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**PARTIAL CLASS A-2 RESPONSE ACTION
OUTCOME STATEMENT**

**BARGE B120 SPILL
BUZZARDS BAY, MASSACHUSETTS
RTN 4-17786**

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ACRONYM AND ABBREVIATION LIST

B&B	B&B Laboratories, Inc.
B120	Bouchard Barge No. 120
CMR	Code of Massachusetts Regulations
CSM	Conceptual Site Model
EPH	Extractable Petroleum Hydrocarbons
ERL	Effects Range - Low
ESI	Environmental Sensitivity Index
GIS	Geographic Information System
GPS	Global Positioning System
IRA	Immediate Response Action
IRAC	Immediate Response Action Clean up
LIT	Lower Intertidal Zone
MADEP	Massachusetts Department of Environmental Protection
MADMF	Massachusetts Division of Marine Fisheries
MADPH	Department of Public Health
MCP	Massachusetts Contingency Plan
MIT	Middle Intertidal Zone
MSRC	Marine Spill Response Corporation
NHESP	Natural Heritage and Endangered Species Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRC	National Response Corporation
NRDA	Natural Resource Damage Assessment
OPA 90	The Oil Pollution Act of 1990
OSRV	Oil Spill Response Vessel
PAH	Polynuclear Aromatic Hydrocarbons
RIDEM	Rhode Island Department of Environmental Management
RP	Responsible Party
RPD	Relative Percent Difference
SCAT	Shoreline Clean up Assessment Team
SHC	Saturated Hydrocarbons
SQuiRT	Screening Quick Reference Table
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
UC	Unified Command
UIT	Upper Intertidal Zone
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VPH	Volatile Petroleum Hydrocarbons
WHG	Woods Hole Group

**PARTIAL CLASS A-2 RESPONSE ACTION
OUTCOME STATEMENT**

**BARGE B120 SPILL
BUZZARDS BAY, MASSACHUSETTS
RTN 4-17786**

1.0 INTRODUCTION

GeoInsight, Inc. (GeoInsight) prepared this Partial Class A-2 Response Action Outcome (Partial RAO) Statement for the release of Number 6 fuel oil from Bouchard Transportation Company, Inc. (“Bouchard” or “RP”) Barge B120 that occurred on April 27, 2003 in Buzzards Bay, Massachusetts. An overview of the release area is presented on Figure 1. GeoInsight prepared this report on behalf of Bouchard. This Partial RAO closes a portion of the impacted shoreline; response actions are currently being conducted at the remainder of the impacted shoreline not addressed by this Partial RAO.

The components of this Partial RAO include background information relative to the entire disposal site (referred to herein as the Site) and segment-specification information used to evaluate individual segments for closure. A Conceptual Site Model (CSM) for the release of fuel oil in Buzzards Bay was developed and submitted with the Phase I Initial Site Investigation Report (Phase I ISI). The CSM provides a comprehensive description of the release, including the nature of No. 6 fuel oil, the likely distribution of oiling caused by the release to a dynamic water body, and the potential exposure points and pathways. The CSM describes the nature and extent of potential impacts associated with the release. For this Partial RAO, the nature and extent of impacts to each segment was evaluated separately.

This Partial RAO applies to segments where the maximum degree of oiling was characterized as very light and light, and also to moderately-oiled sandy beaches (i.e., segments that are composed primarily of sand) where response actions have been completed. The portion of the shoreline addressed by this Partial RAO is the intertidal zone at the identified segments.

Evaluation of potential risk was addressed using a combination of a Method 1 Risk Characterization to evaluate risk to human health, and a Method 3 Risk Characterization and Stage I Environmental Screening to evaluate risk to the environment. Segment-specific information and risk characterization are discussed in Sections 4.1 and 4.2, respectively.

This Partial Class A-2 RAO was prepared in accordance with the Massachusetts Contingency Plan (MCP) 310 CMR 40.0000. Bureau of Waste Site Cleanup (BWSC) transmittal form, BWSC-104, is attached to this document and incorporated by reference herein.

2.0 RELEASE BACKGROUND

On the afternoon of April 27, 2003, Barge B120 released approximately 22,000 to 55,000 gallons¹ of No. 6 fuel oil soon after entering the western approach of Buzzards Bay. The RP notified the U.S. Coast Guard (USCG) of the release. The USCG notified state and federal oil spill response authorities and directed the tug and barge to proceed to Buoy 10 (Anchorage Lima) in Buzzards Bay, where it anchored and was subsequently boomed. After the remaining cargo and oily water was transferred from the ruptured tank on Barge B120 to other B120 tanks or to Barge B-10, both barges proceeded to the Mirant facility in Sandwich, Massachusetts.

In the days following the release, the oil was driven by winds and currents and primarily affected the north, northwest, and northeast portions of the bay including Westport, Dartmouth, New Bedford, Fairhaven, Mattapoisett, Marion, Wareham, Bourne and Falmouth. Shoreline oiling was unevenly distributed and generally concentrated at exposed points and peninsulas (e.g., Barney's Joy Point, Mishaum Point, West Island, Sconticut Neck and Long Island). In addition, a few isolated areas of sporadic shoreline oiling were reported in limited parts of the Elizabeth Islands and Rhode Island (e.g., Little Compton and Block Island). Many shorelines in the project area were unoiled or lightly oiled. As described in the Phase I ISI and CSM, the released oil primarily impacted the intertidal zone of these shorelines, with the greatest degree of impacts in the upper intertidal zone.

On the evening of April 27, 2003, federal and state response agencies arrived on-site. The state and federal agencies included the USCG (Federal On-Scene Coordinator), the National Oceanic and Atmospheric Administration (NOAA), and the Massachusetts Department of Environmental Protection (MADEP). Gallagher Marine Systems, Inc. (Gallagher), the firm retained by the RP to manage the emergency response on its behalf, arrived on scene and began to coordinate boom

¹ *Independent Marine Consulting, Ltd., 2003*

deployment. Over 1,500 feet of 16-inch containment boom was initially deployed around the barge's stern in an attempt to contain the released material.

By the morning of April 28, 2003, the barge was boomed. The clean-up contractors, Clean Harbors Environmental Services, Inc. (Clean Harbors) and Marine Spill Response Corporation, arrived on the scene and initiated efforts to recover spilled oil and clean up oiled shorelines. Recovery and clean-up operations included utilizing skimming boats, deployment of boom and sorbent material, power washing and other manual techniques.

The Unified Command, consisting of the USCG, MADEP, and the RP, was established to direct and oversee clean-up operations. USCG also obtained input from NOAA representatives regarding clean up operations and strategies. The RP's environmental representative for responses conducted under the Oil Pollution Act of 1990 (OPA 90), ENTRIX, Inc. (ENTRIX), arrived on-scene and began to collect environmental data and information in conjunction with the Natural Resource Trustees (Trustees). Trustee representatives include NOAA, which is the lead Administrative Trustee, the U.S. Fish and Wildlife Service (USFWS), Massachusetts Executive Office of Environmental Affairs, the Rhode Island Department of Environmental Management (RIDEM) and the Wampanoag "Aquinnah" Tribe of Gay Head. Additional response actions required under the MCP 310 CMR 40.0000 were conducted by GeoInsight. Richard J. Wozmak, P.E., P.H. of GeoInsight is the Licensed Site Professional (LSP)-of-record for the release.

2.1 SEGMENT IDENTIFICATION

The oiled areas of shoreline were initially divided into 15 primary geographical divisions to facilitate cleanup operations. The Elizabeth Islands and divisions to the east of the Cape Cod Canal were labeled with an "E" prefix (3 divisions), and the divisions to the west of the Cape Cod Canal were labeled with a "W" prefix (12 divisions). The initial divisions were subdivided into individual shoreline segments in mid-May so that these individual segments could be evaluated separately during Shoreline Cleanup Assessment Team (SCAT) reconnaissance visits. The shoreline was divided into a total of 149 shoreline segments that are shown in Figure 1 and

listed in Table 1. As described in the February 10, 2004 IRA Status report, twenty-nine (29) segments were subsequently found to be unoiled and not part of the Site. Therefore, the Site is composed of 120 shoreline segments that were oiled as part of the release. These shoreline segments are listed in Table 2.

Individual shoreline segments were classified based upon the shoreline composition, public use, and vegetation. The oiled shorelines included the following shoreline classifications:

Shoreline Classification	Shoreline Type
1A	Heavily utilized, public recreational sand beaches
1B	Less utilized, semi-public and private sand beaches
1C	Mixed sand and gravel, gravel (pebble to boulder) and rip rap groins (jetties)
1D	Rip rap seawalls, bulkheads, piers, docks, and pilings
1E	Rocky shorelines
1F	Salt marshes
2	Roseate tern habitat (Ram Island, Bird Island, and Penikese Island, in particular)
3	Piping plover habitat

2.2 SEGMENT RANKING AND GROUPING

The segments presented in Table 3 are conservatively categorized according to the maximum degree of oiling observed on a particular segment. For example, if a segment was mostly lightly oiled, but there was a small portion that that was heavily oiled, then this segment was considered to be heavily oiled for this grouping. The designation of oiling categories were based upon the observed distribution of oil as well as the width of the area of oiling on the shoreline, in accordance with the following matrix:

**CHARACTERIZATION OF DEGREE OF OILING:
BASED UPON SCAT OBSERVATIONS**

Oil Distribution (% Cover)	Width of Oiled Band			
	≤ 3 feet	3 feet to ≤ 6 feet	6 feet to ≤ 9 feet	> 9 feet
≤ 1	Very Light	Very Light	Very Light	Light
1 to ≤ 10	Light	Light	Moderate	Moderate
10 to ≤ 50	Moderate	Moderate	Moderate	Heavy
50 to ≤ 90	Moderate	Heavy	Heavy	Heavy
90 to 100	Heavy	Heavy	Heavy	Heavy

After the degree of oiling was determined, each segment was given a ranking value based upon the degree of oiling over the entire segment. Heavily oiled segments were assigned a value of 4, moderately oiled a value of 3, lightly oiled a value of 2, and very lightly oiled a value of 1. The segment oiling was calculated by weighting the proportion of each segment based on the oiling category and summing across oiling categories. For example, the entire shoreline of Ram Island was considered to be heavily oiled, so this segment has a ranking of 4. In contrast, Mishaum Point East is also considered to be heavily oiled, but the oiling at Mishaum Point East (97% of the segment) was mostly very light, with only a small area near the tip of Mishaum Point (3% of the segment) with heavy oiling; therefore the ranking for Mishaum Point East is much lower $[(1 \times 97\%) + (4 \times 3\%) = 1.09]$.

The oiling category for the impacted segments along with the numerical ranking value is presented in Table 2. A comprehensive table of information for each segment included in this Partial RAO is presented in Appendix A.

3.0 SUMMARY OF RESPONSE ACTIONS

The following is a summary of response actions that are described in detail in the Phase I ISI and CSM. The key elements of each activity are presented below to provide an overview of activities performed to characterize and remediate the release of No. 6 oil in Buzzards Bay.

3.1 UNIFIED COMMAND INITIAL RESPONSE ACTIONS

Initial response actions are described in the May 23, 2003 Immediate Response Action: Treatment and Completion Guidelines Plan (IRATCGP) prepared by Unified Command. The objectives of the IRATCGP were primarily to remove visible oil on sandy beaches and mobile or “wipeable” oil from rocky areas. It is important to note that the IRATCGP objectives were to remove as much oil as possible on the shore; however, some residual oil may have been left in areas where it was not feasible or necessary to remove or clean the impacted material and because there was minimal or no environmental benefit to further cleanup efforts. In these instances where natural recovery was preferable to further cleanup, these segments were designated “no further action required.” The IRATCGP objectives were designed to balance the needs of shoreline cleanup for human use along with minimizing impacts to the marine ecosystem (and associated fishing and shellfish industries) and also to reduce impacts to non-marine species such as shorebirds.

Cleanup endpoint criteria for completing immediate response actions for the individual shoreline types were developed as part of the IRATCGP. The cleanup endpoint criteria for the individual shoreline types are listed below.

SHORELINE CLASSIFICATION AND CLEANUP ENDPOINT CRITERIA

Shoreline Classification	Shoreline Type	Cleanup Endpoint Criteria
1A	Heavily utilized, public recreational sand beaches	No visible surface or subsurface oil (not detectable by sight, smell, feel), to the maximum extent possible, as rapidly as possible.
1B	Less utilized, semi-public and private sand beaches	No visible surface, subsurface oil to trace (discontinuous film or spots of oil, an odor, or tackiness), to the maximum extent possible.
1C	Mixed sand and gravel, gravel (pebble to boulder) and rip rap groins (jetties)	No sheen, surface soil does not come off on the finger when touched, subsurface oil to trace (discontinuous film or spots of oil, an odor, or tackiness).
1D	Rip rap seawalls, bulkheads, piers, docks, and pilings	No sheen, oil does not come off on the finger when touched.
1E	Rocky shorelines	No sheen, oil does not come off on the finger when touched.
1F	Salt marshes	No sheen.
2	Roseate tern habitat (Ram Island, Bird Island, and Penikese Island, in particular)	No sheen, residual surface oil on rocky surfaces exposed at low tide does not come off on the finger when touched, intertidal vegetation and associated sediments are free of mobile oil, and intertidal vegetation and associated sediments do not provide a ready source of oil contamination to birds.
3	Piping plover habitat	Case-by-case evaluation and decision points.

These cleanup endpoint criteria were developed to provide an endpoint for the initial response actions under the IRATCGP. When Unified Command agreed that the cleanup endpoint criteria were met for the individual segment or it was infeasible to achieve the specified endpoint criteria, based upon the input from the Immediate Response Action Completion (IRAC) teams, the immediate response actions were deemed complete for that segment, and the emergency response shoreline cleanup operations ended.

The initial response efforts focused primarily on containment, removal and clean-up of the spilled oil. On-water recovery efforts using skimming boats and deployment of boom and sorbent material were utilized to contain and recover spilled oil prior to stranding on the

shoreline. Once oil was ashore, shoreline clean-up activities included manual removal of oiled substrate and material (e.g., wrack and rocks), high-pressure washing, manual wiping, use of sorbents (e.g., snare) and substrate excavation. Emergency restoration, including re-planting of salt marsh vegetation, was also conducted during this time at several isolated areas. A variety of data (e.g., SCAT data) were collected during clean-up operations to help document oiled shorelines and prioritize clean-up of the oil.

During the first week, daily (or twice daily) overflights were conducted to track the movement of the oil and to direct and prioritize clean-up operations. Overflights also provided an opportunity to document the extent of shoreline oiling and were used in conjunction with SCAT inspections to determine the extent of shoreline oiling and assess appropriate clean-up techniques for each part of the visibly oiled surveyed shoreline.

The SCAT were typically composed of representatives from the USCG, MADEP and ENTRIX, with occasional participation by representatives from USFWS, Massachusetts Division of Marine Fisheries (DMF), Clean Harbors, and municipalities (or their designated representatives). The specific goals of the SCAT program included the following:

- Document the location, amount, and type (e.g., tarballs, patties, and splatter) of oil on the shoreline;
- Provide the planning and operations sections of the Unified Command with accurate shoreline oiling information to aid in clean-up operations; and
- Formulate recommendations for appropriate clean-up methods, priorities and constraints to be implemented under the direction of the Unified Command.

Based on SCAT records, a total of approximately 84 miles of shoreline in Massachusetts were estimated to be oiled to varying degrees. More than two-thirds of the oiled shoreline received only trace or light oiling. Refer to the Phase I ISI and CSM for a description of the shoreline oiling and additional information regarding shoreline characterization and remedial actions conducted by Unified Command.

3.2 IRAC EVALUATION

Between April 27, 2003 and June 6, 2003, the reconnaissance activities were conducted by SCAT to characterize oil impacts with the primary objective of supporting clean-up operations. IRAC team inspections began on June 10, 2003 and focused on whether individual shoreline segments met the cleanup criteria specified in the IRATCGP. After each IRAC inspection, the parties representing Unified Command identified one of the three following conclusions:

1. The segment met IRAC endpoints;
2. The segment did not meet IRAC endpoints, but further treatment was not feasible; or
3. The segment did not meet IRAC endpoints and further treatment was feasible.

The decision as to whether further treatment was feasible was jointly determined in the field by the IRAC inspection team. The IRAC team considered several factors in the decision as to whether further treatment was feasible, including the risk of damaging ecological receptors during cleanup operations, accessibility of the area for cleanup crews and equipment, and the potential for additional weathering of the observed oil.

IRAC team reconnaissances were conducted through September 3, 2003 and focused upon segments that were considered to have been oiled as a result of the release. The initial shoreline inspections identified 29 segments that were not oiled by the release. These 29 segments were not inspected by the IRAC teams; however, representatives of the Environmental Unit inspected these segments in August 2003 and confirmed that these segments were not oiled by the release. Table 2 includes a list of the 120 shoreline segments and the status of these segments considered to be oiled as of the completion of IRAC inspections on September 3, 2003.

3.3 MCP IRA ACTIVITIES

After September 3, 2003, evaluation of shoreline segments transitioned from Unified Command to GeoInsight as the LSP-of-Record. Unified Command continued to be involved in response actions related to the Site, and retained authority with regard to cleanup activities. GeoInsight responded to reports of oil from citizens and continued to conduct IRAC-like inspections.

To continue evaluation of segments that did not pass formal IRAC signoff, an MCP Immediate Response Action (MCP IRA) was initiated to address potential Imminent Hazards, if present, and to respond to time-critical conditions that necessitated immediate response actions. These objectives were developed to meet the applicable General Provisions for Immediate Response Actions listed in 310 CMR 40.0411(1), which are to assess the release, threat of release, or site conditions and, where appropriate, contain, isolate, remove or secure a release or threat of release of oil in order to:

- (a) abate, prevent or eliminate any Imminent Hazard to health, safety, public welfare or the environment; and/or
- (b) respond to any other time-critical release, threat of release and/or site conditions.

The MCP IRA response action strategies included:

1. Removing potentially mobile oil (oil that has the potential to mobilize and impact other areas); and
2. Addressing potential Imminent Hazards to human health, public welfare, safety, and the environment, as listed in 310 CMR 40.0321.

Field assessments were conducted to evaluate whether MCP IRA criteria were satisfied in segments that had not passed IRATCGP criteria, assess the presence of buried oil, and respond to public concerns. The assessment specifically focused on the potential for mobile oil to mobilize and exacerbate current environmental conditions if not removed immediately. The initial MCP IRA Plan was submitted on September 15, 2003 and an IRA Plan errata sheet was submitted on September 25, 2003 in response to MADEP comments to the IRA Plan. IRA activities conducted between September and December 2003 were summarized in an MCP IRA Status Report submitted to MADEP on February 10, 2004. IRA activities between January and April 2004 are summarized in the Phase I ISI and CSM report.

4.0 RESPONSE ACTION OUTCOME

4.1 SEGMENT-SPECIFIC INFORMATION

This Class A-2 Partial RAO complies with 310 CMR 40.1056 and applies to a portion of segments that were identified as having maximum oiling in the very light or light categories, or were categorized as moderately oiled but the segment consisted entirely of sandy beach. Some segments that failed the IRAC inspections or are currently being evaluated for potentially buried oil are not part of this RAO and comprehensive response actions are ongoing and will continue at these segments. A list of the segments that are addressed by this Partial RAO is presented in Table 3. Pertinent information for each segment is presented on individual segment Partial RAO Summary Forms attached in Appendix C. Additional information for each segment is attached to each Partial RAO Summary Form, including:

- Segment Map;
- Topographic Map;
- DEP MCP 21E Map;
- SCAT and IRAC Inspection Forms;
- GeoInsight Shoreline Inspection Forms (for segments where GeoInsight responded to reports of oil); and
- Tabulated Summary of Analytical Results (for segments where MCP sediment samples were collected).

Information presented for each segment includes identification and location, physical description, and sensitive receptors. The Partial RAO Summary Forms summarize reconnaissance and inspection activity information compiled from the SCAT and IRAC inspections forms.

Sediment sampling was conducted in January 2004 for a subset of segments under Partial RAO consideration including segments considered to be representative of segments where the oiling was very light, light, and moderate. Sediment sampling activities are described in Section 4.1.4 of this report and analytical results for the sampled segments are presented on tables included with each individual Partial RAO Summary Form package.

A total of 57 segments of the 120 oiled segments were selected for partial RAO closure evaluation. The segments are listed on Table 3, and segments sampled in January 2004 are highlighted.

4.1.1 Physical Characteristics

Each segment was characterized by its primary and secondary shoreline type, as identified by the SCAT using the classification criteria described in Section 2.2. For example, the primary shoreline type may be 1A (public sandy beach) and the secondary shoreline type may be 1D (seawalls, rip raps, and groins). Shoreline hydrogeology includes information regarding adjacent waterways and shoreline features. A United States Geological Survey (USGS) topographic map showing local topography and area features is included with each data package.

4.1.2 Sensitive Receptors

To evaluate potential sensitive receptors in the Buzzards Bay area, GeoInsight obtained information from the Massachusetts Natural Heritage & Endangered Species Program (NHESP) and the MADEP. The MADEP information was summarized on the map identified as the DEP MCP 21E Buzzards Bay Map (MassGIS Map) attached in Appendix B.

Review of the MassGIS Map indicated that areas to the east and southeast of the Cape Cod Canal, as well as the Elizabeth Islands to the south, are within a Medium Yield Potentially Productive Aquifer and a USEPA-Designated Sole Source Aquifer. A High Yield Potentially Productive Aquifer is located near the Cape Cod Canal. Municipal public supply wells near the shoreline are located in Bourne, Falmouth, Fairhaven, Mattapoisett, and on Cuttyhunk Island (part of the Elizabeth Islands). Non-community public water supplies are located near the shoreline in Westport, Dartmouth, and Wareham.

The intertidal zone of the shoreline provides habitat for various species, such as shorebirds and marine invertebrates. Information obtained from the NHESP indicated that several threatened or endangered species may be present in the vicinity of the intertidal zone of the shoreline. For example, two bird species that nest in this area include the roseate tern (*Sterna dougallii*), which

is listed as an endangered species under Massachusetts and Federal law, and the piping plover (*Charadrius melodus*), which is listed as a threatened species under Massachusetts and Federal law. Refer to the NHESP maps included with each shoreline summary package in Appendix C for additional information about endangered or threatened species habitat. People use the shoreline primarily for seasonal recreational purposes, such as swimming, fishing, or walking. Visual oil impacts to shoreline areas have occurred primarily between the high and low tide zones, with generally minor impacts in the supratidal zone. Environmental and human receptors for each segment included in the Partial RAO are summarized on the Summary Form Data Packages (Appendix C).

4.1.3 Reconnaissance, Response and Inspection Activities

The Partial RAO Summary Forms include the date of field inspections and pertinent information summarized from SCAT and IRAC inspection forms. Copies of the original SCAT and IRAC inspection forms are attached with the Partial RAO Summary Form Data Packages (Appendix C). Additional inspections and reconnaissance activities conducted by GeoInsight and ENTRIX are summarized on Shoreline Inspection Forms, also included in the Partial RAO Summary Form Data Packages.

After the deactivation of the Unified Command post on September 3, 2003, GeoInsight responded to several reports of oil by citizens in the Buzzards Bay area. A summary of the calls received between September 3, 2003 and December 31, 2003, and the associated observations and responses by GeoInsight were summarized in the February 10, 2003 IRA Status Report.

4.1.4 Segment Sediment Sampling

To evaluate the potential presence of residual oil, GeoInsight and ENTRIX personnel collected sediment samples from segments that were considered to be representative of very light, light, and moderate segment categories. The analytical results for these segments are summarized in Table 4 and copies of the laboratory analytical reports are included in Appendix D. Samples were also collected at segments not included in this Partial RAO report (e.g., moderately oiled marshes, heavily oiled segments). Data from these segments are described in the Phase I ISI and

CSM report. A representative cross section of the oiled segments was selected for sampling based on oiling category and substrate. The samples were collected from segments where sand substrates (shoreline type 1A, 1B, or 1C) or marsh substrate (shoreline type 1F) were identified. The shoreline segments were categorized by degree of oiling (e.g., very light, light), sorted by the numerical oiling score, and segments were selected from each oiling category based upon the highest oiling scores in each category. Samples were also collected from locations where field reconnaissances identified areas of relatively greater oiling at a particular segment, with the objective of selecting locations that would provide a conservative, “worst-case” evaluation of oiling at these segments. In addition, the sample locations were structured so that a least one segment from each municipality was selected for sampling. Refer to the Phase I ISI and CSM report for additional information regarding the sampling program.

The following table indicates the total number of segments in each oiling category and the number of segments sampled in each category:

NUMBER OF SEGMENTS SELECTED FOR SAMPLING

Oiling Category	Total Number of Segments considered for this Partial RAO	Total Number of Segments Sampled by Oiling Category
Very Light	38	3
Light	16	7
Moderate (sandy beaches only)	3	2
Total	57	12

Three to four sampling locations within each segment were identified for analytical evaluation. A sample location represents a central point in a given segment around which one upper intertidal (UIT) and one lower intertidal (LIT) sample was collected. Samples were also collected from the middle intertidal (MIT) zone at selected locations. The latitude and longitude of the center of each sampling location were recorded using a hand-held global positioning system (GPS).

Samples collected at the UIT, LIT, and MIT zones were composite samples consisting of three aliquots collected within the corresponding tidal zone and approximately 10 meters apart. A sampling schematic presented as Figure 4 illustrates how three composite samples along the LIT, UIT, and MIT were collected at locations approximately 10 meters apart. For each sample (i.e., UIT, LIT, or MIT), the three sample aliquots were composited by the analytical laboratory for analysis of extractable petroleum hydrocarbons (EPH) fractions and polyaromatic hydrocarbons (PAHs) by USEPA Method 8270 with selected ion monitoring to achieve low-level detection limits. Samples were stored on ice and delivered by field personnel directly to the laboratory at the end of each sample collection day. Samples were submitted to Groundwater Analytical, Inc. of Buzzards Bay, Massachusetts for compositing and analysis. After compositing, the remainder of the sample aliquots were frozen by the laboratory and stored for future analysis, if needed.

4.1.5 Analytical Results

Analytical data are presented on Table 4 and are included in the Partial RAO Summary Form Data Packages included in Appendix C. EPH hydrocarbon fractions were generally not detected in the samples collected for this assessment, with detectable concentrations in only one of the samples collected for this Partial RAO (sample E107-UIT-02). Low concentrations of PAH were detected in the soil samples, with some of the detected concentrations below the laboratory detection limit and therefore estimated; these estimated concentrations are flagged with a “J” qualifier in the laboratory report and on the data tables. Concentrations of detected hydrocarbons in the soil samples were below applicable standards for all of the sampled segments. Discussion of the analytical results is presented in Section 4.2.

4.1.6 Data Quality Assurance and Validation Procedures

ENTRIX performed an independent quality assessment and validation of all analytical data using quality control criteria established by U.S. Environmental Protection Agency (EPA) National Functional Guidelines for the Contract Laboratory Program. The results of these reviews were summarized in data validation reports prepared for each set of sample results.

A “Level II” data validation was conducted for analyses of EPH and PAH in sediments collected as part of this assessment. The MCP sediment samples were analyzed by Groundwater Analytical, (GWA), Inc. in accordance with MADEP methodology for EPH and EPA SW-846 methodology for PAHs: measurement of EPH by MADEP-EPH-98-1 and PAH by 8270C. The Level II review did not include an assessment of backup initial calibration, continuing calibration, or raw analytical data, only the summary results and QC tables provided by the laboratory. The results of the data validation indicated that the data were within the laboratory QC parameters and that the results are acceptable for the intended use.

In addition, GeoInsight evaluated field sample duplicate results and holding times for EPH and PAH analyses for the MCP sediment samples. Reproducible results were within acceptable limits for field duplicates and samples were analyzed within holding times. Duplicate sample results are summarized in the Phase I ISI and CSM report.

4.1.7 Nature and Extent of Impacts

The comprehensive nature and extent of impacts from the release of No. 6 fuel oil in Buzzards Bay is described in the Phase I ISI and CSM. The extent of impacts at each segment is characterized by the maximum degree of oiling and the oiling score for that segment. Specific information regarding where oil was observed in each segment is summarized on each Partial RAO Summary Form. The maximum degree of oiling of the segments described in this Partial RAO is primarily very light, or light, with three segments that were moderately oiled consisting only of sandy beaches.

4.2 RISK CHARACTERIZATION

The risk characterization was completed using a combination Method 1 and Method 3 approach, as provided for in the MCP. The potential risk to human health was evaluated using the Method 1 risk characterization and comparison of analytical data to published Method 1 Risk Characterization Standards. Potential risks to the environment were characterized using a Method 3 risk characterization and a Stage I Environmental Screening.

As part of the risk characterization, the potential exposure pathways were evaluated for the various media. For a complete exposure pathway to be present, there must be an exposure point at which there is a potential contact with the impacted medium by a receptor and there must be an exposure route (e.g., ingestion, inhalation, dermal contact) at the exposure point. If one of these two criteria is not met, then the exposure pathway is not complete and a condition of No Significant Risk has been achieved for this scenario. In other words, without exposure, the risk is zero. Therefore, incomplete exposure pathways were eliminated from further consideration as part of this risk characterization.

4.2.1 Evaluation of Media Potentially Impacted by the Release

To evaluate potential risk exposure pathways, GeoInsight developed a list of potentially-impacted media and then evaluated if these media were impacted by the release, with the objective of finding whether a complete exposure pathway was present. An exposure pathway means the mechanism by which human or environmental receptors inhale, consume, absorb, or otherwise take in oil and/or hazardous material at an exposure point. This list of potentially-impacted media (i.e., soil, sediment, surface water, ground water, and air) and evaluation is specific to these shoreline segments that are addressed by this Partial RAO; additional evaluation as part of comprehensive response actions will be conducted for segments that are not addressed by this Partial RAO. For the identified media where impacts were potentially present, and therefore constituted a complete exposure pathway, GeoInsight identified applicable state standards to compare with the analytical data collected during this investigation. The list of potentially-impacted media and the exposure pathway evaluation are presented below.

4.2.1.1 Soil

This Partial RAO addresses impacts to shoreline in the intertidal zone for the 57 segments that met the criteria for Partial RAO selection described above. As described in the Phase I ISI and CSM report, the oil from the release primarily impacted the intertidal zone, with most of the impacts present in the upper intertidal zone. Based upon the definition of “sediment” and “soil” in the MCP (310 CMR 40.0006), all detrital and inorganic or organic matter found in tidal waters below the mean high water line is defined as sediment. Therefore soil, as defined in the MCP, is

not impacted by this release and the Method 1 Risk Characterization Standards for soil are not directly applicable to this media. However, GeoInsight recognizes that people use the intertidal zone for recreational purposes, and therefore the analytical data collected during the field sampling program were compared to Method 1 Risk Characterization Standards for soil to evaluate human health risk. The assumptions used in the derivation of the Method 1 Risk Characterization Standards are consistent with the anticipated human exposure potential in the intertidal zone. The Method 1 Risk Characterization Standards are expected to be conservative because the intertidal zone is submerged by tides twice per day, which limits human exposure. The analytical data were compared to the Method 1 S-1/GW-1, S-2/GW-2, and S-1/GW-3 Standards to provide a conservative evaluation of human health risk, recognizing that ground water in some areas may not be categorized as GW-1 or GW-2.

4.2.1.2 Sediment

To evaluate potential risks associated with exposure of marine organisms to sediment in the intertidal zone, GeoInsight used the Screening Quick Reference Table (SQuiRT) for Organics standards developed by NOAA (Buchman, 1999). The analytical data were compared to the Effects Range-Low (ERL) values for marine sediment listed in the SQuiRT table. Potential risks to terrestrial organisms were evaluated using studies that monitored the effects of petroleum hydrocarbons on terrestrial organisms, primarily birds. The risk characterization for terrestrial organisms is described in detail in Section 4.2.5.4.

4.2.1.3 Surface Water

Surface water is not expected to be currently impacted within the project area, and not within the segments considered as part of this Partial RAO. It is important to note that analytical results for surface water samples collected in April and May 2003 showed that PAH concentrations within three days of the release were below the USEPA Ambient Water Quality Criteria - Criterion Maximum Concentration (CMC) for protection of aquatic resources, even in areas considered to be “worst-case” based upon the degree of surface oiling in these areas. Worst case samples were collected offshore of heavily oiled shorelines and under or near slicks or tar mats in open water. The analytical results for individual PAHs were well below 1 microgram per liter ($\mu\text{g/L}$). The

surface water analytical data are summarized in Table 5. The surface water sampling locations and analytical results are presented in the Phase I ISI and CSM report.

In addition, most of the segments addressed by this Partial RAO are segments that were only lightly or very lightly oiled from the release, and hydrocarbons are not expected to be present in these segments at concentrations that would dissolve into surface water. No. 6 fuel oil is comprised of mostly heavy-end hydrocarbons and generally does not have a significant soluble fraction. Limited oil that may be present on these segments has been exposed to wave action, tidal action, and photooxidation for nearly a year, and the remaining soluble fraction is expected to be below laboratory analytical detection limits in adjacent surface water. The segments that were moderately oiled that are addressed by this Partial RAO are primarily sandy beaches that were cleaned to a high standard (no visible oil) during the Unified Command remedial actions and these beaches have little to no exposed rocky surfaces where residual splatter could be present. Based upon the data presented above, because impacts to surface water were not identified within three days after the release, a complete exposure pathway for surface water was not identified and therefore a risk characterization for surface water exposure was not performed.

4.2.1.4 Ground Water

Ground water is not expected to be impacted, based upon the same information presented above in the surface water evaluation in Section 4.2.1.3. In addition, ground water beneath the intertidal zone is expected to flow into Buzzards Bay, so impacts to ground water would not be expected to flow inland towards other receptors. Based upon these criteria, a complete exposure pathway was not identified and therefore a risk characterization for ground water exposure was not performed.

4.2.1.5 Air

No. 6 fuel oil is generally composed of the “heavy end” hydrocarbons and does not have a substantial mass of volatile hydrocarbons. NOAA representatives reported that the inhalation hazard of weathered oil in open air is negligible, and that oil collected from the intertidal rocky shoreline was moderately weathered within 6 weeks of the release (Miles, 2003). Based upon the limited degree of oiling at the segments considered for this Partial RAO and the extensive

weathering of the limited remaining oil present on these segments, ambient air is not expected to be impacted by the release currently or in the future. Based upon this assessment, a complete exposure pathway was not identified for air, and therefore a risk characterization for air was not performed.

4.2.2 Background Evaluation

At the shorelines considered as part of this Partial RAO, background concentrations of EPH hydrocarbon fractions and PAH were assumed to be below laboratory detection limits in shoreline sediment. However, it is important to recognize that historic releases could contribute to background EPH hydrocarbon fractions and PAH at other locations in Buzzards Bay (e.g., New Bedford Harbor). Additional evaluation of background conditions will be conducted as part of comprehensive response actions at segments that are not addressed in this Partial RAO.

4.2.3 Hot Spot Evaluation

In accordance with the MCP, a Hot Spot is defined as a discrete area where contaminant concentrations (in soil or ground water) are substantially higher than concentrations in the surrounding area. Identified Hot Spots must be considered as distinct and separate exposure points. GeoInsight evaluated the shoreline segments for this Partial RAO for Hot Spots, including the limited residual splatter that may be present at some of these shoreline segments. The segments that are considered as part of this Partial RAO met the IRATCGP criteria (including having no wipeable oil present) during the IRAC inspection process. The limited residual splatter that may be present at some of these shoreline segments is expected to be present mostly as a stain on rocks, or possibly small amounts of dry, highly weathered oil. Based upon this evaluation, these small areas of limited to no exposure do not constitute Hot Spots and do not require additional characterization as part of this Partial RAO.

4.2.4 Imminent Hazard Evaluation

An Imminent Hazard evaluation was performed pursuant of 310 CMR 40.0322 to identify hazards that would pose significant risk of harm to human health, safety, public welfare, or the environment if they were present for even a short period of time. The Imminent Hazard

Evaluations are conducted using actual or likely exposures under current Site uses and conditions. Pursuant to the MCP, the following conditions, if identified, would pose an Imminent Hazard to health, safety, public welfare, and/or the environment:

- the presence of OHM vapors within buildings, structures, or underground utility conduits at a concentration equal to or greater than 10 percent of the Lower Explosive Limit (LEL);
- a release to the environment of reactive material that threatens human health or safety;
- a release to the roadway that endangers public safety;
- a release of OHM to the environment that poses a significant risk to human health when present for even a short period of time;
- a release of OHM to the environment that produces immediate or acute adverse impacts to fresh water or salt water fish populations; or
- a release of OHM to the environment that produces readily apparent effects to human health, including respiratory distress or dermal irritation.

Based upon our understanding of known current conditions at the Site, and considering the definition of Imminent Hazard in the MCP and the criteria outlined above, current conditions do not pose an Imminent Hazard or warrant the performance of a quantitative Imminent Hazard Evaluation.

4.2.5 Evaluation of Continuing Releases

Based upon observations of the small amounts of residual oil present in localized areas at these segments, the residual oil is not a source of ongoing impacts. The residual oil present at these segments is composed primarily of small, hardened areas of splatter that have been exposed to ongoing weathering since the release. Observations indicate that this oil does not produce sheens, and this oil is also hardened in-place on these rock surfaces, is effectively immobile, and will weather over time.

4.2.6 Evaluation of Readily Apparent Harm

As part of the Stage I Environmental Screening, an evaluation of readily apparent harm to the environment was evaluated for the segments addressed by this Partial RAO. At these segments, stressed biota (including vegetation and animals) were not observed during the site reconnaissance visits, and stressed biota are not expected to be present at these locations due to the low degree of oiling. At this time, the small amounts of residual petroleum that may be present on rock surfaces as splatter in limited areas are not expected to produce an oil sheen on the water surface. Surface water concentrations are below the USEPA Ambient Water Quality Criteria – CMCs, and therefore also below Massachusetts Surface Water Standards (which includes USEPA CMCs). The small amounts of residual oil that are present at these segments are primarily present as splatter on rock surfaces, and the total surface area of exposed oil on these shorelines is expected to be small (less than 100 square feet). The results of sediment sampling indicate that concentrations of PAH and EPH hydrocarbon fractions are very low, below applicable Method 1 soil standards and NOAA SQUIRT ERLs for sediment. Based upon these data, a condition of readily apparent harm is not present at these locations.

4.2.7 Applicable or Suitably Analogous Standards

For environmental risk characterizations conducted under the MCP, the following two sets of applicable or suitably analogous standards apply to surface water impacts: 1) Massachusetts Surface Water Quality Standards (established in 314 CMR 4.00), and 2) the Wetlands Protection Act Standards (established in 310 CMR 10.00).

The Massachusetts Surface Water Quality Standards are numerical values for dissolved oxygen, temperature, pH, fecal coliform, solids, color and turbidity, oil and grease, and taste and odor. In addition, 314 CMR 4.05(5)(e) indicates that water quality criteria established by USEPA shall be used for compounds where numerical standards have not been established. Based upon the characteristics of this release (No. 6 fuel oil released in April 2003), the release is not expected to have current or future adverse impacts that would affect dissolved oxygen, temperature, pH, fecal coliform, solids, color, turbidity, taste, or odor. Non-aqueous phase liquid (NAPL) is not observed to be present on the water surface at this time, and because the dissolved fraction of

No. 6 oil is composed primarily of PAH, evaluation of the significant risk associated with the dissolved fraction is best evaluated using the CMC values established in the NOAA SQuiRT standards, which were developed for individual PAH as well as total dissolved PAH.

The Wetlands Protection Act regulates alterations to wetlands and includes alterations or damages caused by a release. The area of the shoreline addressed by this Partial RAO is the intertidal zone of selected shoreline segments, and therefore several areas subject to protection under the Wetlands Protection Act, including land subject to tidal action, coastal resource areas, and salt marshes are part of this RAO. Based upon the degree of oiling (mostly light or very light), the clean up operations that were conducted, and the sediment sampling data collected for this investigation, adverse impacts are not likely.

4.2.8 Evaluation of Significant Risk

4.2.8.1 Risk to Safety

Potential risks to safety were evaluated by considering the threat of physical harm or bodily injury, due to the presence of oil. Slicks of oil, oiled walkways, and pools of oil are not present in the portion of the Site evaluated as part of this Partial RAO. Potential for slip and fall hazard from oiled rocks is not present at these locations. IRAC inspections confirmed that wipeable oil was removed by cleanup operations. Rusted or corroded drums or containers, open pits, lagoons, or other dangerous structures associated with this release are not present. A threat of fire or explosion, including the presence of explosive vapors, does not exist. Uncontainerized materials that exhibit corrosive, reactive, or flammable characteristics are not present at the Site. A Condition of No Significant Risk of harm to safety exists at the portion of the Site addressed by this Partial RAO under current conditions.

4.2.8.2 Risk to Public Welfare

The risk of harm to public welfare was evaluated by comparing concentrations of detected petroleum constituents in soil to the Upper Concentration Limits (UCLs) defined in the MCP. UCLs have not been exceeded in sediment samples collected from the Site. Based upon the observations of the segments that were lightly or very lightly oiled, and the understanding that

the sandy segments that were moderately oiled were cleaned to a higher criteria (i.e., no visible oil) NAPL is not expected to be present at these locations at conditions above the UCL.

Additionally, the risk to public welfare was also defined for those segments that are accessible to the public as the potential for residual oil to create a nuisance condition such as rubbing off on skin when touched to the degree that limits public or community use (active or passive) of the shoreline segment. Based upon the criteria described above, a Significant Risk to public welfare is not present at the portion of the Site included in the Partial RAO. Small, localized areas of limited "splatter" of oil may be present at these locations, but these conditions do not present a risk to public welfare.

4.2.8.3 Risk to Human Health

As described in Section 4.1.4, samples of intertidal sediment were collected at 14 segments using a conservative sampling strategy to provide a "worst-case" estimate of residual oil concentrations in sediment. For each segment, sediment samples analytical results were compared to MCP Method 1 S-1 standards. Analytical data from each individual sample did not exceed S-1/GW-1, S-1/GW-2, or S-1/GW-3 Risk Characterization standards. Based upon these data, a Condition of No Significant Risk has been achieved for human health at these segments.

4.2.8.4 Risk to the Environment and Stage I Environmental Screening

Exposure of ecological receptors to B120 oil may be associated with residual oil in the water column, the sediment, and the food web. As described above, PAH concentrations in the water column were below applicable CMC standards for marine waters within 3 days of the release. Residual oil in the water column would have dissipated over the past 12 months, and therefore concentrations would remain below the CMC standard. As such, current exposure pathways via surface water were not identified and do not pose a significant risk to the environment.

Similarly, significant exposure pathways via sediment to the benthic community were not identified because the concentrations of total and individual PAH were below corresponding ERL guidelines in each sample from segments under Partial RAO consideration (see Phase I ISI

and CSM). Therefore, significant risk to the benthic community was not identified for the segments under Partial RAO consideration.

To be conservative, consideration of ecological exposure via the food web focused on consumers that may have the greatest exposure to residual oil. Based on the current distribution of residual oil, the primary exposure pathway into the food web would be through benthic or epibenthic invertebrates in intertidal habitats associated with measurable concentrations of PAHs. Assessment of this exposure route focused on birds since they may heavily utilize the intertidal zone, are secondary consumers in the Site area, and have a high ingestion rate relative to body size. These attributes contribute to a conservative estimate of exposure for receptors of potential concern. Since birds and mammals metabolize PAHs relatively quickly, the greatest potential exposure from the food web would be to the secondary consumers that feed directly on prey in contact with oil. The exposure route to tertiary consumers would be reduced relative to secondary consumers due to the varied feeding strategies, extensive foraging ranges, and the relatively rapid metabolism of PAHs in higher trophic levels.

The table below summarizes representative bird species that utilize the shoreline habitats of Buzzards Bay based upon project-specific wildlife reconnaissance surveys and overflight records as well as general information from Christmas Bird Counts, SEANET Marine Bird Summaries and the literature. Theoretically, the birds that would have the greatest exposure via sediment or shellfish ingestion pathways would be those that obtain the majority of their diet from the intertidal habitat, have relatively small foraging ranges, and have relatively high ingestion rates. Therefore, small shorebirds would have the greatest potential exposure compared to larger species such as pelicans or great blue herons.

Therefore, this assessment focused on relatively small shorebirds that frequently occur along Buzzards Bay shorelines and feed on intertidal benthic invertebrates (Piping plover) or shellfish (American oystercatcher). The mean body weights and ingestion rates for these species were obtained from the literature (Wilcox 1959, Not et al. 1984). For the Piping plover, the mean body weight is approximately 0.06 kg and the ingestion rate is 0.04 kg/d. For the American oystercatcher, the mean body weight is 0.60 kg and the ingestion rate is 0.21 kg/d.

**REPRESENTATIVE BIRD SPECIES THAT UTILIZE
BUZZARDS BAY SHORELINES**

NAME		PRIMARY SHORELINE HABITATS		
Common	Scientific	Sandy / Cobble Beach	Rocky	Marsh
American Black Duck	<i>Anas rubripes</i>			X
Brant	<i>Branta bernicla</i>			X
Bufflehead	<i>Bucephala albeola</i>			X
Canvasback	<i>Aythya valisineria</i>			X
Cormorant, Double-crested	<i>Phalacrocorax auritus</i>		X	
Cormorant, Great	<i>Phalacrocorax carbo</i>		X	
Dunlin	<i>Calidris alpina</i>	X		
Eider, Common	<i>Somateria mollissima</i>			X
Egret, Great	<i>Ardea alba</i>			X
Gadwall	<i>Anas strepera</i>			X
Goose, Canada	<i>Branta canadensis</i>			X
Gull, Bonapartes	<i>Larus philadelphia</i>	X	X	
Gull, Great Black-backed Gull	<i>Larus marinus</i>	X	X	
Gull, Herring	<i>Larus argentatus</i>	X	X	

NAME		PRIMARY SHORELINE HABITATS		
Common	Scientific	Sandy / Cobble Beach	Rocky	Marsh
Gull, Ring-billed	<i>Larus delawarensis</i>	X	X	
Goldeneye, Common	<i>Bucephala clangula</i>			X
Heron, Black-crowned Night	<i>Nycticorax nycticorax</i>			X
Heron, Great Blue	<i>Ardea herodias</i>			X
Heron, Green	<i>Butorides virescens</i>			X
Killdeer	<i>Charadrius vociferus</i>	X		
Mallard	<i>Anas platyrhynchos</i>			X
Merganser, Common	<i>Mergus merganser</i>			X
Merganser, Hooded	<i>Lophodytes cucullatus</i>			X
Merganser, Red-breasted	<i>Mergus serrator</i>			X
Oystercatcher, American	<i>Haematopus palliatus</i>	X	X	
Plover, Black-bellied	<i>Pluvialis squatarola</i>	X	X	
Plover, Piping	<i>Charadrius melodus</i>	X		
Plover, Semipalmated	<i>Charadrius semipalmatus</i>	X		
Sanderling	<i>Calidris alba</i>	X		
Sandpiper, Purple	<i>Calidris maritima</i>		X	
Scaup, Greater	<i>Aythya marila</i>			X
Swan, Mute	<i>Cygnus olor</i>			X
Tern, Common	<i>Sterna hirundo</i>	X		X
Tern, Least	<i>Sterna antillarum</i>	X		
Tern, Roseate	<i>Sterna dougallii</i>	X	X	X
Turnstone, Ruddy	<i>Arenaria interpres</i>	X	X	
Yellowlegs, Greater	<i>Tringa melanoleuca</i>	X	X	X
Willet	<i>Catoptrophorus semipalmatus</i>	X	X	X

Assessment of the exposure route to shorebirds focused specifically on sediment concentrations in sand or sand/gravel habitats, and shellfish concentrations to assess ecological exposure via the food web. The birds were assumed to obtain 100% of their diet from the intertidal habitat with either (1) high sediment concentrations based on the results of site-specific MCP sampling conducted in January 2004 (upper 95% confidence limit = 0.14 mg/kg), or (2) high shellfish concentrations based upon site-specific sampling conducted between July and October 2002 (upper 95% confidence limit = 0.34 mg/kg). Since site-specific tissue concentrations were not available for intertidal benthic invertebrates, tissue concentrations were extrapolated from measured sediment concentrations using a bioaccumulation factor (BAF). Specifically, the BAF was calculated as the upper 95% confidence limit of the maximum observed BAF from four pertinent studies on PAH concentrations in sediments and benthic invertebrates (Klosterhaus et al. 2002, Landrum et al. 2002, Schuler et al. 2003, and Westone and Mayer 1998). This resulted in a BAF of 9.4, which was multiplied by the sediment concentration (upper 95% confidence limit = 0.14 mg/kg) to estimate the benthic tissue concentration of 1.31 mg/kg. It should be apparent from the methodology used to calculate the BAF that this estimate is extremely conservative and should not be used to estimate benthic invertebrate tissue concentrations in more sensitive analyses. However, the conservative nature of this estimate is appropriate for the current analysis.

Patton and Dieter (1980) reported the No Observed Adverse Effects Level (NOAEL) for aromatic hydrocarbons, including PAHs, in the diet of a bird was 400 mg/kg over a 210-day period. Although this study included more hydrocarbons than just PAHs, a concentration of 400 mg/kg PAH was used in this assessment to be conservative. Since there may be species-specific toxicological responses to contaminants, an uncertainty factor of 5 was applied to the literature-based NOAEL, which resulted in an estimated NOAEL for this Site of 80 mg/kg. The PAH concentration in the diet was converted to a daily dose based on the daily ingestion rate relative to body weight (Sample et al. 1996). Since the Piping plover's daily ingestion rate is approximately 80% of its body weight, its daily dose would be 64 mg/kg/d, indicating it would need to consume almost 50 kg of benthic invertebrates each day to exceed the NOAEL (actual daily consumption rate of approximately 0.04 kg). Similarly, the daily ingestion rate for the American oystercatcher is 35% of its body weight, so its daily dose would be 28 mg/kg/d and it

would need to consume over 80 kg of shellfish per day to exceed the NOAEL based on the upper 95% confidence limit of shellfish concentrations (actual daily ingestion rate of approximately 0.21 kg). A summary of the input parameters used for this initial assessment is provided in the table below.

In conclusion, there is no exposure pathway to ecological receptors via the water column or via sediment to the benthic community in segments under Partial RAO consideration. In addition, there is no significant risk to the food web associated with any residual oil to shorebirds or any other consumers even if it is assumed that the birds at highest risk obtained 100% of their diet from the area with the highest residual concentrations in the segments under Partial RAO consideration (upper 95% limit for sediment and shellfish concentrations).

SUMMARY OF INPUT PARAMETERS FOR INITIAL RISK ASSESSMENT FOR BIRDS

PARAMETER	VALUE	
	Piping Plover	American Oystercatcher
Mean body weight (kg)	0.055	0.603
Daily ingestion rate (kg)	0.044	0.209
Daily ingestion/Mean body weight	80%	34.7%
Literature-based NOAEL (mg/kg)	400	400
Uncertainty factor	5	5
Project-specific NOAEL (mg/kg)	80	80
Daily dose to exceed NOAEL (mg/kg/d)	64.0	27.8
Concentration in prey (mg/kg)	1.31 ¹	0.34
Theoretical daily ingestion to exceed NOAEL (kg)	48.85	81.76

¹ Incorporates bioaccumulation factor of 9.4 and upper 95% sediment concentration of 0.14 mg/kg

4.3 FEASIBILITY OF ACHIEVING BACKGROUND

The segments selected for this Partial RAO were not heavily impacted by the release of No. 6 fuel oil. These segments are characterized as very light to moderately oiled, with most of these segments either lightly or very lightly oiled. Selected moderate segments were included that consisted primarily of sandy substrates. Low concentrations of residual oil (present as isolated splatter on rocks) at these segments are expected to attenuate via natural weathering conditions. The shoreline is exposed to continuous wave action, tidal fluctuation, and storm events. These conditions promote scouring of residual oil that may be present in the remaining portions of the segments where oil impacts are present.

Based upon the remedial actions performed by Unified Command, two alternatives available to remediate residual oil on rocks were: 1) high-pressure, hot water (hotsy) washing of rocks, using sorbents to catch separate-phase oil produced by the washing, and 2) excavation and disposal of oiled rocks with rock replacement. These remedial actions could adversely disturb the ecosystem that is naturally recovering from impacts of the release. For example, the hotsy operations can re-introduce oil into the marine food chain. In addition, the hot water can destroy the organisms present on the rock substrate (e.g., algae, snails) and slow down ecological recovery. Rock removal and replacement destroys the ecosystem present in these areas, and the organisms must then re-colonize in this area. With these remedial technologies, it is important to recognize that while the removal of highly weathered oil splatter may be beneficial from an aesthetic standpoint, the benefit is offset by the destruction of the ecosystem during the remedial action.

For the segments selected for closure under this Partial RAO, it is likely that background conditions will be achieved within a relatively short time frame (approximately 3 to 5 years) as the oil naturally degrades and weathers over time. Additional remedial activities are not proposed for these segments because the potential impacts of additional cleanup are greater than the potential benefits of additional remedial actions.

4.4 CLASS OF RESPONSE ACTION OUTCOME

The class of Response Action Outcome is designated pursuant to 310 CMR 40.1036 based upon whether remedial actions were conducted and whether background conditions were achieved. For this Partial RAO, remedial activities were performed by Unified Command and GeoInsight, but it is recognized that small localized areas of limited splatter may be present that are above naturally-occurring background. Therefore the appropriate class for this Partial RAO is Class A-2.



5.0 PUBLIC INVOLVEMENT

Notification of submittal of the Partial Class A-2 RAO was provided to the affected municipalities and copies of the letter to municipal officials are attached as Appendix E. Additionally, this Partial Class A-2 RAO will be available on the buzzardsbay.org website.

6.0 PARTIAL CLASS A-2 RAO SUMMARY

1. On April 27, 2003, approximately 22,000 to 55,000 gallons of No. 6 oil were released from Bouchard Barge B120 near the western approach to Buzzards Bay. The released oil was less dense than seawater and floated on the water column until winds and currents pushed the oil ashore.
2. The oil distribution on the shoreline ranged from relatively very light to relatively heavy, with many shorelines in the spill area either unoiled or lightly oiled. The oil impacted sediments and rocks in the intertidal zone, and most of the oil impacts were located in the upper intertidal zone, which is where waves and tides stranded the released oil onshore.
3. Initial response actions were overseen by Unified Command, which was composed of the USCG (as the federal on-scene coordinator), MADEP (as the state on-scene coordinator), and RP. The initial response actions focused primarily on gross oil containment and cleanup. Cleanup activities consisted of manual removal of oil and associated substrate, hot water, high pressure (hotsy) washing, sorbent use, and rock excavation/replacement. SCAT reconnaissances were conducted until June 6, 2003 to evaluate the shoreline oiling and focus cleanup operations. IRAC inspections were conducted between June 10 and September 3, 2003 to evaluate the cleanup operations relative to the target criteria established by Unified Command.
4. In September 2003 the Unified Command post was deactivated and ongoing response actions were transitioned to the LSP to conduct response actions in accordance with the MCP. An IRA Plan was initiated to address potential Imminent Hazards, if present, and to conduct remedial actions at time-critical locations. Field reconnaissances were conducted and remedial actions were implemented to address oil encountered by the reconnaissance teams. The IRA activities are currently on-going.
5. In January and March 2004, GeoInsight and ENTRIX field personnel collected samples at 27 segments to characterize EPH and PAH concentrations in intertidal sediment.

Twelve (12) sampled segments were included in risk characterization to be conservatively representative of the 57 shoreline segments being considered to this partial RAO.

6. EPH hydrocarbon fractions were not reported in the samples. PAH concentrations reported in the samples were below applicable Method 1 Risk Characterization Standards and also below the NOAA SQUIRT ERLs at these segments.
7. Fifty-seven (57) segments were evaluated for closure in accordance with the MCP 310 CMR 40.0000. The segments selected for closure evaluation included very light or light categories, or were categorized as moderately oiled but the segment consisted primarily of sandy beach. Note that segments within these categories that are part of the ongoing IRA were not included in the RAO evaluation.
8. The selected segments were evaluated for significant risk to human health, the environment, public welfare, and safety. A condition of No Significant Risk was identified for the 57 segments evaluated as part of this Partial Class A-2 RAO.

7.0 RECOMMENDATIONS

Based upon this characterization and evaluation, the conditions for an RAO have been achieved for these 57 segments; comprehensive response actions will continue at the remaining 63 segments.

8.0 REFERENCES

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**TABLE 1
 COMPREHENSIVE SHORELINE SEGMENT IDENTIFICATION SUMMARY
 B120 RELEASE
 BUZZARDS BAY, MASSACHUSETTS**

Segment	Segment Name	Town	Degree of Oiling	Oil Ranking Score
E1-01	Grey Gables-Gilder Road Beach	Bourne	Very Light	<1.00
E1-02	Mashnee/Hog Islands North	Bourne	Very Light	<1.00
E1-03	Mashnee Island	Bourne	Very Light	<1.00
E1-04	Mashnee/Hog Islands South	Bourne	Unoiled	0.00
E1-05	Monument Beach	Bourne	Unoiled	0.00
E1-06	Phinney's Harbor South	Falmouth	Unoiled	0.00
E1-07	Wings Neck	Falmouth	Very Light	1.00
E1-08	Barlow's Landing	Bourne	Very Light	<1.00
E1-09	Patuisset	Bourne	Very Light	<1.00
E1-10	Scraggy Neck North	Bourne	Very Light	1.00
E1-11	Scraggy Neck South	Bourne	Moderate	1.00
E1-12	Megansett Beach	Falmouth	Very Light	1.00
E1-13	Nye's Neck	Falmouth	Heavy	2.92
E1-14	New Silver Beach (Wild Harbor)	Falmouth	Moderate	<1.00
E1-15	Crow Point	Falmouth	Heavy	<1.00
E1-16	Old Silver Beach	Falmouth	Unoiled	0.00
E2-01	Falmouth Cliffs	Falmouth	Very Light	<1.00
E2-02	West Falmouth Harbor	Falmouth	Very Light	<1.00
E2-03	Chappaquoit Beach	Falmouth	Unoiled	0.00
E2-04	Black Beach	Falmouth	Unoiled	0.00
E2-05	Saconneset Beach	Falmouth	Very Light	<1.00
E2-06	Hamlin's Point Beach	Falmouth	Very Light	<1.00
E2-07	Wood Neck Beach	Falmouth	Very Light	<1.00
E2-08	Racing Beach	Falmouth	Very Light	<1.00
E2-09	Quissett Harbor	Falmouth	Very Light	<1.00
E2-10	Long Neck to Gansett Point	Woods Hole	Very Light	<1.00
E2-11	Penzance Island	Woods Hole	Very Light	<1.00
E3-01	Penikese Island	Gosnold	Very Light	1.00
E3-02	Cuttyhunk Island	Gosnold	Light	1.72
E3-03	Nashaweena Island	Gosnold	Very Light	1.00
E3-04	Pasque Island	Gosnold	Light	1.21
E3-05	Naushon Island	Gosnold	Light	1.21
E3-06	Uncatena Island	Gosnold	Moderate	2.00
E3-07	Weepecket Islands	Gosnold	Very Light	1.00
W1B-01	Taylor Point Canal	Buzzards Bay	Unoiled	0.00
W1B-02	Taylor Point North	Buzzards Bay	Unoiled	0.00
W1B-03	Butler Cove	Wareham	Unoiled	0.00
W1B-04	Jacob's Neck	Wareham	Unoiled	0.00
W1B-05	Pleasant Harbor	Wareham	Unoiled	0.00
W1B-06	Broad Cove (+seg 6.5)	Wareham	Unoiled	0.00
W1B-07	Stony Point Dike	Wareham	Very Light	<1.00
W1B-08	Temples Knob	Wareham	Very Light	<1.00
W1B-09	Little Harbor Beach	Wareham	Unoiled	0.00
W1B-10	Little Harbor	Wareham	Unoiled	0.00
W1B-11	Bourne Cove	Wareham	Unoiled	0.00
W1B-12	Warren Point (MA)	Wareham	Moderate	3.00
W1B-13	Indian Neck	Wareham	Very Light	1.00
W1B-14	Long Beach	Wareham	Very Light	1.00
W1B-15	Wareham River East Shore	Wareham	Moderate	1.80
W1B-16	Minot Forest Beach	Wareham	Moderate	3.00
W1B-17	Wareham Neck North	Wareham	Very Light	<1.00
W1B-18	Pinehurst Beach	Wareham	Unoiled	0.00
W1B-19	Broad Marsh River East	Wareham	Unoiled	0.00
W1B-20	Broad Marsh River West	Wareham	Unoiled	0.00
W1B-21	Swift's Neck Beach	Wareham	Light	2.00
W1B-22	Swift's Beach	Wareham	Light	2.00
W1B-23	Mark's Cove	Wareham	Light	2.00
W1B-24	Nobska Beach	Wareham	Very Light	<1.00
W1B-25	Cromeset Beach	Wareham	Unoiled	0.00
W1B-26	Briarwood Beach	Wareham	Unoiled	0.00

**TABLE 1
 COMPREHENSIVE SHORELINE SEGMENT IDENTIFICATION SUMMARY
 B120 RELEASE
 BUZZARDS BAY, MASSACHUSETTS**

Segment	Segment Name	Town	Degree of Oiling	Oil Ranking Score
W1B-27	Rose Point	Wareham	Unoiled	0.00
W1B-28	Weweantic River West Shore	Marion	Very Light	<1.00
W1B-29	Delano Road North	Marion	Unoiled	0.00
W1B-30	Delano Road South	Marion	Unoiled	0.00
W1B-31	Great Hill Point	Marion	Moderate	3.00
W1B-32	Piney Point Beach	Marion	Very Light	<1.00
W1B-33	Piney Point South	Marion	Moderate	3.00
W1C-00	Bird Island	Marion	Very Light	1.00
W1C-01	Butler's Point	Marion	Moderate	3.00
W1C-02	Planting Island Causeway	Marion	Heavy	3.00
W1C-03	Planting Island Cove	Marion	Unoiled	0.00
W1C-04	Blankinship Cove	Marion	Moderate	1.46
W1C-05	Sippican Harbor East	Marion	Moderate	3.00
W1C-06	Hammet's Cove Beach	Marion	Unoiled	0.00
W1C-07	Little Neck	Marion	Unoiled	0.00
W1C-08	Tabor Academy Beach	Marion	Unoiled	0.00
W1C-09	Marion Town Beach	Marion	Unoiled	0.00
W1C-10	Silvershell Beach	Marion	Moderate	<1.00
W1C-11	Sippican Harbor West	Marion	Very Light	<1.00
W1C-12	Converse Point East	Marion	Moderate	2.63
W1C-13	Little Ram Island	Marion	Very Light	<1.00
W1D-01	Aucoot Cove	Mattapoisett	Moderate	1.46
W1D-02	Harbor Beach	Mattapoisett	Very Light	<1.00
W1D-03	Holly Woods / Hiller Cove	Mattapoisett	Moderate	2.00
W1D-04	Holly Woods / Peases Point	Mattapoisett	Moderate	2.23
W1D-05	Point Connett Beach	Mattapoisett	Heavy	2.00
W1E-01	Nye Cove / Strawberry Cove	Mattapoisett	L	1.33
W1E-02	Strawberry Cove	Mattapoisett	L	1.46
W1E-03	Strawberry Point West	Mattapoisett	Moderate	2.28
W1E-04	Crescent Beach	Mattapoisett	Heavy	3.92
W1E-05	Mattapoisett Harbor East	Mattapoisett	Moderate	1.26
W1E-06	Mattapoisett Town Beach	Mattapoisett	Moderate	3.00
W1F-01	Brandt Beach	Mattapoisett	Heavy	2.49
W1F-02	Brandt Island West	Mattapoisett	Heavy	3.34
W1F-03	Brandt Island East	Mattapoisett	Heavy	3.07
W1F-04	Brandt Island Cove	Mattapoisett	Heavy	2.19
W1F-05	Mattapoisett Neck West	Mattapoisett	Heavy	3.77
W1F-06	Mattapoisett Neck South	Mattapoisett	Heavy	2.74
W1F-07	Mattapoisett Shores	Mattapoisett	Moderate	2.94
W1F-08	Mattapoisett Neck East	Mattapoisett	Heavy	1.08
W1F-09	Mattapoisett Harbor North	Mattapoisett	Moderate	1.00
W1G-00	Ram Island	Mattapoisett	Heavy	4.00
W2A-01	Fort Phoenix	Fairhaven	Moderate	1.79
W2A-02	Harbor View	Fairhaven	Heavy	3.00
W2A-03	Pope's Beach	Fairhaven	Moderate	3.00
W2A-04	Manhattan Ave	Fairhaven	Heavy	3.65
W2A-05	Sunset Beach	Fairhaven	Moderate	2.00
W2A-06	Silver Shell Beach	Fairhaven	Light	2.00
W2A-07	Scotcut Neck West	Fairhaven	Heavy	2.17
W2A-08	Wilbur Point	Fairhaven	Moderate	2.40
W2A-09	Scotcut Neck East	Fairhaven	Heavy	3.00
W2A-10	Long Island and Causeway South	Fairhaven	Heavy	3.44
W2A-11	West Island West	Fairhaven	Heavy	3.95
W2A-12	Rocky Point to East Cove	Fairhaven	Heavy	1.19
W2A-13	East Cove	Fairhaven	Light	1.00
W2A-14	Pine Creek to North Point	Fairhaven	Moderate	3.00
W2A-15	West Island North	Fairhaven	Light	1.10
W2A-16	Long Island and Causeway North	Fairhaven	Very Light	<1.00
W2A-17	Scotcut Neck Northeast (Marsh)	Fairhaven	Very Light	<1.00
W2A-18	Little Bay (Marsh)	Fairhaven	Very Light	<1.00

TABLE 1
COMPREHENSIVE SHORELINE SEGMENT IDENTIFICATION SUMMARY
B120 RELEASE
BUZZARDS BAY, MASSACHUSETTS

Segment	Segment Name	Town	Degree of Oiling	Oil Ranking Score
W2A-19	Shaw Cove	Fairhaven	Heavy	2.23
W2B-01	Round Hill to Barekneed Rocks	Dartmouth	Light	2.00
W2B-02	Padanaram Harbor	Dartmouth	Light	<1.00
W2B-03	Clarke's Cove West	Dartmouth/New Bedford	Very Light	1.00
W2B-04	Clarke's Cove East	New Bedford	Light	1.60
W2B-05	Fort Taber	New Bedford	Moderate	1.44
W2B-06	Clarke's Point East	New Bedford	Very Light	<1.00
W2B-09	New Bedford Harbor (inner)	New Bedford	Unoiled	0.00
W3A-01	Mishaum Point East	Dartmouth	Heavy	1.05
W3A-02	Salters Point West	Dartmouth	Moderate	3.00
W3A-03	Pier Beach (Salter's Point)	Dartmouth	Moderate	2.44
W3A-04	Salters Point East	Dartmouth	Light	2.00
W3A-05	Round Hill Beach West	Dartmouth	Heavy	2.14
W3A-06	Round Hill Beach East	Dartmouth	Heavy	2.77
W3B-01	Slocum's River	Dartmouth	Light	1.37
W3B-02	Mishaum Point West	Dartmouth	Heavy	3.65
W3C-01	East Beach (Westport)	Westport	Light	2.00
W3C-02	Little Beach	Dartmouth	Light	1.00
W3C-03	Barney's Joy (W of barbed)	Dartmouth	Heavy	4.00
W3C-04	Barney's Joy (E of barbed)	Dartmouth	Heavy	2.60
W3C-05	Demarest Lloyd State Park Beach	Dartmouth	Very Light	1.00
W3C-06	Demarest Lloyd State Park Marsh	Dartmouth	Very Light	1.00
W3D-01	Quicksand Point	Westport	Very Light	1.00
W3D-02	Cockeast Pond Beach	Westport	Light	2.00
W3D-03	Elephant Rock Beach	Westport	Light	2.00
W3D-04	Horseneck Beach West	Westport	Moderate	2.18
W3D-05	Horseneck Beach East	Westport	Light	1.71
W3D-06	Gooseberry Neck East	Westport	Moderate	2.06
W3D-07	Gooseberry Neck West	Westport	Moderate	2.05

Note: Highlighted Segments are Unoiled

**TABLE 2
DEGREE OF OILING FOR OILED SEGMENTS
B.120 RELEASE
BUZZARDS BAY, MASSACHUSETTS**

Segment ID	Segment Name	Town	Degree of Oiling	Oil Ranking Score
E1-01	Gray-Gables-Gilder Road Beach	Bourne	Very Light	<1.00
E1-02	Mashnee/Hog Islands North	Bourne	Very Light	<1.00
E1-03	Mashnee Island	Bourne	Very Light	<1.00
E1-07	Wings Neck	Falmouth	Very Light	1.00
E1-08	Barlow's Landing	Bourne	Very Light	<1.00
E1-09	Patuisset	Bourne	Very Light	<1.00
E1-10	Scraggy Neck North	Bourne	Very Light	1.00
E1-11	Scraggy Neck South	Bourne	Moderate	1.00
E1-12	Megansett Beach	Falmouth	Very Light	1.00
E1-13	Nye's Neck	Falmouth	Heavy	2.92
E1-14	New Silver Beach (sunset pt)	Falmouth	Moderate	<1.00
E1-15	Crow Point	Falmouth	Heavy	<1.00
E2-01	Falmouth Cliffs	Falmouth	Very Light	<1.00
E2-02	West Falmouth Harbor	Falmouth	Very Light	<1.00
E2-05	Saconneset Beach	Falmouth	Very Light	<1.00
E2-06	Hamlin's Point Beach	Falmouth	Very Light	<1.00
E2-07	Wood Neck Beach	Falmouth	Very Light	<1.00
E2-08	Racing Beach	Falmouth	Very Light	<1.00
E2-09	Quisset Harbor	Falmouth	Very Light	<1.00
E2-10	Long Neck to Gansett Point	Woods Hole	Very Light	<1.00
E2-11	Penzance Island	Woods Hole	Very Light	<1.00
E3-01	Penikese Island	Gosnold	Very Light	1.00
E3-02	Cuttyhunk Island	Gosnold	Light	1.72
E3-03	Nashaweena Island	Gosnold	Very Light	1.00
E3-04	Pasque Island	Gosnold	Light	1.21
E3-05	Naushon Island	Gosnold	Light	1.21
E3-06	Uncatena Island	Gosnold	Moderate	2.00
E3-07	Weepecket Islands	Gosnold	Very Light	1.00
W1B-07	Stony Point Dike/Cedar Point	Wareham	Very Light	<1.00
W1B-08	Temples Knob	Wareham	Very Light	<1.00
W1B-12	Warren Point (MA)	Wareham	Moderate	3.00
W1B-13	Indian Neck	Wareham	Very Light	1.00
W1B-14	Long Beach	Wareham	Very Light	1.00
W1B-15	Wareham River East Shore	Wareham	Moderate	1.80
W1B-16	Minot Forest Beach	Wareham	Moderate	3.00
W1B-17	WAREHAM Neck North	Wareham	Very Light	<1.00
W1B-21	Swift's Neck Beach	Wareham	Light	2.00
W1B-22	Swift's Beach	Wareham	Light	2.00
W1B-23	Mark's Cove	Wareham	Light	2.00
W1B-24	Nobska Beach	Wareham	Very Light	<1.00
W1B-28	Weweantic River West Shore	Marion	Very Light	<1.00
W1B-31	Great Hill Point	Marion	Moderate	3.00
W1B-32	Piney Point Beach	Marion	Very Light	<1.00
W1B-33	Piney Point South	Marion	Moderate	3.00
W1C-00	Bird Island	Marion	Very Light	1.00
W1C-01	Butler's Point	Marion	Moderate	3.00
W1C-02	Planting Island Causeway	Marion	Heavy	3.00
W1C-04	Blankinship Cove	Marion	Moderate	1.46
W1C-05	Sippican Harbor East	Marion	Moderate	3.00
W1C-10	Silver Shell Beach	Marion	Moderate	<1.00
W1C-11	Sippican Harbor West	Marion	Very Light	<1.00
W1C-12	Converse Point East	Marion	Moderate	2.63
W1C-13	Little Ram Island	Marion	Very Light	<1.00
W1D-01	Aucoot Cove	Mattapoisett	Moderate	1.46
W1D-02	Harbor Beach	Mattapoisett	Very Light	<1.00
W1D-03	Holly Woods / Hiller Cove	Mattapoisett	Moderate	2.00
W1D-04	Holly Woods / Peases Point	Mattapoisett	Moderate	2.23
W1D-05	Point Connett Beach	Mattapoisett	Heavy	2.00
W1E-01	Nye Cove / Strawberry Cove	Mattapoisett	L	1.33
W1E-02	Strawberry Cove	Mattapoisett	L	1.46
W1E-03	Strawberry Point West	Mattapoisett	Moderate	2.28
W1E-04	Crescent Beach	Mattapoisett	Heavy	3.92
W1E-05	Mattapoisett Harbor East	Mattapoisett	Moderate	1.26
W1E-06	Mattapoisett Town Beach	Mattapoisett	Moderate	3.00
W1F-01	Brandt Beach	Mattapoisett	Heavy	2.49
W1F-02	Brandt Island West (Howards Beach)	Mattapoisett	Heavy	3.34
W1F-03	Brandt Island East	Mattapoisett	Heavy	3.07
W1F-04	Brandt Island Cove	Mattapoisett	Heavy	2.19
W1F-05	Mattapoisett Neck West	Mattapoisett	Heavy	3.77

TABLE 2
DEGREE OF OILING FOR OILED SEGMENTS
B.120 RELEASE
BUZZARDS BAY, MASSACHUSETTS

Segment ID	Segment Name	Town	Degree of Oiling	Oil Ranking Score
W1F-06	Mattapoisett Neck South	Mattapoisett	Heavy	2.74
W1F-07	Mattapoisett Shores	Mattapoisett	Moderate	2.94
W1F-08	Mattapoisett Neck East	Mattapoisett	Heavy	1.08
W1F-09	Mattapoisett Harbor North	Mattapoisett	Moderate	1.00
W1G-00	Ram Island	Mattapoisett	Heavy	4.00
W2A-01	Fort Phoenix	Fairhaven	Moderate	1.79
W2A-02	Harbor View	Fairhaven	Heavy	3.00
W2A-03	Pope's Beach	Fairhaven	Moderate	3.00
W2A-04	Manhattan Ave	Fairhaven	Heavy	3.65
W2A-05	Sunset Beach	Fairhaven	Moderate	2.00
W2A-06	Silver Shell Beach	Fairhaven	Light	2.00
W2A-07	Scoticut Neck West	Fairhaven	Heavy	2.17
W2A-08	Wilbur Point	Fairhaven	Moderate	2.40
W2A-09	Scoticut Neck East	Fairhaven	Heavy	3.00
W2A-10	Long Island and Causeway South	Fairhaven	Heavy	3.44
W2A-11	West Island West	Fairhaven	Heavy	3.95
W2A-12	Rocky Point to East Cove (Town Beach)	Fairhaven	Heavy	1.19
W2A-13	East Cove	Fairhaven	Light	1.00
W2A-14	Pine Creek to North Point	Fairhaven	Moderate	3.00
W2A-15	West Island North	Fairhaven	Light	1.10
W2A-16	Long Island and Causeway North	Fairhaven	Very Light	<1.00
W2A-17	Scoticut Nech Northeast (marsh)	Fairhaven	Very Light	<1.00
W2A-18	Little Bay (marsh)	Fairhaven	Very Light	<1.00
W2A-19	Shaw Cove	Fairhaven	Heavy	2.23
W2B-01	Round Hill to Barekneed Rocks	Dartmouth	Light	2.00
W2B-02	Padanaram Harbor	Dartmouth	Light	<1.00
W2B-03	Clarke's Cove West	Dartmouth	Very Light	1.00
W2B-04	Clarke's Cove East	New Bedford	Light	1.60
W2B-05	Fort Taber	New Bedford	Moderate	1.44
W2B-06	Clarke's Point East	New Bedford	Very Light	<1.00
W3A-01	Mishaum Point East	Dartmouth	Heavy	1.05
W3A-02	Salters Point West	Dartmouth	Moderate	3.00
W3A-03	Pier Beach (Salter's Point)	Dartmouth	Moderate	2.44
W3A-04	Salters Point East	Dartmouth	Light	2.00
W3A-05	Round Hill Beach West	Dartmouth	Heavy	2.14
W3A-06	Round Hill Beach East	Dartmouth	Heavy	2.77
W3B-01	Slocum's River	Dartmouth	Light	1.37
W3B-02	Mishaum Point West	Dartmouth	Heavy	3.65
W3C-01	East Beach (Westport)	Westport	Light	2.00
W3C-02	Little Beach	Dartmouth	Light	1.00
W3C-03	Barney's Joy (W of barbed)	Dartmouth	Heavy	4.00
W3C-04	Barney's Joy (E of barbed)	Dartmouth	Heavy	2.60
W3C-05	Demarest Lloyd State Park Beach	Dartmouth	Very Light	1.00
W3C-06	Demarest Lloyd State Park Marsh	Dartmouth	Very Light	1.00
W3D-01	Quicksand Point	Westport	Very Light	1.00
W3D-02	Cockeast Pond Beach	Westport	Light	2.00
W3D-03	Elephant Rock Beach	Westport	Light	2.00
W3D-04	Horseneck Beach West	Westport	Moderate	2.18
W3D-05	Horseneck Beach East	Westport	Light	1.71
W3D-06	Gooseberry Neck East	Dartmouth	Moderate	2.06
W3D-07	Gooseberry Neck West	Westport	Moderate	2.05

**TABLE 3
PARTIAL RAO SEGMENTS AND DEGREE OF OILING
B.120 RELEASE
BUZZARDS BAY, MASSACHUSETTS**

Segment ID	Segment Name	Degree of Oiling	Oil Ranking Score	IRAC Class*
E1-01	Gray Gables-Gilder Road Beach	Very Light	<1.00	1B
E1-02	Mashnee/ Hog Islands	Very Light	<1.00	1B,C
E1-03	Mashnee Island	Very Light	<1.00	1B,C,D
E1-07	Wings Neck	Very Light	1.00	1A,C,D
E1-08	Barlow's Landing	Very Light	<1.00	1B
E1-09	Patuisset	Very Light	<1.00	1B,C
E1-10	Scraggy Neck North	Very Light	1.00	1B,C,E
E1-12	Megansett Beach	Very Light	1.00	1A,B,C,D
E2-01	Falmouth Cliffs	Very Light	<1.00	1E
E2-02	West Falmouth Harbor	Very Light	<1.00	1B,C,D
E2-05	Saconsset Beach	Very Light	<1.00	1B
E2-06	Hamlin's Point East	Very Light	<1.00	1C
E2-07	Wood Neck Beach	Very Light	<1.00	1A,B,C
E2-08	Racing Beach	Very Light	<1.00	1A,C
E2-09	Quisset Harbor	Very Light	<1.00	1C
E2-10	Long Neck to Gansett Point	Very Light	<1.00	1B,C,E
E2-11	Penzance Island	Very Light	<1.00	1C,E
E3-01	Penikese Island	Very Light	1.00	1C,E,2
E3-02	Cuttyhunk Island	Light	1.73	1B,C,D,F,3
E3-03	Nashaweena Island	Very Light	1.00	1B,C,2,3
E3-04	Pasque Island	Light	1.21	1B,C
E3-05	Naushon Island	Light	1.21	1B,C,D,E,F,3
E3-07	Weepecket Islands	Very Light	1.00	1B,C,D,E,F
W1B-07	Stoney Point Dike	Very Light	<1.00	1C
W1B-08	Temples Knob	Very Light	<1.00	1A,C
W1B-13	Indian Neck	Very Light	1.00	1B,C
W1B-14	Long Beach	Very Light	1.00	1B,C
W1B-16	Minot Forest Beach	Moderate	3.00	1A
W1B-17	Wareham Neck North	Very Light	<1.00	1C
W1B-21	Swift's Neck Beach	Light	2.00	1B,C,F
W1B-22	Swift's Beach	Light	2.00	1A,C,F
W1B-23	Mark's Cove	Light	2.00	1A,F
W1B-24	Nobska Beach	Very Light	<1.00	1B, C
W1B-28	Weweantic River West Shore	Very Light	<1.00	1C
W1B-32	Piney Point Beach	Very Light	<1.00	1B
W1C-00	Bird Island	Very Light	1.00	1D,2
W1C-13	Little and Ram Island	Very Light	<1.00	1E,C
W1D-02	Harbor Beach	Very Light	<1.00	1B,E,F
W2A-15	West Island North	Light	1.10	1B,C,F,3
W2A-16	Long Island and Causeway North	Very Light	<1.00	1B,C,F
W2A-17	Scoticut Neck Northeast	Very Light	<1.00	1F
W2A-18	Little Bay	Very Light	<1.00	1F
W2B-01	Round Hill to Barekneed Rocks	Light	2.00	1A, B, C, D
W2B-02	Padanaram Harbor	Light	<1.00	1A, B, C, D, E, F
W2B-03	Clarke's Cove West	Very Light	1.00	1A, B, C, D
W2B-04	Clarke's Cove East	Light	1.60	1A, C, D, F
W2B-06	Clarke's Point East	Very Light	<1.00	1A, C, D, E
W3B-01	Slocum's River	Light	1.37	1C, E, F
W3C-01	East Beach (Westport)	Light	2.00	1A, C
W3C-02	Little Beach	Light	1.00	1B, C, 3
W3C-05	Demarest Lloyd State Park Beach	Very Light	1.00	1A, C, E 3
W3D-01	Quicksand Point	Very Light	1.00	1C, E
W3D-02	Cockeast Pond Beach	Light	2.00	1A, E
W3D-03	Elephant Rock Beach	Light	2.00	1A, C, E, 3
W3D-04	Horseneck Beach West	Moderate	2.18	1A, C, 3
W3D-05	Horseneck Beach East	Light	1.71	1A, C
W3D-06	Gooseberry Neck East	Moderate	2.06	1A, C, E

Note: Highlighted segments were sampled in 2004

*IRAC Classes:

- 1A: Heavily utilized, public recreational sand beaches
- 1B: Less utilized, semi-public and private beaches
- 1C: Mixed sand and gravel beaches, gravel (pebble to boulder) and rip rap groins and jetties
- 1D: Rip rap seawalls, bulkheads, docks, and pilings
- 1E: Rocky shorelines
- 1F: Salt marshes
- 2: Roseate Tern habitat
- 3: Piping Plover habitat

TABLE 4
SUMMARY OF SEDIMENT ANALYTICAL RESULTS FOR RAO CHARACTERIZATION
BUZZARDS BAY, MASSACHUSETTS
SEGMENT: E1-07
Wings Neck, Wareham
Sampling Date: 1/20/04
OILING CATEGORY: VERY LIGHT

Analyte	Sample Location 1	Sample Location 2	Sample Location 3		MCP Method 1 Standards			NOAA Standards Marine Sediments
	Upper Intertidal Zone	Upper Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	S-1 / GW-1	S-1 / GW-2	S-1 / GW-3	ERL
	E107-UIT-01	E107-UIT-02	E107-UIT-03	E107-LIT-03				
EPH								
C ₉ -C ₁₈ Aliphatic Hydrocarbons	ND(32)	ND(30)	ND(32)	ND(33)	1,000	1,000	1,000	NA
C ₁₉ -C ₃₆ Aliphatic Hydrocarbons	ND(32)	39	ND(32)	ND(33)	2,500	1,000	1,000	NA
C ₁₁ -C ₂₂ Aromatic Hydrocarbons	ND(32)	ND(30)	ND(32)	ND(33)	200	800	800	NA
PAH by GC/MS-SIM by method 8270								
Naphthalene	0.006 j	0.007 j	0.006 j	0.007 j	4	100	100	0.160
2-Methylnaphthalene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	4	500	500	0.070
Acenaphthylene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	100	100	100	0.044
Acenaphthene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	20	1,000	1,000	0.016
Fluorene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	400	1,000	1,000	0.019
Phenanthrene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	700	1,000	100	0.240
Anthracene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	1,000	1,000	1,000	0.085
Fluoranthene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	1,000	1,000	1,000	0.600
Pyrene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	700	700	700	0.665
Benzo(a)anthracene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	0.7	0.7	0.7	0.261
Chrysene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	7	7	7	0.384
Benzo(b)fluoranthene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	0.7	0.7	0.7	NA
Benzo(k)fluoranthene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	7	7	7	0.430
Benzo(a)pyrene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	0.7	0.7	0.7	0.430
Indeno(1,2,3-cd)pyrene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	0.7	0.7	0.7	NA
Dibenzo(a,h)anthracene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	0.7	0.7	0.7	0.063
Benzo(g,h,i)perylene	ND(0.011)	ND(0.010)	ND(0.011)	ND(0.011)	1,000	1,000	1,000	NA

NOTES:

1. Results in mg/Kg (milligrams per kilogram).
2. EPH: Extractable Petroleum Hydrocarbons.
2. ND(x) = constituent not detected at practical quantitation limits noted in parentheses.
3. PAH by GC/MS-SIM: Polyaromatic Hydrocarbons with Selected Ion Monitoring.
4. j: estimated concentration/ detected below standard laboratory reporting limits.
5. MCP: Massachusetts Contingency Plan.
6. NOAA ERL: National Oceanic and Atmospheric Administration Effects Range Low.
7. NA: Not Available.

TABLE 4
SUMMARY OF SEDIMENT ANALYTICAL RESULTS FOR RAO CHARACTERIZATION
BUZZARDS BAY, MASSACHUSETTS
SEGMENT: E2-10
Sampling Date: 1/19/04
OILING CATEGORY: VERY LIGHT

Analyte	Sample Location 1		Sample Location 2		Sample Location 3	MCP Method 1 Standards			NOAA Standards Marine Sediments
	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	S-1 / GW-1	S-1 / GW-2	S-1 / GW-3	ERL
	E210-UIT-01	E210-LIT-01	E210-UIT-02	E210-LIT-02	E210-UIT-03				
EPH									
C ₉ -C ₁₈ Aliphatic Hydrocarbons	ND (32)	ND (35)	ND (30)	ND (30)	ND (30)	1,000	1,000	1,000	NA
C ₁₉ -C ₃₆ Aliphatic Hydrocarbons	ND (32)	ND (35)	ND (30)	ND (30)	ND (30)	2,500	1,000	1,000	NA
C ₁₁ -C ₂₂ Aromatic Hydrocarbons	ND (32)	ND (35)	ND (30)	ND (30)	ND (30)	200	800	800	NA
PAH by GC/MS-SIM method 8270									
Naphthalene	0.008 j	0.009 j	0.009 j	0.011	0.008 j	4	100	100	0.160
2-Methylnaphthalene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	4	500	500	0.070
Acenaphthylene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	100	100	100	0.044
Acenaphthene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	20	1,000	1,000	0.016
Fluorene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	400	1,000	1,000	0.019
Phenanthrene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	700	1,000	100	0.240
Anthracene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	1,000	1,000	1,000	0.085
Fluoranthene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	1,000	1,000	1,000	0.600
Pyrene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	700	700	700	0.665
Benzo(a)anthracene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	0.7	0.7	0.7	0.261
Chrysene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	7	7	7	0.384
Benzo(b)fluoranthene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	0.7	0.7	0.7	NA
Benzo(k)fluoranthene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	7	7	7	0.430
Benzo(a)pyrene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	0.7	0.7	0.7	0.430
Indeno(1,2,3-cd)pyrene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	0.7	0.7	0.7	NA
Dibenzo(a,h)anthracene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	0.7	0.7	0.7	0.063
Benzo(g,h,i)perylene	ND (0.011)	ND (0.012)	ND (0.010)	ND (0.010)	ND (0.010)	1,000	1,000	1,000	NA

NOTES:

1. Results in mg/Kg (milligrams per kilogram).
2. EPH: Extractable Petroleum Hydrocarbons.
2. ND(x) = constituent not detected at practical quantitation limits noted in parentheses.
3. PAH by GC/MS-SIM: Polycyclic Aromatic Hydrocarbons with Selected Ion Monitoring.
4. j: estimated concentration/ detected below standard laboratory reporting limits.
5. MCP: Massachusetts Contingency Plan.
6. NOAA ERL: National Oceanic and Atmospheric Administration Effects Range Low.
7. NA: Not Available.

TABLE 4
SUMMARY OF SEDIMENT ANALYTICAL RESULTS FOR RAO CHARACTERIZATION
BUZZARDS BAY, MASSACHUSETTS
SEGMENT: E3-04
Pasque Island, Elizabeth Islands
Sampling Date: 3/2/04
OILING CATEGORY: LIGHT

Analyte	Sample Location 1			Sample Location 2			Sample Location 3			MCP Method 1 Standards			NOAA Standards Marine Sediments
	Upper Intertidal Zone	Middle Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Middle Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Middle Intertidal Zone	Lower Intertidal Zone	S-1 / GW-1	S-1 / GW-2	S-1 / GW-3	ERL
	E304-UIT-01	E304-MID-01	E304-LIT-01	E304-UIT-02	E304-MID-02	E304-LIT-02	E304-UIT-03	E304-MID-03	E304-LIT-03				
EPH													
C ₉ -C ₁₈ Aliphatic Hydrocarbons	ND(30)	ND(32)	ND(34)	ND(30)	ND(31)	ND(31)	ND(34)	ND(37)	ND(37)	1,000	1,000	1,000	NA
C ₁₉ -C ₃₆ Aliphatic Hydrocarbons	ND(30)	ND(32)	ND(34)	ND(30)	ND(31)	ND(31)	ND(34)	ND(37)	ND(37)	2,500	1,000	1,000	NA
C ₁₁ -C ₂₂ Aromatic Hydrocarbons	ND(30)	ND(32)	ND(34)	ND(30)	ND(31)	ND(31)	ND(34)	ND(37)	ND(37)	200	800	800	NA
method 8270													
Naphthalene	0.009 j	0.009 j	0.010 j	0.007 j	0.009 j	0.009 j	0.009 j	0.011 j	0.011 j	4	100	100	0.160
2-Methylnaphthalene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	4	500	500	0.070
Acenaphthylene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	100	100	100	0.044
Acenaphthene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	20	1,000	1,000	0.016
Fluorene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	400	1,000	1,000	0.019
Phenanthrene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	700	1,000	100	0.240
Anthracene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	1,000	1,000	1,000	0.085
Fluoranthene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	1,000	1,000	1,000	0.600
Pyrene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	700	700	700	0.665
Benzo(a)anthracene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	0.7	0.7	0.7	0.261
Chrysene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	7	7	7	0.384
Benzo(b)fluoranthene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	0.7	0.7	0.7	NA
Benzo(k)fluoranthene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	7	7	7	0.430
Benzo(a)pyrene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	0.7	0.7	0.7	0.430
Indeno(1,2,3-cd)pyrene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	0.7	0.7	0.7	NA
Dibenzo(a,h)anthracene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	0.7	0.7	0.7	0.063
Benzo(g,h,i)perylene	ND(0.010)	ND(0.011)	ND(0.011)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.011)	ND(0.012)	ND(0.012)	1,000	1,000	1,000	NA

NOTES:

1. Results in mg/Kg (milligrams per kilogram).
2. EPH: Extractable Petroleum Hydrocarbons.
3. ND(x) = constituent not detected at practical quantitation limits noted in parentheses.
4. PAH by GC/MS-SIM: Polycyclic Aromatic Hydrocarbons with Selected Ion Monitoring.
5. j: estimated concentration/ detected below standard laboratory reporting limits.
6. MCP: Massachusetts Contingency Plan.
7. NOAA ERL: National Oceanic and Atmospheric Administration Effects Range Low.
8. NA: Not Available.

TABLE 4
SUMMARY OF SEDIMENT ANALYTICAL RESULTS FOR RAO CHARACTERIZATION
BUZZARDS BAY, MASSACHUSETTS
SEGMENT: W1B-14
Long Beach, Wareham
Sampling Date: 1/20/04
OILING CATEGORY: VERY LIGHT

Analyte	Sample Location 1	Sample Location 2		Sample Location 3		MCP Method 1 Standards		NOAA Standards Marine Sediments
	Upper Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	S-1 / GW-2	S-1 / GW-3	
	W1B14-UIT-01	W1B14-UIT-02	W1B14-LIT-02	W1B14-UIT-03	W1B14-LIT-03			ERL
EPH								
C ₉ -C ₁₈ Aliphatic Hydrocarbons	ND(34)	ND(33)	ND(34)	ND(33)	ND(35)	1,000	1,000	NA
C ₁₉ -C ₃₆ Aliphatic Hydrocarbons	ND(34)	ND(33)	ND(34)	ND(33)	ND(35)	1,000	1,000	NA
C ₁₁ -C ₂₂ Aromatic Hydrocarbons	ND(34)	ND(33)	ND(34)	ND(33)	ND(35)	800	800	NA
PAH by GC/MS-SIM by method 8270								
Naphthalene	0.013	0.007 j	0.009 j	0.012	0.007 j	100	100	0.160
2-Methylnaphthalene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	500	500	0.070
Acenaphthylene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	100	100	0.044
Acenaphthene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	1,000	1,000	0.016
Fluorene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	1,000	1,000	0.019
Phenanthrene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	1,000	100	0.240
Anthracene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	1,000	1,000	0.085
Fluoranthene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	1,000	1,000	0.600
Pyrene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	700	700	0.665
Benzo(a)anthracene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	0.7	0.7	0.261
Chrysene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	7	7	0.384
Benzo(b)fluoranthene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	0.7	0.7	NA
Benzo(k)fluoranthene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	7	7	0.430
Benzo(a)pyrene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	0.7	0.7	0.430
Indeno(1,2,3-cd)pyrene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	0.7	0.7	NA
Dibenzo(a,h)anthracene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	0.7	0.7	0.063
Benzo(g,h,i)perylene	ND(0.011)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.012)	1,000	1,000	NA

NOTES:

1. Results in mg/Kg (milligrams per kilogram).
2. EPH: Extractable Petroleum Hydrocarbons.
2. ND(x) = constituent not detected at practical quantitation limits noted in parentheses.
3. PAH by GC/MS-SIM: Polyaromatic Hydrocarbons with Selected Ion Monitoring.
4. j: estimated concentration/ detected below standard laboratory reporting limits.
5. MCP: Massachusetts Contingency Plan.
6. NOAA ERL: National Oceanic and Atmospheric Administration Effects Range Low.
7. NA: Not Available.

TABLE 4
SUMMARY OF SEDIMENT ANALYTICAL RESULTS FOR RAO CHARACTERIZATION
BUZZARDS BAY, MASSACHUSETTS
SEGMENT: W1B-16
Minot Forest Beach, Wareham
Sampling Date: 1/21/04
OILING CATEGORY: MODERATE

Analyte	Sample Location 1		Sample Location 2		Sample Location 3		MCP Method 1 Standards		NOAA Standards Marine Sediments
	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	S-1 / GW-2	S-1 / GW-3	ERL
	W1B16-UIT-01	W1B16-LIT-01	W1B16-UIT-02	W1B16-LIT-02	W1B16-UIT-03	W1B16-LIT-03			
EPH									
C ₉ -C ₁₈ Aliphatic Hydrocarbons	ND(31)	ND(33)	ND(31)	ND(37)	ND(37)	ND(35)	1,000	1,000	NA
C ₁₉ -C ₃₆ Aliphatic Hydrocarbons	ND(31)	ND(33)	ND(31)	ND(37)	ND(37)	ND(35)	1,000	1,000	NA
C ₁₁ -C ₂₂ Aromatic Hydrocarbons	ND(31)	ND(33)	ND(31)	ND(37)	ND(37)	ND(35)	800	800	NA
PAH by GC/MS-SIM by method 8270									
Naphthalene	0.009 j	0.010 j	0.008 j	0.011 j	0.010 j	0.011 j	100	100	0.160
2-Methylnaphthalene	ND(0.010)	ND(0.011)	0.006 j	ND(0.012)	0.007 j	ND(0.012)	500	500	0.070
Acenaphthylene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	ND(0.012)	100	100	0.044
Acenaphthene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	ND(0.012)	1,000	1,000	0.016
Fluorene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	ND(0.012)	1,000	1,000	0.019
Phenanthrene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	ND(0.012)	1,000	100	0.240
Anthracene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	ND(0.012)	1,000	1,000	0.085
Fluoranthene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	0.009 j	1,000	1,000	0.600
Pyrene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	0.008 j	700	700	0.665
Benzo(a)anthracene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	ND(0.012)	0.7	0.7	0.261
Chrysene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	ND(0.012)	7	7	0.384
Benzo(b)fluoranthene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	ND(0.012)	0.7	0.7	NA
Benzo(k)fluoranthene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	ND(0.012)	7	7	0.430
Benzo(a)pyrene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	ND(0.012)	0.7	0.7	0.430
Indeno(1,2,3-cd)pyrene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	ND(0.012)	0.7	0.7	NA
Dibenzo(a,h)anthracene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	ND(0.012)	0.7	0.7	0.063
Benzo(g,h,i)perylene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.012)	ND(0.012)	1,000	1,000	NA

NOTES:

1. Results in mg/Kg (milligrams per kilogram).
2. EPH: Extractable Petroleum Hydrocarbons.
2. ND(x) = constituent not detected at practical quantitation limits noted in parentheses.
3. PAH by GC/MS-SIM: Polycyclic Aromatic Hydrocarbons with Selected Ion Monitoring.
4. j: estimated concentration/ detected below standard laboratory reporting limits.
5. MCP: Massachusetts Contingency Plan.
6. NOAA ERL: National Oceanic and Atmospheric Administration Effects Range Low.
7. NA: Not Available.

TABLE 4
SUMMARY OF SEDIMENT ANALYTICAL RESULTS FOR RAO CHARACTERIZATION
BUZZARDS BAY, MASSACHUSETTS
SEGMENT: W1B-22
Swift's Beach, Wareham
Sampling Date: 1/21/04
OILING CATEGORY: LIGHT

Analyte	Sample Location 1		Sample Location 2		Sample Location 3		MCP Method 1 Standards		NOAA Standards Marine Sediments
	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	S-1 / GW-2	S-1 / GW-3	ERL
	W1B22-UIT-01	W1B22-LIT-01	W1B22-UIT-02	W1B22-LIT-02	W1B22-UIT-03	W1B22-LIT-03			
EPH									
C ₉ -C ₁₈ Aliphatic Hydrocarbons	ND(31)	ND(34)	ND(30)	ND(35)	ND(34)	ND(36)	1,000	1,000	NA
C ₁₉ -C ₃₆ Aliphatic Hydrocarbons	ND(31)	ND(34)	ND(30)	ND(35)	ND(34)	ND(36)	1,000	1,000	NA
C ₁₁ -C ₂₂ Aromatic Hydrocarbons	ND(31)	ND(34)	ND(30)	ND(35)	ND(34)	ND(36)	800	800	NA
PAH by GC/MS-SIM method 8270									
Naphthalene	0.008 j	0.010 j	0.009 j	0.011 j	0.010 j	0.011 j	100	100	0.160
2-Methylnaphthalene	ND(0.010)	0.006 j	0.006 j	0.006 j	ND(0.011)	0.006 j	500	500	0.070
Acenaphthylene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.011)	ND(0.012)	100	100	0.044
Acenaphthene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.011)	ND(0.012)	1,000	1,000	0.016
Fluorene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.011)	ND(0.012)	1,000	1,000	0.019
Phenanthrene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.011)	ND(0.012)	1,000	100	0.240
Anthracene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.011)	ND(0.012)	1,000	1,000	0.085
Fluoranthene	ND(0.010)	ND(0.011)	ND(0.010)	0.013	ND(0.011)	ND(0.012)	1,000	1,000	0.600
Pyrene	ND(0.010)	ND(0.011)	ND(0.010)	0.011 j	ND(0.011)	ND(0.012)	700	700	0.665
Benzo(a)anthracene	ND(0.010)	ND(0.011)	ND(0.010)	0.014	ND(0.011)	ND(0.012)	0.7	0.7	0.261
Chrysene	ND(0.010)	ND(0.011)	ND(0.010)	0.012	ND(0.011)	ND(0.012)	7	7	0.384
Benzo(b)fluoranthene	ND(0.010)	ND(0.011)	ND(0.010)	0.013	ND(0.011)	ND(0.012)	0.7	0.7	NA
Benzo(k)fluoranthene	ND(0.010)	ND(0.011)	ND(0.010)	0.013	ND(0.011)	ND(0.012)	7	7	0.430
Benzo(a)pyrene	ND(0.010)	ND(0.011)	ND(0.010)	0.009 j	ND(0.011)	ND(0.012)	0.7	0.7	0.430
Indeno(1,2,3-cd)pyrene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.011)	ND(0.012)	0.7	0.7	NA
Dibenzo(a,h)anthracene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.011)	ND(0.012)	0.7	0.7	0.063
Benzo(g,h,i)perylene	ND(0.010)	ND(0.011)	ND(0.010)	ND(0.012)	ND(0.011)	ND(0.012)	1,000	1,000	NA

NOTES:

1. Results in mg/Kg (milligrams per kilogram).
2. EPH: Extractable Petroleum Hydrocarbons.
2. ND(x) = constituent not detected at practical quantitation limits noted in parentheses.
3. PAH by GC/MS-SIM: Polyaromatic Hydrocarbons with Selected Ion Monitoring.
4. j: estimated concentration/ detected below standard laboratory reporting limits.
5. MCP: Massachusetts Contingency Plan.
6. NOAA ERL: National Oceanic and Atmospheric Administration Effects Range Low.
7. NA: Not Available.

TABLE 4
SUMMARY OF SEDIMENT ANALYTICAL RESULTS FOR RAO CHARACTERIZATION
BUZZARDS BAY, MASSACHUSETTS
SEGMENT: W2A-15
West Island North, New Bedford
Sampling Date: 1/21/04
OILING CATEGORY: LIGHT

Analyte	Sample Location 1	Sample Location 2	Sample Location 3		MCP Method 1 Standards			NOAA Standards Marine Sediments
	Upper Intertidal Zone	Upper Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	S-1 / GW-1	S-1 / GW-2	S-1 / GW-3	ERL
	W2A15-UIT-01	W2A15-UIT-02	W2A15-UIT-03	W2A15-LIT-03				
EPH								
C ₉ -C ₁₈ Aliphatic Hydrocarbons	ND (34)	ND (40)	ND (35)	ND (33)	1,000	1,000	1,000	NA
C ₁₉ -C ₃₆ Aliphatic Hydrocarbons	ND (34)	ND (40)	ND (35)	ND (33)	2,500	1,000	1,000	NA
C ₁₁ -C ₂₂ Aromatic Hydrocarbons	ND (34)	ND (40)	ND (35)	ND (33)	200	800	800	NA
PAH by GC/MS-SIM by method 8270								
Naphthalene	0.011	0.015	0.011 j	0.010 j	4	100	100	0.160
2-Methylnaphthalene	0.008 j	0.009 j	0.006 j	ND (0.011)	4	500	500	0.070
Acenaphthylene	ND (0.011)	ND (0.013)	ND (0.012)	ND (0.011)	100	100	100	0.044
Acenaphthene	ND (0.011)	ND (0.013)	ND (0.012)	ND (0.011)	20	1,000	1,000	0.016
Fluorene	ND (0.011)	ND (0.013)	ND (0.012)	ND (0.011)	400	1,000	1,000	0.019
Phenanthrene	ND (0.011)	ND (0.013)	ND (0.012)	ND (0.011)	700	1,000	100	0.240
Anthracene	ND (0.011)	0.007 j	ND (0.012)	ND (0.011)	1,000	1,000	1,000	0.085
Fluoranthene	ND (0.011)	0.013	ND (0.012)	ND (0.011)	1,000	1,000	1,000	0.600
Pyrene	ND (0.011)	0.018	ND (0.012)	ND (0.011)	700	700	700	0.665
Benzo(a)anthracene	ND (0.011)	ND (0.013)	ND (0.012)	ND (0.011)	0.7	0.7	0.7	0.261
Chrysene	ND (0.011)	0.017	ND (0.012)	ND (0.011)	7	7	7	0.384
Benzo(b)fluoranthene	ND (0.011)	0.009 j	ND (0.012)	ND (0.011)	0.7	0.7	0.7	NA
Benzo(k)fluoranthene	ND (0.011)	0.007 j	ND (0.012)	ND (0.011)	7	7	7	0.430
Benzo(a)pyrene	ND (0.011)	0.009 j	ND (0.012)	ND (0.011)	0.7	0.7	0.7	0.430
Indeno(1,2,3-cd)pyrene	ND (0.011)	ND (0.013)	ND (0.012)	ND (0.011)	0.7	0.7	0.7	NA
Dibenzo(a,h)anthracene	ND (0.011)	ND (0.013)	ND (0.012)	ND (0.011)	0.7	0.7	0.7	0.063
Benzo(g,h,i)perylene	ND (0.011)	0.008 j	ND (0.012)	ND (0.011)	1,000	1,000	1,000	NA

NOTES:

1. Results in mg/Kg (milligrams per kilogram).
2. EPH: Extractable Petroleum Hydrocarbons.
2. ND(x) = constituent not detected at practical quantitation limits noted in parentheses.
3. PAH by GC/MS-SIM: Polyaromatic Hydrocarbons with Selected Ion Monitoring.
4. j: estimated concentration/ detected below standard laboratory reporting limits.
5. MCP: Massachusetts Contingency Plan.
6. NOAA ERL: National Oceanic and Atmospheric Administration Effects Range Low.
7. NA: Not Available.

TABLE 4
SUMMARY OF SEDIMENT ANALYTICAL RESULTS FOR RAO CHARACTERIZATION
BUZZARDS BAY, MASSACHUSETTS
SEGMENT: W2B-01
Round Hill Beach, Dartmouth
Sampling Date: 1/21/04
OILING CATEGORY: LIGHT

Analyte	Sample Location 1		Sample Location 2		Sample Location 3		MCP Method 1 Standards			NOAA Standards Marine Sediments
	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	S-1 / GW-1	S-1 / GW-2	S-1 / GW-3	ERL
	W2B01-UIT-01	W2B01-LIT-01	W2B01-UIT-02	W2B01-LIT-02	W2B01-UIT-03	W2B01-LIT-03				
EPH										
C ₉ -C ₁₈ Aliphatic Hydrocarbons	ND(31)	ND(35)	ND(32)	ND(37)	ND(33)	ND(34)	1,000	1,000	1,000	NA
C ₁₉ -C ₃₆ Aliphatic Hydrocarbons	ND(31)	ND(35)	ND(32)	ND(37)	ND(33)	ND(34)	2,500	1,000	1,000	NA
C ₁₁ -C ₂₂ Aromatic Hydrocarbons	ND(31)	ND(35)	ND(32)	ND(37)	ND(33)	ND(34)	200	800	800	NA
PAH by GC/MS-SIM method 8270										
Naphthalene	0.012	0.012	0.012	0.015	0.009 j	0.011	4	100	100	0.160
2-Methylnaphthalene	0.008 j	0.008 j	0.008 j	0.010 j	0.006 j	0.008 j	4	500	500	0.070
Acenaphthylene	ND(0.010)	ND(0.012)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.011)	100	100	100	0.044
Acenaphthene	ND(0.010)	ND(0.012)	ND(0.011)	ND(0.012)	ND(0.011)	ND(0.011)	20	1,000	1,000	0.016
Fluorene	ND(0.010)	0.011 j	ND(0.011)	0.009 j	ND(0.011)	ND(0.011)	400	1,000	1,000	0.019
Phenanthrene	0.052	0.120	0.014	0.110	0.006 j	0.024	700	1,000	100	0.240
Anthracene	0.010	0.031	ND(0.011)	0.041	ND(0.011)	0.008 j	1,000	1,000	1,000	0.085
Fluoranthene	0.110	0.210	0.034	0.270	0.014	0.068	1,000	1,000	1,000	0.600
Pyrene	0.082	0.160	0.028	0.220	0.012	0.054	700	700	700	0.665
Benzo(a)anthracene	0.039	0.078	0.013	0.120	0.006 j	0.028	0.7	0.7	0.7	0.261
Chrysene	0.044	0.084	0.018	0.120	0.007 j	0.032	7	7	7	0.384
Benzo(b)fluoranthene	0.036	0.064	0.014	0.094	0.006 j	0.025	0.7	0.7	0.7	NA
Benzo(k)fluoranthene	0.036	0.063	0.012	0.092	0.006 j	0.024	7	7	7	0.430
Benzo(a)pyrene	0.042	0.078	0.016	0.120	0.007 j	0.030	0.7	0.7	0.7	0.430
Indeno(1,2,3-cd)pyrene	0.024	0.042	0.009 j	0.058	ND(0.011)	0.017	0.7	0.7	0.7	NA
Dibenzo(a,h)anthracene	0.006 j	0.011 j	ND(0.011)	0.017	ND(0.011)	ND(0.011)	0.7	0.7	0.7	0.063
Benzo(g,h,i)perylene	0.025	0.042	0.009 j	0.058	ND(0.011)	0.017	1,000	1,000	1,000	NA

NOTES:

1. Results in mg/Kg (milligrams per kilogram).
2. EPH: Extractable Petroleum Hydrocarbons.
3. ND(x) = constituent not detected at practical quantitation limits noted in parentheses.
4. PAH by GC/MS-SIM: Polyaromatic Hydrocarbons with Selected Ion Monitoring.
5. j: estimated concentration/ detected below standard laboratory reporting limits.
6. MCP: Massachusetts Contingency Plan.
7. NOAA ERL: National Oceanic and Atmospheric Administration Effects Range Low.
8. NA: Not Available.

TABLE 4
SUMMARY OF SEDIMENT ANALYTICAL RESULTS FOR RAO CHARACTERIZATION
BUZZARDS BAY, MASSACHUSETTS
SEGMENT: W2B-04
Clark's Cove East, New Bedford
Sampling Date: 1/21/04
OILING CATEGORY: LIGHT

Analyte	Sample Location 1		Sample Location 2		Sample Location 3		MCP Method 1 Standards			NOAA Standards Marine Sediments
	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	S-1 / GW-1	S-1 / GW-2	S-1 / GW-3	ERL
	W2B04-UIT-01	W2B04-LIT-01	W2B04-UIT-02	W2B04-LIT-02	W2B04-UIT-03	W2B04-LIT-03				
EPH										
C ₉ -C ₁₈ Aliphatic Hydrocarbons	ND(35)	ND(35)	ND(35)	ND(33)	ND(30)	ND(31)	1,000	1,000	1,000	NA
C ₁₉ -C ₃₆ Aliphatic Hydrocarbons	ND(35)	ND(35)	ND(35)	ND(33)	ND(30)	ND(31)	2,500	1,000	1,000	NA
C ₁₁ -C ₂₂ Aromatic Hydrocarbons	ND(35)	ND(35)	ND(35)	ND(33)	ND(30)	ND(31)	200	800	800	NA
PAH by GC/MS-SIM method 8270										
Naphthalene	0.012	0.014	0.012	0.012	0.009 j	0.012	4	100	100	0.160
2-Methylnaphthalene	0.007 j	0.010 j	0.006 j	0.007 j	0.005 j	0.007 j	4	500	500	0.070
Acenaphthylene	ND(0.012)	ND(0.012)	ND(0.012)	ND(0.011)	ND(0.010)	ND(0.010)	100	100	100	0.044
Acenaphthene	ND(0.012)	ND(0.012)	ND(0.012)	ND(0.011)	ND(0.010)	ND(0.010)	20	1,000	1,000	0.016
Fluorene	ND(0.012)	ND(0.012)	ND(0.012)	ND(0.011)	ND(0.010)	0.008 j	400	1,000	1,000	0.019
Phenanthrene	0.009 j	0.027	0.008 j	0.009	ND(0.010)	0.053	700	1,000	100	0.240
Anthracene	ND(0.012)	0.006 j	ND(0.012)	ND(0.011)	ND(0.010)	0.015	1,000	1,000	1,000	0.085
Fluoranthene	0.022	0.072	0.022	0.022	ND(0.010)	0.074	1,000	1,000	1,000	0.600
Pyrene	0.019	0.058	0.019	0.020	ND(0.010)	0.058	700	700	700	0.665
Benzo(a)anthracene	0.010 j	0.028	0.009 j	0.010 j	ND(0.010)	0.031	0.7	0.7	0.7	0.261
Chrysene	0.010 j	0.027	0.011 j	0.011	ND(0.010)	0.031	7	7	7	0.384
Benzo(b)fluoranthene	0.009 j	0.023	0.010 j	0.010 j	ND(0.010)	0.026	0.7	0.7	0.7	NA
Benzo(k)fluoranthene	0.009 j	0.021	0.009 j	0.009 j	ND(0.010)	0.025	7	7	7	0.430
Benzo(a)pyrene	0.012	0.028	0.012	0.012	ND(0.010)	0.033	0.7	0.7	0.7	0.430
Indeno(1,2,3-cd)pyrene	0.007 j	0.017	0.008 j	0.007 j	ND(0.010)	0.017	0.7	0.7	0.7	NA
Dibenzo(a,h)anthracene	ND(0.012)	ND(0.012)	ND(0.012)	ND(0.011)	ND(0.010)	ND(0.010)	0.7	0.7	0.7	0.063
Benzo(g,h,i)perylene	0.008 j	0.018	0.009 j	0.008 j	ND(0.010)	0.018	1,000	1,000	1,000	NA

NOTES:

1. Results in mg/Kg (milligrams per kilogram).
2. EPH: Extractable Petroleum Hydrocarbons.
3. ND(x) = constituent not detected at practical quantitation limits noted in parentheses.
4. j: estimated concentration/ detected below standard laboratory reporting limits.
5. MCP: Massachusetts Contingency Plan.
6. NOAA ERL: National Oceanic and Atmospheric Administration Effects Range Low.
7. NA: Not Available.

TABLE 4
SUMMARY OF SEDIMENT ANALYTICAL RESULTS FOR RAO CHARACTERIZATION
BUZZARDS BAY, MASSACHUSETTS
SEGMENT: W3C-01
East Beach, Westport
Sampling Date: 1/21/04
OILING CATEGORY: LIGHT

Analyte	Sample Location 1		Sample Location 2		Sample Location 3		MCP Method 1 Standards		NOAA Standards Marine Sediments
	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	S-1 / GW-2	S-1 / GW-3	ERL
	W3C01-UIT-01	W3C01-LIT-01	W3C01-UIT-02	W3C01-LIT-02	W3C01-UIT-03	W3C01-LIT-03			
EPH									
C ₉ -C ₁₈ Aliphatic Hydrocarbons	ND(33)	ND(36)	ND(34)	ND(37)	ND(32)	ND(38)	1,000	1,000	NA
C ₁₉ -C ₃₆ Aliphatic Hydrocarbons	ND(33)	ND(36)	ND(34)	ND(37)	ND(32)	ND(38)	1,000	1,000	NA
C ₁₁ -C ₂₂ Aromatic Hydrocarbons	ND(33)	ND(36)	ND(34)	ND(37)	ND(32)	ND(38)	800	800	NA
PAH by GC/MS-SIM by method 8270									
Naphthalene	0.009 j	0.011 j	0.010 j	0.011 j	0.010 j	0.013	100	100	0.160
2-Methylnaphthalene	ND (0.011)	0.009 j	0.008 j	0.007 j	0.0006 j	0.009 j	500	500	0.070
Acenaphthylene	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	100	100	0.044
Acenaphthene	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	1,000	1,000	0.016
Fluorene	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	1,000	1,000	0.019
Phenanthrene	0.010 j	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	1,000	100	0.240
Anthracene	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	1,000	1,000	0.085
Fluoranthene	0.007 j	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	1,000	1,000	0.600
Pyrene	0.006 j	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	700	700	0.665
Benzo(a)anthracene	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	0.7	0.7	0.261
Chrysene	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	7	7	0.384
Benzo(b)fluoranthene	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	0.7	0.7	NA
Benzo(k)fluoranthene	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	7	7	0.430
Benzo(a)pyrene	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	0.7	0.7	0.430
Indeno(1,2,3-cd)pyrene	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	0.7	0.7	NA
Dibenzo(a,h)anthracene	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	0.7	0.7	0.063
Benzo(g,h,i)perylene	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.011)	ND (0.013)	1,000	1,000	NA

NOTES:

1. Results in mg/Kg (milligrams per kilogram).
2. EPH: Extractable Petroleum Hydrocarbons.
2. ND(x) = constituent not detected at practical quantitation limits noted in parentheses.
3. PAH by GC/MS-SIM: Polyaromatic Hydrocarbons with Selected Ion Monitoring.
4. j: estimated concentration/ detected below standard laboratory reporting limits.
5. MCP: Massachusetts Contingency Plan.
6. NOAA ERL: National Oceanic and Atmospheric Administration Effects Range Low.
7. NA: Not Available.

TABLE 4
SUMMARY OF SEDIMENT ANALYTICAL RESULTS FOR RAO CHARACTERIZATION
BUZZARDS BAY, MASSACHUSETTS
SEGMENT: W3D-03
Elephant Rock Beach, Westport
Sampling Date: 1/20/04
OILING CATEGORY: LIGHT

Analyte	Sample Location 1		Sample Location 2		Sample Location 3		MCP Method 1 Standards			NOAA Standards Marine Sediments
	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	S-1 / GW-1	S-1 / GW-2	S-1 / GW-3	ERL
	W3D03-UIT-01	W3D03-LIT-01	W3D03-UIT-02	W3D03-LIT-02	W3D03-UIT-03	W3D03-LIT-03				
EPH										
C ₉ -C ₁₈ Aliphatic Hydrocarbons	ND (35)	ND (34)	ND (33)	ND (38)	ND (34)	ND (36)	1,000	1,000	1,000	NA
C ₁₉ -C ₃₆ Aliphatic Hydrocarbons	ND (35)	ND (34)	ND (33)	ND (38)	ND (34)	ND (36)	2,500	1,000	1,000	NA
C ₁₁ -C ₂₂ Aromatic Hydrocarbons	ND (35)	ND (34)	ND (33)	ND (38)	ND (34)	ND (36)	200	800	800	NA
PAH by GC/MS-SIM by method 8270										
Naphthalene	0.006 j	0.006 j	0.006 j	0.008 j	0.006 j	0.006 j	4	100	100	0.160
2-Methylnaphthalene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	4	500	500	0.070
Acenaphthylene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	100	100	100	0.044
Acenaphthene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	20	1,000	1,000	0.016
Fluorene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	400	1,000	1,000	0.019
Phenanthrene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	700	1,000	100	0.240
Anthracene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	1,000	1,000	1,000	0.085
Fluoranthene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	1,000	1,000	1,000	0.600
Pyrene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	700	700	700	0.665
Benzo(a)anthracene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	0.7	0.7	0.7	0.261
Chrysene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	7	7	7	0.384
Benzo(b)fluoranthene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	0.7	0.7	0.7	NA
Benzo(k)fluoranthene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	7	7	7	0.430
Benzo(a)pyrene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	0.7	0.7	0.7	0.430
Indeno(1,2,3-cd)pyrene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	0.7	0.7	0.7	NA
Dibenzo(a,h)anthracene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	0.7	0.7	0.7	0.063
Benzo(g,h,i)perylene	ND (0.012)	ND (0.011)	ND (0.011)	ND (0.013)	ND (0.011)	ND (0.012)	1,000	1,000	1,000	NA

NOTES:

1. Results in mg/Kg (milligrams per kilogram).
2. EPH: Extractable Petroleum Hydrocarbons.
3. ND(x) = constituent not detected at practical quantitation limits noted in parentheses.
4. j: estimated concentration/ detected below standard laboratory reporting limits.
5. MCP: Massachusetts Contingency Plan.
6. NOAA ERL: National Oceanic and Atmospheric Administration Effects Range Low.
7. NA: Not Available.

TABLE 4
SUMMARY OF SEDIMENT ANALYTICAL RESULTS FOR RAO CHARACTERIZATION
BUZZARDS BAY, MASSACHUSETTS
SEGMENT: W3D-04
Horseneck Beach West, Westport
Sampling Date: 1/20/04
OILING CATEGORY: MODERATE

Analyte	Sample Location 1		Sample Location 2		Sample Location 3		MCP Method 1 Standards			NOAA Standards Marine Sediments
	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	Upper Intertidal Zone	Lower Intertidal Zone	S-1 / GW-1	S-1 / GW-2	S-1 / GW-3	ERL
	W3D04-UIT-01	W3D04-LIT-01	W3D04-UIT-02	W3D04-LIT-02	W3D04-UIT-03	W3D04-LIT-03				
EPH										
C ₉ -C ₁₈ Aliphatic Hydrocarbons	ND (30)	ND (35)	ND (33)	ND (37)	ND (37)	ND (38)	1,000	1,000	1,000	NA
C ₁₉ -C ₃₆ Aliphatic Hydrocarbons	ND (30)	ND (35)	ND (33)	ND (37)	ND (37)	ND (38)	2,500	1,000	1,000	NA
C ₁₁ -C ₂₂ Aromatic Hydrocarbons	ND (30)	ND (35)	ND (33)	ND (37)	ND (37)	ND (38)	200	800	800	NA
PAH by GC/MS-SIM by method 8270										
Naphthalene	0.006 j	0.006 j	0.006 j	0.007 j	0.008 j	0.008 j	4	100	100	0.160
2-Methylnaphthalene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	4	500	500	0.070
Acenaphthylene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	100	100	100	0.044
Acenaphthene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	20	1,000	1,000	0.016
Fluorene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	400	1,000	1,000	0.019
Phenanthrene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	700	1,000	100	0.240
Anthracene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	1,000	1,000	1,000	0.085
Fluoranthene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	1,000	1,000	1,000	0.600
Pyrene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	700	700	700	0.665
Benzo(a)anthracene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	0.7	0.7	0.7	0.261
Chrysene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	7	7	7	0.384
Benzo(b)fluoranthene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	0.7	0.7	0.7	NA
Benzo(k)fluoranthene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	7	7	7	0.430
Benzo(a)pyrene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	0.7	0.7	0.7	0.430
Indeno(1,2,3-cd)pyrene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	0.7	0.7	0.7	NA
Dibenzo(a,h)anthracene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	0.7	0.7	0.7	0.063
Benzo(g,h,i)perylene	ND (0.010)	ND (0.012)	ND (0.011)	ND (0.012)	ND (0.012)	ND (0.013)	1,000	1,000	1,000	NA

NOTES:

1. Results in mg/Kg (milligrams per kilogram).
2. EPH: Extractable Petroleum Hydrocarbons.
3. ND(x) = constituent not detected at practical quantitation limits noted in parentheses.
3. PAH by GC/MS-SIM: Polyaromatic Hydrocarbons with Selected Ion Monitoring.
4. j: estimated concentration/ detected below standard laboratory reporting limits.
5. MCP: Massachusetts Contingency Plan.
6. NOAA ERL: National Oceanic and Atmospheric Administration Effects Range Low.
7. NA: Not Available.

**TABLE 5
WATER COLUMN ANALYTICAL RESULTS
BARGE B120 SPILL
BUZZARDS BAY, MASSACHUSETTS**

ANALYTE	SWAP-1: Near inlet of Allen's Pond					SWBJP-1: North end of Barney's Joy Point					NOAA SQUIRT Marine Surface Water Quality
	Sampling Date:	4/29/2003	4/30/2003	5/1/2003	5/5/2003	5/12/2003	4/29/2003	4/30/2003	5/1/2003	5/5/2003	5/12/2003
Napthalene	ND (<0.0094) U	0.012	ND (<0.0095) U	0.011	ND (<0.013) U	0.085	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	2,350
Methylnapthalene, 2-	0.019	0.030	0.022	0.024	0.021	0.28	0.019	0.025	0.025	ND (<0.014) U	300
Acenaphthylene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.0095) U	ND (<0.011) U	ND (<0.013) U	ND (<0.0093) U	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	300
Acenaphthene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.0095) U	ND (<0.011) U	ND (<0.013) U	0.020	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	970
Fluorene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.0095) U	ND (<0.011) U	ND (<0.013) U	0.024	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	300
Phenanthrene	ND (<0.0094) U	0.012	0.012	ND (<0.011) U	ND (<0.013) U	0.076	ND (<0.0097) U	0.014	0.014	ND (<0.014) U	7.7
Anthracene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.0095) U	ND (<0.011) U	ND (<0.013) U	ND (<0.0093) U	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	300
Fluoranthene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.0095) U	ND (<0.011) U	ND (<0.013) U	ND (<0.0093) U	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	40
Pyrene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.0095) U	ND (<0.011) U	ND (<0.013) U	0.024	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	300
Benzo[a]anthracene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.0095) U	ND (<0.011) U	ND (<0.013) U	0.010	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	300
Chrysene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.0095) U	ND (<0.011) U	0.026	0.030	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	300
Benzo[b]fluoranthene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.0095) U	ND (<0.011) U	0.033	ND (<0.0093) U	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	300
Benzo[k]fluoranthene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.0095) U	ND (<0.011) U	ND (<0.013) U	ND (<0.0093) U	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	300
Benzo[a]pyrene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.0095) U	ND (<0.011) U	ND (<0.013) U	ND (<0.0093) U	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	300
Indeno[1,2,3-cd]pyrene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.0095) U	ND (<0.011) U	ND (<0.013) U	ND (<0.0093) U	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	300
Dibenzo[a,h]anthracene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.0095) U	ND (<0.011) U	ND (<0.013) U	ND (<0.0093) U	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	300
Benzo[g,h,i]perylene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.0095) U	ND (<0.011) U	ND (<0.013) U	ND (<0.0093) U	ND (<0.0097) U	ND (<0.01) U	ND (<0.011) U	ND (<0.014) U	300
Other PAH	0.078	0.126	0.116	0.175	0.160	2.151	0.067	0.121	0.131	0.015	NA
Total PAH	0.097	0.180	0.150	0.210	0.240	2.700	0.086	0.160	0.170	0.015	300

Notes:

1. All concentrations in ug/l (equivalent to parts per billion).
2. C1-Napthalene reported value was used as a substitute for 2-Methylnapthalene.
3. ND() = constituent not detected at practical quantitation limit noted in parentheses.

Notes from lab's validation report:

4. Samples with undetected PAHs can be considered as undetected ("U" qualifier) above the reporting method detection limit.
5. Concentrations with positive results below target reporting method detection limit can be considered as estimated ("J" qualifier).
6. "Other PAH" is the sum of other PAH (excluding those listed above) detected in the laboratory analysis.
7. "Total PAH" is the sum of all PAH detected in the laboratory analysis.

TABLE 5
WATER COLUMN ANALYTICAL RESULTS
BARGE B120 SPILL
BUZZARDS BAY, MASSACHUSETTS

ANALYTE	SWCC-1: Near Entrance of Clark's Cove					SWWP-1: Southwest of Wilbur's Point					NOAA SQUIRT
	4/29/2003	4/30/2003	5/1/2003	5/5/2003	5/12/2003	4/29/2003	4/30/2003	5/1/2003	5/5/2003	5/12/2003	Marine Surface Water Quality
Sampling Date:	4/29/2003	4/30/2003	5/1/2003	5/5/2003	5/12/2003	4/29/2003	4/30/2003	5/1/2003	5/5/2003	5/12/2003	Criteria Maximum Concentration
Napthalene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	0.018	ND (<0.011) U	ND (<0.01) U	0.013	ND (<0.013) U	2,350
Methylnapthalene, 2-	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	0.011	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	0.011	0.015	ND (<0.013) U	300
Acenaphthylene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.01) U	ND (<0.0099) U	ND (<0.013) U	300
Acenaphthene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.01) U	ND (<0.0099) U	ND (<0.013) U	970
Fluorene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.01) U	ND (<0.0099) U	ND (<0.013) U	300
Phenanthrene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	0.010	ND (<0.011) U	0.014	0.011	ND (<0.013) U	7.7
Anthracene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.01) U	ND (<0.0099) U	ND (<0.013) U	300
Fluoranthene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.01) U	ND (<0.0099) U	ND (<0.013) U	40
Pyrene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.01) U	ND (<0.0099) U	ND (<0.013) U	300
Benzo[a]anthracene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.01) U	ND (<0.0099) U	ND (<0.013) U	300
Chrysene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.01) U	ND (<0.0099) U	ND (<0.013) U	300
Benzo[b]fluoranthene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.01) U	ND (<0.0099) U	ND (<0.013) U	300
Benzo[k]fluoranthene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.01) U	ND (<0.0099) U	ND (<0.013) U	300
Benzo[a]pyrene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.01) U	ND (<0.0099) U	ND (<0.013) U	300
Indeno[1,2,3-cd]pyrene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	0.011	ND (<0.011) U	ND (<0.01) U	ND (<0.0099) U	ND (<0.013) U	300
Dibenzo[a,h]anthracene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.01) U	ND (<0.0099) U	ND (<0.013) U	300
Benzo[g,h,i]perylene	ND (<0.0089) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.01) U	ND (<0.0099) U	ND (<0.013) U	300
Other PAH	0.009	0.011	ND	0.012	ND	0.071	0.014	0.435	0.061	0.028	NA
Total PAH	0.009	0.011	ND	0.023	ND	0.110	0.014	0.460	0.1	0.028	300

Notes:

1. All concentrations in ug/l (equivalent to parts per billion).
2. C1-Napthalene reported value was used as a substitute for 2-Methylnapthalene.
3. ND() = constituent not detected at practical quantitation limit noted in parentheses.

Notes from lab's validation report:

4. Samples with undetected PAHs can be considered as undetected ("U" qualifier) above the reporting method detection limit.
5. Concentrations with positive results below target reporting method detection limit can be considered as estimated ("J" qualifier).
6. "Other PAH" is the sum of other PAH (excluding those listed above) detected in the laboratory analysis.
7. "Total PAH" is the sum of all PAH detected in the laboratory analysis.

TABLE 5
WATER COLUMN ANALYTICAL RESULTS
BARGE B120 SPILL
BUZZARDS BAY, MASSACHUSETTS

ANALYTE	SWWI-1: One and a Half Miles South of West Island					SWWI-2: North of West Island					NOAA SQUIRT
	4/29/2003	4/30/2003	5/1/2003	5/5/2003	5/12/2003	4/29/2003	4/30/2003	5/1/2003	5/5/2003	5/12/2003	Marine Surface Water Quality
Sampling Date:	4/29/2003	4/30/2003	5/1/2003	5/5/2003	5/12/2003	4/29/2003	4/30/2003	5/1/2003	5/5/2003	5/12/2003	Criteria Maximum Concentration
Napthalene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	0.013	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	2,350
Methylnapthalene, 2-	0.027	0.028	0.029	ND (<0.01) U	ND (<0.013) U	0.0097	0.047	0.024	0.014	0.014	300
Acenaphthylene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	300
Acenaphthene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	970
Fluorene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	300
Phenanthrene	0.025	0.015	0.012	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	0.027	0.016	ND (<0.011) U	ND (<0.012) U	7.7
Anthracene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	300
Fluoranthene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	40
Pyrene	0.014	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	300
Benzo[a]anthracene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	300
Chrysene	0.013	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	300
Benzo[b]fluoranthene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	300
Benzo[k]fluoranthene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	300
Benzo[a]pyrene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	300
Indeno[1,2,3-cd]pyrene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	300
Dibenzo[a,h]anthracene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	300
Benzo[g,h,i]perylene	ND (<0.0094) U	ND (<0.0094) U	ND (<0.018) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0095) U	ND (<0.0092) U	ND (<0.011) U	ND (<0.011) U	ND (<0.012) U	300
Other PAH	0.771	0.227	0.079	0.039	0.014	0.047	0.553	0.250	0.065	0.049	NA
Total PAH	0.850	0.270	0.120	0.039	0.014	0.057	0.640	0.290	0.079	0.063	300

Notes:

1. All concentrations in ug/l (equivalent to parts per billion).
2. C1-Napthalene reported value was used as a substitute for 2-Methylnapthalene.
3. ND() = constituent not detected at practical quantitation limit noted in parentheses.

Notes from lab's validation report:

4. Samples with undetected PAHs can be considered as undetected ("U" qualifier) above the reporting method detection limit.
5. Concentrations with positive results below target reporting method detection limit can be considered as estimated ("J" qualifier).
6. "Other PAH" is the sum of other PAH (excluding those listed above) detected in the laboratory analysis.
7. "Total PAH" is the sum of all PAH detected in the laboratory analysis.

TABLE 5
WATER COLUMN ANALYTICAL RESULTS
BARGE B120 SPILL
BUZZARDS BAY, MASSACHUSETTS

ANALYTE	SWCL-1: Cleveland Ledge Lighthouse					SWCL-2: Three Mile South of Cleveland Ledge Lighthouse					NOAA SQUIRT
	Sampling Date:	4/29/2003	4/30/2003	5/1/2003	5/5/2003	5/12/2003	4/29/2003	4/30/2003	5/1/2003	5/5/2003	5/12/2003
											Criteria Maximum Concentration
Napthalene	ND (<0.011) U	0.016	ND (<0.0091) U	0.015	ND (<0.012) U	ND (<0.0095) U	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	2,350
Methylnapthalene, 2-	ND (<0.011) U	0.036	0.011	ND (<0.01) U	ND (<0.012) U	ND (<0.0095) U	0.015	0.016	ND (<0.01) U	ND (<0.013) U	300
Acenaphthylene	ND (<0.011) U	ND (<0.0097) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.012) U	ND (<0.0095) U	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	300
Acenaphthene	ND (<0.011) U	ND (<0.0097) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.012) U	ND (<0.0095) U	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	970
Fluorene	ND (<0.011) U	ND (<0.0097) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.012) U	ND (<0.0095) U	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	300
Phenanthrene	ND (<0.011) U	0.020	0.0095	ND (<0.01) U	ND (<0.012) U	0.017	0.014	0.012	ND (<0.01) U	ND (<0.013) U	7.7
Anthracene	ND (<0.011) U	ND (<0.0097) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.012) U	ND (<0.0095) U	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	300
Fluoranthene	ND (<0.011) U	ND (<0.0097) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.012) U	ND (<0.0095) U	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	40
Pyrene	ND (<0.011) U	ND (<0.0097) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.012) U	0.013	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	300
Benzo[a]anthracene	ND (<0.011) U	ND (<0.0097) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.012) U	ND (<0.0095) U	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	300
Chrysene	ND (<0.011) U	ND (<0.0097) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.012) U	0.013	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	300
Benzo[b]fluoranthene	ND (<0.011) U	ND (<0.0097) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.012) U	ND (<0.0095) U	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	300
Benzo[k]fluoranthene	ND (<0.011) U	ND (<0.0097) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.012) U	ND (<0.0095) U	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	300
Benzo[a]pyrene	ND (<0.011) U	ND (<0.0097) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.012) U	ND (<0.0095) U	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	300
Indeno[1,2,3-cd]pyrene	ND (<0.011) U	ND (<0.0097) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.012) U	ND (<0.0095) U	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	300
Dibenzo[a,h]anthracene	ND (<0.011) U	ND (<0.0097) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.012) U	ND (<0.0095) U	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	300
Benzo[g,h,i]perylene	ND (<0.011) U	ND (<0.0097) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.012) U	ND (<0.0095) U	ND (<0.0094) U	ND (<0.0093) U	ND (<0.01) U	ND (<0.013) U	300
Other PAH	ND	0.378	0.060	0.065	ND	0.667	0.131	0.102	0.130	ND	NA
Total PAH	ND	0.450	0.080	0.080	ND	0.710	0.160	0.130	0.130	ND	300

Notes:

1. All concentrations in ug/l (equivalent to parts per billion).
2. C1-Napthalene reported value was used as a substitute for 2-Methylnapthalene.
3. ND() = constituent not detected at practical quantitation limit noted in parentheses.

Notes from lab's validation report:

4. Samples with undetected PAHs can be considered as undetected ("U" qualifier) above the reporting method detection limit.
5. Concentrations with positive results below target reporting method detection limit can be considered as estimated ("J" qualifier).
6. "Other PAH" is the sum of other PAH (excluding those listed above) detected in the laboratory analysis.
7. "Total PAH" is the sum of all PAH detected in the laboratory analysis.

TABLE 5
WATER COLUMN ANALYTICAL RESULTS
BARGE B120 SPILL
BUZZARDS BAY, MASSACHUSETTS

ANALYTE	SWPI-1: Just North of Penikese Island				SWQH-1: Quicks Hole				NOAA SQUIRT
	Sampling Date:	4/30/2003	5/1/2003	5/5/2003	5/12/2003	4/30/2003	5/1/2003	5/5/2003	5/12/2003
Napthalene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	ND (<0.013) U	2,350
Methylnapthalene, 2-	0.017	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	0.0093	ND (<0.011) U	ND (<0.011) U	ND (<0.013) U	300
Acenaphthylene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	ND (<0.013) U	300
Acenaphthene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	ND (<0.013) U	970
Fluorene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	ND (<0.013) U	300
Phenanthrene	0.014	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	ND (<0.013) U	7.7
Anthracene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	ND (<0.013) U	300
Fluoranthene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	ND (<0.013) U	40
Pyrene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	ND (<0.013) U	300
Benzo[a]anthracene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	ND (<0.013) U	300
Chrysene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	0.023	300
Benzo[b]fluoranthene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	0.014	300
Benzo[k]fluoranthene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	0.021	300
Benzo[a]pyrene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	0.016	300
Indeno[1,2,3-cd]pyrene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	ND (<0.013) U	300
Dibenzo[a,h]anthracene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	0.021	300
Benzo[g,h,i]perylene	ND (<0.0096) U	ND (<0.0096) U	ND (<0.01) U	ND (<0.014) U	ND (<0.0093) U	ND (<0.011) U	ND (<0.011) U	0.017	300
Other PAH	0.119	0.024	0.024	ND	0.015	ND	ND	0.018	NA
Total PAH	0.150	0.024	0.024	ND	0.024	ND	ND	0.130	300

Notes:

1. All concentrations in ug/l (equivalent to parts per billion).
2. C1-Napthalene reported value was used as a substitute for 2-Methylnapthalene.
3. ND() = constituent not detected at practical quantitation limit noted in parentheses.

Notes from lab's validation report:

4. Samples with undetected PAHs can be considered as undetected ("U" qualifier) above the reporting method detection limit.
5. Concentrations with positive results below target reporting method detection limit can be considered as estimated ("J" qualifier).
6. "Other PAH" is the sum of other PAH (excluding those listed above) detected in the laboratory analysis.
7. "Total PAH" is the sum of all PAH detected in the laboratory analysis.

TABLE 5
WATER COLUMN ANALYTICAL RESULTS
BARGE B120 SPILL
BUZZARDS BAY, MASSACHUSETTS

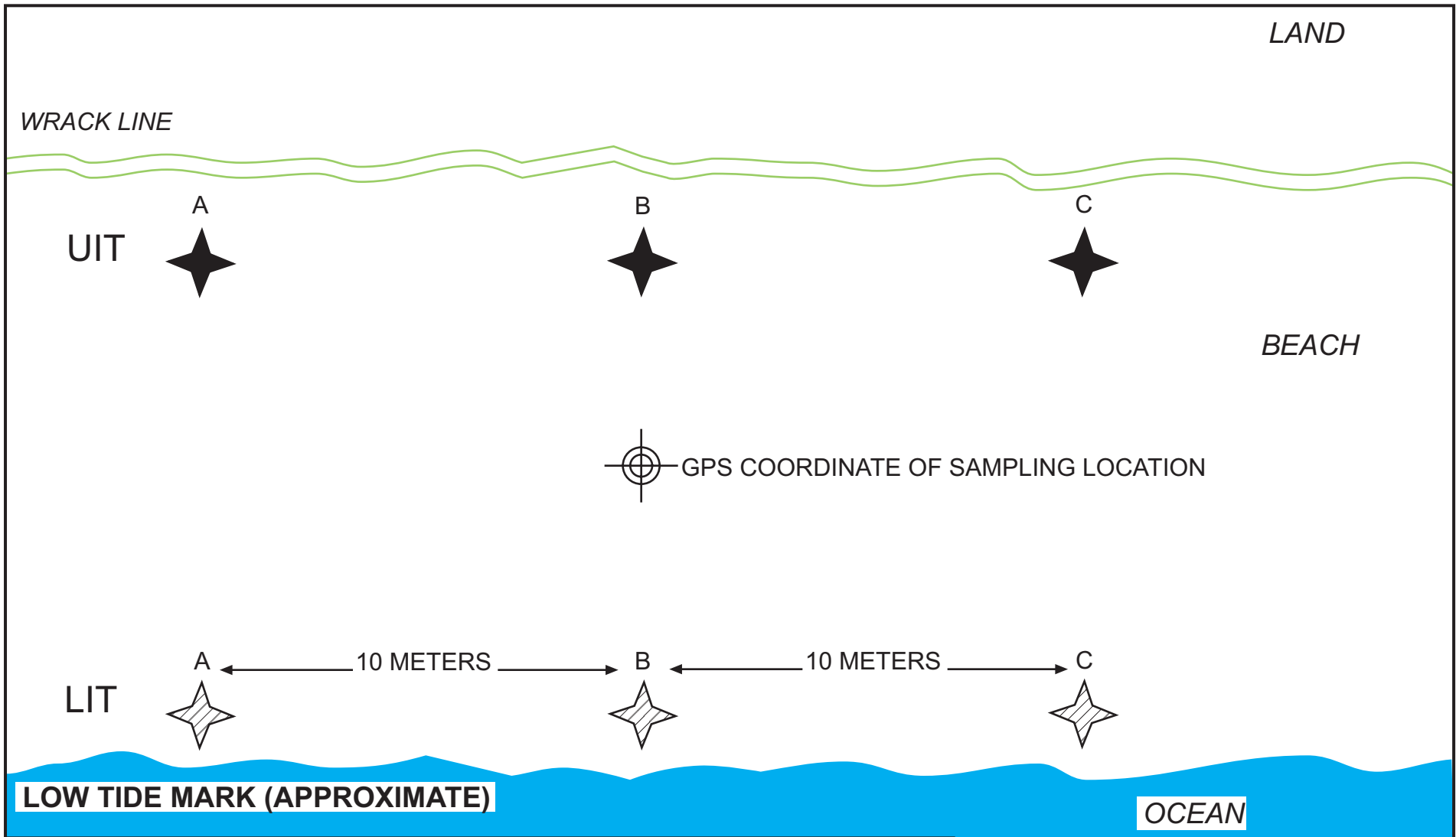
ANALYTE	SWCH-1: Cuttyhunk Island				DUP-1	NOAA SQUIRT Marine Surface Water Quality
	Sampling Date:	4/30/2003	5/1/2003	5/5/2003	5/12/2003	4/30/2003
Napthalene	ND (<0.01) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	0.010	2,350
Methylnapthalene, 2-	ND (<0.01) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	0.039	300
Acenaphthylene	ND (<0.01) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0088) U	300
Acenaphthene	ND (<0.01) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0088) U	970
Fluorene	ND (<0.01) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0088) U	300
Phenanthrene	0.011	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	0.017	7.7
Anthracene	ND (<0.01) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0088) U	300
Fluoranthene	0.014	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0088) U	40
Pyrene	0.047	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0088) U	300
Benzo[a]anthracene	ND (<0.01) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0088) U	300
Chrysene	ND (<0.01) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0088) U	300
Benzo[b]fluoranthene	ND (<0.01) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0088) U	300
Benzo[k]fluoranthene	ND (<0.01) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0088) U	300
Benzo[a]pyrene	ND (<0.01) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0088) U	300
Indeno[1,2,3-cd]pyrene	ND (<0.01) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0088) U	300
Dibenzo[a,h]anthracene	ND (<0.01) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0088) U	300
Benzo[g,h,i]perylene	ND (<0.01) U	ND (<0.0091) U	ND (<0.01) U	ND (<0.013) U	ND (<0.0088) U	300
Other PAH	0.000	ND	ND	ND	0.314	NA
Total PAH	0.072	ND	ND	ND	0.380	300

Notes:



1. All concentrations in ug/l (equivalent to parts per billion).
2. C1-Napthalene reported value was used as a substitute for 2-Methylnapthalene.
3. ND() = constituent not detected at practical quantitation limit noted in parentheses.

Notes from lab's validation report:

4. Samples with undetected PAHs can be considered as undetected ("U" qualifier) above the reporting method detection limit.
5. Concentrations with positive results below target reporting method detection limit can be considered as estimated ("J" qualifier).
6. "Other PAH" is the sum of other PAH (excluding those listed above) detected in the laboratory analysis.
7. "Total PAH" is the sum of all PAH detected in the laboratory analysis.



LEGEND

-   COMPOSITE SOIL SAMPLE
- UIT UPPER INTERTIDAL (3 POINT COMPOSITE)
- LIT LOWER INTERTIDAL(3 POINT COMPOSITE)



PROJECT:
Bouchard Barge 120 Oil Spill

LOCATION:
Buzzards Bay, Massachusetts

TITLE:
COMPOSITE SOIL SAMPLE LAYOUT

DESIGNED: LAC	DRAWN: LMR	CHECKED: KDT	APPROVED: RJW	FIGURE #: 4
SCALE: Not to Scale	DATE: 4/14/04	FILE: FIGURE4 RAO	PROJECT #: 3871-000	

NOTE: SAMPLES WERE COLLECTED FROM THE MIDDLE INTERTIDAL ZONE FROM SELECTED LOCATIONS USING THE SPACING AND COMPOSITING DESCRIBED ABOVE.