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Draft Final Report

LABORATORY TESTING IN SUPPORT OF ENVIRONMENTAL ASSESSMENT

Sampling and Environmental Testing
Brushneck Cove
Warwick, RI

DRAFT FINAL REPORT

for

Sampling and Environmental Testing—Brushneck Cove,
Warwick, RI

Submitted to

Department of the Army
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1.0 INTRODUCTION

1.1 Project Description

The Corps of Engineers, North Atlantic Division New England District (NAE) is acquiring data for the analysis of environmental impacts associated with the restoration project located in Brushneck Cove, Warwick, RI. The work performed was to assist NAE in gathering physical and chemical data to characterize the sediment to determine the alternatives available for disposal.

1.2 Scope of Work

The project scope of work consisted of sediment core collections from each of the 11 designated sampling locations to project depth (-10ft MLLW?) or refusal. Sediment collections were performed within Brushneck and Buttonwoods Coves to collect material to perform physical and chemical evaluations of the vibracore samples. Sediment cores were collected at each location and analyzed for physical and chemical analyses.

Field Collections— TG&B performed all sediment coring activities under the supervision of a Battelle Chief Scientist.

Physical and Chemical Analyses— Grain size (GS) and total organic carbon (TOC) analysis of all 11 sediment cores were performed by Applied Marine Sciences (AMS) of League City, TX. Battelle conducted metals and organic (polychlorinated biphenyls (PCBs) as congeners, polynuclear aromatic hydrocarbons (PAHs), and chlorinated pesticides) analyses on the 11 sediment cores.

1.3 Organization of this Report

This report was prepared in accordance with the requirements outlined in the NAE Statement of Work (SOW) for Brushneck Cove, RI. This report is organized in four sections and three attachments. Section 1.0 is an introduction and describes the project and scope of work. A summary of the materials and methods used in support of this project is presented in Section 2.0. Results of physical and chemical testing for the sediment samples are discussed in Section 3.0. References are provided in Section 4.0. Complete test results are provided as attachments to this report: Attachment A contains the results of the sediment grain size and TOC testing and Attachment B contains the results of the organic contaminant and metals testing. Attachment C contains the final field survey report for Brushneck Cove. Each attachment contains sample custody and receipt records as appropriate.

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2.0 MATERIALS AND METHODS

2.1 Sample Collection/Processing

On September 5 and 6, 2007, a single core sample was taken at each of the 11 separate locations in Brushneck Cove and Buttonwoods Cove located in Warwick, RI (Table 2-1, Figure 2-1). Sediment cores were transported to Battelle's Duxbury facility for processing. All cores were processed on September 7 and 10, 2007; a representative from NAE (Todd Randall) observed the core processing and provided guidance regarding sub-sampling. The sampled intervals are indicated in the core logs (Attachment C). Cores were cut laterally and characterized. After physical characterization was completed, each sediment core was individually homogenized and divided into subsamples for physical and chemical analyses.

Sediment core collections, rinsate blank collections, and sample processing methods are summarized below. Complete details on the survey/sampling methods can be found in the Brushneck Cove Sampling and Analysis Plan (SAP) (Battelle 2007) and Field Sampling Report (Attachment C).

Table 2-1. Cross-reference for Station ID and Individual Sample ID.

Sampling Area	Station ID	Sample ID
Brushneck Cove	BNC-C-01	GAG-005-A
	BNC-C-02	GAG-006-A
	BNC-C-03	GAG-007-A
	BNC-C-04	GAG-008-A
	BNC-C-05	GAG-009-A
	BNC-C-06	GAG-010-A
	BNC-C-07	GAG-011-A GAG-016-A
Buttonwoods Cove	BNC-C-08	GAG-002-A
	BNC-C-09	GAG-001-A GAG-014-A
	BNC-C-10	GAG-003-A GAG-015-A
	BNC-C-11	GAG-004-A

2.1.1 Sediment Core Collections

Vibracore samples were collected to the depths specified in the SOW and summarized in the Brushneck SAP (Battelle 2007). Battelle and its subcontractor, TG&B, were responsible for collecting all vibracore samples.

Core samples were collected at each of 11 stations (Figure 2-1) using a vibracorer to maximize efficiency and core recovery. The cores were captured in pre-rinsed polycarbonate (Lexan™) liners. Each acceptable core was capped on the bottom while horizontal, and then capped on the top while positioned vertically. All sediment cores were labeled and stored upright (in the containers). During all field activities samples were stored on the vessel in barrels or bags filled with ice. Chain of Custody (COC) for each core section was initiated in the field. Samples were transported from the field to Battelle in the ice filled barrels. Upon arrival at Battelle, samples were placed in a secure, continuously monitored cold room which is maintained at $4^{o}C \pm 2^{o}C$. Core characterization, homogenization, and aliquotting were conducted at Battelle Duxbury (see Section 2.1.3).

2.1.2 Rinsate Blank Sampling

One rinsate blank was collected during the coring survey. All materials to which the vibracore was exposed (e.g., core liners) were decontaminated then rinsed with deionized water. The rinsate blank sample was stored cold (4°C±2°C) until chemical analysis.

2.1.3 Core Processing and Subsampling

Sediment cores were processed and visually characterized at Battelle on September 7 and 10, 2007 under the oversight of the NAE. Cores were cut laterally using electric tin snips and were generally characterized in terms of sediment type (silt, sand, and clay), color, odor, and horizons. In general, the material in each core was found to be similar throughout the length of the core and consisted of dark grey silty, clay with some shell hash. Three cores were found to have a transition to a fine sand; these cores were subsectioned and the sandy layer was retained separately. In one case, the lower layer from the Station BNC-C-09 (sample GAG-014) was also analyzed for grain size and TOC. The other sandy fractions were archived (GAG-015 and GAG-016).

On Monday, September 10, 2007, samples collected for grain size and TOC analyses were shipped to Applied Marine Sciences (AMS), metal samples were shipped to Battelle Sequim, and samples collected for organics analyses were hand delivered to the analytical laboratory at Battelle, Duxbury. The remaining sediment from each core was archived; split samples were stored frozen (-20°C) and cold (4°C±2°C) in 16 oz pre-cleaned glass wide mouth jars. Archive samples will be used for additional compositing and physical and chemical testing, if needed.

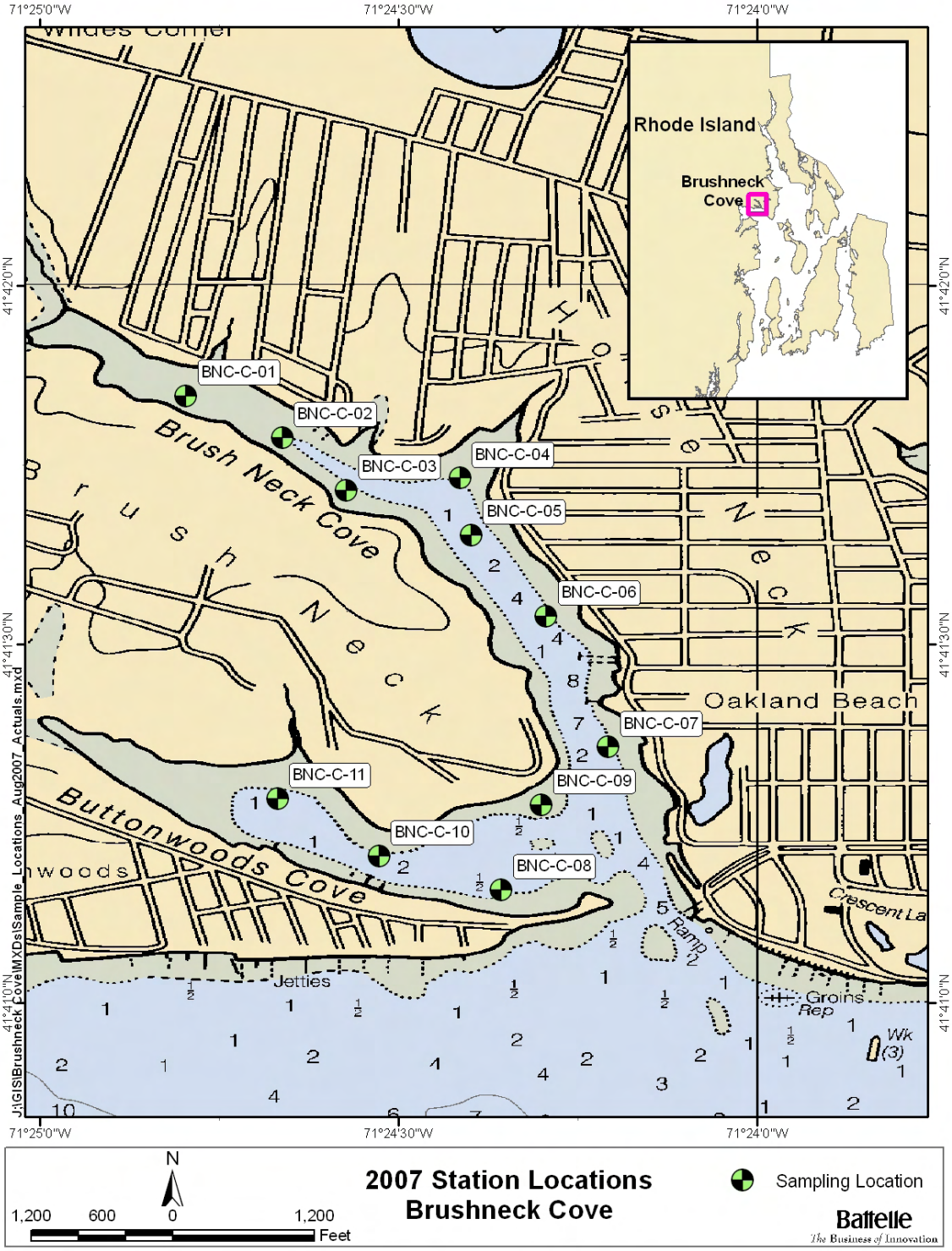

Figure 2-1. Sampling Locations within Buttonwoods Cove and Brushneck Cove, RI.

2.2 Physical and Chemical Testing

This section summarizes the methods used for physical and chemical testing of the Brushneck Cove sediment samples. Physical testing included grain size and percent moisture measurements. Chemical testing on sediment samples included TOC, polychlorinated biphenyl (PCB), chlorinated pesticide, polycyclic aromatic hydrocarbon (PAH), and metals analyses.

Laboratory quality assurance plans that detail the specifics of the analytical requirements were developed for each laboratory. The complete list of parameters and target detection limits is provided in Table 2-2. A routine set of quality control (QC) samples was prepared with each set of samples, by parameter and media, to monitor data quality in terms of accuracy and precision. The frequency and type of QC samples, and QC acceptance criteria, are discussed in greater detail in Section 2.3.

2.2.1 Grain Size and TOC

The 11 individual sediment core samples collected at Brushneck Cove were analyzed by Applied Marine Science (AMS) for gravel, sand, silt, and clay. Grain size was measured according to ASTM D422 for gravel, sand, silt and clay using sieve and hydrometer; visual classifications were estimated according to ASTM D2487, and water content was measured according to ASTM D2216. Results are reported on a dry-weight basis.

Total Organic Carbon (TOC) samples were analyzed according to EPA SW846 Method 9060 by AMS. All samples were analyzed in duplicate from each composite. Results are reported on a dry-weight basis.

2.2.2 Organic Contaminants

2.2.2.1 Organic Contaminants in Sediment

The 11 sediment samples were extracted for PCB congeners, chlorinated pesticides and PAHs following general NOAA Status and Trends (NS&T) methodologies (Peven and Uhler 1993; Battelle SOP 5-192). Approximately 30-grams of wet sediment was fortified with a set of surrogate internal standards (SIS), and extracted three times with methylene chloride using shaker techniques. The combined extract was dried over anhydrous sodium sulfate, concentrated to approximately 1-mL and cleaned using alumina column, activated copper and HPLC. The post-HPLC extract was concentrated to approximately 1-mL, and fortified with a set of internal standards (IS) Extracts were then qualitatively split 50:50, and one half was exchanged into hexane for PCB and chlorinated pesticide analysis by gas chromatography/electron capture detection (GC/ECD) (Battelle SOP 5-128). Extracts for PAH analyses were analyzed directly using gas chromatography/mass spectrometry (GC/MS) in the selected ion mode (Battelle SOP 5-157). All target compounds were quantified by the method of internal standards using IS and results were reported in ng/g dry weight.

Total PCBs were calculated by summing the 18 NOAA congeners (denoted by '*' in Table 2-2) and multiplying the total by 2 (EPA/USACE 2004). Non-detects were included in the sum by using ½ of the MDL reported.

2.2.2.2 Organic Contaminants in Rinsate Blank Sample

One rinsate blank sample was extracted for PCBs, chlorinated pesticides, and PAHs according to Battelle SOP 5-200, *Water Extraction for Trace Level Semi-Volatile Organic Contaminant Analysis*. Approximately 1-L of each water sample was fortified with a set of SIS, and extracted three times with methylene chloride using separatory funnel techniques. The combined extract was dried over anhydrous sodium sulfate and concentrated to approximately 1-mL. The extract was then fortified with a set of internal standards (IS), solvent exchanged into hexane, and analyzed directly by GC/ECD for PCB and

chlorinated pesticides (Battelle SOP 5-128). Rinsate blank extracts were analyzed for PAH using GC/MS in the selected ion mode (Battelle SOP 5-157). All target compounds were quantified by the method of internal standards using IS and results are reported in ng/L.

2.2.3 Metals

2.2.3.1 Metals in Sediments

Sediment samples were analyzed for eight metals: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), and zinc (Zn). Samples were freeze-dried and homogenized using a ball-mill prior to digestion according to Battelle SOP MSL-C-003, *Percent Dry Weight and Homogenizing Dry Sediment, Soil and Tissue*. Sediment samples were digested in accordance with Battelle SOP MSL-I-006, *Mixed Acid Sediment Digestion*. An approximately 200-mg (dry weight) aliquot of each sample was combined with nitric and hydrochloric acids (aqua regia) in a Teflon bomb and heated in an oven at 130ºC (±10ºC) for a minimum of eight hours. After heating and cooling, deionized water was added to the sediment digestate to achieve analysis volume. Digestates were submitted for analysis by three methods.

Digested samples were analyzed for Hg using cold-vapor atomic absorption spectroscopy (CVAA) according to Battelle SOP MSL-I-016, *Total Mercury in Tissues and Sediments by Cold Vapor Atomic Absorption*. This procedure is based on modification of EPA Method 245.5

Digested samples were analyzed for Cr, Cu, Pb, Ni, and Zn using inductively coupled plasma optical emissions spectroscopy (ICP-OES) according to Battelle SOP MSL-I-033, *Determination of Elements in Aqueous and Digestate Samples by ICP-OES*. This procedure is based on two methods modified and adapted for analysis of low level samples: EPA Method 6010B and 200.7.

Digested samples were analyzed for As and Cd using inductively coupled plasma-mass spectrometry (ICP-MS) according to Battelle SOP MSL-I-022, *Determination of Elements in Aqueous and Digestate Samples by ICP/MS*. The base methods for this procedure are EPA Method 1638 and EPA Method 6020 with adaptations for the analysis of trace level metals in digested sediment and tissue samples.

All metals results are reported in µg/g dry weight.

2.2.3.2 Metals in Rinsate Blank Sample

The equipment rinsate blank was analyzed for As, Cd, Cr, Cu, Pb, Hg, Ni, and Zn. The samples were submitted for analyses by two methods.

Samples were analyzed for total Hg by cold vapor atomic fluorescence (CVAF) in accordance with Battelle SOP *MSL-I-013*; *Total Mercury in Aqueous Samples by CVAF based on EPA Method 1631 Revision E*. Samples were analyzed for all other metals by inductively coupled plasma-mass spectrometry (ICP-MS) in accordance with Battelle SOP *MSL-I-022; Determination of Elements in Aqueous and Digestate Samples by ICP/MS*, which was adapted from US EPA Method 1638. Samples were acid solubilized prior to analysis by ICP-MS in accordance with the total recoverable metals (TRM) method in Battelle SOP *MSL-I-022*. The analysis guidelines for this procedure are adapted from USEPA Method 1638 Determination of Trace Elements in Ambient Waters by Inductively Coupled Plasma-Mass Spectrometry. The TRM methodology is adapted from USEPA Method 1640 - Determination of Trace Elements in Ambient Waters by On-Line Chelation Preconcentration and Inductively Coupled Plasma-Mass Spectrometry.

All results for the sample will be reported in µg/L.

Table 2-2. Sediment Parameters and Target Detection Limits (DL)

Parameter	DL	Parameter	DL
Polycyclic Aromatic Hydrocarbons	**ng/g DW (ppb)**	**Chlorinated Pesticides**	**ng/g DW (ppb)**
Naphthalene	10	4,4'-DDD	1
Acenaphthylene	10	4,4'-DDE	1
Acenaphthene	10	4,4'-DDT	1
Fluorene	10	aldrin	1
Anthracene	10	a-chlordane	1
Phenanthrene	10	g-chlordane	1
Fluoranthene	10	lindane	1
Pyrene	10	cis-nonachlor	1
Benzo(a)anthracene	10	trans-nonachlor	1
Chrysene	10	oxychlordane	1
Benzo(b)fluoranthene	10	dieldrin	1
Benzo(k)fluoranthene	10	endosulfan I	1
Benzo(a)pyrene	10	endosulfan II	1
Indeno(1,2,3-cd)pyrene	10	endrin	1
Dibenzo(a,h)anthracene	10	heptachlor	1
Benzo(g,h,i)perylene	10	heptachlor epoxide	1
		hexachlorobenzene	1
		methoxychlor	1
		Toxaphene	25
Polychlorinated Biphenyls	**ng/g DW (ppb)**	**Metals**	**µg/g DW (ppm)**
Cl2(8) *	1	Arsenic	0.4
Cl3(18) *	1	Cadmium	0.07
Cl3(28) *	1	Chromium	0.5
Cl4(44) *	1	Copper	0.5
Cl4(49)	1	Lead	0.5
Cl4(52) *	1	Mercury	0.02
Cl4(66) *	1	Nickel	0.5
Cl5(87)	1	Zinc	1.0
Cl5(101) *	1		
Cl5(105) *	1	**Ancillary Parameters**	**% DW**
Cl5(118) *	1	TOC	0.1
Cl6(128) *	1	Grain Size	NA
Cl6(138) *	1	Percent Moisture	1.0
Cl6(153) *	1		
Cl7(170) *	1		
Cl7(180) *	1		
Cl7(183)	1		
Cl7(184)	1		
Cl7(187) *	1		
Cl8(195) *	1		
Cl9(206) *	1		
Cl10(209) *	1		

NA = Not applicable
ng/g DW (ppb), nanograms per gram dry weight (ppb, parts per billion)
µg/g DW (ppm), micrograms per gram dry weight (ppm, parts per million)
* indicates PCB congeners included in sum of Total PCB

2.3 Quality Assurance/Quality Control Procedures

Field and analytical activities used in the collection and analysis of sediments for physical and chemical testing followed approved SOPs, referenced agency methods, or the SAP (Battelle 2006). Deviations are documented in Section 2.3.4.

2.3.1 Measurement Quality Objectives

Project specific Measurement Quality Objectives (MQOs), against which all data from this project were evaluated, are presented in Table 2-3. Physical and chemical data were evaluated against the MQOs, and data reporting qualifiers (Table 2-4) were applied when the analytical MQOs were exceeded.

2.3.2 Chain of Custody

Sample custody forms accompanied all samples from the field to the laboratory and between laboratories. Copies of custody and laboratory receipt forms are provided in Attachments A, B, and C.

2.3.3 Data Audits/QA Review

All data received internal verification and validation following established procedures at the laboratory where the data were generated. QA/QC narratives and QA/QC checklists as required by the RIM (EPA/USACE 2004) are provided with the sample data in Attachments A and B. These narratives include a discussion of the chemistry QC results; a description of MQO exceedances; and the impact, if any, the exceedances may have on the overall field sample data.

Table 2-3. Measurement Quality Objectives

QC Parameter	Measure or Acceptance Criteria [a]	Corrective Action
Accuracy Method Blank	*Organics & Metals:* <5×MDL *Organics & Metals:* <RL	Reextract, reanalyze, and/or blank subtract[e]; document corrective actions
Accuracy Lab Control Sample (LCS)	*Organics:* 50 to 120% Recovery *Metals:* 75 to 125% Recovery	Reextract, reanalyze, and/or document and justify; all corrective actions documented
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	*Organics:* 50 to 120% Recovery[b] *Metals:* 75 to 125% Recovery[b]	As above
Standard Reference Material (SRM)	*Organics:* ≤30% PD [d] from target concentration plus the 95% confidence interval. *Metals:* Within 25% PD[c] from certified value.	As above
Surrogate Internal Standard (SIS)	*Organics:* 30 - 150% Recovery	As above
Precision Duplicates & MS/MSD	*Organics & Metals:* ≤30% RPD[b] between % recoveries *Organics & Metals:* ≤30% RPD[c] between values *TOC:* RPD ≤ 30% *Grain Size:* RPD ≤ 25%	As above

MDL: method detection limit; PD: percent difference; RPD: relative percent difference
[a] Quality control samples are based on an analytical batch size of 20.
[b] Analyte concentration in MS must be >5× background concentration to be used for data quality assessment.
[c] For analytes detected at concentrations >10× MDL.
[d] Percent Difference (PD) determined using surrogate corrected data. PD only determined for certified analytes.
[e] Blank subtracting is applicable to metals only, and would require the NAE project manager's consultation and approval

Table 2-4. Standard Data Reporting Qualifiers.

Data Qualifier	Definition
J	Analyte detected at level less than the laboratory achieved detection limit (i.e., ssRL for organics and RL for metals) but above Method Detection Limit (MDL).
j	For Metals: analyte detected below the Limit of Quantitation /RL; concentration reported may be an estimate.
E	Estimate, result > highest concentration level in the calibration.
B	Analyte concentration found in the sample at a concentration <5x the level found in the procedural blank (the qualifier is only applied to the affected field samples).
U	Not detected above laboratory achieved method detection limit; ssRL (organics) or RL (metals) reported.
N	QC value outside the accuracy or precision criteria goal.
n	QC value outside the accuracy or precision data quality objective, but meets contingency criteria.

2.3.4 Protocol Deviations

2.3.4.1 Field Survey

None.

2.3.4.2 Physical and Chemical Testing

None.

3.0 RESULTS

This section summarizes results obtained from physical and chemical testing of sediment core and rinsate blank samples collected at Brushneck Cove, RI. Each of the 11 cores were characterized, homogenized, and sampled for grain size, total organic carbon (TOC), organics (PCB/PEST/PAH), and metals analyses.

Chemistry results for the sediments were evaluated against the laboratory based method detection limits (MDL) and reporting limits (RL) such that:

- Organic contaminants and metals not-detected or detected at levels below the Laboratory MDL were reported as the RL and U flagged
- Organic contaminants and metals detected at levels above the Laboratory MDL and below the RL were J flagged (metals results were flagged with a lower case j)

Complete test results are provided as attachments to this report (Attachment A includes grain size and TOC test results and Attachment B includes organic contaminant and metals test results). Results of all physical and chemical tests are summarized below.

3.1 Grain Size and Total Organic Carbon

Grain size and TOC data for the samples are summarized in Table 3-1 and are presented in greater detail in Attachment A. Generally, the sediment composition ranged from dark grey, silty clay in the top portion of the core to fine sand in the lower portion of the core. The most notable transition was observed for Station BNC-C-09 (GAG-001), proximate to Buttonwoods Beach, which exhibited a transition from fine sand to coarse sand with some fine gravel and a distinct horizon from 1.8 to 2.5 feet. The lower portion of material from this core was retained and analyzed separately for grain size and TOC (GAG-014).

Table 3-1. Summary of Grain Size and TOC Data

Sample ID	% Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Silt	% Clay	% Water Content	% Total Solids	% TOC Average[1]
GAG-001	0.56	0.92	7.73	68.34	15.48	6.97	25	80	0.38
GAG-002	1.21	0.17	1.83	21.43	45.68	29.68	77	56	1.67
GAG-003	0.00	0.29	3.58	28.02	39.66	28.45	80	55	1.75
GAG-004	0.00	0.00	1.05	10.35	55.44	33.16	101	50	2.72
GAG-005	0.00	0.91	1.74	19.05	48.17	30.13	84	54	2.76
GAG-006	0.00	0.12	2.08	19.34	46.73	31.73	88	53	2.32
GAG-007	0.00	0.24	3.06	22.65	38.90	35.15	88	53	2.16
GAG-008	0.00	0.00	0.86	12.37	50.00	36.77	96	51	2.30
GAG-009	0.00	0.27	1.29	16.36	47.72	34.36	87	53	1.99
GAG-010	0.00	0.00	1.63	27.48	42.55	28.34	71	59	1.53
GAG-011	0.00	0.00	3.84	40.32	36.98	18.86	56	64	1.09
GAG-014	0.36	1.57	4.23	84.34	9.17	0.33	20	84	0.03
GAG-014 Dup	0.33	1.46	4.34	82.96	10.60	0.31	20	84	NA

NA = Not Applicable; [1] Average of 2 measurements.

As expected, fine-grained sediments typically contained higher levels of TOC. For example, sample GAG-004, had the highest percentage of fine material (88.66% silt + clay) and the highest percentage of TOC (2.72%). Sample GAG-014, representing the sandy, lower portion of Core GAG-001 (Station BNC-

C-09), had the lowest percentage of fine material (9.5% silt + clay) and the lowest percentage of TOC (0.03%). A number of cores also possessed layers of shell hash. The sediments from all but one location (Station BNC-C-09) produced a noticeable sulfur odor.

3.1.1 Polychlorinated Biphenyl Congeners and Chlorinated Pesticides

Low levels of PCB and pesticide compounds were detected in all of the samples collected (Table 3-2). Total PCB concentrations ranged from 3 to 20 ug/g (ppb) with the lowest concentrations corresponding to the sediment sample containing the lowest percent fines (GAG-001; station BNC-C-09). Limited pesticides were detected including DDD, DDE, chlordanes, cis and trans-nonachlor, dieldrin and methoxychlor. In general, pesticide concentrations were at or below the target detection limit of 1 ng/g (ppb).

Table 3-2 Summary of Sediment PCB and Chlorinated Pesticide Data (ng/g dry weight)

Sample ID	GAG-001		GAG-002		GAG-003		GAG-004		GAG-005		GAG-006	
Station ID	BNC-C-09		BNC-C-08		BNC-C010		BNC-C-11		BNC-C-01		BNC-C-02	
	Value	qual	Value	qual	Value	qual	Value	qual	Value	qual	Value	qual
PCBs												
Cl2(08)	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
Cl3(18)	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
Cl3(28)	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
Cl4(44)	0.09	B	0.37		0.43		0.65		0.68		0.73	
Cl4(49)	0.18	BME	2.19	ME	1.65	ME	6.52	ME	1.6	ME	3.06	ME
Cl4(52)	0.18	B	0.22	B	0.31	B	0.46	B	0.42	B	0.45	B
Cl4(66)	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
Cl5(87)	0.09	U	0.32		0.41		0.73		0.34		0.52	
Cl5(101)	0.1		0.33		0.33		0.55		0.28		0.59	
Cl5(105)	0.09	U	0.12	U	0.13	U	0.12	J	0.11	J	0.14	
Cl5(118)	0.08	J	0.24		0.34		0.39		0.42		0.53	
Cl6(128)	0.09	U	0.12	U	0.11	J	0.13	U	0.12	U	0.12	U
Cl6(138)	0.09		0.24		0.36		0.47		0.55		0.55	
Cl6(153)	0.08	J	0.2		0.3		0.41		0.44		0.57	
Cl7(170)	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
Cl7(180)	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.3	
Cl7(183)	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.17	
Cl7(184)	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
Cl7(187)	0.09	U	0.17		0.17		0.25		0.24		0.33	
Cl8(195)	0.09	U	0.17		0.14		0.2		0.11	J	0.48	
Cl9(206)	0.09	U	0.26		0.22		0.29		0.22		0.43	
Cl10(209)	0.09	U	0.26		0.22		0.31		0.15		0.39	
Total PCB	2.96		6.3		7.16		9.48		8.52		12.17	
Pesticides												
4,4 DDD	0.09	U	0.23		0.24		0.51		1.67		1.59	
4,4 DDE	0.1		0.31		0.41		0.49		1.16		1.24	
4,4 DDT	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
Aldrin	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
a-Chlordane	0.09	U	0.12	U	0.13	U	0.13	U	0.93		0.98	
g-Chlordane	0.09	U	0.12	U	0.25		0.39		1.65		1.66	
Lindane	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
cis-Nonachlor	0.09	U	0.12	U	0.13	U	0.13	U	0.51		0.37	
trans-Nonachlor	0.09	U	0.12	U	0.13	U	0.13	U	0.89		0.76	
Oxychlordane	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
Dieldrin	0.09	U	0.3		0.25		0.48		0.34		0.56	

Endosulfan I	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
Sample ID	**GAG-001**		**GAG-002**		**GAG-003**		**GAG-004**		**GAG-005**		**GAG-006**	
Station ID	**BNC-C-09**		**BNC-C-08**		**BNC-C010**		**BNC-C-11**		**BNC-C-01**		**BNC-C-02**	
	Value	**qual**	**Value**	**qual**	**Value**	**qual**	**Value**	**qual**	**Value**	**qual**	**Value**	**qual**
Endosulfan II	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
Endrin	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
Heptachlor	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
Heptachlor epoxide	0.09	U	0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
Hexachlorobenzene	0.76		0.12	U	0.13	U	0.13	U	0.12	U	0.12	U
Methoxychlor	0.09	U	0.99		1.63		1.98		0.89		0.81	
Toxaphene	3.67	U	3.67	U	3.67	U	3.67	U	3.67	U	3.67	U
Sample ID	**GAG-007**		**GAG-008**		**GAG-009**		**GAG-010**		**GAG-011**			
Station ID	**BNC-C-03**		**BNC-C-04**		**BNC-C-05**		**BNC-C-06**		**BNC-C-07**			
	Value	**qual**	**Value**	**qual**	**Value**	**qual**	**Value**	**qual**	**Value**	**qual**		
PCBs												
Cl2(08)	0.12	U	0.15	U	0.13	U	0.11	U	0.11	U		
Cl3(18)	0.12	U	0.15	U	0.13	U	0.11	U	0.11	U		
Cl3(28)	0.12	U	0.15	U	0.13	U	0.11	U	0.11	U		
Cl4(44)	0.53		0.78		0.48		0.38		0.33			
Cl4(49)	3.2	ME	3.24	ME	1.34	ME	0.86	ME	1.27	ME		
Cl4(52)	0.3	B	0.74	B	0.22	B	0.25	B	0.3	B		
Cl4(66)	0.12	U	0.15	U	0.13	U	0.11	U	0.11	U		
Cl5(87)	0.47		0.57		0.22		0.11	U	0.21			
Cl5(101)	0.52		1.01		0.28		0.31		0.32			
Cl5(105)	0.12		0.29		0.13	U	0.11	U	0.11	U		
Cl5(118)	0.39		0.97		0.21		0.21		0.27			
Cl6(128)	0.12	U	0.39		0.13	U	0.11	U	0.11	U		
Cl6(138)	0.49		1.14		0.54		0.25		0.31			
Cl6(153)	0.42		1.28		0.2		0.23		0.31			
Cl7(170)	0.12	U	0.36		0.13	U	0.11	U	0.11	U		
Cl7(180)	0.19		0.63		0.13	U	0.11	U	0.14			
Cl7(183)	0.12	U	0.29		0.13	U	0.11	U	0.11	U		
Cl7(184)	0.12	U	0.15	U	0.13	U	0.11	U	0.11	U		
Cl7(187)	0.19		0.55		0.15		0.1	J	0.15			
Cl8(195)	0.1	J	0.4		0.13	U	0.11	U	0.39			
Cl9(206)	0.13		0.61		0.13	U	0.11	U	0.18			
Cl10(209)	0.12		0.56		0.13	U	0.11	U	0.15			
Total PCB	8.19		20.44		5.8		5.1		6.99			
Pesticides												
4,4 DDD	0.82		2.87		0.31		0.19		0.47			
4,4 DDE	0.77		1.85		0.27		0.19		0.38			
4,4 DDT	0.12	U	0.23		0.13	U	0.11	U	0.11	U		
Aldrin	0.12	U	0.15	U	0.13	U	0.11	U	0.11	U		
a-Chlordane	0.43		0.7		0.13	U	0.3		0.11	U		
g-Chlordane	0.67		1.28		0.25		0.15		0.27			
Lindane	0.12	U	0.15	U	0.13	U	0.11	U	0.11	U		
cis-Nonachlor	0.17		0.64		0.08	J	0.11	U	0.19			
trans-Nonachlor	0.29		0.43		0.13	U	0.11	U	0.11	U		
Oxychlordane	0.12	U	0.15	U	0.13	U	0.11	U	0.11	U		
Dieldrin	0.5		1.38		0.22		0.11	U	0.23			
Endosulfan I	0.12	U	0.15	U	0.13	U	0.11	U	0.11	U		
Endosulfan II	0.12	U	0.15	U	0.13	U	0.11	U	0.11	U		

Sample ID	GAG-007		GAG-008		GAG-009		GAG-010		GAG-011	
Station ID	BNC-C-03		BNC-C-04		BNC-C-05		BNC-C-06		BNC-C-07	
	Value	qual	Value	qual	Value	qual	Value	qual	Value	qual
Endrin	0.12	U	0.15	U	0.13	U	0.11	U	0.11	U
Heptachlor	0.12	U	0.15	U	0.13	U	0.11	U	0.11	U
Heptachlor epoxide	0.12	U	0.15	U	0.13	U	0.11	U	0.11	U
Hexachlorobenzene	0.12	U	0.15	U	0.13	U	0.11	U	0.11	U
Methoxychlor	1.23		4.22		0.97		2.79		1.32	
Toxaphene	3.67	U	3.67	U	3.67	U	3.67	U	3.67	U

3.1.2 Polynuclear Aromatic Hydrocarbons

PAHs were detected in all sediment samples (Table 3-3). Total PAHs ranged from 51 to 638 ng/g (ppb) with the highest concetentrations observed at the inland-most stations within Brush Neck Cove. All sediment samples, however, appear to have a similar PAH distribution pattern which is dominated by fluoranthene and pyrene, and other high molecular weight PAHs. This pattern suggests pyrogenic PAH sources indicative of combusted petroleum products and similar to what is often observed in urban run-off.

Table 3-3. Summary of Sediment PAH Data (ng/g dry weight)

Sample ID	GAG-001		GAG-002		GAG-003		GAG-004		GAG-005		GAG-006	
Station ID	BNC-C-09		BNC-C-08		BNC-C010		BNC-C-11		BNC-C-01		BNC-C-02	
	Value	qual	Value	qual	Value	Value	qual	qual	Value	qual	Value	qual
Naphthalene	0.97	B	1.81	B	1.86	B	2.55		3.07	B	2.78	B
Acenaphthylene	1.05		1.45		1.31		2.03		7.9		4.05	
Acenaphthene	0.41	U	0.34	J	0.37	J	0.66		1		1.21	
Fluorene	0.48		0.93		1.12		1.52		1.87		2.01	
Anthracene	1.86		2.63		2.65		3.35		7.97		5.93	
Phenanthrene	9.05		8.13		8.08		9.38		20.59		19.78	
Fluoranthene	21.21		23.17		20.67		30.76		115.35		78.48	
Pyrene	18.91		23.2		18.58		29.57		107.46		89.41	
Benzo(a)anthracene	6.77		8.59		6.76		10		45.78		30.84	
Chrysene	8.07		10.05		9		13.03		56.33		41.1	
Benzo(b)fluoranthene	7.19		9.71		9.31		14.17		59.93		50.18	
Benzo(k)fluoranthene	7.28		9.69		9.05		13.96		60.44		49.61	
Benzo(a)pyrene	7.41		9.81		8.42		12.87		58.7		43.31	
Indeno(1,2,3-cd) pyrene	5.35		7.58		7.26		11.17		44.3		38.82	
Dibenz(a,h)anthracene	1.03		1.39		1.41		2.2		8.7		7.31	
Benzo(g,h,i)perylene	4.84		6.62		6.54		10.24		38.69		33.53	
Total PAH [1]	101		125		112		168		638		498	

Sample ID	GAG-007		GAG-008		GAG-009		GAG-010		GAG-011	
Station ID	BNC-C-03		BNC-C-04		BNC-C-05		BNC-C-06		BNC-C-07	
	Value	qual	Value	qual	Value	qual	Value	qual	Value	qual
Naphthalene	1.97	B	4.64		1.66	B	1.14	B	1.49	B
Acenaphthylene	2.17		8.87		0.92		0.6		1.57	
Acenaphthene	0.64		1.69		0.4	J	0.25	J	0.29	J
Fluorene	1.2		3.25		0.75		0.51	J	0.78	
Anthracene	3.11		11.6		1.76		1.04		2.27	
Phenanthrene	9.41		29.4		5.72		2.45		7.26	
Fluoranthene	37.13		12.03		21.73		9.35		23.63	

Sample ID	GAG-007		GAG-008		GAG-009		GAG-010		GAG-011		
Station ID	BNC-C-03		BNC-C-04		BNC-C-05		BNC-C-06		BNC-C-07		
	Value	qual	Value	qual	Value	qual	Value	qual	Value	qual	
Pyrene	38.14		134.97		20.27		8.36		24.14		
Benzo(a)anthracene	13.18		44.67		7.15		2.72		9.15		
Chrysene	18.89		56.51		11.17		4.26		11.99		
Benzo(b)fluoranthene	23.3		69.82		12.37		4.74		10.85		
Benzo(k)fluoranthene	21.33		69.12		11.62		4.36		12.11		
Benzo(a)pyrene	18.6		61.91		10.31		3.58		10.43		
Indeno(1,2,3-cd) pyrene	17.14		53.8		9.66		3.26		7.77		
Dibenz(a,h)anthracene	3.24		10.72		1.69		0.62		1.46		
Benzo(g,h,i)perylene	15.69		47.82		8.87		3.32		7.3		
Total PAH [1]	225		621		126		51		131		

[1] Total PAH is the sum of the 16 PAHs (1/2 MDL included for "U" flagged data)

3.1.3 Metals

Target metals were detected in all samples and concentrations were relatively similar across samples. Metals data is presented in Table 3-4.

Table 3-4. Summary of Metals Data (µg/g dry weight)

Sample ID	GAG-001		GAG-002		GAG-003		GAG-004		GAG-004 Duplicate		GAG-005	
Station ID	BNC-C-09		BNC-C-08		BNC-C010		BNC-C-11		BNC-C-11		BNC-C-01	
	Value	qual	Value	qual	Value	qual	Value	qual	Value	qual	Value	qual
Arsenic	1.91		5.47		4.87		5.66		6.13		5.36	
Cadmium	0.209		0.507		0.533		0.672		0.698		0.521	
Chromium	13.1		39.0		36.6		50.2		52.2		42.0	
Copper	5.49		10.9		11.1		17.3		17.6		13.3	
Mercury	0.0135	j	0.0314		0.0272		0.0609		0.0590		0.0640	
Nickel	4.71		14.7		13.9		17.5		17.9		14.7	
Lead	4.21		9.14		8.86		14.2		15.0		16.6	
Zinc	23.8		58.2		53.2		72.9		76.1		66.2	
Sample ID	**GAG-006**		**GAG-007**		**GAG-008**		**GAG-009**		**GAG-010**		**GAG-011**	
Station ID	**BNC-C-02**		**BNC-C-03**		**BNC-C-04**		**BNC-C-05**		**BNC-C-06**		**BNC-C-07**	
	Value	**qual**	**Value**	**qual**	**Value**	**qual**	**Value**	**qual**	**Value**	**qual**	**Value**	**qual**
Arsenic	5.47		4.94		6.45		5.71		4.28		3.53	
Cadmium	0.559		0.517		0.570		0.467		0.366		0.373	
Chromium	43.0		41.5		51.1		41.4		34.8		26.6	
Copper	15.0		12.2		16.9		11.3		8.49		9.72	
Mercury	0.0689		0.0318		0.0748		0.0241		0.0182	j	0.0335	
Nickel	14.6		14.6		17.4		14.9		12.7		9.53	
Lead	17.1		11.4		18.8		10.2		7.92		8.97	
Zinc	67.3		58.8		77.3		60.3		49.9		45.8	

3.1.4 Quality Control

In general, results from the QC samples were good and met the MQOs. QA/QC narratives, which include a discussion of the QC results and a description of MQO exceedances and the impact, if any, the exceedances may have on the overall sample data are provided in Attachments A and B.

3.1.5 Rinsate Blank

Target PCB and pesticide compounds were not detected at levels above the Laboratory MDL or RL in the field rinsate blank sample (Table 3-5). PAHs were detected in the rinsate blank; however, the PAH compounds detected in the blank were primarily low molecular weight PAHs. The PAHs detected in the samples were dominated by the high molecular weight compounds, indicating that the impact on sediment data quality is minimal.

Only nickel and lead were detected above the MDL in the rinsate blank (Table 3-5). However, the concentrations of these metals in the rinsate blank were several orders of magnitude lower than the concentrations in the associated sediment samples, indicating that the impact on the sediment data quality is minimal.

Table 3-5. Summary of Rinsate Blank Data

Rinsate Blank-GAG-012					
	Value	**qual**		**Value**	**qual**
PCBs	**ng/L**		**PAHs**	**ng/L**	
Cl2(08)	0.48	U	Naphthalene	91.55	
Cl3(18)	0.48	U	Acenaphthylene	2.39	U
Cl3(28)	0.48	U	Acenaphthene	3.83	
Cl4(44)	0.48	U	Fluorene	29.11	
Cl4(49)	0.48	U	Anthracene	2.39	U
Cl4(52)	0.48	U	Phenanthrene	15.17	
Cl4(66)	0.48	U	Fluoranthene	1.97	J
Cl5(87)	0.48	U	Pyrene	2.	J
Cl5(101)	0.48	U	Benzo(a)anthracene	2.39	U
Cl5(105)	0.48	U	Chrysene	2.39	U
Cl5(118)	0.48	U	Benzo[b]fluoranthene	2.39	U
Cl6(128)	0.48	U	Benzo[k]fluoranthene	4.78	U
Cl6(138)	0.48	U	Benzo[a]pyrene	2.39	U
Cl6(153)	0.48	U	Indeno[1,2,3-c,d]-pyrene	2.39	U
Cl7(170)	0.48	U	Dibenz[a,h]anthracene	2.39	U
Cl7(180)	0.48	U	Benzo[g,h,i]perylene	2.39	U
Cl7(183)	0.47	U	**Metals**	**µg/L**	
Cl7(184)	0.47	U	Arsenic	0.015	U
Cl7(187)	0.48	U	Cadmium	0.001	U
Cl8(195)	0.48	U	Chromium	0.083	U
Cl9(206)	0.48	U	Copper	0.009	j
Cl10(209)	0.48	U	Mercury	0.00019	U
Total PCB	10.49	U	Nickel	0.0606	
			Lead	0.00776	
			Zinc	0.209	U
Pesticides	**ng/L**		**Pesticides cont.**		
4,4 DDD	0.48	U	Dieldrin	0.48	U
4,4 DDE	0.48	U	Endosulfan I	0.48	U
4,4 DDT	0.48	U	Endosulfan II	0.48	U
Aldrin	0.48	U	endrin	0.9	U
a-Chlordane	0.48	U	heptachlor	0.94	U
g-Chlordane	0.48	U	heptachlor epoxide	0.4	U

Rinsate Blank-GAG-012					
	Value	**qual**		**Value**	**qual**
Lindane	0.48	U	Hexachlorobenzene	0.76	U
cis-Nonachlor	0.48	U	methoxychlor	0.47	U
trans-Nonachlor	0.48	U	Toxaphene	95.43	U
Oxychlordane	0.48	U			

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4.0 REFERENCES

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Peven, C.S. and A.D. Uhler. 1993. Analytical procedures followed by Battelle Ocean Sciences and Science Applications International Corporation to quantify organic contaminants. Pp. 141-161 in Lauenstein, G.G., and A.Y. Cantillo (Eds.), Sampling and Analytical Methods of the National Status and Trends Program National Benthic Surveillance and Mussel Watch Project. Volume IV. NOAA Technical Memorandum NOS ORCA 71. National Oceanic and Atmospheric Administration, Silver Spring, MD.

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Attachment A

Results of Physical Measurements: Grain Size and Total Organic Carbon (TOC)

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Table II-7: Quality Control Summary for Analyses of Sediment Grain Size and Total Organic Carbon

Method Reference Numbers: ASTM D422 (Particle Size Analysis of Soils) and EPA 9060A (Total Organic Carbon)

Quality Control (QC) Element	**Acceptance Criteria***	**Criteria Met? Yes/No**	**List Results Outside Criteria (Cross-Reference Results Table in Data Report)**	**Location of Results (Retained at Lab or in Data Package)**
Grain Size: Analytical Replicates	Analyze one sample in duplicate for each group of field samples (RPD<25%)	Yes	None	In Data Package
Total Organic Carbon: Standard Reference Materials	Within the limits provided by vendor	Yes	None	In Data Package
Total Organic Carbon: Analytical Replicates	Analyze samples in duplicate (RPD<30%)	Yes	None	In Data Package

*The Quality Control Acceptance Criteria are general guidelines. If alternative criteria are used, they must be documented in this table.

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Grain Size Results

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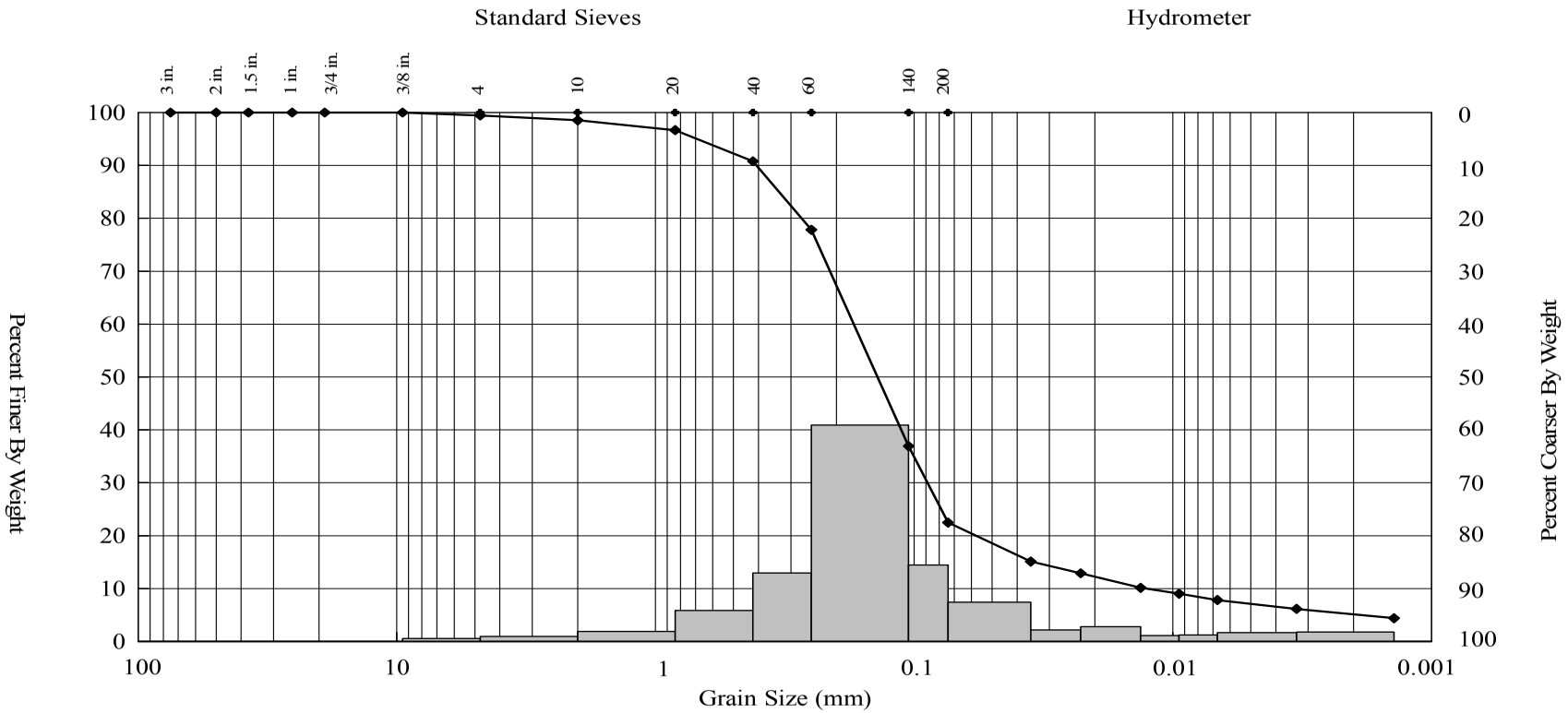
GEOTECHNICAL RESULTS



Gravel (%)	Sand (%)			Fines (%)	
	Coarse	Medium	Fine	Silt	Clay
0.56	0.92	7.73	68.34	15.48	6.97

Water Cont. (%)	Total Solids (%)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
25	80								

Material Description

Silty Sand ("SM"), dark greenish gray (10Y 4/1)

Client:	Battelle
Client Project Title:	Brushneck Cove
Client Project Number:	G606430
AMS Project Number:	07-102
Date Sampled:	9/5/2007
Date Analyzed:	9/14/2007
Matrix, Method:	Sediment, ASTM D 422
Client Sample ID:	GAG-001-A
AMS Sample ID:	28690

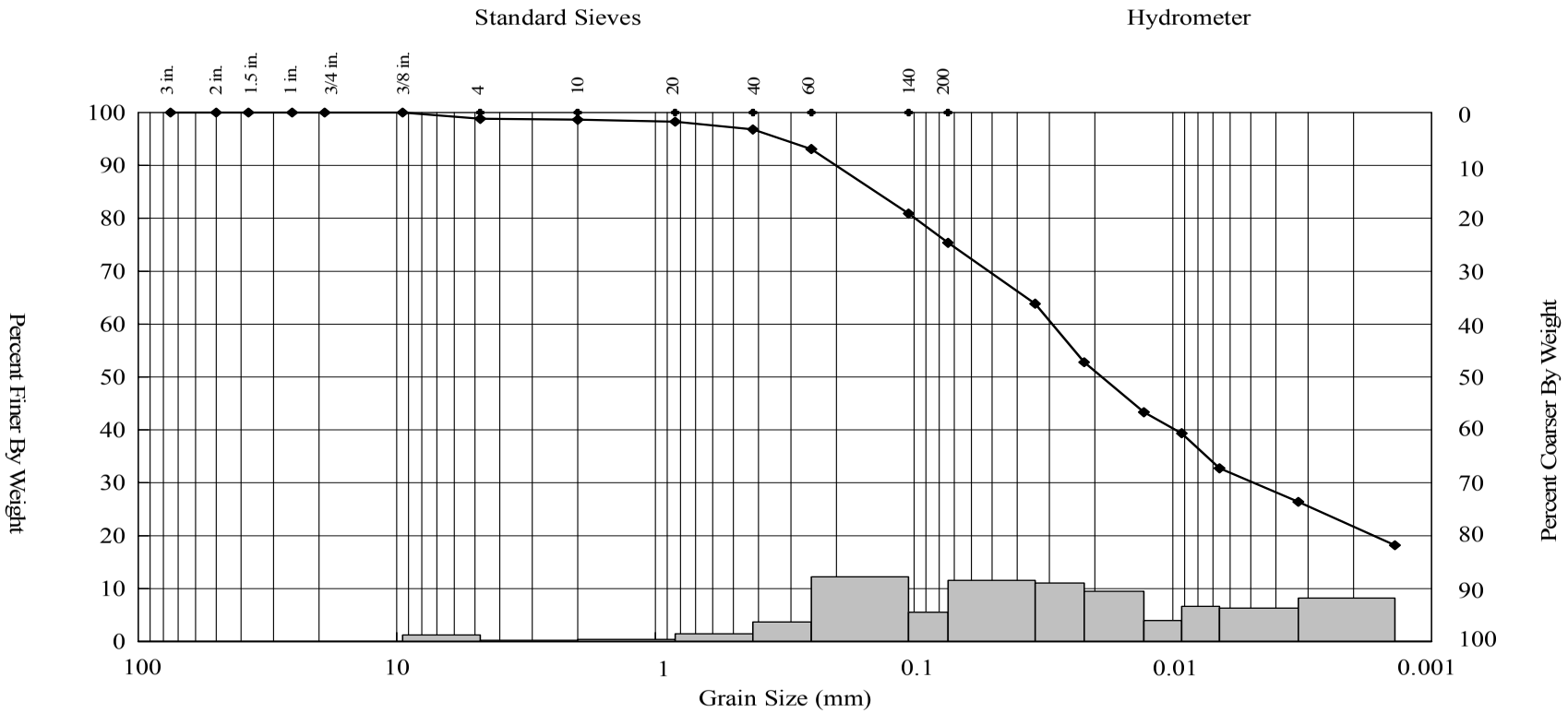
APPLIED MARINE SCIENCES, INC.
502 N. Hwy 3, Suite B
League City, TX 77573
281.554.7272 Tel.
281.554.6356 Fax

These analyses were performed in accordance with ASTM standards, the 2006 DoD Quality Systems Manual (Version 3), and the 2003 NELAC Standard.

K.S. Davis, P.G.
AMS, Inc. Technical Director

ACCREDITED IN ACCORDANCE WITH nelac
Laboratory No. E87956

GEOTECHNICAL RESULTS



Gravel (%)	Sand (%)			Fines (%)	
	Coarse	Medium	Fine	Silt	Clay
1.21	0.17	1.83	21.43	45.68	29.68

Water Cont. (%)	Total Solids (%)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
77	56								

Material Description

Elastic Silt with Sand ("MH"), very dark greenish gray (10Y 3/1)

Client:	Battelle
Client Project Title:	Brushneck Cove
Client Project Number:	G606430
AMS Project Number:	07-102
Date Sampled:	9/5/2007
Date Analyzed:	9/14/2007
Matrix, Method:	Sediment, ASTM D 422
Client Sample ID:	GAG-002-A
AMS Sample ID:	28691

APPLIED MARINE SCIENCES, INC.
502 N. Hwy 3, Suite B
League City, TX 77573
281.554.7272 Tel.
281.554.6356 Fax

These analyses were performed in accordance with ASTM standards, the 2006 DoD Quality Systems Manual (Version 3), and the 2003 NELAC Standard.

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AMS, Inc. Technical Director

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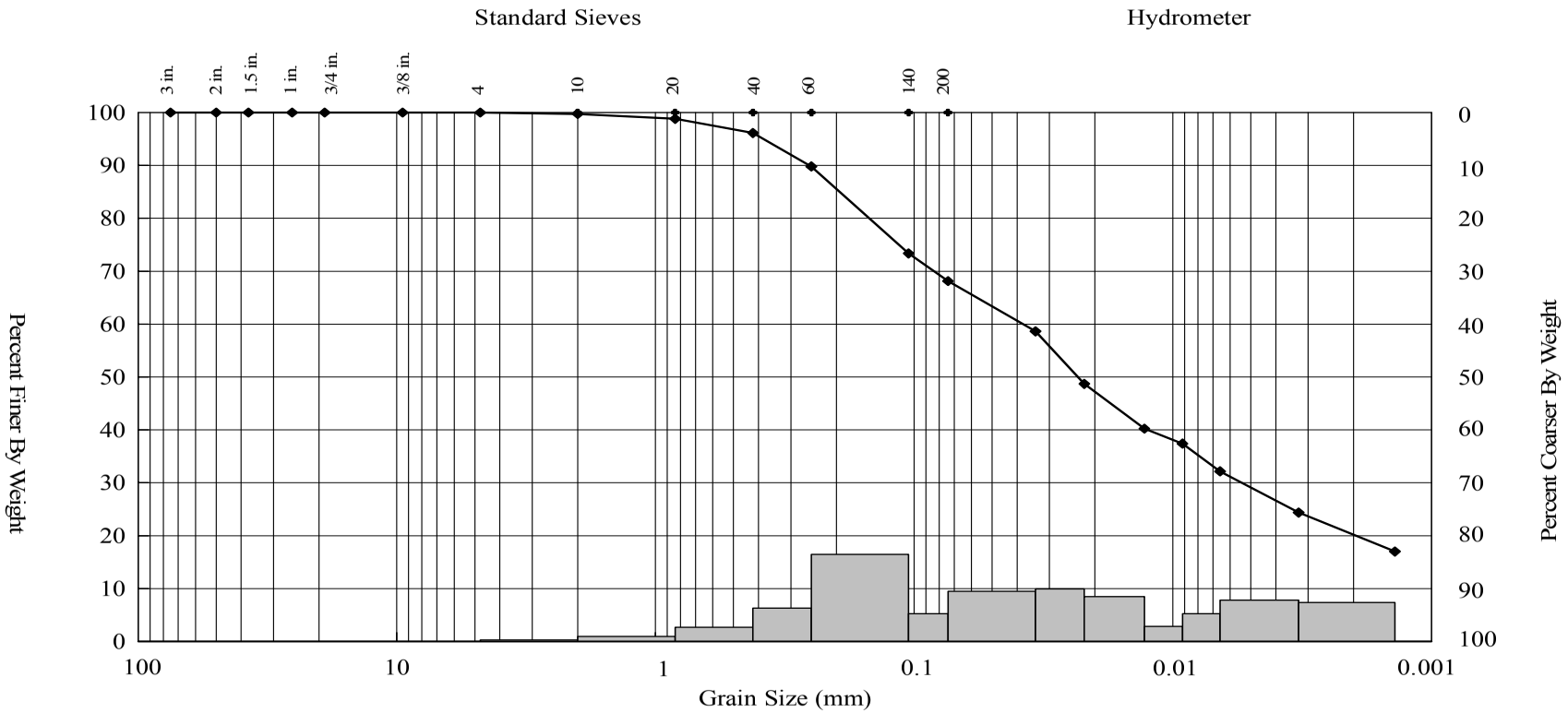
Laboratory No. E87956

GEOTECHNICAL RESULTS



Gravel (%)	Sand (%)			Fines (%)	
	Coarse	Medium	Fine	Silt	Clay
0.00	0.29	3.58	28.02	39.66	28.45

Water Cont. (%)	Total Solids (%)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
80	55								

Material Description

Sandy Elastic Silt ("MH"), very dark greenish gray (10Y 3/1)

Client:	Battelle
Client Project Title:	Brushneck Cove
Client Project Number:	G606430
AMS Project Number:	07-102
Date Sampled:	9/5/2007
Date Analyzed:	9/14/2007
Matrix, Method:	Sediment, ASTM D 422
Client Sample ID:	GAG-003-A
AMS Sample ID:	28692

APPLIED MARINE SCIENCES, INC.
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281.554.6356 Fax

These analyses were performed in accordance with ASTM standards, the 2006 DoD Quality Systems Manual (Version 3), and the 2003 NELAC Standard.

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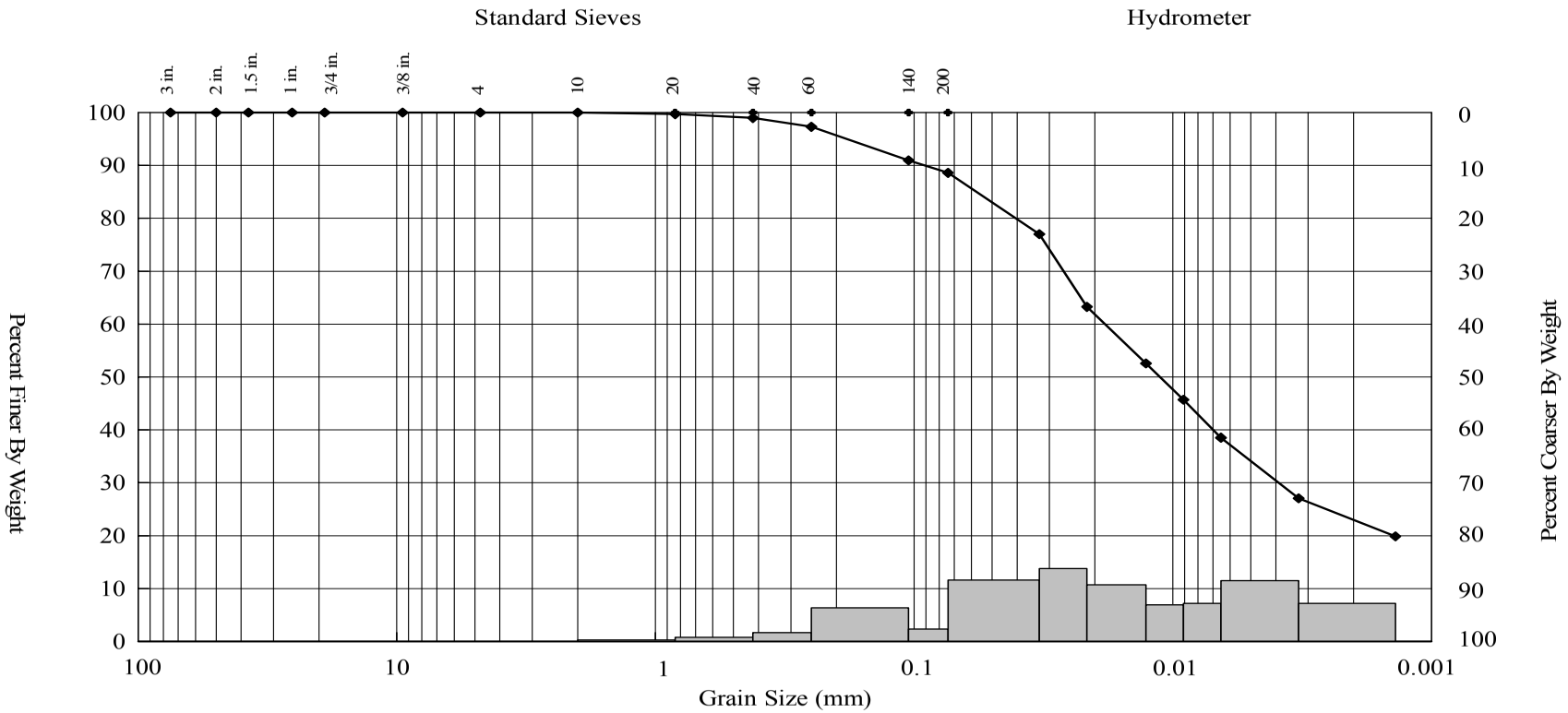
ACCREDITED IN ACCORDANCE WITH nelac
Laboratory No. E87956

GEOTECHNICAL RESULTS



Gravel (%)	Sand (%)			Fines (%)	
	Coarse	Medium	Fine	Silt	Clay
0.00	0.00	1.05	10.35	55.44	33.16

Water Cont. (%)	Total Solids (%)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
101	50								

Material Description

Elastic Silt ("MH"), greenish black (10Y 2.5/1)

Client:	Battelle
Client Project Title:	Brushneck Cove
Client Project Number:	G606430
AMS Project Number:	07-102
Date Sampled:	9/5/2007
Date Analyzed:	9/14/2007
Matrix, Method:	Sediment, ASTM D 422
Client Sample ID:	GAG-004-A
AMS Sample ID:	28693

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These analyses were performed in accordance with ASTM standards, the 2006 DoD Quality Systems Manual (Version 3), and the 2003 NELAC Standard.

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AMS, Inc. Technical Director

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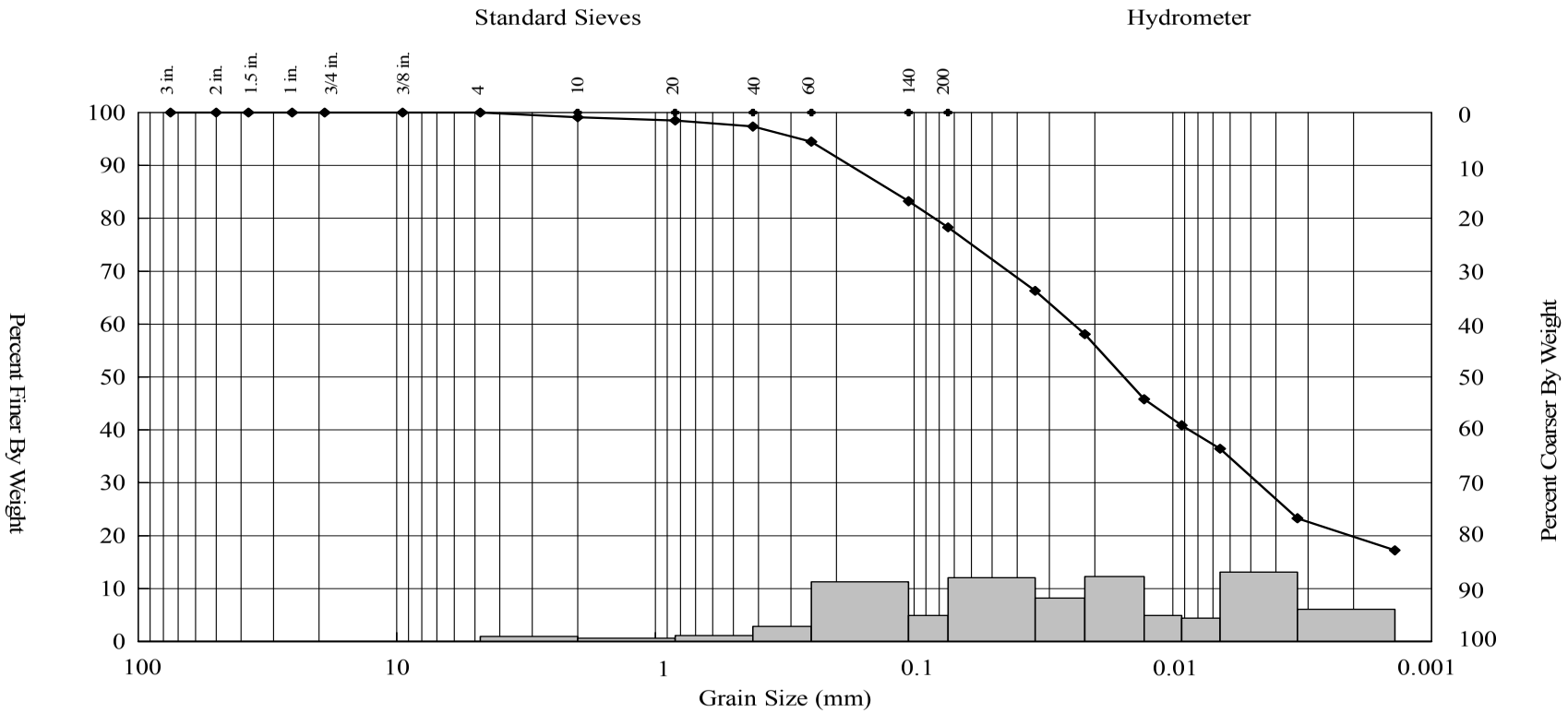
GEOTECHNICAL RESULTS



Gravel (%)	Sand (%)			Fines (%)	
	Coarse	Medium	Fine	Silt	Clay
0.00	0.91	1.74	19.05	48.17	30.13

Water Cont. (%)	Total Solids (%)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
84	54								

Material Description

Elastic Silt with Sand ("MH"), greenish black (10Y 2.5/1)

Client:	Battelle
Client Project Title:	Brushneck Cove
Client Project Number:	G606430
AMS Project Number:	07-102
Date Sampled:	9/5/2007
Date Analyzed:	9/14/2007
Matrix, Method:	Sediment, ASTM D 422
Client Sample ID:	GAG-005-A
AMS Sample ID:	28694

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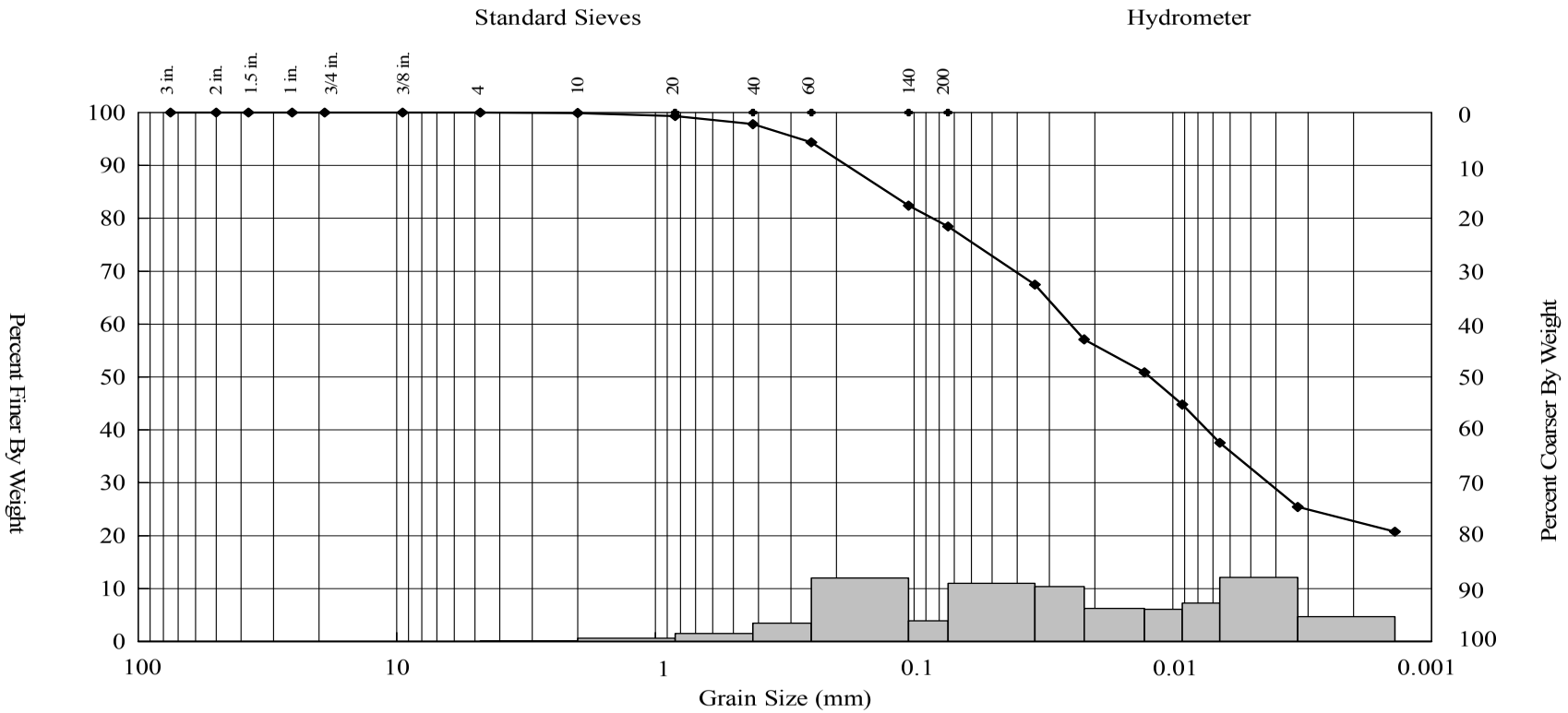

Gravel (%)	Sand (%)			Fines (%)	
	Coarse	Medium	Fine	Silt	Clay
0.00	0.12	2.08	19.34	46.73	31.73

Water Cont. (%)	Total Solids (%)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
88	53								

Material Description

Elastic Silt with Sand ("MH"), very dark greenish gray (10Y 3/1)

Client:	Battelle
Client Project Title:	Brushneck Cove
Client Project Number:	G606430
AMS Project Number:	07-102
Date Sampled:	9/5/2007
Date Analyzed:	9/14/2007
Matrix, Method:	Sediment, ASTM D 422
Client Sample ID:	GAG-006-A
AMS Sample ID:	28695

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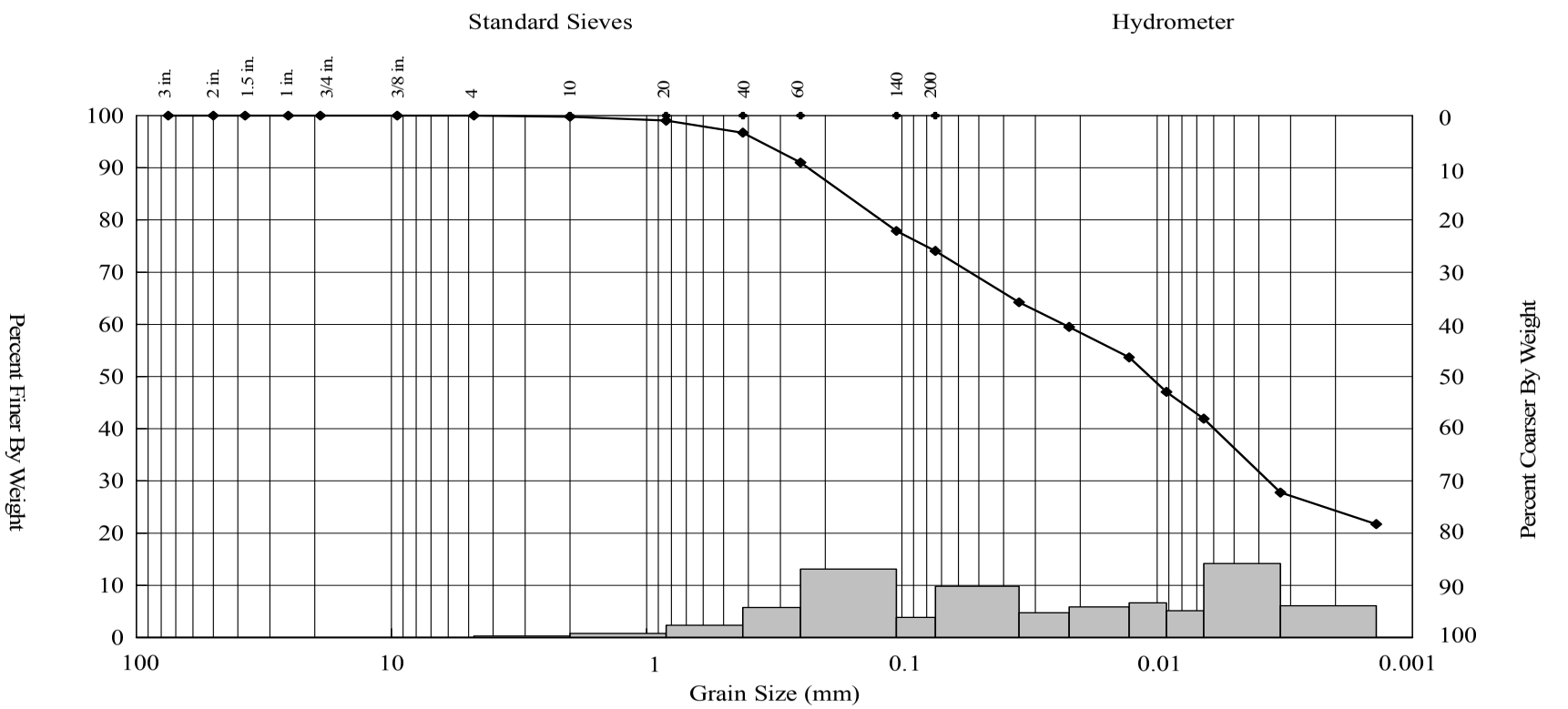
GEOTECHNICAL RESULTS



Gravel (%)	Sand (%)			Fines (%)	
	Coarse	Medium	Fine	Silt	Clay
0.00	0.24	3.06	22.65	38.90	35.15

Water Cont. (%)	Total Solids (%)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
88	53								

Material Description

Elastic Silt with Sand ("MH"), very dark greenish gray (10Y 3/1)

Client:	Battelle
Client Project Title:	Brushneck Cove
Client Project Number:	G606430
AMS Project Number:	07-102
Date Sampled:	9/5/2007
Date Analyzed:	9/14/2007
Matrix, Method:	Sediment, ASTM D 422
Client Sample ID:	GAG-007-A
AMS Sample ID:	28696

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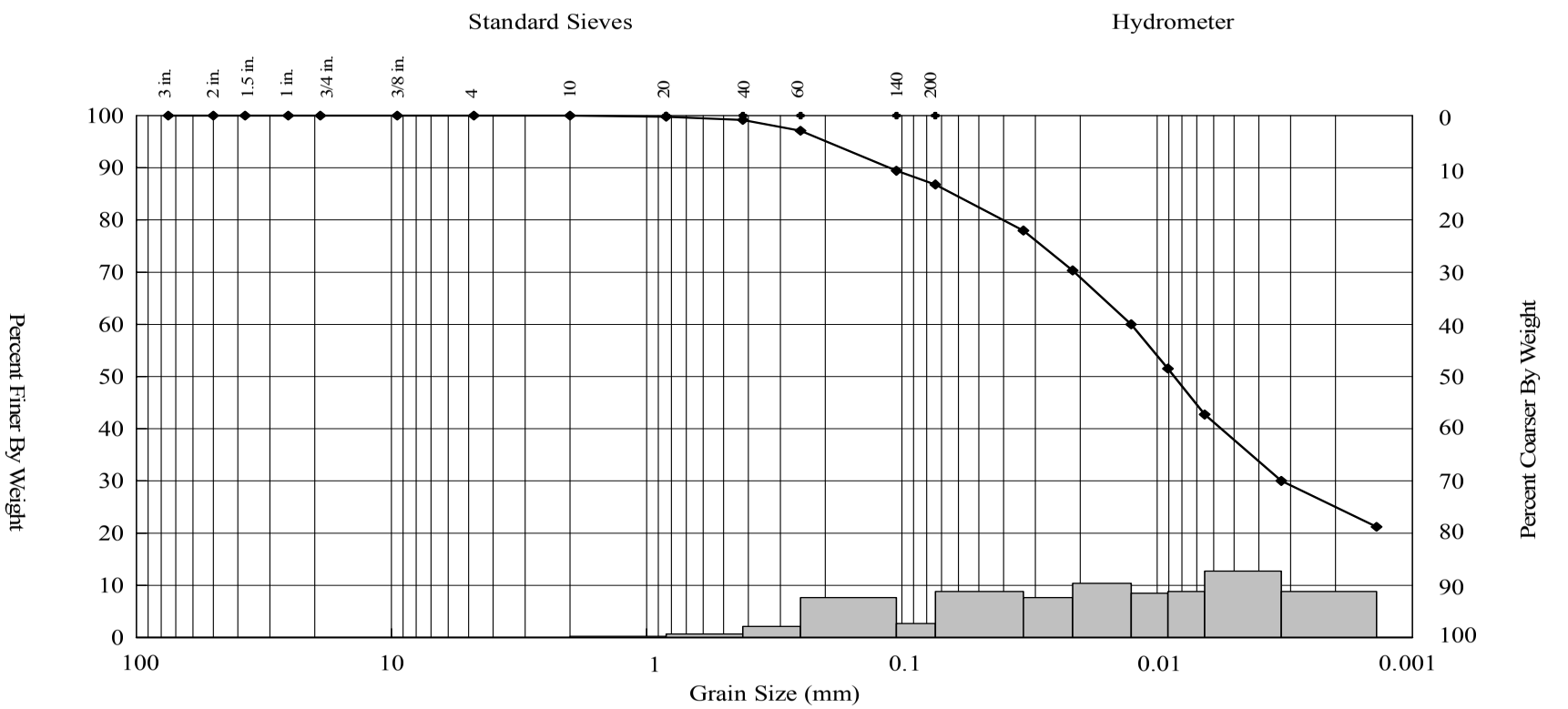
GEOTECHNICAL RESULTS



Gravel (%)	Sand (%)			Fines (%)	
	Coarse	Medium	Fine	Silt	Clay
0.00	0.00	0.86	12.37	50.00	36.77

Water Cont. (%)	Total Solids (%)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
96	51								

Material Description

Elastic Silt ("MH"), greenish black (10Y 2.5/1)

Client:	Battelle
Client Project Title:	Brushneck Cove
Client Project Number:	G606430
AMS Project Number:	07-102
Date Sampled:	9/5/2007
Date Analyzed:	9/14/2007
Matrix, Method:	Sediment, ASTM D 422
Client Sample ID:	GAG-008-A
AMS Sample ID:	28697

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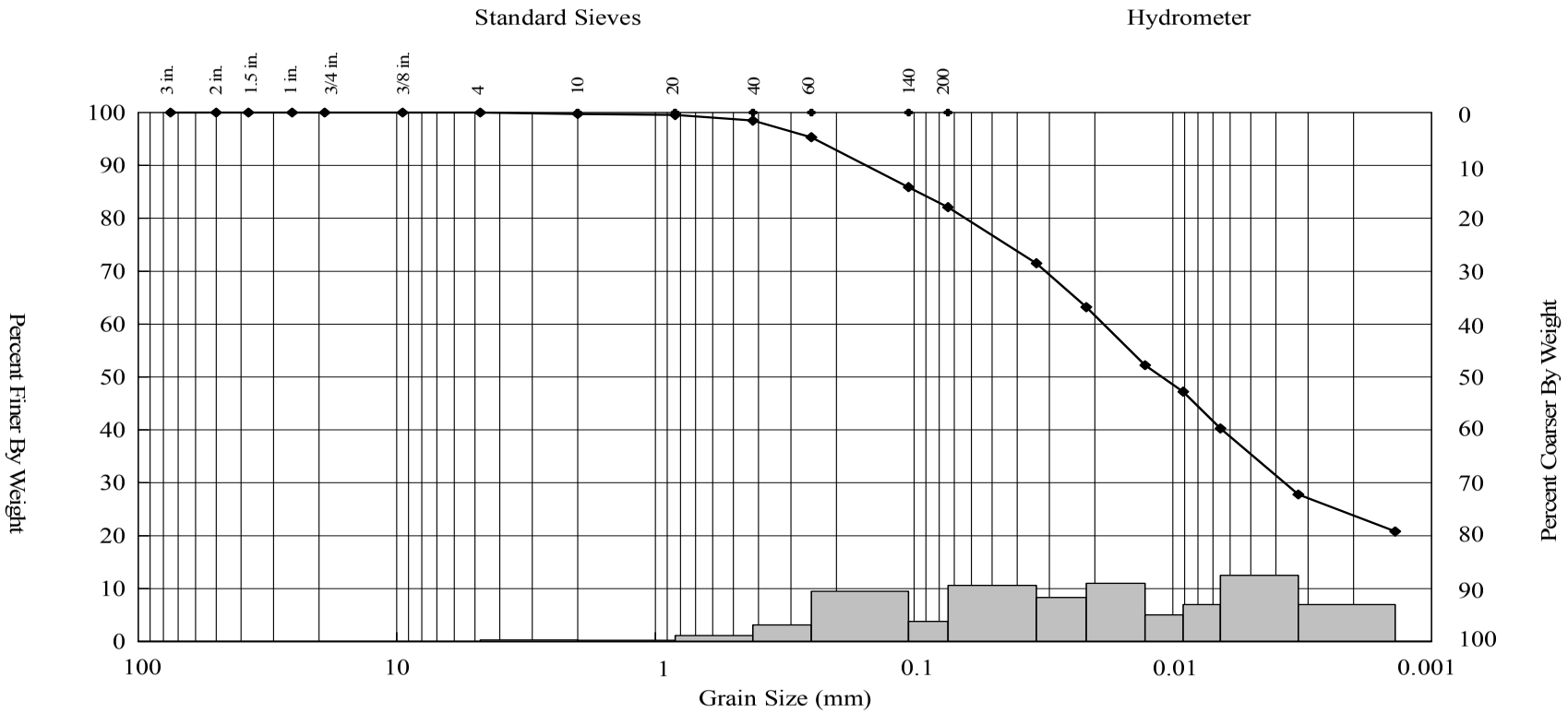
GEOTECHNICAL RESULTS



Gravel (%)	Sand (%)			Fines (%)	
	Coarse	Medium	Fine	Silt	Clay
0.00	0.27	1.29	16.36	47.72	34.36

Water Cont. (%)	Total Solids (%)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
87	53								

Material Description

Elastic Silt with Sand ("MH"), very dark greenish gray (10Y 3/1)

Client:	Battelle
Client Project Title:	Brushneck Cove
Client Project Number:	G606430
AMS Project Number:	07-102
Date Sampled:	9/5/2007
Date Analyzed:	9/14/2007
Matrix, Method:	Sediment, ASTM D 422
Client Sample ID:	GAG-009-A
AMS Sample ID:	28698

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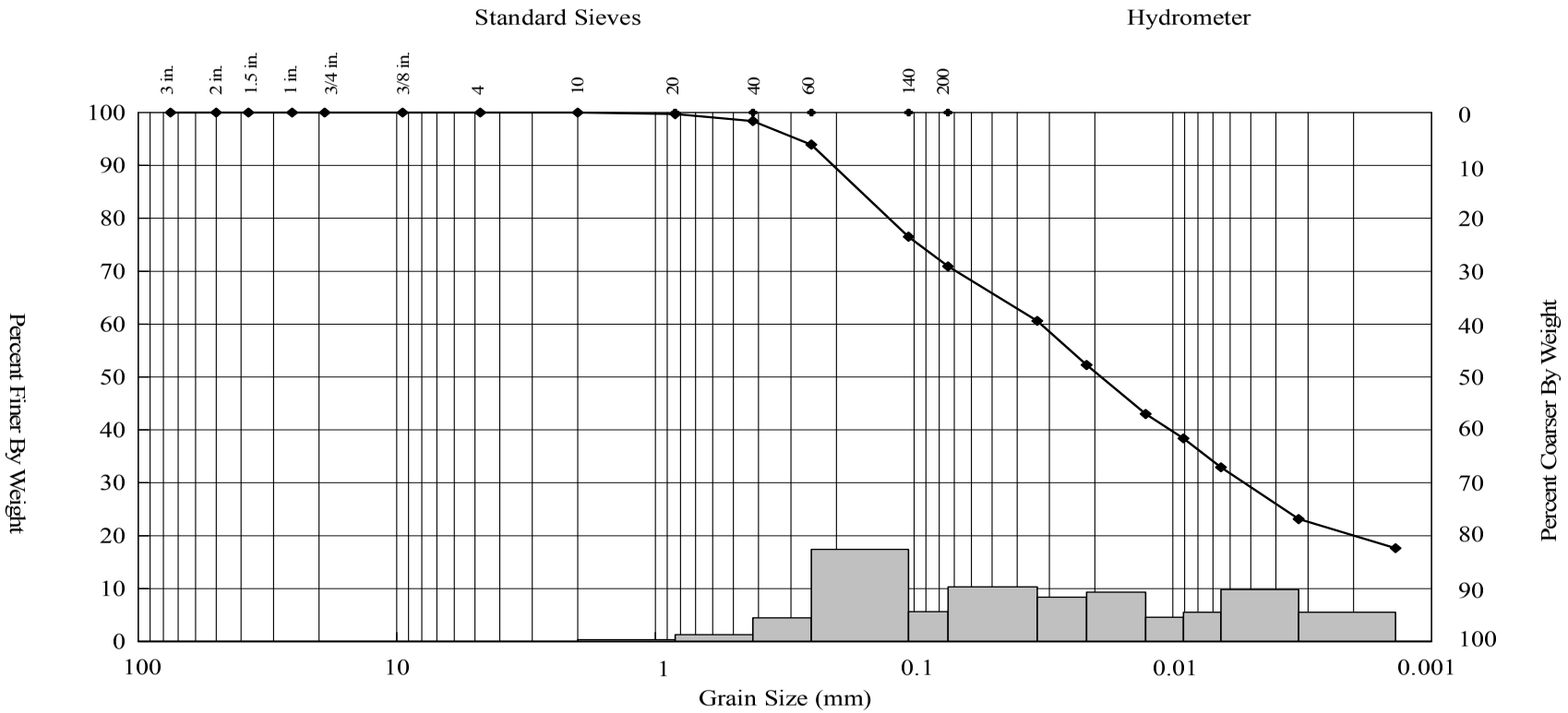
GEOTECHNICAL RESULTS



Gravel (%)	Sand (%)			Fines (%)	
	Coarse	Medium	Fine	Silt	Clay
0.00	0.00	1.63	27.48	42.55	28.34

Water Cont. (%)	Total Solids (%)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
71	59								

Material Description

Elastic Silt with Sand ("MH"), very dark greenish gray (10Y 3/1)

Client:	Battelle
Client Project Title:	Brushneck Cove
Client Project Number:	G606430
AMS Project Number:	07-102
Date Sampled:	9/6/2007
Date Analyzed:	9/14/2007
Matrix, Method:	Sediment, ASTM D 422
Client Sample ID:	GAG-010-A
AMS Sample ID:	28699

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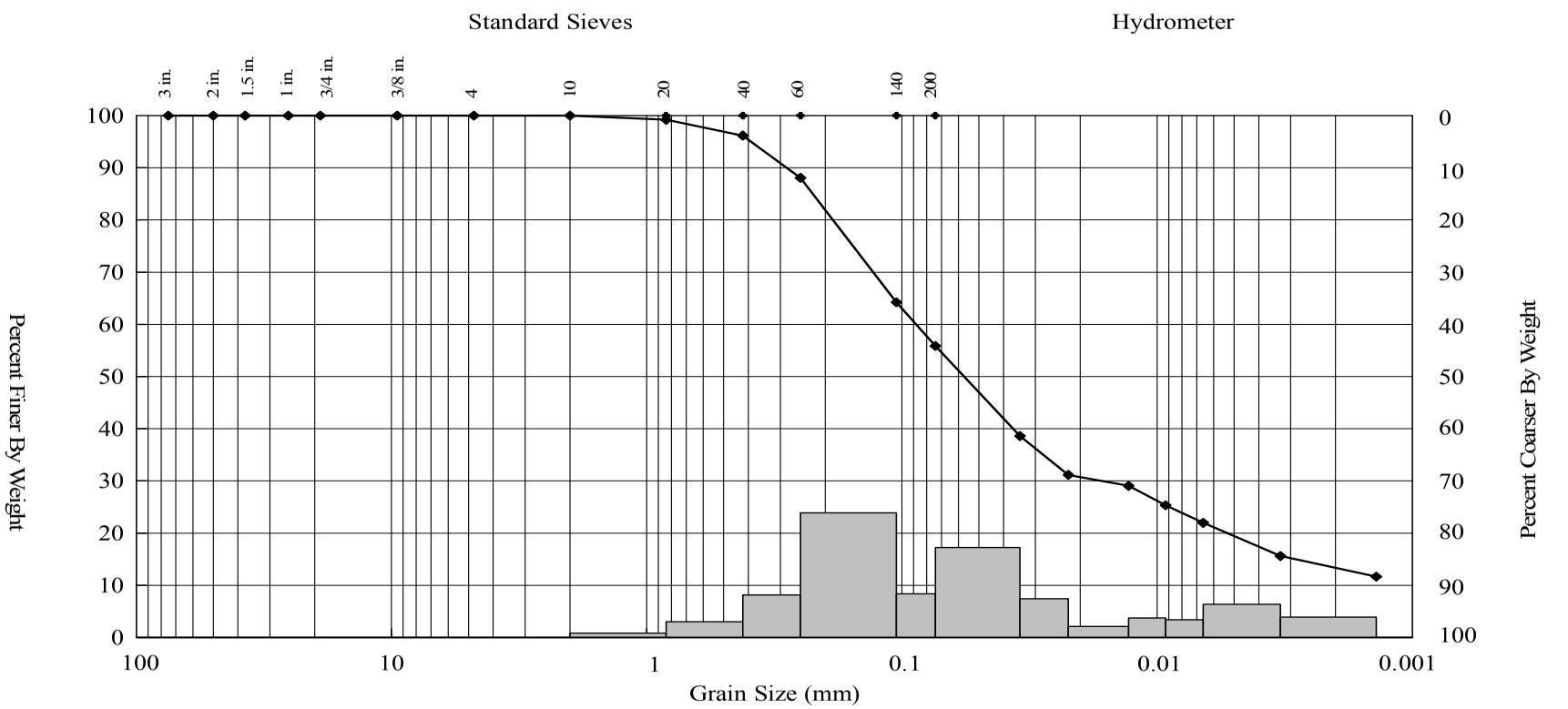
GEOTECHNICAL RESULTS



Gravel (%)	Sand (%)			Fines (%)	
	Coarse	Medium	Fine	Silt	Clay
0.00	0.00	3.84	40.32	36.98	18.86

Water Cont. (%)	Total Solids (%)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
56	64								

Material Description

Sandy Elastic Silt ("MH"), greenish black (10Y 2.5/1)

Client:	Battelle
Client Project Title:	Brushneck Cove
Client Project Number:	G606430
AMS Project Number:	07-102
Date Sampled:	9/6/2007
Date Analyzed:	9/14/2007
Matrix, Method:	Sediment, ASTM D 422
Client Sample ID:	GAG-011-A
AMS Sample ID:	28700

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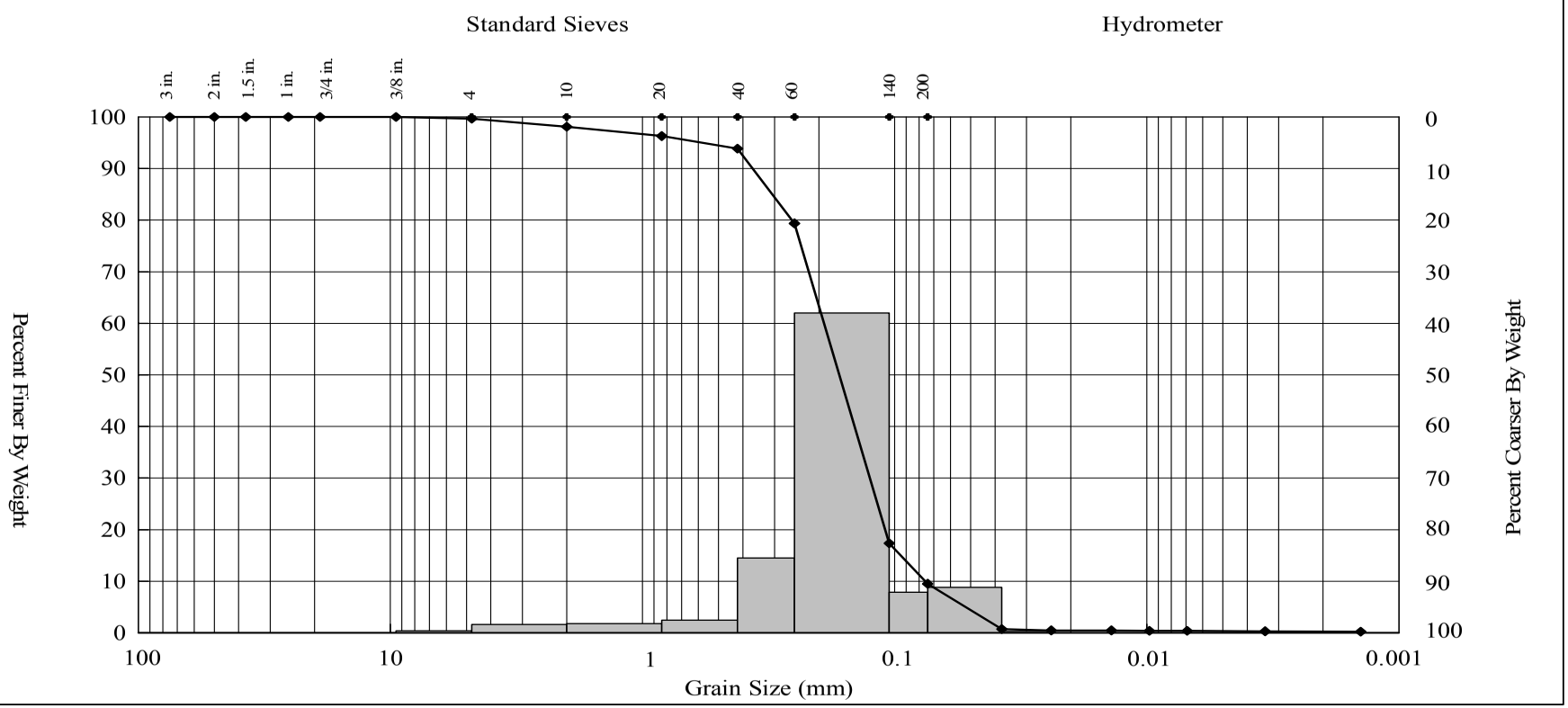

Gravel (%)	Sand (%)			Fines (%)	
	Coarse	Medium	Fine	Silt	Clay
0.36	1.57	4.23	84.34	9.17	0.33

Water Cont. (%)	Total Solids (%)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
20	84	0.31	0.19	0.17	0.13	0.09	0.08	1.20	2.51

Material Description

Poorly Graded Sand with Silt ("SP-SM"), pale olive (5Y 6/4)

Client:	Battelle
Client Project Title:	Brushneck Cove
Client Project Number:	G606430
AMS Project Number:	07-102
Date Sampled:	9/5/2007
Date Analyzed:	9/14/2007
Matrix, Method:	Sediment, ASTM D 422
Client Sample ID:	GAG-014-A
AMS Sample ID:	28701

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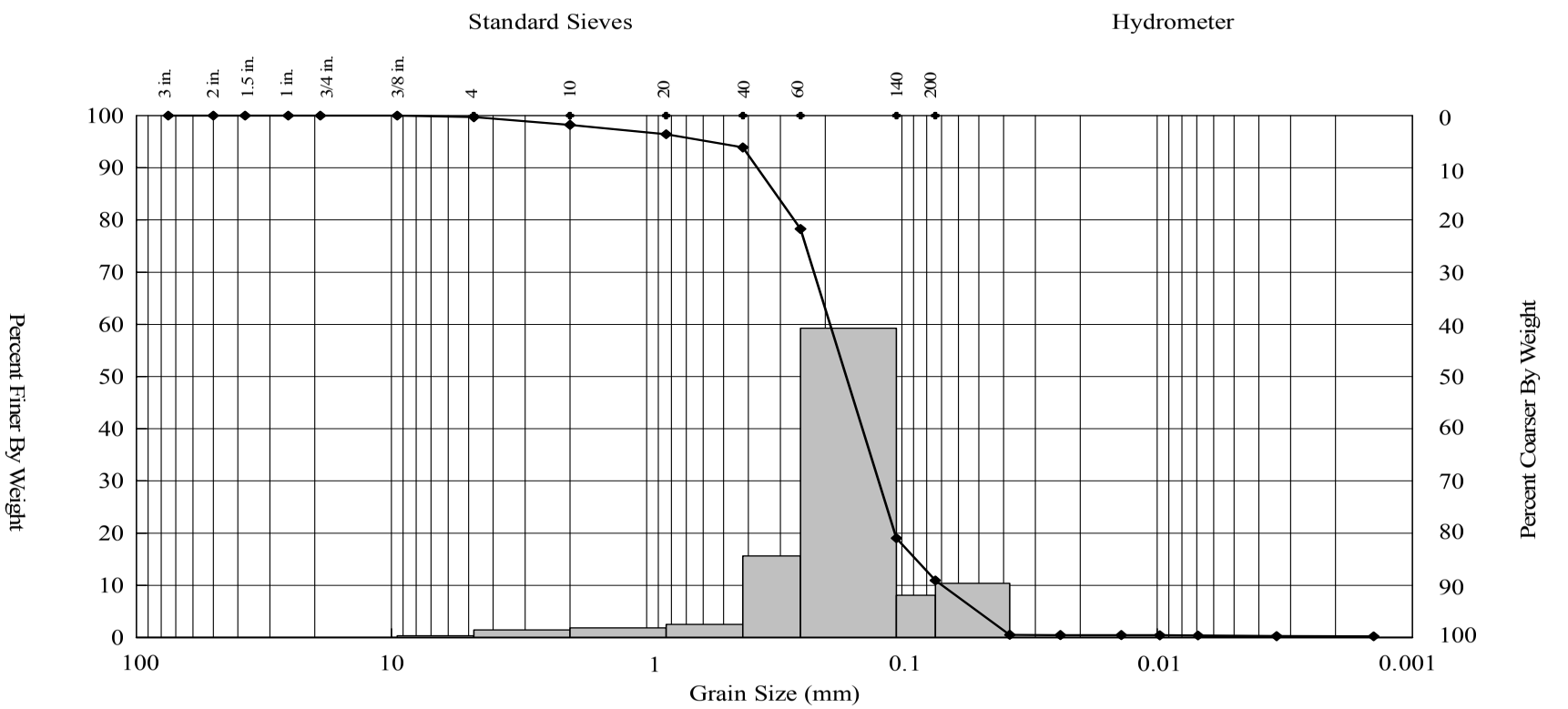

Gravel (%)	Sand (%)			Fines (%)	
	Coarse	Medium	Fine	Silt	Clay
0.33	1.46	4.34	82.96	10.60	0.31

Water Cont. (%)	Total Solids (%)	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
20	84	0.03	0.19	0.17	0.13	0.09	0.07	1.29	2.75

Material Description

Poorly Graded Sand with Silt ("SP-SM"), pale olive (5Y 6/4)

Client:	Battelle
Client Project Title:	Brushneck Cove
Client Project Number:	G606430
AMS Project Number:	07-102
Date Sampled:	9/5/2007
Date Analyzed:	9/14/2007
Matrix, Method:	Sediment, ASTM D 422
Client Sample ID:	GAG-014-A
AMS Sample ID:	28701-2

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QUALITY CONTROL RESULTS

Client:	Battelle	AMS Project Number:	07-102
Project Title:	Brushneck Cove	Date Sampled:	9/5/2007
Project Number:	G606430	Date Analyzed:	9/14/2007
Client Sample ID:	GAG-014-A	Matrix:	Sediment
AMS Sample ID:	28701	Method:	ASTM D 422
		Batch:	091407-01

Particle Diameter Range (mm)	U.S. Standard Sieve Mesh #	Size Class	Sample Result (%)	Duplicate Result (%)	RPD (%)	Data Qualifier	QC Limits (% RPD)
4.76	No. 4	Gravel	0.36	0.33	8.70		≤ 25
2.00	No. 10	Coarse Sand	1.57	1.46	7.26		≤ 25
0.425	No. 40	Medium Sand	4.23	4.34	2.57		≤ 25
0.074	No. 200	Fine Sand	84.34	82.96	1.65		≤ 25
<0.074 - 0.005	Hydrometer	Silt	9.17	10.60	14.47		≤ 25
<0.005	Hydrometer	Clay	0.33	0.31	6.25		≤ 25

Samples in Batch: 28690 28692 28694 28696 28698 28700
28691 28693 28695 28697 28699 28701

Qualifiers: Q - RPD value outside Quality Control Limits
I - Insufficient sample material to perform Quality Control Analyses

Soil Classification: Unified Soil Classification System (USCS) classifications are estimated in accordance with ASTM D 2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) unless the sample contains less than 5% fines (GW, GP, SW, and SP), or the Liquid Limit, Plastic Limit, and Plasticity Index (Atterberg Limits) have been determined in accordance with ASTM D 4318. When these values have been determined the samples are definitively classified using ASTM D 2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

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Total Organic Carbon (TOC) Results

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ANALYTICAL RESULTS

Client:	Battelle	AMS Project Number:	07-102
Project Number:	G606430	Date Sampled:	9/5/2007
Project Name:	Brushneck Cove	Date Received:	9/11/2007
Client Sample ID:	GAG-001-A		
AMS Sample ID:	28702		

Parameter	Result	Unit	Data Qualifier	LOD	LOQ	Method	Matrix	Date Analyzed
Total Organic Carbon	0.38	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007
Total Organic Carbon	0.38	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007

Quality Assurance: These analyses were performed in accordance with EPA guidelines, the 2006 DoD Quality Systems Manual for Environmental Laboratories (Version 3), and the 2003 NELAC Standard, with the following exceptions:

* TOC sample not analyzed in quadruplicate
* TOC spike duplicate not analyzed every 10 samples

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ANALYTICAL RESULTS

Client:	Battelle	AMS Project Number:	07-102
Project Number:	G606430	Date Sampled:	9/5/2007
Project Name:	Brushneck Cove	Date Received:	9/11/2007
Client Sample ID:	GAG-002-A		
AMS Sample ID:	28703		

Parameter	Result	Unit	Data Qualifier	LOD	LOQ	Method	Matrix	Date Analyzed
Total Organic Carbon	1.52	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007
Total Organic Carbon	1.81	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007

Quality Assurance: These analyses were performed in accordance with EPA guidelines, the 2006 DoD Quality Systems Manual for Environmental Laboratories (Version 3), and the 2003 NELAC Standard, with the following exceptions:

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ANALYTICAL RESULTS

Client:	Battelle	AMS Project Number:	07-102
Project Number:	G606430	Date Sampled:	9/5/2007
Project Name:	Brushneck Cove	Date Received:	9/11/2007
Client Sample ID:	GAG-003-A		
AMS Sample ID:	28704		

Parameter	Result	Unit	Data Qualifier	LOD	LOQ	Method	Matrix	Date Analyzed
Total Organic Carbon	1.69	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007
Total Organic Carbon	1.80	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007

Quality Assurance: These analyses were performed in accordance with EPA guidelines, the 2006 DoD Quality Systems Manual for Environmental Laboratories (Version 3), and the 2003 NELAC Standard, with the following exceptions:

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ANALYTICAL RESULTS

Client:	Battelle	AMS Project Number:	07-102
Project Number:	G606430	Date Sampled:	9/5/2007
Project Name:	Brushneck Cove	Date Received:	9/11/2007
Client Sample ID:	GAG-004-A		
AMS Sample ID:	28705		

Parameter	Result	Unit	Data Qualifier	LOD	LOQ	Method	Matrix	Date Analyzed
Total Organic Carbon	2.81	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007
Total Organic Carbon	2.62	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007

Quality Assurance: These analyses were performed in accordance with EPA guidelines, the 2006 DoD Quality Systems Manual for Environmental Laboratories (Version 3), and the 2003 NELAC Standard, with the following exceptions:

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ANALYTICAL RESULTS

Client:	Battelle	AMS Project Number:	07-102
Project Number:	G606430	Date Sampled:	9/5/2007
Project Name:	Brushneck Cove	Date Received:	9/11/2007
Client Sample ID:	GAG-005-A		
AMS Sample ID:	28706		

Parameter	Result	Unit	Data Qualifier	LOD	LOQ	Method	Matrix	Date Analyzed
Total Organic Carbon	2.77	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007
Total Organic Carbon	2.74	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007

Quality Assurance: These analyses were performed in accordance with EPA guidelines, the 2006 DoD Quality Systems Manual for Environmental Laboratories (Version 3), and the 2003 NELAC Standard, with the following exceptions:

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ANALYTICAL RESULTS

Client:	Battelle	AMS Project Number:	07-102
Project Number:	G606430	Date Sampled:	9/5/2007
Project Name:	Brushneck Cove	Date Received:	9/11/2007
Client Sample ID:	GAG-006-A		
AMS Sample ID:	28707		

Parameter	Result	Unit	Data Qualifier	LOD	LOQ	Method	Matrix	Date Analyzed
Total Organic Carbon	2.30	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007
Total Organic Carbon	2.33	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007

Quality Assurance: These analyses were performed in accordance with EPA guidelines, the 2006 DoD Quality Systems Manual for Environmental Laboratories (Version 3), and the 2003 NELAC Standard, with the following exceptions:

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* TOC spike duplicate not analyzed every 10 samples

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ANALYTICAL RESULTS

Client:	Battelle	AMS Project Number:	07-102
Project Number:	G606430	Date Sampled:	9/5/2007
Project Name:	Brushneck Cove	Date Received:	9/11/2007
Client Sample ID:	GAG-007-A		
AMS Sample ID:	28708		

Parameter	Result	Unit	Data Qualifier	LOD	LOQ	Method	Matrix	Date Analyzed
Total Organic Carbon	1.99	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007
Total Organic Carbon	2.33	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007

Quality Assurance: These analyses were performed in accordance with EPA guidelines, the 2006 DoD Quality Systems Manual for Environmental Laboratories (Version 3), and the 2003 NELAC Standard, with the following exceptions:

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* TOC spike duplicate not analyzed every 10 samples

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ANALYTICAL RESULTS

Client:	Battelle	AMS Project Number:	07-102
Project Number:	G606430	Date Sampled:	9/5/2007
Project Name:	Brushneck Cove	Date Received:	9/11/2007
Client Sample ID:	GAG-008-A		
AMS Sample ID:	28709		

Parameter	Result	Unit	Data Qualifier	LOD	LOQ	Method	Matrix	Date Analyzed
Total Organic Carbon	2.20	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007
Total Organic Carbon	2.40	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007

Quality Assurance: These analyses were performed in accordance with EPA guidelines, the 2006 DoD Quality Systems Manual for Environmental Laboratories (Version 3), and the 2003 NELAC Standard, with the following exceptions:

* TOC sample not analyzed in quadruplicate
* TOC spike duplicate not analyzed every 10 samples

KS Davis, P.G.
AMS, Inc. Technical Director

ACCREDITED IN ACCORDANCE WITH nelac
Laboratory No. E87956

Applied Marine Sciences, Inc.

502 N. Hwy 3, Suite B, League City, TX 77573, (281) 554-7272 Fax (281) 554-6356

ANALYTICAL RESULTS

Client:	Battelle	AMS Project Number:	07-102
Project Number:	G606430	Date Sampled:	9/5/2007
Project Name:	Brushneck Cove	Date Received:	9/11/2007
Client Sample ID:	GAG-009-A		
AMS Sample ID:	28710		

Parameter	Result	Unit	Data Qualifier	LOD	LOQ	Method	Matrix	Date Analyzed
Total Organic Carbon	2.02	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007
Total Organic Carbon	1.96	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007

Quality Assurance: These analyses were performed in accordance with EPA guidelines, the 2006 DoD Quality Systems Manual for Environmental Laboratories (Version 3), and the 2003 NELAC Standard, with the following exceptions:

* TOC sample not analyzed in quadruplicate
* TOC spike duplicate not analyzed every 10 samples

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ANALYTICAL RESULTS

Client:	Battelle	AMS Project Number:	07-102
Project Number:	G606430	Date Sampled:	9/6/2007
Project Name:	Brushneck Cove	Date Received:	9/11/2007
Client Sample ID:	GAG-010-A		
AMS Sample ID:	28711		

Parameter	Result	Unit	Data Qualifier	LOD	LOQ	Method	Matrix	Date Analyzed
Total Organic Carbon	1.53	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007
Total Organic Carbon	1.53	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007

Quality Assurance: These analyses were performed in accordance with EPA guidelines, the 2006 DoD Quality Systems Manual for Environmental Laboratories (Version 3), and the 2003 NELAC Standard, with the following exceptions:

* TOC sample not analyzed in quadruplicate
* TOC spike duplicate not analyzed every 10 samples

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ANALYTICAL RESULTS

Client:	Battelle	AMS Project Number:	07-102
Project Number:	G606430	Date Sampled:	9/6/2007
Project Name:	Brushneck Cove	Date Received:	9/11/2007
Client Sample ID:	GAG-011-A		
AMS Sample ID:	28712		

Parameter	Result	Unit	Data Qualifier	LOD	LOQ	Method	Matrix	Date Analyzed
Total Organic Carbon	1.05	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007
Total Organic Carbon	1.13	%		0.01	0.03	EPA 9060A	Sediment	9/25/2007

Quality Assurance: These analyses were performed in accordance with EPA guidelines, the 2006 DoD Quality Systems Manual for Environmental Laboratories (Version 3), and the 2003 NELAC Standard, with the following exceptions:

* TOC sample not analyzed in quadruplicate
* TOC spike duplicate not analyzed every 10 samples

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ANALYTICAL RESULTS

Client:	Battelle	AMS Project Number:	07-102
Project Number:	G606430	Date Sampled:	9/5/2007
Project Name:	Brushneck Cove	Date Received:	9/11/2007
Client Sample ID:	GAG-014-A		
AMS Sample ID:	28713		

Parameter	Result	Unit	Data Qualifier	LOD	LOQ	Method	Matrix	Date Analyzed
Total Organic Carbon	0.03	%	J	0.01	0.03	EPA 9060A	Sediment	9/25/2007
Total Organic Carbon	0.03	%	J	0.01	0.03	EPA 9060A	Sediment	9/25/2007

Quality Assurance: These analyses were performed in accordance with EPA guidelines, the 2006 DoD Quality Systems Manual for Environmental Laboratories (Version 3), and the 2003 NELAC Standard, with the following exceptions:

* TOC sample not analyzed in quadruplicate
* TOC spike duplicate not analyzed every 10 samples

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Applied Marine Sciences, Inc.

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QUALITY CONTROL RESULTS

Client: Battelle
Project Number: G606430
Project Name: Brushneck Cove
Matrix: Sediment
Method: EPA 9060A

AMS Project Number: 07-102
Date Analyzed: 9/25/2007
Batch ID: 092507-01

Method Blank (Batch Continuing Blank (CB)), Continuing Calibration Verification (CCV) and Independent Continuing Calibration Verification (ICCV) Results:

AMS Sample ID	Result (%)	CCV Conc. (%)	Relative % Difference (%)	Data Qualifier	LOD (%)	LOQ (%)	QC Limits (%)
CB-01	0.01	0.01	--	**U**	0.01	0.03	≤ 0.03
CCV-01	3.16	3.23	2.19		0.01	0.03	≤ 5 RPD
ICCV-01	2.10	2.00	4.88		0.01	0.03	≤ 5 RPD

Sample Duplicate Results:

AMS Sample ID	Result (%)	Duplicate Result (%)	Relative % Difference (%)	Data Qualifier	LOD (%)	LOQ (%)	QC Limits
28713	0.03	0.03	0.00	**J**	0.01	0.03	≤ 25 RPD

Samples in Batch (AMS ID):

28702	28705	28708	28711
28703	28706	28709	28712
28704	28707	28710	28713

Quality Assurance: These analyses were performed in accordance with EPA guidelines, the 2006 DoD Quality Systems Manual for Environmental Laboratories (Version 3), and the 2003 NELAC Standard, with the following exceptions:

* TOC samples not analyzed in quadruplicate
* TOC spike duplicate not analyzed every 10 samples

Project-specific Quality Assurance requirements supersede those provided by the above quality systems and documents. Measurements of uncertainty are available upon request.

KS Davis, P.G.
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QUALITY CONTROL

Client: Battelle
Project Number: G606430
Project Name: Brushneck Cove

AMS Project Number: 07-102

Data Qualifiers:

U	Undetected at the Limit of Detection (LOD): The associated value is the Limit of Detection, adjusted by any dilution factor used in the analysis.
J	The analyte was positively identified, but was below the Limit of Quantitation (LOQ). The quantitation is an estimate.
B	Blank contamination: The analyte was detected above one-half the LOD in an associated blank.
Q	One or more Quality Control criteria failed. Data usability should be carefully assessed by the Project Team.
I	Insufficient sample was provided to perform required Quality Control analyses and/or to meet method-specific sample volume recommendations.

Definitions:

LOD	The Limit of Detection (LOD) is determined by quantitative establishment of the Method Detection Limit (MDL), as defined in 40 CFR 136(b).
LOQ	The Limit of Quantitation (LOQ) is the minimum level, concentration or quantity of a target variable (target analyte) that can be quantitatively reported with a specified level of confidence. As defined in DoD QSM §D.1.2.2, the LOQ value must be a minimum of 3 times the LOD, although the specified level of confidence may have a lower quantitative value.

Quality Assurance: These analyses were performed in accordance with EPA guidelines, the 2006 DoD Quality Systems Manual for Environmental Laboratories (Version 3), and the 2003 NELAC Standard, with the following exceptions:

* TOC samples not analyzed in quadruplicate
* TOC spike duplicate not analyzed every 10 samples

Project-specific Quality Assurance requirements supersede those provided by the above quality systems and documents. Measurements of uncertainty are available upon request.

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Attachment B

Sediment Chemistry Results

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PCB/Pesticides Results

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Table II-3: Quality Control Summary for Analyses of Pesticides and PCB in Sediment.

Method Reference Number: 8081B

Quality Control (QC) Element	Acceptance Criteria*	Criteria Met? Yes/No	List results outside criteria (Cross-reference results table in data report)	Location of Results (Retained at Lab or in Data Package)
Initial Calibration	Must be performed prior to the analysis of any QC sample or field sample $r^2 \geq 0.995$	Yes		Retained at lab
Calculation of Method Detection Limits (MDLs)	For each matrix, analyzed once per 12 month period (see Section 5.2 for MDL procedure)	Yes		Retained at lab
Calibration Verification (Second Source)	Once, after initial calibration (< 20% PD)	Yes		Retained at lab
Continuing Calibration	Every 24 hours (± 20% D)	Yes		Retained at lab
Standard Reference Materials	+/- 30% PD plus variance	Yes		In Data Package
Method Blank	No target analytes > 5 x MDL	Yes		In Data Package
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One set (MS/MSD) per group of field samples. Must contain all target analytes. (Recovery Limits 50 to 120%; RPD <30%)	Yes		In Data Package
Analytical Replicates	Analyze one sample in duplicate for each group of field samples (RPD < 30%)	Yes		In Data Package
Surrogate Recoveries	Calculate % recovery (30 to 150% recovery)	Yes		In Data Package

* The Quality Control Acceptance Criteria are general guidelines. If alternate criteria are used, they must be documented in this table.

Pesticide/PCB – Sediment QA/QC Summary
Batch 07-0255

PROJECT: USACE/NAE – Brushneck Cove
PARAMETER: Pesticide/PCB
LABORATORY: Battelle, Duxbury, MA
MATRIX: Sediment Composites
SAMPLE CUSTODY: Sediment cores for this project were collected on 9/5/2007 and 9/6/2007. They were composited and the composites were hand delivered to the Chemistry Sample Custodian on 9/10/2007. The samples were received in good condition and no custody issues were noted. Samples were logged into Battelle LIMS and received unique IDs. Composite sediment samples were stored in the walk-in refrigerator until sample preparation could begin.

	Reference Method	Method Blank	Surrogate Recovery	LCS Recovery	MS/MSD Recovery	SRM Percent Difference	Sample Replicate Relative Percent Difference	Detection Limits (ng/g dry wt)
Pesticide /PCB	General NS&T	<5xMDL	30-150% Recovery	50-120% Recovery	50-120% Recovery ≤30% RPD (analyte conc. in MS must be >5x background)	Average PD ≤ 30% (plus variance) (for analytes > 5x MDL)	≤30% RPD (analytes must be > 10 x MDL to be used for data quality assessment)	MDL: 0.06 – 3.67

METHOD: Sediment samples were extracted for PCB and pesticides following general NS&T methods. Approximately 30 g of sediment was spiked with surrogates and extracted three times with dichloromethane using shaker table techniques. The combined extract was dried over anhydrous sodium sulfate, concentrated, processed through activated copper, alumina cleanup column, concentrated, and further purified by GPC/HPLC. The post-HPLC extract was concentrated, fortified with internal standards (IS) and split for the required analyses. Extracts intended for PCB/Pest analysis were solvent exchanged into hexane and then analyzed using gas chromatography/electron capture detector (GC/ECD), following general NS&T methods. Sample data were quantified by the method of internal standards, using the spiked IS compounds. Pesticide/PCB data was originally acquired from batch 07-0243, but because of poor QC results the samples were re-extracted as batch 07-0255 for pesticide/PCB data only.

HOLDING TIMES: Sediment samples were prepared for analysis in one analytical batch and were extracted within 1 – year of sample collection. All extracts were analyzed within 40 days of extraction.

Batch	Extraction Date	Analysis Date
07-0255	10/09/2006	10/13/2007 – 10/15/2007

Pesticide/PCB – Sediment QA/QC Summary
Batch 07-0255

BLANK:

A procedural blank (PB) was prepared with the analytical batch. The PB was analyzed to ensure the sample extraction and analysis methods were free of contamination.

07-0255 – No exceedences noted.

Comments – Trace amounts of several PCB congeners were detected in the blank, but all were less than the laboratory control limit (5 x MDL). Any field sample concentrations that were greater than the reporting limit, but less than 5 times the concentration in the associated blank, were qualified with a "B". This resulted in 14 concentrations being "B" qualified.

LABORATORY CONTROL SAMPLE:

A laboratory control sample (LCS) was prepared with the analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy.

07-0255 – No exceedences noted.

Comments – All percent recoveries of spiked target analytes were within the laboratory control limit (50-120%).

MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

A pair of matrix spike (MS) and matrix spike duplicate (MSD) samples was prepared with each analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy. The RPD between percent recoveries was calculated to measure the data quality in terms of precision.

07-0255 – No percent recovery exceedences noted. No RPD exceedences noted.

Comments – All percent recoveries of spiked target analytes were within the laboratory control limit (50-120%). All RPDs were within the laboratory control limits (< 30%).

REPLICATES:

Duplicate analysis was performed with each analytical batch. RPDs between duplicate analyses were calculated to measure data quality in terms of precision.

07-0255 – No exceedences noted.

Comments – All RPDs were within the laboratory control limits (< 30%).

SRM:

A standard reference material (NIST SRM 1944) was prepared with the analytical batch. The percent difference (PD) between the measured value and the certified range was calculated to measure data quality in terms of accuracy.

07-0255 – No exceedences noted.

Comments – All percent differences were within the laboratory control limits (<30 % difference plus variance).

Pesticide/PCB – Sediment QA/QC Summary
Batch 07-0255

SURROGATES: Two surrogate compounds were added prior to extraction, including PCB 34 and PCB 152. The recovery of each surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

07-0255 – All surrogate percent recoveries for this batch were within the laboratory control limits (30-150%)

Comments – None.

CALIBRATIONS: The GC/ECD was calibrated with a 6 level curve, with a correlation coefficient of >0.995. Each batch of samples analyzed is bracketed by continuing calibration verification (CCV) sample, run at a frequency of minimally every 24 hours. The PD between the initial calibration (ICAL) and the continuing calibration samples should be <20% for each compound. Additionally an Initial Calibration Check (ICC) sample is run immediately following the ICAL. The ICC is to have a percent difference < 20%.

07-0255 – No ICAL exceedences. No CCV exceedences. No ICC exceedences.

Comments – All calibration criteria were met.

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	GAG-001-C	GAG-002-C	GAG-003-C	GAG-004-C
Battelle ID	Q0237-P1	Q0238-P1	Q0239-P1	Q0240-P1
Sample Type	SA	SA	SA	SA
Collection Date	09/05/07	09/05/07	09/05/07	09/05/07
Extraction Date	10/09/07	10/09/07	10/09/07	10/09/07
Analysis Date	10/13/07	10/14/07	10/14/07	10/14/07
Analytical Instrument	ECD	ECD	ECD	ECD
% Moisture	19.97	42.18	45.77	46.92
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	24.31	17.52	16.28	15.95
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Units	UG/KG_DRY	UG/KG_DRY	UG/KG_DRY	UG/KG_DRY
4,4'-DDD	0.09 U	0.23	0.24	0.51
4,4'-DDE	0.1	0.31	0.41	0.49
4,4'-DDT	0.09 U	0.12 U	0.13 U	0.13 U
aldrin	0.09 U	0.12 U	0.13 U	0.13 U
a-chlordane	0.09 U	0.12 U	0.13 U	0.13 U
g-chlordane	0.09 U	0.12 U	0.25	0.39
Lindane	0.09 U	0.12 U	0.13 U	0.13 U
cis-nonachlor	0.09 U	0.12 U	0.13 U	0.13 U
trans-nonachlor	0.09 U	0.12 U	0.13 U	0.13 U
oxychlordane	0.09 U	0.12 U	0.13 U	0.13 U
dieldrin	0.09 U	0.3	0.25	0.48
endosulfan I	0.09 U	0.12 U	0.13 U	0.13 U
endosulfan II	0.09 U	0.12 U	0.13 U	0.13 U
endrin	0.09 U	0.12 U	0.13 U	0.13 U
heptachlor	0.09 U	0.12 U	0.13 U	0.13 U
heptachlor epoxide	0.09 U	0.12 U	0.13 U	0.13 U
Hexachlorobenzene	0.76	0.12 U	0.13 U	0.13 U
methoxychlor	0.09 U	0.99	1.63	1.98
Toxaphene	3.67 U	3.67 U	3.67 U	3.67 U
Cl2(8)	0.09 U	0.12 U	0.13 U	0.13 U
Cl3(18)	0.09 U	0.12 U	0.13 U	0.13 U
Cl3(28)	0.09 U	0.12 U	0.13 U	0.13 U
Cl4(44)	0.09 B	0.37	0.43	0.65
Cl4(49)	0.18 BME	2.19 ME	1.65 ME	6.52 ME
Cl4(52)	0.18 B	0.22 B	0.31 B	0.46 B
Cl4(66)	0.09 U	0.12 U	0.13 U	0.13 U
Cl5(87)	0.09 U	0.32	0.41	0.73
Cl5(101)	0.1	0.33	0.33	0.55
Cl5(105)	0.09 U	0.12 U	0.13 U	0.12 J
Cl5(118)	0.08 J	0.24	0.34	0.39
Cl6(128)	0.09 U	0.12 U	0.11 J	0.13 U
Cl6(138)	0.09	0.24	0.36	0.47
Cl6(153)	0.08 J	0.2	0.3	0.41
Cl7(170)	0.09 U	0.12 U	0.13 U	0.13 U
Cl7(180)	0.09 U	0.12 U	0.13 U	0.13 U
Cl7(183)	0.09 U	0.12 U	0.13 U	0.13 U
Cl7(184)	0.09 U	0.12 U	0.13 U	0.13 U
Cl7(187)	0.09 U	0.17	0.17	0.25
Cl8(195)	0.09 U	0.17	0.14	0.2
Cl9(206)	0.09 U	0.26	0.22	0.29
Cl10(209)	0.09 U	0.26	0.22	0.31
Surrogate Recoveries (%)				
Cl3(34)	74	104	104	104
Cl6(152)	72	100	99	97

Not Surrogate Corrected

Analyzed by Restucci Jr, Richard
10/29/2007

Main: S07-0255ECD-Master_128-Final.xls

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	GAG-005-C	GAG-006-C	GAG-007-C	GAG-008-C
Battelle ID	Q0241-P1	Q0242-P1	Q0243-P1	Q0244-P1
Sample Type	SA	SA	SA	SA
Collection Date	09/05/07	09/05/07	09/05/07	09/05/07
Extraction Date	10/09/07	10/09/07	10/09/07	10/09/07
Analysis Date	10/14/07	10/14/07	10/14/07	10/14/07
Analytical Instrument	ECD	ECD	ECD	ECD
% Moisture	42.9	44.39	44.22	53.14
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	17.28	16.83	16.98	14.33
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Units	UG/KG_DRY	UG/KG_DRY	UG/KG_DRY	UG/KG_DRY
4,4'-DDD	1.67	1.59	0.82	2.87
4,4'-DDE	1.16	1.24	0.77	1.85
4,4'-DDT	0.12 U	0.12 U	0.12 U	0.23
aldrin	0.12 U	0.12 U	0.12 U	0.15 U
a-chlordane	0.93	0.98	0.43	0.7
g-chlordane	1.65	1.66	0.67	1.28
Lindane	0.12 U	0.12 U	0.12 U	0.15 U
cis-nonachlor	0.51	0.37	0.17	0.64
trans-nonachlor	0.89	0.76	0.29	0.43
oxychlordane	0.12 U	0.12 U	0.12 U	0.15 U
dieldrin	0.34	0.56	0.5	1.38
endosulfan I	0.12 U	0.12 U	0.12 U	0.15 U
endosulfan II	0.12 U	0.12 U	0.12 U	0.15 U
endrin	0.12 U	0.12 U	0.12 U	0.15 U
heptachlor	0.12 U	0.12 U	0.12 U	0.15 U
heptachlor epoxide	0.12 U	0.12 U	0.12 U	0.15 U
Hexachlorobenzene	0.12 U	0.12 U	0.12 U	0.15 U
methoxychlor	0.89	0.81	1.23	4.22
Toxaphene	3.67 U	3.67 U	3.67 U	3.67 U
Cl2(8)	0.12 U	0.12 U	0.12 U	0.15 U
Cl3(18)	0.12 U	0.12 U	0.12 U	0.15 U
Cl3(28)	0.12 U	0.12 U	0.12 U	0.15 U
Cl4(44)	0.68	0.73	0.53	0.78
Cl4(49)	1.6 ME	3.06 ME	3.2 ME	3.24 ME
Cl4(52)	0.42 B	0.45 B	0.3 B	0.74 B
Cl4(66)	0.12 U	0.12 U	0.12 U	0.15 U
Cl5(87)	0.34	0.52	0.47	0.57
Cl5(101)	0.28	0.59	0.52	1.01
Cl5(105)	0.11 J	0.14	0.12	0.29
Cl5(118)	0.42	0.53	0.39	0.97
Cl6(128)	0.12 U	0.12 U	0.12 U	0.39
Cl6(138)	0.55	0.55	0.49	1.14
Cl6(153)	0.44	0.57	0.42	1.28
Cl7(170)	0.12 U	0.12 U	0.12 U	0.36
Cl7(180)	0.12 U	0.3	0.19	0.63
Cl7(183)	0.12 U	0.17	0.12 U	0.29
Cl7(184)	0.12 U	0.12 U	0.12 U	0.15 U
Cl7(187)	0.24	0.33	0.19	0.55
Cl8(195)	0.11 J	0.48	0.1 J	0.4
Cl9(206)	0.22	0.43	0.13	0.61
Cl10(209)	0.15	0.39	0.12	0.56
Surrogate Recoveries (%)				
Cl3(34)	85	105	108	106
Cl6(152)	83	94	104	101

Not Surrogate Corrected

Analyzed by Restucci Jr, Richard
10/29/2007

Main: S07-0255ECD-Master_128-Final.xls

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	GAG-009-C	GAG-010-C	GAG-011-C
Battelle ID	Q0245-P1	Q0246-P1	Q0247-P1
Sample Type	SA	SA	SA
Collection Date	09/05/07	09/06/07	09/06/07
Extraction Date	10/09/07	10/09/07	10/09/07
Analysis Date	10/14/07	10/15/07	10/15/07
Analytical Instrument	ECD	ECD	ECD
% Moisture	46.86	39.21	35.56
% Lipid	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	16.16	18.33	19.71
Size Unit-Basis	G_DRY	G_DRY	G_DRY
Units	UG/KG_DRY	UG/KG_DRY	UG/KG_DRY
4,4'-DDD	0.31	0.19	0.47
4,4'-DDE	0.27	0.19	0.38
4,4'-DDT	0.13 U	0.11 U	0.11 U
aldrin	0.13 U	0.11 U	0.11 U
a-chlordane	0.13 U	0.3	0.11 U
g-chlordane	0.25	0.15	0.27
Lindane	0.13 U	0.11 U	0.11 U
cis-nonachlor	0.08 J	0.11 U	0.19
trans-nonachlor	0.13 U	0.11 U	0.11 U
oxychlordane	0.13 U	0.11 U	0.11 U
dieldrin	0.22	0.11 U	0.23
endosulfan I	0.13 U	0.11 U	0.11 U
endosulfan II	0.13 U	0.11 U	0.11 U
endrin	0.13 U	0.11 U	0.11 U
heptachlor	0.13 U	0.11 U	0.11 U
heptachlor epoxide	0.13 U	0.11 U	0.11 U
Hexachlorobenzene	0.13 U	0.11 U	0.11 U
methoxychlor	0.97	2.79	1.32
Toxaphene	3.67 U	3.67 U	3.67 U
Cl2(8)	0.13 U	0.11 U	0.11 U
Cl3(18)	0.13 U	0.11 U	0.11 U
Cl3(28)	0.13 U	0.11 U	0.11 U
Cl4(44)	0.48	0.38	0.33
Cl4(49)	1.34 ME	0.86 ME	1.27 ME
Cl4(52)	0.22 B	0.25 B	0.3 B
Cl4(66)	0.13 U	0.11 U	0.11 U
Cl5(87)	0.22	0.11 U	0.21
Cl5(101)	0.28	0.31	0.32
Cl5(105)	0.13 U	0.11 U	0.11 U
Cl5(118)	0.21	0.21	0.27
Cl6(128)	0.13 U	0.11 U	0.11 U
Cl6(138)	0.54	0.25	0.31
Cl6(153)	0.2	0.23	0.31
Cl7(170)	0.13 U	0.11 U	0.11 U
Cl7(180)	0.13 U	0.11 U	0.14
Cl7(183)	0.13 U	0.11 U	0.11 U
Cl7(184)	0.13 U	0.11 U	0.11 U
Cl7(187)	0.15	0.1 J	0.15
Cl8(195)	0.13 U	0.11 U	0.39
Cl9(206)	0.13 U	0.11 U	0.18
Cl10(209)	0.13 U	0.11 U	0.15
Surrogate Recoveries (%)			
Cl3(34)	106	108	101
Cl6(152)	102	102	100

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	Procedural Blank
Battelle ID	BL021PB-P
Sample Type	PB
Collection Date	10/09/07
Extraction Date	10/09/07
Analysis Date	10/13/07
Analytical Instrument	ECD
% Moisture	41.92
% Lipid	NA
Matrix	SEDIMENT
Sample Size	17.60
Size Unit-Basis	G_DRY
Units	UG/KG_DRY
4,4'-DDD	0.12 U
4,4'-DDE	0.12 U
4,4'-DDT	0.12 U
aldrin	0.12 U
a-chlordane	0.12 U
g-chlordane	0.12 U
Lindane	0.12 U
cis-nonachlor	0.12 U
trans-nonachlor	0.12 U
oxychlordane	0.12 U
dieldrin	0.12 U
endosulfan I	0.12 U
endosulfan II	0.12 U
endrin	0.12 U
heptachlor	0.12 U
heptachlor epoxide	0.12 U
Hexachlorobenzene	0.12 U
methoxychlor	0.12 U
Toxaphene	3.67 U
Cl2(8)	0.12 U
Cl3(18)	0.12 U
Cl3(28)	0.09 J
Cl4(44)	0.06 J
Cl4(49)	0.06 J
Cl4(52)	0.18
Cl4(66)	0.12 U
Cl5(87)	0.12 U
Cl5(101)	0.12 U
Cl5(105)	0.12 U
Cl5(118)	0.12 U
Cl6(128)	0.12 U
Cl6(138)	0.12 U
Cl6(153)	0.12 U
Cl7(170)	0.12 U
Cl7(180)	0.12 U
Cl7(183)	0.12 U
Cl7(184)	0.12 U
Cl7(187)	0.12 U
Cl8(195)	0.12 U
Cl9(206)	0.12 U
Cl10(209)	0.12 U

Surrogate Recoveries (%)

Cl3(34)	107
Cl6(152)	104

Not Surrogate Corrected

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10/29/2007

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	060208-03: Sand, White Quartz, -50+70				
Battelle ID	BL022LCS-P				
Sample Type	LCS				
Collection Date	10/09/07				
Extraction Date	10/09/07				
Analysis Date	10/13/07				
Analytical Instrument	ECD				
% Moisture	NA				
% Lipid	NA				
Matrix	SEDIMENT				
Sample Size	30.20				
Size Unit-Basis	G_DRY				
Units	UG/KG_DRY		Target	% Recovery	Qualifier
4,4'-DDD	5.15		5.30	97	
4,4'-DDE	5.38		5.30	102	
4,4'-DDT	4.94		5.30	93	
aldrin	4.71		5.30	89	
a-chlordane	4.86		5.30	92	
g-chlordane	4.34		5.31	82	
Lindane	3.95		5.30	75	
cis-nonachlor	5.2		5.30	98	
trans-nonachlor	4.83		5.31	91	
oxychlordane	5.1		5.33	96	
dieldrin	5.12		5.30	97	
endosulfan I	4.73		5.30	89	
endosulfan II	5.08		5.30	96	
endrin	4.99		5.30	94	
heptachlor	4.16		5.30	78	
heptachlor epoxide	4.34		5.30	82	
Hexachlorobenzene	5.35		5.31	101	
methoxychlor	5.29		5.30	100	
Toxaphene	3.67	U			
Cl2(8)	5.14		5.31	97	
Cl3(18)	4.6		5.31	87	
Cl3(28)	4.64		5.30	88	
Cl4(44)	5.32		5.31	100	
Cl4(49)	5.15		5.32	97	
Cl4(52)	5.23		5.30	99	
Cl4(66)	5.45		5.30	103	
Cl5(87)	5.29		5.25	101	
Cl5(101)	5.29		5.31	100	
Cl5(105)	5.38		5.30	102	
Cl5(118)	5.5		5.30	104	
Cl6(128)	5.35		5.33	100	
Cl6(138)	5.33		5.31	100	
Cl6(153)	5.47		5.30	103	
Cl7(170)	5.39		5.32	101	
Cl7(180)	5.51		5.32	104	
Cl7(183)	5.44		5.32	102	
Cl7(184)	5.45		5.32	102	
Cl7(187)	5.48		5.31	103	
Cl8(195)	5.36		5.31	101	
Cl9(206)	5		5.31	94	
Cl10(209)	5.05		5.30	95	
Surrogate Recoveries (%)					
Cl3(34)	103				
Cl6(152)	110				

Not Surrogate Corrected

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	070906-01: NIST 1944						
Battelle ID	BL023SRM-P						
Sample Type	SRM						
Collection Date	10/09/07						
Extraction Date	10/09/07						
Analysis Date	10/13/07						
Analytical Instrument	ECD						
% Moisture	NA						
% Lipid	NA						
Matrix	SEDIMENT						
Sample Size	2.03						
Size Unit-Basis	G_DRY		Certified		Passing	Actual	
Units	UG/KG_DRY		Value	+/-	%Difference	%Difference	Qualifier
4,4'-DDD	104.67						
4,4'-DDE	77.89						
4,4'-DDT	156.97		119	11.00	39.24	31.9	
aldrin	1.03	U					
a-chlordane	18.59		16.51	0.83	35.03	12.6	
g-chlordane	102.22						
Lindane	6.08						
cis-nonachlor	8.53						
trans-nonachlor	10.71		8.2	0.51	36.22	30.6	
oxychlordane	1.03	U					
dieldrin	29.64						
endosulfan I	1.03	U					
endosulfan II	1.03	U					
endrin	5.33						
heptachlor	1.03	U					
heptachlor epoxide	1.03	U					
Hexachlorobenzene	7.72		6.03	0.35	35.8	28	
methoxychlor	179.29						
Toxaphene	3.67	U					
Cl2(8)	28.76		22.3	2.30	40.31	29	
Cl3(18)	51.04		51	2.60	35.1	0.1	
Cl3(28)	69.44		80.8	2.70	33.34	14.1	
Cl4(44)	57.78		60.2	2.00	33.32	4	
Cl4(49)	41.81	ME	53	1.70	33.21	21.1	
Cl4(52)	64.29		79.4	2.00	32.52	19	
Cl4(66)	55.19		71.9	4.30	35.98	23.2	
Cl5(87)	21.94		29.9	4.30	44.38	26.6	
Cl5(101)	81.18		73.4	2.50	33.41	10.6	
Cl5(105)	19.4		24.5	1.10	34.49	20.8	
Cl5(118)	44.59		58	4.30	37.41	23.1	
Cl6(128)	9.93	ME	8.47	0.28	33.31	17.2	
Cl6(138)	59.62		62.1	3.00	34.83	4	
Cl6(153)	73.42		74	2.90	33.92	0.8	
Cl7(170)	19.16		22.6	1.40	36.19	15.2	
Cl7(180)	38.67		44.3	1.20	32.71	12.7	
Cl7(183)	15.84		12.19	0.57	34.68	29.9	
Cl7(184)	1.02	U					
Cl7(187)	21.34		25.1	1.00	33.98	15	
Cl8(195)	2.96		3.75	0.39	40.4	21.1	
Cl9(206)	8.05		9.21	0.51	35.54	12.6	
Cl10(209)	5.4	ME	6.81	0.33	34.85	20.7	

Surrogate Recoveries (%)

Cl3(34)	89
Cl6(152)	95

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	GAG-008-C	GAG-008-C			
Battelle ID	Q0244-P1	Q0244MS-P			
Sample Type	SA	MS			
Collection Date	09/05/07	9/5/2007			
Extraction Date	10/09/07	10/9/2007			
Analysis Date	10/14/07	10/14/2007			
Analytical Instrument	ECD	ECD			
% Moisture	53.14	53.14			
% Lipid	NA	NA			
Matrix	SEDIMENT	SEDIMENT			
Sample Size	14.33	7.09			
Size Unit-Basis	G_DRY	G_DRY			
Units	UG/KG_DRY	UG/KG_DRY		Target	% Recovery	Qualifier
4,4'-DDD	2.87	29.67		22.58	119	
4,4'-DDE	1.85	26.54		22.58	109	
4,4'-DDT	0.23	26.36		22.58	116	
aldrin	0.15 U	23.49		22.58	104	
a-chlordane	0.7	24.97		22.58	107	
g-chlordane	1.28	25.67		22.60	108	
Lindane	0.15 U	22.4		22.58	99	
cis-nonachlor	0.64	26.35		22.58	114	
trans-nonachlor	0.43	25.47		22.60	111	
oxychlordane	0.15 U	26.16		22.68	115	
dieldrin	1.38	27.28		22.58	115	
endosulfan I	0.15 U	22.87		22.58	101	
endosulfan II	0.15 U	25.93		22.58	115	
endrin	0.15 U	26.36		22.58	117	
heptachlor	0.15 U	24.25		22.58	107	
heptachlor epoxide	0.15 U	24.09		22.59	107	
Hexachlorobenzene	0.15 U	24.31		22.60	108	
methoxychlor	4.22	30.91		22.57	118	
Toxaphene	3.67 U	3.67	U			
Cl2(8)	0.15 U	24.23		22.63	107	
Cl3(18)	0.15 U	21.56		22.63	95	
Cl3(28)	0.15 U	20.94		22.59	93	
Cl4(44)	0.78	23.63		22.61	101	
Cl4(49)	3.24 ME	28.69	ME	22.66	112	
Cl4(52)	0.74 B	23.19		22.57	99	
Cl4(66)	0.15 U	23.55		22.59	102	
Cl5(87)	0.57	23.93		22.37	104	
Cl5(101)	1.01	23.54		22.61	100	
Cl5(105)	0.29	24.69		22.59	108	
Cl5(118)	0.97	25.27		22.59	108	
Cl6(128)	0.39	24.19		22.70	105	
Cl6(138)	1.14	24.51		22.61	103	
Cl6(153)	1.28	24.66		22.59	103	
Cl7(170)	0.36	24.9		22.68	108	
Cl7(180)	0.63	25.03		22.66	108	
Cl7(183)	0.29	24.63		22.66	107	
Cl7(184)	0.15 U	24.46		22.66	108	
Cl7(187)	0.55	24.2		22.63	105	
Cl8(195)	0.4	24.72		22.63	107	
Cl9(206)	0.61	23.5		22.63	101	
Cl10(209)	0.56	23.15		22.59	100	
Surrogate Recoveries (%)						
Cl3(34)	106	108				
Cl6(152)	101	110				

Not Surrogate Corrected

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	GAG-008-C					
Battelle ID	Q0244MSD-P					
Sample Type	MSD					
Collection Date	9/5/2007					
Extraction Date	10/9/2007					
Analysis Date	10/14/2007					
Analytical Instrument	ECD					
% Moisture	53.14					
% Lipid	NA					
Matrix	SEDIMENT					
Sample Size	7.39					
Size Unit-Basis	G_DRY					
Units	UG/KG_DRY		Target	% Recovery	Qualifier	RPD (%)	Qualifier
4,4'-DDD	25.85		21.66	106		11.6	
4,4'-DDE	23.32		21.67	99		9.6	
4,4'-DDT	22.19		21.66	101		13.8	
aldrin	21.9		21.66	101		2.9	
a-chlordane	23.15		21.67	104		2.8	
g-chlordane	23.72		21.69	103		4.7	
Lindane	19.63		21.66	91		8.4	
cis-nonachlor	22.89		21.67	103		10.1	
trans-nonachlor	24.04		21.68	109		1.8	
oxychlordane	24.22		21.76	111		3.5	
dieldrin	23.32		21.66	101		13.0	
endosulfan I	22.75		21.67	105		3.9	
endosulfan II	22.31		21.67	103		11.0	
endrin	22.43		21.66	104		11.8	
heptachlor	21.52		21.66	99		7.8	
heptachlor epoxide	22.24		21.67	103		3.8	
Hexachlorobenzene	22.95		21.68	106		1.9	
methoxychlor	26.99		21.66	105		11.7	
Toxaphene	3.67	U					
Cl2(8)	21.68		21.72	100		6.8	
Cl3(18)	20.95		21.72	96		1.0	
Cl3(28)	19.88		21.67	92		1.1	
Cl4(44)	23.05		21.69	103		2.0	
Cl4(49)	25.44	ME	21.74	102		9.3	
Cl4(52)	22.53		21.65	101		2.0	
Cl4(66)	22.61		21.67	102		0.0	
Cl5(87)	21.25		21.47	96		8.0	
Cl5(101)	22.65		21.69	100		0.0	
Cl5(105)	21.88		21.67	100		7.7	
Cl5(118)	22.41		21.67	99		8.7	
Cl6(128)	21.31		21.78	96		9.0	
Cl6(138)	22.01		21.69	96		7.0	
Cl6(153)	21.88		21.67	95		8.1	
Cl7(170)	22.15		21.76	100		7.7	
Cl7(180)	22.24		21.74	99		8.7	
Cl7(183)	21.76		21.74	99		7.8	
Cl7(184)	21.55		21.74	99		8.7	
Cl7(187)	21.38		21.72	96		9.0	
Cl8(195)	21.75		21.72	98		8.8	
Cl9(206)	20.67		21.72	92		9.3	
Cl10(209)	20.62		21.67	93		7.3	

Surrogate Recoveries (%)

Cl3(34)	107
Cl6(152)	102

Not Surrogate Corrected

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	GAG-010-C	GAG-010-C		
Battelle ID	Q0246-P1	Q0246DUP-P1		
Sample Type	SA	QADU		
Collection Date	09/06/07	9/6/2007		
Extraction Date	10/09/07	10/9/2007		
Analysis Date	10/15/07	10/15/2007		
Analytical Instrument	ECD	ECD		
% Moisture	39.21	39.21		
% Lipid	NA	NA		
Matrix	SEDIMENT	SEDIMENT		
Sample Size	18.33	18.41		
Size Unit-Basis	G_DRY	G_DRY		
Units	UG/KG_DRY	UG/KG_DRY	RPD	Qualifier
4,4'-DDD	0.19	0.21	10.0	
4,4'-DDE	0.19	0.2	5.1	
4,4'-DDT	0.11 U	0.11 U	NA	
aldrin	0.11 U	0.11 U	NA	
a-chlordane	0.3	0.28	6.9	
g-chlordane	0.15	0.13	14.3	
Lindane	0.11 U	0.11 U	NA	
cis-nonachlor	0.11 U	0.11 U	NA	
trans-nonachlor	0.11 U	0.11 U	NA	
oxychlordane	0.11 U	0.11 U	NA	
dieldrin	0.11 U	0.2	16.2	
endosulfan I	0.11 U	0.11 U	NA	
endosulfan II	0.11 U	0.11 U	NA	
endrin	0.11 U	0.11 U	NA	
heptachlor	0.11 U	0.11 U	NA	
heptachlor epoxide	0.11 U	0.11 U	NA	
Hexachlorobenzene	0.11 U	0.11 U	NA	
methoxychlor	2.79	2.16	25.5	
Toxaphene	3.67 U	3.67 U	NA	
Cl2(8)	0.11 U	0.11 U	NA	
Cl3(18)	0.11 U	0.11 U	NA	
Cl3(28)	0.11 U	0.11 U	NA	
Cl4(44)	0.38	0.43	12.3	
Cl4(49)	0.86 ME	1.13 ME	27.1	
Cl4(52)	0.25 B	0.22 B	12.8	
Cl4(66)	0.11 U	0.11 U	NA	
Cl5(87)	0.11 U	0.11 U	NA	
Cl5(101)	0.31	0.26	17.5	
Cl5(105)	0.11 U	0.11 U	NA	
Cl5(118)	0.21	0.18	15.4	
Cl6(128)	0.11 U	0.11 U	NA	
Cl6(138)	0.25	0.26	3.9	
Cl6(153)	0.23	0.18	24.4	
Cl7(170)	0.11 U	0.11 U	NA	
Cl7(180)	0.11 U	0.11 U	NA	
Cl7(183)	0.11 U	0.11 U	NA	
Cl7(184)	0.11 U	0.11 U	NA	
Cl7(187)	0.1 J	0.1 J	NA	
Cl8(195)	0.11 U	0.11 U	NA	
Cl9(206)	0.11 U	0.11 U	NA	
Cl10(209)	0.11 U	0.11 U	NA	
Surrogate Recoveries (%)				
Cl3(34)	108	104		
Cl6(152)	102	98		

Not Surrogate Corrected

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Glossary of Data Qualifiers

Flag:	Application:
B	Analyte concentration found in the sample at a concentration <5x the level found in the procedural blank.
D	Dilution Run. Initial run outside linear range of instrument.
E	Estimate, result is greater than the highest concentration level in the calibration.
H	Surrogate diluted out. Used when surrogate recovery is affected by excessive dilution of the sample extract.
J	Analyte detected below the sample-specific Reporting Limit (RL).
m	Confirmation column manually over-ridden by analyst
ME	Significant Matrix Interference - Estimated value.
MI	Significant Matrix Interference - value could not be determined or estimated.
n	Quality Control (QC) value is outside the accuracy or precision Data Quality Objective (DQO), but meets the contingency criteria.
N	Quality Control (QC) value is outside the accuracy or precision Data Quality Objective (DQO)
NA	Not applicable
p	Dual column value exceeds RPD criteria
T	Holding Time (HT) exceeded.
U	Analyte not detected at 3:1 signal:noise ratio.

PAH Results

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Table II-2: Quality Control Summary for Analyses of Polyaromatic Hydrocarbons (PAHs) in Sediment.

Method Reference Number: 8270C

Quality Control (QC) Element	Acceptance Criteria*	Criteria Met? Yes/No	List results outside criteria (Cross-reference results table in data report)	Location of Results (Retained at Lab or in Data Package)
Initial Calibration	Must be performed prior to the analysis of any QC sample or field sample (<25 % RSD for each compound, 15% on average)	Yes		Retained at lab
Calculation of Method Detection Limits (MDLs)	For each matrix, analyzed once per 12 month period (see Section 5.2 for MDL procedure)	Yes		Retained at lab
Calibration Verification (Second Source)	Once, after initial calibration (<25%D)	Yes		In Data Package
Continuing Calibration	At the beginning of every 12 hour shift (<25%D)	Yes		In Data Package
Standard Reference Materials	+/- 30% plus variance	No	Benzo(a)anthracene, chrysene, benzo(a)pyrene, and benzo(g,h,i)perylene were all under-recovered in the SRM.	In Data Package
Method Blank	No target analytes > 5 x MDL	Yes		In Data Package
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One set (MS/MSD) per group of field samples. Must contain all target analytes. (Recovery Limits 50 to 120%; RPD <30%)	Yes		In Data Package
Analytical Replicates	Analyze one sample in duplicate for each group of field samples (RPD < 30%)	Yes		In Data Package
Surrogate Recoveries	Calculate % recovery (30 to 150% recovery)	Yes		In Data Package
Internal Standard Areas	Within 50 to 100% of internal standards in continuing calibration check	Yes		In Data Package

* The Quality Control Acceptance Criteria are general guidelines. If alternate criteria are used, they must be documented in this table.

PAH – SEDIMENT QA/QC SUMMARY
Batch 07-0243

PROJECT: USACE/NAE – Brushneck Cove
PARAMETER: PAH
LABORATORY: Battelle, Duxbury, MA
MATRIX: Sediment Composites
SAMPLE CUSTODY: Sediment cores for this project were collected on 9/5/2007. They were composited and the composites were hand delivered to the Chemistry Sample Custodian on 9/10/2007. The samples were received in good condition and no custody issues were noted. Samples were logged into Battelle LIMS and received unique IDs. Composite sediment samples were stored in the walk-in refrigerator until sample preparation could begin.

	Reference Method	Method Blank	Surrogate Recovery	LCS Recovery	MS Recovery	SRM Percent Difference	Sample Replicate Relative Percent Difference	Detection Limits (ng/g dry wt)
PAH	General NS&T	<5xMDL	30-150% Recovery	50-120% Recovery	50-120% Recovery (analyte conc. in MS must be >5x background)	Average PD ≤ 30% (plus variance) (for analytes > 5 x MDL)	≤30% RPD (analytes must be > 10x MDL to be used for data quality assessment)	MDL: 0.18 – 0.57

METHOD: Sediment samples were extracted for PAH following general NS&T methods. Approximately 30 g of sediment was spiked with surrogates and extracted three times with dichloromethane using shaker table techniques. The combined extract was dried over anhydrous sodium sulfate, concentrated, processed through alumina cleanup column, concentrated, and further purified by GPC/HPLC. The post-HPLC extract was concentrated, fortified with internal standards (IS) and split for the required analyses. Extracts intended for PAH analysis were analyzed using gas chromatography/mass spectrometry (GC/MS) operating in the selected ion monitoring (SIM) mode, following general NS&T methods. Sample data were quantified by the method of internal standards, using the spiked IS compounds.

HOLDING TIMES: Sediment samples were prepared for analysis in one analytical batch and were extracted within 14-days of sample collection. All extracts were analyzed within 40 days of extraction.

Batch	Extraction Date	Analysis Date
07-0243	9/19/2007	10/3/2007 – 10/4/2007

PAH – SEDIMENT QA/QC SUMMARY
Batch 07-0243

BLANK:

A procedural blank (PB) was prepared with each analytical batch. Blanks were analyzed to ensure the sample extraction and analysis methods were free of contamination.

07-0243 – No exceedences noted.

Comments– No target analytes were detected in the procedural blank at a concentration greater than the laboratory control limit (5 x MDL). However, naphthalene was detected in the procedural blank at a concentration greater than the RL. Any field sample concentrations that are greater than the reporting limit, but less than 5 times the concentration in the associated blank have been qualified with a "B". This resulted in 11 samples being "B" qualified. No further corrective action was taken.

LABORATORY CONTROL SAMPLE:

A laboratory control sample (LCS) was prepared with each analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy.

07-0243 – No exceedences noted.

Comments – All target analytes were recovered within the specified laboratory control limits (50-120%).

MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

A pair of matrix spike (MS) and matrix spike duplicate samples (MSD) was prepared with each analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy. The RPD between percent recoveries was calculated to measure the data quality in terms of precision.

07-0243 – No exceedences noted.

Comments – All target analytes were recovered within the specified laboratory control limits (50-120%). All RPDs were within the specified laboratory control range (< 30%).

REPLICATES:

A laboratory replicate (duplicate) sample was prepared with each analytical batch. The RPD between duplicate analyses for each target analyte is calculated to measure data quality in terms of precision.

07-0243 – No exceedences noted.

Comments – All RPDs between the laboratory duplicate samples were within the specified laboratory control limits ($\leq$30%), except for phenanthrene. The RPD calculated between the lab duplicate (GAG-010-C) for this compound is 36.1%, however this compound was not detected at a concentration great enough to be used for data quality assessment. The RPD was qualified with an "n" to indicate contingency criteria have been met. No corrective action was required.

PAH – SEDIMENT QA/QC SUMMARY
Batch 07-0243

SRM: A standard reference material (NIST SRM 1944) was prepared with the analytical batch. The percent difference (PD) between the measured value and the certified range was calculated to measure data quality in terms of accuracy.

07-0243 – 4 exceedences noted.

Comments – Percent difference for all certified target analytes were within the control limits (≤ 30% plus variance), except for benzo(a)anthracene, chrysene, benzo(a)pyrene and benzo(g,h,i)perylene, which were all recovered below criteria. Accuracy for these compounds was demonstrated in the LCS, MS, and MSD samples. Chromatography and calculations were reviewed and no discrepancies were found. Exceedences were qualified with an "N". No corrective action was taken.

SURROGATES: Four surrogate compounds were added prior to extraction, including naphthalene-d8, acenaphthen-d10, phenanthrene-d10, and benzo(a)pyrene-d12. The recovery of each surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

07-0243 – No exceedences noted.

Comments – All surrogate percent recoveries were within the laboratory control limits (30-150%)

CALIBRATIONS: The GC/MS is calibrated with a minimum of a 5 level curve. The RSD between response factors for the individual target analytes must be <30%, with a mean < 15%. Each batch of samples analyzed is bracketed by a calibration check sample, run at a frequency of minimally every 12 hours. This PD between the initial calibration RF and CCV should be <25% for individual analytes. Additionally an initial calibration check sample (ICC) sample is run immediately after each initial calibration. The percent difference between the ICC and the initial calibration should be < 25%.

07-0243 – All calibration criteria have been met.

Comments – None.

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	GAG-001-C	GAG-002-C	GAG-003-C	GAG-004-C
Battelle ID	Q0237-P	Q0238-P	Q0239-P	Q0240-P
Sample Type	SA	SA	SA	SA
Collection Date	09/05/07	09/05/07	09/05/07	09/05/07
Extraction Date	09/19/07	09/19/07	09/19/07	09/19/07
Analysis Date	10/03/07	10/03/07	10/03/07	10/03/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	19.97	42.18	45.77	46.92
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	24.81	17.55	16.38	16.45
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Units	UG/KG_DRY	UG/KG_DRY	UG/KG_DRY	UG/KG_DRY
Naphthalene	0.97 B	1.81 B	1.86 B	2.55 B
Acenaphthylene	1.05	1.46	1.31	2.03
Acenaphthene	0.41 U	0.34 J	0.37 J	0.66
Fluorene	0.48	0.93	1.12	1.52
Anthracene	1.86	2.63	2.65	3.35
Phenanthrene	9.05	8.13	8.08	9.38
Fluoranthene	21.21	23.17	20.67	30.76
Pyrene	18.91	23.2	18.58	29.57
Benzo(a)anthracene	6.77	8.59	6.76	10
Chrysene	8.07	10.05	9	13.03
Benzo(b)fluoranthene	7.19	9.71	9.31	14.17
Benzo(k)fluoranthene	7.28	9.69	9.05	13.96
Benzo(a)pyrene	7.41	9.81	8.42	12.87
Indeno(1,2,3-cd)pyrene	5.35	7.58	7.26	11.17
Dibenz(a,h)anthracene	1.03	1.39	1.41	2.2
Benzo(g,h,i)perylene	4.84	6.62	6.54	10.24
Surrogate Recoveries (%)				
Naphthalene-d8	59	79	74	69
Acenaphthene-d10	58	76	73	67
Phenanthrene-d10	73	90	88	83
Benzo(a)pyrene-d12	71	91	87	86

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	GAG-005-C	GAG-006-C	GAG-007-C	GAG-008-C
Battelle ID	Q0241-P	Q0242-P	Q0243-P	Q0244-P
Sample Type	SA	SA	SA	SA
Collection Date	09/05/07	09/05/07	09/05/07	09/05/07
Extraction Date	09/19/07	09/19/07	09/19/07	09/19/07
Analysis Date	10/04/07	10/03/07	10/04/07	10/04/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	42.9	46.83	44.22	53.14
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	17.47	15.50	17.38	14.48
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Units	UG/KG_DRY	UG/KG_DRY	UG/KG_DRY	UG/KG_DRY
Naphthalene	3.07 B	2.78 B	1.97 B	4.64
Acenaphthylene	7.9	4.05	2.17	8.87
Acenaphthene	1	1.21	0.64	1.69
Fluorene	1.87	2.01	1.2	3.25
Anthracene	7.97	5.93	3.11	11.6
Phenanthrene	20.59	19.78	9.41	29.4
Fluoranthene	115.35	78.48	37.13	123.03
Pyrene	107.46	89.41	38.14	134.97
Benzo(a)anthracene	45.78	30.84	13.18	44.67
Chrysene	56.33	41.1	18.89	56.51
Benzo(b)fluoranthene	59.93	50.18	23.3	69.82
Benzo(k)fluoranthene	60.44	49.61	21.33	69.12
Benzo(a)pyrene	58.7	43.31	18.6	61.91
Indeno(1,2,3-cd)pyrene	44.3	38.82	17.14	53.8
Dibenz(a,h)anthracene	8.7	7.31	3.24	10.72
Benzo(g,h,i)perylene	38.69	33.53	15.69	47.82
Surrogate Recoveries (%)				
Naphthalene-d8	66	66	62	61
Acenaphthene-d10	71	68	65	65
Phenanthrene-d10	91	85	81	85
Benzo(a)pyrene-d12	93	91	82	90

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
10/29/2007

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	GAG-009-C	GAG-010-C	GAG-011-C
Battelle ID	Q0245-P	Q0246-P	Q0247-P
Sample Type	SA	SA	SA
Collection Date	09/05/07	09/06/07	09/06/07
Extraction Date	09/19/07	09/19/07	09/19/07
Analysis Date	10/04/07	10/04/07	10/04/07
Analytical Instrument	MS	MS	MS
% Moisture	46.86	39.39	35.56
% Lipid	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	16.28	18.52	19.44
Size Unit-Basis	G_DRY	G_DRY	G_DRY
Units	UG/KG_DRY	UG/KG_DRY	UG/KG_DRY
Naphthalene	1.66 B	1.14 B	1.49 B
Acenaphthylene	0.92	0.6	1.57
Acenaphthene	0.4 J	0.25 J	0.29 J
Fluorene	0.75	0.51 J	0.78
Anthracene	1.76	1.04	2.27
Phenanthrene	5.72	2.45	7.26
Fluoranthene	21.73	9.35	23.63
Pyrene	20.27	8.36	24.14
Benzo(a)anthracene	7.15	2.72	9.15
Chrysene	11.17	4.26	11.99
Benzo(b)fluoranthene	12.37	4.74	10.85
Benzo(k)fluoranthene	11.62	4.36	12.11
Benzo(a)pyrene	10.31	3.58	10.43
Indeno(1,2,3-cd)pyrene	9.66	3.26	7.77
Dibenz(a,h)anthracene	1.69	0.62	1.46
Benzo(g,h,i)perylene	8.87	3.32	7.3
Surrogate Recoveries (%)			
Naphthalene-d8	65	68	65
Acenaphthene-d10	68	65	65
Phenanthrene-d10	84	81	83
Benzo(a)pyrene-d12	86	79	83

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	Procedural Blank
Battelle ID	BK952PB-P
Sample Type	PB
Collection Date	09/19/07
Extraction Date	09/19/07
Analysis Date	10/03/07
Analytical Instrument	MS
% Moisture	42.16
% Lipid	NA
Matrix	SEDIMENT
Sample Size	17.65
Size Unit-Basis	G_DRY
Units	UG/KG_DRY
Naphthalene	0.75
Acenaphthylene	0.57 U
Acenaphthene	0.57 U
Fluorene	0.57 U
Anthracene	0.57 U
Phenanthrene	0.57 U
Fluoranthene	0.57 U
Pyrene	0.57 U
Benzo(a)anthracene	0.57 U
Chrysene	0.57 U
Benzo(b)fluoranthene	0.57 U
Benzo(k)fluoranthene	1.14 U
Benzo(a)pyrene	0.57 U
Indeno(1,2,3-cd)pyrene	0.57 U
Dibenz(a,h)anthracene	0.57 U
Benzo(g,h,i)perylene	0.57 U
Surrogate Recoveries (%)	
Naphthalene-d8	77
Acenaphthene-d10	74
Phenanthrene-d10	87
Benzo(a)pyrene-d12	90

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	060208-03: Sand, White Quartz, -50+70			
Battelle ID	BK953LCS-P			
Sample Type	LCS			
Collection Date	09/19/07			
Extraction Date	09/19/07			
Analysis Date	10/03/07			
Analytical Instrument	MS			
% Moisture	NA			
% Lipid	NA			
Matrix	SEDIMENT			
Sample Size	28.86			
Size Unit-Basis	G_DRY			
Units	UG/KG_DRY	Target	% Recovery	Qualifier
Naphthalene	46.04	69.31	66	
Acenaphthylene	45.92	69.36	66	
Acenaphthene	48.23	69.35	70	
Fluorene	47.68	69.34	69	
Anthracene	52.26	69.31	75	
Phenanthrene	51.69	69.33	75	
Fluoranthene	58.18	69.33	84	
Pyrene	61.45	69.32	89	
Benzo(a)anthracene	51.57	69.32	74	
Chrysene	49.68	69.33	72	
Benzo(b)fluoranthene	49.94	69.36	72	
Benzo(k)fluoranthene	53.34	69.34	77	
Benzo(a)pyrene	50.36	69.36	73	
Indeno(1,2,3-cd)pyrene	47.92	69.33	69	
Dibenz(a,h)anthracene	49.31	69.34	71	
Benzo(g,h,i)perylene	44.74	69.32	65	

Surrogate Recoveries (%)

Naphthalene-d8	61
Acenaphthene-d10	58
Phenanthrene-d10	69
Benzo(a)pyrene-d12	67

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	070906-01: NIST 1944
Battelle ID	BK954SRM-P
Sample Type	SRM
Collection Date	09/19/07
Extraction Date	09/19/07
Analysis Date	10/03/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	SEDIMENT
Sample Size	1.98
Size Unit-Basis	G_DRY
Units	UG/KG_DRY

		Certified Value	+/-	Passing %Difference	Actual %Difference	Qualifier
Naphthalene	890.82	1650	310.04	48.79	46	
Acenaphthylene	574.35					
Acenaphthene	267.54					
Fluorene	308.71					
Anthracene	915.14	1770	329.93	48.64	48.3	
Phenanthrene	3912.47	5270	219.76	34.17	25.8	
Fluoranthene	6914.49	8920	320.23	33.59	22.5	
Pyrene	7668.93	9700	420.01	34.33	20.9	
Benzo(a)anthracene	3055.59	4720	109.98	32.33	35.3	N
Chrysene	3818.76	5900	270.22	34.58	35.3	N
Benzo(b)fluoranthene	2518.18	3870	419.90	40.85	34.9	
Benzo(k)fluoranthene	2875.54	4390	640.06	44.58	34.5	
Benzo(a)pyrene	2615.71	4300	129.86	33.02	39.2	N
Indeno(1,2,3-cd)pyrene	2081.81	2780	100.08	33.6	25.1	
Dibenz(a,h)anthracene	570.85	759	81.97	40.8	24.8	
Benzo(g,h,i)perylene	1834.03	2840	99.97	33.52	35.4	N

Surrogate Recoveries (%)

Naphthalene-d8	75
Acenaphthene-d10	81
Phenanthrene-d10	103
Benzo(a)pyrene-d12	105

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	GAG-006-C	GAG-006-C			
Battelle ID	Q0242-P	Q0242MS-P			
Sample Type	SA	MS			
Collection Date	09/05/07	9/5/2007			
Extraction Date	09/19/07	9/19/2007			
Analysis Date	10/03/07	10/3/2007			
Analytical Instrument	MS	MS			
% Moisture	46.83	45.26			
% Lipid	NA	NA			
Matrix	SEDIMENT	SEDIMENT			
Sample Size	15.50	8.38			
Size Unit-Basis	G_DRY	G_DRY			
Units	UG/KG_DRY	UG/KG_DRY	Target	% Recovery	Qualifier
Naphthalene	2.78 B	194.04	238.71	80	
Acenaphthylene	4.05	199.35	238.88	82	
Acenaphthene	1.21	207.49	238.82	86	
Fluorene	2.01	211.56	238.79	88	
Anthracene	5.93	240.58	238.70	98	
Phenanthrene	19.78	246.77	238.78	95	
Fluoranthene	78.48	325.07	238.78	103	
Pyrene	89.41	362.55	238.75	114	
Benzo(a)anthracene	30.84	257.49	238.72	95	
Chrysene	41.1	248.74	238.76	87	
Benzo(b)fluoranthene	50.18	259.88	238.87	88	
Benzo(k)fluoranthene	49.61	274.99	238.79	94	
Benzo(a)pyrene	43.31	272.45	238.85	96	
Indeno(1,2,3-cd)pyrene	38.82	246.49	238.78	87	
Dibenz(a,h)anthracene	7.31	218.78	238.79	89	
Benzo(g,h,i)perylene	33.53	221.32	238.74	79	
Surrogate Recoveries (%)					
Naphthalene-d8	66	75			
Acenaphthene-d10	68	73			
Phenanthrene-d10	85	89			
Benzo(a)pyrene-d12	91	94			

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
10/29/2007

MS: S07-0243MS-Master_157-Final.xls

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	GAG-006-C					
Battelle ID	Q0242MSD-P					
Sample Type	MSD					
Collection Date	9/5/2007					
Extraction Date	9/19/2007					
Analysis Date	10/3/2007					
Analytical Instrument	MS					
% Moisture	44.39					
% Lipid	NA					
Matrix	SEDIMENT					
Sample Size	8.4					
Size Unit-Basis	G_DRY					
Units	UG/KG_DRY	Target	% Recovery	Qualifier	RPD (%)	Qualifier
Naphthalene	188.58	238.14	78		2.5	
Acenaphthylene	196.78	238.31	81		1.2	
Acenaphthene	205.65	238.25	86		0.0	
Fluorene	211.45	238.23	88		0.0	
Anthracene	245.7	238.13	101		3.0	
Phenanthrene	248.43	238.21	96		1.0	
Fluoranthene	323.12	238.21	103		0.0	
Pyrene	358.76	238.18	113		0.9	
Benzo(a)anthracene	256.16	238.15	95		0.0	
Chrysene	246.49	238.19	86		1.2	
Benzo(b)fluoranthene	255.55	238.30	86		2.3	
Benzo(k)fluoranthene	271.98	238.23	93		1.1	
Benzo(a)pyrene	265.56	238.29	93		3.2	
Indeno(1,2,3-cd)pyrene	240.06	238.21	84		3.5	
Dibenz(a,h)anthracene	219.85	238.23	89		0.0	
Benzo(g,h,i)perylene	218.23	238.17	78		1.3	

Surrogate Recoveries (%)

Naphthalene-d8	71
Acenaphthene-d10	71
Phenanthrene-d10	90
Benzo(a)pyrene-d12	93

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
10/29/2007

MS: S07-0243MS-Master_157-Final.xls

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	GAG-010-C		GAG-010-C			
Battelle ID	Q0246-P		Q0246DUP-P			
Sample Type	SA		QADU			
Collection Date	09/06/07		9/6/2007			
Extraction Date	09/19/07		9/19/2007			
Analysis Date	10/04/07		10/4/2007			
Analytical Instrument	MS		MS			
% Moisture	39.39		39.21			
% Lipid	NA		NA			
Matrix	SEDIMENT		SEDIMENT			
Sample Size	18.52		19.18			
Size Unit-Basis	G_DRY		G_DRY			
Units	UG/KG_DRY		UG/KG_DRY		RPD	Qualifier
Naphthalene	1.14	B	1.39	B	19.8	
Acenaphthylene	0.6		0.58		3.4	
Acenaphthene	0.25	J	0.26	J	NA	
Fluorene	0.51	J	0.56		9.3	
Anthracene	1.04		1.24		17.5	
Phenanthrene	2.45		3.53		36.1	n
Fluoranthene	9.35		10.97		15.9	
Pyrene	8.36		9.71		14.9	
Benzo(a)anthracene	2.72		3.68		30.0	
Chrysene	4.26		5.04		16.8	
Benzo(b)fluoranthene	4.74		5.12		7.7	
Benzo(k)fluoranthene	4.36		4.71		7.7	
Benzo(a)pyrene	3.58		4.11		13.8	
Indeno(1,2,3-cd)pyrene	3.26		3.45		5.7	
Dibenz(a,h)anthracene	0.62		0.65		4.7	
Benzo(g,h,i)perylene	3.32		3.45		3.8	
Surrogate Recoveries (%)						
Naphthalene-d8	68		71			
Acenaphthene-d10	65		69			
Phenanthrene-d10	81		84			
Benzo(a)pyrene-d12	79		82			

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Glossary of Data Qualifiers

Flag:	Application:
B	Analyte concentration found in the sample at a concentration <5x the level found in the procedural blank.
D	Dilution Run. Initial run outside linear range of instrument.
E	Estimate, result is greater than the highest concentration level in the calibration.
H	Surrogate diluted out. Used when surrogate recovery is affected by excessive dilution of the sample extract.
J	Analyte detected below the sample-specific Reporting Limit (RL).
m	Confirmation column manually over-ridden by analyst
ME	Significant Matrix Interference - Estimated value.
MI	Significant Matrix Interference - value could not be determined or estimated.
n	Quality Control (QC) value is outside the accuracy or precision Data Quality Objective (DQO), but meets the contingency criteria.
N	Quality Control (QC) value is outside the accuracy or precision Data Quality Objective (DQO)
NA	Not applicable
p	Dual column value exceeds RPD criteria
T	Holding Time (HT) exceeded.
U	Analyte not detected at 3:1 signal:noise ratio.

Table II-3: Quality Control Summary for Analyses of Pesticides and PCB in Rinsate Blank

Method Reference Number: 8081B

Quality Control (QC) Element	Acceptance Criteria*	Criteria Met? Yes/No	List results outside (Cross-reference results table in data report)	Location of Results (Retained at Lab or in Data Package)
Initial Calibration	Must be performed prior to the analysis of any QC sample or field sample (r^2 > 0.995)	Yes		Retained at Lab
Calculation of Method Detection Limits (MDLs)	For each matrix, analyzed once per 12 month period (see Section 5.2 for MDL procedure)	Yes		Retained at Lab
Calibration Verification (Second Source)	Once, after initial calibration (80 to 120% recovery of each compound)	Yes		Retained at Lab
Continuing Calibration	Every 20 injections ($\pm$ 20 % D)	Yes		Retained at Lab
Standard Reference Materials	Within the limits provided by vendor	NA		In Data Package
Method Blank	No target analytes > RL	Yes		In Data Package
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One set (MS/MSD) per group of field samples. Must contain all target analytes. (Recovery Limits 50 to 120%; RPD <30%)	NA		In Data Package
Analytical Replicates	Analyze one sample in duplicate for each group of field samples (RPD < 30%)	NA		In Data Package
Surrogate Recoveries	Calculate % recovery (30 to 150% recovery)	Yes		In Data Package

* The Quality Control Acceptance Criteria are general guidelines. If alternate criteria are used, they must be documented in this table.

Pesticide/PCB – Rinsate Blank QA/QC Summary
Batch 07-0239

PROJECT: USACE/NAE – Brushneck Cove
PARAMETER: Pesticide/PCB
LABORATORY: Battelle, Duxbury, MA
MATRIX: Rinsate Blank
SAMPLE CUSTODY: A Rinsate blank sample was collected on 9/62007 and delivered to the Chemistry Sample Custodian on 9/7/2007. Upon arrival the cooler temperatures was recorded at 3.0°C. The sample was received in good condition and no custody issues were noted. It was logged into Battelle LIMS to receive a unique ID. The rinsate blank was stored in refrigerator at 4°C until sample preparation could begin.

	Reference Method	Method Blank	Surrogate Recovery	LCS Recovery	Detection Limits (ng/L)
PCB/Pest	General NS&T	<5xMDL	30-150% Recovery	50-120% Recovery	MDL: 0.26 – 0.94 Toxaphene RL: 100.2

METHOD: The rinsate blank sample was analyzed to ensure field collection methods were free of contamination. Approximately 1 L of water was spiked with surrogates and extracted three times with dichloromethane using separatory funnel techniques. The extracts were then concentrated, fortified with internal standard (IS) and split for the required analysis. The split extract for PCB/pesticide analysis was solvent exchanged into hexane, and analyzed using gas chromatography/electron capture detection (GC/ECD), following general NS&T methods. Sample data were quantified by the method of internal standards, using the spiked IS compounds. Data were evaluated against 2007 MDLs.

HOLDING TIMES: The rinsate blank sample was extracted within 7 days of sample collection and analyzed within 40 days of extraction.

Batch	Extraction Date	Analysis Date
07-0239	9/12/2007	9/15/2007

Pesticide/PCB – Rinsate Blank QA/QC Summary
Batch 07-0239

BLANK:

A procedural blank (PB) was prepared with the analytical batch. Blanks are analyzed to ensure the sample extraction and analysis methods were free of contamination.

07-0239 – No exceedences noted.

Comments – No target analytes were detected in the procedural blank.

LABORATORY CONTROL SAMPLE:

A laboratory control sample (LCS) was prepared with the analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy.

07-0239 – No exceedences noted.

Comments – All percent recoveries of spiked target analytes were within the laboratory control limit (50-120%).

SURROGATES:

Two surrogate compounds were added prior to extraction, including PCB 34 and PCB 152. The recovery of each surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

07-0239 – No exceedences noted.

Comments – Percent recoveries for all surrogate compounds were within the laboratory control limits (30 – 150% recovery).

CALIBRATIONS:

The instrument is calibrated with a 6-level calibration. The co-efficient of determination for the initial calibration (ICAL) must be ≥ 0.995. Continuing calibration verification (CCV) samples are analyzed minimally every 24 hours. The percent difference for the CCV samples must be $\leq 20\%$. Additionally an Instrument Calibration Check (ICC) sample is run after each initial calibration. The percent difference for the ICC also must be $\leq 20\%$.

07-0239 – No ICAL exceedences noted.
No ICC exceedences noted.
No CCV exceedences noted.

Comments - None

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	GAG-013
Battelle ID	Q0236-P
Sample Type	SA
Collection Date	09/06/07
Extraction Date	09/12/07
Analysis Date	09/15/07
Analytical Instrument	ECD
% Moisture	NA
% Lipid	NA
Matrix	WATER
Sample Size	1.05
Size Unit-Basis	L_LIQUID
Units	NG/L_LIQUID
4,4'-DDD	0.48 U
4,4'-DDE	0.48 U
4,4'-DDT	0.48 U
aldrin	0.48 U
a-chlordane	0.48 U
g-chlordane	0.48 U
Lindane	0.48 U
cis-nonachlor	0.48 U
trans-nonachlor	0.48 U
oxychlordane	0.48 U
dieldrin	0.48 U
endosulfan I	0.48 U
endosulfan II	0.48 U
endrin	0.48 U
heptachlor	0.48 U
heptachlor epoxide	0.48 U
Hexachlorobenzene	0.48 U
methoxychlor	0.48 U
Toxaphene	95.43 U
Cl2(8)	0.48 U
Cl3(18)	0.48 U
Cl3(28)	0.48 U
Cl4(44)	0.48 U
Cl4(49)	0.48 U
Cl4(52)	0.48 U
Cl4(66)	0.48 U
Cl5(87)	0.48 U
Cl5(101)	0.48 U
Cl5(105)	0.48 U
Cl5(118)	0.48 U
Cl6(128)	0.48 U
Cl6(138)	0.48 U
Cl6(153)	0.48 U
Cl7(170)	0.48 U
Cl7(180)	0.48 U
Cl7(183)	0.47 U
Cl7(184)	0.47 U
Cl7(187)	0.48 U
Cl8(195)	0.48 U
Cl9(206)	0.48 U
Cl10(209)	0.48 U

Surrogate Recoveries (%)

Cl3(34)	101
Cl6(152)	99

Not Surrogate Corrected

Analyzed by Meara, Michael
10/29/2007

Main: L07-0239ECD-Master_128-Final.xls

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	Procedural Blank
Battelle ID	BK938PB-P
Sample Type	PB
Collection Date	09/12/07
Extraction Date	09/12/07
Analysis Date	09/15/07
Analytical Instrument	ECD
% Moisture	NA
% Lipid	NA
Matrix	WATER
Sample Size	1.00
Size Unit-Basis	L_LIQUID
Units	NG/L_LIQUID
4,4'-DDD	0.5 U
4,4'-DDE	0.5 U
4,4'-DDT	0.5 U
aldrin	0.5 U
a-chlordane	0.5 U
g-chlordane	0.5 U
Lindane	0.5 U
cis-nonachlor	0.5 U
trans-nonachlor	0.5 U
oxychlordane	0.5 U
dieldrin	0.5 U
endosulfan I	0.5 U
endosulfan II	0.5 U
endrin	0.5 U
heptachlor	0.5 U
heptachlor epoxide	0.5 U
Hexachlorobenzene	0.5 U
methoxychlor	0.5 U
Toxaphene	100.2 U
Cl2(8)	0.5 U
Cl3(18)	0.5 U
Cl3(28)	0.5 U
Cl4(44)	0.5 U
Cl4(49)	0.5 U
Cl4(52)	0.5 U
Cl4(66)	0.5 U
Cl5(87)	0.5 U
Cl5(101)	0.5 U
Cl5(105)	0.5 U
Cl5(118)	0.51 U
Cl6(128)	0.5 U
Cl6(138)	0.51 U
Cl6(153)	0.5 U
Cl7(170)	0.5 U
Cl7(180)	0.5 U
Cl7(183)	0.5 U
Cl7(184)	0.5 U
Cl7(187)	0.5 U
Cl8(195)	0.5 U
Cl9(206)	0.5 U
Cl10(209)	0.5 U

Surrogate Recoveries (%)

Cl3(34)	100
Cl6(152)	94

Not Surrogate Corrected

Analyzed by Meara, Michael
10/29/2007

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	060208-03: Sand, White Quartz, -50+70
Battelle ID	BK939LCS-P
Sample Type	LCS
Collection Date	09/12/07
Extraction Date	09/12/07
Analysis Date	09/15/07
Analytical Instrument	ECD
% Moisture	NA
% Lipid	NA
Matrix	WATER
Sample Size	1.00
Size Unit-Basis	L_LIQUID

Units	NG/L_LIQUID		Target	% Recovery	Qualifier
4,4'-DDD	17.2		20.01	86	
4,4'-DDE	17.78		20.02	89	
4,4'-DDT	18.35		20.01	92	
aldrin	17.19		20.01	86	
a-chlordane	18.29		20.01	91	
g-chlordane	18.47		20.03	92	
Lindane	18.97		20.01	95	
cis-nonachlor	17.08		20.01	85	
trans-nonachlor	18.33		20.03	92	
oxychlordane	18.82		20.10	94	
dieldrin	16.91		20.01	85	
endosulfan I	18.83		20.02	94	
endosulfan II	17.39		20.01	87	
endrin	17.81		20.01	89	
heptachlor	17.64		20.01	88	
heptachlor epoxide	18.49		20.02	92	
Hexachlorobenzene	18.93		20.03	95	
methoxychlor	18.25		20.01	91	
Toxaphene	100.2	U			
Cl2(8)	16.61		20.06	83	
Cl3(18)	16.06		20.06	80	
Cl3(28)	16.35		20.02	82	
Cl4(44)	17.63		20.04	88	
Cl4(49)	17.71		20.08	88	
Cl4(52)	17.87		20.00	89	
Cl4(66)	18.51		20.02	92	
Cl5(87)	17.29		19.83	87	
Cl5(101)	18.53		20.04	92	
Cl5(105)	17.61		20.02	88	
Cl5(118)	18.51		20.02	92	
Cl6(128)	17.98		20.12	89	
Cl6(138)	18.54		20.04	93	
Cl6(153)	18.4		20.02	92	
Cl7(170)	18.3		20.10	91	
Cl7(180)	18.35		20.08	91	
Cl7(183)	17.96		20.08	89	
Cl7(184)	17		20.08	85	
Cl7(187)	17.5		20.06	87	
Cl8(195)	17.08		20.06	85	
Cl9(206)	17.25		20.06	86	
Cl10(209)	17.21		20.02	86	

Surrogate Recoveries (%)

Cl3(34)	96
Cl6(152)	92

Not Surrogate Corrected

Analyzed by Meara, Michael
10/29/2007

LCS: L07-0239ECD-Master_128-Final.xls

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Glossary of Data Qualifiers

Flag:	Application:
B	Analyte concentration found in the sample at a concentration <5x the level found in the procedural blank.
D	Dilution Run. Initial run outside linear range of instrument.
E	Estimate, result is greater than the highest concentration level in the calibration.
H	Surrogate diluted out. Used when surrogate recovery is affected by excessive dilution of the sample extract.
J	Analyte detected below the sample-specific Reporting Limit (RL).
m	Confirmation column manually over-ridden by analyst
ME	Significant Matrix Interference - Estimated value.
MI	Significant Matrix Interference - value could not be determined or estimated.
n	Quality Control (QC) value is outside the accuracy or precision Data Quality Objective (DQO), but meets the contingency criteria.
N	Quality Control (QC) value is outside the accuracy or precision Data Quality Objective (DQO)
NA	Not applicable
p	Dual column value exceeds RPD criteria
T	Holding Time (HT) exceeded.
U	Analyte not detected at 3:1 signal:noise ratio.

Table II-2: Quality Control Summary for Analyses of Polyaromatic Hydrocarbons (PAHs) and other base-neutrals in Rinsate

Method Reference Number: 8270C

Quality Control (QC) Element	Acceptance Criteria*	Criteria Met? Yes/No	List results outside criteria (Cross-reference results table in data report)	Location of Results (Retained at Lab or in Data Package)
Initial Calibration	Must be performed prior to the analysis of any QC sample or field sample (<20 % RSD for each compound)	Yes		Retained at Lab
Calculation of Method Detection Limits (MDLs)	For each matrix, analyzed once per 12 month period (see Section 5.2 for MDL procedure)	Yes		Retained at Lab
Calibration Verification (Second Source)	Once, after initial calibration (80 to 120% recovery of each compound)	Yes		Retained at Lab
Continuing Calibration	At the beginning of every 12 hour shift (± 15 % D)	Yes		Retained at Lab
Standard Reference Materials	Within the limits provided by vendor	NA		In Data Package
Method Blank	No target analytes > RL	Yes		In Data Package
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One set (MS/MSD) per group of field samples. Must contain all target analytes. (Recovery Limits 50 to 120%; RPD <30%)	NA		In Data Package
Analytical Replicates	Analyze one sample in duplicate for each group of field samples (RPD < 30%)	NA		In Data Package
Surrogate Recoveries	Calculate % recovery (30 to 150% recovery)	Yes		In Data Package

* The Quality Control Acceptance Criteria are general guidelines. If alternate criteria are used, they must be documented in this table.

PAH –Rinsate Blank QA/QC SUMMARY
Batch 07-0239

PROJECT: USACE/NAE – Brushneck Cove
PARAMETER: PAH
LABORATORY: Battelle, Duxbury, MA
MATRIX: Rinsate Blank
SAMPLE CUSTODY: A Rinsate blank sample was collected on 9/6/2007 and delivered to the Chemistry Sample Custodian on 9/7/2007. Upon arrival the cooler temperatures was recorded at 3.0°C. The sample was received in good condition and no custody issues were noted. It was logged into Battelle LIMS to receive a unique ID. The rinsate blank was stored in refrigerator at 4°C until sample preparation could begin.

	Reference Method	Method Blank	Surrogate Recovery	LCS Recovery	Detection Limits (ng/L)
PAH	General NS&T	<5xMDL	30-150% Recovery	50-120% Recovery	~0.59 – 1.55

METHOD: The rinsate blank sample was analyzed to ensure field collection methods were free of contamination. Approximately 1 L of water was spiked with surrogates and extracted three times with dichloromethane using separatory funnel techniques. The extracts were then concentrated, fortified with internal standard (IS) and split for the required analysis. Extracts intended for PAH analysis were analyzed using gas chromatography/mass spectrometry (GC/MS) operating in the selected ion monitoring (SIM) mode, following general NS&T methods. Sample data were quantified by the method of internal standards, using the spiked IS compounds.

HOLDING TIMES: The rinsate blank was extracted within 7 days of sample collection, and the extract was analyzed within 40 days of extraction.

Batch	Extraction Date	Analysis Date
07-0239	9/12/2007	10/3/2007 – 10/4/2007

PAH –Rinsate Blank QA/QC SUMMARY
Batch 07-0239

BLANK:

A procedural blank (PB) was prepared with each analytical batch. Blanks were analyzed to ensure the sample extraction and analysis methods were free of contamination.

07-0239 – No target analytes were detected in the procedural blank at a concentration greater than the laboratory control limit (5 x MDL).

Comments – None.

LABORATORY CONTROL SAMPLE:

A laboratory control sample (LCS) was prepared with each analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy.

07-0239 – One exceedence noted.

Comments – All target analytes were recovered within the specified laboratory control limits (50-120%), except for Pyrene. This compound was over-recovered in the LCS. Since this compound was not detected above the reporting limit in the rinsate sample, this exceedence has no impact on the data. No further corrective action was needed.

SURROGATES:

Four surrogate compounds were added prior to extraction, including naphthalene-d8, acenaphthene-d10, phenanthrene-d10, and benzo(a)pyrene-d12. The recovery of each surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

07-0239 – No exceedences noted.

Comments – All surrogate percent recoveries were within the laboratory control limits (30-150%).

CALIBRATIONS:

The GC/MS is calibrated with a minimum of a 5 level curve. The RSD between response factors for the individual target analytes must be <30%, with a mean < 15%. Each batch of samples analyzed is bracketed by a calibration check sample (CCV), run at a frequency of minimally every 12 hours. This PD between the initial calibration RF and the CCV should be <25% for individual analytes. Additionally an initial calibration check sample (ICC) sample is run immediately after each initial calibration. The percent difference between the ICC and the initial calibration should be < 25%.

07-0239 – No exceedences noted.

Comments – All calibration criteria have been met.

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	GAG-013	
Battelle ID	Q0236-P	
Sample Type	SA	
Collection Date	09/06/07	
Extraction Date	09/12/07	
Analysis Date	10/03/07	
Analytical Instrument	MS	
% Moisture	NA	
% Lipid	NA	
Matrix	WATER	
Sample Size	1.05	
Size Unit-Basis	L_LIQUID	
Units	NG/L_LIQUID	
Naphthalene	91.55	
Acenaphthylene	2.39	U
Acenaphthene	3.83	
Fluorene	29.11	
Anthracene	2.39	U
Phenanthrene	15.17	
Fluoranthene	1.97	J
Pyrene	2	J
Benzo(a)anthracene	2.39	U
Chrysene	2.39	U
Benzo(b)fluoranthene	2.39	U
Benzo(k)fluoranthene	4.78	U
Benzo(a)pyrene	2.39	U
Indeno(1,2,3-cd)pyrene	2.39	U
Dibenz(a,h)anthracene	2.39	U
Benzo(g,h,i)perylene	2.39	U
Surrogate Recoveries (%)		
Naphthalene-d8	89	
Acenaphthene-d10	86	
Phenanthrene-d10	97	
Benzo(a)pyrene-d12	102	

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	Procedural Blank
Battelle ID	BK938PB-P
Sample Type	PB
Collection Date	09/12/07
Extraction Date	09/12/07
Analysis Date	10/03/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	WATER
Sample Size	1.00
Size Unit-Basis	L_LIQUID
Units	NG/L_LIQUID
Naphthalene	2.29 J
Acenaphthylene	2.51 U
Acenaphthene	2.52 U
Fluorene	2.51 U
Anthracene	2.51 U
Phenanthrene	2.51 U
Fluoranthene	2.51 U
Pyrene	2.51 U
Benzo(a)anthracene	2.51 U
Chrysene	2.51 U
Benzo(b)fluoranthene	2.51 U
Benzo(k)fluoranthene	5.02 U
Benzo(a)pyrene	2.51 U
Indeno(1,2,3-cd)pyrene	2.51 U
Dibenz(a,h)anthracene	2.51 U
Benzo(g,h,i)perylene	2.51 U
Surrogate Recoveries (%)	
Naphthalene-d8	89
Acenaphthene-d10	88
Phenanthrene-d10	102
Benzo(a)pyrene-d12	105

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Project Client: USACE - North Atlantic Division
Project Name: Brushneck Cove
Project Number: G606430-DUXSEDCHEM

Client ID	060208-03: Sand, White Quartz, -50+70			
Battelle ID	BK939LCS-P			
Sample Type	LCS			
Collection Date	09/12/07			
Extraction Date	09/12/07			
Analysis Date	10/03/07			
Analytical Instrument	MS			
% Moisture	NA			
% Lipid	NA			
Matrix	WATER			
Sample Size	1.00			
Size Unit-Basis	L_LIQUID			
Units	NG/L_LIQUID	Target	% Recovery	Qualifier
Naphthalene	854.84	1000.20	85	
Acenaphthylene	944.16	1000.90	94	
Acenaphthene	990.71	1000.65	99	
Fluorene	1010.95	1000.55	101	
Anthracene	1158.53	1000.15	116	
Phenanthrene	1083.37	1000.50	108	
Fluoranthene	1189.54	1000.50	119	
Pyrene	1286.88	1000.35	129	N
Benzo(a)anthracene	1069	1000.25	107	
Chrysene	992.87	1000.40	99	
Benzo(b)fluoranthene	1038.07	1000.85	104	
Benzo(k)fluoranthene	1096.56	1000.55	110	
Benzo(a)pyrene	1121.22	1000.80	112	
Indeno(1,2,3-cd)pyrene	1050.81	1000.50	105	
Dibenz(a,h)anthracene	1066.46	1000.55	107	
Benzo(g,h,i)perylene	936.58	1000.30	94	

Surrogate Recoveries (%)

Naphthalene-d8	79
Acenaphthene-d10	78
Phenanthrene-d10	91
Benzo(a)pyrene-d12	94

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Glossary of Data Qualifiers

Flag:	Application:
B	Analyte concentration found in the sample at a concentration <5x the level found in the procedural blank.
D	Dilution Run. Initial run outside linear range of instrument.
E	Estimate, result is greater than the highest concentration level in the calibration.
H	Surrogate diluted out. Used when surrogate recovery is affected by excessive dilution of the sample extract.
J	Analyte detected below the sample-specific Reporting Limit (RL).
m	Confirmation column manually over-ridden by analyst
ME	Significant Matrix Interference - Estimated value.
MI	Significant Matrix Interference - value could not be determined or estimated.
n	Quality Control (QC) value is outside the accuracy or precision Data Quality Objective (DQO), but meets the contingency criteria.
N	Quality Control (QC) value is outside the accuracy or precision Data Quality Objective (DQO)
NA	Not applicable
p	Dual column value exceeds RPD criteria
T	Holding Time (HT) exceeded.
U	Analyte not detected at 3:1 signal:noise ratio.

Metals Results

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Analytical Chemistry Data Package
Inorganics Analysis

Project: Bushneck Cove

Analysis of Metals in Sediment and Rinsate Blank Water

Battelle Project No. 53809
CF No. 2799

Marine Sciences Laboratory
1529 West Sequim Bay Road
Sequim, WA 98382
(360) 681-4564

CERTIFICATION STATEMENT AND DATA RELEASE

Battelle Marine Sciences Laboratory is releasing the following data set:

BUSHNECK COVE SEDIMENT CHEMISTRY

METALS IN SEDIMENT AND RINSATE BLANK

We certify that the data contained within this data set is authentic:

Carolyn Jones for JMB 10/4/07

Jill M. Brandenberger — Date

MSL Metals Chemistry Project Manager

10/4/07

~~Janet Cloutier~~ — Date

MSL QA Officer

Table II-5: Quality Control Summary for Analyses of Metals in Sediments, Tissue and Water Matrices

USACE NED - Bushneck Cove

Method Reference Numbers: Various Reference Numbers

Quality Control (QC) Element	Acceptance Criteria*	Criteria Met? Yes/No	List results outside criteria (Cross-reference results table in data report)	Location of Results (Retained at Lab or in Data Package)
Linear Range Determination for ICP	Performed Quarterly (NOTE: MSL performs daily for ICP-MS)	Yes		Retained at Lab
Initial Calibration for ICP-MS, ICP-OES, and Hg	Performed Daily (Correlation Coefficient $\geq$0.995)	Yes		Retained at Lab
Calculation of Method Detection Limits (MDLs)	For each matrix, analyzed once per 12 month period (see Section 5.2 for MDL procedure)	Yes		In Data Package
Initial Calibration Verification/ Continuing Calibration Verification	Hg: 80 to 120% recovery Other metals: 90 to 110% recovery	Yes		Retained at Lab
Initial Calibration Blank/ Continuing Calibration Blank	No target analytes > Instrument Detection Limit (IDL)	No	NOTE: This criteria is not met for one or more CCBs for As, Cu, Ni, and Pb. MSL SOP uses 3x MDL to evaluate ICB/CCB impacts. Sample concentrations exceed 100x CCB concentrations detected above RL; no impact to reported results.	Retained at Lab
Standard Reference Materials	Within the limits provided by vendor. ALTERNATE QC CRITERION OF ±25%	Yes		In Data Package
Method Blank	No target analytes > RL	Yes		In Data Package
Sample Spike/ Sample Duplicate	One set per group of field samples. Must contain all target analytes. Recovery Limits (75 to 125%; RPD < 20% or < 35%)	Yes		In Data Package

Table II-5: Quality Control Summary for Analyses of Metals in Sediments, Tissue and Water Matrices

USACE NED - Bushneck Cove

Method Reference Numbers: Various Reference Numbers

Quality Control (QC) Element	Acceptance Criteria*	Criteria Met? Yes/No	List results outside criteria (Cross-reference results table in data report)	Location of Results (Retained at Lab or in Data Package)
Analytical Replicates	Analyze one sample in duplicate for each group of field samples (RPD < 30%)	No		In Data Package

* The Quality Control Acceptance Criteria are general guidelines. If alternate criteria are used, they must be documented in this table.

QA/QC NARRATIVE

PROJECT: Bushneck Cove
PARAMETER: Metals
LABORATORY: Battelle Marine Sciences Laboratory (MSL), Sequim, Washington
MATRIX: Sediment
SAMPLE CUSTODY AND PROCESSING: Eleven sediment samples for metals analyses were received at MSL on 09/11/07. All samples were received in good condition (i.e., no sample containers were broken). Samples were assigned a Battelle central file (CF) identification number (2799) and were entered into Battelle's laboratory information management system.

The following lists information on sample receipt and processing activities:

	Lab Sample IDs: 2799*1-11 Description: Sediment
Sample collection dates:	09/05/07, 09/06/07
Laboratory arrival date:	09/11/07
Cooler temp. on arrival:	3.7°C
Digestion (HNO_3/HCl)	09/24/07
CVAA Analysis Date (Hg)	09/27/07
ICP-OES Analysis Date (Cr, Cu, Pb, Ni, Zn)	09/26/07
ICP-MS Analysis Date (As, Cd)	09/25/07

DATA QUALITY OBJECTIVES:

Analyte	Analytical Method	Range of Recovery	SRM Accuracy	Laboratory Duplicate Precision	RIM RL (µg/g)	Project MDL [2] (µg/g)	Project RL [3] (µg/g)
As	ICP-MS	75-125%	≤25% [1]	≤30% [1]	0.4	0.1	0.3
Cd	ICP-MS	75-125%	≤25% [1]	≤30% [1]	0.07	0.004	0.01
Cr	ICP-OES	75-125%	≤25% [1]	≤30% [1]	0.5	0.05	0.2
Cu	ICP-OES	75-125%	≤25% [1]	≤30% [1]	0.5	0.1	0.3
Hg	CVAA	75-125%	≤25% [1]	≤30% [1]	0.02	0.005	0.02
Ni	ICP-OES	75-125%	≤25% [1]	≤30% [1]	0.5	0.05	0.2
Pb	ICP-OES	75-125%	≤25% [1]	≤30% [1]	0.5	0.1	0.3
Zn	ICP-OES	75-125%	≤25% [1]	≤30% [1]	1	0.2	0.6

(1) Evaluated for analytes >10x the MDL
(2) Reported from the Annual Method Detection Limit (MDL) Study as determined on a dry weight basis using seven replicates of a solid matrix, mixed acid digestion.
(3) Reporting Limit (RL) determined as 3.18 * achieved MDL.

METHODS: Sediment samples were analyzed for eight metals: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), and zinc (Zn). Samples were freeze-dried and homogenized using a ball-mill prior to digestion according to Battelle SOP MSL-C-003, *Percent Dry Weight and Homogenizing Dry Sediment, Soil and Tissue*. Sediment samples were digested in accordance with Battelle SOP MSL-I-006, *Mixed Acid Sediment Digestion*. An approximately 200-mg (dry weight) aliquot of each sample was combined with nitric and hydrochloric acids (aqua regia) in a Teflon bomb and heated in an oven at 130ºC (±10ºC) for a minimum of eight hours. After heating and cooling, deionized water was added to the sediment digestate to achieve analysis volume. Digestates were submitted for analysis by three methods.

QA/QC NARRATIVE

METHODS: Digested samples were analyzed for Hg using cold-vapor atomic absorption spectroscopy (CVAA) according to Battelle SOP MSL-I-016, *Total Mercury in Tissues and Sediments by Cold Vapor Atomic Absorption*. This procedure is based on modification of EPA Method 245.5

Digested samples were analyzed for As and Cd using inductively coupled plasma-mass spectrometry (ICP-MS) according to Battelle SOP MSL-I-022, *Determination of Elements in Aqueous and Digestate Samples by ICP/MS*. The base methods for this procedure are EPA Method 1638 and EPA Method 6020 with adaptations for the analysis of trace level metals in digested sediment and tissue samples.

Digested samples were analyzed for all other metals using inductively coupled plasma optical emissions spectroscopy (ICP-OES) according to Battelle SOP MSL-I-033, *Determination of Elements in Aqueous and Digestate Samples by ICP-OES*. This procedure is based on two methods modified and adapted for analysis of low level samples: EPA Method 6010B and 200.7.

HOLDING TIMES: The target holding times of 28 days for Hg and six months for all other metals were achieved for all samples.

DETECTION LIMITS: Analytical results were reported to laboratory achieved method detection limits (MDL) and achieved reporting limits (RL) defined as 3.18*MDL. Laboratory MDLs are determined annually and are based on seven replicates of a solid matrix, mixed acid digestion. All achieved laboratory reporting limits met RIM target RLs. Data were evaluated and flagged in accordance with the following criteria:

U Not detected at or above the Limit of Detection/MDL

j Analyte detected below the Limit of Quantitaion /RL; concentration reported may be an estimate

N QC value outside the accuracy or precision criteria goal (Spikes ±25%R; SRM ≤25%PD; Replicates ±30%RPD)

n QC value outside the accuracy or precision data quality objective, but meets contingency criteria.

METHOD BLANKS: One method blank was analyzed with the set of sediment samples. Analytes concentrations in the method blank were not detected at a level greater than the MDL. The data are not blank corrected.

LABORATORY CONTROL SAMPLE ACCURACY: One laboratory control sample (LCS) was analyzed with the set of samples. The percent recoveries for the LCS were within the QC acceptance criterion of 75-125% recovery for all metals.

MATRIX SPIKE ACCURACY: One sediment was selected for a matrix spike/matrix spike duplicate sample. The percent recoveries for the MS/MSD samples were within the QC acceptance criterion of 75-125% recovery for all metals.

DUPLICATE PRECISION: Precision for this set of samples was assessed by the analysis of laboratory duplicates and matrix spike duplicates. Precision was expressed as the relative percent difference (RPD) of replicate results. The RPD values for the duplicates were within the QC criterion of ≤30% RPD. The RPD values for the MS/MSD samples were within the QC criterion of ≤20% RPD.

QA/QC NARRATIVE

STANDARD REFERENCE MATERIAL ACCURACY:

SRM accuracy was expressed as the percent difference (PD) between the measured and certified or reference value for the SRM.

The SRM analyzed with this set of sediment samples was SRM 1944 New York/New Jersey Waterway Sediment. This SRM is certified for all metals except Cu and Hg. The reference values are reported for evaluation purposes. The percent differences from the certified or reference values were within the QC acceptance criterion of PD $\leq$25% for all metals.

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USACE NED - Bushneck Cove
Metals in Sediment

(concentrations in ug/g, dry weight)

Sponsor ID	MSL Code	Site Description	Collection Date	Percent Moisture	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
				Analytical Batch ID:	*ICP-MS*	*ICP-MS*	*ICP-OES*	*ICP-OES*	*CVAA*	*ICP-OES*	*ICP-OES*	*ICP-OES*
				CAS Number:	7440-38-2	7440-43-9	7440-47-3	7440-50-8	7439-97-6	7440-02-0	7439-92-1	7440-66-6
GAG-001-D	2799-1	BNC-C-09	09/05/07	21.6	1.91	0.209	13.1	5.49	0.0135 j	4.71	4.21	23.8
GAG-002-D	2799-2	BNC-C-08	09/05/07	43.9	5.47	0.507	39.0	10.9	0.0314	14.7	9.14	58.2
GAG-003-D	2799-3	BNC-C-10	09/05/07	45.3	4.87	0.533	36.6	11.1	0.0272	13.9	8.86	53.2
GAG-004-D	2799-4r1	BNC-C-11	09/05/07	51.5	5.66	0.672	50.2	17.3	0.0609	17.5	14.2	72.9
GAG-004-D	2799-4r2	BNC-C-11	09/05/07	51.5	6.13	0.698	52.2	17.6	0.0590	17.9	15.0	76.1
GAG-005-D	2799-5	BNC-C-01	09/05/07	47.3	5.36	0.521	42.0	13.3	0.0640	14.7	16.6	66.2
GAG-006-D	2799-6	BNC-C-02	09/05/07	46.2	5.47	0.559	43.0	15.0	0.0689	14.6	17.1	67.3
GAG-007-D	2799-7	BNC-C-03	09/05/07	46.0	4.94	0.517	41.5	12.2	0.0318	14.6	11.4	58.8
GAG-008-D	2799-8	BNC-C-04	09/05/07	48.2	6.45	0.570	51.1	16.9	0.0748	17.4	18.8	77.3
GAG-009-D	2799-9	BNC-C-05	09/05/07	46.6	5.71	0.467	41.4	11.3	0.0241	14.9	10.2	60.3
GAG-010-D	2799-10	BNC-C-06	09/06/07	40.7	4.28	0.366	34.8	8.49	0.0182 j	12.7	7.92	49.9
GAG-011-D	2799-11	BNC-C-07	09/06/07	36.1	3.53	0.373	26.6	9.72	0.0335	9.53	8.97	45.8
Laboratory Achieved Method Detection Limit (MDL)					**0.1**	**0.004**	**0.05**	**0.1**	**0.005**	**0.05**	**0.1**	**0.2**
Reporting Limit (RL = 3.18 * MDL)					0.3	0.01	0.2	0.3	0.02	0.2	0.3	0.6
Target RL					*0.4*	*0.07*	*0.5*	*0.5*	*0.02*	*0.5*	*0.5*	*1*
Procedural Blank												
Blank 092107		Blank			0.1 U	0.004 U	0.05 U	0.1 U	0.005 U	0.05 U	0.1 U	0.2 U
Laboratory Control Sample (Blank Spike)												
LCS092107		LCS			25.7	26.1	25.7	25.3	1.68	25.8	25.7	25.3
Blank 092107		Blank			0.1 U	0.004 U	0.05 U	0.1 U	0.005 U	0.05 U	0.1 U	0.2 U
	Spike Concentration				25	25	25	25	2.0	25	25	25
	Percent Recovery				**103%**	**104%**	**103%**	**101%**	**84%**	**103%**	**103%**	**101%**
MATRIX SPIKE RESULTS												
2799-8 MS		Matrix Spike			53.3	44.8	89.7	59.5	1.81	55.7	56.2	158
2799-8 MSD		Matrix Spike Duplicate			55.4	49.3	98.7	66.0	2.06	62.6	63.0	172
GAG-008-D	2799-8		09/05/07	48.2	6.45	0.570	51.1	16.9	0.075	17.4	18.8	77.3
	Spike Concentration, MS				41.8	41.8	41.8	41.8	1.67	41.8	41.8	83.7
	Spike Concentration, MSD				47.6	47.6	47.6	47.6	1.90	47.6	47.6	95.2
	Percent Recovery, MS				**112%**	**106%**	**92%**	**102%**	**104%**	**92%**	**90%**	**97%**
	Percent Recovery, MSD				**103%**	**102%**	**100%**	**103%**	**105%**	**95%**	**93%**	**99%**
	RPD				**9%**	**3%**	**8%**	**1%**	**1%**	**4%**	**4%**	**3%**

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USACE NED - Bushneck Cove
Metals in Sediment

(concentrations in ug/g, dry weight)

Sponsor ID	MSL Code	Site Description	Collection Date	Percent Moisture	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
		Analytical Batch ID:			*ICP-MS*	*ICP-MS*	*ICP-OES*	*ICP-OES*	*CVAA*	*ICP-OES*	*ICP-OES*	*ICP-OES*
		CAS Number:			7440-38-2	7440-43-9	7440-47-3	7440-50-8	7439-97-6	7440-02-0	7439-92-1	7440-66-6
DUPLICATE PRECISION												
GAG-004-D	2799-4r1		09/05/07	51.5	5.66	0.672	50.2	17.3	0.0609	17.5	14.2	72.9
GAG-004-D	2799-4r2		09/05/07	51.5	6.13	0.698	52.2	17.6	0.0590	17.9	15.0	76.1
	MEAN				5.90	0.685	51.2	17.5	0.0600	17.7	14.6	74.5
	RPD				**8%**	**4%**	**4%**	**2%**	**3%**	**3%**	**5%**	**4%**
STANDARD REFERENCE MATERIAL												
1944 092107	SRM				20.8	8.92	224	365	3.53	63.2	278	606
	certified or reference value				18.9	8.80	266	380	3.4	76.1	330	656
	range				±2.8	±1.4	±24	±40	±0.09	±5.60	±48.0	±75
	Percent Difference				**10%**	**1%**	**16%**	**4%**	**4%**	**17%**	**16%**	**8%**

U Not detected at or above the Limit of Detection/MDL
j Analyte detected below the Limit of Quantitaion /RL; concentration reported may be an estimate
N QC value outside the accuracy or precision criteria goal (Spikes ±25%R; SRM ≤25%PD; Replicates ±30%RPD)
n QC value outside the accuracy or precision data quality objective, but meets contingency criteria.

Battelle Marine Science Laboratory

Method Detection Limit Study Summary

Date: 10/2/2007

MATRIX: Solid, Aqua Regia Digestion

UNITS: µg/g dry weight

	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
Instrument:	ICP-MS	ICP-MS	ICP-OES	ICP-OES	CVAA	ICP-OES	ICP-OES	ICP-OES
Analysis Date:	2/28/2007	3/20/2007	3/8/2007	2/9/2007	3/8/2007	6/11/2007	6/11/2007	3/8/2007
CAS Code:	7440-38-2	7440-43-9	7440-47-3	7440-50-8	7439-97-6	7440-02-0	7439-92-1	7440-66-6
MDL 1	0.00895	0.0205	0.302	0.106	0.0110	0.127	1.01	0.297
MDL 2	0.0592	0.0240	0.285	0.121	0.0112	0.118	1.02	0.301
MDL 3	0.0290	0.0213	0.307	0.113	0.0107	0.117	1.06	0.313
MDL 4	0.0385	0.0208	0.273	0.108	0.0105	0.124	1.09	0.293
MDL 5	0.0641	0.0215	0.282	0.110	0.00980	NA	1.01	0.393
MDL 6	0.0508	0.0213	0.275	0.107	0.0106	0.114	0.980	0.285
MDL 7	0.120	0.0218	0.296	0.0985	0.0106	0.117	1.05	0.288
MDL 8	0.0409	0.0234	NA	0.0812	0.0114	0.119	1.05	0.278
MEAN	0.0514	0.0218	0.288	0.106	0.0107	0.1192	1.03	0.306
STDEV	0.03275	0.00123	0.0134	0.0118	0.00049	0.00455	0.0356	0.0368
MDL	0.0982	0.00370	0.0422	0.0352	0.00148	0.0143	0.107	0.110
RL	0.312	0.0118	0.134	0.112	0.00469	0.0455	0.340	0.351

ICP-MS - Inductively Coupled Plasma Mass Spectrometry

CVAA = Cold Vapor Atomic Absorption Spectroscopy

ICP-OES = Inductively Coupled Plasma Optical Emissions Spectroscopy

RL = MDL*3.18

Table II-5: Quality Control Summary for Analyses of Metals in Sediments, Tissue and Water Matrices
USACE NED - Bushneck Cove
Method Reference Numbers: Various Reference Numbers

Quality Control (QC) Element	Acceptance Criteria*	Criteria Met? Yes/No	List results outside criteria (Cross-reference results table in data report)	Location of Results (Retained at Lab or in Data Package)
Linear Range Determination for ICP	Performed Quarterly (NOTE: MSL performs daily for ICP-MS)	Yes		Retained at Lab
Initial Calibration for ICP-MS, ICP-OES, and Hg	Performed Daily (Correlation Coefficient ≥0.995)	Yes		Retained at Lab
Calculation of Method Detection Limits (MDLs)	For each matrix, analyzed once per 12 month period (see Section 5.2 for MDL procedure)	Yes		In Data Package
Initial Calibration Verification/ Continuing Calibration Verification	Hg: 80 to 120% recovery Other metals: 90 to 110% recovery	Yes		Retained at Lab
Initial Calibration Blank/ Continuing Calibration Blank	No target analytes > Instrument Detection Limit (IDL)	Yes		Retained at Lab
Standard Reference Materials	Within the limits provided by vendor. ALTERNATE QC CRITERION OF ±25% DIFFERENCE	Yes		In Data Package
Method Blank	No target analytes > RL	Yes		In Data Package
Sample Spike/ Sample Duplicate	One set per group of field samples. Must contain all target analytes. Recovery Limits (75 to 125%; RPD < 20% or < 35%)	Yes	NOTE: The matrix for rinsate blanks is DI water; therefore a blank spike serves as the matrix spike and is not performed in duplicate.	In Data Package
Analytical Replicates	Analyze one sample in duplicate for each group of field samples (RPD < 30%)	No	NOTE: Rinsate blanks are not analyzed in duplicate.	In Data Package

* The Quality Control Acceptance Criteria are general guidelines. If alternate criteria are used, they must be documented in this table

QA/QC NARRATIVE

PROJECT: USACE/NED Bushneck Cove

PARAMETER: Metals

LABORATORY: Battelle Marine Sciences Laboratory, Sequim, Washington

MATRIX: Rinsate Blanks

SAMPLE CUSTODY AND PROCESSING: One rinsate blank for metals analyses was received at MSL on 09/11/07. The preserved sample was received in good condition (i.e., no sample containers were broken), assigned a Battelle central file (CF) identification number (2799), and entered into Battelle's laboratory information management system.

The following lists information on sample receipt and processing activities:

	Lab Sample IDs: 2799-12 Description: Rinsate Blank
Sample collection dates:	09/06/07
Laboratory arrival date:	09/11/07
Cooler temp. on arrival:	3.7°C
CVAF Analysis Date: (Hg)	09/21/07
ICP-MS Analysis Date: (As, Cd, Cr, Cu, Pb, Ni, Zn)	09/25/07

QA/QC DATA QUALITY OBJECTIVES:

Analyte	Analytical Method for Freshwater	MS Range of Recovery[1]	SRM Percent Difference[1]	Replicate Precision[1]	NED Reporting Limits (µg/L)	Lab Detection Limits (µg/L)[2]	Lab Reporting Limits (µg/L)[3]
Arsenic	ICP-MS	75-125%	≤25%	≤30%	1	0.015	0.05
Cadmium	ICP-MS	75-125%	≤25%	≤30%	1	0.001	0.003
Chromium	ICP-MS	75-125%	≤25%	≤30%	1	0.08	0.3
Copper	ICP-MS	75-125%	≤25%	≤30%	0.6	0.004	0.013
Mercury	CVAF	75-125%	≤25%	≤30%	0.4	0.000188	0.0006
Nickel	ICP-MS	75-125%	≤25%	≤30%	1	0.013	0.04
Lead	ICP-MS	75-125%	≤25%	≤30%	1	0.001	0.003
Zinc	ICP-MS	75-125%	≤25%	≤30%	1	0.2	0.7

[1] Evaluated for analytes >10x the MDL

[2] Reported from the Water Method Detection Limit (MDL) Study as determined using seven replicates of spiked DI water.

[3] Lab Reporting Limit (RL) determined as 3.18 * achieved MDL.

METHODS: The equipment rinsate blank was analyzed for arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), and zinc (Zn). The samples were submitted for analyses by two methods.

Samples were analyzed for total Hg by cold vapor atomic fluorescence (CVAF) in accordance with Battelle SOP *MSL-I-013*; *Total Mercury in Aqueous Samples by CVAF based on EPA Method 1631 Revision E.*

Samples were analyzed for all other metals by inductively coupled plasma-mass spectrometry (ICP-MS) in accordance with Battelle SOP *MSL-I-022; Determination of Elements in Aqueous and Digestate Samples by ICP/MS*, which was adapted from US EPA Method 1638.

All data are reported in units of µg/L for each sample.

QA/QC NARRATIVE

HOLDING TIMES: Established holding times of 90 days for Hg and six months for trace metals were achieved.

DETECTION LIMITS: Laboratory achieved detection limit are reported from the annual MDL study for freshwater. The reporting limits provided are determined as 3.18 times the laboratory achieved MDL. Data were evaluated and flagged to the following criteria:

U Not detected above laboratory achieved MDL; MDL reported.

j Analyte detected is less than the achieved RL, but greater than MDL

N QC value outside the accuracy or precision criteria goal (Spikes ±25%R; SRM ≤25%PD; Replicates ±30%RPD)

n QC value outside the accuracy or precision data quality objective, but meets contingency criteria.

METHOD BLANKS: One method blank was analyzed with this batch of samples. Method blank concentrations were all less than the RL. Samples were not blank corrected.

BLANK SPIKE /LABORATORY CONTROL SAMPLES: A minimum of one laboratory control samples (LCS) or ongoing precision and recovery (OPR) sample was prepared and analyzed with this batch of samples. Percent recoveries for the LCS sample were within the QC acceptance criteria of 75% to 125% for all metals.

MATRIX SPIKE ACCURACY: The sample matrix for rinsate blanks is deionized water; therefore LCS samples serve as matrix spikes.

STANDARD REFERENCE MATERIAL ACCURACY: Two standard reference materials were analyzed with this batch of samples. SRM 1641d for Hg and SRM 1640 for metals analyzed by ICP-MS. Accuracy for SRMs was expressed as the percent difference (PD) between the measured and certified values.

One replicate of SRM 1641d for Hg was analyzed with this batch of samples. The percent difference for the SRM recovery was 6% and within the QC acceptance criterion of ± 25%.

One replicate of SRM 1640 was analyzed with this batch of samples. The percent differences were within the QC acceptance criterion of ± 25% for all metal.

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USACE NED - Bushneck Cove
Metals in Rinsate Water
Samples Received on 09/11/07

(concentrations in µg/L)

Sponsor ID	MSL Code	Site Description	Collection Date	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
			Instrument:	*ICP-MS*	*ICP-MS*	*ICP-MS*	*ICP-MS*	*CVAF*	*ICP-MS*	*ICP-MS*	*ICP-MS*
			CAS Number:	7440-38-2	7440-43-9	7440-47-3	7440-50-8	7439-97-6	7440-02-0	7439-92-1	7440-66-6
GAG-012	2799-12	Rinsate Blank	09/06/07	0.015 U	0.001 U	0.083 U	0.00900 j	0.000188 U	0.0606	0.00776	0.209 U
Detection Limits											
Laboratory Achieved Method Detection Limit (MDL				**0.015**	**0.001**	**0.083**	**0.004**	**0.000188**	**0.013**	**0.001**	**0.209**
Reporting Limit (RL = 3.18 * MDL)				0.05	0.003	0.3	0.013	0.0006	0.04	0.003	0.7
Procedural Blank											
BLANK092007 or TRM BLKR1				0.015 U	0.001 U	0.083 U	0.004 U	0.000188 U	0.013 U	0.001 U	0.209 U
Blank Spike/Matrix Spike Sample											
OPR092007run1 (Hg) or TRM +5ppb				1.97	1.98	1.67	1.93	0.00549	1.91	2.04	2.05
OPR092007run2 (Hg)				NA	NA	NA	NA	0.00544	NA	NA	NA
BLANK092007 or TRM BLKR1				0.015 U	0.001 U	0.083 U	0.004 U	0.000188 U	0.013 U	0.001 U	0.209 U
	Spiking Level			2	2	2	2	0.00512	2	2	2
	Percent Recovery			**99%**	**99%**	**84%**	**96%**	**104%**	**96%**	**102%**	**102%**
	Percent Recovery			NA	NA	NA	NA	**103%**	NA	NA	NA
STANDARD REFERENCE MATERIAL											
1641d092007 (Hg) or 1640TRM				28.18	23.82	38.48	85.73	1470	27.31	29.15	58.03
	certified or reference value			26.67	22.79	38.6	85.2	1590	27.4	27.89	53.2
	range			±0.410	± 0.96	±1.6	± 1.2	±18	± 0.8	± 0.14	± 1.1
	Percent Difference			**6%**	**5%**	**0%**	**1%**	**8%**	**0%**	**5%**	**9%**

U Not detected above laboratory achieved MDL; MDL reported
j Analyte detected below the Limit of Quantitaion /RL; concentration reported may be an estimate
N QC value outside the accuracy or precision criteria goal (Spikes ±30%R; SRM ≤25%PD; Replicates ±30%RPD)
n QC value outside the accuracy or precision data quality objective, but meets contingency criteria.
-- Not available/applicable

Battelle Marine Science Laboratory

Method Detection Limit Study Summary

Date: 10/2/2007

MATRIX: Freshwater (TRM)

	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
Instrument:	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	CVAF	ICP-MS	ICP-MS	ICP-MS	ICP-MS
	3/6/2007	3/6/2007	3/6/2007	3/6/2007	3/6/2007	1/25/2007	3/6/2007	3/6/2007	3/6/2007	3/6/2007
CAS Code:	7440-22-4	7440-38-2	7440-43-9	7440-47-3	7440-50-8	7439-97-6	7440-02-0	7439-92-1	7782-49-2	7440-66-6
MDL 1	0.0106	0.278	0.00936	0.309	0.0553	0.000736	0.0757	0.00895	0.310	0.224
MDL 2	0.00951	0.285	0.00918	0.354	0.0526	0.000573	0.0713	0.00946	0.305	0.222
MDL 3	0.00912	0.289	0.00869	0.315	0.0535	0.000596	0.0710	0.00882	0.312	0.226
MDL 4	0.0101	0.285	0.00843	0.339	0.0519	0.000660	0.0773	0.00832	0.311	0.205
MDL 5	0.00965	0.287	0.00863	0.341	0.0547	0.000652	0.0807	0.00897	0.314	0.210
MDL 6	0.00901	0.291	0.00903	0.275	0.0549	0.000702	0.0730	0.00935	0.322	0.390
MDL 7	0.00934	0.279	0.00928	0.330	0.0537	0.000599	0.0801	0.00902	0.312	0.208
MEAN	0.00962	0.285	0.00894	0.323	0.0538	0.000645	0.0756	0.0090	0.312	0.241
STDEV	0.000563	0.00485	0.00036	0.0263	0.00125	0.000060	0.0040	0.00037	0.0051	0.0664
MDL	0.00177	0.0152	0.00113	0.0827	0.00394	0.000188	0.0125	0.00117	0.0161	0.209

cc: Project Manager/Central File
Login File 2799

SAMPLE LOGIN

(SOP# MSL-A-001)

Project Manager: Brandenberger
Date Received: 09/11/07
Batch: 1

PROJECT: Brushneck Cove

SPONSOR CODE	Site Description	BATTELLE CODE	MATRIX	STORAGE LOCATION	PARAMETERS REQUESTED	COLLECTION DATE	INITIALS
GAG-001-D ✓	na	2799-1 ✓	sediment ✓	Deep Freezer B-1	metals	09/05/07 ✓	CS/MLFM
GAG-002-D	na	2799-2	sediment	Deep Freezer B-1	metals	09/05/07	CS/MLFM
GAG-003-D	na	2799-3	sediment	Deep Freezer B-1	metals	09/05/07	CS/MLFM
GAG-004-D	na	2799-4	sediment	Deep Freezer B-1	metals	09/05/07	CS/MLFM
GAG-005-D	na	2799-5	sediment	Deep Freezer B-1	metals	09/05/07	CS/MLFM
GAG-006-D	na	2799-6	sediment	Deep Freezer B-1	metals	09/05/07	CS/MLFM
GAG-007-D	na	2799-7	sediment	Deep Freezer B-1	metals	09/05/07	CS/MLFM
GAG-008-D	na	2799-8	sediment	Deep Freezer B-1	metals	09/05/07	CS/MLFM
GAG-009-D	na	2799-9	sediment	Deep Freezer B-1	metals	09/05/07	CS/MLFM
GAG-010-D	na	2799-10	sediment	Deep Freezer B-1	metals	09/06/07 ✓	CS/MLFM
GAG-011-D ✓	na	2799-11	sediment	Deep Freezer B-1	metals	09/06/07 ✓	CS/MLFM
GAG-012 ✓	na	2799-12 ✓	water ✓	Prep Lab L-4-A	metals	09/06/07 ✓	CS/MLFM

VIAS

Chain of Custody

Battelle
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Project Number: G606430	Project Name: **Brushneck Cove**
Sampler's Signature:	ANALYSIS REQUESTED → "NUMBER OF CONTAINERS"

Collection Date/Time	Battelle ID	Client ID	Sample Description	PEST	PCB	TPH	PAH	VOA	TBT	METALS	TOC	Grain Size	ACIDIFIED	PRESERVED	Total No. of Containers
9/5/07 10:50	GAG-001-D	2799-1	Sediment Composite of Top portion of core GAG-001							X					1
9/5/07 11:20	GAG-002-D	2	Sediment Composite of Single Core							X					1
9/5/07 11:45	GAG-003-D	3	Sediment Composite of Single Core							X					1
9/5/07 12:25	GAG-004-D	4	Sediment Composite of Single Core							X					1
9/5/07 13:20	GAG-005-D	5	Sediment Composite of Single Core							X					1
9/5/07 13:50	GAG-006-D	6	Sediment Composite of Single Core							X					1
9/5/07 14:25	GAG-007-D	7	Sediment Composite of Single Core							X					1
9/5/07 15:15	GAG-008-D	8	Sediment Composite of Single Core							X					1
9/5/07 15:45	GAG-009-D	9	Sediment Composite of Single Core							X					1
9/6/07 8:20	GAG-010-D	10	Sediment Composite of Single Core							X					1
9/6/07 8:46	GAG-011-D	11	Sediment Composite of Single Core							X					1
9/6/07 9:45	GAG-012	2799-12	Metals Equipment Blank							X					1

Reliquished By:	Date/Time	Received By:	Date/Time
Jessica M Foley	9/10/07 1500	Battelle MSL C Sustich	9/11/07 1230
Reliquished By:	Date/Time	Received By:	Date/Time

Comments:

Battelle
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September 10, 2007

Ms. Jill Brandenberger
Ms. Carolynn Suslick (Sample Custodian)
Battelle Marine Sciences Laboratory (MSL)
1529 West Sequim Bay Road (Room MSL5)
Sequim, Washington 98382

Subject: USACE NAE DO #30, Brushneck Cove Sediments for Metals Analyses

Dear Jill:

Enclosed please find **11 sediment samples and one (1) rinsate blank** collected in support of the Brushneck Cove project. Sediment samples must be analyzed for 8 metals, (see Brushneck Cove SAP for further details). Samples were collected from September 5 -6, 2007; custody records are enclosed with the samples. Please return the signed custody forms to Lynda Short at Battelle.

Sample results are due within 4-weeks of receipt of samples at your laboratory. Final data are required in electronic and hardcopy formats. The electronic copies of the data will include your standard excel spreadsheet data summary as well as the electronic data deliverable (EDD) in the DMSmart EDD format. If you have any questions regarding these samples please call me at (781) 952-5295.

Sincerely,

Lynda M. Short

Lynda Short
Project Manager

LOG-IN CHECKLIST Bushneck Cove Bat 1 Reference SOP# MSL-A-001

Central File #: New 2799 Sample No(s): 1-12 Project Manager: Jones

TO BE COMPLETED BY PROJECT MANAGER (prior to arrival when possible)

Matrix: sed/seawater WP# W82099

Yes	No	
☐	☑	Navy-type Project (requires high-level sample tracking procedures)
☐	☑	Filter Samples: Amount: Entire sample Half of sample
☑	☐	Freeze dry sample(s) - samples will be weighed and placed in ultralow temp freezer (Lab# 130)
☐	☑	Special instructions:

Sample Preservation Instructions: Samples preserved in field

Date To Archive: Date To Dispose:

TO BE COMPLETED UPON SAMPLE ARRIVAL/LOG-IN

Yes	No	N/A	Indicate in Appropriate Box
☐	☑	☐	Was a custody seal present?
☐	☐	☑	Was the custody seal intact?
☑	☐	☐	Was cooler(s) temperature(s) within acceptable range of 4±2°C or frozen? (if multiple coolers, note temp. of each) 3.7 °C ___ °C
☐	☐	☑	Was Project Manager notified of any custody/login discrepancies (cooler temp, sponsor codes, etc)? Comment/Remedy:
☑	☐	☐	Were all chain of custody forms signed and dated?
☐	☑	☐	Were samples filtered at MSL?

Sample condition(s): (Acceptable) Other (explain):

Container type: (Teflon) Poly Glass (Spex) SGD Other:

Notes: labels & tape added to spex jars by sampler

Completed By: CJonelin Date/Time: 9/11/07 1230

SAMPLE PRESERVATION

☐	Sample(s) were preserved at MSL
☑	Sample(s) were preserved prior to arrival at MSL (noted on CoC / Sample / per PM Instruction) WAT
☐	Random pH checked for ~10% of samples (use dip paper) Sample IDs:
☐	Complete pH check required for project (use pH meter and record on pH Record form)

If preservation necessary, record Acid Lot#

Type: ☐	0.2% HNO3	Notes:
☐	0.5% HCl (Hg samples)	Notes:
☑	Refrigerate (Freeze)	Notes: SGDS - dup for B-1
☐	Other	Notes:

Completed By: CJonelin Date/Time: 9/11/07 1230

WAT - prep Lab L4A

Revsed 033006