320	J	NA		NA		NA		NA	
2-Methylnaphthalene	ug/Kg	500	U	NA		NA		NA		NA	
Acenaphthylene	ug/Kg	490	J	NA		NA		NA		NA	
Acenaphthene	ug/Kg	390	J	NA		NA		NA		NA	
Fluorene	ug/Kg	500	U	NA		NA		NA		NA	
Phenanthrene	ug/Kg	1600		NA		NA		NA		NA	
Anthracene	ug/Kg	570		NA		NA		NA		NA	
Fluoranthene	ug/Kg	3000		NA		NA		NA		NA	
Pyrene	ug/Kg	2600		NA		NA		NA		NA	
Benzo(a)anthracene	ug/Kg	1300		NA		NA		NA		NA	
Chyrsene	ug/Kg	1600		NA		NA		NA		NA	
Benzo(b)fluoranthene	ug/Kg	1700		NA		NA		NA		NA	
Benzo(k)flluoranthene	ug/Kg	840		NA		NA		NA		NA	
Benzo(a)pyrene	ug/Kg	1400		NA		NA		NA		NA	
Indeno(1,2,3-cd)pyrene	ug/Kg	1200		NA		NA		NA		NA	
Dibenzo(a,h)anthracene	ug/Kg	660		NA		NA		NA		NA	
Benzo(g,h,I)perylene	ug/Kg	1100		NA		NA		NA		NA	
Aluminum	mg/Kg	5100	J	NA		NA		NA		NA	
Antimony	mg/Kg	1.6	U	NA		NA		NA		NA	
Arsenic	mg/Kg	2.6		NA		NA		NA		NA	
Barium	mg/Kg	41		NA		NA		NA		NA	
Beryllium	mg/Kg	0.65	U	NA		NA		NA		NA	
Cadmium	mg/Kg	0.81	U	NA		NA		NA		NA	
Calcium	mg/Kg	1400	J	NA		NA		NA		NA	
Chromium	mg/Kg	22		NA		NA		NA		NA	
Cobalt	mg/Kg	8.1	U	NA		NA		NA		NA	
Copper	mg/Kg	33	U	NA		NA		NA		NA	
Iron	mg/Kg	13000	J	NA		NA		NA		NA	
Lead	mg/Kg	67		NA		NA		NA		NA	
Magnesium	mg/Kg	2300	J	NA		NA		NA		NA	
Manganese	mg/Kg	290	J	NA		NA		NA		NA	
Mercury	mg/Kg	0.073		NA		NA		NA		NA	
Nickel	mg/Kg	16	U	NA		NA		NA		NA	
Potassium	mg/Kg	930	J	NA		NA		NA		NA	
Selenium	mg/Kg	16	U	NA		NA		NA		NA	
Silver	mg/Kg	8.1	U	NA		NA		NA		NA	
Sodium	mg/Kg	810	U	NA		NA		NA		NA	
Thallium	mg/Kg	8.1	U	NA		NA		NA		NA	
Vanadium	mg/Kg	14		NA		NA		NA		NA	
Zinc	mg/Kg	81	U	NA		NA		NA		NA	

Matrix spike, laboratory duplicates or MS/MSD performed as follows:
TCO: 42396-01 lab dup
PCB: 42455-01lab dup
PCB: 42398-01 matrix spike
6010B:42445-03 MS/MSD

Table I: Validated Results and Reco

Field ID Lab ID Analyte	Units	MHP-CS-062601-Sed B-8 42399-01		MHP-CS-062601-Sed B-9 42399-02		MHP-CS-062601-Sed B-10 42399-03		MHP-CS-062601-Sed B-11 42399-04	
PCB-1016	ug/Kg	80	U	80	U	80	U	80	U
PCB-1221	ug/Kg	80	U	80	U	80	U	80	U
PCB-1232	ug/Kg	80	U	80	U	80	U	80	U
PCB-1242	ug/Kg	80	U	80	U	80	U	80	U
PCB-1248	ug/Kg	80	U	80	U	80	U	80	U
PCB-1254	ug/Kg	80	U	80	U	80	U	180	
PCB-1260	ug/Kg	80	U	80	U	80	U	80	U
Reduced PCB	ugPCB/gC	4	U	2	U	1.1	U	3.3	
TCO	%	2		4		7.2		5.5	
Percent Solids	%	79		68		63		56	
Naphthalene	ug/Kg	400	U	NA		NA		NA	
2-Methylnaphthalene	ug/Kg	400	U	NA		NA		NA	
Acenaphthylene	ug/Kg	400	UJ	NA		NA		NA	
Acenaphthene	ug/Kg	400	U	NA		NA		NA	
Fluorene	ug/Kg	400	U	NA		NA		NA	
Phenanthrene	ug/Kg	400	U	NA		NA		NA	
Anthracene	ug/Kg	400	U	NA		NA		NA	
Fluoranthene	ug/Kg	400	U	NA		NA		NA	
Pyrene	ug/Kg	400	U	NA		NA		NA	
Benzo(a)anthracene	ug/Kg	400	U	NA		NA		NA	
Chyrsene	ug/Kg	400	U	NA		NA		NA	
Benzo(b)fluoranthene	ug/Kg	400	U	NA		NA		NA	
Benzo(k)flluoranthene	ug/Kg	400	U	NA		NA		NA	
Benzo(a)pyrene	ug/Kg	400	U	NA		NA		NA	
Indeno(1,2,3-cd)pyrene	ug/Kg	400	U	NA		NA		NA	
Dibenzo(a,h)anthracene	ug/Kg	400	U	NA		NA		NA	
Benzo(g,h,I)perylene	ug/Kg	400	U	NA		NA		NA	
Aluminum	mg/Kg	3700	J	NA		NA		NA	
Antimony	mg/Kg	1.3	U	NA		NA		NA	
Arsenic	mg/Kg	2.9		NA		NA		NA	
Barium	mg/Kg	26	U	NA		NA		NA	
Beryllium	mg/Kg	0.53	U	NA		NA		NA	
Cadmium	mg/Kg	0.66	U	NA		NA		NA	
Calcium	mg/Kg	1000	J	NA		NA		NA	
Chromium	mg/Kg	13	U	NA		NA		NA	
Cobalt	mg/Kg	6.6	U	NA		NA		NA	
Copper	mg/Kg	26	U	NA		NA		NA	
Iron	mg/Kg	8800	J	NA		NA		NA	
Lead	mg/Kg	13	U	NA		NA		NA	
Magnesium	mg/Kg	1400	J	NA		NA		NA	
Manganese	mg/Kg	150	J	NA		NA		NA	
Mercury	mg/Kg	0.043	U	NA		NA		NA	
Nickel	mg/Kg	13	U	NA		NA		NA	
Potassium	mg/Kg	230	J	NA		NA		NA	
Selenium	mg/Kg	13	U	NA		NA		NA	
Silver	mg/Kg	6.6	U	NA		NA		NA	
Sodium	mg/Kg	660	U	NA		NA		NA	
Thallium	mg/Kg	6.6	U	NA		NA		NA	
Vanadium	mg/Kg	7.9		NA		NA		NA	
Zinc	mg/Kg	66	U	NA		NA		NA	

Matrix spike, laboratory duplicates or
TCO: 42396-01 lab dup
PCB: 42455-01lab dup
PCB: 42398-01 matrix spike
6010B:42445-03 MS/MSD

Table I: Validated Results and Reco

Field ID Lab ID Analyte	Units	MHP-CS-062701-Unstream-1 42445-01		MHP-CS-062701-Unstream-2 42445-04		MHP-CS-062701-Unstream-3 42445-05		MHP-CS-062701-Unstream-4 42445-06	
PCB-1016	ug/Kg	80	U	80	U	80	U	80	U
PCB-1221	ug/Kg	80	U	80	U	80	U	80	U
PCB-1232	ug/Kg	80	U	80	U	80	U	80	U
PCB-1242	ug/Kg	80	U	80	U	80	U	80	U
PCB-1248	ug/Kg	80	U	80	U	80	U	80	U
PCB-1254	ug/Kg	170		80	U	80	U	80	U
PCB-1260	ug/Kg	80	U	80	U	80	U	80	U
Reduced PCB	ugPCB/gC	12		8.9	U	6.7	U	7.3	U
TCO	%	1.4		0.9		1.2		1.1	
Percent Solids	%	86		88		88		90	
Naphthalene	ug/Kg	360	U	NA		NA		NA	
2-Methylnaphthalene	ug/Kg	360	U	NA		NA		NA	
Acenaphthylene	ug/Kg	360	U	NA		NA		NA	
Acenaphthene	ug/Kg	360	U	NA		NA		NA	
Fluorene	ug/Kg	360	U	NA		NA		NA	
Phenanthrene	ug/Kg	360	U	NA		NA		NA	
Anthracene	ug/Kg	360	U	NA		NA		NA	
Fluoranthene	ug/Kg	360	U	NA		NA		NA	
Pyrene	ug/Kg	360	U	NA		NA		NA	
Benzo(a)anthracene	ug/Kg	360	U	NA		NA		NA	
Chyrsene	ug/Kg	360	U	NA		NA		NA	
Benzo(b)fluoranthene	ug/Kg	360	U	NA		NA		NA	
Benzo(k)flluoranthene	ug/Kg	360	U	NA		NA		NA	
Benzo(a)pyrene	ug/Kg	360	U	NA		NA		NA	
Indeno(1,2,3-cd)pyrene	ug/Kg	360	U	NA		NA		NA	
Dibenzo(a,h)anthracene	ug/Kg	360	U	NA		NA		NA	
Benzo(g,h,I)perylene	ug/Kg	360	U	NA		NA		NA	
Aluminum	mg/Kg	1400	J	NA		NA		NA	
Antimony	mg/Kg	1.2	U	NA		NA		NA	
Arsenic	mg/Kg	1.2	U	NA		NA		NA	
Barium	mg/Kg	24	U	NA		NA		NA	
Beryllium	mg/Kg	0.48	U	NA		NA		NA	
Cadmium	mg/Kg	0.6	U	NA		NA		NA	
Calcium	mg/Kg	400	J	NA		NA		NA	
Chromium	mg/Kg	12	U	NA		NA		NA	
Cobalt	mg/Kg	6	U	NA		NA		NA	
Copper	mg/Kg	24	U	NA		NA		NA	
Iron	mg/Kg	3600	J	NA		NA		NA	
Lead	mg/Kg	12	U	NA		NA		NA	
Magnesium	mg/Kg	640	J	NA		NA		NA	
Manganese	mg/Kg	72	J	NA		NA		NA	
Mercury	mg/Kg	0.037	U	NA		NA		NA	
Nickel	mg/Kg	12	U	NA		NA		NA	
Potassium	mg/Kg	170	J	NA		NA		NA	
Selenium	mg/Kg	12	U	NA		NA		NA	
Silver	mg/Kg	6	U	NA		NA		NA	
Sodium	mg/Kg	600	U	NA		NA		NA	
Thallium	mg/Kg	6	U	NA		NA		NA	
Vanadium	mg/Kg	6	U	NA		NA		NA	
Zinc	mg/Kg	60	U	NA		NA		NA	

Matrix spike, laboratory duplicates or
TCO: 42396-01 lab dup
PCB: 42455-01lab dup
PCB: 42398-01 matrix spike
6010B:42445-03 MS/MSD

Table I: Validated Results and Reco

Field ID Lab ID Analyte	Units	MHP-CS-062701-Unstream-5 42445-02		MHP-CS-062701-Unstream-6 42445-07		MHP-CS-062701-Unstream-7 42445-08		MHP-CS-062701-Unstream-8 42445-09	
PCB-1016	ug/Kg	80	U	80	U	80	U	80	U
PCB-1221	ug/Kg	80	U	80	U	80	U	80	U
PCB-1232	ug/Kg	80	U	80	U	80	U	80	U
PCB-1242	ug/Kg	80	U	80	U	80	U	80	U
PCB-1248	ug/Kg	80	U	80	U	80	U	80	U
PCB-1254	ug/Kg	820		80	U	80	U	80	U
PCB-1260	ug/Kg	80	U	80	U	80	U	80	U
Reduced PCB	ugPCB/gC	59		6.7	U	6.7	U	7.3	U
TCO	%	1.4		1.2		1.2		1.1	
Percent Solids	%	91		81		88		85	
Naphthalene	ug/Kg	340	U	NA		NA		NA	
2-Methylnaphthalene	ug/Kg	340	U	NA		NA		NA	
Acenaphthylene	ug/Kg	340	U	NA		NA		NA	
Acenaphthene	ug/Kg	340	U	NA		NA		NA	
Fluorene	ug/Kg	340	U	NA		NA		NA	
Phenanthrene	ug/Kg	340	U	NA		NA		NA	
Anthracene	ug/Kg	340	U	NA		NA		NA	
Fluoranthene	ug/Kg	340	U	NA		NA		NA	
Pyrene	ug/Kg	340	U	NA		NA		NA	
Benzo(a)anthracene	ug/Kg	340	U	NA		NA		NA	
Chyrsene	ug/Kg	340	U	NA		NA		NA	
Benzo(b)fluoranthene	ug/Kg	340	U	NA		NA		NA	
Benzo(k)flluoranthene	ug/Kg	340	U	NA		NA		NA	
Benzo(a)pyrene	ug/Kg	340	U	NA		NA		NA	
Indeno(1,2,3-cd)pyrene	ug/Kg	340	U	NA		NA		NA	
Dibenzo(a,h)anthracene	ug/Kg	340	U	NA		NA		NA	
Benzo(g,h,I)perylene	ug/Kg	340	U	NA		NA		NA	
Aluminum	mg/Kg	2400	J	NA		NA		NA	
Antimony	mg/Kg	1.1	U	NA		NA		NA	
Arsenic	mg/Kg	1.1	U	NA		NA		NA	
Barium	mg/Kg	23	U	NA		NA		NA	
Beryllium	mg/Kg	0.45	U	NA		NA		NA	
Cadmium	mg/Kg	0.56	U	NA		NA		NA	
Calcium	mg/Kg	710	J	NA		NA		NA	
Chromium	mg/Kg	11	U	NA		NA		NA	
Cobalt	mg/Kg	5.6	U	NA		NA		NA	
Copper	mg/Kg	23	U	NA		NA		NA	
Iron	mg/Kg	5200	J	NA		NA		NA	
Lead	mg/Kg	12		NA		NA		NA	
Magnesium	mg/Kg	1400	J	NA		NA		NA	
Manganese	mg/Kg	86	J	NA		NA		NA	
Mercury	mg/Kg	0.036	U	NA		NA		NA	
Nickel	mg/Kg	11	U	NA		NA		NA	
Potassium	mg/Kg	520	J	NA		NA		NA	
Selenium	mg/Kg	11	U	NA		NA		NA	
Silver	mg/Kg	5.6	U	NA		NA		NA	
Sodium	mg/Kg	560	U	NA		NA		NA	
Thallium	mg/Kg	5.6	U	NA		NA		NA	
Vanadium	mg/Kg	7.6		NA		NA		NA	
Zinc	mg/Kg	56	U	NA		NA		NA	

Matrix spike, laboratory duplicates or
TCO: 42396-01 lab dup
PCB: 42455-01lab dup
PCB: 42398-01 matrix spike
6010B:42445-03 MS/MSD

Table I: Validated Results and Reco

Field ID Lab ID Analyte	Units	MHP-CS-062701-Unstream-9 42445-03		MHP-CS-062601-ESW-N 42398-01		MHP-CS-062601-ESW-N Field Dup. 42398-07		MHP-CS-062601-ESW-Mid 42398-02	
PCB-1016	ug/Kg	80	U	80	U	80	U	80	U
PCB-1221	ug/Kg	80	U	80	U	80	U	80	U
PCB-1232	ug/Kg	80	U	80	U	80	U	80	U
PCB-1242	ug/Kg	80	U	80	U	80	U	80	U
PCB-1248	ug/Kg	80	U	80	U	80	U	80	U
PCB-1254	ug/Kg	110		80	U	80	U	80	U
PCB-1260	ug/Kg	80	U	80	U	80	U	80	U
Reduced PCB	ugPCB/gC	12		NA		NA		NA	
TCO	%	0.94		NA		NA		NA	
Percent Solids	%	86		93		92		96	
Naphthalene	ug/Kg	380	U	NA		NA		NA	
2-Methylnaphthalene	ug/Kg	380	U	NA		NA		NA	
Acenaphthylene	ug/Kg	380	U	NA		NA		NA	
Acenaphthene	ug/Kg	380	U	NA		NA		NA	
Fluorene	ug/Kg	380	U	NA		NA		NA	
Phenanthrene	ug/Kg	380	U	NA		NA		NA	
Anthracene	ug/Kg	380	U	NA		NA		NA	
Fluoranthene	ug/Kg	380	U	NA		NA		NA	
Pyrene	ug/Kg	380	U	NA		NA		NA	
Benzo(a)anthracene	ug/Kg	380	U	NA		NA		NA	
Chyrsene	ug/Kg	380	U	NA		NA		NA	
Benzo(b)fluoranthene	ug/Kg	380	U	NA		NA		NA	
Benzo(k)flluoranthene	ug/Kg	380	U	NA		NA		NA	
Benzo(a)pyrene	ug/Kg	380	U	NA		NA		NA	
Indeno(1,2,3-cd)pyrene	ug/Kg	380	U	NA		NA		NA	
Dibenzo(a,h)anthracene	ug/Kg	380	U	NA		NA		NA	
Benzo(g,h,I)perylene	ug/Kg	380	U	NA		NA		NA	
Aluminum	mg/Kg	1400	J	NA		NA		NA	
Antimony	mg/Kg	1.1	U	NA		NA		NA	
Arsenic	mg/Kg	1.1	U	NA		NA		NA	
Barium	mg/Kg	22	U	NA		NA		NA	
Beryllium	mg/Kg	0.45	U	NA		NA		NA	
Cadmium	mg/Kg	0.56	U	NA		NA		NA	
Calcium	mg/Kg	280	J	NA		NA		NA	
Chromium	mg/Kg	11	U	NA		NA		NA	
Cobalt	mg/Kg	5.6	U	NA		NA		NA	
Copper	mg/Kg	22	U	NA		NA		NA	
Iron	mg/Kg	3800	J	NA		NA		NA	
Lead	mg/Kg	11	U	NA		NA		NA	
Magnesium	mg/Kg	810	J	NA		NA		NA	
Manganese	mg/Kg	87	J	NA		NA		NA	
Mercury	mg/Kg	0.039	U	NA		NA		NA	
Nickel	mg/Kg	11	U	NA		NA		NA	
Potassium	mg/Kg	160	J	NA		NA		NA	
Selenium	mg/Kg	11	U	NA		NA		NA	
Silver	mg/Kg	5.6	U	NA		NA		NA	
Sodium	mg/Kg	560	U	NA		NA		NA	
Thallium	mg/Kg	5.6	U	NA		NA		NA	
Vanadium	mg/Kg	5.6	U	NA		NA		NA	
Zinc	mg/Kg	56	U	NA		NA		NA	

Matrix spike, laboratory duplicates or
TCO: 42396-01 lab dup
PCB: 42455-01lab dup
PCB: 42398-01 matrix spike
6010B:42445-03 MS/MSD

Table I: Validated Results and Reco

Field ID Lab ID Analyte	Units	MHP-CS-062601-ESW-S 42398-03		MHP-CS-062601-SSW-E 42398-04		MHP-CS-062601-SSW-Mid 42398-05		MHP-CS-062601-SSW-W 42398-06	
PCB-1016	ug/Kg	80	U	80	U	80	U	80	U
PCB-1221	ug/Kg	80	U	80	U	80	U	80	U
PCB-1232	ug/Kg	80	U	80	U	80	U	80	U
PCB-1242	ug/Kg	80	U	80	U	80	U	80	U
PCB-1248	ug/Kg	80	U	80	U	80	U	80	U
PCB-1254	ug/Kg	130		80	U	80	U	80	U
PCB-1260	ug/Kg	80	U	80	U	80	U	80	U
Reduced PCB	ugPCB/gC	NA		NA		NA		NA	
TCO	%	NA		NA		NA		NA	
Percent Solids	%	89		83		86		85	
Naphthalene	ug/Kg	NA		NA		NA		NA	
2-Methylnaphthalene	ug/Kg	NA		NA		NA		NA	
Acenaphthylene	ug/Kg	NA		NA		NA		NA	
Acenaphthene	ug/Kg	NA		NA		NA		NA	
Fluorene	ug/Kg	NA		NA		NA		NA	
Phenanthrene	ug/Kg	NA		NA		NA		NA	
Anthracene	ug/Kg	NA		NA		NA		NA	
Fluoranthene	ug/Kg	NA		NA		NA		NA	
Pyrene	ug/Kg	NA		NA		NA		NA	
Benzo(a)anthracene	ug/Kg	NA		NA		NA		NA	
Chyrsene	ug/Kg	NA		NA		NA		NA	
Benzo(b)fluoranthene	ug/Kg	NA		NA		NA		NA	
Benzo(k)flluoranthene	ug/Kg	NA		NA		NA		NA	
Benzo(a)pyrene	ug/Kg	NA		NA		NA		NA	
Indeno(1,2,3-cd)pyrene	ug/Kg	NA		NA		NA		NA	
Dibenzo(a,h)anthracene	ug/Kg	NA		NA		NA		NA	
Benzo(g,h,I)perylene	ug/Kg	NA		NA		NA		NA	
Aluminum	mg/Kg	NA		NA		NA		NA	
Antimony	mg/Kg	NA		NA		NA		NA	
Arsenic	mg/Kg	NA		NA		NA		NA	
Barium	mg/Kg	NA		NA		NA		NA	
Beryllium	mg/Kg	NA		NA		NA		NA	
Cadmium	mg/Kg	NA		NA		NA		NA	
Calcium	mg/Kg	NA		NA		NA		NA	
Chromium	mg/Kg	NA		NA		NA		NA	
Cobalt	mg/Kg	NA		NA		NA		NA	
Copper	mg/Kg	NA		NA		NA		NA	
Iron	mg/Kg	NA		NA		NA		NA	
Lead	mg/Kg	NA		NA		NA		NA	
Magnesium	mg/Kg	NA		NA		NA		NA	
Manganese	mg/Kg	NA		NA		NA		NA	
Mercury	mg/Kg	NA		NA		NA		NA	
Nickel	mg/Kg	NA		NA		NA		NA	
Potassium	mg/Kg	NA		NA		NA		NA	
Selenium	mg/Kg	NA		NA		NA		NA	
Silver	mg/Kg	NA		NA		NA		NA	
Sodium	mg/Kg	NA		NA		NA		NA	
Thallium	mg/Kg	NA		NA		NA		NA	
Vanadium	mg/Kg	NA		NA		NA		NA	
Zinc	mg/Kg	NA		NA		NA		NA	

Matrix spike, laboratory duplicates or
TCO: 42396-01 lab dup
PCB: 42455-01lab dup
PCB: 42398-01 matrix spike
6010B:42445-03 MS/MSD

Table I: Validated Results and Reco

Field ID Lab ID Analyte	Units	MHP-CS-062801-Rinseate 42587-01 (ug/L)	
PCB-1016	ug/Kg	0.2	UJ
PCB-1221	ug/Kg	0.2	UJ
PCB-1232	ug/Kg	0.2	UJ
PCB-1242	ug/Kg	0.2	UJ
PCB-1248	ug/Kg	0.2	UJ
PCB-1254	ug/Kg	0.2	UJ
PCB-1260	ug/Kg	0.2	UJ
Reduced PCB	ugPCB/gC	NA	
TCO	%	NA	
Percent Solids	%	NA	
Naphthalene	ug/Kg	NA	
2-Methylnaphthalene	ug/Kg	NA	
Acenaphthylene	ug/Kg	NA	
Acenaphthene	ug/Kg	NA	
Fluorene	ug/Kg	NA	
Phenanthrene	ug/Kg	NA	
Anthracene	ug/Kg	NA	
Fluoranthene	ug/Kg	NA	
Pyrene	ug/Kg	NA	
Benzo(a)anthracene	ug/Kg	NA	
Chyrsene	ug/Kg	NA	
Benzo(b)fluoranthene	ug/Kg	NA	
Benzo(k)fliuoranthene	ug/Kg	NA	
Benzo(a)pyrene	ug/Kg	NA	
Indeno(1,2,3-cd)pyrene	ug/Kg	NA	
Dibenzo(a,h)anthracene	ug/Kg	NA	
Benzo(g,h,I)perylene	ug/Kg	NA	
Aluminum	mg/Kg	NA	
Antimony	mg/Kg	NA	
Arsenic	mg/Kg	NA	
Barium	mg/Kg	NA	
Beryllium	mg/Kg	NA	
Cadmium	mg/Kg	NA	
Calcium	mg/Kg	NA	
Chromium	mg/Kg	NA	
Cobalt	mg/Kg	NA	
Copper	mg/Kg	NA	
Iron	mg/Kg	NA	
Lead	mg/Kg	NA	
Magnesium	mg/Kg	NA	
Manganese	mg/Kg	NA	
Mercury	mg/Kg	NA	
Nickel	mg/Kg	NA	
Potassium	mg/Kg	NA	
Selenium	mg/Kg	NA	
Silver	mg/Kg	NA	
Sodium	mg/Kg	NA	
Thallium	mg/Kg	NA	
Vanadium	mg/Kg	NA	
Zinc	mg/Kg	NA	

Matrix spike, laboratory duplicates or
TCO: 42396-01 lab dup
PCB: 42455-01lab dup
PCB: 42398-01 matrix spike
6010B:42445-03 MS/MSD

Table II
Overall Evaluation of Data for Soil and Sediment Results
Sullivan Ledge Superfund Site, Sampling Events 2001

DQO	Sampling* and/or Analytical Method Appropriate Yes or No	Measurement Error		Sampling Variability**	Potential Usability Issues
		Analytical Error Refer to qualifications in Table I	Sampling Error*		
Confirmational sampling to assess if cleanup criteria listed below was achieved: Soils: <10 mg/kg PCBs Sediment: <20 ug PCB/gCarbon	Both - Yes	J	None	NA	None: Detected results qualified as approximate for aluminum, calcium, iron, magnesium, manganese, and potassium in five sediment samples based on minor excursions from precision requirements.
		UJ	None	NA	None: Nondetected results were qualified as approximate in Rinse Blank due to holding time.
		UJ, J	None	NA	None: Detected and nondetected results were qualified as approximate for acenaphthylene in two sediment samples based on minor excursion from continuing calibration.
		J	None	NA	None: Detected results reported at concentrations less than laboratory established reporting limit were qualified as approximate for three compounds in sediment sample MHP-CS-062601-DivSwale-1.

Table Notes:

* The evaluation of "sampling error" cannot be completely assess in the data validation. Field sampling notes were reviewed during the validation for compliance with SAP requirements. Excursions from SAP requirements were not observed based on review of the field sampling logs and notes.

**Sampling variability is not assessed in the data validation.

Source: O'Brien & Gere

Appendix B

Data validation worksheets and notes

Harding Lawson Associates
Engineering and Environmental Services

SHEET 1 OF 1
JOB NO. OU-1
DATE Wed, 8/1/01
COMPUTED BY RTC
CHECKED BY

PROJECT Sullivan's Ledge OU-1
SUBJECT

Tier 1 Data

arrived a few days ago. Covers samples collected June 26-27 at the Ledge.

Summer 2001 Samples

- Diversion Swale (5 total)
- Unnamed Stream (9)
- Sed. Basin (4)
- East Swale (ESW) (3+1)
- South Swale (SSW) (3)

- Duplicate (one) (w/ East Swale) — which one at North
- Rinsate (6/28/01)

Do you need a copy of my field notes?

Travis Canon

SULLIVAN'S LEDGE SAMPLING EVENTS

1.0 DATA COMPLETENESS FOR PCB and TCO ANALYSIS

1.0 Traffic Report or Lab Narrative Notes: Briefly discuss any special notes regarding problems with sample receipt, condition of samples, analytical problems, or special notations affecting the quality of data as documented by the laboratory in the case file or narrative.

None

1.2 Documentation Completion

1.2.1 Were the correct units indicated, ug/L for waters and ug/kg dry weight for soils? Yes

1.2.2 Were sample results for each parameter corrected for percent solids for soil samples? Yes

1.2.3 Were any of the samples diluted beyond requirements? If yes, were these dilutions noted on the Form Is.

Yes / Yes

1.2.4 Were raw data to support analyses and QC operations present and complete? Yes

Actions: If no, for any of the above, contact the laboratory for an explanation. If missing data cannot be provided, use professional judgement in qualifying data. Review all problems and resolutions regarding data completeness in final report.

1.3 List below any communication with laboratory regarding problems with data completeness, with reference to data, contact person, specific problems and resolutions (This would include missing raw data or applicable QC forms etc).

1). Please provide MS recovery data
4 2398-01 MS. – Not available.

2). Travis Conan - which is duplicate 4 2601
from East Swale – 1 North end

All met

2.0 HOLDING TIMES AND PRESERVATION

PCB: Soil/sediment samples must be extracted within 14 days of collection. Extracts must be analyzed within 40 days of extraction.

TCO: Analyze within 7 days.
Summarize below the samples in which holding time criteria was exceeded.

Sample ID	Date Collected	Date Extracted	Date Analyzed	Action
	6/26/01	7/1/01 (PB-1350-N)	7/2/01 7/3/01	met
	6/27/01	7/3/01 (PB-1352-N)	7/3-4/01	met
Equipment Rinse	6/28/01	7/12/01 Rec 7/5/01	7/17/01	7 days.-None ~~UJ~~ Rinse Blank-Note in Report
TCO	6/26/01	NA	6/28/01 (TCO-131-S)	met
	6/27/01		6/29/01 (TCO-132-S)	met

Actions:

a. If holding times are exceeded, detected and nondetected results are approximated, J(+), UJ(-).

b. If samples are not extracted within 14 days for waters or 28 days for soils, detected and nondetected results are flagged as unusable "R".

3.0 SURROGATE COMPOUND RECOVERY

3.1 Were surrogate compounds evaluated for each of the samples, blanks and QC samples at the concentrations specified in the analytical method?

Yes ~6.7 ug/kg

Actions: If no contact laboratory for explanation and describe problems/resolutions in final narrative report. Reject associated sample data if surrogates were not evaluated. Use professional judgement in qualifying sample data, if the incorrect concentrations were used.

Actions For When Surrogate Recovery Criteria Are Exceeded: Sample data are only qualified when both surrogate compounds exceed criteria.

a. If %recovery is <10% for both surrogates, flag positive results as estimated "L" and reject detection limits "R".

b. If %recovery is less than control limit but >10% for both surrogates, flag associated sample results and detection limits as estimated "L" and "UL".

c. If %recovery is > upper control limit for both surrogates, flag positive results as estimated "K".

d. If % recovery is biased low for one surrogate and biased high for the other surrogate, approximate detected results as "J" and detection limits "UJ"

TCMX Lab 25-121
DCBP Lab 28-138%

SULLIVAN'S LEDGE SAMPLING EVENTS

All met

3.2 List below the samples in which surrogate recovery criteria were exceeded. Per QAPP Control Limits are 30% to 150%.

Sample ID	Surrogate	%Rec.	Action

6/26/01 - all met
6/27/01 all met

SULLIVAN'S LEDGE SAMPLING EVENTS

3.3 If surrogate recoveries were outside of control limits, were the affected samples or method blanks re-extracted and/or reanalyzed?

a. If no, document in case narrative that the laboratory was not in compliance with SOW requirements.

b. If any surrogate fails to meet criteria for reanalyzed field sample, follow actions specified for initial analysis and document in the narrative report that excursions from surrogate criteria most likely resulted from sample matrix effects.

c. If both surrogates are out of control limits in method blank sample and this sample was not reanalyzed; reject sample data in the method blank and associated field and QC samples. Data may be determined to be acceptable if additional QA/QC demonstrates that method blank excursions were an isolated occurrence.

3.5 Are transcription/calculation errors present (check a minimum of 10% of SMC calculations)?

none

If yes, note necessary corrections. Present sample calculation for surrogate recovery below for at least one surrogate compound.

3.6 Were surrogate compounds within established retention times?

6/26/01- met
6/27/01- met
> Evaluated through raw data review

Actions: Evaluate raw data using an expanded retention time window criteria.

5.0 LABORATORY CONTROL SAMPLE (LCS) ANALYSIS

5.1 Were LCSs extracted for each extraction batch, and every 20 samples of similar matrix whichever is greater?

Actions: If no, contact laboratory for explanation and describe problems/ resolutions in final narrative report. Generally, qualification of sample data is not required when LCSs are not at the correct frequency of concentration. Document in the narrative report that the laboratory was not in compliance.

Actions: Qualification is performed for specific compounds that exceeded criteria in samples within the same extraction batch.

a. If LCS recoveries is greater than control limits, approximate detected results as approximated "K" (sample detection limits are not qualified).

b. If LCS recoveries is less than control limits but >10%, approximate detected results as "L" and detection limits as "UL".

c. If LCS recoveries <10%, reject detection limits "R".

Spiked w/ 1254 at ~ 170ug/kg CL 70-130%

All met

SULLIVAN'S LEDGE SAMPLING EVENTS

5.2 List below %Recoveries of compounds which did not meet criteria. LCSs spiked with Aroclor 1254; recoveries within laboratory limits.

LCS ID	Compound	%Recovery	Action	Samples Affected
PB-1350-N	met			
PB-1352-N	met			

6.0 BLANK ANALYSES

Blank analyses are performed and evaluated to assess the existence and magnitude of laboratory and field contamination.

6.1 Were method blanks analyzed for each group of samples of similar matrix? Yes

Actions: If no, contact laboratory for explanation and review in data completeness section. If blanks are not available, an evaluation of blank contamination can not be made. Reject associated detected results. Alternatively, field and or trip blank analyses can be used in place of method blanks to evaluate overall contamination effects.

6.2 Field/Equipment Blanks

6.2.1 Were field/equipment blanks collected and analyzed at the frequency specified in the site specific QAPP or Scope of Work? Yes

Note: Field blanks are usually collected at a minimum frequency of one per 20 field samples.

Actions: If no, note in data report that an evaluation of field contamination could not be made with reference to specific sampling event.

6.3 Summarize compounds detected in any of the blanks analyzed. Actions levels are calculated at 5x blank value. Blank samples are not be qualified with respect to other blanks.

If the sample concentration is > CRDL and < Action level, report concentration flagged with a "B".

If the sample concentration is > Action level, qualification of data is not necessary.

SULLIVAN'S LEDGE SAMPLING EVENTS

All met

6.3 Blank excursions.

Blank ID	Compound	Conc. (ug/L)	Action Level (ug/L)	Samples Affected
PB-1350-N	met			
TCO 6/28/01	met			
PB-1352-N	met			
TCO 6/29/01	met			
Rinse	met			

4.0 MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) ANALYSIS

4.1 Were MS/MSDs analyzed at the required concentration for each group of twenty samples of similar matrix?

Yes

Actions: If no, contact laboratory for explanation and describe problems/ resolutions in final narrative report. Generally, qualification of sample data is not required when MS/MSDs are not at the correct frequency of concentration. Document in the narrative report that the laboratory was not in compliance.

MS 1016/1260 at ~ 170 ug/kg.

Actions Required When MS/MSD Recovery or RPD Criteria Are Exceeded: Qualification is performed for the compound exceededing criteria in the unspiked sample only.

a. If both the MS/MSD have <10% recovery, detection limits for that analyte are rejected "R", and detected results are approximated "L".

b. If both MS/MSD have recoveries >control limits, approximate detected results as "K" (detection limits are not qualified).

c. If both MS/MSD have recoveries >10% but < control limits, approximate detection limits as "UJ" and detected results "J"(if one recovery is <10% and the other is >10% but less than control limits qualify as stated).

d. If one recovery is biased high and the other biased low, approximate detected results "J" and detection limits "UJ".

e. If RPD criteria are not met, approximate detected sample results "J".

CLP Validation Actions
USEPA Functional Guidelines state that NO ACTION IS TAKEN ON MS/MSD DATA ALONE.
Using informed professional judgement the data reviewer may use MS/MSD results in conjunction with other QC criteria to qualify the data.4.2 List below %Recoveries and RPDs of compounds which did not meet criteria.

~~6/26/01 - No MS/MSD.~~

All met

SULLIVAN'S LEDGE SAMPLING EVENTS

4.2 MS/MSD recovery excursions. Spiked with Aroclor 1016 and 1260. Recoveries and RPDs within laboratory limits.

MS/MSD ID	Compound	%Recovery	RPD	Action
42396-01 Labdup	TCO		40%	OK.
6/28/01				
42455-01 Labdup	PCB		17%	OK
42455-02 MS	diluted out			
42398-01 MS	1254	met		

7.0 GC INITIAL CALIBRATION

Calibration criteria has been established to verify that GC is capable of producing acceptable quantitative data.

7.1 Were initial calibrations performed at the required concentrations, prior to sample analysis, whenever GC system is modified, and whenever continuing calibration criteria are exceeded (five point calibration of all aroclors is required for PCB aroclor 1254 and any other detected aroclor with one calibration standard at the reporting limit)?

Ye

Actions: If initial calibration data can not provided, reject associated sample data.

Actions Required for Calibration Excursions:

a. If RSD > 20% of if Correlation coefficient <0.990 approximate detection limits "UJ" and detected sample results "J" for affected compounds quantitated from the column which exceeded criteria (Quantitation is performed using two GC columns).

7.3 Check for transcription/calculation errors; check a minimum of one compound/internal standard to verify that calibration factors have been calculated correctly.

7.4 List below compounds and surrogate compounds which did not meet initial calibration.

IC DCB TMX > 6pt 0.4-40 ng/mL

1016 > 6pt 4-400 ng/mL individual peaks
1260 ↓ 20-2000 ng/mL actual
1254 ↓

per internal lab QA/QC If RSD > 10% calibration curve generated and used for quantitation. When RSD < 10% average RRF.

ECD1 1254 L1 pK1 $\frac{6333}{4}$ = 1583 ✓

All met

SULLIVAN'S LEDGE SAMPLING EVENTS

RSDs ≤20% (Correlation Coefficient >0.990)

INSTRUMENT ID: GC6 ECD1 / ECD2

Date	Compound	%RSD	Action	Samples Affected
6/15/01	1016/1260	met		
6/21/01	1254/SS	met		

8.0 CONTINUING CALIBRATION

8.1 Were continuing calibration standards analyzed prior to sample analysis, every 12 hours or every 20 injections, and at the end of the analytical sequence? Yes

Actions: If no, contact laboratory for explanation and review in data completeness section. Reject associated sample data if continuing calibration data can not be provided.

8.2 Check for transcription/calculation errors; check a minimum of one compound/internal standard to verify that calibration factors have been calculated correctly using the specified internal standard Present an example calculation below and summarize necessary corrections:

Actions Required for Continuing Calibration Excursions:

a. If %D > 15% approximate detected and non-detected sample results "J", " UJ" for compounds.

8.3 Verify that calibration standards contained PCB Aroclor 1254 or any detected aroclor.

Minimally done very 10 sample.

SULLIVAN'S LEDGE SAMPLING EVENTS

8.3 List below compounds and surrogate compounds which did not meet continuing calibration.

All met

%Ds ≤15%

INSTRUMENT ID:

Date (GC ID/Column ID)	Compound	%D	Action	Samples Affected
7/2/01 1333	1660	met		
1407	1254	met		
↓ 2054	1254	met		
7/3/01 0320	1254	met		
7/3/01 0540	1254	met		
7/3/01 1629	1254	met		
↓ 2356	1254	met		
7/4/01 0217	1254	met		
7/4/01 1138	1254	met		
↓ 1655	1254	met		

see 726

9.0 INSTRUMENT PERFORMANCE CRITERIA

9.1 Were target compounds and surrogates resolved and within established RT windows for calibration standards?

Actions: Use professional judgement to evaluate and qualify data: Yes

9.2 Were calibration standards, blanks, and field samples analyzed in accordance with analytical sequence requirements presented in the method? Yes

allnet

10.0 FIELD DUPLICATE AND SPLIT SAMPLE ANALYSIS

10.1 Were field duplicates collected and analyzed at the frequency specified in the site specific QAPP or Scope of Work? Yes

If no, document in the narrative that precision of field sampling methods could not be evaluated.

If yes, calculate RPD for detected results >5xPQL and apply the following control limits.

Per QAPP Soil/sediment: RPD $\leq$ 75% or $\pm$ 2xPQL for results <5xPQL.

10.2 Summarize below compounds that did not meet above criteria.

Duplicate ID	Compound	RPD	Actions	Samples Affected
DUP 6/26/01	Both ND	NA	met	
East Swale	North End			

Actions:

a. If RPD criteria is exceeded, approximate sample results for the affected compound in the field duplicate pairs. Use professional judgement to qualify additional sample data.

11.0 COMPOUND IDENTIFICATION AND QUANTITATION

MINALLY VERIFY IDENTIFICATIONS AND QUANTITATION AT 10% FREQUENCY

11.1 Was chromatographic performance acceptable with respect to:

Baseline stability?

Resolution?

Peak shape?

Full scale graph (attenuation)?

Other_____?

Yes

Actions: If no, for any of the above, review below problems and qualification of data that was necessary. Use professional judgement in quality data.

11.2 Was the RRT of each reported compound within established retention times windows?

11.3 Were detected compounds confirmed on a second GC column or by GC/MS in accordance with QAPP requirements? Yes

11.4 Were samples reanalyzed at the appropriate dilution, when saturation occurred or when concentrations exceed linear range of the calibration curve? Yes

Action: Sample results quantitated with responses that exceed calibration range are approximated. In addition depending on data quality objectives of the project reanalysis of diluted extract may be required. Review resolutions in the narrative report.

11.5 Are the required quantitation limits (detection limits) adjusted to reflect sample dilutions and for soils, sample moisture? Yes

Actions: If no and errors are large, request resubmittal of data package.

11.6 Were compounds detected at concentrations below RL reported and qualified with a "J"? No

Actions: If no, make necessary corrections: Reported to RL only.

11.7 Acid cleanup / Copper cleanup.

SULLIVAN'S LEDGE SAMPLING EVENTS

RAW DATA REVIEW; NOTES AND COMMENTS.

MHP-CS-0626 01- Div Swale 1

Spks $\frac{290.\ ng/mL\ (10mL)}{(30.19\ g)\ (0.63)} = 150\ ng/g =$

150 ug/Kg.

TCO = $\cancel{\frac{(34.571 - 33.125)}{(110.07 - 108.6237)}}$ ~~x100~~ = $\frac{34.571 - 33.125}{34.571} \times 100 =$

4.2% ✓

$\cancel{\frac{(125.5703 - 110.07)}{50.071 - 34.571}}$

$\cancel{\frac{2.076}{15.50}}$ $\cancel{\frac{1.446}{15.50}}$ x~~100~~ =

50.071

% solids $\frac{(110.07 - 75.499)}{(125.5703 - 75.499)} \times 100 =$

$\frac{34.571}{50.071} \times 100 =$ 69% ✓

42455-01

1254 5pks. $\frac{(449.90\ ng/mL)(10mL)}{(30.34g)(0.86)} = 170\ ug/kg$ ✓

TCO $\frac{42.917 - 42.312}{42.917} \times 100 = 1.4\%$ ✓

42398-01

1254 5pks $\frac{(200.0)(10)}{(30.45)(0.93)} = 71 < RL$ ✓

Overall Assessent.

1). Overall confirmation column pk 1 was not used in calc. due to coeluting interference. %Ds - Okay between two columns

2). % solids > 30% - Yes.

3). 100% useability. No Quals for PCBs or TCO so no impact on usability - Rinse Blank analyzed over holding time.

Sullivan Ledge

O'Brien & Gere Engineers Data Validation Form for Metals and Wet Chemistry Analyses

Date: 11/01 **Number of samples and compounds per sample:** 5/23

Project Number: 5509.005

Validator: M. Listman **Equipment Banks:** —

Project: Sullivan Ledge **Blind/Field Duplicates:** —

Laboratory: GW Analytical **MS/MSDs** 1

QAPP: yes **DV Guidelines: USEPA Region I**

Laboratory package number: — **FULL VALIDATION**

Method references:

SW846 (1996)

CT	Sample, TB, EB, MS/MSD, FD Identification	Date collected 2001	Date received 2001	Methods	M	Laboratory ID	~~SDG~~ %solids ≤30%
OK	MHP-CS-062601-	6/26	6/27	6010B/7471A	Sed	42399-01	N
	Sed B-8						
OK	MHP-CS-062601-	6/26	6/27	6010B/7471A	Sed	42396-01	N
	Div Swale-1						
OK	MHP-CS-062701-	6/27	6/28	6010B/7471A	Sed	42445-01	N
	Un Stream-1						
	MHP-CS-062701-					42445-02	N
	Un Stream-5						
	MHP-CS-062701-					42445-03	N
	Un Stream-9						

Sullivan Ledge

CT	Sample, TB, EB, MS/MSD, FD Identification	Date collected 2001	Date received 2001	Methods	M	Laboratory ID	SDG

NA

Sullivan Ledge

Sample ID	QC Batch

USABILITY SUMMARY:

Number of samples * number of compounds per sample = total analyses in project
Percent rejected = total rejected analyses/total analyses in project
Percent Usability = Usable analyses (total analyses – rejected) / total analyses in project

Sample Type	Type of Excursion – Data Rejection	Total number of samples in packages	Number of affected samples	Number of compounds per sample	Total rejected analyses	Percent Rejected	Percent Usability
		5	0	23	0	0	100

Sullivan Ledge

Data Validation Forms

The following worksheets are based on: Region I Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses (USEPA Region 1, 2/89).
These documents have been modified to specifically reflect the requirements presented in USEPA SW-846 Methods, Standard Methods, and USEPA Water and Wastewater Methods.

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1.0 Data completeness
2.0 Holding times
3.0 Blank analysis
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5.0 Laboratory duplicate and MSD analysis
6.0 Laboratory control sample (LCS)
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8.0 Field duplicate analysis
9.0 Calibration
10.0 Interference Check Sample Analysis
11.0 Verification of Instrument Parameters and Results
12.0 Analyte quantitation and reported detection limits
13.0 Additional Notes and Overall Data Assessment

Data Qualifiers

U The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Note To Data Validators:

The following procedure should be followed when using these forms:

1. Fill out forms completely; for partial validation, raw data is not reviewed.
2. Use specific and unique identifications when identifying QC samples for documenting in the data validation report.
3. Reference **client identifications** not the lab ID on the forms.
4. Indicate bias when possible (↑↓).
5. Use laboratory control limits where available or limits identified in the QAPP.
6. Qualify associated sample result sheets clearly in ink under column marked QUAL.
7. Note that, due to possible rounding discrepancies, allow recoveries to fail criteria by 1% outside the control limits.

1.0 DATA COMPLETENESS FOR INORGANIC ANALYSIS

1.1 Traffic Report or Lab Narrative Notes: Briefly discuss any issues with sample receipt or condition of samples.

1.2 Were samples iced for sample shipment? Yes

ACTION: If the cooler temperature was elevated (> 10° C), then note in the validation report, and use professional judgement to qualify results. Minimally, many wet chemistry parameters should be qualified as approximate (J and UJ). In some instances, nondetected results should be rejected.

1.3 Were sample results for each parameter corrected for percent solids for soil samples? Yes

ACTION: If any sample analyzed as a soil contains less than 30% solids, qualify detected results as approximate (J) and nondetects as rejected (R). Refer to cross reference table.

1.4 List below any communication with laboratory regarding problems with data completeness, with reference to data, contact person, specific problems and resolutions (This would include missing QC forms).

i). Provide ICP run 7/3/01 (42445-01 to 03)

provided OK.

1.5 Were equipment blanks, MS/MSD, field duplicate samples analyzed at the correct frequency as listed in the QAPP?

No FDUP
NO EQBLK

2.0 HOLDING TIMES

The objective is to ascertain the validity of results based on holding of the same from the time of sample collection to the time of preparation or analysis.

Holding time requirements from collection and preservation (4 degrees during storage for all parameters):

- Metals:180 days; HNO3 to pH <2.
- Mercury: 28 days; HNO3 to pH <2.
- Arsenic speciation: 5 days
- Cyanide: 14 days; NaOH to pH >12.
- TSS: 7 days.
- Nitrate and nitrite: 48 hours.
- Sulfate: 28 days.
- Bicarbonate and carbonate alkalinity: 14 days
- TOC, Phosphate and Ammonia: 28 days: pH <2 H2SO4.
-

2.1 Have any inorganic holding times, determined from date of collection to date of analysis, been exceeded?

No

2.2 Has the correct sample preservation been performed? Yes

ACTIONS:

If holding times are not met for mercury or cyanide, qualify all results greater than the detection limit as estimated and results less than detection limit as estimated (UJ).

If holding times for mercury or cyanide are exceeded by two times the holding time criteria, reject detects and detection limits (R).

If holding times are exceeded for metals, reject detects and detection limits (R).

If holding times for mercury or cyanide are exceeded by two times the holding time criteria, reject detects and detection limits (R).

All met

Solutia Woburn Soils

2.3 Summarize below the samples qualified due to holding time excursions.

Sample ID	Analyte	Date Collected ~~2000~~ 2001	Date Analyzed ~~2000~~ 2001 (Batch ID)	Excursion (Number of days out) and Action
	6010B	6/26/01 6/27/01	7/2/01, 7/3/01 (01365-S)	met
	7471A	6/26/01 6/27/01	6/29/01 (01036-S)	met

3.0 Blank Analysis

The assessment of blank analysis results is to determine the existence and magnitude of contamination resulting from laboratory or field activities. The criteria for evaluation of blanks applies to any blank associated with the samples (method, calibration, field). If problems with any blank exist, all associated data must be evaluated to determine whether or not there is a variability in the data or if the problem is an isolated occurrence. The blanks include preparation/method blank, calibration blanks, and field blanks.

The blank analyses may not involve the same weights, volumes, or dilutions as the associated samples. It may be easier to work from the raw data to compare blank and sample concentrations.

3.1 Was one preparation/method blank prepared for each matrix and with each batch of samples digested?

Yes

ACTION: If no, note in the validation report, and use professional judgement in qualifying the data. Minimally, qualify detected and nondetected results as approximate (J and UJ).

3.2 Was a field blank analyzed in accordance with the QAPP? NA

Data is qualified using the highest concentration detected in the associated blank samples. The blanks include preparation/method blank, calibration blanks, and field blanks.

ACTIONS:

Calculate a Blank Action Level as 5 times the highest concentration detected in any associated blank and apply the following to samples:

a. When the concentration is greater than the laboratory reporting limit (LRL), but less than the Blank Action Level, qualify the detected result as nondetected (U).
b. When the sample concentration is greater than the Blank Action Level, qualification is not required.

All met

3.3 Summarize the samples qualified due to blank excursions.

Unique Blank ID	Analyte	Highest Conc. (Units)	Blank Action Level (Units)	Samples Affected
01365-S	6010	met		
01036-S	7471A	met		

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category: Metals
Matrix: Soil

CAS Number	Analyte	Result	Units	Reporting Limit	QC Batch	Method
7429-90-5	Aluminum	BRL	mg/Kg	50	MM-1365-SB	6010B
7440-36-0	Antimony	BRL	mg/Kg	1.0	MM-1365-SB	6010B
7440-38-2	Arsenic	BRL	mg/Kg	5.0	MM-1365-SB	6010B
7440-39-3	Barium	BRL	mg/Kg	20	MM-1365-SB	6010B
7440-41-7	Beryllium	BRL	mg/Kg	0.4	MM-1365-SB	6010B
7440-43-9	Cadmium	BRL	mg/Kg	0.5	MM-1365-SB	6010B
7440-70-2	Calcium	BRL	mg/Kg	100	MM-1365-SB	6010B
7440-47-3	Chromium	BRL	mg/Kg	10	MM-1365-SB	6010B
7440-48-4	Cobalt	BRL	mg/Kg	5.0	MM-1365-SB	6010B
7440-50-8	Copper	BRL	mg/Kg	20	MM-1365-SB	6010B
7439-89-6	Iron	BRL	mg/Kg	10	MM-1365-SB	6010B
7439-92-1	Lead	BRL	mg/Kg	10	MM-1365-SB	6010B
7439-95-4	Magnesium	BRL	mg/Kg	50	MM-1365-SB	6010B
7439-96-5	Manganese	BRL	mg/Kg	5.0	MM-1365-SB	6010B
7439-97-6	Mercury	BRL	mg/Kg	0.050	MP-1036-SB	7471A
7440-02-0	Nickel	BRL	mg/Kg	10	MM-1365-SB	6010B
7440-09-7	Potassium	BRL	mg/Kg	100	MM-1365-SB	6010B
7782-49-2	Selenium	BRL	mg/Kg	30	MM-1365-SB	6010B
7440-22-4	Silver	BRL	mg/Kg	5.0	MM-1365-SB	6010B
7440-23-5	Sodium	BRL	mg/Kg	500	MM-1365-SB	6010B
7440-28-0	Thallium	BRL	mg/Kg	5.0	MM-1365-SB	6010B
7440-62-2	Vanadium	BRL	mg/Kg	5.0	MM-1365-SB	6010B
7440-66-6	Zinc	BRL	mg/Kg	50	MM-1365-SB	6010B

Method References: Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Update III (1996).

Report Notations: BRL Indicates result, if any, is below reporting limit for analyte. Reporting limit is the lowest value that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

10A

4.0 MATRIX SPIKE/LABORATORY DUPLICATE ANALYSIS

The matrix spike is designed to provide information about the effect of each sample matrix on the sample preparation procedures and the measurement methodology. If the spike is added to the sample prior to distillation or digestion, it is a predigestion/predistillation or matrix spike. If the spike is added to after the completion of the distillation or digestion it is a post-digestion/post-distillation spike. Matrix spike recoveries are evaluated based on method or laboratory generated control limits. Duplicate sample determinations are used to demonstrate acceptable method precision by the laboratory at the time of analysis. Precision is than evaluated by calculating RPD between the two results.

4.1 Was one matrix spike and laboratory duplicate (or MSD) prepared and analyzed for each group of samples with similar matrix for each delivery group?

Yes MS/MSD

ACTION: If no, note in data validation report, and use professional judgement to qualify results.

4.2 Were the recovery and RPD within control limits? ? No see attached

Control limit of 75-125% and RPD <20% for results >5xLRL applies to metals, otherwise laboratory control limits are used. . If any result is less than 5 times the reporting limit, a control limit of ± the LRL is used to evaluate the result for waters and ±2xLRL for soils.

The spike recovery limits do not apply when the sample concentration exceeds the spike concentration by a factor of 4 or greater. If more than one spiked sample result per matrix and for each group of samples, and one spiked recovery is not within criteria, qualify all of the samples in the same matrix and group.

ACTION FOR WATERS
%Recovery <30%: reject nondetected results (R), and approximate detected results (J).

%Recoveries >30% but < control limits: approximate nondetected results (UJ) and detected results (J).

%Recoveries >control limits, approximate detected results (J). Nondetected results do Not require qualification.

If RPD >20% or if results <5xLRL are not within ±LRL; Qualify detected results as (J).

Solutia Woburn Soils

4.3 Summarize below MS/MSD or MS/Lab Duplicate analyses and samples qualified due to excursions.
Note: If sample concentration exceeds the spike concentration by a factor of 4 or more, no action is taken.
Note: If more than one spike is analyzed and one is not within criteria, flag all samples.

Unique MS/DUP ID	Analyte	%Recovery bias [control limits]	RPD	Action	Samples Affected
MHP-CS-062701-	Al	4xRule	69		all on pg 1 samples.
Unstream 9	Ca	4xRule	39		
	Fe	4xRule	57		
	Mg	4xRule	80		
	Mn	met	50		
	K	4xRule	51		
per lab nonconformance report - sample was coarse and contained a lot of pebbles. Sample redigested and reanalyzed w/ similar results.					
Batch QC	Hg	met	met		

5.0 LABORATORY CONTROL SAMPLE (LCS)

The laboratory control sample serves as a monitor of the performance of each step during the analysis, including the sample preparation. If criteria are not met, the laboratory performance and method accuracy are in question. Laboratory control limits are used to assess LCS recoveries. If laboratory control limits are not available use 80% to 120%.

5.1 Were LCSs analyzed for each sample matrix, for each digestion/distillation batch?

Yes

ACTION: If no, note in the data validation report. and use professional judgement to qualify data. Minimally, qualify detected and nondetected results as approximate (J and UJ). Data may be acceptable if matrix spike analysis was performed.

5.2 Were the control limits met?

Yes

ACTION FOR WATERS

%Recovery <50%: reject nondetected results (R), and reject detected results (R).

%Recoveries >50% but < control limits: approximate nondetected results (UJ) and detected results (J).

%Recoveries >control limits, approximate detected results (J). Nondetected results do NOT require qualification.

ACTION FOR SOILS

Results <EPA control windows: approximate nondetected results (UJ) and detected results (J).

Results >EPA control windows: approximate detected results (J) only.

all met

5.3 List LCS analyses and samples qualified due to LCS excursions.

Unique LCS ID	Analyte	%Recovery bias [control limit]	Action	Samples Affected (client/lab ID)

6.0 SERIAL DILUTION ANALYSIS

Although not required by method 6010B, the serial dilution analysis (five-fold dilution) is performed to evaluate whether significant chemical and physical interferences are present due to sample matrix. The serial dilution analysis must agree within a 10% difference of the original determination after correction for dilution.
Note: Serial dilutions are only required for initial concentrations ≥50 times the LRL for ICP analysis.

6.1 Was a serial dilution performed for each sample matrix for each group of samples as required?

NO

ACTION: If no, note in the data validation report.

6.2 Are results outside of control limits; was a positive or negative interference exhibited?

ACTION:

Qualify associated sample results in the same group and matrix as approximate (UJ, J) regardless of whether a positive or negative interference was exhibited if %D >15%

If more than one serial dilution is performed and exceeds criteria, all associated sample results are qualified.

Not performed / No Action but put in report.

6.3 List serial dilution analyses and samples qualified due to serial dilution excursions (Note for Region I %D >15% result in qualification of data)

Unique Serial Dilution ID	Analyte	%D	Action	Samples Affected

Not performed.

7.0 FIELD DUPLICATE

Field duplicates, which are blind field samples submitted to the laboratory for analysis, demonstrate sample collection precision. Precision is than evaluated by calculating RPD between the two results.

7.1 Was a field duplicate collected and analyzed according to the QAPP?

ACTION: If no for the previous question, note in the data validation report that field precision was not evaluated.

7.2 Was the RPD within control limits? For field duplicates consult the QAPP, if none listed in the QAPP, use RPD <30% for waters and RPD <50% for soils. If any result is less than 5 times the reporting limit, a control limit of ± 2xLRL is used to evaluate waters and for soils

ACTION
Qualify detected results in the associated samples of the same matrix as follows:

Sample Results	Both >2xLRL	Both <2xLRL, or one result is nondetected or <2xRL
Criteria	RPD <30% for waters or <50% for soils	Results not within ±2xRL
Detects	J	J
Nondetects	NA	UJ

Note: Associated samples may be batched by sample delivery group, data of sample collection, and/or matrix.

NA

7.3. Summarize below samples qualified due to field duplicate excursions.

Field Duplicate ID	Analyte	RPD	Actions	Samples Affected

NA

8.0 CALIBRATION

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable quantitative data for metals and inorganics. Initial calibration demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing calibration verification establishes that the initial calibration is still valid by checking the performance of the instrument on a continual basis.

Method notes:
Inductively coupled argon plasma atomic emission spectrometry (ICP-AES) allows simultaneous or rapid sequential determination of many elements in a short time. The disadvantage of ICP is background radiation from other elements and the plasma gases. ICP uses high-resolution optics and background correction to minimize these interferences. However, analysis for traces of inorganic analytes in the presence of large excess of a single analyte (high calcium) is difficult. ICP and direct aspiration or flame atomic absorption spectrometry (flame AA) have comparable detection limits. Flame AA analysis is relatively free of interelement spectral interferences. Graphite furnace atomic absorption spectrometry (GFAA) will exhibit lower detection limits than ICP or Flame AA, but the technique is so sensitive that interferences is a problem. Cold-vapor atomic absorption spectrometry (CVAA) uses a chemical reaction to reduce mercury selectively. The procedure is very sensitive, but is subject to interferences. Inductively coupled plasma mass spectrometry (ICP/MS) exhibits greater sensitivity than GFAA or flame AA, but isobaric elemental interferences, caused by different elements forming atomic ions with the same mass-to-charge ratio, is a problem. Mathematical corrections are used to minimize interferences in ICP/MS.

For ICP, acid digestion is required for all but prefiltered and acidified groundwater samples. Samples not digested must be matrix matched with standards. Detection limits, sensitivity, and linear concentrations ranges vary with the wavelength, spectrometer, matrix and operating conditions. Background correction is required for trace element determination. Background must be measured adjacent to analyte lines on samples during analysis. The position selected for the background-intensity measurement, on either or both sides of the analytical line, will be determined by the complexity of the spectrum adjacent to the analytical line. In one mode of analysis the position used should be as free as possible from spectral interferences and should reflect the same change in background intensity as occurs at the analyte wavelength measured.

Interferences for ICP analysis:
Spectral interferences are caused by background emission from continuous or recombination phenomena, stray light from the line emission of the high concentration elements, overlap of a spectral line from another element, or unresolved overlap of molecular band spectra.
Background emission and stray light can usually be compensated for by subtracting the background emission determined by measurements adjacent to the analyte wavelength peak. Spectral scans of samples or single element solutions in the analyte regions may indicate when alternative wavelengths are desirable because of severe spectral interference.
Spectral overlaps may be avoided by using an alternate wavelength or can be compensated for by use of equations that correct for interelement contributions. Instruments that use equations for interelement correction require the interfering elements be analyzed at the same time at the element of interest. When operative and uncorrected, interferences will produce false positive determinations and be reported as analyte concentrations. Users may apply interelement correction equations determined on their instruments with tested concentration ranges to compensate for the effects of interfering elements. Some potential spectral interferences observed for the recommended wavelengths are given in the following table. For multivariate methods using whole spectral regions, spectral interferences are handled by including spectra of the interfering elements in the algorithm. The interferences listed are only those that occur between method analytes. Only interferences of a direct overlap nature are listed. When using interelement correction equations, the interference may be expressed as analyte concentration equivalents (false concentrations) arising from 100 mg/L of the interference element. For example, assume that As is to be determined in a sample containing 10 mg/L of Al. According to the table, 100 mg/L of Al would yield a false signal for As equivalent to approximately 1.3 mg/L. Therefore, the presence of 10 mg/L of Al would result in a false signal for As equivalent to approximately 0.13 mg/L. The user is cautions that other instruments may exhibit different levels of interference than shown on the table. The interference effect must be evaluated for each individual instrument, whether configured as sequential or simultaneous instrument. When using the recommended wavelengths, the analyst is required to determine and document for each wavelength the effect from referenced interferences as well as any other suspected interferences that may be specific the instrument or the matrix. Users of sequential instruments must verify the absence of spectral interference by scanning over a range of 0.5 nm centered on the wavelength of interest. Samples that show an elevated background emission may be background corrected by applying a correction factor.

If the correction routine is operating properly, the determined apparent analyte concentration from analysis of each interference solution should fall within a specific concentration range around the calibration blank (multiplying concentration of the interfering element by the value of the correction factor/10). If after the subtraction of the calibration blank the analyte concentration falls outside of this range, a change in the correction factor of more than 10% should be suspected.

When interelement corrections are applied, spectral interference check solutions are analyzed daily for verification. If the correction factors are found to be within the 20% criteria for 5 consecutive days, the frequency is extended to weekly. If the nature of the samples is such they do not contain concentrations of the interfering elements at ± one reporting limit from zero, daily verification is not required. All interelement correction factors must be verified and updated every 6 months or when an instrument change occurs.

When interelement corrections are not used the following may be applied: a computer software routine to notify the analyst when an interfering element is detected, or analysis of the interference check sample which contains similar concentrations of the major components of the samples on a continuing basis to verify the absence of effects at the wavelengths selected.
Physical interferences, associated with sample nebulization and transport, are reduced by diluting the sample, using a peristaltic pump, using an internal standard, or by using a high solids nebulizer.

Chemical interferences include molecular compound formation, ionization effects, and vaporization effects. These are controlled by selection of operating conditions, buffering of samples, matrix matching, and standard additions.
Memory interferences, resulting when analytes in a previous sample contribute to the signals in the next sample, are controlled by adjusting the rinse periods and the use of rinse blanks.

Potential Interferences for ICP
Analyte Concentration Equivalents Arising From Interference at the 100 mg/L Level

Analyte	Wavelength (nm)	Interferant									
		Al	Ca	Cr	Cu	Fe	Mg	Mn	Ni	Tl	V
Al	308.215	-	-	-	-	-	-	0.21	-	-	1.4
Sb	206.833	0.47	-	2.9	-	0.08	-	-	-	0.25	0.45
As	193.696	1.3	-	0.44	-	-	-	-	-	-	1.1
Ba	455.403	-	-	-	-	-	-	-	-	-	-
Be	313.042	-	-	-	-	-	-	-	-	0.04	0.05
Cd	226.502	-	-	-	-	0.03	-	-	0.02	-	-
Ca	317.933	-	-	0.08	-	0.01	0.01	0.04	-	0.03	0.03
Cr	267.716	-	-	-	-	0.003	-	0.04	-	-	0.04
Co	228.616	-	-	0.03	-	0.005	-	-	0.03	0.15	-
Cu	324.754	-	-	-	-	0.003	-	-	-	0.05	0.02
Fe	259.940	-	-	-	-	-	-	0.12	-	-	-
Pb	220.353	0.17	-	-	-	-	-	-	-	-	-
Mg	279.079	-	0.02	0.11	-	0.13	-	0.25	-	0.07	0.12
Mn	257.610	0.005	-	0.01	-	0.002	0.002	-	-	-	-
Mo	202.030	0.05	-	-	-	0.03	-	-	-	-	-
Ni	231.604	-	-	-	-	-	-	-	-	-	-
Se	196.026	0.23	-	-	-	0.09	-	-	-	-	-
Na	588.995	-	-	-	-	-	-	-	-	0.08	-
Tl	190.864	0.30	-	-	-	-	-	-	-	-	-
V	292.402	-	-	0.05	-	0.005	-	-	-	0.02	-
Zn	213.856	-	-	-	0.14	-	-	-	0.29	-	-

Note:
Dashes indicate that interference was not observed, even with interferents at elevated concentrations.
The figures recorded as analyte concentrations are not the actual observed concentrations; to obtain those figures, add the listed concentration to the interferent figure.
Interferences will be affected by background choice; other intereferences may be present.

For ICP:
Mixed calibration standards, prepared using the same types and volumes as the samples. Each standard mixture should be analyzed separately to determine possible spectral interferences or impurities. The calibration curve consists of a blank and a standard.

Calibration blanks are prepared using the same concentrations of the acids in the standards and the samples. The blanks are used to flush the system between standards and before samples and for all initial and continuing calibration blank determinations. A calibration blank is analyzed immediately after the ICV and CCV. The results are to be within three times the IDL. If the blank is less than $1/10^{th}$ the concentration of the action limit and no sample is within of the action limit, corrections are not performed.

Method blanks must contain all the reagents in the same volumes as used in the sample processing and must be carried through the complete preparation procedure as the samples. One method blank is prepared for each batch of samples.

The initial calibration verification (ICV) is prepared from a standard source different from the calibration standard at a concentration within the calibration range. Check the calibration with the ICV following the initial calibration.

The continuing calibration verification (CCV) is prepared in the same acid matrix, using the same standards as the calibration at a concentration near the mid-point of the calibration curve. The CCV is analyzed immediately following daily calibration, and after every tenth sample and at the end of the analytical sequence.

The ICV and CCV must be within 10% of the calibration with a relative standard deviation of < 5% from replicate integrations. Otherwise, the sample analysis is discontinued, the cause determined, the instrument is recalibrated, and all samples following the last acceptable ICV or CCV must be reanalyzed..

Although not required, the calibration near the detection limit (CRI) may be analyzed at the beginning and end of the analytical sequence, or at a minimum of twice per 8-hour working shift. The CRI is two times the contract required detection limit (CRDL) or two times the instrument detection limit, whichever is greater for all analytes except Al, Ba, Ca, Fe, Mg, Na, and K. Laboratory limits are used to evaluate the recovery of the CRI.

The interference check solution contains known concentrations of interfering elements to test the correction factors. The elements of interest are spiked at 0.5 to 1 mg/L. In the absence of measurable analyte, overcorrection could go undetected because a negative value could be reported as zero. If the particular instrument will display overcorrection as a negative number, the spiking will not be necessary. The check solution must agree within 20% of the expected value. Otherwise, the problem is corrected and the instrument recalibrated.

An initial demonstration of performance for background correction points, upper limits of the dynamic range, method and instrument detection limits, determination and verification of interelement correction equations, using the same instrument, operating conditions, and calibration routine as the samples. The optimized operating conditions should provide the lowest reliable instrument detection limits and method detection limits. The upper dynamic range should be checked every 6 months.

The method of standard additions (MSA) is used if interference is suspected or if a new matrix is analyzed. The standards are added at one or more levels to aliquots of the sample. The MSA compensates for enhancement or depression of an analyte signal by a matrix. The single method consists of adding standard to the first aliquot of sample, and adding acid blank at the same volume as the standard to the second aliquot.

The calculation:
Concentration = Intensity unfortified * volume of standard * concentration of standard
/ intensity fortified – intensity unfortified * volume sample
A second option is to use several fortified portions and linear regression analysis.
Samples with concentrations that exceed the linear calibration range are diluted and reanalyzed.
All results should be reported with up to three significant figures.

For mercury analysis: The CVAA is used; the mercury is reduced to the elemental state and aerated from solution in a closed system. The absorbance of the mercury vapor is measured as a function of concentration. A final volume of 100 milliliters (using BOD bottles) is used for analysis.
Five standards and one blank are prepared each day of analysis for the calibration curve. The absorption versus micrograms of mercury is plotted. The mercury concentration is read from the calibration curve, or MSA is used. After calibration, the curve is verified by a calibration blank and a calibration check standard made from a source independent from the calibration standard at mid-range is used. The ICV must be within 10% of the true value to verify the curve. The CCV is analyzed after every 10 samples; this must be within 20% of the true value or the previous samples must be reanalyzed. If the sample matrix is so complex that viscosity, surface tension, and components can't be accurately matched with standards, MSA is used.

Although not required, the calibration near the detection limit (CRA) may be analyzed at the beginning of the analytical sequence after the ICV. The CRA is at the contract required detection limit (CRDL) or the instrument detection limit, whichever is greater. Laboratory limits are used to evaluate

the recovery of the CRA.

For GFAA analysis:
A minimum of three standards and one blank are prepared each day of analysis for the calibration curve. Background correction must be performed; otherwise sample absorbance will be greater than it should be and the result will be erroneously high. After calibration, the curve is verified by a calibration blank and a calibration check standard made from a source independent from the calibration standard at mid-range is used. The ICV must be within 10% of the true value to verify the curve. The CCV is analyzed after every 10 samples; this must be within 20% of the true value or the previous samples must be reanalyzed. If the sample matrix is so complex that viscosity, surface tension, and components can't be accurately matched with standards, MSA is used. If the sample concentration is greater than the upper range of the calibration curve, samples are diluted in the same acid matrix and reanalyzed.

Although not required, the calibration near the detection limit (CRA) may be analyzed at the beginning of the analytical sequence after the ICV. The CRA is prepared at the contract required detection limit (CRDL) or the instrument detection limit, whichever is greater. Laboratory limits are used to evaluate the recovery of the CRA.

For cyanide analysis; A reflux-distillation procedure using a strong acid and magnesium catalyst, is used to extract cyanide salts and insoluble cyanide. Both total and cyanide amenable to chlorination are determined by this technique. Reactive cyanide, generated by exposure to mild acid, is not determined by this method. Cyanide in the form of hydrocyanic acid (HCN) is purged from the sample and captured into a alkaline scrubber solution. The concentration of cyanide in the scrubber is then determined. Oxidizing such as chlorine decomposes most cyanides. After determining that chlorine is present, sodium arsenite solution or ascorbic acid is added to samples to remove the chlorine. Sulfide interference is removed by adding bismuth nitrate to waste before distillation. Interference of nitrate/nitrite is removed by pretreatment with sulfamic acid before distillation. Aqueous samples are preserved by adding 50% NaOH until the pH is greater than or equal to 12 at the time of collection. The final volume of the scrubber is 250 milliliters. Six calibration standards for samples without sulfide range from 20 to 400 µg/L. The absorbance of the standards versus the cyanide concentration is used to quantitate the sample results. For samples with sulfide, five standards ranging from 20 to 400 µg/L are prepared in the same manner as the samples. Two standards (high and low) should be distilled and compared to similar values on the calibration curve to check the distillation procedure. The values should compare within 10% of the undistilled standards. The calibration curve is verified for every sample batch by the analysis of a calibration standard that is prepared from independent sources. The standard must be within 15%of the expected value. The method of standard additions is used for analysis of samples that have matrix interferences, such as samples that contain sulfides.

Correlation coefficients for calibration curves should be ≥ 0.995 to ensure linearity over the calibration range.

8.1 Was adequate calibration information provided?

ACTION: If no immediately contact laboratory for additional information and explanation. If calibration data cannot be provided, immediately contact Project Manager. Verify calibrations by review of raw data. Check ICV/CCV calculation for each type of analysis performed Check for transcription/calculation calibration errors. If errors are present, a more in-depth review of the data is required. Request corrections from the laboratory.

8.2 Did the laboratory use the proper number of standards for calibration, at the proper concentration and was the calibration frequency performed as required?

ACTION: Qualify associated detected sample results as approximate (J) and reject detection limits (R)

ICP – Yes

GFAA – NA

CN – NA

Hg 0.2 – 5.0 ug/L Spt OK

Other Wet Chemistry NA

8.3 Did the laboratory prepare and analyze CRI or CRA standards? NA 6010B
Note if recoveries were within laboratory criteria. Otherwise use 50-150% as control limits. Note, these standard concentrations may be at 2xLRL or at concentrations specified by CLP

ACTION: Qualify associated detected sample results as approximate (J) and detection limits as estimated (UJ).

8.4 Were the correlation coefficients for the calibration curves for mercury, cyanide and GFAA methods ≥ 0.995? Note if the calibration curve was generated using a computer assisted second degree fit. If not, qualify as follows.

ACTION: Qualify associated detected sample results as approximate (J) and detection limits as estimated (UJ).

GFAA – NA

Hg 6/29/01 met

CN – NA

Other Wet Chemistry – NA

8.5 Was one of the midrange cyanide standards distilled and within 10% of the undistilled standards? NA

ACTION: Qualify associated detected sample results as approximate (J) and detection limits as estimated (UJ).

8.6 Were initial and continuing calibration verification standards (ICV, CCV) within criteria? NO see attached
ICP/GFAA – 90-110%
Mercury – 80-120%
Cyanide/Wet chemisty- 85%-115%

ACTION:

ICP/GFAA:	**Recoveries between 75-89%, approximate detected (J) and nondetects (UJ).** **Recoveries 111-125%: approximate detected results (J).** **Recoveries <75% or >125%: reject detected and nondetected results (R).**
Mercury	**Recoveries between 65-79%, approximate detected (J) and nondetects (UJ).** **Recoveries 121-135%: approximate detected results (J).** **Recoveries <65% or >135%: reject detected and nondetected results (R).**
Cyanide/wet chem	**Recoveries between 70-84%, approximate detected (J) and nondetects (UJ).** **Recoveries 116-130%: approximate detected results (J).** **Recoveries <70% or >130%: reject detected and nondetected results (R).**
	Recoveries >130%: positive results are rejected (R) and nondetected results are acceptable.

No Quals.

Sullivan Ledge

8.6 List below any initial and continuing calibration verifications, including correlation coefficients and CRA/CRI excrusions and samples qualified .

Analysis Date and Standard ID	Analyte	Excursion	Action	Samples Affected
~~7/2/01~~ 7/2/01	Se CCV3	112%	J	none
6/29/01	Hg	allmet		
7/3/01	allmet			

9.0 ICP INTERFERENCE CHECK SAMPLE ANALYSIS

The ICP interference check sample verifies interelement and background correction factors. Solution A which contains the interferents (Al, Ca, or Mg typically at 500 mg/L , Fe at 200 mg/L), and solution AB which contains the analytes (at 0.5, 1.0 mg/L) mixed with the interferents are analyzed. Both solutions are analyzed for all wavelengths used for each analyte reported by ICP at the beginning of each analytical run. In the absence of measurable analyte, overcorrection could go undetected because a negative value could be reported as zero. If the particular instrument will display overcorrection as a negative number, the spiking will not be necessary. The check solution must agree within 20% of the expected value. Otherwise, the problem is corrected and the instrument recalibrated.

The interference check solution is prepared to contain known concentrations of interfering elements that will provide an adequate test of the correction factors. Spike the sample with the elements of interest, particularly those with known interferences at 0.5 to 1 mg/L. In the absence of measurable analyte, overcorrection could go undetected because a negative value could be reported as zero. If the particular instrument will display overcorrection as a negative number, this spiking procedure will not be necessary.

9.1 Were ICP ICS analyses performed at the required frequency? Yes

ACTION: Qualify the associated sample results as approximate (UJ,J).

9.2 Were the recoveries for ICS AB within 80-120% recovery and ICSA concentrations < instrument reporting limits? Yes

Recalculate from the raw data one or more of the analyte percent recoveries (%R) using the following equation, and verify that the recalculated value agrees with the laboratory reported values.
ICS %R = Found Solution AB /True Solution AB *100
Where:
Found Solution AB = concentration (in µg/L) of each analyte measured in the analysis of solution AB.
True Solution AB = concentration (in µg/L) of each analyte in solution AB.

ACTION: Qualification is only necessary for those samples in which the concentrations of interferents (Aluminum, calcium, iron, and magnesium) are comparable to or greater than the levels of the corresponding ICS solution.

If %recovery is > 120% and the sample results are < IDL, no action is taken.

If % recovery is >120% and the sample results are > IDL, qualify associated sample results as approximate (J).

If % recovery is 50-79% and the sample results are > IDL, qualify associated sample results as approximate (J).

If sample results are < IDL and the % recovery is 50-79%, qualify associated sample results as estimated (UJ) due **to the possibility of false negatives.**

If % recovery is < 50%, qualify associated sample results as rejected (R).

If results > 2 times the LRL are observed for elements which are not present in the ICSA solution, associated sample results with analyte concentrations that are comparable to those levels found in the ICS (false positive) are qualified as approximate (J).

If negative results are observed for elements that are not present in the ICS solution and their absolute value is > 2xLRL, associated sample results, nondetected results are qualified as approximate (UJ).

All met

Solutia Woburn Soils

9.3 Summarize below ICP ICS analyses and samples qualified due to ICP ICS excursions.

Analysis Date	Analyte	%Recovery or ICSA concentration	Action	Samples Affected (client/lab)
7/2/01	6010B	met		
7/2/01 Run 2	Se	met		
7/5/01	K	met		
7/3/01	met			

10.0 VERIFICATION OF INSTRUMENT PARAMETERS AND RESULTS

NA - not CLP

10.1 Are the following present for metals:

- instrument detection limits
- ICP linear ranges
- ICP interelement correction factors

Action: Document in the data validation report.

10.2 Were the instrument detection limits present for the remaining inorganic analytes?

Action: Document in the data validation report.

11.0 ANALYTE QUANTITATION AND REPORTED DETECTION LIMITS

VERIFY IDENTIFICATIONS AND QUANTITATION AT APPROXIMATELY A 10% FREQUENCY FOR EACH TYPE OF SAMPLE CALCULATION

The objective is to ensure that the reported sample quantitation results are accurate.

11.1 Were sample weights, volumes and dilutions taken into account when reporting sample results and detection limits?

Yes

ACTION: If no sample results may be inaccurate; note necessary changes and request resubmittals of laboratory packages.

11.2 Were samples reanalyzed at the appropriate dilution, when concentrations exceed linear range of the calibration curve?

Yes

ACTION: Qualify sample results as approximate (J).

The raw data should be examined to verify that the correct calculation of the sample results was reported by the laboratory. Digestion and distillation logs, instrument printouts, strip charts, etc. should be compared to the reported sample results recorded on the Inorganic Forms. Examine the raw data for any anomalies (i.e., baseline shifts, negative absorbance, omissions, legibility, etc.).

Sample calculation:

Concentration (µg/L) = Concentration from curve (µg/L) * Dilution factor
Concentration (µg/Kg) = Concentration from curve (µg/L) * Final volume (ml) * Dilution factor / Weight of sample

Document which sample analyses were reviewed and indicate frequency of raw data review, approximately 10% of data should be verified through raw data review. Show calculation below:

12.0 ADDITIONAL NOTES AND OVERALL DATA ASSESSMENT

Microwave digestion

42396-01

Al $\frac{(31.193)(\cancel{100}\ 50)}{(0.492)(0.63)} = 5031$ Lab 5100 mg/kg ✓

Cr $\frac{(0.138)(50)}{(0.492)(0.63)} = 22$ mg/kg Lab 22 ✓

Pb $\frac{(0.410)(50)}{(0.492)(0.63)} = 66.1$ Lab 67 mg/kg ✓

Hg $\frac{(0.266\ ug/L)(\cancel{100}\ 0.1)}{(0.587g)(0.63)(\cancel{1000})}$ = 0.072 Lab 0.073 ✓ ug/g = mg/kg

GROUNDWATER ANALYTICAL

Trace Metals by ICP-AES and CVAA

Field ID: MHP-CS-062601-DivSwale-1
Project: Sullivan's Ledge/C47968
Client: Harding Lawson Associates
Container: 250 mL Glass
Preservation: Cool
Matrix: Soil

Laboratory ID: 42396-01
Sampled: 06-26-01
Received: 06-27-01
% Solids 63

CAS Number	Analyte	Concentration	Units	Reporting Limit	Analyzed	QC Batch	Method
7429-90-5	Aluminum, Total	5,100 J	mg/Kg	81	07-02-01	MM-01365-S	6010B
7440-36-0	Antimony, Total	BRL	mg/Kg	1.6	07-02-01	MM-01365-S	6010B
7440-38-2	Arsenic, Total	2.6	mg/Kg	1.6	07-02-01	MM-01365-S	6010B
7440-39-3	Barium, Total	41	mg/Kg	33	07-02-01	MM-01365-S	6010B
7440-41-7	Beryllium, Total	BRL	mg/Kg	0.65	07-02-01	MM-01365-S	6010B
7440-43-9	Cadmium, Total	BRL	mg/Kg	0.81	07-02-01	MM-01365-S	6010B
7440-70-2	Calcium, Total	1,400 J	mg/Kg	160	07-02-01	MM-01365-S	6010B
7440-47-3	Chromium, Total	22	mg/Kg	16	07-02-01	MM-01365-S	6010B
7440-48-4	Cobalt, Total	BRL	mg/Kg	8.1	07-02-01	MM-01365-S	6010B
7440-50-8	Copper, Total	BRL	mg/Kg	33	07-02-01	MM-01365-S	6010B
7439-89-6	Iron, Total	13,000 J	mg/Kg	16	07-02-01	MM-01365-S	6010B
7439-92-1	Lead, Total	67	mg/Kg	16	07-02-01	MM-01365-S	6010B
7439-95-4	Magnesium, Total	2,300 J	mg/Kg	81	07-02-01	MM-01365-S	6010B
7439-96-5	Manganese, Total	290 J	mg/Kg	8.1	07-02-01	MM-01365-S	6010B
7439-97-6	Mercury, Total	0.073	mg/Kg	0.054	06-29-01	MP-01036-S	7471A
7440-02-0	Nickel, Total	BRL	mg/Kg	16	07-02-01	MM-01365-S	6010B
7440-09-7	Potassium, Total	930 J	mg/Kg	160	07-02-01	MM-01365-S	6010B
7782-49-2	Selenium, Total	BRL	mg/Kg	16	07-02-01	MM-01365-S	6010B
7440-22-4	Silver, Total	BRL	mg/Kg	8.1	07-02-01	MM-01365-S	6010B
7440-23-5	Sodium, Total	BRL	mg/Kg	810	07-02-01	MM-01365-S	6010B
7440-28-0	Thallium, Total	BRL	mg/Kg	8.1	07-02-01	MM-01365-S	6010B
7440-62-2	Vanadium, Total	14	mg/Kg	8.1	07-02-01	MM-01365-S	6010B
7440-66-6	Zinc, Total	BRL	mg/Kg	81	07-02-01	MM-01365-S	6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Trace Metals by ICP-AES and CVAA

Field ID: MHP-CS-062601-Sed B-8
Project: Sullivan's Ledge/C47968
Client: Harding Lawson Associates
Container: 250 mL Glass
Preservation: Cool
Matrix: Soil

Laboratory ID: 42399-01
Sampled: 06-26-01
Received: 06-27-01
% Solids 79

CAS Number	Analyte	Concentration	Units	Reporting Limit	Analyzed	QC Batch	Method
7429-90-5	Aluminum, Total	3,700 J	mg/Kg	66	07-02-01	MM-01365-S	6010B
7440-36-0	Antimony, Total	BRL	mg/Kg	1.3	07-02-01	MM-01365-S	6010B
7440-38-2	Arsenic, Total	2.9	mg/Kg	1.3	07-02-01	MM-01365-S	6010B
7440-39-3	Barium, Total	BRL	mg/Kg	26	07-02-01	MM-01365-S	6010B
7440-41-7	Beryllium, Total	BRL	mg/Kg	0.53	07-02-01	MM-01365-S	6010B
7440-43-9	Cadmium, Total	BRL	mg/Kg	0.66	07-02-01	MM-01365-S	6010B
7440-70-2	Calcium, Total	1,000 J	mg/Kg	130	07-02-01	MM-01365-S	6010B
7440-47-3	Chromium, Total	BRL	mg/Kg	13	07-02-01	MM-01365-S	6010B
7440-48-4	Cobalt, Total	BRL	mg/Kg	6.6	07-02-01	MM-01365-S	6010B
7440-50-8	Copper, Total	BRL	mg/Kg	26	07-02-01	MM-01365-S	6010B
7439-89-6	Iron, Total	8,800 J	mg/Kg	13	07-02-01	MM-01365-S	6010B
7439-92-1	Lead, Total	BRL	mg/Kg	13	07-02-01	MM-01365-S	6010B
7439-95-4	Magnesium, Total	1,400 J	mg/Kg	66	07-02-01	MM-01365-S	6010B
7439-96-5	Manganese, Total	150 J	mg/Kg	6.6	07-02-01	MM-01365-S	6010B
7439-97-6	Mercury, Total	BRL	mg/Kg	0.043	06-29-01	MP-01036-S	7471A
7440-02-0	Nickel, Total	BRL	mg/Kg	13	07-02-01	MM-01365-S	6010B
7440-09-7	Potassium, Total	230 J	mg/Kg	130	07-02-01	MM-01365-S	6010B
7782-49-2	Selenium, Total	BRL	mg/Kg	13	07-02-01	MM-01365-S	6010B
7440-22-4	Silver, Total	BRL	mg/Kg	6.6	07-02-01	MM-01365-S	6010B
7440-23-5	Sodium, Total	BRL	mg/Kg	660	07-02-01	MM-01365-S	6010B
7440-28-0	Thallium, Total	BRL	mg/Kg	6.6	07-02-01	MM-01365-S	6010B
7440-62-2	Vanadium, Total	7.9	mg/Kg	6.6	07-02-01	MM-01365-S	6010B
7440-66-6	Zinc, Total	BRL	mg/Kg	66	07-02-01	MM-01365-S	6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Trace Metals by ICP-AES and CVAA

Field ID: MHP-CS-062701-UnStream-1
Project: Sullivan's Ledge/C47968
Client: Harding Lawson Associates
Container: 250 mL Glass
Preservation: Cool
Matrix: Soil

Laboratory ID: 42445-01
Sampled: 06-27-01
Received: 06-28-01
% Solids 86

CAS Number	Analyte	Concentration	Units	Reporting Limit	Analyzed	QC Batch	Method
7429-90-5	Aluminum, Total	1,400 J	mg/Kg	60	07-02-01	MM-1365-S	6010B
7440-36-0	Antimony, Total	BRL	mg/Kg	1.2	07-02-01	MM-1365-S	6010B
7440-38-2	Arsenic, Total	BRL	mg/Kg	1.2	07-02-01	MM-1365-S	6010B
7440-39-3	Barium, Total	BRL	mg/Kg	24	07-02-01	MM-1365-S	6010B
7440-41-7	Beryllium, Total	BRL	mg/Kg	0.48	07-02-01	MM-1365-S	6010B
7440-43-9	Cadmium, Total	BRL	mg/Kg	0.6	07-02-01	MM-1365-S	6010B
7440-70-2	Calcium, Total	400 J	mg/Kg	120	07-02-01	MM-1365-S	6010B
7440-47-3	Chromium, Total	BRL	mg/Kg	12	07-02-01	MM-1365-S	6010B
7440-48-4	Cobalt, Total	BRL	mg/Kg	6.0	07-02-01	MM-1365-S	6010B
7440-50-8	Copper, Total	BRL	mg/Kg	24	07-02-01	MM-1365-S	6010B
7439-89-6	Iron, Total	3,600 J	mg/Kg	12	07-02-01	MM-1365-S	6010B
7439-92-1	Lead, Total	BRL	mg/Kg	12	07-02-01	MM-1365-S	6010B
7439-95-4	Magnesium, Total	640 J	mg/Kg	60	07-02-01	MM-1365-S	6010B
7439-96-5	Manganese, Total	72 J	mg/Kg	6.0	07-02-01	MM-1365-S	6010B
7439-97-6	Mercury, Total	BRL	mg/Kg	0.037	06-29-01	MP-1036-S	7471A
7440-02-0	Nickel, Total	BRL	mg/Kg	12	07-02-01	MM-1365-S	6010B
7440-09-7	Potassium, Total	170 J	mg/Kg	120	07-02-01	MM-1365-S	6010B
7782-49-2	Selenium, Total	BRL	mg/Kg	12	07-03-01	MM-1365-S	6010B
7440-22-4	Silver, Total	BRL	mg/Kg	6.0	07-02-01	MM-1365-S	6010B
7440-23-5	Sodium, Total	BRL	mg/Kg	600	07-02-01	MM-1365-S	6010B
7440-28-0	Thallium, Total	BRL	mg/Kg	6.0	07-02-01	MM-1365-S	6010B
7440-62-2	Vanadium, Total	BRL	mg/Kg	6.0	07-02-01	MM-1365-S	6010B
7440-66-6	Zinc, Total	BRL	mg/Kg	60	07-02-01	MM-1365-S	6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Trace Metals by ICP-AES and CVAA

Field ID: MHP-CS-062701-UnStream-5
Project: Sullivan's Ledge/C47968
Client: Harding Lawson Associates
Container: 250 mL Glass
Preservation: Cool
Matrix: Soil

Laboratory ID: 42445-02
Sampled: 06-27-01
Received: 06-28-01
% Solids 91

CAS Number	Analyte	Concentration	Units	Reporting Limit	Analyzed	QC Batch	Method
7429-90-5	Aluminum, Total	2,400 J	mg/Kg	56	07-02-01	MM-1365-S	6010B
7440-36-0	Antimony, Total	BRL	mg/Kg	1.1	07-02-01	MM-1365-S	6010B
7440-38-2	Arsenic, Total	BRL	mg/Kg	1.1	07-02-01	MM-1365-S	6010B
7440-39-3	Barium, Total	BRL	mg/Kg	23	07-02-01	MM-1365-S	6010B
7440-41-7	Beryllium, Total	BRL	mg/Kg	0.45	07-02-01	MM-1365-S	6010B
7440-43-9	Cadmium, Total	BRL	mg/Kg	0.56	07-02-01	MM-1365-S	6010B
7440-70-2	Calcium, Total	710 J	mg/Kg	110	07-02-01	MM-1365-S	6010B
7440-47-3	Chromium, Total	BRL	mg/Kg	11	07-02-01	MM-1365-S	6010B
7440-48-4	Cobalt, Total	BRL	mg/Kg	5.6	07-02-01	MM-1365-S	6010B
7440-50-8	Copper, Total	BRL	mg/Kg	23	07-02-01	MM-1365-S	6010B
7439-89-6	Iron, Total	5,200 J	mg/Kg	11	07-02-01	MM-1365-S	6010B
7439-92-1	Lead, Total	12	mg/Kg	11	07-02-01	MM-1365-S	6010B
7439-95-4	Magnesium, Total	1,400 J	mg/Kg	56	07-02-01	MM-1365-S	6010B
7439-96-5	Manganese, Total	86 J	mg/Kg	5.6	07-02-01	MM-1365-S	6010B
7439-97-6	Mercury, Total	BRL	mg/Kg	0.036	06-29-01	MP-1036-S	7471A
7440-02-0	Nickel, Total	BRL	mg/Kg	11	07-02-01	MM-1365-S	6010B
7440-09-7	Potassium, Total	520 J	mg/Kg	110	07-02-01	MM-1365-S	6010B
7782-49-2	Selenium, Total	BRL	mg/Kg	11	07-03-01	MM-1365-S	6010B
7440-22-4	Silver, Total	BRL	mg/Kg	5.6	07-02-01	MM-1365-S	6010B
7440-23-5	Sodium, Total	BRL	mg/Kg	560	07-02-01	MM-1365-S	6010B
7440-28-0	Thallium, Total	BRL	mg/Kg	5.6	07-02-01	MM-1365-S	6010B
7440-62-2	Vanadium, Total	7.6	mg/Kg	5.6	07-02-01	MM-1365-S	6010B
7440-66-6	Zinc, Total	BRL	mg/Kg	56	07-02-01	MM-1365-S	6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Trace Metals by ICP-AES and CVAA

Field ID:	MHP-CS-062701-UnStream-9	Laboratory ID:	42445-03
Project:	Sullivan's Ledge/C47968	Sampled:	06-27-01
Client:	Harding Lawson Associates	Received:	06-28-01
Container:	250 mL Glass	% Solids	86
Preservation:	Cool		
Matrix:	Soil		

CAS Number	Analyte	Concentration	Units	Reporting Limit	Analyzed	QC Batch	Method
7429-90-5	Aluminum, Total	1,400 J	mg/Kg	56	07-02-01	MM-1365-S	6010B
7440-36-0	Antimony, Total	BRL	mg/Kg	1.1	07-03-01	MM-1369-S	6010B
7440-38-2	Arsenic, Total	BRL	mg/Kg	1.1	07-02-01	MM-1369-S	6010B
7440-39-3	Barium, Total	BRL	mg/Kg	22	07-02-01	MM-1369-S	6010B
7440-41-7	Beryllium, Total	BRL	mg/Kg	0.45	07-02-01	MM-1369-S	6010B
7440-43-9	Cadmium, Total	BRL	mg/Kg	0.56	07-02-01	MM-1369-S	6010B
7440-70-2	Calcium, Total	280 J	mg/Kg	110	07-02-01	MM-1369-S	6010B
7440-47-3	Chromium, Total	BRL	mg/Kg	11	07-03-01	MM-1369-S	6010B
7440-48-4	Cobalt, Total	BRL	mg/Kg	5.6	07-02-01	MM-1369-S	6010B
7440-50-8	Copper, Total	BRL	mg/Kg	22	07-03-01	MM-1369-S	6010B
7439-89-6	Iron, Total	3,800 J	mg/Kg	11	07-02-01	MM-1365-S	6010B
7439-92-1	Lead, Total	BRL	mg/Kg	11	07-03-01	MM-1369-S	6010B
7439-95-4	Magnesium, Total	810 J	mg/Kg	56	07-03-01	MM-1369-S	6010B
7439-96-5	Manganese, Total	87 J	mg/Kg	5.6	07-03-01	MM-1369-S	6010B
7439-97-6	Mercury, Total	BRL	mg/Kg	0.039	06-29-01	MP-01036-S	7471A
7440-02-0	Nickel, Total	BRL	mg/Kg	11	07-03-01	MM-1369-S	6010B
7440-09-7	Potassium, Total	160 J	mg/Kg	110	07-05-01	MM-1369-S	6010B
7782-49-2	Selenium, Total	BRL	mg/Kg	11	07-03-01	MM-1369-S	6010B
7440-22-4	Silver, Total	BRL	mg/Kg	5.6	07-02-01	MM-1369-S	6010B
7440-23-5	Sodium, Total	BRL	mg/Kg	560	07-03-01	MM-1369-S	6010B
7440-28-0	Thallium, Total	BRL	mg/Kg	5.6	07-03-01	MM-1369-S	6010B
7440-62-2	Vanadium, Total	BRL	mg/Kg	5.6	07-03-01	MM-1369-S	6010B
7440-66-6	Zinc, Total	BRL	mg/Kg	56	07-03-01	MM-1369-S	6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

Sullivan Ledge

PAHs

O'Brien & Gere Engineers Data Validation Form - USEPA Method 8270C Semivolatile Organics

Date: 11/01 **Number of samples and compounds per sample:** 5/17 target

Project Number: 5509.005

Validator: Melissa Lisma **Equipment Blanks:** —

Project: Sullivan Ledge **Blind/Field Duplicates:** —

Laboratory: GW Analytical **MS/MSDs:** —

QAPP: Yes **DV Guidelines: USEPA Region I**

Laboratory package number: — **FULL VALIDATION**

Method reference: USEPA. 1996. *Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846)*, 3rd Edition. Washington, D.C.

CT	Sample, TB, EB, MS/MSD, FD Identification	Date collected 2001	Date received 2001	%Solids (if <30%)	M	Laboratory ID	DF
OK	MHP-CS-062601-	6/26/01	6/27/01	N		42396-01	1
	Div Swale 1						
	MHP-CS-062701-	6/27/01	6/28/01	N		42445-01	1
OK	Unstream-1						
	Unstream-5					02	1
	Unstream-9					03	1
OK	MHP-CS-062601-	6/26	6/27	N		42399-01	1
	Sed-B-8						

Tom Malone
SVOC lab manager
contact at GW Analytical.

Sullivan Ledge

CT	Sample, TB, EB, MS/MSD, FD Identification	Date collected 2001	Date received 2001	%Solids (if <30%)	M	Laboratory ID	DF

Note: CT indicates cooler temperature; M indicates matrix; DF indicates laboratory dilution factor if applicable. MS/MSD indicates matrix spike/matrix spike duplicate.

NA

Sullivan Ledge

Sample ID	QC Batch

See Holding time summary.

USABILITY SUMMARY:

Number of samples * number of compounds per sample = total analyses in project
Percent rejected = total rejected analyses/total analyses in project
Percent Usability = Usable analyses (total analyses – rejected) / total analyses in project

Sample Type	Type of Excursion – Data Rejection	Total number of samples in packages	Number of affected samples	Number of compounds per sample	Total rejected analyses	Percent Rejected	Percent Usability
		5	0	17	0	0	100

Data Validation Forms
For Analyses of Semivolatile Organics by USEPA SW-846 Method 8270C

The following worksheets are based on:

- U.S. Environmental Protection Agency (USEPA) Region I. 1996. EPA-New England Data Validation Functional Guidelines for Evaluting Environmental Analyses.
- USEPA. 1996. *Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846)*, 3rd Edition. Washington, D.C.

These documents have been modified to specifically reflect the requirements presented in USEPA SW-846 Method 8270C. (National Functional Guidelines and Region I guidelines apply to USEPA CLP Methods rather than SW-846 Methods.)

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1.0 Data completeness
2.0 Holding times
3.0 Surrogate recovery
4.0 Matrix spike/matrix spike duplicate (MS/MSD) analysis
5.0 Laboratory control sample (LCS) analysis
6.0 Blank analysis
7.0 GC/MS tuning criteria
8.0 Initial calibration
9.0 Continuing calibration
10.0 Internal standards evaluation
11.0 Field duplicate analysis
12.0 Target compound list identification, quantitation, and system performance

Data Qualifiers

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Note To Data Validators:

The following procedure should be followed when using these forms:

1. Fill out forms completely; cross out sections not applicable to the project.
2. Use specific and unique identifications when identifying QC samples for documenting in the data validation report.
3. Reference both client and laboratory identifications on the forms for cross checking purposes.
4. Indicate bias when possible (↑↓).
5. Qualify associated sample result sheets clearly in ink under column marked QUAL.
6. Note that, due to possible rounding discrepancies, allow recoveries to fail criteria by 1% outside the control limits.

1.0 DATA COMPLETENESS FOR SEMIVOLATILE ANALYSIS

1.1 Traffic Report or Lab Narrative Notes: Briefly discuss any issues regarding problems with sample receipt or condition of samples.

None

Solutia Soils

1.2 Were sample results for each parameter corrected for percent solids for soil samples?

REFER TO CROSS REFERENCE TABLE FOR PERCENT SOLIDS. Yes all >30%

ACTION: If any sample analyzed as a soil, other than TCLP, contains percent solids >30%, qualify detected results as approximate (J) and nondetected results as rejected (R).

1.3 Were samples iced for sample shipment? Yes

1.4 Were samples stored at the laboratory in refrigerator and protected from light until sample preparation and analysis?

Yes

ACTIONS:

If the cooler temperature was elevated (> 10° C), then note in the validation report and use professional judgement in qualifying data.

If samples were not refrigerated and protected from light prior to sample extraction and analysis, qualify detected results as approximate (J) and nondetected results as approximate (UJ).

1.4 List below any communication with laboratory regarding problems with data completeness, reference to data, contact

Solutia Soils
person, specific problems and resolutions (This would include QC forms etc).

1). Provide IC tune form for MS3 6/19/01
(BNO ~~61901~~ 62701.Res) – OK received

1.5 Were equipment blanks, MS/MSD, field duplicate samples analyzed at the correct frequency as listed in the QAPP?

NA

2.0 HOLDING TIMES

The objective is to ascertain the validity of the analytical results based on the holding time of the sample from the time of collection to the time of analysis.

2.1 Method 8270: Aqueous samples must be extracted within 7 days of collection and soil/sediment samples must be extracted within 14 days from collection. Extracts must be analyzed within 40 days from extraction. Samples must be stored at 4°C ±2.

ACTIONS:

a. **If extraction holding times are exceeded, associated sample results are flagged as approximate (UJ, J).**

b. **If analysis holding times are exceeded, detected and nondetected sample results are qualified as approximate (J and UJ).**

c. **If extraction holding times are exceeded by more than 28 days if the analysis was >60 days, for original or reanalysis, associated sample results are qualified as approximate for positive results (J) and non-detected results are rejected (R).**

All met

Solutia Soils

2.2 Summarize below the samples qualified due to holding time excursions.

Sample ID	Date Collected	Date Extracted (Batch ID)	Date Analyzed	Action (number of days out and qualifier)
	6/26/01	6/29/01 (SV-0993-M)	7/2/01 7/6/01	met
	6/27/01	↓		

3.0 SURROGATE RECOVERY

Surrogates are compounds chemically similar to analytes, but are not expected to occur in samples. Laboratory performance on individual samples is evaluated based on spiking each sample, blank, and QC sample with surrogates, prior to sample preparation. Percent recoveries of surrogates are used to evaluate the overall performance of the gas chromatograph system and to evaluate individual sample matrix effects. Laboratory generated control limits are used to evaluate the recoveries. The evaluation of the results is not necessarily straightforward. The sample itself may produce effects due to such factors as interferences and high concentrations of analytes. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the evaluation and review of data based on specific sample results is frequently subjective and demands analytical experience and professional judgement.

3.1 Were surrogates evaluated for each of the samples, blanks and QC samples at the concentrations specified in the analytical method?

Yes BN - per method.

If samples required dilution due to high concentration of target compounds, the surrogates may be diluted out. If more than 5x dilution is used, sample results are not qualified due to surrogate recovery unless the undiluted analysis of the sample has been qualified due to surrogate recoveries.

Any time there are two or more analyses for a particular fraction the reviewer must determine which are the best data to report. Considerations should include but are not limited to:
a. Surrogate recovery (marginal versus gross deviation).
b. Technical holding times.
c. Comparison of the values of the target compounds reported in each fraction.
d. Other QC information, such as performance of internal standards.

ACTIONS:

a. Qualification of data is necessary if two or more base-neutral or acid surrogates are out of control limits or if any one surrogate compound has a recovery <10%.

Sample Results	Percent Recovery		
	<10% for any one surrogate	>10% but <Control Limit for 2 or more acid or base surrogates	>Control Limit for 2 or more acid or base surrogates
Detects	J	J	J
Nondetects	R	UJ	None

b. If surrogate recovery is outside of criteria, the lab should perform a re-extraction to confirm that the excursion is due to sample matrix effects rather than the lab deficiency. If the re-extraction was not performed, document in case narrative that the laboratory was not in compliance with method requirements. If surrogate recoveries exceeded criteria in the re-extraction, the laboratory is required to report both sets of sample data. Validate the data set with the best recoveries, consider also internal standard results.

c. In the special case of a blank analysis with surrogates out of specification, the reviewer must give special consideration to the validity of associated sample data. The basic concern is whether the blank problems represent an isolated problem with the blank alone, or whether there is a fundamental problem with the analytical process. For example, if one or more samples in the batch show acceptable system monitoring compound recoveries, the reviewer may choose to consider the blank problem to be an isolated occurrence.

All met

Solutia Soils

3.2 List below samples qualified due to surrogate excursions.

Sample ID	Surrogate	%Recovery	Action

Note:
PD6 - ~~phenol-d6~~
~~2FP - 2-fluorophenol~~
~~246TP - 2,4,6-tribromophenol~~
NB – nitrobenzene-d5 23-120
2FBP - 2-fluorobiphenyl 30-115
TP - terphenyl-d14 18-137

6/26/01 - all met
6/27/01 - allmet

4.0 MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) ANALYSIS

MS/MSD analyses are performed to evaluate the effects of sample matrix on method performance. Representative compounds are spiked into a field sample prior to sample preparation. Consult the QAPP to determine if the complete target compound list is required for the spiking solution. Percent recoveries and RPDs are then evaluated.

4.1 Were MS/MSDs analyzed at the required concentration for each group of samples of similar matrix and at a frequency as listed in the QAPP (typically one in 20)?

For 8270 - At a minimum, the target compounds 1,2,4-trichlorobenzene, acenaphthene, 2,4-dinitrotoluene, pyrene, n-nitroso-di-n-propylamine, 1,4-dichlorobenzene, pentachlorophenol, phenol, 2-chlorophenol, 4-chloro-3-methylphenol, and 4-nitrophenol must be included in the spiking solutions. The QAPP may require that the entire target compound list be included in the spiking solution. If the lab did not use the entire list and was required to, note that in the data validation report. The MS solution can be the same as the LCS and must be different from the calibration standards. The concentration of the spike solution should be base/neutrals at 100 mg/L and acids at 200 mg/L for water and soil samples, and five times higher for waste samples. If compliance monitoring, the spike concentration should be the regulatory limit or one to five times the background concentration (historical concentrations), whichever is greater. If no regulatory limits, the spike should be at 20 times the quantitation limit. Compare the recoveries to lab generated control limits.
If the MS recovery is outside of criteria and LCS is within criteria, a matrix effect is suspected. If both MS and surrogate recoveries are out of criteria, analytical problems are suspected.

ACTIONS:

a. Qualification is limited to the unspiked sample only and only when both MS/MSD recoveries are outside control limits.

Sample Results	RPD >CL	Percent Recovery		
		<10%	>10% but <Control Limit	>Control Limit
Detects	J	J	J	J
Nondetects	UJ	R	UJ	None

b. If MS/MSDs not analyzed, contact laboratory for explanation and describe problems/ resolutions in final narrative report. Generally, qualification of sample data is not required when MS/MSDs are not at the correct frequency or concentration. Document in the narrative report that the laboratory was not in compliance.

c. If it appears that the MS/MSD results indicate a systematic problem, qualify all associated data, UJ, J.

None

Solutia Soils

4.2 List below all MS/MSDs and samples qualified due to MS/MSD excursions.

Unique MS/MSD ID	Compound	% Recoveries, bias, [control limits]	RPD [control limit]	Action
	None			

5.0 LABORATORY CONTROL SAMPLE (LCS) ANALYSIS

Data for Laboratory Control Samples (LCS) are generated to provide information on the accuracy of the analytical method and the laboratory performance. The LCS must be extracted and analyzed concurrently with the samples in the batch, using the same instrumentation as the samples. Laboratory control samples are analyzed to verify that the lab can perform an analysis in a clean matrix. An LCS excursion may indicate extraction or chromatography problems. Corrective actions include the reanalysis of samples or new LCS analysis.

5.1 Were LCSs extracted and analyzed at the required concentration with each analytical batch for each sample matrix? Check the QAPP for frequency of LCS.

Yes w/ 8270 recommended.

For 8270 – The LCS consists of clean matrix similar to the sample matrix and of the same weight or volume. The QAPP may require that the entire target compound list be included in the spiking solution. If the lab did not use the entire list and was required to, note that in the data validation report. Otherwise, the LCS is spiked with the same analytes as the MS and at the same concentration. The LCS solution can be the same as the MS and must be different from the calibration standards. If compliance monitoring, the spike concentration should be the regulatory limit or one to five times the background concentration (historical concentrations), whichever is greater. If there are no regulatory limits, the spike should be at 20 times the quantitation limit. Compare the recoveries to lab generated control limits.

ACTIONS:

a. Qualification is performed for specific compounds that exceeded criteria in samples within the same extraction or analytical batch.

Sample Results	Percent Recovery		
	<10%	>10% but <Control Limit	>Control Limit
Detects	J	J	J
Nondetects	R	UJ	None

b. If LCSs not analyzed contact laboratory for explanation and describe problems/ resolutions in final narrative report. Generally, qualification of sample data is not required when LCSs are not at the correct frequency or concentration. Document in the narrative report that the laboratory was not in compliance.

c. If the majority of compounds did not meet requirements, qualify all data as approximate (J or UJ).

d. If complete fractions (acid/base) have recovery problems, all the target analytes in that fraction may be qualified if the LCS did not contain all target analytes

w/ acenaphthene at 2700 ug/kg & 500 OK
pyrene

All met

Solutia Soils

5.3 List below all LCSs and samples qualified due to LCS excursions.

Unique LCS ID	Compound	% Recovery, bias, [control limits]	Action	Samples Affected
SV-0993-M	met			

acenaphthene 31-137%
pyrene 35-142

6.0 BLANK ANALYSES

The purpose of laboratory (or field) blank analysis is to determine the existence and magnitude of contamination resulting from laboratory (or field) activities. The criteria for evaluation of blanks apply to any blank associated with the samples (e.g., method blanks, instrument blanks, and equipment blanks). If problems with any blank exist, all associated data must be carefully evaluated to determine whether or not there is an inherent variability in the data, or if the problem is an isolated occurrence not affecting other data. A method blank is analyzed for 8270 analysis to ensure that the total system (introduction device, transfer lines and GC/MS system) is free of contamination.

6.1 Were method blanks analyzed for each group of samples of similar matrix? Yes

ACTIONS: If no, contact laboratory for explanation and review in data completeness section. If blanks are not available, an evaluation of blank contamination cannot be made. Alert the Project Manager immediately. Alternatively, field blank analyses can be used to evaluate overall contamination effects. However, method blanks are required for assessment of blank contamination for the instrument and solvents used by the lab.

6.2 Were equipment blanks collected and analyzed at the frequency specified in the site specific QAPP or Scope of Work? **Note: Equipment blanks are usually collected at a minimum frequency of one per 20 field samples. Equipment blanks are used only to qualify aqueous samples and are not used to qualify soil/sediment samples.**

NA

6.3 If inordinate numbers of target compounds are found at low levels in the blank(s), it may be indicative of a problem and should be noted for action.

NA

Instrument blanks should be analyzed after high concentrations, otherwise carryover may be suspected. In instances where more than one blank is associated with a given sample, qualification should be based upon a comparison with the associated blank having the highest concentration of a contaminant.

ACTIONS:
Blank Action Levels are calculated at 5x blank (method) value (10x for phthalates). Blank samples are not to be qualified with respect to other blanks. Blank evaluation must be done using the same weights, volumes, or dilution. It may be easier to work from the raw data sheets for blanks and samples.

a. **If the sample concentration is < laboratory reporting limit (LRL) and < Blank Action level, report the LRL with a "U".**

b. **If the sample concentration is > LRL and < Blank Action level, report concentration with a "U".**

c. **If the sample concentration is > Blank Action level, qualification of data is not necessary.**

All met

Solutia Soils

6.5 Summarize all blanks and any samples qualified due to blank contamination.

Unique Blank Identification	Compound	Highest Conc. (Units)	Blank Action Level (Units)	Samples Affected and Action
SV-0993-M	met			

7.0 INTERNAL STANDARDS EVALUATION

Internal standard areas are evaluated to assess GC/MS instrument performance and/or loss of sensitivity; (to effectively check drifting method performance, poor injection execution, and the need for system inspection or maintenance), therefore affecting compound quantitation.

For 8270, Internal standards **must** be monitored in all samples, blanks, and standards with internal standards 1,4-dichlorobenzene-d4, napthalene-d8, acenaphthene-d10, phenanthrene-d10, chrysene-d12, and perylene-d12 or other compounds that have similar retention times at 40 ng/µL or lower for more sensitive instruments. The internal standard should permit the compounds of interest to have retention times of 0.8-1.2 relative to the internal standards. Area is used to calculate response factors. Use the internal standard used for calculation should have a retention time closest to the analyte.

7.1 Were internal standard areas of samples or blanks within +100% or -50% of the internal standard associated with the continuing calibration standard?

Yes

Note: The laboratory is required to reanalyze field, QC, and blank samples when internal standard criteria are not met.

ACTIONS: Qualification if limited to those compounds quantitated with the affected internal standard.

Sample Results	Percent Area Recovery		
	<20%	>20% but <Control Limit	>Control Limit
Detects	J	J	J
Nondetects	R	UJ	None

7.2 Are retention times of the internal standards within 30 seconds of the associated calibration standard?

Yes

ACTION:
If retention times are outside criteria, reject undetected results, R, for compounds quantitated with that internal standard. Be aware that false positive and negative results may exist so carefully examine chromatographic profile.

7.3 Were samples and method blanks reanalyzed when internal standard criteria was exceeded?

NA

ACTION: Document in the narrative report that the laboratory was not in compliance with analytical method requirements.
If yes, and internal standard areas remain outside criteria, validate both sets of sample data with respect to above actions.

If there are two analyses for a particular fraction, the reviewer must determine which are the best data to report. Considerations should include:
a. Magnitude and direction of the IS area shift.
b. Magnitude and direction of the IS retention time shift.
c. Technical holding times.
d. Comparison of the values of the target compounds reported in each fraction.
e. Other QC results.

All met

Solutia Soils

7.4 List samples qualified due to internal standard excursions.

Sample ID	Internal Standard	% Recovery	Action

Table Notes:

6/26/01 - met

6/27/01 - met

8.0 FIELD DUPLICATE ANALYSIS

8.1 Were field duplicates collected and analyzed at the frequency specified in the site specific QAPP? If no, document in the narrative that precision of field sampling methods could not be evaluated.

Summarize below compounds detected in field duplicate samples and the RPDs. Evaluate data based on RPD specified in the QAPP or use the following if none specified: RPD <30% for aqueous samples and <50% for soil/sediment samples for concentrations >2xLRL. For sample results <2xRL use criteria that results must be within ± 2xRL .

Duplicate IDs	Compound	RPD	Action
		NA	

ACTIONS: Qualification refers to field duplicate samples only. Use professional judgement to apply field duplicate actions to all samples of similar matrix.

Sample Results	Both >2xLRL	Both <2xLRL, or one result is nondetected or <2xRL
Criteria	RPD <30% for waters or <50% for soils	Results not within ±2xRL
Detects	J	J
Nondetects	NA	UJ

9.0 GC/MS TUNING CRITERIA

Tuning and performance criteria are established to verify GC/MS performance. Three scans (the peak apex scan and the scans immediately preceding and following the apex) are acquired and averaged. Background subtraction is performed using a single scan no more than 20 scans prior to the elution of DFTPP (not part of the DFTPP peak). Other documented approaches suggested by the instrument manufacturer may be used. The following table provides criteria to follow. Otherwise, other tuning criteria may be used if method performance is not adversely affected. The samples, standards and associated QC samples must be analyzed using the same tune conditions, within the 12 hour clock that is started at the time of injection of the DFTPP solution. For 8270, 50 ng/µL of decafluorotriphenylphosphine (DFTPP) is used. The standard should also contain ng/µL of 4,4'-DDT, pentachlorophenol, and benzidine to verify injection port inertness and GC column performance. Degradation of DDT to DDE and DDD should not exceed 20%. Benzidine and PCP should not have peak tailing (<5%).

9.1 Were GC/MS tuning performances for 50-ng injection of DFTPP analyzed for every twelve hours of sample analysis for each GC/MS instrument used? Yes

9.2 Have the ion abundance criteria documented by the method been met for each tune (verify that ion abundance's have been normalized to m/z 198)? Yes

9.3 Check for transcription/calculation errors between raw data and the reporting form. If errors are present, a more in-depth review of the data is required. Request corrections from the laboratory. Summarize necessary corrections.

none

9.4 Are the spectra of the mass calibration acceptable?

Yes

9.5 Was the tune performance standard injected at the beginning of the analytical sequence and were all the samples analyzed within the 12-hour clock?

Yes

9.6 Did degradation of DDT and evaluation of benzidine and PCP meet criteria?

Yes

VALIDATION ACTIONS:

a. **If tuning has not been done, reject associated sample data (R) and contact laboratory for explanation. Discuss in data completeness section in the data validation report.**

b. **If no for 7.2, 7.4, or 7.5 reject associated sample results (R).**

c. **If the reviewer has reason to believe that instrument performance check criteria were achieved using techniques other than those described above, then additional information on the instrument performance checks should be obtained. If the techniques employed are found to be at variance with the method, the performance and procedures of the laboratory may merit evaluation. If the reviewer has reason to believe that an inappropriate technique was used to obtain background subtraction (such as background subtracting from the solvent front or from another region of the chromatogram rather than the DFTPP peak), then this should be noted for action.**

Some of the most critical factors in the DFTPP criteria are the non-instrument specific requirements that are also not unduly affected by the location of the spectrum on the chromatographic profile. The m/z ratios for 198/1990 and 442/443 are critical. These ratios are based on the natural abundances of carbon 12 and carbon 13 and should always be met. Similarly, the relative abundances for m/z 68, 70, 197, and 441 indicate the condition of the instrument and the suitability of the resolution adjustment and are very important. Note that all of the foregoing abundances relate to adjacent ions; they are relatively insensitive to differences in instrument design and position of the spectrum on the chromatographic profile. For the ions at m/z 51, 127, and 275, the actual relative abundance is not as critical. For instance, if m/z 275 has 40% relative abundance (criteria: 10.0-30.0%) and other criteria are met, then the deficiency is minor. The relative abundance of m/z 365 is an indicator of suitable instrument zero adjustment. If relative abundance for m/z 365 is zero, minimum detection limits may be affected. On the other hand, if m/z 365 is present, but less than the 0.75% minimum abundance criteria, the deficiency is not as serious.

Decafluorotriphenylphosphine Ions and Abundance Criteria for 8270C	
Mass	**Ion Abundance Criteria**
51	30-60 percent of 198
68	Less than 2 percent of 69
70	Less than 2 percent of 69
127	40 to 60% of 198
197	Less than 1 percent of 198
198	Base Peak, 100 percent relative abundance
199	5 to 9 percent of 198
275	10 to 30 percent of 198
365	Greater than 1 percent of 198
441	Present but less than 443
442	Greater than 40 percent of 198
443	17 to 23 percent of 442

All met

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9.7 List all tunes and any samples qualified due to tune excursions

INSTRUMENT ID: MS3

Unique Tune ID (Date/Time)	Comments	Tune Met (Y/N	Heated Purge? (Y/N)	Samples Affected
6/26/01 2009	IC	Y	NA	✓
7/2/01 1018	CCV	Y	NA	✓
	MS6			
6/15/01 1705	IC	Y	NA	✓
7/6/01 1012	CCV	Y	NA	✓

* Tune for IC not provided. - ~~not requested~~ provided

10.0 GC/MS INITIAL CALIBRATION

Calibration criteria have been established to verify that GC/MS is capable of producing acceptable quantitative data. Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for compounds on the target compound list. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run and of producing a linear calibration curve. All target compounds must have corresponding initial and continuing calibrations.

For 8270, internal calibration is used. Prepare a minimum of five concentrations of standards, **with one concentration being at or below the project DQO (establishing the method quantitation limit – which must be as low as the regulatory or action limit)** and the remaining concentrations should correspond to the expected range of sample concentrations and should not be greater than the working range of the detector. Use internal standards 1,4-dichlorobenzine-d4, naphthalene-d8, acenaphthene-d10, phenanthrene-d10, chrysene-d12, perylene-d12 or other compounds that have similar retention times at 40 ng/µg/L or lower for more sensitive instruments. The internal standard should permit the compounds of interest to have retention times of 0.8-1.2 relative to the internal standards. Area is used to calculate response factors. The internal standard used for calculation should have a retention time closest to the analyte.

RF = (Comp response *IS concentration)/(IS response * Comp conc)

The system performance check compounds (SPCCs), which are evaluated for compound stability and degradation caused by contaminated lines or active sites in the system, must meet mean response factor criteria of 0.05: n-nitroso-di-n-propylamine, hexachlorocyclopentadiene, 2,4-dinitrophenol, 4-nitrophenol.

The calibration check compounds (CCCs), which are evaluated for integrity of the system; high variability may indicate system leaks or reactive sites on the column, acenaphthene, 1,4-dichlorobenzene, hexachlorobutadiene, n-nitroso-diphenylamine, di-n-octyl phthalate, fluoranthene, benzo(a)pyrene, 4-chloro-3-methylphenol, 2,4-dichlorophenol, 2-nitrophenol, phenol, pentachlorophenol, 2,4,6-trichlorophenol, must be equal to or less than 30%.

The retention time should agree within 0.06 relative retention time units in each calibration standard.

Linearity – Both linear and nonlinear calibration is allowed. Nonlinear calibration may be necessary for low detection limits.

Linear calibration using average calibration or RF – calibration factors and RFs are a measure of the slope of the calibration relationship and assumes the curve passes through the origin. The factor should not vary with the concentration of the standard. However, when the variation, measured as the relative standard deviation (RSD) is less than or equal to 15%, the use of the linear model is appropriate and the average calibration or RF is used for concentration.

If the RSD of target analytes is greater than 15%, the initial calibration may be acceptable as the mean of the RSDs for all analytes less than or equal to 15%. This approach will lead to greater uncertainty for those analytes for which the RSD is greater than 15%.

Linear calibration using least squares regression – If the RSD is greater than 15%, or if the analyst so chooses, linearity through the origin cannot be assumed and a linear regression of response verses concentration equation that does not pass through the origin may be used. The instrument response is dependent variable (y) and the concentration is the independent variable (x). The regression will produce the slope and intercept for a linear equation ($y=mx+b$) where y is the peak area, m is the slope, x is the concentration and b is the intercept. The origin is not forced through zero and do not use the origin as the sixth calibration point. The regression calculation will result in the correlation coefficient – r –, which is a measure of the "goodness of fit". A value of 1.00 is perfect, and for quantitative purposes, r must be greater than or equal to 0.99.

Non-linear calibration – if other approaches don't meet criteria, no more than third order non-linear may be used. First order (linear) requires five standards, second order (quadratic) model requires six standards and third order requires seven standards. The "goodness of fit" of the polynomial equation is evaluated by the weighted coefficient of the determination (COD), which must be greater than 0.99.

Solutia Soils

10.1 Were initial calibrations performed at the required concentrations prior to sample analysis, whenever GC/MS system is modified, and whenever continuing calibration criteria are exceeded?

Yes 5-6 pt 5 ug/mL to 160 ug/mL OK

Note: Initial and continuing calibrations for water analysis are also used to evaluate medium soil analysis. Verify that secondary ion quantitation has only been performed when there were sample interferences with the primary ion. If secondary ion quantitation has been performed the laboratory must document reasons in case narrative.

Validation Actions:
Check QAPP criteria for remaining compounds.

a. **If initial calibration data can not provided, reject associated sample data (R).**

b. **If RRF <criteria (SPCC criteria, QAPP criteria or EPA Region I remaining analytes) reject sample detection limits (R), and approximate detected results (J) for the affected compounds.**

c. **If %RSD > criteria (CCC criteria, QAPP or EPA Region I criteria for remaining analytes) approximate detected and non-detected results (UJ, J).**

10.2 Check for transcription/calculation errors; check a minimum of one compound to verify that calibration factors and %RSDs have been calculated correctly using the internal standard. If errors are present, a more in-depth review of the data is required. Request corrections from the laboratory. Show calculations below.

Naphthalene 5 ug/mL RRF = 1.161 ✓

160 ug/mL RRF 1.328 ✓

$\bar{X}$ = 1.203 ✓

RSD = 7.89 ✓

When RSD >15% Quad. curve for

undeno(1,2,3-cd) pyrene (RSD 20.2) curve OK

dibenzo(ah) anthracene 19.7

benzo(ghi) perylene 21.1

All met

Solutia Soils

10.3 List below all initial calibrations and compounds qualified for initial calibration excursions. Region I criteria RRF >0.050; RSD <30%.

INSTRUMENT ID: MS3

Analysis Date	Compound	RRF or RSD Excursion	Action	Samples Affected
6/19/01	all met	- quad curves	~~w/ RSDs >15%~~	- all compounds. OK
	MS6			
~~7/5/01~~ 6/16/01	all met			

11.0 CONTINUING CALIBRATION/VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data. Continuing calibration checks satisfactory performance of the instrument on a day-to-day basis. The initial calibration is verified once every 12 hours.

For 8270, a calibration standard near the midpoint concentration of the calibration range must meet the verification criteria.
The system performance check compounds (SPCCs), which are evaluated for compound stability and degradation caused by contaminated lines or active sites in the system, must meet mean response factor criteria of 0.05: n-nitroso-di-n-propylamine, hexachlorocyclopentadiene, 2,4-dinitrophenol, 4-nitrophenol.
The calibration check compounds (CCCs), which are evaluated for integrity of the system; high variability may indicate system leaks or reactive sites on the column, acenaphthene, 1,4-dichlorobenzene, hexachlorobutadiene, n-nitroso-diphenylamine, di-n-octyl phthalate, fluoranthene, benzo(a)pyrene, 4-chloro-3-methylphenol, 2,4-dichlorophenol, 2-nitrophenol, phenol, pentachlorophenol, 2,4,6-trichlorophenol, must be equal to or less than 20% D, where %D is percent difference when performing the average response factor calibration and percent drift when using a regression calibration. Corrective action must be taken if these criteria are not met prior to the analysis of samples. If the CCCs are not included in the list of analytes for a project, and not included in the standards, all analytes must meet the 20% D criterion.

The retention time of the internal standards must not change by more than 30 seconds from that in the mid-point standard of the most recent initial calibration sequence. Otherwise, corrections must be made and the samples analyzed under this calibration must be reanalyzed. The area of the internal standards must not change by a factor of two (-50% to +100%) from that in the mid-point standard of the most recent initial calibration sequence. Otherwise corrections must be made and the samples analyzed under this calibration must be reanalyzed.

11.1 Were continuing calibration standards analyzed for each twelve hours of sample analysis, for each analyte, for each GC/MS? Yes 40 ug/mL

11.2 Was the continuing calibration standard compared to the correct initial calibration? Yes

VALIDATION ACTIONS:

a. **If no, contact laboratory for explanation and review in data completeness section. Reject associated sample data if continuing calibration data can not be provided (R).**
b. **If RRF <criteria (SPCC, QAPP or Region I criteria for remaining analytes) reject, (R) sample detection limits and approximate (J) detected results for the affected compounds.**
c. **If %D > criteria (CCC, QAPP or Region I criteria for remaining analytes) approximate detected and non-detected sample results (UJ,J).**

11.3 Check for transcription/calculation errors; check a minimum of one compound to verify that calibration factors and %D have been calculated correctly using the specified internal standard. If errors are present, a more in-depth review of the data is required. Request corrections from the laboratory. Show calculation below.

Checked MS6 - 7/6/01 - pyrene OK

11.4 List below all continuing calibrations, and samples qualified due to continuing calibration excursions. Region I criteria RRF >0.050 and %D<25%.

INSTRUMENT ID: MS3

Analysis Date	Compound	RRF or %D Excursion	Action	Samples Affected
7/2/01 1154	acenaphthylene	-34.6	J	MHP-CS-0626 01-Div Swale 1
			UJ	MHP-CS-062601-Sed-B-8
	MS6			
7/6/01 1517	PAHs	all met		

12.0 TARGET COMPOUND LIST IDENTIFICATION, QUANTITATION, AND SYSTEM PERFORMANCE

VERIFY IDENTIFICATIONS AND QUANTITATION AT APPROXIMATELY A 10% FREQUENCY FOR EACH TYPE OF SAMPLE CALCULATION

The objective of the criteria for GC/MS qualitative analysis is to minimize the number of erroneous identifications of compounds. An erroneous identification can either be a false positive (reporting a compound present when it is not) or a false negative (not reporting a compound that is present). The identification criteria can be applied more easily in detecting false positives than false negatives. More information is available for false positives due to the requirement for submittal of data supporting positive identifications. Negatives, or non-detected compounds, on the other hand represent an absence of data and are, therefore, more difficult to assess. One example of detecting false negatives is the not reporting of a Target Compound that is reported as a TIC.
For quantitation evaluation, the objective is to ensure that the reported quantitation results and the detection limits are accurate.

For 8270, samples should be screened to minimize contamination of the instrument. Dilutions are performed to keep the analyte concentration in the upper half of the calibration range. The qualitative identification of analytes is based on retention time, and on comparison of the sample mass spectrum to a reference mass spectrum generated by the lab using the conditions of the method.
1. The relative retention times (RRTs) must be within +0.06 RRT units of the standard RRT.
2. Mass spectra of the sample compound and a current laboratory-generated standard (i.e., the mass spectrum from the associated calibration standard) must match according to the following criteria:
a. The characteristic ions are the three ions of greatest relative intensity or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum
b. The relative intensities of the characteristic ions must agree within ± 30% between the standard and sample spectra. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must be between 20 and 80%.)
c. Structural isomers that produce similar mass spectra should be identified as individual isomers if they have different retention times. Resolution is achieved if the height of the valley between two peaks is less than 25% of the sum of the two peak heights.
d. Identification is hampered when sample components are not resolved and produce mass spectra containing ions contributed by more than one analyte. Appropriate selection of sample spectra and background spectra is important.
e. Examination of extracted ion current profiles can aid in the selection of spectra. When analytes coelute the identification may be met, but each spectrum will contain extraneous ions contributed by the coeluting compound.

12.1 Were the SVOC reconstructed ion chromatograms, the mass spectra for the identified compounds, and the data system printouts included?

If no, contact laboratory and summarize problems and resolutions in data completeness section.

12.2 Was chromatographic performance acceptable with respect to:
Baseline stability?
Resolution?
Peak shape?
Full scale graph (attenuation)?
Extraneous peaks?
Other_____?

Actions: If no, for any of the above, review below problems and qualification of data that was necessary. Use professional judgement to qualify data.

12.3 Was the RRT of each reported compound within criteria?
RRT= RT analyte/RT internal standard

12.4 Did all the ions present in the mass spectrum meet criteria for concentrations greater than the reporting limit?
Note: If ions >10% in the sample spectrum are not present in the standard spectrum, verify that these have been accoutered for by the analyst.

12.5 Were sample and standard relative intensities within criteria for concentrations greater than the reporting limit?

Actions: If no for any of the above, use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected (R) or changed to non-detected (U). Summarize qualifications performed below and in the narrative report.

12.6 Were samples reanalyzed at the appropriate dilution, when saturation occurred or when concentrations exceed linear range of the calibration curve?
Note: When sample dilution is performed, the laboratory typically reports two sets of sample data, diluted sample with responses within linear range and undiluted sample (least diluted sample is reported if two sets of dilutions were performed).

NA

Action: Sample results quantitated with responses that exceed calibration range are approximated (UJ,J). In addition depending on data quality objectives of the project reanalysis of diluted extract may be required. Review resolutions in the narrative report.

12.7 Were correct quantitation ions, internal standard, calibration standard, and RF used?

12.8 Are the contract required quantitation limits (detection limits) adjusted to reflect sample dilutions and for soils, sample moisture?

ACTIONS: If no request resubmittal of data package.

Sample calculation:

For 8270 Concentration (µg/L) = [Area analyte * Conc IS * Dilution factor * Vol of extract (µl)] /[Area IS*RF from IC *Volume sample extracted (ml)] * 1000

Concentration (µg/Kg) = [Area analyte * Conc IS * Dilution factor * Vol of extract injected (µl)] /[Area IS*RF from IC *weight sample (g)] * 1000

12.9 Was the complete target compound list reported for each sample result? Yes

12.10 Were compounds detected at concentrations below CRQL (or PQL) reported and qualified with a "J"? Yes

ACTIONS: If no, request corrections from the laboratory. Summarize necessary corrections.

Document which sample analyses were reviewed and indicate frequency of raw data review. Approximately 10% of data should be verified through raw data review. Show calculations below.

42396-01

Quad. curve used to quantitate results since RSD > 15%

pyrene $\cancel{\frac{(87612)(40)(1000\,\mu l)}{(121573)(1.455)(15.719)(0.63)}}$ =

from curve $\frac{(25.3)(1000)}{(15.719)(0.63)}$ = 2600 ug/kg ✓

42445-01-03 - No target PAHs detected.

42399-01 - No target PAHs detected.

GROUNDWATER ANALYTICAL

EPA Method 8270C
Polynuclear Aromatic Hydrocarbons by GC/MS

Field ID:	MHP-CS-062601-DivSwale-1	Laboratory ID:	42396-01
Project:	Sullivan's Ledge/C47968	QC Batch ID:	SV-0993-M
Client:	Harding Lawson Associates	Sampled:	06-26-01
Container:	250 mL Glass	Received:	06-27-01
Preservation:	Cool	Extracted:	06-29-01
Matrix:	Soil	Analyzed:	07-02-01
% Moisture:	37	Dilution Factor:	1

CAS Number	Analyte	Concentration	Units	Reporting Limit
91-20-3	Naphthalene	320 J	ug/Kg	500
91-57-6	2-Methylnaphthalene	BRL	ug/Kg	500
208-96-8	Acenaphthylene	490 J	ug/Kg	500
83-32-9	Acenaphthene	390 J	ug/Kg	500
86-73-7	Fluorene	BRL	ug/Kg	500
85-01-8	Phenanthrene	1,600	ug/Kg	500
120-12-7	Anthracene	570	ug/Kg	500
206-44-0	Fluoranthene	3,000	ug/Kg	500
129-00-0	Pyrene	2,600	ug/Kg	500
56-55-3	Benzo[a]anthracene	1,300	ug/Kg	500
218-01-9	Chrysene	1,600	ug/Kg	500
205-99-2	Benzo[b]fluoranthene	1,700	ug/Kg	500
207-08-9	Benzo[k]fluoranthene	840	ug/Kg	500
50-32-8	Benzo[a]pyrene	1,400	ug/Kg	500
193-39-5	Indeno[1,2,3-c,d]pyrene	1,200	ug/Kg	500
53-70-3	Dibenzo[a,h]anthracene	660	ug/Kg	500
191-24-2	Benzo[g,h,i]perylene	1,100	ug/Kg	500

QC Surrogate Compounds	Recovery	QC Limits
Nitrobenzene-d_5	48 %	23 - 120 %
2-Fluorobiphenyl	56 %	30 - 115 %
Terphenyl-d_{14}	67 %	18 - 137 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as selected from the Polynuclear Aromatic Hydrocarbon analytes specified by the Target Compound List (TCL) of the US EPA Contract Laboratory Program. Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution, percent moisture and sample size.

GROUNDWATER ANALYTICAL

EPA Method 8270C
Polynuclear Aromatic Hydrocarbons by GC/MS

Field ID:	MHP-CS-062601-Sed B-8	Laboratory ID:	42399-01
Project:	Sullivan's Ledge/C47968	QC Batch ID:	SV-0993-M
Client:	Harding Lawson Associates	Sampled:	06-26-01
Container:	250 mL Glass	Received:	06-27-01
Preservation:	Cool	Extracted:	06-29-01
Matrix:	Soil	Analyzed:	07-02-01
% Moisture:	21	Dilution Factor:	1

CAS Number	Analyte	Concentration	Units	Reporting Limit
91-20-3	Naphthalene	BRL	ug/Kg	400
91-57-6	2-Methylnaphthalene	BRL	ug/Kg	400
208-96-8	Acenaphthylene	BRL UJ	ug/Kg	400
83-32-9	Acenaphthene	BRL	ug/Kg	400
86-73-7	Fluorene	BRL	ug/Kg	400
85-01-8	Phenanthrene	BRL	ug/Kg	400
120-12-7	Anthracene	BRL	ug/Kg	400
206-44-0	Fluoranthene	BRL	ug/Kg	400
129-00-0	Pyrene	BRL	ug/Kg	400
56-55-3	Benzo[a]anthracene	BRL	ug/Kg	400
218-01-9	Chrysene	BRL	ug/Kg	400
205-99-2	Benzo[b]fluoranthene	BRL	ug/Kg	400
207-08-9	Benzo[k]fluoranthene	BRL	ug/Kg	400
50-32-8	Benzo[a]pyrene	BRL	ug/Kg	400
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL	ug/Kg	400
53-70-3	Dibenzo[a,h]anthracene	BRL	ug/Kg	400
191-24-2	Benzo[g,h,i]perylene	BRL	ug/Kg	400

QC Surrogate Compounds	Recovery	QC Limits
Nitrobenzene-d_5	50 %	23 - 120 %
2-Fluorobiphenyl	59 %	30 - 115 %
Terphenyl-d_{14}	70 %	18 - 137 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as selected from the Polynuclear Aromatic Hydrocarbon analytes specified by the Target Compound List (TCL) of the US EPA Contract Laboratory Program. Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution, percent moisture and sample size.

GROUNDWATER ANALYTICAL

EPA Method 8270C
Polynuclear Aromatic Hydrocarbons by GC/MS

Field ID:	MHP-CS-062701-UnStream-1	Laboratory ID:	42445-01
Project:	Sullivan's Ledge/C47968	QC Batch ID:	SV-0993-M
Client:	Harding Lawson Associates	Sampled:	06-27-01
Container:	250 mL Glass	Received:	06-28-01
Preservation:	Cool	Extracted:	06-29-01
Matrix:	Soil	Analyzed:	07-06-01
% Moisture:	14	Dilution Factor:	1

CAS Number	Analyte	Concentration	Units	Reporting Limit
91-20-3	Naphthalene	BRL	ug/Kg	360
91-57-6	2-Methylnaphthalene	BRL	ug/Kg	360
208-96-8	Acenaphthylene	BRL	ug/Kg	360
83-32-9	Acenaphthene	BRL	ug/Kg	360
86-73-7	Fluorene	BRL	ug/Kg	360
85-01-8	Phenanthrene	BRL	ug/Kg	360
120-12-7	Anthracene	BRL	ug/Kg	360
206-44-0	Fluoranthene	BRL	ug/Kg	360
129-00-0	Pyrene	BRL	ug/Kg	360
56-55-3	Benzo[a]anthracene	BRL	ug/Kg	360
218-01-9	Chrysene	BRL	ug/Kg	360
205-99-2	Benzo[b]fluoranthene	BRL	ug/Kg	360
207-08-9	Benzo[k]fluoranthene	BRL	ug/Kg	360
50-32-8	Benzo[a]pyrene	BRL	ug/Kg	360
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL	ug/Kg	360
53-70-3	Dibenzo[a,h]anthracene	BRL	ug/Kg	360
191-24-2	Benzo[g,h,i]perylene	BRL	ug/Kg	360

QC Surrogate Compounds	Recovery	QC Limits
Nitrobenzene-d_5	53 %	23 - 120 %
2-Fluorobiphenyl	65 %	30 - 115 %
Terphenyl-d_{14}	70 %	18 - 137 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as selected from the Polynuclear Aromatic Hydrocarbon analytes specified by the Target Compound List (TCL) of the US EPA Contract Laboratory Program. Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution, percent moisture and sample size.

GROUNDWATER ANALYTICAL

EPA Method 8270C
Polynuclear Aromatic Hydrocarbons by GC/MS

Field ID:	MHP-CS-062701-UnStream-5	Laboratory ID:	42445-02
Project:	Sullivan's Ledge/C47968	QC Batch ID:	SV-0993-M
Client:	Harding Lawson Associates	Sampled:	06-27-01
Container:	250 mL Glass	Received:	06-28-01
Preservation:	Cool	Extracted:	06-29-01
Matrix:	Soil	Analyzed:	07-06-01
% Moisture:	9	Dilution Factor:	1

CAS Number	Analyte	Concentration	Units	Reporting Limit
91-20-3	Naphthalene	BRL	ug/Kg	340
91-57-6	2-Methylnaphthalene	BRL	ug/Kg	340
208-96-8	Acenaphthylene	BRL	ug/Kg	340
83-32-9	Acenaphthene	BRL	ug/Kg	340
86-73-7	Fluorene	BRL	ug/Kg	340
85-01-8	Phenanthrene	BRL	ug/Kg	340
120-12-7	Anthracene	BRL	ug/Kg	340
206-44-0	Fluoranthene	BRL	ug/Kg	340
129-00-0	Pyrene	BRL	ug/Kg	340
56-55-3	Benzo[a]anthracene	BRL	ug/Kg	340
218-01-9	Chrysene	BRL	ug/Kg	340
205-99-2	Benzo[b]fluoranthene	BRL	ug/Kg	340
207-08-9	Benzo[k]fluoranthene	BRL	ug/Kg	340
50-32-8	Benzo[a]pyrene	BRL	ug/Kg	340
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL	ug/Kg	340
53-70-3	Dibenzo[a,h]anthracene	BRL	ug/Kg	340
191-24-2	Benzo[g,h,i]perylene	BRL	ug/Kg	340

QC Surrogate Compounds	Recovery	QC Limits
Nitrobenzene-d_5	39 %	23 - 120 %
2-Fluorobiphenyl	50 %	30 - 115 %
Terphenyl-d_{14}	55 %	18 - 137 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as selected from the Polynuclear Aromatic Hydrocarbon analytes specified by the Target Compound List (TCL) of the US EPA Contract Laboratory Program. Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution, percent moisture and sample size.

GROUNDWATER ANALYTICAL

EPA Method 8270C
Polynuclear Aromatic Hydrocarbons by GC/MS

Field ID:	MHP-CS-062701-UnStream-9	Laboratory ID:	42445-03
Project:	Sullivan's Ledge/C47968	QC Batch ID:	SV-0993-M
Client:	Harding Lawson Associates	Sampled:	06-27-01
Container:	250 mL Glass	Received:	06-28-01
Preservation:	Cool	Extracted:	06-29-01
Matrix:	Soil	Analyzed:	07-06-01
% Moisture:	14	Dilution Factor:	1

CAS Number	Analyte	Concentration	Units	Reporting Limit
91-20-3	Naphthalene	BRL	ug/Kg	380
91-57-6	2-Methylnaphthalene	BRL	ug/Kg	380
208-96-8	Acenaphthylene	BRL	ug/Kg	380
83-32-9	Acenaphthene	BRL	ug/Kg	380
86-73-7	Fluorene	BRL	ug/Kg	380
85-01-8	Phenanthrene	BRL	ug/Kg	380
120-12-7	Anthracene	BRL	ug/Kg	380
206-44-0	Fluoranthene	BRL	ug/Kg	380
129-00-0	Pyrene	BRL	ug/Kg	380
56-55-3	Benzo[a]anthracene	BRL	ug/Kg	380
218-01-9	Chrysene	BRL	ug/Kg	380
205-99-2	Benzo[b]fluoranthene	BRL	ug/Kg	380
207-08-9	Benzo[k]fluoranthene	BRL	ug/Kg	380
50-32-8	Benzo[a]pyrene	BRL	ug/Kg	380
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL	ug/Kg	380
53-70-3	Dibenzo[a,h]anthracene	BRL	ug/Kg	380
191-24-2	Benzo[g,h,i]perylene	BRL	ug/Kg	380

QC Surrogate Compounds	Recovery	QC Limits
Nitrobenzene-d_5	42 %	23 - 120 %
2-Fluorobiphenyl	53 %	30 - 115 %
Terphenyl-d_{14}	63 %	18 - 137 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as selected from the Polynuclear Aromatic Hydrocarbon analytes specified by the Target Compound List (TCL) of the US EPA Contract Laboratory Program. Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution, percent moisture and sample size.

O'BRIEN & GERE
ENGINEERS, INC.

December 27, 2001

Mr. David O. Lederer
Remedial Project Manager
Environmental Protection Agency (HBO)
Region 1
1 Congress Street, Suite 1100
Boston, MA 02114-2023

Re: Sullivan's Ledge Superfund Site
Summer 2001 Soil and Sediment Data
File: 5509.005 #2

Dear Dave:

In July 2001, Harding ESE, in response to a request by the Sullivan's Ledge Site Group, collected 6 soil and 18 sediment samples for analysis for PCBs and TOC (sediment samples only). In addition, 5 sediment samples were analyzed for PAHs and metals. This sampling was conducted as a baseline precursor to the bi-annual sampling required by Section VI.B.2 of the Statement of Work (SOW).

The data validation report for the sampling program is attached. Sampling locations are shown on the attached field sampling sheets prepared by HLA. PCB results are summarized on attached Tables 1 and Table 2. PAH and metals results for the five sediment samples are summarized on Table 3. As discussed in the draft Operable Unit 1 Remedial Construction Report, the PCB sample results were consistent with the December 2000 results, and were non-detect for PCBs at 16 locations, with the detected results ranging from 0.110 mg/kg to 0.820 mg/kg, and averaging 0.230 mg/kg.

Please contact us if you have any questions pertaining to this letter.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC

James R. Heckathorne, PE
Vice President

cc: S. Wood, E. Bertaut, R. Connors, E. Vaughn, D. Dwight, S. Alfonse, M. Wade, G. Swenson, J. O'Loughlin

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Un-named Stream: Summer 2001

Harding Lawson Associates
Construction Division
7000 E. Belleview Ave. Suite 209
Greenwood Village, Colorado 80111
Phone (303) 221-1360
Fax (303) 221-1361

Page 1 of 1
Lab I.D.: Groundwater Analytical
Work Authorization Number: C47968
Sample Round/Episode: Summer 2001

CHAIN-OF-CUSTODY RECORD

Project Name/Project No.	Sample Date	Sample Technique:	Site Identification:
Sullivan's Ledge C47968	Wed 6/27/01	Grab	Un-named Stream
Sampler: (~~Signature~~)	Sample Depth: (~~Ft.~~)	File-Type/Matrix:	Sampled upstream (#1) to downstream (#9; at Pond A).
R. Travis Canon	0-5"	Sediment	

	TIME	SAMPLE I.D.	ANALYSIS REQUIRED	CONTAINER	PRESERVATIVE/REMARKS
1	15:00	MHP-CS-	062701-UnStream	-1 ⊛	One-Week
2	15:10	↓	↓	-2	Turn
3	17:00			-3	
4	16:46			-4	
5	16:35			-5 ⊛	
•					Analysis:
6	16:20	MHP-CS-	062701-UnStream	-6	• PCBs [all samples]
7	16:10	↓	↓	-7	• TCO [all samples]
8	15:57			-8	⊛ PAH (8270)
9	15:50	↓	↓	-9 ⊛	⊛ TAL Metals (6010/7470)

also on these.

Note to HLA: Used SS bowls + spoons to collect samples; all equip. deconned per specs prior to being used. All samples ~~to~~ thoroughly mixed before being put into sample jar. Sample #1 collected 10ft below outlet culvert from Sed. Basin.

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
R. Travis Canon	Th 6/28/01 11:15	6/28 11:15
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Airbill Number: Groundwater Analytical pick up

Final File Copy/White Lab File Copy/Yellow Field Copy/Pink

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• MHP-CS- : Material Handling Plan - Confirmation Sample

• MHP-CS-062701-UnStream-1, 2, 3, 4, 5, 6, 7, 8, 9.

SL-RTC8-93 Un-named Stream — Wed 6/27/01

Summer 2001

• Sampling (#1) started 10 ft downstream (North) from Sed. Basin outlet pipe, then at ≈200 ft intervals till Pond A.

Scott Fisher, NEE, accompanied me on the sampling (in part) to cross-train him on Sullivan's sampling proceedures. (Samples #1 + 2).

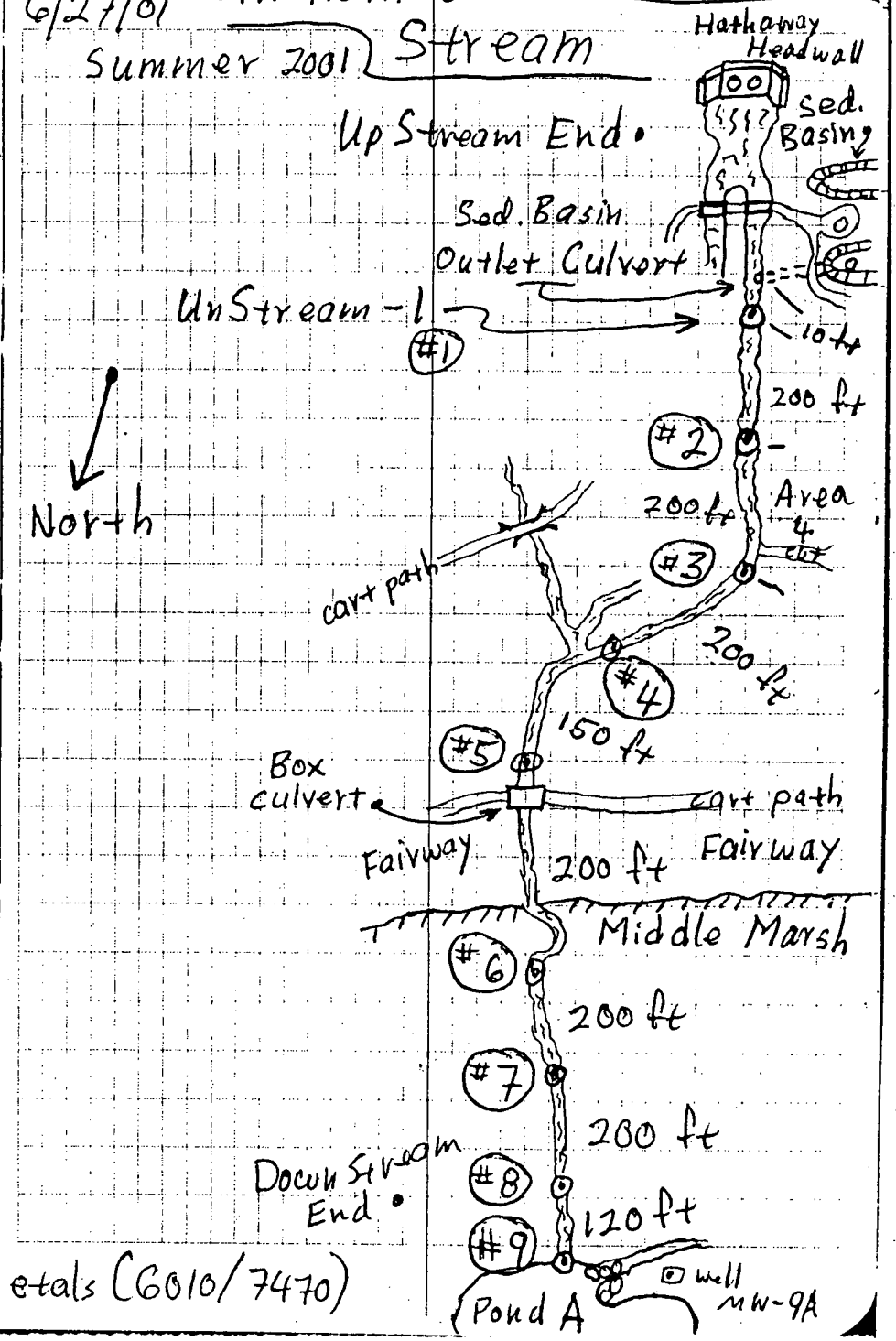
Time		Sampling #
15:00	⊛	MHP-CS-062701-UnStream-1 1
15:10		-2 2
17:00		-3 9
16:46		-4 8
16:35	⊛	-5 7
16:20		MHP-CS-062701-UnStream-6 6
16:10		-7 5
15:57		-8 4
15:50	⊛	-9 3

• PCBs • TCOs ← all samples

⊛ Analylized for PAH (8270) + Tal metals (6010/7470)

Wed 6/27/01 Un-named Stream — SL-RTC8-93

Summer 2001



Diversion Swale: Summer 2001

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Page 1 of 1
Lab I.D.: Groundwater Analytical
Work Authorization Number: C47968
Sample Round/Episode: Summer 2001

CHAIN-OF-CUSTODY RECORD

Project Name/Project No.	Sample Date	Sample Technique:	Site Identification:
Sullivan's Ledge C47968	Tu 6/26/01	Grab	Diversion Swale
Sampler: (~~Signature~~)	**Sample Depth: (~~FT~~)**	**File-Type/Matrix:**	
R. Travis Canon	0-5"	Sediment	

TIME	SAMPLE I.D.	ANALYSIS REQUIRED	CONTAINER	PRESERVATIVE/REMARKS
15:58	MHP-CS-	062601-Div Swale-1	(*) #1 only	One-week turn
15:50	MHP-CS-	062601-Div Swale-2		
15:40	MHP-CS-	062601-Div Swale-3		
15:33	MHP-CS-	062601-Div Swale-4		
16:16	MHP-CS-	062601-Div Swale-Hath		
		• PCBs		• 250 ml clear
		• TCO (Total Comb. Carbon)		glass jar
	only #1 (*)	• PAH (8270) + • TAL metals (6010/7470)		
Note to HLA: Used SS bowls + spoons, decanted per specs. Samples thoroughly mixed prior to putting sample in jar. Bulk of H_2O decanted off.				

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
R. Travis Canon	Wed 10:44 6/27/01	[illegible]
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Airbill Number: Groundwater Analytical Pickup

Final File Copy/White Lab File Copy/Yellow Field Copy/Pink

• MHP-CS- : Material Handling Plan - Confirmation Sample

00385 CD

• MHP-CS-062601-Div Swale-1, 2, 3, 4, + Hath.

SL-RTC8-90 Summer 2001 | Diversion Swale | Tu 6/26/01

• 5 Samples collected, 4 from original, previous location plus one new sample (Hath.) per J. O'Loughlin. Div Swale-1 collected across from, then 10 ft downstream from Sed. Basin outlet. #2, 3, + 4 are then 200 ft downstream.

"Hath" sample collected ~~instruc~~ Per instructions from J. O'Loughlin: 10 ft North (downstream) from the East 42" RCP pipe in headwall at Hath. Rd.

Time	rec	Sample #
15:38	MHP-	Cs-062601-Div.Swale-1 ⊗
15:50	↓	-2
15:40		-3
15:33		-4
16:16		-Hath

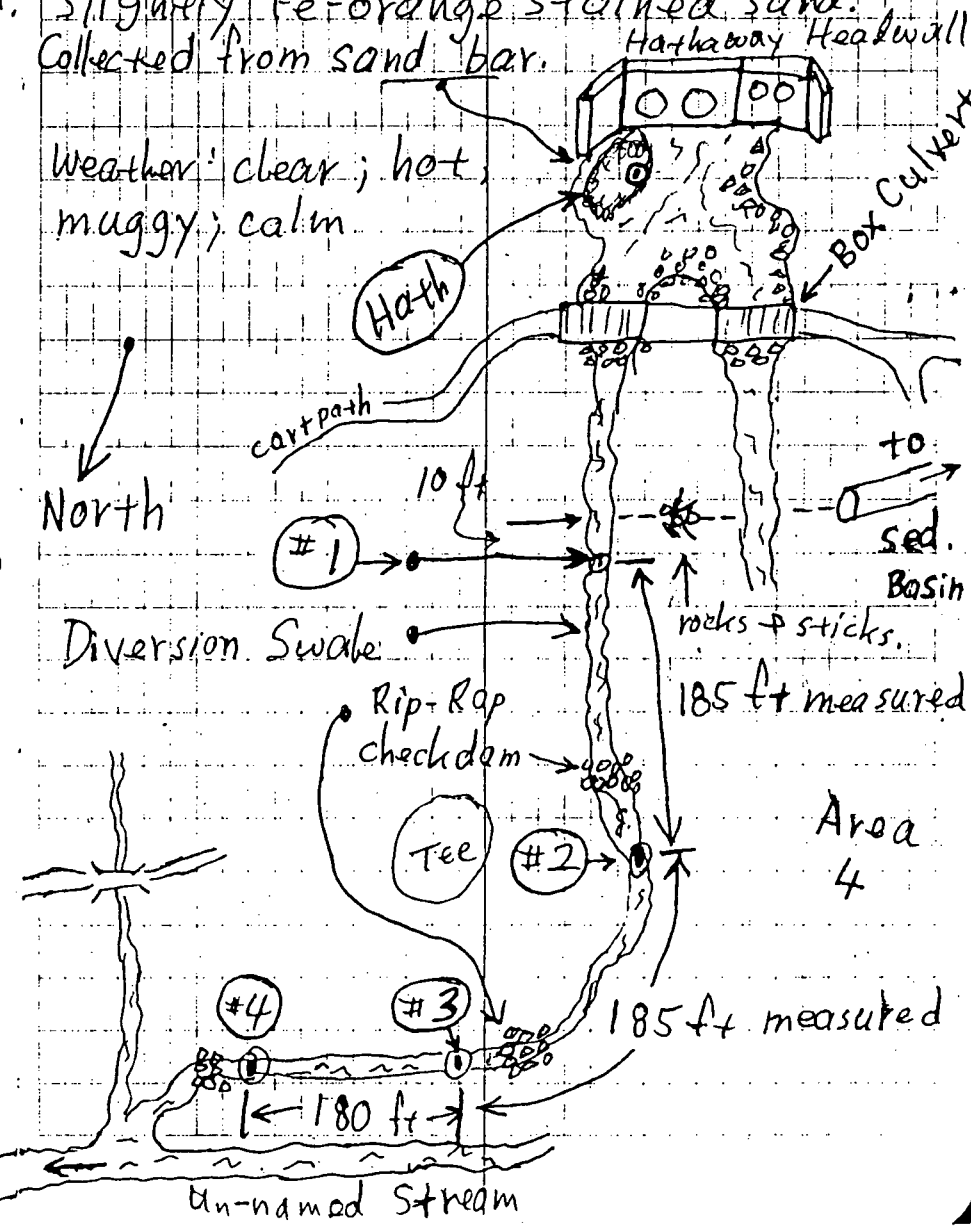
• Analysis: ① PCBs ⊗ Also for PAH and TAL metals
② TCO

• Material: #2, 3, + 4 very similar: fine to med. sand w/ a grey clay layer ≈ 1-3" down. #1 was silty fine sand in a

SL-RTC8-91 Summer 2001 | Diversion Swale | Tu 6/26/01

bladish grey ooze. "Hath" was fine to coarse sand; no clay or organics. Slightly Fe-orange stained sand. Collected from sand bar.

Weather: clear; hot; muggy; calm



Sed. Basin : Summer 2001

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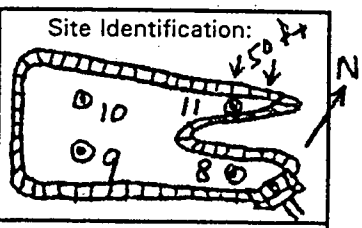
Page ____ of 1
Lab I.D.: Groundwater Analytical
Work Authorization Number: C47968.06
Sample Round/Episode: Summer 2001

CHAIN-OF-CUSTODY RECORD

Project Name/Project No.	Sample Date	Sample Technique:	Site Identification:
Sullivan's Ledge C47968	Tu 6/26/01	Grab	
Sampler: (~~Signature~~) R. Travis Canon	Sample Depth: ~~[illegible]~~ 0-5"	File-Type/Matrix: Sediment	

TIME	SAMPLE I.D.	ANALYSIS REQUIRED	CONTAINER	PRESERVATIVE/REMARKS
• 9:00	MHP-CS-	062601-SedB-	8 ⊛	↑50↑
• 9:20	↓	-SedB-	9	• One-Week
• 9:40	↓	-SedB-	10	Turn
• 10:00	↓	-SedB-	11	
			• 250ml wide-mouth jar	
		• PCBs (all samples)		
		• TCO (all samples) [Total Comb. Organics]		
	⊛	• PAH, #8270 (Sed B-8 only)		
	⊛	• TAL metals, #6010/7470 (Sed B-8 only)		

Note to HLA: Samples collected close to original locations with decanned (per specs.) SS bowls + spoons. All samples thoroughly mixed especially #8, 9 + 10 due to their high clay content. Only #11 had excess water which was decanted off.

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
R. Travis Canon	Wed 6/27/01 10:45	[signature]
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Airbill Number: Groundwater Analytical pickup

• MHP-CS-062601-SedB-8, 9, 10, + 11

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• MHP-CS : Material Handing Plan-Cont. Sample

Sed. Basin

Summer 2001

Tu 6/26/01

8:00-8:45 Pick up decon equip. at shawmutt landfill. Decon SS bowls + spoons, including alkonox soap, alcohol rinse, + De-ionized water rinse.

- Sampled original 4 locations in sediment Basin, #8, 9, 10, + 11. #10 + 11 ~~are~~ were sampled 50 ft west of the basin "horns" (or ends). 4 samples total.

Time	Sample #
9:00	MHP-CS-062601-Sed B-8
9:20	-9
9:40	-10
10:00	-11

- #8: clayey silt; no excess water.
- #9: silty clay, no excess water
- #10: silty clay; no excess water
- #11: black, organic clayey ooze; much RTC water; excess water decanted off.

Weather: clear, hot, muggy, still, calm.

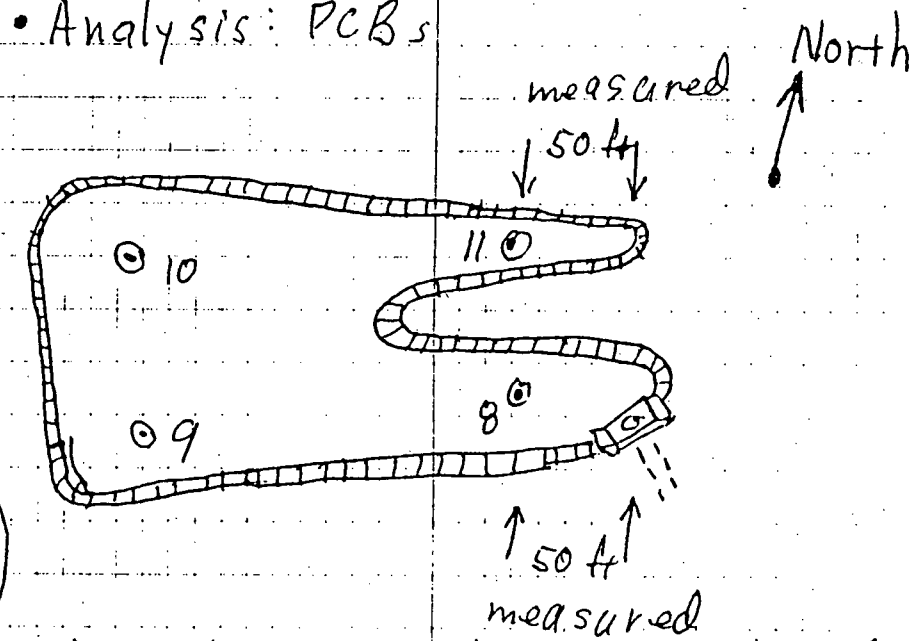
Sed. Basin

Summer 2001

Tu 6/26/01

Note: Samples #9 + 10 and to some extent #8 were very clayey and took a long time to thoroughly mix. Some organics (mostly roots) are mixed in. #11 was very organic + black; ~~oozey~~ RTC oozey.

- Analysis: PCBs



A small amount of water collected in jar after ≈ 30 minutes. This H_2O was decanted off.

East + South Swales: Summer 2001

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Page 1 of 1
Lab I.D.: Groundwater Analytical
Work Authorization Number: C47968
Sample Round/Episode: Summer 2001

CHAIN-OF-CUSTODY RECORD

Project Name/Project No.	Sample Date	Sample Technique:	Site Identification:
Sullivan's Ledge 47968	Tu 6/26/01	Grab	• E. Swale: North, mid., + South end.
Sampler: (~~Signature~~) R. Travis Canon	Sample Depth: (Ft.) 0-4"	File-Type/Matrix: Sediment	• S. Swale: East, Middle + W. ends

TIME	SAMPLE I.D.	ANALYSIS REQUIRED	CONTAINER	PRESERVATIVE/REMARKS
	East Swale (ESw)			• One-Week
• 13:30	MHP-CS-	062601-ESw	-N ← • Dup	Turn
• 13:20	↓	↓	-Mid RTC 7/10/01	
• 13:10	↓	↓	-S	
			• PCBs	• 250 ml clear
	South	Swale (SSw)		glass jars
• 12:15	MHP-CS-	062601-SSw	-E	
• 12:25	MHP-CS-	062601-SSw	-Mid	
• 12:35	MHP-CS-	062601-SSw	-W	
• X	MHP-CS-	062601-Dup	← • Duplicate sample taken w/	
			ESw-N RTC	7/10/01
Note to HLA: Used SS bowls + spoons, deconed per specs. All samples thoroughly mixed prior to placing into jar.				

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
R. Travis Canon	Wed 6/27/01 10:46	[illegible]
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Airbill Number: Groundwater pickup.

Final File Copy/White Lab File Copy/Yellow Field Copy/Pink

00384 CD

• MHP-CS: Material Handling Plan-Confirmation Sample

(S) MHP-CS-062601-SSw-E, Mid, W

(E) MHP-CS-062601-ESw-N, Mid, S

SL-RTC8-86

Summer 2001

East Swale

TU 6/26/01

3 Samples collected from the East Swale at the North, Middle, + South ends.
Used SS bowls + spoons deconned per specs. Sample material thoroughly mixed prior to placing into 250 ml wide-mouth jars.

Time	Sample #
13:30	MHP-CS-062601-ESw-N
13:20	-Mid
~~12~~:10	-S
13:30	MHP-CS-062601-Dup w/ N

• Analysis: PCBs

• Material: Very similar in all 3 samples: silty very fine-fine sand; minor clay; trace roots; sediment damp (no excess water).

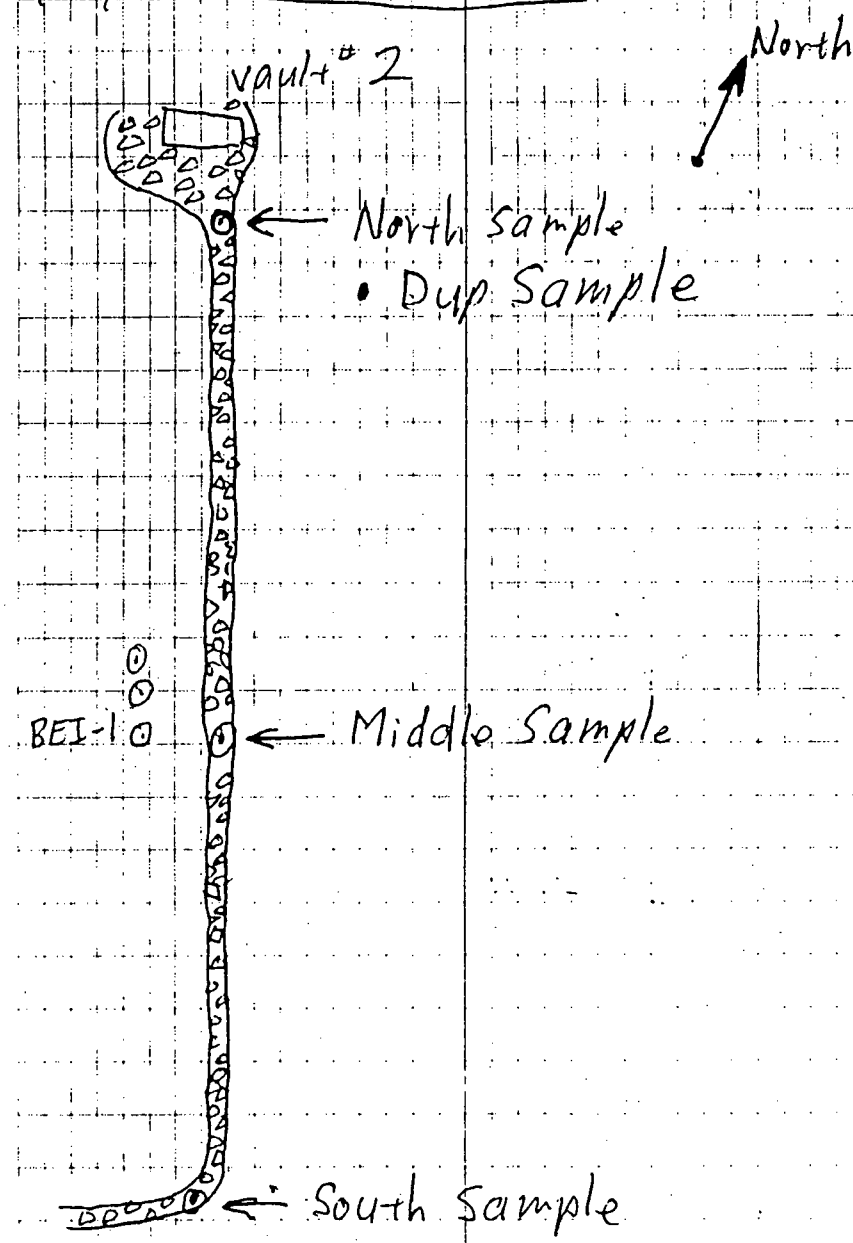
Weather: hot; muggy; clear-PC; calm

TU 6/26/01

East Swale

SL-RTC8-87

Summer 2001



SL-RTC8-88 / South Swale — Tu 6/26/01

Summer 2001

- 3 Samples collected from the South Swale at the East, Middle, + North ends.

RTC used SS bowls + spoons decontaminated per specs. Sample material thoroughly mixed prior to putting into wide-mouth jars.

Time	Sample #
12:15	MHP-CS-062601-SSw-E
12:25	MHP-CS-062601-SSw-Mid
12:35	MHP-CS-062601-SSw-W

- Analysis: PCBs

- Material in all 3 samples very much the same: very fine to fine sand w/ some to minor clay; trace organics (roots). All 3 samples saturated; excess water decanted out of sample.

Weather: hot, clear w/ a few puffs; muggy; calm

Tu 6/26/01 — South Swale — SL-RTC8-89

Summer 2001

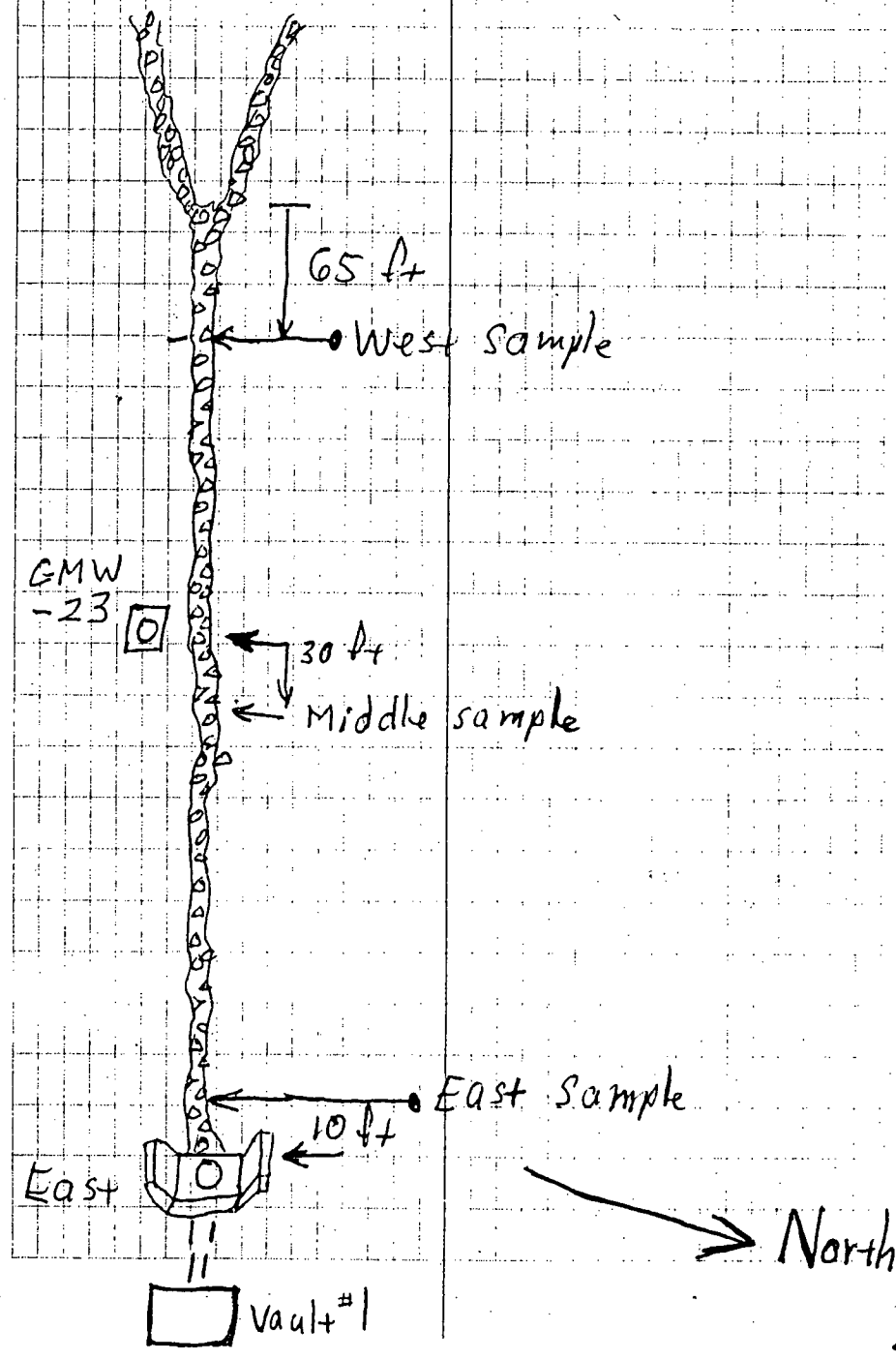


TABLE 1
SULLIVAN'S LEDGE SUPERFUND SITE
PCB CONCENTRATIONS IN SOIL AND SEDIMENT SAMPLES

Samples Collected Before Phase III Construction											
Cap Samples[2]				Cap Swale Samples[3]		Sed. Basin Samples[4]		Diversion Swale Samples[5]			
Sample Location	PCB conc. (ug/Kg)			Sample Location	PCB conc. (ug/Kg)	Sample Location	PCB conc. (ug/Kg)	Sample Location	PCB conc. (ug/Kg)		
Cap-12	70			ESW-N	220	Sed-08	210	S-1	140		
Cap-13	ND			ESW-MID	760	Sed-09	390	S-2	370		
Cap-14	ND			ESW-S	370	Sed-10	180	S-2R	120		
Cap-17	ND			SSW-E	ND	Sed-11	980	S-3	200		
Cap-18	ND			SSW-MID	ND			S-4	150		
				SSW-W	120			S-5	ND		
								S-6	70		
								S-7	ND		
								S-8	ND		

Samples Collected After Phase III Construction (DECEMBER 2000 and MARCH 2001)											
Cap Samples[6]		Cap Samples[7]		Cap Swale Samples[8]		Sed. Basin Samples[9]		Diversion Swale Samples[10]		Un-named Stream Samples[11]	
Sample Location	PCB conc. (ug/Kg)	Sample Location	PCB conc. (ug/Kg)	Sample Location	PCB conc. (ug/Kg)	Sample Location	PCB conc. (ug/Kg)	Sample Location	PCB conc. (ug/Kg)	Sample Location	PCB conc. (ug/Kg)
Cap-12	ND	Cap-20	ND	ESW-N	240	Sed-08	130	S-1	ND	US-1	ND
Cap-13	ND	Cap-21	ND	ESW-MID	87	Sed-09	250	S-2	ND	US-2	220
Cap-14	ND	Cap-21D	ND	ESW-S	ND	Sed-10	ND	S-3	100	US-3	ND
Cap-15	ND	Cap-22	ND	ESW-S DUP	ND	Sed-11	250	S-4	520	US-4	ND
Cap-16	ND	Cap-23	ND	SSW-E	ND					US-5	ND
Cap-17	ND	Cap-24	ND	SSW-Mid	ND			S-4 R	ND	US-5D	ND
Cap-18	ND	Cap-25	ND	SSW-Mid DUP	ND			S-4 UP	ND	US-6	ND
Cap-19	ND	Cap-26	ND	SSW-W	140			S-4 DOWN	ND	US-7	ND
		Cap-27	ND					S-4 FAIRWAY	ND	US-8	ND
		Cap-28	ND					S-4 ISLE	ND	US-9	ND
		Cap-29	ND								

Samples Collected After Phase III Construction (JUNE 2001)											
Cap Samples		Cap Samples		Cap Swale Samples[12]		Sed. Basin Samples[13]		Diversion Swale Samples[14]		Un-named Stream Samples[15]	
Sample Location	PCB conc. (ug/Kg)	Sample Location	PCB conc. (ug/Kg)	Sample Location	PCB conc. (ug/Kg)	Sample Location	PCB conc. (ug/Kg)	Sample Location	PCB conc. (ug/Kg)	Sample Location	PCB conc. (ug/Kg)
				ESW-N	ND	Sed-08	ND	S-1	150	US-1	170
				ESW-N (DUP)	ND	Sed-09	ND	S-2	100	US-2	ND
				ESW-MID	ND	Sed-10	ND	S-3	ND	US-3	ND
				ESW-S	130	Sed-11	180	S-4	ND	US-4	ND
				SSW-E	ND			Hathaway	210	US-5	820
				SSW-Mid	ND					US-6	ND
				SSW-W	ND					US-7	ND
										US-8	ND
										US-9	110

NOTES:

1. Samples collected by and analyzed on behalf of Harding Lawson Associates, Inc.
2. Collected on 4/27/00 from portions of cap outside of bermed area.
3. Collected on 4/27/00 from eastern drainage swale (ESW) and southern drainage swale (SSW).
4. Collected on 4/28/00 from sedimentation basin.
5. Collected on 4/26/00 from diversion swale. Sample S-2R collected on 07/13/00, after excavation between stations S-1 and S-3.
6. Collected on 12/01/00 from cap, at approximate locations of previous samples.
7. Collected on 12/02/00 from cap, at new locations.
8. Collected on 12/03/00 from cap swales, at approximate locations of previous samples.
9. Collected on 12/01/00 from sedimentation basin, at approximate locations of previous samples.
10. Initial samples S-1 through S-4 collected on 12/02/01. Additional samples (S-4R, S-4 UP, S-4 DOWN, S-4 FAIRWAY, S-4 ISLE) collected on 3/1/01 at locations relative to initial sample S-4.
11. Collected on 12/03/00 from the un-named stream, at new locations.
12. Collected on June 26, 2001 from cap swales.
13. Collected on June 26, 2001 from sedimentation basin.
14. Collected on June 26, 2001 from diversion swale.
15. Collected on June 27, 2001 from Un-Named Stream.

TABLE 2
SULLIVAN'S LEDGE SUPERFUND SITE
PCB CONCENTRATIONS IN SEDIMENT SAMPLES[1]

Location	Sample ID	PCB Conc. ug/kg		TCO Conc.[2] %		ug PCBs / Gram Carbon[3]	
		DEC. 00	JUN. 01	DEC. 00	JUN. 01	DEC. 00	JUN. 01
Sedimentation Basin	Sed-08	130	LT 80	4.7	2.0	2.8	LT 4.0
Sedimentation Basin	Sed-09	250	LT 80	5.9	4.0	4.2	LT 2.0
Sedimentation Basin	Sed-10	LT 80	LT 80	3.6	7.2	LT 2.2	LT 1.1
Sedimentation Basin	Sed-11	250	180	4.8	5.5	5.2	3.3
Diversion Swale	Hathaway	-	210	-	0.71	-	**30**
Diversion Swale	S-1	LT 80	150	1.9	4.2	LT 4.2	3.6
Diversion Swale	S-2	LT 80	100	1.1	2.1	LT 7.3	4.8
Diversion Swale	S-3	100	LT 80	1.4	1.4	LT 7.1	LT 5.7
Diversion Swale	S-4	520	LT 80	1.6	1.4	**32.5**	LT 5.7
Diversion Swale[4]	S-4R	LT 80	-	1.5	-	LT 5.3	-
Diversion Swale[4]	S-4 UP	LT 80	-	1.3	-	LT 6.2	-
Diversion Swale[4]	S-4 DOWN	LT 80 / 890	-	1.9	-	LT 4.2 / **47**	-
Diversion Swale[4]	S-4 FAIRWAY	LT 80	-	1.4	-	LT 5.7	-
Diversion Swale[4]	S-4 ISLE	LT 80	-	1.5	-	LT 5.3	-
Un-Named Stream	US-1	LT 80	170	1.1	1.4	LT 7.3	12
Un-Named Stream	US-2	220	LT 80	0.28	0.9	**78**	LT 8.9
Un-Named Stream	US-3	LT 80	LT 80	0.80	1.2	LT 10	LT 6.7
Un-Named Stream	US-4	LT 80	LT 80	1.1	1.1	LT 7.3	LT 7.3
Un-Named Stream	US-5	LT 80	820	0.76	1.4	LT 10	**59**
Un-Named Stream	US-5DUP	LT 80	LT 80	-	-	-	-
Un-Named Stream	US-6	LT 80	LT 80	0.95	1.2	LT 8.4	LT 6.7
Un-Named Stream	US-7	LT 80	LT 80	0.97	1.2	LT 8.2	LT 6.7
Un-Named Stream	US-8	LT 80	LT 80	0.79	1.1	LT 10	LT 7.3
Un-Named Stream	US-9	LT 80	110	0.74	0.94	LT 11	12

Notes:
1. Samples collected by and analyzed on behalf of Harding Lawson Associates, Inc. See Table 1 for date of sample collection.
2. Total Combustable Organics.
3. Statement of Work criteria is 20 ug PCBs / gram carbon.
4. Initial samples S-1 through S-4 collected on 12/02/01. Additional samples (S-4R, S-4 UP, S-4 DOWN, S-4 FAIRWAY, S-4 ISLE) collected on 3/1/01at locations relative to S-4.

TABLE 3
SULLIVAN'S LEDGE SUPERFUND SITE
PAH AND METALS CONCENTRATIONS IN SEDIMENT SAMPLES[1]

	Sedimentation Basin	Diversion Swale	Un-Named Stream		
	Sed-8	S-1	US-1	US-5	US-9
Naphthalene	LT 400	320 J	LT 360	LT 340	LT 380
2-Methylnaphthalene	LT 400	LT 500	LT 360	LT 340	LT 380
Acenaphthylene	LT 400	490 J	LT 360	LT 340	LT 380
Acenaphthene	LT 400	390 J	LT 360	LT 340	LT 380
Fluorene	LT 400	LT 500	LT 360	LT 340	LT 380
Phenanthrene	LT 400	1600	LT 360	LT 340	LT 380
Anthracene	LT 400	570	LT 360	LT 340	LT 380
Fluoranthene	LT 400	3000	LT 360	LT 340	LT 380
Pyrene	LT 400	2600	LT 360	LT 340	LT 380
Benzo(a)anthracene	LT 400	1300	LT 360	LT 340	LT 380
Chyrsene	LT 400	1600	LT 360	LT 340	LT 380
Benzo(b)fluoranthene	LT 400	1700	LT 360	LT 340	LT 380
Benzo(k)flluoranthene	LT 400	840	LT 360	LT 340	LT 380
Benzo(a)pyrene	LT 400	1400	LT 360	LT 340	LT 380
Indeno(1,2,3-cd)pyrene	LT 400	1200	LT 360	LT 340	LT 380
Dibenzo(a,h)anthracene	LT 400	660	LT 360	LT 340	LT 380
Benzo(g,h,I)perylene	LT 400	1100	LT 360	LT 340	LT 380
Aluminum	3700 J	5100 J	1400 J	2400 J	1400 J
Antimony	LT 1.3	LT 1.6	LT 1.2	LT 1.1	LT 1.1
Arsenic	2.9	2.6	LT 1.2	LT 1.1	LT 1.1
Barium	LT 26	41	LT 24	LT 23	LT 22
Beryllium	LT 0.53	LT 0.65	LT 0.48	LT 0.45	LT 0.45
Cadmium	LT 0.66	LT 0.81	LT 0.6	LT 0.56	LT 0.56
Calcium	1000 J	1400 J	400 J	710 J	280 J
Chromium	LT 13	22	LT 12	LT 11	LT 11
Cobalt	LT 6.6	LT 8.1	LT 6	LT 5.6	LT 5.6
Copper	LT 26	LT 33	LT 24	LT 23	LT 22
Iron	8800 J	13000 J	3600 J	5200 J	3800 J
Lead	LT 13	67	LT 12	12	LT 11
Magnesium	1400 J	2300 J	640 J	1400 J	810 J
Manganese	150 J	290 J	72 J	86 J	87 J
Mercury	LT 0.043	0.073	LT 0.037	LT 0.036	LT 0.039
Nickel	LT 13	LT 16	LT 12	LT 11	LT 11
Potassium	230 J	930 J	170 J	520 J	160 J
Selenium	LT 13	LT 16	LT 12	LT 11	LT 11
Silver	LT 6.6	LT 8.1	LT 6	LT 5.6	LT 5.6
Sodium	LT 660	LT 810	LT 600	LT 560	LT 560
Thallium	LT 6.6	LT 8.1	LT 6	LT 5.6	LT 5.6
Vanadium	7.9	14	LT 6	7.6	LT 5.6
Zinc	LT 66	LT 81	LT 60	LT 56	LT 56

Notes:
1. Samples collected by and analyzed on behalf of Harding Lawson Associatews, Inc. See Table 1 for date of sample collection.