GROUNDWATER ANALYTICAL

Groundwater Analytical, Inc.
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September 22, 2005

Mr. Kevin Trainer
GeoInsight, Inc.
5 Lan Drive
Second Floor
Westford, MA 01886

LABORATORY REPORT

Project: **Buzzards Bay/3871-002**
Lab ID: **87247**
Received: **08-30-05**

Dear Kevin:

Enclosed are the analytical results for the above referenced project. The project was processed for Standard turnaround.

This letter authorizes the release of the analytical results, and should be considered a part of this report. This report contains a sample receipt report detailing the samples received, a project narrative indicating project changes and non-conformances, a quality control report, and a statement of our state certifications.

The analytical results contained in this report meet all applicable NELAC standards, except as may be specifically noted, or described in the project narrative. This report may only be used or reproduced in its entirety.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,

Eric H. Jensen
Operations Manager

EHJ/kal
Enclosures

GROUNDWATER ANALYTICAL

Sample Receipt Report

Project: **Buzzards Bay/3871-002**
Client: **GeoInsight, Inc.**
Lab ID: **87247**

Delivery: **Hand**
Airbill: **n/a**
Lab Receipt: **08-30-05**

Temperature: **4.8'C**
Chain of Custody: **Present**
Custody Seal(s): **n/a**

Lab ID	Field ID		Matrix	Sampled	Method				Notes
87247-1	W2A02-82905-01		Soil	8/29/05 11:30	MA DEP EPH with PAHs by 8270C-Mod SIM				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C613445	120 mL Amber Glass	Proline	BX17622	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
87247-2	W2A02-82905-02		Soil	8/29/05 11:32	MA DEP EPH with PAHs by 8270C-Mod SIM				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C613447	120 mL Amber Glass	Proline	BX17622	None	n/a	n/a	n/a		

GROUNDWATER ANALYTICAL

Data Certification

Project: **Buzzards Bay/3871-002** Lab ID: **87247**
Client: **GeoInsight, Inc.** Received: **08-30-05 20:21**

MA DEP Compendium of Analytical Methods						
Project Location: **n/a**				MA DEP RTN: **n/a**		
This Form provides certifications for the following data set: MA DEP EPH: 87247-01,-02						
Sample Matrices:	Groundwater ( )	Soil/Sediment (X)	Drinking Water ( )	Other ( )		
MCP SW-846 Methods Used	8260B ( )	8151A ( )	8330 ( )	6010B ( )	7470A/1A ( )	
	8270C ( )	8081A ( )	VPH ( )	6020 ( )	9012A[2] ( )	
As specified in MA DEP Compendium of Analytical Methods. (check all that apply)	8082 ( )	8021B ( )	EPH (X)	7000 S[3] ( )	Other ( )	
	1. List Release Tracking Number (RTN), if known.					
	2. SW-846 Method 9012A (Equivalent to 9014) or MA DEP Physiologically Available Cyanide (PAC) Method					
	3. S - SW-846 Methods 7000 Series. List individual method and analyte.					

An affirmative response to questions A, B, C and D is required for "Presumptive Certainty" status.

A.	Were all samples received by the laboratory in a condition consistent with that described on the Chain-of-Custody documentation for the data set?	Yes
B.	Were all QA/QC procedures required for the specified analytical method(s) included in this report followed, including the requirement to note and discuss in a narrative QC data that did not meet appropriate performance standards or guidelines?	Yes
C.	Does the analytical data included in this report meet all the requirements for "Presumptive Certainty," as described in Section 2.0 of the MA DEP document CAM VII A, *Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data*?	Yes
D.	VPH and EPH methods only: Was the VPH or EPH method run without significant modifications, as specified in Section 11.3?	Yes

A response to questions E and F below is required for "Presumptive Certainty" status.

E.	Were all QC performance standards and recommendations for the specified methods achieved?	Yes
F.	Were results for all analyte-list compounds/elements for the specified method(s) reported?	Yes

All No answers are addressed in the attached Project Narrative.

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Position: Operations Manager
Printed Name: Eric H. Jensen Date: 09-22-05

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**W2A02-82905-01**	Matrix:	**Soil**
Project:	**Buzzards Bay/3871-002**	Container:	**120 mL Amber Glass**
Client:	**Geolnsight, Inc.**	Preservation:	**Cool**
Laboratory ID:	**87247-01**	QC Batch ID:	**EP-2142-M**
Sampled:	**08-29-05 11:30**	Instrument ID:	**GC-9 Agilent 6890**
Received:	**08-30-05 20:21**	Sample Weight:	**15 g**
Extracted:	**09-12-05 14:00**	Final Volume:	**1 mL**
Analyzed (AL):	**09-22-05 05:08**	% Solids:	**88**
Analyzed (AR):	**09-22-05 05:52**	Aliphatic Dilution Factor:	**1**
Analyst:	**MM**	Aromatic Dilution Factor:	**1**

EPH Ranges	Concentration	Notes	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL		mg/Kg	33
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL		mg/Kg	33
n-C11 to n-C22 Aromatic Hydrocarbons †◊	BRL		mg/Kg	33
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	BRL		mg/Kg	33

QC Surrogate Compound		Spiked	Measured	Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	2.9	2.2	**76 %**	40 - 140 %
	2-Bromonaphthalene	2.9	2.3	**79 %**	40 - 140 %
Extraction:	Chloro-octadecane	2.9	2.1	**72 %**	40 - 140 %
	ortho -Terphenyl	2.9	2.2	**74 %**	40 - 140 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.1.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (Revision 1.1, 2004).
Sample extraction performed by microwave accelerated solvent extraction technique. 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 size and dilution.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

EPA Method 8270C (Modified)
MA DEP EPH Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

Field ID:	**W2A02-82905-01**	Matrix:	**Soil**
Project:	**Buzzards Bay/3871-002**	Container:	**120 mL Amber Glass**
Client:	**GeoInsight, Inc.**	Preservation:	**Cool**
Laboratory ID:	**87247-01**	QC Batch ID:	**EP-2142-M**
Sampled:	**08-29-05 11:30**	Instrument ID:	**MS-6 HP 6890**
Received:	**08-30-05 20:21**	Sample Volume:	**15 g**
Extracted:	**09-12-05 14:00**	Final Volume:	**1 mL**
Analyzed:	**09-21-05 12:28**	Percent Solids:	**88**
Analyst:	**JJT**	Dilution Factor:	**1**

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
91-20-3	Naphthalene	BRL		ug/Kg	11
91-57-6	2-Methylnaphthalene	BRL		ug/Kg	11
208-96-8	Acenaphthylene	BRL		ug/Kg	11
83-32-9	Acenaphthene	BRL		ug/Kg	11
86-73-7	Fluorene	BRL		ug/Kg	11
85-01-8	Phenanthrene	**42**		ug/Kg	11
120-12-7	Anthracene	BRL		ug/Kg	11
206-44-0	Fluoranthene	**110**		ug/Kg	11
129-00-0	Pyrene	**130**		ug/Kg	11
56-55-3	Benzo[a]anthracene	**55**		ug/Kg	11
218-01-9	Chrysene	**63**		ug/Kg	11
205-99-2	Benzo[b]fluoranthene	**63**		ug/Kg	11
207-08-9	Benzo[k]fluoranthene	**27**		ug/Kg	11
50-32-8	Benzo[a]pyrene	**43**		ug/Kg	11
193-39-5	Indeno[1,2,3-c,d]pyrene	**36**		ug/Kg	11
53-70-3	Dibenzo[a,h]anthracene	**17**		ug/Kg	11
191-24-2	Benzo[g,h,i]perylene	**29**		ug/Kg	11

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
ortho-Terphenyl	2,900	2,100	**72 %**	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method.
Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.
Sample extraction performed by EPA Method 3546. 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 size and dilution.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**W2A02-82905-02**	Matrix:	**Soil**
Project:	**Buzzards Bay/3871-002**	Container:	**120 mL Amber Glass**
Client:	**GeoInsight, Inc.**	Preservation:	**Cool**
Laboratory ID:	**87247-02**	QC Batch ID:	**EP-2142-M**
Sampled:	**08-29-05 11:32**	Instrument ID:	**GC-9 Agilent 6890**
Received:	**08-30-05 20:21**	Sample Weight:	**15 g**
Extracted:	**09-12-05 14:00**	Final Volume:	**1 mL**
Analyzed (AL):	**09-22-05 06:36**	% Solids:	**83**
Analyzed (AR):	**09-22-05 07:21**	Aliphatic Dilution Factor:	**1**
Analyst:	MM	Aromatic Dilution Factor:	**1**

EPH Ranges	Concentration	Notes	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL		mg/Kg	36
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL		mg/Kg	36
n-C11 to n-C22 Aromatic Hydrocarbons †◊	BRL		mg/Kg	36
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	BRL		mg/Kg	36

QC Surrogate Compound		Spiked	Measured	Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	3.2	2.2	**69 %**	40 - 140 %
	2-Bromonaphthalene	3.2	2.3	**72 %**	40 - 140 %
Extraction:	Chloro-octadecane	3.2	2.2	**70 %**	40 - 140 %
	ortho-Terphenyl	3.2	2.3	**74 %**	40 - 140 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.1.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (Revision 1.1, 2004). Sample extraction performed by microwave accelerated solvent extraction technique. 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 size and dilution.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

EPA Method 8270C (Modified)
MA DEP EPH Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

Field ID:	**W2A02-82905-02**	Matrix:	**Soil**
Project:	**Buzzards Bay/3871-002**	Container:	**120 mL Amber Glass**
Client:	**GeoInsight, Inc.**	Preservation:	**Cool**
Laboratory ID:	**87247-02**	QC Batch ID:	**EP-2142-M**
Sampled:	**08-29-05 11:32**	Instrument ID:	**MS-6 HP 6890**
Received:	**08-30-05 20:21**	Sample Volume:	**15 g**
Extracted:	**09-12-05 14:00**	Final Volume:	**1 mL**
Analyzed:	**09-21-05 13:07**	Percent Solids:	**83**
Analyst:	**JJT**	Dilution Factor:	**1**

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
91-20-3	Naphthalene	BRL		ug/Kg	12
91-57-6	2-Methylnaphthalene	BRL		ug/Kg	12
208-96-8	Acenaphthylene	BRL		ug/Kg	12
83-32-9	Acenaphthene	BRL		ug/Kg	12
86-73-7	Fluorene	BRL		ug/Kg	12
85-01-8	Phenanthrene	**19**		ug/Kg	12
120-12-7	Anthracene	BRL		ug/Kg	12
206-44-0	Fluoranthene	**33**		ug/Kg	12
129-00-0	Pyrene	**29**		ug/Kg	12
56-55-3	Benzo[a]anthracene	**14**		ug/Kg	12
218-01-9	Chrysene	**13**		ug/Kg	12
205-99-2	Benzo[b]fluoranthene	BRL		ug/Kg	12
207-08-9	Benzo[k]fluoranthene	BRL		ug/Kg	12
50-32-8	Benzo[a]pyrene	BRL		ug/Kg	12
193-39-5	Indeno[1,2,3-c,d]pyrene	**12**		ug/Kg	12
53-70-3	Dibenzo[a,h]anthracene	BRL		ug/Kg	12
191-24-2	Benzo[g,h,i]perylene	BRL		ug/Kg	12

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
ortho-Terphenyl	3,200	2,300	**72** %	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method.
Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.
Sample extraction performed by EPA Method 3546. 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 size and dilution.

GROUNDWATER ANALYTICAL

Project Narrative

Project:	**Buzzards Bay/3871-002**	Lab ID:	**87247**
Client:	**GeoInsight, Inc.**	Received:	**08-30-05 20:21**

A. Documentation and Client Communication

The following documentation discrepancies, and client changes or amendments were noted for this project:

1. Samples identified as 'W2A2-82905-01' and 'W2A2-82905-02' were taken off hold and analyzed by MA DEP EPH, per Kevin Trainer, 09-08-05.

B. Method Modifications, Non-Conformances and Observations

The sample(s) in this project were analyzed by the references analytical method(s), and no method modifications, non-conformances or analytical issues were noted, except as indicated below:

1. MA DEP EPH Note: Samples 87247-01,-02. Polynuclear aromatic hydrocarbon (PAH) target analytes were identified and quantified by GC/MS-SIM, in accordance with the method provision for alternate determinative methodologies. GC/MS-SIM was used to achieve low quantification limits necessary for regulatory compliance. Target analytes were determined utilizing the same sample extract used for carbon range determination by GC/FID.

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CHAIN-OF-CUSTODY RECORD AND WORK ORDER

№ 200703

Project Name: Buzzards Bay	Firm: GeoInsight
Project Number: 3871-002	Address: 5 Lan Drive
Sampler Name: AW/LC	City / State / Zip: Westford, MA 01886
Project Manager: Kevin Trainer	Telephone: 978-692-1114

TURNAROUND

- ☒ STANDARD (10 Business Days)
- ☐ PRIORITY (5 Business Days)
- ☐ RUSH (RAN- ________) (Rush requires Rush Authorization Number)
- ☒ Please Email to: kdtrainer@geoinc.com PDF to
- ☐ Please FAX to: ________

BILLING

- ☐ Purchase Order No.: ________
- ☐ Third Party Billing: ________
- ☐ GWA Quote: ________

INSTRUCTIONS: Use separate line for each container (except replicates).

Sampling Date	Sampling Time	Sample Identification	Matrix: Soil/Sed.	Type: Grab	Container(s): Number	Container(s): 250mL/8 oz Glass	Preservation: Ice	Filtered: No	Laboratory Number (Lab Use Only)
8-29-05	1130	W2A02-82905-01	X	X	1	X	X	X	82047
	1132	W2A02-82905-02	X	X	1	X	X	X	
	1138	W2A02-82905-03	X	X	1	X	X	X	
	1150	W2A02-82905-04	X	X	1	X	X	X	

Matrix columns: Groundwater, Drinking Water, Wastewater, Soil/Sed., Other Solid, Oil/Organic Liquid. Type: Composite, Grab. Container(s): Number, 40mL VOA Vial, 60mL/2 oz Glass, 120mL/4 oz Amber Glass, 250mL/8 oz Glass, 500mL/16 oz Glass, 1L/32 oz Amber Glass, 250mL/8 oz Plastic, 500mL/16 oz Plastic, 1L/32 oz Plastic, 120mL Sterile. Preservation: HCl, HNO_3, H_2SO_4, NaOH, Methanol, Sodium Bisulfate, Ice. Filtered: Yes, No.

ANALYSIS REQUEST

Volatiles — OPTIONS: ☐ TIC Search; SDWA: ☐ 524.2+MTBE; NPDES: ☐ 624, ☐ 602+MTBE, ☐ 601, ☐ 601/602+MTBE; RCRA/21E: ☐ 8260B TCL+MTBE, ☐ 8260B NH PETROLEUM, ☐ 8260B, ☐ 8021B Aromatics, ☐ 8021B Halocarbons, ☐ 8021B

Semivolatiles — OPTIONS: ☐ Acid Only, ☐ B/N Only, ☐ TIC Search; SDWA: ☐ 525.2; NPDES: ☐ 625, ☐ 625 PAHs only; RCRA/21E: ☐ 8270C, ☐ 8270C PAHs only

Pest/Herb/PCBs (Extractable, Vol.) — SDWA: ☐ 505 ☐ 508, ☐ 531.1, ☐ 515.1, ☐ 504.1 EDB/DBCP; NPDES: ☐ 608 Pesticides, ☐ 608 PCBs, ☐ 615; RCRA/21E: ☐ 8081A Pesticides, ☐ 8082 PCBs, ☐ 8151A Herbicides, ☐ 8011 EDB/DBCP

Metals — OPTIONS: Specify For Water Samples ☐ Total ☐ Dissolved; SDWA: ☐ Lead and Copper; NPDES: ☐ 13 Priority Pollutant; RCRA/21E: ☐ 8 RCRA, ☐ 5 RCRA, ☐ MA List Metals, ☐ 23 TAL, ☐ Specify:

Petroleum Hydrocarbon (Ext. TPH, Vol. TPH): ☐ TPH-IR; ☐ Diesel Range Organics (DRO) ☐ ME DRO; ☐ CT ETPH; ☐ MA DEP EPH wall targets ☐ EPH Carbon Ranges only ☐ EPH w/4 PAHs; ☐ Hydrocarbon Fingerprint (GC/FID by ASTM D3328-00-Mod.); ☐ TPH by GC/FID (8015B Mod) Quantitative Only; ☐ Gasoline Range Organics (GRO) ☐ ME GRO; ☐ MA DEP VPH wall targets ☐ VPH Carbon ranges only

Haz. Waste: ☐ TCLP ☐ SPLP ☐ 8 Metals ☐ Pb only ☐ VOA ☐ Semi VOA ☐ Pesticides ☐ Herbicides; ☐ Corrosivity (as pH) ☐ Reactivity ☐ Ignitability (as Flashpoint) ☐ Paint Filter; ☐ MA Basic Disposal Criteria: 8260B, TPH by GC, PCBs, 5 Metals, Corrosivity, Ignitability, Reactivity

General Chemistry: ☐ Nitrate ☐ Nitrite ☐ Chloride ☐ Fluoride ☐ Sulfate; ☐ Dissolved Phosphorus; ☐ Ammonia ☐ TKN ☐ Total Phosphorus ☐ Total N (as NO2/NO3/TKN); ☐ Oil & Grease; ☐ COD ☐ TOC; ☐ BOD ☐ TDS ☐ TSS ☐ TS ☐ Alkalinity; ☐ Cyanide, Total ☐ Cyanide, Physiologically Available; ☐ pH ☐ Dissolved Oxygen ☐ Turbidity; ☐ Total Coliform ☐ Fecal Coliform ☐ HPC

Other

HOLD ANALYSIS

REMARKS / SPECIAL INSTRUCTIONS

MA DEP MCP Data Enhancement Affirmation

☐ YES ☐ NO MCP Data Certification required.

☐ YES ☐ NO MCP Drinking Water Sample included. (Require collection of contingent duplicate sample. Trip blanks are also required, if VOA sample collected).

Signature: ________

DATA QUALITY OBJECTIVES

Regulatory Program

State	Standard	Deliverables
☐ CT	☒ MCP GW-1/S-1	☐ PWS Form
☐ ME	☒ MCP GW-2/S-2	☐ MWRA
☒ MA	☐ NY STARS	☐ ________
☐ NH	☐ Drinking Water	
☐ NY	☐ Wastewater	
☐ RI	☐ Waste Disposal	
☐ VT	☐ Dredge Material	
☐ ___	☐ ________	

Project Specific QC

Many regulatory programs and EPA methods require project specific QC. Project specific QC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory QC is not project specific unless prearranged. Project specific QC samples are charged on a per sample basis. **Each MS, MSD and Sample Duplicate requires an additional sample aliquot.**

Project Specific QC Required
- ☐ Sample Duplicate
- ☐ Matrix Spike
- ☐ Matrix Spike Duplicate

Selection of QC Sample
- ☐ Please use sample: ________

CHAIN-OF-CUSTODY RECORD

NOTE: All samples submitted subject to Standard Terms and Conditions on reverse hereof.

Relinquished by	Date	Time	Received by	
Relinquished by Sampler: [signature]	8/30/05	2021	Received by:	Receipt Temperature: ☐ Ice ☐ Refrigerated 2-6 C Recommended 4.8
Relinquished by:			Received by:	Container Count:
Relinquished by:			Received by Laboratory: [signature]	Shipping/Airbill Number:
Method of Shipment: ☐ GWA Courier ☐ Express Mail ☐ Federal Express ☐ UPS ☐ Hand ☐ ________				Custody Seal Number:

GROUNDWATER ANALYTICAL

Quality Assurance/Quality Control

A. Program Overview

Groundwater Analytical conducts an active Quality Assurance program to ensure the production of high quality, valid data. This program closely follows the guidance provided by *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans,* US EPA QAMS-005/80 (1980), and *Test Methods for Evaluating Solid Waste,* US EPA, SW-846, Update III (1996).

Quality Control protocols include written Standard Operating Procedures (SOPs) developed for each analytical method. SOPs are derived from US EPA methodologies and other established references. Standards are prepared from commercially obtained reference materials of certified purity, and documented for traceability.

Quality Assessment protocols for most organic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. All samples, standards, blanks, laboratory control samples, matrix spikes and sample duplicates are spiked with internal standards and surrogate compounds. All instrument sequences begin with an initial calibration verification standard and a blank; and excepting GC/MS sequences, all sequences close with a continuing calibration standard. GC/MS systems are tuned to appropriate ion abundance criteria daily, or for each 12 hour operating period, whichever is more frequent.

Quality Assessment protocols for most inorganic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. Standard curves are derived from one reagent blank and four concentration levels. Curve validity is verified by standard recoveries within plus or minus ten percent of the curve.

B. Definitions

Batches are used as the basic unit for Quality Assessment. A Batch is defined as twenty or fewer samples of the same matrix which are prepared together for the same analysis, using the same lots of reagents and the same techniques or manipulations, all within the same continuum of time, up to but not exceeding 24 hours.

Laboratory Control Samples are used to assess the accuracy of the analytical method. A Laboratory Control Sample consists of reagent water or sodium sulfate spiked with a group of target analytes representative of the method analytes. Accuracy is defined as the degree of agreement of the measured value with the true or expected value. Percent Recoveries for the Laboratory Control Samples are calculated to assess accuracy.

Method Blanks are used to assess the level of contamination present in the analytical system. Method Blanks consist of reagent water or an aliquot of sodium sulfate. Method Blanks are taken through all the appropriate steps of an analytical method. Sample data reported is not corrected for blank contamination.

Surrogate Compounds are used to assess the effectiveness of an analytical method in dealing with each sample matrix. Surrogate Compounds are organic compounds which are similar to the target analytes of interest in chemical behavior, but which are not normally found in environmental samples. Percent Recoveries are calculated for each Surrogate Compound.

GROUNDWATER ANALYTICAL

Quality Control Report
Laboratory Control Samples

		LCS		LCSD	
Category:	MA DEP EPH Method	Instrument ID:	GC-9 Agilent 6890	Instrument ID:	GC-9 Agilent 6890
QC Batch ID:	EP-2142-M	Extracted:	09-12-05 14:00	Extracted:	09-12-05 14:00
Matrix:	Soil	Analyzed (AL):	09-13-05 01:09	Analyzed (AL):	09-13-05 02:37
Units:	mg/Kg	Analyzed (AR):	09-13-05 01:53	Analyzed (AR):	09-13-05 03:21
		Analyst:	MM	Analyst:	MM

CAS Number	Analyte	LCS			LCS Duplicate				QC Limits	
		Spiked	Measured	Recovery	Spiked	Measured	Recovery	RPD	Spike	RPD
111-84-2	*n*-Nonane (C_9)	3.3	1.6	47 %	3.3	1.5	46 %	2 %	30 - 140 %	25%
124-18-5	*n*-Decane (C_{10})	3.3	1.8	55 %	3.3	1.8	54 %	2 %	40 - 140 %	25%
112-40-3	*n*-Dodecane (C_{12})	3.3	1.9	58 %	3.3	1.9	57 %	2 %	40 - 140 %	25%
629-59-4	*n*-Tetradecane (C_{14})	3.3	1.9	59 %	3.3	1.9	59 %	1 %	40 - 140 %	25%
544-76-3	*n*-Hexadecane (C_{16})	3.3	2.2	68 %	3.3	2.2	67 %	2 %	40 - 140 %	25%
593-45-3	*n*-Octadecane (C_{18})	3.3	2.6	80 %	3.3	2.7	81 %	1 %	40 - 140 %	25%
n/a	*n*-C9 to *n*-C18 Group	20	12	61 %	20	12	61 %	1 %	40 - 140 %	25%
629-92-5	*n*-Nonadecane (C_{19})	3.3	2.6	80 %	3.3	2.7	82 %	3 %	40 - 140 %	25%
112-95-8	*n*-Eicosane (C_{20})	3.3	2.7	83 %	3.3	2.8	86 %	3 %	40 - 140 %	25%
629-97-0	*n*-Docosane (C_{22})	3.3	2.7	83 %	3.3	2.8	86 %	4 %	40 - 140 %	25%
646-31-1	*n*-Tetracosane (C_{24})	3.3	2.8	84 %	3.3	2.9	87 %	3 %	40 - 140 %	25%
630-01-3	*n*-Hexacosane (C_{26})	3.3	2.7	82 %	3.3	2.8	85 %	3 %	40 - 140 %	25%
630-02-4	*n*-Octacosane (C_{28})	3.3	2.7	82 %	3.3	2.8	85 %	4 %	40 - 140 %	25%
638-68-6	*n*-Triacontane (C_{30})	3.3	2.7	82 %	3.3	2.8	86 %	4 %	40 - 140 %	25%
630-06-8	*n*-Hexatriacontane (C_{36})	3.3	2.4	73 %	3.3	2.5	77 %	5 %	40 - 140 %	25%
n/a	*n*-C19 to *n*-C36 Group	26	21	81 %	26	22	84 %	4 %	40 - 140 %	25%
91-20-3	Naphthalene	3.3	2.0	61 %	3.3	1.9	56 %	9 %	40 - 140 %	25%
91-57-6	2-Methylnaphthalene	3.3	2.1	64 %	3.3	1.9	58 %	9 %	40 - 140 %	25%
208-96-8	Acenaphthylene	3.3	2.3	69 %	3.3	2.0	62 %	11 %	40 - 140 %	25%
83-32-9	Acenaphthene	3.3	2.1	65 %	3.3	1.9	58 %	11 %	40 - 140 %	25%
86-73-7	Fluorene	3.3	2.3	71 %	3.3	2.1	63 %	12 %	40 - 140 %	25%
85-01-8	Phenanthrene	3.3	2.7	82 %	3.3	2.3	71 %	14 %	40 - 140 %	25%
120-12-7	Anthracene	3.3	3.0	91 %	3.3	2.8	83 %	8 %	40 - 140 %	25%
206-44-0	Fluoranthene	3.3	3.2	96 %	3.3	2.8	86 %	11 %	40 - 140 %	25%
129-00-0	Pyrene	3.3	3.2	96 %	3.3	2.8	86 %	11 %	40 - 140 %	25%
56-55-3	Benzo[a]anthracene	3.3	3.3	100 %	3.3	3.1	93 %	7 %	40 - 140 %	25%
218-01-9	Chrysene	3.3	3.4	102 %	3.3	3.3	99 %	3 %	40 - 140 %	25%
205-99-2	Benzo[b]fluoranthene	3.3	3.1	94 %	3.3	2.8	86 %	10 %	40 - 140 %	25%
207-08-9	Benzo[k]fluoranthene	3.3	3.2	98 %	3.3	3.1	94 %	4 %	40 - 140 %	25%
50-32-8	Benzo[a]pyrene	3.3	3.1	94 %	3.3	2.9	88 %	7 %	40 - 140 %	25%
193-39-5	Indeno[1,2,3-c,d]pyrene	3.3	2.6	79 %	3.3	2.4	73 %	8 %	40 - 140 %	25%
53-70-3	Dibenzo[a,h]anthracene	3.3	2.8	84 %	3.3	2.7	81 %	4 %	40 - 140 %	25%
191-24-2	Benzo[g,h,i]perylene	3.3	2.4	74 %	3.3	2.3	69 %	6 %	40 - 140 %	25%
n/a	PAH Group	56	47	83 %	56	43	77 %	8 %	40 - 140 %	25%

QC Surrogate Compound		Spiked	Measured	Recovery	Spiked	Measured	Recovery		QC Limits
Fractionation:	2-Fluorobiphenyl	2.7	2.1	78 %	2.7	2.0	74 %		40 - 140 %
	2-Bromonaphthalene	2.7	2.2	81 %	2.7	2.1	78 %		40 - 140 %
Extraction:	Chloro-octadecane	2.7	2.1	78 %	2.7	2.1	78 %		40 - 140 %
	ortho-Terphenyl	2.7	2.3	85 %	2.7	1.9	70 %		40 - 140 %

Fractionation Breakthrough Evaluation						QC Limits
91-20-3	Naphthalene	LCS	0 %	LCSD	0 %	5%
91-57-6	2-Methylnaphthalene	LCS	0 %	LCSD	0 %	5%

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (Revision 1.1, 2004). Method modified by use of microwave accelerated solvent extraction technique.

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

The LCS and LCSD are prepared from separate source standards than those used for calibration.

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category:	MA DEP EPH	Instrument ID:	GC-9 Agilent 6890
QC Batch ID:	EP-2142-M	Extracted:	09-12-05 14:00
Matrix:	Soil	Analyzed (AL):	09-12-05 23:40
		Analyzed (AR):	09-13-05 00:24
		Analyst:	MM

EPH Ranges	Concentration	Notes	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL		mg/Kg	30
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL		mg/Kg	30
n-C11 to n-C22 Aromatic Hydrocarbons †◊	BRL		mg/Kg	30
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	BRL		mg/Kg	30

QC Surrogate Compound		Spiked	Measured	Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	2.7	1.9	72 %	40 - 140 %
	2-Bromonaphthalene	2.7	2.0	74 %	40 - 140 %
Extraction:	Chloro-octadecane	2.7	1.9	73 %	40 - 140 %
	ortho-Terphenyl	2.7	2.0	76 %	40 - 140 %

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (Revision 1.1, 2004).
Sample extraction performed by microwave accelerated solvent extraction technique.

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 size and dilution.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Quality Control Report
Laboratory Control Samples

		LCS		LCSD	
Category:	EPA 8270C Modified	Instrument ID:	MS-6 HP 6890	Instrument ID:	MS-6 HP 6890
QC Batch ID:	EP-2142-M	Extracted:	09-12-05 14:00	Extracted:	09-12-05 14:00
Matrix:	Soil	Analyzed:	09-13-05 14:03	Analyzed:	09-13-05 14:43
Units:	ug/Kg	Analyst:	JJT	Analyst:	JJT

CAS Number	Analyte	LCS			LCS Duplicate				QC Limits	
		Spiked	Measured	Recovery	Spiked	Measured	Recovery	RPD	Spike	RPD
91-20-3	Naphthalene	330	220	67 %	330	200	61 %	10 %	40 - 140 %	20%
91-57-6	2-Methylnaphthalene	330	240	73 %	330	220	67 %	9 %	40 - 140 %	20%
85-01-8	Phenanthrene	330	250	76 %	330	230	70 %	8 %	40 - 140 %	20%
83-32-9	Acenaphthene	330	280	85 %	330	250	76 %	11 %	40 - 140 %	20%
208-96-8	Acenaphthylene	330	260	79 %	330	230	70 %	12 %	40 - 140 %	20%
86-73-7	Fluorene	330	260	79 %	330	240	73 %	8 %	40 - 140 %	20%
120-12-7	Anthracene	330	260	79 %	330	240	73 %	8 %	40 - 140 %	20%
206-44-0	Fluoranthene	330	300	91 %	330	290	88 %	3 %	40 - 140 %	20%
129-00-0	Pyrene	330	300	91 %	330	290	88 %	3 %	40 - 140 %	20%
56-55-3	Benzo[a]anthracene	330	310	94 %	330	300	91 %	3 %	40 - 140 %	20%
218-01-9	Chrysene	330	300	91 %	330	290	88 %	3 %	40 - 140 %	20%
205-99-2	Benzo[b]fluoranthene	330	290	88 %	330	280	85 %	4 %	40 - 140 %	20%
207-08-9	Benzo[k]fluoranthene	330	310	94 %	330	290	88 %	7 %	40 - 140 %	20%
50-32-8	Benzo[a]pyrene	330	300	91 %	330	290	88 %	3 %	40 - 140 %	20%
193-39-5	Indeno[1,2,3-c,d]pyrene	330	290	88 %	330	280	85 %	4 %	40 - 140 %	20%
53-70-3	Dibenzo[a,h]anthracene	330	270	82 %	330	260	79 %	4 %	40 - 140 %	20%
191-24-2	Benzo[g,h,i]perylene	330	310	94 %	330	290	88 %	7 %	40 - 140 %	20%

QC Surrogate Compound	Spiked	Measured	Recovery	Spiked	Measured	Recovery	QC Limits
ortho -Terphenyl	2,700	2,200	81 %	2,700	2,000	74 %	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method.
Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.
Sample extraction performed by EPA Method 3510C.

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

The LCS and LCSD are prepared from separate source standards than those used for calibration.

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category:	EPA Method 8270C (Mod.) - EPH PAHs by GC/MS-SIM	Instrument ID:	MS-6 HP 6890
QC Batch ID:	EP-2142-M	Extracted:	09-12-05 14:00
Matrix:	Soil	Analyzed:	09-13-05 13:23
		Analyst:	JJT

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
91-20-3	Naphthalene	BRL		ug/Kg	10
91-57-6	2-Methylnaphthalene	BRL		ug/Kg	10
208-96-8	Acenaphthylene	BRL		ug/Kg	10
83-32-9	Acenaphthene	BRL		ug/Kg	10
86-73-7	Fluorene	BRL		ug/Kg	10
85-01-8	Phenanthrene	BRL		ug/Kg	10
120-12-7	Anthracene	BRL		ug/Kg	10
206-44-0	Fluoranthene	BRL		ug/Kg	10
129-00-0	Pyrene	BRL		ug/Kg	10
56-55-3	Benzo[a]anthracene	BRL		ug/Kg	10
218-01-9	Chrysene	BRL		ug/Kg	10
205-99-2	Benzo[b]fluoranthene	BRL		ug/Kg	10
207-08-9	Benzo[k]fluoranthene	BRL		ug/Kg	10
50-32-8	Benzo[a]pyrene	BRL		ug/Kg	10
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL		ug/Kg	10
53-70-3	Dibenzo[a,h]anthracene	BRL		ug/Kg	10
191-24-2	Benzo[g,h,i]perylene	BRL		ug/Kg	10

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
ortho-Terphenyl	2,700	2,100	78 %	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method.
Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.
Sample extraction performed by EPA Method 3546.

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 size and dilution.

GROUNDWATER ANALYTICAL

Certifications and Approvals

Groundwater Analytical maintains environmental laboratory certification in a variety of states. Copies of our current certificates may be obtained from our website:

http://www.groundwateranalytical.com/qualifications.htm

CONNECTICUT, Department of Health Services, PH-0586

Categories: Potable Water, Wastewater, Solid Waste and Soil
http://www.dph.state.ct.us/BRS/Environmental_Lab/OutStateLabList.htm

FLORIDA, Department of Health, Bureau of Laboratories, E87643

Categories: SDWA, CWA, RCRA/CERCLA
http://www.floridadep.org/labs/qa/dohforms.htm

MAINE, Department of Human Services, MA103

Categories: Drinking Water and Wastewater
http://www.state.me.us/dhs/eng/water/Compliance.htm

MASSACHUSETTS, Department of Environmental Protection, M-MA-103

Categories: Potable Water and Non-Potable Water
http://www.state.ma.us/dep/bspt/wes/files/certlabs.pdf

NEW HAMPSHIRE, Department of Environmental Services, 202703

Categories: Drinking Water and Wastewater
http://www.des.state.nh.us/asp/NHELAP/labsview.asp

NEW YORK, Department of Health, 11754

Categories: Potable Water, Non-Potable Water and Solid Waste
http://www.wadsworth.org/labcert/elap/comm.html

PENNSYLVANIA, Department of Environmental Protection, 68-665

Environmental Laboratory Registration (Non-drinking water and Non-wastewater)
http://www.dep.state.pa.us/Labs/Registered/

RHODE ISLAND, Department of Health, 54

Categories: Surface Water, Air, Wastewater, Potable Water, Sewage
http://www.healthri.org/labs/labsCT_MA.htm

U.S. Department of Agriculture, Soil Permit, S-53921

Foreign soil import permit

VERMONT, Department of Environmental Conservation, Water Supply Division

Category: Drinking Water
http://www.vermontdrinkingwater.org/wsops/labtable.PDF