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Feasibility Study for Marine Sediment/ Management of Migration

McAllister Point Landfill
Naval Station Newport
Newport, Rhode Island

Northern Division
Naval Facilities Engineering Command
Contract Number N62472-90-D-1298
Contract Task Order 0218

February 1999

TETRA TECH NUS, INC.

FEASIBILITY STUDY
for Marine Sediment/Management of Migration
MCALLISTER POINT LANDFILL
NAVAL STATION NEWPORT - Newport, Rhode Island

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C-NAVY-5-99-1349W

May 3, 1999

COPY

Project Number N5278

Mr. James Shafer
Remedial Project Manager
Northern Division, Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop 82
Lester, Pennsylvania 19113

Reference: CLEAN Contract No. N62472-90-D-1298
Contract Task Order 0218

Subject: Marine Sediment Feasibility Study Report – Final, Revision 1 (Section 5)
McAllister Point Landfill,
Naval Station Newport (NSN), Newport, Rhode Island

Dear Mr. Shafer:

Enclosed are four copies of the revised Section 5 of the Final Marine Sediment Feasibility Study (FS) Report for the McAllister Point Landfill site. Please replace the section 5 text and tables in the February 1999 Final FS report with the revised text and tables provided here.

Section 5 of the Final FS has been revised to address the comments in EPA's March 8, 1999 letter regarding compliance with ARARs. The revisions were made in accordance with the March 8 letter and subsequent telephone conversations between TtNUS, the Navy, and EPA.

Pursuant to your request, copies of the report have been sent directly to EPA, RIDEM, and other interested parties. Please contact me if you have any questions about this transmittal.

Sincerely,

Diane K. McKenna

Diane K. McKenna
Project Manager

DM:rt

Enclosure

c: M. Griffin, NSN (w/enc.-4)
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C-NAVY-2-99-1323W

February 10, 1999

Project Number N5278

COPY

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Remedial Project Manager
Northern Division, Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop 82
Lester, Pennsylvania 19113

Reference: CLEAN Contract No. N62472-90-D-1298
Contract Task Order 0218

Subject: Final Feasibility Study Report for Marine Sediment/Management of Migration, McAllister Point Landfill, Naval Station Newport (NSN), Newport, Rhode Island

Dear Mr. Shafer:

Enclosed are four copies of the Final Feasibility Study (FS) Report for Marine Sediment and Management of Migration at the McAllister Point Landfill. Pursuant to your request, copies of the report have been forwarded directly to EPA, the RIDEM, and other interested parties.

The report addresses the written comments provided by the EPA, RIDEM, and NOAA on the preliminary final FS report. Revisions to the report were made in accordance with the discussions and correspondence with the regulatory agencies since the submittal of the preliminary final report.

Please contact me if you have any questions about this transmittal.

Sincerely,

Diane K. McKenna

Diane K. McKenna
Project Manager

DM:rt

Enclosure

c: M. Griffin, NSN (w/enc.-4)
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File N5278-8.0 (w/enc.)/N5278-3.2 (w/o enc.)

W5297174F

FEASIBILITY STUDY
For Marine Sediment/Management of Migration

MCALLISTER POINT LANDFILL
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION - NAVY (CLEAN) CONTRACT

Submitted to:
Northern Division
Environmental Branch, Code 1812BJH
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop # 2
Lester, Pennsylvania 19113-2090

Submitted by:
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Contract Number N62472-90-D-1298
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February 1999

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N5278-8.0
Final FS Rev. 1
Section 5
5/3/99

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LIST OF ACRONYMS

AAL	Rhode Island Ambient Air Limit
ACOE	U.S. Army Corps of Engineers
ARAR	Applicable or Relevant and Appropriate Requirement
AVS	Acid Volatile Sulfides
AWQC	Ambient Water Quality Criteria
B&RE	Brown & Root Environmental
CAD	Contained Aquatic Disposal
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of Concern
CT	Central Tendency
DAF	Dissolved Air Flotation
EPA	U.S. Environmental Protection Agency
ERA	Marine Ecological Risk Assessment
ER-L	Effects Range-Low: NOAA Adverse Effects Benchmark Value For Sediment
ER-M	Effects Range-Median: NOAA Adverse Effects Benchmark Value For Sediment
FFA	Federal Facilities Interagency Agreement
FS	Feasibility Study
FWENC	Foster Wheeler Environmental Corporation
GRA	General Response Action
HHRA	Human Health Risk Assessment
HI	Hazard Index Ratio
IAS	Initial Assessment Study
IEUBK	Integrated Exposure and Uptake Biokinetic Model
IRP	Installation Restoration Program
IU/BK	Integrated Uptake/Biokinetic Model
MCL	Maximum Contaminant Level
mg/kg	milligram per kilogram
mg/l	milligram per liter
MLW	Mean Low Water Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan

LIST OF ACRONYMS (Continued)

NETC	Naval Education and Training Center
NIOSH	National Institute for Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Administration
NORTHDIV	Northern Division
NPL	National Priorities List
NS	Nearshore
O&M	Operation and Maintenance
OS	Offshore
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PDI	Pre-Design Investigation
POTW	Publicly-Owned Treatment Works
PPE	Personnel Protective Equipment
PRG	Preliminary Remedial Goal
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RfD	Risk Reference Dose
RI	Remedial Investigation
RIDEM	Rhode Island Department of Environmental Management
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SAIC	Science Applications International Corporation
SARA	Superfund Amendment and Reauthorization Act
SEM	Simultaneously Extracted Metals
SER	Shore Establishment Realignment Program
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List

LIST OF ACRONYMS (Continued)

TBC	To Be Considered Guidance
TCL	Target Compound List
TCLP	Toxic Characteristic Leaching Procedure
TCR	Tissue Concentration Ratio
TEV-HQ	Threshold Effects Value - Hazard Quotient
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TRC	TRC Environmental Corporation
TSDF	Treatment, Storage, and Disposal Facility
TSS	Total Suspended Solids
TWA	Time-Weighted Average Concentration
µg/dl	microgram per deciliter
µg/kg	microgram per kilogram
µg/l	microgram per liter
URI	University of Rhode Island
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

OVERVIEW

This feasibility study (FS) report relates the process used to evaluate a variety of approaches to address contaminated marine sediment and landfill debris in the nearshore and offshore areas off the McAllister Point Landfill at Naval Station Newport in Newport, Rhode Island. Five alternatives are presented for consideration as the Navy's cleanup strategy for the nearshore portions of the site. Four alternatives are presented for consideration for the offshore portions of the site.

The FS also evaluated available data for site groundwater and landfill gas to determine whether they were media of concern for the FS. It was concluded that groundwater and landfill gas do not pose a risk to human health or the environment, therefore they were not identified as media of concern for this FS. Remedial alternatives were not developed in the FS to address groundwater or landfill gas.

BACKGROUND

The Navy used the information from several studies to develop the FS. These included several phases of remedial investigations, a human health risk assessment, and a marine ecological risk assessment. The main findings of these investigations pertinent to the FS are summarized below.

Investigations of the areas offshore of the McAllister Point Landfill concluded that landfill materials intermixed with contaminated sediment are present seaward of the landfill along much of its length and extend out as far as 70 feet from the revetment in the central portion of the landfill. The landfill materials are estimated to be up to 15 feet thick at the revetment in the central portion of the landfill and taper to less than 1 foot at the north and south ends of the landfill. The sediment contains elevated concentrations of polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and metals. Landfill materials observed included ash, glass, pottery, brick, large metal pieces, and submarine netting.

A marine human health risk assessment was performed to estimate the potential for adverse effects to human health from the contaminants that are present in marine sediment and shellfish. This study found a potential for increased risk of cancer and non cancer health effects to adults ingesting 36 meals per year or more of shellfish taken from the nearshore areas off McAllister Point Landfill (cancer risk of 9 in 10,000 to 8 in 1,000 and non-cancer HI of 4 to 40). Both cancer and non-cancer risks were

also identified for children ingesting 3 meals per year or more of shellfish from the site (cancer risk of 2 in 100,000 to 2 in 10,000 and non-cancer HI of 0.5 to 5). The study also found a potential for increased risk of cancer, but no increased risk of non-cancer health effects, to adults ingesting 3 meals per year or more of shellfish taken from the site (cancer risk of 2 in 10,000 to 3 in 10,000 and non-cancer HI of less than 1). Negligible increases of risk were estimated from recreational activities such as swimming, wading, and collection of shellfish.

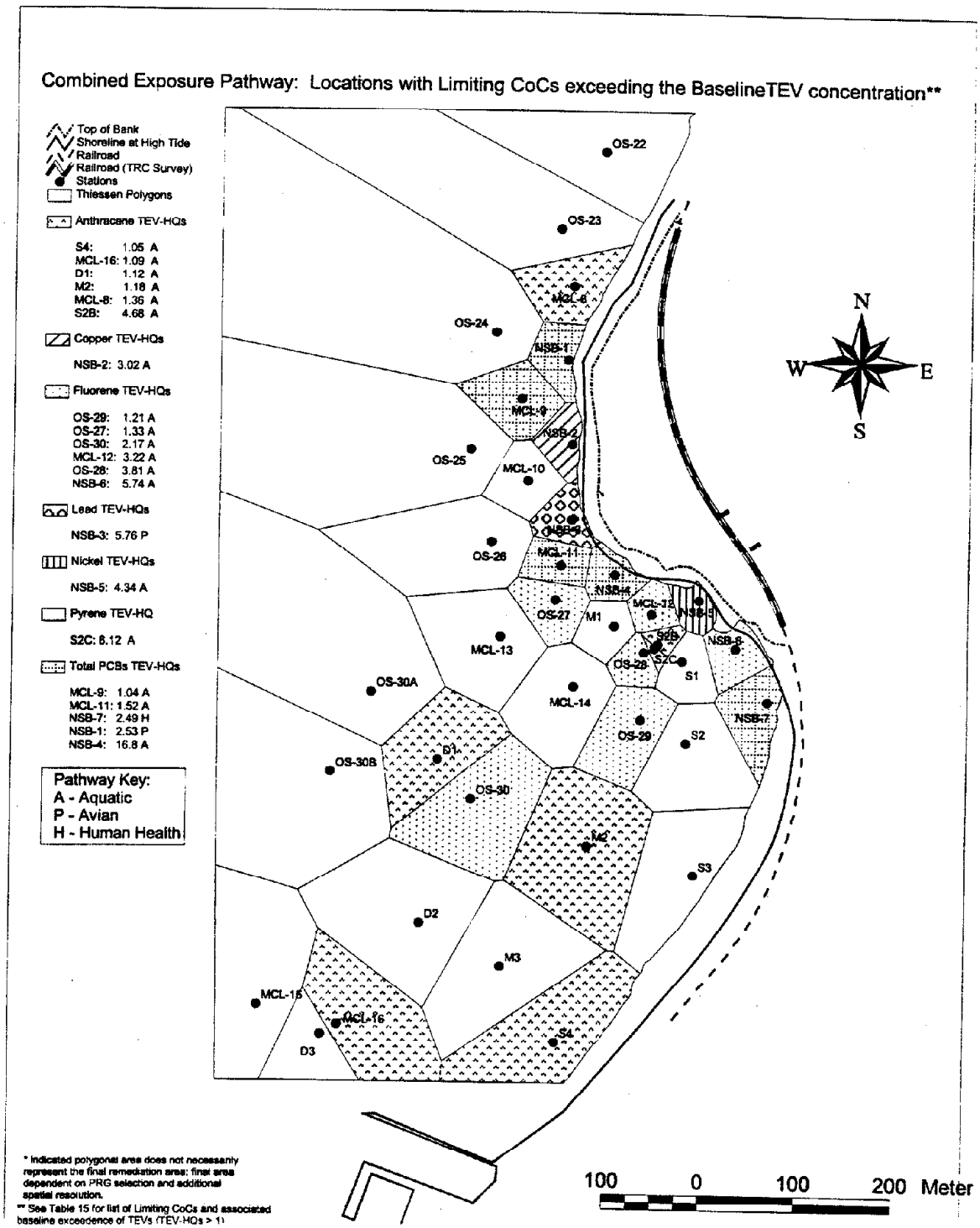
The marine ecological risk assessment was performed to estimate the potential for adverse effects to aquatic organisms (infaunal benthic communities, blue mussels, and fish) and shore birds from the contaminants that are present in marine sediment and marine organisms. The risk assessment found an increased potential for adverse health effects to the ecological systems from their exposure to contaminants in sediment and aquatic organisms. The highest potential for risk was found in the nearshore intertidal area off the central portion of the landfill.

FEASIBILITY STUDY PROCESS

The FS identified two sets of preliminary remediation goals, or PRGs: a baseline set and a recommended set. PRGs are concentrations of contaminants that, if allowed to remain in the marine sediment, are not anticipated to pose an increased risk of adverse effects to human health or the environment. Sediments that contain concentrations of contaminants in excess of the baseline and recommended PRGs were identified and are depicted on Figures ES-1 and ES-2, respectively. The baseline PRGs were used in the FS as a conservative approach to delineate the areas that may require remediation. However, it is advised that the recommended PRGs be used as the final cleanup criteria.

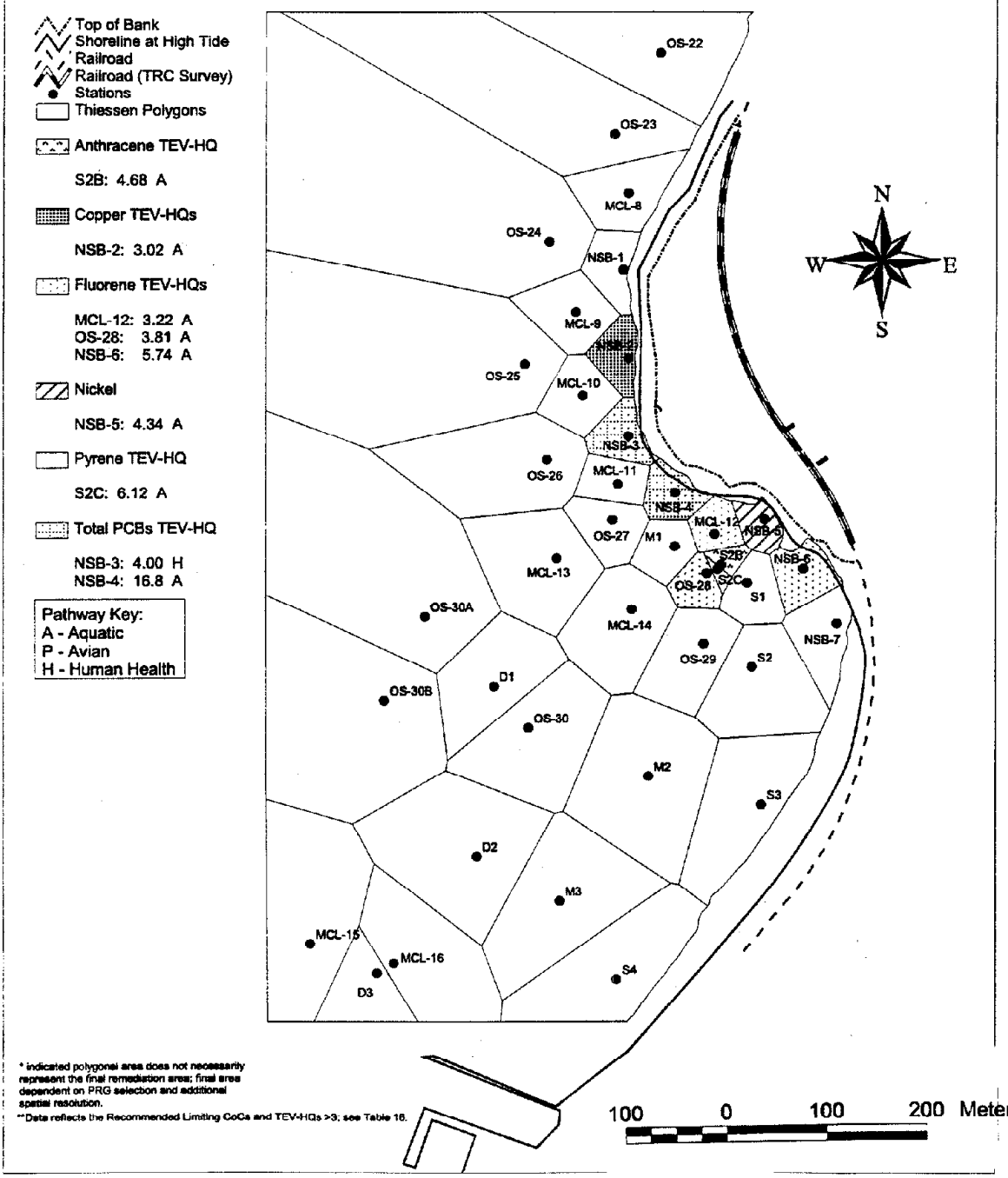
The FS evaluated a range of options to address the marine sediment. Current technologies were evaluated to determine if they could be effectively used to protect human health and the environment by containing, removing, or treating the contaminants and if they could be implemented in the areas where the contaminants are present. General technology options assessed were capping the sediment, dredging sediment and removing it off site, restricting access to persons collecting shellfish, and monitoring sediment concentrations to assess any changes in site conditions and risk.

The remedial action alternatives developed to address the contaminants in the marine sediment were evaluated against seven criteria identified in the National Contingency Plan (NCP): overall protection, compliance with other environmental laws, long-term effectiveness, reduction of toxicity through



AREAS EXCEEDING BASELINE PRGs	FIGURE ES-1
McALLISTER POINT FEASIBILITY STUDY	
NEWPORT, RHODE ISLAND	TETRA TECH NUS, INC.
Source: Preliminary Remediation Goals for NETC McAllister Point Landfill SAIC Corp., May, 1998	REV.: 0 DATE: 02 OCT 98 ACAD NAME: DWG\NAVY\MC_PT\FS\TEV_HQ1A.DWG
	55 Jonspin Road Wilmington, MA 01887 (978)658-7899

Combined Exposure Pathway: Locations with Limiting CoCs exceeding the Recommended TEV concentration*



* indicated polygonal area does not necessarily represent the final remediation area; final area dependent on PRG selection and additional spatial resolution.

**Data reflects the Recommended Limiting CoCs and TEV-HQs >3; see Table 16.

AREAS EXCEEDING RECOMMENDED PRGs	FIGURE ES-2
McALLISTER POINT FEASIBILITY STUDY	TETRA TECH NUS, INC.
NEWPORT, RHODE ISLAND	55 Jonspin Road Wilmington, MA 01887 (978)658-7899
Source: Preliminary Remediation Goals for NETC McAllister Point Landfill SAIC Corp., May, 1998	REV.: 0 DATE: 02 OCT 98 ACAD NAME: DWG\NAVY\MC_PT\FS\TEV_HQ3.DWG

treatment, short-term effectiveness, implementability, and cost (for a 30-year period). Two additional criteria identified in the NCP, state and public acceptance, will be evaluated in the Record of Decision following the receipt of public and regulatory comments on the Final FS and the proposed remedial action plan.

Remedial alternatives were developed for two broad areas of the site: 1) the nearshore and elevated-risk offshore (NS/ER) area, which includes the intertidal zone and a subtidal area south of the landfill that had high contaminant concentrations in sediment and risks similar to those identified for the intertidal zone, and 2) the remaining offshore (OS) area, which had lower contaminant concentrations than those in the NS/ER area. The alternatives evaluated for the nearshore and elevated-risk offshore areas are: 1) no action, 2) limited action (access limitations and long-term monitoring), 3) capping, 4) capping with dredging to match existing grade, and 5) dredging and disposal. The alternatives evaluated for the OS areas are: 1) no action, 2) limited action (long-term monitoring), 3) capping, and 4) dredging and disposal. The FS discusses how each alternative meets the seven criteria and then evaluates how well each compares to one another.

SUMMARY OF NEARSHORE/ELEVATED-RISK OFFSHORE ALTERNATIVES

Alternative NS/ER-1 (no action) is evaluated as a baseline to which other alternatives can be compared. It would provide no added protection of human health or the environment from the contaminants. An existing state-imposed shellfishing ban in the area of Narragansett Bay offshore of NSN may provide some protection of human health, but the adequacy of enforcement efforts is unknown. Since contaminants would remain at the site, a 5-year review would be required under the law. The present worth cost of this alternative is estimated at $46,000.

Alternative NS/ER- 2 (limited action) includes installing fencing, buoys, and signs to notify people of the existing shellfishing ban and the hazards associated with the contaminated sediments to discourage use of the area for shellfishing and general recreation. The access restrictions would be maintained and replaced as needed. Annual monitoring would be performed to evaluate any changes in contaminant concentrations or site risk. A review of the alternative would be performed every 5 years to evaluate the need to take further action or to discontinue this action. This alternative would provide limited protection to humans, but not to the environment. The present worth cost of this alternative is estimated at $656,000.

Alternative NS/ER-3 (capping) consists of constructing a cap over the impacted sediment. The cap would be 2 to 3 feet thick and would cover approximately 6.1 acres of intertidal, subtidal, and upland area. The cap would be inspected quarterly and maintained as needed. Annual monitoring would be performed to evaluate the long-term effectiveness of the cap and identify any changes in site risk. A review of the alternative would be performed every 5 years to evaluate the need to take further action or to discontinue this action. This alternative would protect humans and the environment, provided that the cap could be constructed and maintained to prevent washout and prevent adverse effects from migration of dissolved contaminants through the cap. Inadequate data are available to predict the long-term effectiveness of the proposed cap. Capping would cause short-term impacts to the aquatic habitat that could be mitigated by proper implementation. However, it would also permanently fill approximately 6 acres of aquatic habitat, causing a loss of aquatic habitat converted to upland and the conversion of subtidal habitat to intertidal habitat. The loss of aquatic habitat would require off-site mitigation. The present worth cost of this alternative is estimated at $12,933,000.

Alternative NS/ER-4 (capping with dredging to match existing grade) is similar to Alternative NS/ER-3, but approximately 2 to 3 feet of contaminated materials would be dredged before constructing the cap so that the top surface of the cap matches the existing grade. Areas where no contaminated sediment remains after dredging would be backfilled with clean fill. Cap inspection and maintenance and long-term monitoring would be the same as described for Alternative NS/ER-3. A review of the alternative would be performed every 5 years to evaluate the need to take further action or to discontinue this action. This alternative would provide overall protection similar to Alternative NS/ER-3, except that a large volume (approximately 22,000 cubic yards) of contaminated sediment would be removed and disposed in a secured landfill (McAllister Point Landfill or an approved off-base landfill), resulting in a smaller volume contaminated sediments left in place and a smaller capped area to maintain. Inadequate data are available to predict the long-term effectiveness of the proposed cap. The short-term impacts to aquatic habitat from this alternative would be similar to those caused by Alternative NS/ER-3, but no long-term impacts to the environment would be caused by this action. The present worth cost of this alternative is estimated at $18,129,000.

Alternative NS/ER-5 (dredging and disposal) includes dredging and disposing of contaminated sediment in a secured landfill. All sediment with contaminants in excess of the selected PRGs would be removed and disposed in McAllister Point Landfill and/or an approved off-base landfill. Based on current data, approximately 34,000 cubic yards of sediment would be removed. Because it would permanently remove all contaminated sediment from the site and require no maintenance to ensure long-term

effectiveness, this alternative would provide the most protection to humans and the environment. However, removing all contaminated sediment from the area adjacent to the landfill revetment may be difficult to do without compromising the integrity of the landfill. Further investigation is needed to determine whether an effective shoring system could be installed to allow complete sediment removal. If an effective shoring system could not be installed, some sediment at the base of the revetment would have to be left in place. The short-term impacts to aquatic habitat from this alternative would be similar to those caused by Alternatives NS/ER-3 and NS/ER-4; no long-term impacts to the environment would be caused by this action. The present worth cost of this alternative is estimated at $22,619,000.

SUMMARY OF OFFSHORE ALTERNATIVES

Alternative OS-1 (no action) is evaluated as a baseline to which other alternatives can be compared. It would provide no added protection of the environment from the contaminants (no risks to human health were identified for the area). Sediments with relatively low contaminant concentrations (above the baseline PRGs, but below recommended PRGs) would remain on site and would continue to pose a potential risk to marine organisms. Since contaminants would remain at the site, a 5-year review would be required under the law. The present worth cost of this alternative is estimated at $46,000.

Alternative OS-2 (limited action) includes annual monitoring to evaluate any changes in contaminant concentrations or changes in site risk. A review of the alternative would be performed every 5 years to evaluate the need to take further action or to discontinue this action. This alternative would provide protection of the environment and ecological receptors by monitoring changes in sediment quality and ecological risk. This alternative is considered to be adequately protective considering the low contaminant concentrations and non-uniform distribution of contaminated sediment in the offshore area. The present worth cost of this alternative is estimated at $657,000.

Alternative OS-3 (capping) consists of constructing a cap over the impacted sediment. The cap would be 2 to 3 feet thick and would cover approximately 40.9 acres of subtidal area. The cap would be inspected quarterly and maintained as needed. Annual monitoring would be performed to evaluate the long-term effectiveness of the cap and identify any changes in site risk. A review of the alternative would be performed every 5 years to evaluate the need to take further action or to discontinue this action. This alternative would protect the environment from exposure to the capped sediment provided that the cap could be constructed and maintained to prevent washout and prevent adverse effects from

migration of dissolved contaminants through the cap. However, installation of the cap would result in short term and long-term impacts to the environment that may be greater than the benefits provided by containing the contaminated sediments. Short-term impacts would include temporary destruction of the hard-bottom aquatic community in the capped area and potential damage to sensitive species outside the capped area from sediment resuspension and migration. Long-term impacts would include destruction of the eelgrass beds within the capped area; destruction of eelgrass beds would be difficult or impossible to fully mitigate. The present worth cost of this alternative is estimated at $20,904,000.

Alternative OS-4 (dredging and disposal) includes dredging and disposing of contaminated sediment in a secured landfill. All sediment with contaminants in excess of the selected PRGs would be removed and disposed in McAllister Point Landfill and/or an approved off-base landfill. Based on current data, approximately 99,000 cubic yards of sediment would be removed. Because it would permanently remove all contaminated sediment from the site and require no maintenance to ensure long-term effectiveness, this alternative would provide the permanent protection of the environment. However, like capping, dredging would result in short-term and long-term impacts to the environment that may be greater than the benefits provided by removing the contaminated sediments. The short- and long-term impacts of this Alternative would be similar to those caused by Alternative OS-3. The present worth cost of this alternative is estimated at $44,043,000.

1.0 INTRODUCTION

At the request of the U.S. Navy ("the Navy"), Tetra Tech NUS (TtNUS) has completed a Feasibility Study (FS) for the McAllister Point Landfill - Site 01 (the site), located at Naval Station Newport (NSN) (formerly the Naval Education and Training Center (NETC)) in Newport, Rhode Island. The FS has been conducted under the Navy's Installation Restoration Program (IRP) in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA). This work is being conducted under Contract Number N62472-90-D-1298 for the Northern Division (NORTHDIV) Naval Facilities Engineering Command headquartered in Lester, Pennsylvania. [Note: The assets of Brown & Root Environmental (B&R Environmental) were purchased on January 1, 1998 by Tetra Tech NUS, Inc.]

This FS has been developed to address marine sediment, and manage groundwater and landfill gas migration concerns at the McAllister Point Landfill. The purpose of this report is to determine whether remedial actions are necessary to address contaminants in marine sediment, groundwater, and landfill gas, and if remedial actions are necessary, to identify and evaluate a range of possible remedial alternatives for each medium. This report supplements the *(Draft Final) Focused Feasibility Study Report, Site 01 - McAllister Point Landfill* (TRC, 1993) and the Record of Decision (ROD) for the site signed in September 1993 that selected a low permeability cap as the final remedy for the source control (landfill materials) operable unit.

This FS was developed based on the results of several studies conducted to assess the nature and extent of contamination in marine sediments adjacent to the landfill, and the human health and ecological risks posed by these sediments and to assess the potential impact of the landfill capping on groundwater quality and landfill gas generation. Results of these studies were presented in the *(Final) McAllister Point Landfill Marine Ecological Risk Assessment Report* (SAIC/URI, 1997) (the marine ERA); the *Technical Memorandum for Phase III Investigations, McAllister Point Landfill Marine Ecological Risk Assessment* (B&R Environmental, 1997a) (the Phase III Technical Memorandum); the *(Draft Final) Remedial Investigation (RI) Report and Human Health Risk Assessment (HHRA)* (B&R Environmental, 1997b); and the *McAllister Point Landfill Quarterly Monitoring Reports* (B&R Environmental, 1997c and 1997d). This document summarizes the conclusions of these reports pertinent to the media of concern for this FS (marine sediment, groundwater, and landfill gas).

The FS report is divided into five sections. This section of the report, Section 1.0 provides background information on the McAllister Point Landfill, including the site location and description; site history; site geology, and hydrogeology; contaminant nature and distribution in the media of concern; and the results of the site investigations and risk assessments.

Section 2.0 describes the development of remediation goals, including identification of potential applicable or relevant and appropriate requirements (ARARs), and media and chemicals of concern for the FS, and development of remedial action objectives (RAOs) and preliminary remediation goals (PRGs).

Section 3.0 describes the general response actions (GRAs), and presents the identification and preliminary screening of potential remedial technologies and the detailed evaluation of candidate technologies and process options.

Section 4.0 describes the remedial alternative development process and provides detailed descriptions of the proposed remedial alternatives for marine sediment.

Section 5.0 provides a detailed analysis of remedial alternatives evaluated based on the criteria specified by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) 40 CFR 300. This section also provides a comparative analysis of the remedial alternatives.

1.1 SITE LOCATION AND DESCRIPTION

The NSN is located approximately 60 miles southwest of Boston, Massachusetts and 25 miles south of Providence, Rhode Island. It occupies approximately 1,063 acres, with portions of the facility located in the City of Newport and Towns of Middletown and Portsmouth, Rhode Island. The facility layout is long and narrow, following the western shoreline of Aquidneck Island for nearly 6 miles facing the east passage of Narragansett Bay. A general location map of the NSN is provided as Figure 1-1.

The McAllister Point Landfill Site is located in the central portion of the NSN (see Figure 1-2). The site is approximately 11.5 acres situated between Defense Highway and Narragansett Bay. A right-of-way for the Rhode Island Department of Transportation (RIDOT) runs in a north-south direction along the eastern side of the site. Site access is from Defense Highway, through a gate in the south-central portion of the site (see Figure 1-3).

Currently, the McAllister Point Landfill is covered by a multi-media low-permeability cap that prevents direct exposure to and further erosion of landfill materials. This cap was constructed in 1995 and 1996. The surface of the cap is vegetated and graded to promote runoff of precipitation, thus minimizing potential infiltration that could cause further leaching of landfill contaminants. The landfill slope facing Narragansett Bay is covered with a stone revetment to protect the cap from wave erosion. The capped area, excluding the revetment, is fenced; however, access to the shoreline adjacent to the landfill is not entirely restricted.

A passive gas vent system was installed during construction of the cap to dissipate potential offgas buildup that could disturb the capping materials. The gas vents are equipped with sampling ports for use in long-term monitoring. A network of groundwater monitoring wells on site are available for use as part of the long-term monitoring program.

1.2 SITE HISTORY

The NSN facility has been in use by the Navy since the era of the Civil War. During World Wars I and II, military activities at the facility increased significantly and the base provided housing for many servicemen. In subsequent peacetime years, use of on-site facilities was slowly phased out until Newport became the headquarters of the Commander Cruiser-Destroyer Force Atlantic in 1962. In April 1973, the Shore Establishment Realignment Program (SER) resulted in the reorganization of naval forces, and activity again declined. This reorganization resulted in the Navy excessing some 1,629 acres of its 2,420 acres. Portions of the facility are currently leased by the Navy to the State of Rhode Island Port Authority and Economic Development Corporation. Some of these areas are, in turn, subleased to private enterprises.

The entire NSN was listed on the U.S. Environmental Protection Agency (EPA) National Priorities List (NPL) of abandoned or uncontrolled hazardous waste sites in November 1989. The NPL identifies those sites that pose a significant threat to the public health and environment. McAllister Point Landfill was listed as one of the sites requiring RI/FS activities. It is currently being studied by the Navy under the Department of Defense Installation Restoration Program (IRP). This program is similar to the EPA's Superfund Program authorized under CERCLA in 1980, as amended by SARA in 1986.

A Federal Facilities Interagency Agreement (FFA) for NSN was signed by the Navy, the State of Rhode Island, and the EPA on March 23, 1992. The FFA outlines response action requirements

under the Department of Defense IRP at NSN. The FFA was developed, in part, to ensure that environmental impacts associated with past and present activities at NSN are thoroughly investigated and remediated, as necessary.

The McAllister Point Landfill was used as a sanitary waste landfill over a 20-year period beginning in 1955, following the closure of the Melville North Landfill. As the site was used, the landfill was extended out into the bay using the wastes as fill material.

During the years the site was operational, it received all the wastes generated at the naval complex. This included wastes from all the operational areas (machine shops, ship repair, etc.), Navy housing areas (domestic refuse), and from the 55 ships that were homeported at Newport before 1973. The materials disposed of in the landfill included construction debris, spent acids, paints, solvents, waste oils (diesel, lube and fuel), and PCB-contaminated transformer oil. The northern portion of the site was reportedly used to dispose of submarine nets, anchors, buoys, and other materials from the World War II era (Parente, 1997).

In interviews conducted for the Initial Assessment Study (Envirodyne Engineers, 1983), operators of the landfill reported that it was common practice for barrels filled with liquids to be brought to the landfill. These barrels contained paints, oils, and other unidentifiable liquids. The barrels were crushed by a bulldozer before being covered. Base personnel also reported that at least two transformers, each of which contained approximately 100 gallons of PCB-contaminated oil, and at least four or five capacitors, were disposed of in the landfill. The Superfund notification for McAllister Point Landfill indicated that PCBs were disposed of at the site.

In the initial years, wastes were simply trucked to the site, spread out with a bulldozer, and then covered over. In the late-1950s or early-1960s, an incinerator was built at the landfill. From that time through about 1970, approximately 98 percent of all the wastes were burned before being disposed of in the landfill. The incinerator was closed about 1970 as a result of the air pollution it was causing. During the remaining years that the site was operational, all wastes were again disposed of directly into the landfill.

Operations at the site were discontinued in the mid-1970s. Thereafter, all wastes generated at NSN were disposed of at the City of Newport's transfer station. A final covering of soil 3-feet thick was placed over the McAllister Point Landfill upon its closure.

Following completion of the Phase I Remedial Investigation (RI) by TRC, a ROD was signed in September 1993 that selected a multi-media, low permeability cap as a source control measure for the landfill. Cap construction commenced in 1995 and was completed in October 1996. However, in April 1996, when cap construction resumed after a winter hiatus, it was noted that erosion had changed the shoreline and revealed the presence of additional landfill materials seaward of the new stone revetment in the area of nearshore sediment sample stations (NSB) NSB-2, NSB-3, and NSB-4 (B&R Environmental, 1997a) (see Figure 1-3). In November 1995, the intertidal zone (the sometimes submerged zone between the mean low water and mean high water lines) in those areas consisted of sand and gravel; in April 1996, approximately 1 foot of sand was absent from the surface in these areas, and landfill debris, consisting of wire, metal, concrete, asphalt, glass, and other material, was visible.

Subsequent investigations revealed that the landfill materials extend into Narragansett Bay well beyond the limits of the revetment. Based on data from off-shore borings, the landfill materials are estimated to be up to 15-feet thick at the toe of the revetment and extend more than 100 feet into the bay in some locations.

1.3 GEOLOGY AND HYDROGEOLOGY

This section presents a summary of the regional, and site geologic and hydrogeologic features. This information is based on the RI drilling program and data from previously published literature and reports of other contractors, which are presented in the *(Draft Final) RI Report* (B&R Environmental, 1997b).

1.3.1 Regional Geology and Hydrogeology

The NSN site is located at the southeastern end of the Narragansett Basin. The rocks of the Narragansett Basin are non-marine sedimentary rocks of Pennsylvanian age. The bedrock at the NSN facility is almost entirely of the Rhode Island Formation. A few areas of thick conglomerates are present within the Rhode Island Formation. They consist of pebbles, cobbles, and boulders interbedded with sandstone and graywacke. Coasters Harbor Island (Figure 1-2) is mostly covered with this conglomerate material. Overlying the Pennsylvanian rocks of the Narragansett Basin are surficial deposits of Pleistocene sediments. These unconsolidated, glacial sediments range in thickness from 1 to 150 feet and consist of till, sand, gravel, and silt.

Many areas on Aquidneck Island, on which the NSN is located, obtain potable water from wells. Groundwater is obtained from the unconsolidated glacial till and outwash deposits, and from the underlying Pennsylvanian bedrock. The average depth to groundwater is 14 feet. In the NSN area, glacial till deposits are typically less than 20 feet thick. Well yields in these materials range from 1 to 120 gallons per minute. Although till is considered an unconsolidated deposit, the upper limit of this well yield is likely from an outwash deposit that is well sorted and stratified. Till wells typically yield a few hundred gallons of water per day or less than 1 gallon per minute. Bedrock well yields range from less than 1 to as much as 55 gallons per minute and are highly dependent on the presence of joints and fractures. Most groundwater is soft or moderately hard. In scattered locations, pumping has led to salt water intrusion.

1.3.2 Site Geology and Hydrogeology

In general, the overburden material at the site consists of four distinct units. These units include: a silt, clay, and shale fragment layer, apparently used as a cover in the central portion of the site at the time of the landfill closure; a silt and sand layer, used as a cover across the southern portion of the site; domestic and construction debris (fill); and glacial till deposits. The silt, clay, and shale fragment "cover" layer ranges from 0 to 4 feet thick and was discontinuous in the central and north-central portion of the site. The silt and sand soil horizon was primarily observed in the southern portion of the site, however, this material was also not continuous. Prior to cap construction, the fill material observed across the site ranged from 3 feet to 8 feet thick in the northern and eastern periphery of the site, to 25 feet and 28 feet in the western portion of the site along Narragansett Bay. After cap construction, fill material was found up to 9 feet thick in borings immediately seaward of the stone revetment at the central portion of the landfill. Fill material was observed more than 50 feet from the shoreline at NSB-3 and NSB-4 (Figure 1-3). The fill material across the majority of the site appears to have been deposited directly on the bedrock surface.

The fill material encountered within the landfill appears to consist of a wide variety of operational, domestic, and construction waste, as well as waste from ships homeported at the base. Domestic waste was primarily observed in the central to north-central portion of the site and consisted of plastic, paper, cloth, and garbage. Fill encountered in the southern portion of the site primarily consisted of bricks, concrete, scrap metal, and wood. A thin layer of ash material was also observed in the north-central portion of the site and is believed to be the waste product of the on-site incinerator previously located in this portion of the site. Fill material encountered in the offshore borings consisted of glass, metal pieces, ash, incinerator slag, asphalt, concrete, brick, and wood.

This material was mixed into gravel, sand, and silt. The largest pieces of debris were visible closest to the toe of the revetment at NSB-3 and NSB-4. The distribution of material encountered indicates that the smaller size debris, particularly the ash, is transportable through wave action and currents.

Glacial till deposits were observed directly over the bedrock surface in the northern and southern portions of the site and at several locations within the central portion of the site. The till material consists of fine to coarse sand and silt, with some horizons containing weathered shale fragments. The bedrock encountered across the site consists of a grey-brown to black, highly weathered to competent, carboniferous shale. The bedrock was encountered at depths ranging from 3 feet in the northern portions of the site to 28 feet in the central portion of the site. The bedrock surface generally exhibits a uniform, westward slope across the site, toward Narragansett Bay.

Groundwater elevation data collected prior to cap construction indicate that shallow and deep groundwater flows from east to west across the site and discharges to Narragansett Bay. The depth to groundwater across the site (as measured on December 29, 1993) ranged from 5.03 feet at off-site monitoring well MW-16R, east of Defense Highway, to 29.12 feet at monitoring well MW-8R, on the northwest edge of the landfill, (see Appendix A, Figure 1 for well locations). Based on single well hydraulic conductivity tests performed on wells across the site prior to cap construction, the hydraulic conductivities in the overburden fill material range from 15.03 ft/day to 59.58 ft/day, reflecting the heterogeneity of the fill material. Hydraulic conductivities observed in the on-site bedrock wells ranged from 0.40 ft/day to 6.40 ft/day. Average horizontal hydraulic gradients for shallow overburden groundwater flow ranged from 0.009 ft/ft (northern inland) to 0.219 ft/ft (northern nearshore) from east to west. Average horizontal hydraulic gradients for the bedrock groundwater ranged from 0.027 ft/ft (southern area) to 0.114 ft/ft (northern area). Gradients for both shallow and bedrock groundwater were higher toward the western edge of the site, due to the significant topographic decrease toward Narragansett Bay. The average linear velocity of shallow groundwater ranged from 2.25 ft/day (northern inland) to 54.72 ft/day (northern nearshore). Average linear velocities for the bedrock groundwater ranged from 0.78 ft/day (southern area) to 3.36 ft/day (northern area). Some of these conditions are expected to change as a result of the construction of the semi-permeable cap, completed in October, 1996. Groundwater elevations beneath the cap are expected to gradually decrease due to reduced infiltration until equilibrium conditions are achieved; however, groundwater will continue to flow strongly toward Narragansett Bay.

The Rhode Island Department of Environmental Management (RIDEM) has classified groundwater in Rhode Island to protect the quality of the state's groundwater resources for use as drinking water and other beneficial uses, and to ensure protection of the public health and welfare, and the environment. Groundwater at the McAllister Point Landfill has been classified as GA Non-attainment (GA-NA). Groundwater classified GA is known or presumed to be suitable for drinking water without treatment. Non-attainment (NA) areas are those areas that are known or presumed to be out of compliance with the standards of the assigned classification. The goal for non-attainment areas is restoration to a quality consistent with the classification. However, the long-term presence of the landfill at this site and its coastal location may preclude this goal from being achieved.

1.4 AQUATIC HABITAT CHARACTERIZATION

A characterization of the aquatic habitat offshore of McAllister Point Landfill was conducted to determine the current conditions (functions and values) of the habitat that could be impacted by remedial actions to address marine sediment. The assessment was conducted based on recent surveys of the area and historical data about the site and surrounding shoreline. This section summarizes the results of the investigations and historical studies, and presents the resulting assessment of the functions and value of the aquatic habitat.

1.4.1 Recent Habitat Investigations

This section summarizes recent acoustic and photographic surveys conducted to support the design and selection of preferred alternatives for the site.

Seafloor topography characterization study

A side-scan sonar survey was performed in Narragansett Bay offshore of the McAllister Point Landfill in February and March 1998. The purpose of the survey was to characterize sea floor topography. This section summarizes information extracted to date from the side scan records, focusing primarily on the distribution of large boulders. A more detailed discussion of survey methods and results is presented in Appendix B.

The survey identified the presence of boulders ranging in size from less than 0.5 meters high to very large boulders up to 2.5 m tall (See Appendix B, Figure 1.1-3). Boulders up to 1m high were

present at the greatest density throughout the study area. Larger boulders were also present throughout the area, but their presence was more sporadic. The distribution of boulders does not appear to have been affected by landfill construction or capping activities.

Subtidal photographic characterization study

A plan view photographic survey of the McAllister Point subtidal environment was performed in April 1998 in order to characterize benthic habitat type as well as to search for the surficial expression of landfill debris that may pose a hazard to site visitors or indicate landfill deposits that might serve as a source of COCs for ecological and human health receptors. A Photosea underwater camera system was used to collect approximately 150 $1m^2$ plan view images of the sea floor in water depths of 1.5 to 20 m in the subtidal area west of the McAllister Point Landfill. This section summarizes information extracted to date from the photographic records, focusing primarily on the distribution of habitat type and landfill debris. A more detailed discussion of survey methods and results, including a selection of representative photographs, is presented in Appendix B.

Seven representative classes of habitat were observed in the area offshore of the landfill, including 1) macrophytic algae, 2) shell lag and macrophytic algae, 3) rock/cobble, 4) rock with macrophytic algae, 5) sand/shell bottom, and 7) eelgrass bed. A general pattern of rocky and rock-algal habitat was observed in the nearshore areas, and increasingly sandy/algal habitat was apparent in deeper offshore waters. Eelgrass beds were also observed in the northern region of the study area. Careful review of the images obtained from the photographic survey failed to reveal evidence of landfill debris at the surface anywhere in the subtidal study area.

Intertidal Area Characterization

The intertidal area off McAllister Point Landfill has been observed during numerous investigations of the site during the past several years. This section presents a description of the intertidal area as observed from the shoreline. A selection of representative photographs of the intertidal area, taken in April 1998, are presented in Appendix B.

Prior to 1996, the intertidal zone adjacent to the landfill consisted of sand and gravel. During the winter of 1995/1996 (during a hiatus in the construction of the landfill cap) erosion changed the

nature of surface materials in the intertidal area: approximately 1 foot of sand was eroded from the surface, leaving a rock/cobble surface. These rocky conditions were first observed in the spring of 1996 and have remained. Observations of the area and photographs taken in April 1998 indicate that the substrate consists a surface armor of rock/cobble (mostly 1 to 6 inch size), with coarse gravelly sand mixed with rock/cobble beneath. Landfill debris, consisting of wire, metal, concrete, asphalt, glass, and other material is visible at the surface. Landfill debris is most pervasive off the central portion of the landfill, near stations NSB-3 and NSB-4. In these areas, large pieces of steel and concrete, and tangles of submarine netting protrude from the surface. (Submarine netting consists of twisted steel cables woven together to form a netting. The cables are comprised of eight strands of 1/4 inch twisted steel wire.) The debris in other areas along the shoreline generally consists of small pieces of metal, glass, pottery, bricks, and asphalt. The debris does not appear to extend below the low tide line, except in a small area off the central portion of the landfill.

In the 2 years since the erosion in the winter of 1995/1996, the intertidal area has remained predominantly rocky and significant natural restoration of the aquatic habitat has occurred. Observations and photographs taken in April 1998 indicate that the area appears to support a significant and diverse intertidal ecological community. Two representative habitat types were observed in the intertidal area: rock/cobble and rock with macrophytic algae. Sessile brown algae is abundant in areas where large stones and concrete pieces are present. Rockweed and barnacles have colonized the larger stones (greater than 6 inches) and concrete pieces. Mussels are present in areas protected from wave action. Periwinkle snails are abundant in lower energy portions of the shoreline, where there is less wave action and the surface stones are smaller. The aquatic community observed in the intertidal zone is similar to that present in the subtidal zone and is typical of the community that would be expected in rocky intertidal areas in the bay.

1.4.2 Historical Information Supporting Habitat Characterization

This section presents a discussion of historical shoreline stability investigations and habitat descriptions that support the habitat characterization of the area.

Historical shoreline stability investigations

Shoreline change measurements conducted by Prof. John Boothroyd, URI (in ASA, 1992), were reviewed to characterize the expected pattern of deposition and/or erosion in the nearshore environment adjacent to McAllister Point Landfill. The study relied on aerial photographic analysis, and characterized change for two index periods covering the year intervals 1938-1975 and 1975-1988. This section presents a summary of the findings of the review. A more detailed discussion of the analysis is presented in Appendix B.

During the period 1975-1988, the westward-facing shoreline of Narragansett Bay was observed to be a generally erosional environment. Only two areas of net deposition were observed: Prudence Island and McAllister Point. The 12 remaining areas were all erosional. For the Prudence Island depositional area, the added material may have come from the area of erosion immediately to the south. In contrast, the deposition observed at McAllister Point is believed to have occurred due to the landfill construction: the large boulders placed at the edge of the landfill and intertidal zone likely absorbed wave energy, thereby minimizing erosion; additionally, sloughing of landfill materials into the bay may have contributed to the net deposition.

Although Professor Boothroyd's analysis did not extend after 1988, it has been noted that a significant erosion event occurred during the final stages of landfill cap construction, after the intertidal boulders had been removed and landfill materials had been consolidated under the cap (but before placement of the revetment). Subsequent observations have noted evidence of continued erosion in the intertidal zone adjacent to the landfill revetment. The intertidal area off the landfill now closely resembles the rocky intertidal area to the north.

Based on the above analysis, it can be concluded that before construction of the landfill, the natural environmental conditions in the vicinity of McAllister Point were similar to the predominant conditions that exist north of the landfill and throughout the westward-facing shorelines of Narragansett Bay, and the conditions that have existed off the landfill since early 1996. The area was likely an erosional area that supported rocky intertidal habitat in the past and will continue to do so into the future. There is no evidence to suggest that alternate habitat types, such as sand beach or fringing marsh could be sustained over the long term, hence remedial designs should favor construction of surface cover consistent with the rocky intertidal conditions found throughout the western-facing shorelines of Narragansett Bay.

Historical habitat descriptions

Benthic Community. As part of the Narragansett Bay Project, the near- and offshore areas in the vicinity of McAllister Point Landfill were characterized by ASA (1992) as part of the Lower Bay Complex. This complex is described as mixed sediments predominated by sands with shell lag and live specimens of the bivalve *Mytilus edulis* and the gastropod *Crepidula fornicata*. This habitat type grades into deeper water into the Mid-Bay Complex with finer sediments inhabited by the common *Nephtys-Nucula* assemblage. The coarser, shelly, shallower areas are more erosional in character and the deeper silt/clay habitats are depositional.

The recent characterization of the intertidal zone of McAllister Point as rock/cobble in nature is a reflection of a fairly constant exposure to wave action and erosional currents. The ASA study characterized the intertidal zone of Dyer Island, to the north of McAllister Point, and found it dominated by the macroalgae *Fucus, Ulva*, and *Ralfsia*, and the mussel *Mytilus* and periwinkle *Littorina*. It is expected that the Aquidneck Island shoreline south of the landfill would be inhabited by a similar flora and fauna. The predominant feature of this shoreline is rocky bottom with macroalgal beds, probably as a consequence of the hydrodynamic regime in this region of the bay. A similar finding was reported by Metcalf and Eddy (1985), which characterized this section of the coastline in support of studies related to the Newport Water Pollution Control Plant discharge.

Menzie-Cura and Associates (1994) conducted a study of the benthic environment adjacent to and near the landfill. Epifaunal and epifloral transects from the shoreline to 100 m offshore were surveyed and the bottom was described as sand and silty sand facies to sand/rock, shell and boulder bottom. The predominant bottom type was rocky. The most frequently observed epibenthos included a number of crab species and starfish, who prey upon *Crepidula*. The predominance of this assemblage was attributed to the exposed, turbulent habitat.

Finally, studies supporting the ecological risk characterization (SAIC/URI, 1997) examined intertidal and subtidal benthic communities adjacent to the landfill. In the intertidal zone, mussel (*Mytilus*) beds and interspersed, shallow sediment deposits were present, which were dominated by the presence of oligochaetes and mussel spat; sessile anenomes, tube-dwelling amphipods, and periwinkles were abundant. Sediment samples also contained high densities of polychaetes. It was concluded that the soft intertidal sediments in the intertidal zone likely originated from erosion

of McAllister Point Landfill. In contrast, the subtidal habitat was characterized as predominately sand and gravel facies admixed with shell and cobble, with the benthic community being composed of polychaete and oligochaete worms, blue and black mussels, and some amphipods. The hard clam *Mercenaria* and bivalve *Pitar* were observed to coexist with the mussel as the likely biomass dominants of the community.

Fisheries. The demersal fish community was surveyed in the area off McAllister Point in the spring, summer, and fall of 1984 (M&E, 1985). Winter flounder was the most common and abundant species in trawls at two stations off McAllister Point (at 70 to 100 foot water depth). Skate and hake were also abundant. It is expected that, in addition to some level of trawl fishing, the area is subject to recreational fishing.

Before the decline of the oyster in Narragansett Bay, the area off McAllister Point was a leased oyster culture bed. It was also recognized as an active conch trap fishery (Olsen et al., 1980). There is an active lobster fishery in the lower part of the East Passage to the south of McAllister Point, however the extent to which the McAllister Point area affects that fishery is unknown.

1.4.3 Habitat Function and Value

The process for evaluating wetland habitat function and values is formalized and well defined. The Army Corps of Engineers (USACE) has developed two approaches to address wetland evaluations: a process to characterize function based on hydrogeomorphic conditions (Brinson, 1993) and a process that relies on the functional relationship between the wetland and aquifers (ACOE NED). In the latter approach, the importance of factors considered includes groundwater recharge/discharge, flood flow alteration, fish and shellfish habitat, nutrient removal, and wildlife habitat among others. No analogous guidance is available for evaluating intertidal and subtidal marine and estuarine habitats.

The USACE approaches, however, do provide a template of functions and values that may apply to marine/estuarine habitats. These attributes include the following: 1) fish/shellfish habitat; 2) wildlife habitat; 3) production export; 4) sediment/shoreline stabilization; 5) recreation; 6) education/scientific value; 7) visual quality/esthetics; 8) endangered species habitat; and 9) uniqueness/heritage. These attributes should be used in an objective sense to evaluate the function and value of this system in its present state. Each attribute is addressed below.

Fish/shellfish Habitat: The various studies cited above indicate that the existing habitat at McAllister Point does serve as fish and shellfish habitat, at a minimum, for winter flounder, hard shell clam, mussels, and conch.

Wildlife Habitat: Specific wildlife use of the McAllister Point intertidal zone is not known. However, it is expected that shore and wading birds would feed on mussel beds in the area, and that these beds would be frequented by local mammal, e.g., raccoon, populations.

Product Export: In the context of wetlands, this function refers to the habitat as a producer of nutrients/carbon to other systems or a producer of food or useable products for human or other living systems. The McAllister Point area is populated by macrophytes, which produce detritus that is distributed to other systems. As noted above, it also produces food products for human consumption, although the area is within a section of the bay designated as a shellfish closure area by RIDEM.

Sediment/Shoreline Stabilization: By definition, the rocky intertidal and shallow subtidal sand/cobble habitat provides shoreline stabilization by the mere presence of rock outcrop.

Recreation: Were it not subject to restricted access, the shoreline itself would be a recreational attraction. However, the presence of the landfill and landfill revetment limit its utility for recreation. The subtidal fishery is subject to recreational fishing, and all coastal areas in Narragansett Bay are considered a recreational resource.

Education/Scientific Value: No current educational or scientific value can be ascribed to this area except that associated with scientific studies related to the landfill itself.

Visual Quality/Aesthetics: None.

Endangered Species: Three species of endangered marine turtle (Kemp's ridley, leatherback, and hawksbill) are known to migrate along the Rhode Island coastline. A fourth species, the loggerhead, which also migrates along the shoreline, is in the threatened status. The extent to which any of these species enters Narragansett Bay and comes in contact with the McAllister Point area is unknown.

Uniqueness/heritage: In its role of protecting critical areas, the Narragansett Bay Comprehensive Conservation and Management Plan (CCMP) (RIDEM, 1992) identifies ecologically critical resources in the bay. Three of these resource types occur off McAllister Point: rocky intertidal zone, current and historic shellfish beds, and subtidal and intertidal areas of high biotic diversity.

1.5 NATURE AND EXTENT OF CONTAMINATION

Numerous investigations have been conducted since 1983 to delineate the presence and distribution of contamination in the environmental media at McAllister Point Landfill and in the adjacent marine environment. The findings of these investigations are presented in recent documents prepared for the Navy, including the RI, the marine ERA, and the Phase III Technical Memorandum. This section summarizes the results of the studies pertinent to the media of concern for this FS: marine sediment and biota, groundwater, and landfill gas.

1.5.1 Sediment

Surface and core sediment sampling was conducted by SAIC/URI in 1994 (Phase I) and 1995 (Phase II) to support the marine ERA. Additional sediment sampling was conducted in 1996 (Phase III) to assess changes in contaminant conditions due to sediment erosion in the nearshore area following construction of the landfill revetment. The Phase III investigation included subsurface exploration seaward of the revetment to determine the thickness of landfill material in the intertidal zone. Details of these investigations are presented in the marine ERA and Phase III Technical Memorandum. This section presents a summary of the nature and extent of contamination in the nearshore (Section 1.5.1.1) and offshore (Section 1.5.1.2) areas. Sediment data summary tables are presented in Appendix C.

For the purposes of this FS, the nearshore area is defined as the coastal area adjacent to McAllister Point Landfill that lies between the landfill revetment and the -3 foot mean low water line (water depth = 3 ft at MLW), and any additional areas outside the -3 ft MLW line that contain landfill materials at depth. The offshore area is the coastal area outside the intertidal zone, but still within proximity of the landfill. The shoreline topography is presented on Figure 1-4.

Observation of materials and evaluation of analytical data from the marine investigations indicate that marine sediment in the nearshore and offshore areas adjacent to McAllister Point Landfill contain elevated concentrations of PAHs, PCBs, and metals. Additionally, the nearshore area

contains landfill debris including small materials such as ash, glass, pottery, and brick, and metal pieces, and larger debris such as large metal pieces, concrete, and tangled masses of submarine netting. The small materials were found mixed into the gravel, sand, and silt sediments in borings located up to 70 feet from the revetment in the central portion of the landfill (NSB-3 to NSB-5). These materials, particularly ash and glass fragments, were also widely distributed at the surface throughout the nearshore area. The large debris were observed primarily in the intertidal zone close to the toe of the revetment in the central portion of the landfill (NSB-3 and NSB-4). See Appendix B for representative photographs of the landfill material encountered in the intertidal zone.

The sediment in both the intertidal zone and offshore areas along the length of the landfill contained PCBs, PAHs, and metals at concentrations exceeding benchmark values for adverse ecological effects due to contamination in sediment (the U.S. Department of Commerce National Oceanic and Atmospheric Administration's (NOAA's) Effects Range-Median (ER-M) and Effects Range-Low (ER-L) adverse effects benchmark values).

1.5.1.1 Nearshore Sediment

The Phase I and Phase II investigations concluded that surface sediment samples collected at five of seven nearshore (NSB) stations contained total PCB concentrations that exceeded the ER-M value, four of the nearshore stations exceeded the ER-L value for total PAHs, and four of the stations exceeded the ER-L value for the pesticide p,p'-DDE. The proposed EPA screening value for tributyltin in marine sediments was not exceeded at any of the nearshore stations.

There was fair agreement in PCB and PAH concentrations at most surface (0-6 cm) sediment stations between the Phase II and Phase III samples; however, substantial differences were observed at three nearshore stations: NSB-4, NSB-5, and NSB-6. Total PCB concentrations at NSB-4 and NSB-5 were considerably higher in Phase III than in Phase II. PAH concentrations at NSB-4 and NSB-6 were higher in Phase III than in Phase II. Total PCB values above the ER-M benchmark were associated with nearshore stations NSB-4, NSB-5, and NSB-7 in the Phase III samples. Total PCBs values above the ER-L benchmark were associated with nearshore stations NSB-1 and NSB-2 in the 1996 samples.

The Phase I and Phase II investigations also concluded that the marine sediments contained elevated concentrations of metals. The highest metal concentrations in surface sediments were generally found at the nearshore stations, where copper, lead, mercury, nickel, and zinc exceeded ER-M

values, while cadmium and chromium only exceeded ER-L values. The spatial pattern of metal distribution and concentrations in the surface sediments was generally similar to those determined in previous investigations, and strongly indicates the McAllister Point Landfill as a dominant source of metals into the marine environment.

Metal concentrations measured in sediments during Phase III were generally higher than those measured previously within the study area. The concentrations of copper, lead, and zinc exhibited the greatest degree of change.

The Phase III data indicated that nearshore stations NSB-2 through NSB-4 had higher concentrations of PCBs and PAHs in the core samples (0-18 cm) relative to the surface sediments (0-6 cm). Concentrations of metals in the nearshore sediment core samples were generally comparable to surface sediment concentrations.

During the Phase III offshore investigation, a small area in the southern intertidal zone near NSB-6 exhibited an oily sheen during low tide (refer to Figure 1-3). An investigation indicated that the sheen may result from a mass of oily debris (soil and rock fragments) just below the surface, encompassing an area approximately 21 feet by 6 feet by 1 foot deep. The material did not extend more than 1.5 feet in depth at any of the sample locations. Analysis of these soils indicates that the soils contain high concentrations of what appears to be waste oil. Analytical results indicated the presence of total petroleum hydrocarbons (up to 24,000 mg/kg in the center of the seep area), gasoline range organics (up to 1.1 mg/kg), diesel range organic compounds (up to 11,800 mg/kg), and PCBs (up to 0.17 mg/kg). A summary of analytical results for the seep area samples is presented in Appendix C.

1.5.1.2 Offshore Sediment

Analytical results from the Phase I, Phase II, and Phase III investigations indicated that offshore sediments generally contained lower concentrations of contaminants than the nearshore sediments.

Total PCBs concentrations in samples from most of the offshore stations only exceeded the ER-L value (and not the ER-M). Similarly, only a few offshore stations exceeded the total PAHs ER-L value. Screening values for pesticides and tributyltin were not exceeded by any of the offshore stations.

There was fair agreement in PCB and PAH concentrations and distribution at most sample stations between the Phase II and Phase III samples; however, substantial differences were observed at one offshore station: MCL-12. Concentrations of most of the individual PCB congeners at MCL-12 were higher in the Phase III than in the Phase II sample, but in general the concentrations were within the same order of magnitude. Concentrations of most PAHs at MCL-12 were approximately one order of magnitude higher in Phase III than in Phase II.

Analytical results from Phase I and Phase II also indicated that the metal concentrations in offshore sediments were generally lower than in the nearshore sediments. Only mercury, nickel, and zinc in offshore sediments exceeded the ER-M values. Metal concentrations measured in offshore sediments during Phase III were generally comparable to those measured previously within the study area. However, at several locations, concentrations of arsenic were approximately one order of magnitude higher during Phase III than in Phase II.

1.5.2 Biota

Biota sampling was conducted in Phase II by URI/SAIC to support the marine ERA. During Phase II studies, 38 biota tissue samples [blue mussels (Mytilus edulis); hard clams (Mercenaria mercenaria); cunner (Tautogolabrus adsperus); and lobster (Homarus americanus) were analyzed for contaminant concentrations.

Blue mussels were collected as representative of bivalve exposure to contaminants in the nearshore (intertidal) area. Total PCBs concentrations in mussels were highest at station NSB-3; p,p'-DDE residues were highest at stations NSB-6 and NSB-7; tributyltin was highest at stations NSB-1 and NSB-3; and total PAHs were highest at station NSB-1. For total PCBs, p,p'-DDE, and total PAHs, sediment in the mussel gut contributed about 10 to 30 percent of the total chemical load of the animal.

Hard clams represented infaunal conditions in the offshore environment. When compared to the mussel results, hard clam tissue concentrations of PCBs, PAHs, and p,p'-DDE were approximately five times lower and also were more spatially uniform among stations. Sediments in the gut of hard clams contributed 5 to 10 percent of the PCBs, PAHs, and p,p'-DDE contained in the animal.

Cunner tissue analytical results were available only for nearshore stations NSB-1, NSB-3, NSB-4, and NSB-6. In general, all the samples contained measurable concentrations of the contaminants,

but no one station had elevated values for all the contaminants. Total PCBs and p,p'-DDE concentrations in fish tissue were many times higher than in bivalves, reflecting possible food web biomagnification of these lipophilic contaminants.

Lobsters were used to represent subtidal epibenthic invertebrates. Concentrations of organic contaminants in lobster tissues were, in general, two times higher at offshore stations MCL-13 and MCL-14 as compared to other offshore stations.

Tissue samples of blue mussels, hard clams, and lobster muscle and hepatopancreas were also analyzed for trace metals. The distributions of arsenic, iron, chromium, zinc, manganese, and nickel did not appear to exhibit either spatial- or species-dependent patterns.

The Phase II bivalve tissue residue results were compared to results from samples collected by TRC in 1993. In general, a good agreement in concentrations and spatial distribution existed for PCBs and tributyltin in mussels and clams between the two data sets. However, PAHs concentrations in mussels reported by TRC were at the low end of the range of concentrations from the Phase II studies, and PAHs concentrations in clams reported by TRC were two to four times higher than those detected in Phase II. Metal tissue concentrations in mussels were, in general, similar between the TRC data and the Phase II studies, except for chromium and nickel, which were approximately five times higher in the TRC data. A similar pattern was identified for hard clam data; TRC results for chromium and nickel were approximately 50 and 10 times higher, respectively, than those from the Phase II investigation. There was no TRC data for lobster or cunner.

Tissue sampling data summary tables are presented in Appendix C. A more comprehensive presentation and discussion of investigation results can be found in the marine ERA.

1.5.3 Groundwater

This section provides a summary of groundwater quality data collected during quarterly monitoring following completion of the low-permeability cap at McAllister Point Landfill in 1996. The monitoring was conducted by Foster Wheeler Environmental Corporation (FWENC) in March 1997, July 1997, September 1997, and January 1998 as part of the operations and maintenance (O&M) monitoring of the landfill required by the 1993 ROD. A summary of the data evaluation and comparisons to water quality criteria and previous groundwater data are presented below. The

analytical data and comparisons with AWQC are presented in the *McAllister Point Landfill Quarterly Monitoring Report* (B&R Environmental, 1998d), which is included in Appendix A.

Samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and total metals. Groundwater analytical data for both sampling rounds were compared with ambient water quality criteria (AWQC) as a conservative indicator of potential impacts to aquatic receptors in Narragansett Bay. Where acute or chronic marine AWQC values were not available, comparison with freshwater screening values was performed. The quarterly monitoring data were also compared with Rhode Island groundwater standards to determine compliance with GA aquifer criteria and with 1993 RI data to evaluate changes over time.

The groundwater samples were collected from 12 new wells installed to replace 13 of the original wells used for the RI, which were abandoned during the initial phase of cap construction. The replacement wells, which are designated with identifiers similar to the corresponding former wells, were generally located within the approximate area of the original wells. However, due to access restrictions caused by the cap construction, some of the wells are located a greater distance away (MW-1: 75 feet and MW-11: 130 feet). The well screens of the replacement wells were installed at the same elevations as those of the corresponding original wells. Well screen elevations and the horizontal distance between corresponding wells are presented on Table 1-A in Appendix A. The locations of the original and new wells are shown on Figure 1 in Appendix A.

Five of the original on-site wells installed for the RI were not replaced during cap construction. Recent data are not available from these locations or from four wells located off site, upgradient of the landfill. The original on-site wells that were not replaced (MW-2S, MW-6S, MW-9R, and MW-22S) had contaminant concentrations that were generally comparable to or lower than the concentrations detected in the monitoring wells that were replaced. None of these wells contained VOCs, SVOCs, pesticides, or PCBs that exceeded federal MCLs and/or state groundwater quality standards during RI sampling. As was the case for wells across the site, including upgradient off-site wells, all of these wells contained several metals at concentrations exceeding federal MCLs and/or state groundwater quality standards. Metals concentrations in these wells were comparable to those in the replaced wells. The RI concluded that several of these metals appear to be naturally-occurring minerals of the site soils and that the metals concentrations were elevated in the RI samples partly due to the high concentration of suspended solids in the samples.

Evaluation of the quarterly monitoring data indicates the presence of VOCs, SVOCs, and metals in both shallow and deep (bedrock) groundwater monitoring wells sampled at the site. Contaminant concentrations in site groundwater were generally lower than state GA aquifer groundwater standards. Exceedance of the GA standard for benzene (GA-5 μg/l) was noted in one shallow well (MW-103S, maximum 12 ug/l in March 1997 and minimum non-detect in January 1998). Exceedance of the GA standard for naphthalene (GA-20 μg/l) was observed in one shallow well (MW-103S, maximum 1800 ug/l in September 1997 and minimum 530 μg/l in January 1998). No other VOCs or SVOCs exceeded GA groundwater standards.

Inorganic analytes were present at concentrations greater than the GA standard in the following wells: lead (GA-15 μg/l) in MW-101R (19.8 μg/l) and MW-103S (44.3 μg/l); arsenic (GA-50 μg/l) in MW-103S (76.4 μg/l), MW-107R (311 μg/l), MW-108R (65 μg/l), and MW-111R (120 μg/l); antimony (GA-6 μg/l) in MW-103S (6.1 μg/l); and nickel (GA-100 μg/l) in MW-103S (346 μg/l). All wells have shown a decrease in the respective metals concentrations in the most recent sample round (January 1998), except for lead in MW-103S, which has shown a slight increase.

No VOCs exceeded marine acute or marine chronic water quality criteria in any of the wells. The only standard that was exceeded was the EcoTox Tier II freshwater value for xylene (1.8 μg/l), which was exceeded in only four wells: MW-103S (23 μg/l); MW-104S (110 μg/l); MW-105S (260 μg/l); and MW-103R (9μg/l). However, these data represent maximum observed concentrations detected in each well during the March 1997 sampling round, except MW-103R, which was collected in January 1998. Each subsequent round has shown a significant decrease in xylene concentrations that range to non-detectable concentrations.

No SVOCs exceeded the established marine acute water quality criteria. SVOCs were detected slightly above the marine chronic water quality criteria in three wells, MW-107R (diethylphthalate: maximum concentration 5 μg/l in September 1997 and minimum concentration non-detect in January 1998); MW-113S (diethylphthalate: maximum concentration 4 μg/l in January 1998 and minimum concentration non-detect in September 1997); and MW-103S (fluoranthene: maximum concentration 29 μg/l in January 1998 and minimum concentration 18 μg/l in September 1997. SVOCs were detected slightly above the proposed marine chronic criteria for phenathrene in two wells, MW-103R (maximum concentration 160 μg/l in June 1997 and minimum concentration 80 μg/l in January 1998) and MW-103R (maximum concentration 7 μg/l in September 1997 and minimum concentration 6 μg/l in January 1998). Well MW-103S has also shown exceedances for

other water quality standards, specifically, the EcoTox Tier II freshwater value for dibenzofuran (maximum 150 µg/l in June 1997 and minimum non-detect in January 1998) and for the fresh water AWQC for napthalene (maximum 1800 µg/l in September 1997 and minimum 530 µg/l in January 1998).

Most of the exceedances of marine chronic criteria were slight and were all less than one order of magnitude higher than the criteria. Comparison with freshwater screening values (used when marine chronic criteria were unavailable) indicated a few isolated exceedances of VOC and SVOC screening values and exceedance of screening values for barium, cobalt, iron, lead, manganese, and nickel in several wells.

The comparison with AWQC is used as an indicator of whether a potential exists for adverse effects to marine organisms. It is a conservative indicator that assumes a worst case scenario where the contaminant concentrations present in groundwater are equivalent to the contaminant concentrations at the exposure point, namely the intertidal zone at the toe of the revetment. However, the actual contaminant concentrations in porewater and surface water in the intertidal zone are likely to be lower than the concentrations in the discharging groundwater because of dilution, adsorption to sediments, and chemical transformation caused by mixing with salt water.

Overall, the concentrations of contaminants detected in March 1997, June 1997, September 1997, and January 1998 are lower than those measured during the RI in 1993, and are generally comparable between sample rounds. However, concentrations of organic compounds that have shown exceedances of water quality standards in MW-103S have generally decreased. Similarly, concentrations of inorganic compounds that have exceeded water quality standards in wells MW-105S, MW-107R, MW-112S, and MW-113S have also generally decreased. Conclusions regarding trends in contaminant concentrations, however, should not be based on these first four quarterly rounds. Monitoring over a longer period is required to assess changes in groundwater quality resulting from installation of the low permeability cap. Additional monitoring will be conducted as part of the quarterly O&M monitoring of the landfill cap required by the source control ROD. A total of 16 quarterly sampling events will be conducted by the time the marine sediment remedy is implemented in the spring of 2001. The data from these sampling events will be evaluated to assess the need for future actions to address site groundwater.

1.5.4 Landfill Gas

FWENC conducted landfill gas monitoring in July 1997, as required by the 1993 ROD. Air samples were collected from permanent sampling ports installed in landfill gas vents located along the eastern perimeter and throughout the plateau of the landfill. Samples were analyzed for volatile organic compounds and methane using a modified method T-01 procedure specified by FWENC.

Air sampling data for all samples were compared to NIOSH and OSHA time-weighted average (TWA) concentrations for workplace exposure. None of the air samples collected at the site were found to exceed the pertinent worker exposure standards. The air sampling data are presented in the *McAllister Point Landfill Second Quarterly Monitoring Report*, which is included in Appendix A. Additional air sampling is planned to ascertain whether the landfill gas emissions exceed state standards. This information will be used to determine whether landfill gas treatment is required.

1.5.5 Groundwater and Sediment Correlation

An evaluation of post-cap groundwater data and marine sediment ecological risk data was conducted to assess whether discharge of site groundwater is contributing to the ecological risk associated with marine sediments at the site. March 1997, June 1997, September 1997, and January 1998 groundwater data were compared with the sediment data and preliminary remediation goals (PRGs) to determine the correlation between contaminants identified in groundwater and contaminants in sediment identified as the primary contributors to unacceptable human health or ecological risk. The results of the evaluation indicate that groundwater is not a significant source of the contaminants that contribute to unacceptable risk in sediments.

Of the compounds identified in sediment with concentrations exceeding PRG values, only nickel (AWQC = 8.2 ug/l) was consistently detected in groundwater samples at concentrations exceeding marine chronic AWQC. Nickel was detected in six of eleven wells sampled. At two of these wells (MW-101R and MW-105R), it exceeded the AWQC in only one of four sampling rounds; at the remaining four wells (MW-103S, MW-103R, MW-107S, and MW-108R), it exceeded the AWQC in three of the four sampling rounds. Only two other compounds with sediment concentrations greater than the PRGs were detected in groundwater at concentrations greater than marine chronic AWQC: copper (AWQC = 2.4 ug/l) was detected in groundwater at two wells (MW-105S and MW-105R) in September 1997 and lead (AWQC = 8.1 ug/l) was detected in groundwater once at wells MW-101R and MW-103S and twice at well MW-111R. Groundwater concentrations of these

compounds generally exceeded the AWQC by a small amount; in all but one instance, the concentrations were within one order of magnitude of the AWQC.

1.6 HUMAN HEALTH RISK ASSESSMENT

This section provides a summary of the results of the Phase II and Supplemental (Phase III) human health risk assessments performed by TRC (Phase II) and B&R Environmental (Phase III) pertinent to the existing (post-capping) conditions and media of concern for the FS. The HHRA, submitted as Volume II of the RI Report, presents the complete, combined assessments of both TRC and B&R Environmental.

The HHRA considered current and anticipated future use of the site, with an aim toward addressing all of the key human exposure media. Six exposure scenarios were developed that evaluated the health risks posed by contamination in marine sediments. The exposure scenarios considered pre-cap trespassing along the shoreline, current and future recreational use of the shoreline, and future use of the intertidal zone for shellfishing. It should be noted that RIDEM has designated the area of Narragansett Bay along the NSN shoreline, including McAllister Point Landfill, as a shellfish closure area due to known or potential sewage discharges in the area. However, the effectiveness of the ban for preventing shellfishing is uncertain and the ban applies only to a few species of shellfish (bivalves only); it does not apply to lobster or finfish. A map showing the shellfish closure areas is presented as Figure 1-5.

The risks for Scenarios 4 through 7 (developed by B&R Environmental using Phase III sediment data) were calculated by zone, following the zones developed for use in the marine ERA (see Figure 1-6). Only zones 1, 2, 3, and 3A were considered in the supplemental HHRA because these zones represented locations that are at least partially within the intertidal zone, and are therefore accessible for direct contact exposures (walking or wading) and shellfishing. These zones also had the highest chemical concentrations detected in sediments. The risks were calculated using average concentrations and maximum concentrations detected in each zone. This approach provided an average case or central tendency (CT) risk and a reasonable maximum exposure case (RME) risk for each zone. A summary of the risk assessment results for the six exposure scenarios is presented below.

Scenario 1: (Pre-cap Trespassing): Pathway cancer risks for Scenario 1 do not exceed the 1E-04 to 1E-06 range for either the mean or RME case. The estimated cancer risks for exposure to sediment under Scenario 1 ranged from 8E-09 (mean for dermal contact with sediment) to 8E-06 (RME for incidental ingestion of sediment). Only arsenic in shoreline/nearshore sediment was associated with individual cancer risk above 1E-06.

The non-cancer hazard index (HI) for exposure to sediment under Scenario 1 ranged from 2E-05 (mean for dermal contact with sediment) to 2E-01 (RME for incidental ingestion of sediment). These HIs do not exceed 1E+00.

Scenario 3 (Future Shellfishing by Recreational Shellfish-Eaters): Ingestion of mussels and clams was associated with cancer risks greater than the 1E-04 to 1E-06 range under the mean and RME cases for Scenario 3. The cancer risks ranged from 2E-04 (mean for mussels, and mean and RME for clams) to 3E-04 (RME for mussels). Arsenic, several carcinogenic PAHs, and Aroclor-1254 in mussels; and arsenic, beryllium, several carcinogenic PAHs, and Aroclor-1254 in clams were associated with individual cancer risks above 1E-06.

The non-cancer HIs for Scenario 3 ranged from 9E-01 (mean for clams) to 1E+00 (RME for clams and mussels). These non-cancer HIs do not exceed 1E+00.

Scenario 4 (Future Shellfishing by Subsistent Fishermen): Ingestion of mussels and clams was associated with cancer risks greater than the 1E-04 to 1E-06 range under the CT and RME cases for Scenario 4. The cancer risks ranged from 9E-04 (CT and RME for mussels in zone 1) to 8E-03 (RME for clams in zone 3A). Arsenic and PCBs were the primary contributors to cancer risk due to ingestion of mussels in zones 1, 2, 3, and ingestion of clams in zone 3A. However, several carcinogenic PAHs were also associated with individual cancer risks above 1E-06. The highest risk levels for subsistent fishermen were from ingestion of clams from zone 3A, however zones 1, 2, and 3 also showed increased cancer risks.

The non-cancer HIs for Scenario 4 ranged from 4E+00 (CT and RME for mussels in zones 1) to 4E+01 (RME for clams in zone 3A). These non-cancer HIs exceed 1E+00. Arsenic is the primary contributor to this adverse health hazard index in zones 1, 2, 3, and 3A. In zone 2, cadmium and copper also have HIs greater than 1E+00 under both CT and RME cases; mercury and zinc have HIs greater than 1E+00 under the RME case. Adverse health effects cannot be ruled out for subsistent fishermen ingesting shellfish from zones 1, 2, 3, or 3A.

Scenario 5 (Future Shellfish Ingestion by Children): Ingestion of clams was associated with cancer risks greater than the 1E-04 to 1E-06 range under the RME case for Scenario 5. The cancer risks ranged from 2E-05 (CT and RME for mussels in zone 1) to 2E-04 (RME for clams in zone 3A). Arsenic and PCBs were associated with individual cancer risks above 1E-06 in zones 1, 2, and 3 from ingestion of mussels. Arsenic was associated with individual cancer risks above 1E-06 from ingestion of clams in zone 3A. Several carcinogenic PAHs were also associated with individual cancer risks above 1E-06 under the RME case for zones 3 and 3A. Adverse effects cannot be ruled out for children eating shellfish from zones 1, 2, 3, or 3A.

The non-cancer HIs for Scenario 5 ranged from 5E-01 (CT and RME for mussels in zones 1) to 5E+00 (RME for clams in zone 3A). The non-cancer HIs for zones 2 and 3A exceed 1E+00. Arsenic is the primary contributor to this adverse health hazard index in both of these zones. In zone 2, cadmium and copper also contribute to the HI under both CT and RME cases. Adverse non-cancer health effects cannot be ruled out for children ingesting shellfish from zones 2 and/or 3A. Adverse non-cancer health effects are not expected for children ingesting shellfish from zones 1 or 3.

EPA's Integrated Exposure and Uptake Biokinetic Model (IEUBK) version 0.99d was used to evaluate potential exposure risks from lead in soil, dust, water, air, and shellfish for future children (ages 0 through 6 years) living nearby and consuming shellfish from zones 1, 2, 3, and/or 3A. The predicted percentage of children aged 0 to 6 years with blood lead concentrations above the guideline of 10 μg/dl (based on the shellfish concentrations and defaults for lead in air, water, and soil) are 2.25 percent (mean and RME) for zone 1; 13.6 percent (mean), and 45.1 percent (RME) for zone 2; 2.7 percent (mean) and 2.87 percent (RME) for zone 3; and 2.25 percent (mean and RME) for zone 3A. The values for zone 2 exceed the criterion level of 5 percent. Therefore, it is not possible to rule out adverse effects based on lead exposure to children aged 0 to 6 years from ingestion of shellfish in zone 2.

Scenario 6 (Adult Recreational Visitors): Pathway cancer risks are below the 1E-04 to 1E-06 range for both the CT and RME cases in zones 1, 2, 3, and 3A for Scenario 6. The estimated cancer risks ranged from 2E-09 (CT and RME for dermal contact with sediment in zone 1 and CT for dermal contact with sediment in zone 3A) to 7E-07 (RME for ingestion of sediment in zone 3).

The non-cancer HIs for Scenario 6 do not exceed 1E+00. The non-cancer HIs for Scenario 6 ranged from 1E-07 (CT and RME for dermal contact with sediments in zone 1) to 1E-02 (RME for ingestion of sediments in zone 2).

Scenario 7 (Child Recreational Visitors): Pathway cancer risks do not exceed the 1E-04 to 1E-06 range for either the CT or RME case in zones 1, 2, 3, and 3A for Scenario 7. Pathway cancer risks fall within the 1E-04 to 1E-06 range for the RME cases in zones 3 and 3A for ingestion of sediment. The estimated cancer risks ranged from 1E-09 (CT and RME for dermal contact with sediment in zone 1 and CT for dermal contact with sediment in zone 3A) to 1E-06 (RME for ingestion of sediment in zone 3 and 3A).

The non-cancer HIs for Scenario 7 do not exceed 1E+00. The non-cancer HIs for Scenario 7 ranged from 5E-07 (CT and RME for dermal contact with sediment in zone 1) to 1E-01 (RME for ingestion of sediment in zone 2).

Summary of Risk Results For Phase III Exposure Scenarios (current conditions): The principal cancer risks in the Zones 1, 2, 3, and 3A under current contaminant conditions are from arsenic through ingestion of shellfish. Subsistent fishermen would have the greatest elevated risk of cancer, followed by child shellfish-eaters, and recreational shellfish-eaters. All four of the zones studied showed increased cancer risks for these scenarios, with Zone 3A showing the highest risk levels. For subsistent fishermen, PCBs and PAHs also contribute to increased cancer risks in all zones. For children, PCBs contribute to increased risk in Zones 1 and 2.

The principal non-cancer risks are also from arsenic through ingestion of shellfish. Again, subsistent fishermen would have the greatest elevated risks, showing elevated risks in all four zones (1, 2, 3, and 3A). Children show increased non-cancer risks due to arsenic in Zones 2 and 3A only. In Zone 2, copper, cadmium, zinc, and mercury also contribute to increased non-cancer risks for subsistent fishermen. Lead in shellfish in Zone 2 would present a risk to children eating shellfish.

Cancer risks are below the 1E-04 to 1E-06 target risk range and non-cancer HIs are below 1E+00 for the recreational, dermal contact exposure scenarios considered.

The HHRA revealed that an unacceptable site-related chemical risk is associated with the consumption of shellfish from the site. Accordingly, representatives from the state have indicated

that should the bacteria-related shellfishing ban be lifted, RIDEM would evaluate the area with respect to potential shellfish closure due to site-related chemical contamination.

1.7 ECOLOGICAL RISK ASSESSMENT

The marine ERA conducted by SAIC and URI, under contract to B&R Environmental, specifically focused on the ecological risks to the marine environment offshore of McAllister Point Landfill from chemicals associated with the landfill. This section provides a summary of the methods and conclusions of the marine ERA. Detailed information on the methodology, results, and conclusions are presented in the *(Final) Marine Ecological Assessment Report* (SAIC/URI, 1997).

The marine ERA was performed in three phases, as described previously in Section 1.4. The marine ERA focused on the marine environment near the McAllister Point Landfill. The marine ERA incorporated field investigations and modeling approaches to develop a line of evidence assessment of potential risks to a variety of indicator species. Investigation activities included terrestrial and shoreline habitat surveys, benthic infaunal and epifaunal surveys in both nearshore and offshore habitats of the portion of Narragansett Bay adjacent to the landfill, chemical analysis of sediment and biota, and toxicity testing. Additionally, studies describing benthic communities within Narragansett Bay were reviewed to provide background information for this assessment. The marine ERA did not address terrestrial risks because a capping plan for the landfill had already been agreed to and executed.

The marine ERA incorporated the assessment of several exposure and effects endpoints within a line of evidence framework. There were five lines of evidence in the exposure assessment, which included:

1. Comparison of sediment contaminant concentrations to NOAA's ER-L and ER-M benchmark values

2. Comparison of porewater concentrations to Ambient Water Quality Criteria

3. Assessment of bioavailability of divalent metals in sediments

4. Assessment of fecal pollution indicator concentrations in sediments

5. Evaluation of contaminant concentrations in aquatic biota tissues relative to the reference location

Correspondingly, there were three lines of evidence in the effects assessment, which included:

1. Evaluation of sediment and porewater toxicity to aquatic organisms and comparison of these results to contaminant concentrations in sediments and porewater

2. Evaluation of field effects indicators (bivalve condition index, benthic community structure, and fecal pollution indicators in tissue) and analysis of these results against contaminant concentration measurements

3. Analysis of contaminant accumulation in aquatic biota tissues and related potential impacts to avian predators due to ingestion of these aquatic biota

Each line of evidence has multiple supporting indicators, such as analyte-specific hazard quotients for sediments and porewater, tissue concentration ratio (TCR) values for each of the aquatic receptors, and amphipod and sea urchin toxicity. These indicators are used to increase the certainty of the assessment with regard to the presumption of adverse exposure or effects conditions. The individual indicators within each line of evidence are interpreted and summarized using semi-quantitative ranking schemes that allow the synthesis of the overall probability of adverse exposure/effects. In the final step of the evaluation, the findings of exposure and effects indicators within each line of evidence are evaluated jointly to interpret the overall probability of adverse ecological exposure effects in each zone within the study area.

The classification of overall ecological risk for the McAllister Point Landfill offshore areas is divided into high, intermediate, low, and baseline categories. The risk probability rankings are defined as follows:

High Risk Probability: Numerous lines of evidence suggest pronounced contaminant exposure and effects, the spatial extent of the apparent impact is great, the impact is likely to be persistent over long periods of time, and the available data support demonstrable exposure-response relationships.

Intermediate Risk Probability: Multiple lines of evidence suggest that measurable exposure or effects -- but not both -- are occurring. Typically, quantitative exposure-response relationships are lacking. The spatial extent of the apparent impact may be highly localized or occur for a very limited duration.

Low Risk Probability: Possible, but minimal impacts based on some of the exposure or effects-based lines of evidence, while impacts are undetectable by the majority of exposure and effects-based lines of evidence. Typically, demonstrable exposure-response relationships are lacking.

Baseline Risk Probability: The probability of adverse exposure and/or ecological effects is equivalent to that from contamination and other environmental conditions not associated with the site.

To facilitate the integration of the results from the numerous lines of evidence, the study area was divided into eight ecological exposure zones based on similar characteristics, contaminant distribution, effects, and proximity of sampling stations. The ecological exposure zones are presented in Figure 1-6.

The marine ERA concluded that the primary contaminant source contributing to ecological risk in the marine environment near McAllister Point Landfill was the landfill itself, as indicated by the distribution of contaminants, and the risk determined by the lines of evidence measured. Highest concentrations of landfill-related contaminants-of-concern (COCs) were found in the shallower areas of the south/central portions of the study area, particularly at sample stations NSB-2, 3, 4, and 5; MCL-12; and S2B. These are the areas where landfill deposits are the largest, where the shoreline was extended due to landfill expansion in the 1970s. These are also the areas that are most susceptible to wave action and erosion.

The routes of COC transport are most likely from erosion and resuspension of in-place contaminants. Prior to cap construction, surface water runoff and seep water percolating out of and through the landfill above grade are expected to have been more important sources of COCs than under current conditions.

Elevated hazard quotient rankings against NOAA ER-L and ER-M benchmarks for sediment were dominated by PCBs and metals in zones 2 and 3. This indicator of risk was also contributed to by the presence of PAHs in zones 3 and 3A, and PCBs in zones 3A and 4. Bioavailability of metals was highest

in zones 1, 2, and 3. Ratios of tissue contaminant concentrations in site stations versus reference stations indicated COC enrichment in biota in zones 3, 4, and 6.

Measured toxicity to test animals was most elevated from sediments collected in zones 2 and 3A. Risks to avian aquatic predators were dominated by metals in sediments and biota in zone 2. PCBs found in samples from zones 2 and 3 also contributed to avian aquatic predator risk.

The overall risk probabilities for each ecological exposure zone in the study area are summarized below and shown on Figure 1-7.

High probability of landfill-related COC risk to infaunal benthic communities, shore birds, blue mussels, and fish:

- Zone 2 (intertidal zone along the most of the landfill shoreline - from north of NSB-2 to south of NSB-5)

Intermediate probability of landfill-related COC risk to infaunal benthic communities, shore birds, blue mussels, and fish:

- Zone 1 (intertidal zone along landfill's northern shoreline)
- Zone 3 (intertidal zone along landfill's southern shoreline)
- Zone 3A (intertidal and subtidal zone south of zone 2)
- Zone 4 (subtidal zone west of zones 1 and 2)
- Zone 6 (depositional area in intertidal and subtidal zones south of landfill)

Low probability of landfill-related COC risk to infaunal benthic communities, shore birds, blue mussels, and fish:

- Zone 5 (subtidal zone west of zone 1 and 2)
- Zone 7 (reference area west of zones 5 and 6)

2.0 DEVELOPMENT OF REMEDIATION OBJECTIVES

This section presents the initial steps in the development of remedial alternatives that will address the human health and ecological concerns identified at the site and comply with all applicable regulations. The process is broken down as follows:

- Identify applicable or relevant and appropriate requirements (ARARs) and other environmental criteria that must be considered in developing remedial action objectives (RAOs) (Section 2.1).

- Develop media-specific RAOs that are protective of human health and the environment and comply with ARARs. RAOs may specify contaminants of concern (COCs), exposure pathways and receptors, and preliminary remediation goals (PRGs) that identify potentially acceptable contaminant levels or ranges of levels for each exposure route (Section 2.2).

- Develop initial estimates of areas or volumes of media that should be addressed by the remedial alternatives (Section 2.3).

After these steps are completed, general response actions (GRAs) that will satisfy the site-specific RAOs can be formulated and applicable technologies identified and evaluated. GRA development and technology identification, screening, and evaluation are presented in Section 3.0.

2.1 ARARS AND TBCS

ARARs, and standards and guidance to be considered (TBCs) are the regulatory and non-regulatory environmental criteria that must be considered while planning and implementing remedial actions. This section provides a brief summary of what constitute ARARs and TBCs, and the various types of ARARs that must be considered in the FS. Section 5.0 identifies the potential ARARs and TBCs for each of the proposed remedial alternatives for the site and describes the actions that must be taken to comply with these requirements.

ARARs are promulgated federal environmental, state environmental, or facility siting requirements that are determined to be legally applicable or relevant and appropriate to the hazardous substances, remedial actions, or other circumstances at a CERCLA site.

The two categories of requirements are defined below:

Applicable Requirements - Section 300.5 of the NCP defines applicable requirements as "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site."

Relevant and Appropriate Requirements - Section 300.5 of the NCP defines relevant and appropriate requirements as "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility citing laws that, while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site."

The NCP Section 300.430(E) states that on-site remedial actions at CERCLA sites must meet ARARs unless there are grounds for invoking a waiver. A waiver is required if ARARs cannot be achieved.

TBCs are non-promulgated criteria, advisories, and guidance issued by the federal or state governments. Along with ARARs, TBCs may be used to develop the remedial action alternatives necessary to protect human health and the environment.

ARARs and TBCs are further divided into three categories: chemical-specific, location-specific, and action-specific. These categories are briefly discussed in Sections 2.1.1 through 2.1.3.

2.1.1 Chemical-Specific ARARs and TBCs

Chemical-specific ARARs and TBCs are usually health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the determination of numerical values that establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment. In general, chemical-specific requirements are set for a single chemical or a closely-related group of chemicals. These requirements do not consider the mixture of chemicals.

Chemical-specific ARARs and TBCs for the remedial alternatives under consideration are identified and discussed in Section 5.0.

2.1.2 Location-Specific ARARs and TBCs

Location-specific ARARs and TBCs are restrictions placed on the concentrations of hazardous substances or the conduct of activities solely because they are in specific areas. The general types of location-specific requirements that may be applied to the McAllister Point Landfill Site include coastal zone, water resources, and floodplain regulations. Location-specific ARARs and TBCs for the remedial alternatives under consideration are identified and discussed in Section 5.0.

2.1.3 Action-Specific ARARs and TBCs

Action-specific ARARs and TBCs are usually technology- or activity-based requirements or limitations on actions taken with respect to the management of hazardous substances, pollutants, or contaminants. These requirements are generally focused on actions taken to remediate, handle, treat, or dispose of hazardous substances, pollutants, or contaminants. These action-specific requirements determine how a selected alternative must be implemented. Action-specific ARARs and TBCs for the remedial alternatives under consideration are identified and discussed in Section 5.0.

2.2 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES (RAOS)

RAOs consist of media-specific goals for protecting human health and the environment. The RAOs specify the media and COCs, exposure pathways and receptors, and acceptable contaminant level or range of levels for each exposure pathway. By specifying both an exposure pathway and target contaminant level(s), the RAOs permit development of a range of alternatives that may achieve protectiveness by reducing exposure to contaminated media or reducing contaminant concentrations.

Sections 2.2.1 through 2.2.4 present the four major components of the RAO development process: identification of the media of concern, identification of the COCs for each medium, development of PRGs, and formulation of RAOs.

2.2.1 Identification of Media of Concern

The media of concern for the FS are identified based on the results of the RI, the site-specific HHRA and marine ERA, and an evaluation of compliance with chemical-specific ARARs. Site investigations have identified marine sediment, groundwater, and landfill gas as potential media of concern at the site. This section presents the evaluations of each of these media for selection as a medium of concern for this FS.

2.2.1.1 Sediment

The results of the site-specific HHRA and marine ERA were evaluated to determine whether nearshore and offshore sediment should be retained as media of concern for the FS.

As discussed in Section 1.6, the HHRA identified unacceptable human health risks associated with ingestion of shellfish containing landfill-related contaminants from the nearshore areas adjacent to the landfill (Zones 1, 2, and 3) and offshore areas in Zone 3A. Cancer risks in these areas exceeded the target risk range of 1E-04 to 1E-06, and non-cancer HIs exceeded the 1E+00 threshold. Unacceptable human health risks due to shellfish ingestion were not identified in the remaining offshore areas (Zones 4, 5, and 6).

As discussed in Section 1.7, the marine ERA identified the nearshore areas adjacent to the central portion of the landfill (Zone 2) as having high probability of landfill-related COC risk to infaunal benthic communities, shore birds, blue mussels, and fish. Intermediate probability of risk was identified for nearshore Zones 1 and 3 at the north and south ends of the landfill, offshore Zones 3A and 6 south of the landfill, and offshore Zone 4 west of Zones 1 and 2. Low probability of landfill-related COC risk to these aquatic organisms was identified for offshore Zone 5, located west of Zone 4.

Risks to avian aquatic predators were identified only for the intertidal areas (nearshore Zones 1, 2, and 3 and offshore Zone 3A, which is partially within the intertidal zone). The marine ERA assumed that the avian predators' feeding range was restricted to these shallow areas. The risks were related to exposure to landfill-related COCs in marine sediment and porewater. The marine ERA concluded that the primary COC source contributing to ecological risk was the landfill itself, as indicated by the distribution of contaminants, and the risk determined by the lines of evidence.

Based on the results of the HHRA and marine ERA, both nearshore and offshore sediment are associated with increased human health or ecological risks. Therefore, both nearshore and offshore sediment are identified as media of concern for the FS.

The risks throughout the nearshore area are comparable; therefore, this area should be considered as a whole in remedial objectives and alternatives development. However, within the offshore, Zone 3A presents different and greater risks than the remaining offshore area. Zone 3A presents a potential risk to both human health and the environment and had some of the highest contaminant concentrations detected in the study area. The rest of the offshore area, having lower contaminant concentrations, presents a potential risk to the environment but does not pose a human health risk. Therefore, Zone 3A will be considered separately from the rest of the offshore in remedial objectives and alternatives development and evaluation. For the remainder of the FS Report, Zone 3A will be referred to as the elevated-risk offshore area. (The breakdown of the study area into the three remedial action areas is further defined in Sections 2.2.4 and 2.3.)

2.2.1.2 Groundwater

To determine whether to retain groundwater as a medium of concern for the FS, available groundwater data were compared with state and federal chemical standards for protection of human health (Rhode Island groundwater standards) and the environment (ambient water quality criteria (AWQCs)). Groundwater data were further compared to sediment data to determine whether a correlation existed between contaminants in groundwater and contaminants that contribute to human health and ecological risk in sediment (see Sections 1.6 and 1.7). The groundwater data used in this evaluation were collected during four quarterly monitoring events following completion of the landfill cap in 1996. The analytical data and comparisons are presented in Appendix A.

Site-specific risk evaluations were not conducted for ingestion of or direct exposure to groundwater. The HHRA did not consider groundwater a potential exposure medium because (1) despite its classification as a GA-NA aquifer, the site groundwater is not considered suitable for future use as a drinking water source because of the site's proximity to Narragansett Bay and historical use as a landfill, and (2) dermal exposures to groundwater are unlikely, given the average depth to groundwater across the site is greater than 16 feet below ground surface. Similarly, the marine ERA did not consider groundwater as a direct contributor to ecological risk.

Site groundwater is generally in compliance with state GA aquifer standards. Only isolated exceedences of the GA standards for benzene, naphthalene, lead, arsenic, antimony, and nickel were noted in a few wells. Most of these exceedences were slight, and all except one (naphthalene at MW-103S) were less than one order of magnitude above the standards. Because site groundwater is not likely to be used as a future source of drinking water and direct exposure is not a concern, the presence of isolated contaminants in exceedence of GA standards is not expected to increase risk to human health.

Groundwater concentrations were also generally lower than marine chronic AWQC. No VOCs exceeded marine chronic AWQC; and only isolated exceedences of fluoranthene, diethylphthalate, arsenic, copper, lead, and nickel were noted in a few wells. Most of the exceedences were slight, and all but one were less than one order of magnitude above the criteria. It is important to note that AWQCs are not standards for groundwater; they are surface water criteria for the protection of aquatic organisms. AWQCs are being considered here as a conservative indicator for evaluation of potential adverse effects to marine organisms. This use assumes that contaminant concentrations present in groundwater would be equivalent to the contaminant concentrations in associated porewater and surface water. However, the actual contaminant concentrations in porewater and surface water in the intertidal zone are likely to be lower than the concentrations in the discharging groundwater due to dilution, adsorption to sediments, and chemical transformation caused by mixing with salt water. Therefore, the isolated exceedences of AWQC are not expected to pose significant risk to aquatic receptors.

Comparison between groundwater and marine sediment data indicates that groundwater is not a significant source of the contaminants in sediment that contribute to unacceptable human health or ecological risk. Of the compounds identified in sediment with concentrations exceeding PRG values (see Section 2.2.3), only nickel was consistently detected in groundwater samples at concentrations exceeding marine chronic AWQC values; it was detected in multiple sampling rounds at four of the eleven wells sampled.

Evaluation of analytical results from the first four quarters of landfill O&M monitoring indicated that groundwater concentrations at the site have decreased since 1993, when the last round of RI sampling was conducted by TRC prior to construction of the cap. Groundwater concentrations are expected to decrease further as a result of the installation of the low permeability landfill cap. This cap has reduced the infiltration and leaching of contaminants from waste materials by site

groundwater and precipitation. Additional O&M monitoring is needed to evaluate future trends in the groundwater elevation and chemistry to determine when equilibrium conditions have been achieved at the site. Once equilibrium is achieved, groundwater chemistry data can be re-evaluated to determine whether additional actions are needed. Continued quarterly groundwater monitoring and evaluation of the resulting analytical data will be conducted as required by the source control ROD to assess the need for future actions to address site groundwater.

Based on these evaluations, groundwater at the site does not appear to pose an unacceptable risk to human health or environmental receptors, or to be a significant contributing source of contamination to marine sediment adjacent to the landfill. Further, it is anticipated that groundwater contaminant concentrations will decrease over time as the hydrogeologic conditions beneath the landfill cap equilibrate. Therefore, groundwater treatment does not appear necessary at this time. However, conclusions regarding trends in contaminant concentrations should not be based on these first four quarterly rounds. Monitoring over a longer period is required under the source control ROD to assess changes in groundwater quality resulting from installation of the low permeability cap. Data from the quarterly groundwater monitoring will be evaluated to assess changes in contaminant concentrations and evaluate the need for future actions.

Groundwater is not identified as a medium of concern for this FS. RAOs will not be developed for groundwater.

2.2.1.3 Landfill Gas

To determine whether to retain landfill gas as a medium of concern for the FS, available landfill gas data collected during July 1997 were evaluated and compared to NIOSH and OSHA time-weighted average concentrations for workplace exposure. Low concentrations of VOCs were detected in samples from some gas vents. However, none of the contaminants detected in the gas samples was found to exceed the worker exposure standards. The landfill gas data and comparisons with air quality criteria are presented in Appendix A.

Because the sampling was not conducted according to protocol approved by RIDEM, the data could not be used to ascertain whether landfill gas emissions exceeded state ambient air quality standards. Additional air sampling will be performed as required under the source control ROD to assess compliance with the state air quality standards, help ensure compliance with OSHA worker safety requirements, and assess the need for active gas collection and treatment.

Landfill gas is not identified as a medium of concern for this FS. RAOs will not be developed for landfill gas.

2.2.2 Identification of Sediment Contaminants of Concern

The sediment COCs are those chemicals that cause unacceptable human health or ecological risks. Sediment contaminants that pose excess carcinogenic risk greater than 1E-06 or have hazard quotients of greater than 1.0 for non-carcinogenic risk were selected as COCs. COCs for protection of human health are:

HUMAN HEALTH CONTAMINANTS OF CONCERN	
PAHS	**INORGANICS**
Benzo(a)anthracene	Arsenic
Chrysene	Cadmium
Benzo(b),(k)fluoranthene	Chromium
Benzo(a)pyrene	Copper
Indeno(1,2,3-cd)pyrene	Mercury
Dibenzo(a,h)anthracene	Silver
PCBs	Zinc
Total PCBs	

COCs identified as posing potential increased risk for ecological receptors are:

ECOLOGICAL CONTAMINANTS OF CONCERN	
PAHS	**INORGANICS**
Acenaphthylene	Arsenic
Acenaphthene	Cadmium
Anthracene	Chromium
Benzo(a)anthracene	Copper
Benzo(a)pyrene	Lead
Chrysene	Mercury
Dibenzo(a,h)anthracene	Nickel
Fluoranthene	Silver
Fluorene	Zinc
2-Methylnaphthalene	**PCBs**
Naphthalene	Total PCBs
Phenanthrene	**PESTICIDES**
Pyrene	o,p'-DDE
Total PAHs	p,p'-DDE
	Hexachlorobenzene
	Mirex

2.2.3 Development of Sediment Preliminary Remediation Goals

The objective of the overall PRG development process is to select a manageable number of COCs and corresponding concentrations that, when implemented as cleanup criteria, will address the areas of unacceptable human health and/or ecological risk. The PRGs must be protective of each of the principal receptors identified at the site: humans, aquatic organisms, and avian aquatic predators; and, they should be reasonable and practical to implement.

Sediment PRGs that are protective of the identified receptors were developed for the site using an approach developed by SAIC that considered the human health and ecological risk, as well as ARARs and TBCs. The general approach used is summarized in Table 2-1. The complete PRG development process is presented in Appendix D. The PRG development resulted in the identification of two sets of pathway-specific PRGs for individual COCs, and PRG recommendations for the combined exposure pathway that would reduce risks to all the identified receptors.

Two sets of PRGs were developed for each COC in order to provide a risk management-based approach for final selection of PRGs. The first set of PRGs (baseline PRGs) was developed based on a Threshold Effects Value - Hazard Quotient (TEV-HQ) of 1, the threshold value at which adverse effects are not expected to occur. These baseline PRGs provide a conservative approach toward PRG implementation that would result in risk reduction in all areas, including the low ecological risk probability areas (areas where possible, but minimal ecological impacts were identified and the association between exposure and adverse effects could not be established).

The second set of PRGs (recommended PRGs) was developed to provide a risk-based means of focusing the remediation on the areas posing the greatest risks. To develop these PRGs, each exposure pathway (aquatic, avian, and human health) was evaluated separately to determine a risk-based point-of-departure that would target risk reduction for that pathway in the most critical areas.

For the aquatic exposure pathway, a spatial analysis of TEV-HQ values was conducted. The analysis concluded that the risk-based point-of-departure between areas of high ecological risk probability and areas of reduced risk probability occurs at concentrations equal to three times the TEV-HQ = 1. Implementing the recommended PRGs for aquatic receptors based on this higher concentration threshold would result in targeting risk reduction in the high ecological risk probability areas and some of the intermediate ecological risk probability areas.

A spatial analysis was also conducted to evaluate the practicality of the baseline PRGs for protection of human health. However, in this case, the analysis focused on the relative potential for exposure rather than the magnitude of risk. From the analysis, it was concluded that implementing PRGs equal to three times the TEV-HQ = 1 (recommended PRGs) would result in targeting risk reduction in the shallow intertidal area where the highest probability of ecological risk was identified and where shellfishing is expected to occur. Deeper areas where shellfishing is much less likely would be excluded from the target area.

For the avian predator exposure pathway, an evaluation of the TEV-HQ values and the ERA assumptions and results concluded that implementation of any PRGs for protection of avian predators may not be warranted. The marine ERA concluded that only slight risks to avian predators were present given the relatively small affected area, the low degree of exposure, and the conservative nature of exposure assumptions (predators are assumed to spend their entire life span at any given station). In addition, any possible risks posed to avian predators in the intertidal area would likely be addressed by remedial actions undertaken in this area based on risks posed to aquatic organisms or humans. Therefore, no recommended PRGs were developed for protection of avian predators.

To determine the baseline and recommended PRGs for implementation that would be protective of all identified receptors, a spatial analysis of the limiting PRGs was conducted for the combined exposure pathway scenario. This analysis concluded that six COCs (copper, nickel, anthracene, fluorene, pyrene, and total PCBs) are the principal contributors of risk at the site. Implementing the PRGs for these six COCs would achieve site-wide risk reduction for all identified receptors because by remediating (removing) these COCs to their PRG concentrations, other co-located COCs will be remediated to levels much lower than their corresponding PRGs. The results of the spatial analysis are presented on Figures 2-1 and 2-2. Figure 2-1 shows the areas that would be addressed under the remedial action if the baseline PRGs were selected as the final remediation criteria. Figure 2-2 shows the areas that would be targeted by recommended PRGs based on concentrations three times the TEV-HQ = 1 for the combined exposure pathway.

Based on the magnitude of ecological risks identified at the site (particularly in the offshore area), it is not readily apparent that selecting the low risk probability threshold (TEV-HQ = 1) baseline PRGs for implementation would be beneficial considering the magnitude of environmental impacts that may be caused by active remediation in the large area represented by the TEV-HQ = 1 thresholds. In the large,

relatively low risk probability offshore areas, the remedial action may present greater environmental impacts than are posed by the existing contamination. In contrast, selection of the recommended PRGs developed to target risk reduction in the most critical areas appears to represent a better balance between aquatic habitat disruption and risk reduction. Remediation would occur in a much smaller area, causing less habitat disruption, and would result in reducing the highest and most certain risks present.

Additionally, an evaluation of the PRG derivation and the ERA assumptions for the human health exposure pathway concluded that the calculated PRGs for protection of human health may be overly conservative, therefore their direct use as cleanup goals may not be warranted. The two limiting PRGs for protection of human health, arsenic and PCBs, were both set based on reference concentrations elsewhere in the bay where no contaminant impacts have occurred and where there is no identified risk to human health from shellfish ingestion. These reference-based values may be overly conservative. Adding to the conservatism of the calculated PRGs are the likely limited use of the area for shellfishing (due to the shellfishing ban and the nature of the area), the small size of the affected area, and the low biomass of available shellfish to support subsistence shellfishing (the primary basis for human health risk at the site). These factors all support the conclusion that the human health-based PRGs for arsenic and PCBs should not be adopted as the recommended PRGs for the combined exposure pathway. As a result, the PRGs for protection of aquatic receptors were adopted as the recommended values for the combined exposure pathway. The baseline and recommended PRGs for all exposure pathways are presented in Table 2-2.

In order to present an evaluation of the complete range of potential remedial actions for both the nearshore and offshore areas, the baseline PRGs will be used in the FS to delineate the limits of the areas that may require remediation. However, it is advised that the recommended PRGs for the combined exposure pathway be selected as the final PRGs for implementing the preferred alternatives. The final selection of PRGs will be made with input from the EPA and RIDEM, following submittal of the FS report. The complete PRG development process is presented in Appendix D. Additional details regarding the selection of recommended PRGs are provided in Sections 3.2 , 3.3, and 4.0 of Appendix D.

2.2.4 Formulation of Sediment Remedial Action Objectives

RAOs for site sediment were formulated based on the site-specific risk assessments, the RI marine investigations, identification of COCs, and development of PRGs presented in the preceding sections. Separate RAOs were identified for different areas of the site because of the differences in risk posed by the areas, as discussed in Sections 1.6, 1.7, and 2.2.1.

For the purposes of RAO development, the study area has been divided into three sections, which are identified below and shown on Figure 2-3.

Nearshore area: For the purposes of the FS, the nearshore area is defined as the coastal area adjacent to McAllister Point Landfill that lies between the landfill revetment and the -3 foot mean low water line (water depth = 3 ft at MLW) and any additional areas outside the -3 ft MLW line that contain landfill materials beneath the surface. The nearshore area roughly corresponds to risk assessment Zones 1, 2, and 3. This area had among the highest risks identified at the site. Sediments in this area pose potential unacceptable risks to humans and ecological receptors. This is the only area where landfill debris are believed to be present beneath the surface of the sediments.

Elevated-risk offshore area: For the purposes of the FS, the elevated-risk offshore area is defined as the subtidal area that roughly corresponds to risk assessment Zone 3A (part of Zone 3A lies within the nearshore area) and includes sample stations MCL-12, S2B, S2C, and OS-28. This area had some of the highest observed contaminant concentrations detected in the study area. Sediments in this area pose potential unacceptable risks to humans and ecological receptors. Water depth in this area ranges from approximately 3 to 15 feet at MLW.

Offshore area: For the purpose of the FS, the offshore area is defined as the subtidal area within the study area that corresponds to risk assessment Zones 4, 5, and 6. No human health risks are associated with this area because the depth of water makes the area inaccessible for direct contact exposures or for shellfishing. Sediments in this area pose lower risks to ecological receptors than sediments in the other areas of the site. Water depth in this area ranges from approximately 3 to 25 feet at MLW.

Because the risks associated with the nearshore and the elevated-risk offshore sediments are similar and the areas are adjacent to one another, these areas are likely to be addressed in the same manner in

any ultimate remedial action selected for the site. Therefore, these areas were considered together in developing of RAOs, and developing and evaluating remedial alternatives.

2.2.4.1 Nearshore and Elevated-Risk Offshore Sediment RAOs

The RAOs for the nearshore and elevated-risk offshore areas address the COC-related risks identified in the HHRA and the marine ERA. In accordance with CERCLA, the RAOs developed for these areas address unacceptable risks to humans identified in the HHRA, and potential risks to aquatic organisms and avian predators identified in the marine ERA. The RAOs identified for the nearshore and elevated-risk offshore areas are presented below.

The RAO for the protection of human health:

- Prevent human ingestion of shellfish impacted by sediments with COC concentrations exceeding the selected PRGs.

RAOs for the protection of the environment and ecological receptors:

- Prevent exposure of aquatic organisms to sediments with COC concentrations exceeding the selected PRGs.

- Prevent avian predator ingestion of shellfish impacted by sediments with COC concentrations exceeding the selected PRGs.

- Minimize migration of sediments with COC concentrations exceeding the selected PRGs to offshore areas and previously unaffected areas of Narragansett Bay.

2.2.4.2 Offshore Sediment RAOs

The RAOs for the offshore area address the COC-related risks identified in the marine ERA. As discussed previously, the marine ERA identified potential risks to aquatic organisms associated with contaminated sediment in the offshore areas; no risks to humans or avian predators were identified. RAOs identified for the offshore area are presented below.

RAOs for the protection of the environment and ecological receptors:

- Prevent exposure of aquatic organisms to sediments with COC concentrations exceeding the selected PRGs.

- Minimize migration of sediments with COC concentrations exceeding the selected PRGs to previously unaffected areas of Narragansett Bay.

2.3 ESTIMATION OF AREAS AND VOLUMES

The area and volume of sediment requiring remedial action were estimated by taking into consideration the marine investigation results, HHRA and marine ERAs, PRG development process, and identified exposure pathways and receptors. As discussed in Section 2.2.3, the areas and volumes of sediment to be considered for remediation were estimated using the baseline PRGs. The area and volume estimates and definitions of the three areas are presented below. The delineated extents of nearshore, elevated-risk offshore, and offshore sediment exceeding the baseline PRGs are shown on Figure 2-3. The detailed assumptions and calculations of area and volume for each area are presented in Appendix E.

Nearshore Area

For the purposes of the FS, the nearshore area is defined as the coastal area adjacent to McAllister Point Landfill that lies between the landfill revetment and the -3 ft MLW line and any additional areas outside the -3 ft MLW line that contain landfill materials beneath the surface.

The nearshore area requiring remediation includes all areas within the -3 ft MLW line with sediment COC concentrations exceeding PRGs, and any additional areas outside the -3 ft MLW line that contain landfill materials beneath the surface and have sediment COC concentrations exceeding PRGs. The area and volume of nearshore sediment to be addressed in the remedial alternatives are:

- Total estimated area exceeding baseline PRGs = 4.2 acres (184,900 square feet)
- Total estimated volume exceeding baseline PRGs = 28,000 cubic yards

Elevated-risk offshore area: For the purposes of the FS, the elevated-risk offshore area is defined as the subtidal area that roughly corresponds to risk assessment Zone 3A and includes sample stations MCL-12, S2B, S2C, and OS-28.

The elevated-risk offshore area requiring remediation includes the subtidal Zone 3A areas with sediment COC concentrations exceeding baseline PRGs. This area consists of polygon areas S2B, S2C, and OS-28 and a portion of polygon area MCL-12, as presented on Figure 2-3. (Polygon areas are the estimated areas associated with the individual sample stations, as identified during PRG development in Appendix D). The area and volume of elevated-risk offshore sediment to be addressed in the remedial alternatives are:

- Total estimated area exceeding baseline PRGs = 1.9 acres (82,800 square feet)
- Total estimated volume exceeding baseline PRGs = 6,000 cubic yards

Offshore Area

For the purposes of the FS, the offshore area is defined as the subtidal area within the study area that corresponds to risk assessment Zones 4, 5, and 6.

The offshore area requiring remediation includes all polygon areas outside the nearshore and elevated-risk offshore areas with sediment COC concentrations exceeding baseline PRGs. The area and volume of offshore sediment to be addressed in the remedial alternatives are:

- Total estimated area exceeding baseline PRGs = 40.9 acres (1,779,900 square feet)
- Total estimated volume exceeding baseline PRGs = 66,000 cubic yards

3.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

Technology identification and screening are important preliminary steps in developing remedial alternatives. In this phase of the FS, potentially applicable technology types and process options are identified. The technologies and process options are then screened by evaluating each with respect to technical implementability, thereby reducing the number considered further. The technologies and process options considered to be implementable are then evaluated in greater detail, and representative options are selected for subsequent development and evaluation of remedial alternatives.

The identification, screening, and evaluation of technology types and process options are summarized below by completing of the following steps in the FS process:

- Development of general response actions (GRAs) for each medium of concern that will satisfy the remedial action objectives (RAOs).

- Identification and screening of remedial technologies applicable to each general response action.

- Evaluation and selection of representative technology types and process options.

Section 3.1 identifies the GRAs that may be implemented at the site. Section 3.2 identifies the technologies to be considered and provides a preliminary screening to focus the technology types deemed applicable. Section 3.3 presents a discussion of the final evaluation and selection of representative technologies. A summary of the technologies retained for further consideration in site-specific remedial alternatives is provided in Section 3.4.

3.1 GENERAL RESPONSE ACTIONS

General response actions describe categories of actions that could be implemented to satisfy the RAOs for each medium of concern at a site. GRAs may include treatment, containment, excavation, extraction, disposal, institutional controls, or a combination of these actions. Typically, in developing remedial alternatives, combinations of GRAs may be identified to fully address all the RAOs.

GRAs identified as applicable for remediation of marine sediment at the site include the following:

- No Action
- Limited Action
- Containment
- Removal and Disposal
- Removal, Treatment, and Disposal

These GRAs are summarized below.

3.1.1 No Action

Under the no action option, the site is left "as is", without implementing institutional controls, containment, removal, or treatment. This option, furthermore, does not provide for monitoring or placing access restrictions on contaminated media at the site. However, examination of this option is retained throughout the FS process, as required by the National Contingency Plan (NCP). This option, although requiring no remedial action, provides a baseline for comparison against which other GRAs can be evaluated.

3.1.2 Limited Action

The limited action option is comprised primarily of institutional controls and access restrictions that may limit use or access to the site to reduce or eliminate risks of exposure to hazardous materials. Limited actions also include implementing a long-term monitoring program to assess changes in environmental conditions existing at the site. While institutional controls and access restrictions alone do not reduce the volume, mobility, or toxicity of contaminated media through direct means, naturally occurring attenuation processes may reduce concentrations of some contaminants over an extended period of time. Data generated from long-term monitoring activities would provide information to assist in determining the rate of natural attenuation, as well as the potential migration of COCs from the marine sediment. Monitoring would also provide information on which to base a decision regarding the need to implement additional remedial actions should migration be observed.

3.1.3 Containment

Containment options reduce potential exposure risks through the application of physical means. Physical barriers prevent direct contact with and manage potential erosion/migration of contaminated media. Barriers may consist of permeable or impermeable caps and may be comprised of natural and/or synthetic materials. Containment reduces the mobility of the contaminated media but does not affect volume or toxicity.

Containment of sediment in an underwater, marine environment also involves issues related to settleability of the capping material during placement, and both permeability and transmissivity of the cap once in place. The cap must also be designed to withstand erosional forces of tides, waves, and localized currents.

3.1.4 Removal and Disposal

Removal technologies are used to collect contaminated media from their present locations and move them for subsequent disposal. For marine sediment, removal is typically performed by the use of excavation and/or dredging equipment. Removal reduces the volume of contaminated media remaining on site and allows site conditions to attenuate more rapidly than they would if left undisurbed or contained within an aqueous cap.

Removal of marine sediment also involves materials handling issues related to sediment suspension, sediment dewatering, and residual water treatment/disposal. Sediment dewatering is necessary as a processing step to render the removed material suitable for disposal as a consolidated solid. Residual water generated from the dewatering of the sediment removed from the marine environment may require treatment prior to direct discharge into Narragansett Bay or disposal at a local publicly-owned treatment works (POTW).

Sediment disposal technologies are combined with removal, or removal and treatment, to develop alternatives for cleanup of contaminated marine sediment at the site. Depending on the nature of the contaminated media, disposal may include the following options: confined aquatic disposal (CAD), landfilling at a designated on-site/on-base location, or disposal at an off-base RCRA Subtitle C/RCRA Subtitle D landfill or treatment, storage, and disposal facility (TSDF). Disposal in a properly secured and maintained manner reduces the mobility of the contaminated media.

3.1.5 Removal, Treatment, and Disposal

Treatment technologies are combined with removal and disposal options. Following removal, contaminated sediments may require treatment to reduce their volume, mobility, and/or toxicity prior to disposal. Treatment options include technology types and process options utilizing thermal, physical, chemical, and/or biological means. Treatment options include in-situ and ex-situ processes. Ex-situ processes may further include both on-site/on-base and off-base options.

In-situ treatment options may not be viable, primarily due to the location of the remedial areas within the marine environment. The nature of the contaminants, their relatively low concentrations, and the extremely low PRGs set for the coastal area may further deem in-situ options ineffective and inefficient in achieving the RAOs. However, options are identified and evaluated for applicability in Section 3.2 (see Table 3-1).

Ex-situ treatment options are included for consideration in combination with off-base disposal options. Based on existing analytical data, marine sediments removed from the site are expected to be of acceptable quality for direct disposal in a RCRA Subtitle D landfill without pretreatment. However, because the available data include little information regarding contaminant concentrations at depth in the nearshore area or for the identified seep area in the intertidal zone at the toe of the McAllister Point Landfill cap, contingency for this GRA included treating approximately 9 percent of the material from the nearshore area due to elevated concentrations of metals restricted for land disposal off site without treatment under RCRA Section 268. Additionally, a contingency has been included for disposal of a small fraction of the removed materials in a RCRA Subtitle C landfill without pretreatment, due to elevated concentrations of organics or metals not governed by the RCRA land disposal restrictions (LDRs). No treatment of any offshore or other nearshore marine sediment is anticipated to be needed beyond the addition of a bulking agent to minimize the presence of free liquids.

3.2 IDENTIFICATION AND PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS

A variety of technologies and process options exist for each GRA described in Section 3.1. These technology types and process options were identified and a preliminary screening was performed

to focus on relevant technologies and process options. A summary of the identification and preliminary screening of technologies and process options associated with the remediation of marine sediment at the site is provided in Table 3-1. All options not eliminated due to overall applicability concerns (technical implementability) are retained for detailed evaluation in Section 3.3. All other options are eliminated based on technology screening.

3.3 EVALUATION AND SELECTION OF REPRESENTATIVE TECHNOLOGIES AND PROCESS OPTIONS

All technologies retained following preliminary screening are evaluated in more detail in this section. The final evaluation and selection of representative process options associated with remediation of marine sediment at the site is based on the criteria presented in Section 3.3.1. A discussion of the detailed evaluation of representative technologies and process options is presented in the Sections 3.3.2 through 3.3.7 and summarized in Table 3-2.

3.3.1 Criteria for Evaluation of Technologies and Process Options

In this step, process options considered implementable following preliminary screening are evaluated in greater detail before representative process options are selected to use in developing remedial alternatives. One representative process option is selected, if possible, from each technology category to simplify subsequent development and evaluation of alternatives without limiting flexibility during remedy selection or remedial design. The evaluation criteria include effectiveness, implementability, and cost, with more of a focus on effectiveness. Brief descriptions of the criteria are as follows:

- Effectiveness focuses on the potential ability of a process option to handle the estimated areas or volumes of media, and to meet the remediation goals identified in the RAOs, the potential impacts to human health and the environment during construction and implementation, and the technical reliability (effectiveness of innovative versus well-proven technologies) with respect to the contaminants and conditions at a site.

- Implementability encompasses both the technical and institutional feasibility of implementing a process. The preliminary screening of technology types and process options was based on an evaluation of technical implementability issues in order to

eliminate options clearly ineffective or unworkable at a site. The subsequent, more detailed, evaluation places greater emphasis on the institutional aspects of implementability (coordination with various regulatory agencies and contractors; the availability of treatment, storage, and disposal services; and the availability of necessary equipment and skilled workers to provide long-term operational and maintenance (O&M) services, etc.).

- Cost plays a limited role in the screening of process options. Options are evaluated based on relative capital and O&M costs (whether the costs are high, medium, or low relative to the other options in the same technology type). At this point in the evaluation, the cost analysis is based on engineering judgment and not on detailed estimates.

A discussion of the screening and detailed evaluation of technology types and process options using these criteria is provided in the following sections.

3.3.2 No Action

The no action option consists of no remedial action at the site. It is included in the FS process to serve as a baseline for comparison.

Assessment of this option is as follows:

- Effectiveness: The option would not be effective in achieving the RAOs for contaminated marine sediment. Contaminants would remain and could continue to pose a risk to the marine environment and/or human health. Impacted sediments could migrate to other areas within Narragansett Bay and connected waterways.

- Implementability: The option would be readily implementable with no associated concerns.

- Cost: The option would have no capital costs, and O&M costs associated with the 5-year reviews would be relatively low.

The no action option is retained for further consideration, as required by the NCP, to provide a baseline comparison against which other GRAs can be evaluated for both contaminated marine

sediment in the nearshore area within the intertidal zone, as well as in the more remote offshore area.

3.3.3 Limited Action

The limited action GRA consists of activities designed to minimize potential risks to human health and the environment primarily by prohibiting or controlling access to impacted areas. The technology types/process options include institutional controls, access restrictions, and long-term monitoring. These options may be conducted independently or in conjunction with other process options to protect human health and the environment.

3.3.3.1 Institutional Controls

Institutional controls include administrative actions to restrict future use of the site that may result in exposure risks. The intertidal and subtidal areas are property of the State of Rhode Island, so any efforts to restrict access or activities must be coordinated with and approved by the state. Use restrictions could prohibit shellfishing, lobstering, and other recreational use of the site. However, a state-imposed ban on collection of bivalves is already in effect in the area of Narragansett Bay off the NSN and McAllister Point Landfill due to known and potential sewage discharges in the area. RIDEM has designated the area as a Permanent Shellfish Closure Area; however, it has noted that the shellfish closure could be lifted in the future if the sewage discharges are addressed through treatment.

Assessment of this option is as follows:

- Effectiveness: Since the option would offer no containment or removal of contaminated marine sediment, it would not be effective in achieving all the RAOs. Institutional controls would not prevent contaminant migration, reduce toxicity, or reduce contaminated sediment volume, and they would not protect marine biota or migratory birds. The existing shellfishing restrictions, if properly enforced by the State of Rhode Island, would deter subsistence and recreational fishermen from collecting shellfish (mussels and clams) and would thereby reduce human health risks associated with ingestion of contaminated shellfish – the primary human health risks identified at the site. However, it is uncertain whether the ban is effectively enforced. New use restrictions, such as bans on collecting

lobster, and swimming and diving in the area, could be placed to provide additional protection. However, additional restrictions may not provide substantially more protection, and the effectiveness of such restrictions would also depend on adequate enforcement by RIDEM. No additional risks to human health and the environment would result from implementation of use restrictions.

- Implementability: There is already a state-imposed shellfishing ban in effect in the area of Narragansett Bay off NSN because of known and potential sewage discharges in the area. Additional use restrictions could be implemented by the State of Rhode Island to prohibit lobstering and general recreational use (diving/bathing) of contaminated areas at the site; however, adopting the new controls may be difficult and take considerable time. RIDEM enforcement of the bans would be necessary since the restrictions would be placed on state-owned land. Navy assistance and coordination with Rhode Island authorities would likely be necessary to enhance enforcement of the restrictions. These additional restrictions, if properly enforced, would deter fishermen and recreational users from collecting potentially contaminated lobster. However, adequate enforcement would be difficult to ensure.

- Cost: The capital and O&M costs for administrative actions and 5-year reviews would be relatively low.

New institutional controls are eliminated from further consideration for the nearshore area because controls prohibiting shellfishing are already in place and restrictions on lobstering and recreational use would be difficult to implement and would likely provide no additional reduction in risk.

Institutional controls were eliminated from further consideration for contaminated sediment in the more remote offshore areas because enforcement of use restrictions would provide no protection of the environment, and no exposure pathways were identified for humans.

3.3.3.2 Access Restrictions

Access restrictions include placing physical barriers or markings to limit site use. Placement of fencing, signs, and buoys would demarcate the impacted area and identify the use restrictions and associated risks. These actions would deter access to the site and the impacted sediment.

Assessment of this option is as follows:

- Effectiveness: Since access restrictions would offer no containment or removal of contaminated marine sediment, they would not be effective in achieving all the RAOs. Access restrictions would not prevent contaminant migration, reduce toxicity, or reduce contaminated sediment volume. They would provide no protection of ecological receptors or the environment.

  Access restrictions such as signs on fencing and buoys would notify people of the existing state shellfishing ban and warn people of the hazards present. These restrictions may deter fishermen and recreational users from shellfishing or diving in the area, but would not prevent public access. Since the access restrictions would be used to reinforce the existing use restrictions on state-owned land, RIDEM enforcement would be necessary. The current restrictions are reportedly not strictly enforced. Navy assistance and coordination with Rhode Island authorities would likely be necessary to enhance enforcement of the restrictions; however, ultimately RIDEM would be responsible for enforcement. Adequate enforcement would be difficult to ensure, particularly in the long term.

- Implementability: The NSN may be able to limit shellfishing and access to contaminated sediments in the state-owned nearshore area by placing fencing, buoys, and signs in the intertidal zone warning people of the existing shellfishing ban and the hazards in the area. Fencing would be placed perpendicular to the shoreline, from the top of the landfill revetment to below the mean low water line at the northern and southern ends of the nearshore area, and the buoys would be placed along the perimeter of the impacted area, just outside the mean low water line.

  Installing and maintaining fencing and signs on Navy-owned land above the high tide line would be readily implementable. Coordination with the state would be required to install and maintain fencing an buoys on state-owned land below the high tide line. However, because the access restrictions would be used to reinforce existing, state-imposed use restrictions, coordination with the state is not expected to be an impediment to placement. Buoy and fence placement would be conducted in accordance with all applicable state and federal regulations.

The fence and buoy system would require at least yearly maintenance to remain effective. Routine maintenance of the access restrictions by the Navy would be readily implementable.

- Cost: The capital and O&M costs for placement of fencing, buoys, and signs would be relatively low.

Access restrictions are retained for further consideration for the nearshore area. Signs and buoys would be placed to identify and demarcate areas of risk in order to deter human access and use of the area for shellfishing. Fencing would be installed in the intertidal zone to deter site access from both the northern and southern directions along the shoreline. Buoys would deter access to the site by water. No protection would be provided to marine biota and migratory birds.

Access restrictions were eliminated from further consideration for the offshore area. No effective access restrictions are implementable for protection of the environment, and no exposure pathways were identified for human health.

3.3.3.3 Long-Term Monitoring

Long-term monitoring includes collecting sediment samples from selected locations to assess the migration of contaminants within the contaminated media (sediment) and to adjacent media (porewater, and subsequently into Narragansett Bay). Monitoring would also provide a means of measuring any natural attenuation processes (intrinsic abiotic and biotic degradation) occurring within the contaminated marine sediment or determining if any of the contaminants present have been diluted or covered by sedimentation processes. It would also provide information to assess potential needs for future remedial action.

Assessment of this option is as follows:

- Effectiveness: Monitoring would not be effective in preventing contaminant migration or reducing toxicity, mobility, or volume of contaminated sediment. However, data collected from monitoring activities would help to identify trends in contaminant concentrations associated with natural attenuation and potential migration off site. Monitoring could also

provide information to assess the need for future remedial action, as well as to monitor the effectiveness of any remedial action being conducted. Short-term risks to human health during monitoring activities would be minimized by the use of personnel protective equipment (PPE).

- Implementability: A long-term monitoring plan would be readily implementable, since trained personnel are available for sample collection and analysis.

- Cost: The capital and O&M costs for a periodic sediment monitoring program would be relatively low for the nearshore area and low to moderate for the offshore area.

The long-term monitoring option is retained for further consideration for both nearshore and offshore areas. While providing no direct protection of human health and the environment, monitoring would provide a means of assessing exposure risks and potential for contaminant migration existing at the site at any point in time. Combined with other process options, monitoring would further provide a means of determining the effectiveness of remedial action activities.

3.3.4 Containment

The containment GRA involves the use of engineering controls to limit potential risks to human health and the environment. It consists of installing and maintaining physical barriers to isolate and contain the contaminated marine sediment. The barrier would be designed to resist erosional forces and withstand washout in the event of a 100-year storm and, therefore, would be able to limit future exposure to surficial contamination and restrict lateral and vertical migration. For containment of contaminated media underwater and in a marine environment, containment may include one of the permeable capping technologies described below. Impermeable caps were eliminated from further consideration during preliminary screening (see Table 3-1).

Prior to selection of a capping design, a pre-design investigation (PDI) (including studies of wave action and local currents) would be required. The PDI would evaluate the wave action and localized currents affecting the areas of concern to assist in determining the type of cap suited to particular areas of the site. Furthermore, the results of the PDI would help to determine the appropriate thickness of the capping materials and anchoring system to secure the cap within the

marine environment, and select the appropriate gradation of fill material to re-create the existing habitat and restrict sediment migration.

3.3.4.1 Natural Cap

Natural capping options include placing natural silts, fill, sand, gravel, and/or crushed stone as a cover directly over the contaminated area. The selection of materials and associated thickness are chosen based on their ability to chemically and physically isolate contaminated marine sediment from the aquatic environment. A natural cap comprised of materials similar to the existing substrate, but with a small fraction of more coarse materials to provide erosion resistance, is recommended for use in underwater containment. For the site, the natural cap would consist of a mixture of sand, gravel, and stone. These materials would settle more rapidly than a smaller grain-sized fill material and would, therefore, help to minimize subsurface disturbance and water column turbidity during placement. The larger particle sizes, typical of sand and crushed stone, would also allow for more uniform placement within areas of strong tidal action or underwater currents. The coarse fraction within the cap would protect the natural cap and limit erosion due to wave action and underwater currents.

A brief discussion of the advantages and disadvantages of a natural cap of sand, gravel and crushed stone is as follows:

> Advantages of a sand, gravel, and crushed stone cap include ease of placement in an underwater environment. The natural cap would not require any shoring or precise placement; it would be easily installed by dropping the fill materials in place and doing minimal grading. Because the material is denser than water, it would settle more rapidly than finer grain-sized natural materials or less dense synthetic capping materials. Sand and/or crushed stone could also serve as a subbase prior to placement of a synthetic capping layer. It could be used to grade the contaminated area, as well as to prevent migration of contaminated material during placement of additional capping layers.
>
> Disadvantages of the use of sand, gravel, and crushed stone as capping materials are related to erosion control issues. The thickness of the natural fill layer must be sufficient to prevent exposure of underlying contaminated marine sediment and minimize flow of contaminant particles through the cap layers. In addition, the coarse materials may need

to be supplemented with sandy silt or clean sediment to properly bind with the contaminated media. The coarse materials in the cap would form an armor layer to limit the impact of wave action and underwater currents, and thereby minimize erosion. The gradation of the fill materials must be selected based on the existing substrate, wave action, and water currents in the area. Installation of a cap would result in permanent filling of intertidal and subtidal areas. Since the cap thickness anticipated for the intertidal zone is expected to be a minimum of 2 feet, installation would decrease the water depth and potentially interfere with navigation close to the existing shoreline. The cap would permanently fill the affected area, covering existing aquatic habitats. Intertidal areas would become upland, and subtidal areas would become intertidal. Restoration and placement of lost habitats may be required off site if losses cannot be mitigated on site. The fill would provide a substrate for some aquatic habitat restoration; however, active restoration of any impacted eel grass beds may be required. Successful restoration of eel grass beds has not been widely demonstrated, and creation of new off-site intertidal and subtidal habitats may be difficult.

Assessment of this option is as follows:

- Effectiveness: Since capping offers no removal or treatment, it would not reduce the toxicity or volume of contaminated sediment. However, capping would be effective in minimizing human and environmental exposures due to direct contact with contaminated marine sediment. The effectiveness of a natural cap in preventing potential migration of contaminants into Narragansett Bay depends on its ability to resist erosion and prevent exposure and migration of the contaminated media. Use of appropriately sized and graded capping materials would limit upward migration of contaminated sediments. Migration of dissolved contaminants through the cap could occur under the force of an upward groundwater gradient, potentially contaminating the cap materials over time. Wave action and local currents may limit the long-term integrity of a natural cap in the marine environment, especially in the high energy areas of the nearshore. Short-term risks to human health and the environment may be associated with cap installation. However, the use of PPE and turbidity control measures would reduce these risks.

  The long-term effectiveness of the natural cap could be monitored by periodically inspecting the cap to ensure that the cap thickness has not decreased, and collecting

sediment samples to determine whether contaminants have been released from the cap. Periodic maintenance would be required to replace any cap materials that had eroded.

- Implementability: Placement of a natural cap is implementable by companies with trained personnel qualified to handle contaminated sediment dredging, grading, and erosion control operations in an aqueous environment. All on-site personnel must be trained in hazardous waste site operations. Proper placement would require considerations of wave action, local currents, and tidal fluctuations. Turbidity control measures would be required to minimize resuspension of contaminated sediment and to limit its migration during capping operations. Installation could be conducted by land-based and barge-mounted equipment; however, in both cases, installation would be complicated by the difficult access to the area caused by the shallow water depth and the presence of the landfill and revetment along the shoreline. Proper anchoring of the cap, and maintenance to ensure its long-term integrity, may be difficult. The ability to have a continuous cap in the presence of large boulders and ledge outcrops may be difficult. It may be difficult to restore or replace the aquatic communities disturbed or destroyed by the capping activities, although the cap material would provide habitat structure suitable for regrowth of these aquatic communities. Creation of new off-site aquatic habitats may be required to replace permanently altered intertidal or subtidal habitats.

- Cost: The capital and O&M costs are moderate for a natural cap comprised of sand and crushed stone layers.

The integrity of a natural cap would be very difficult to maintain in areas of high erosional forces (high energy areas). Therefore, the use of natural caps has been eliminated from consideration for nearshore, high energy areas.

Containment using a natural (sand, gravel, stone) cap has been retained for further consideration for nearshore areas where erosional forces (wave and tidal action) are expected to be low (low energy areas). The use of natural caps was also retained for offshore areas where erosional forces are expected to be low. A PDI would need to be performed to determine areas where natural capping will be suitable as a containment method.

3.3.4.2 Multi-Media Cap

Multi-media caps include the placement of both natural and synthetic barriers directly over a contaminated area. The barriers may include a subbase of sand and/or crushed stone, a layer of synthetic material to prevent particle migration through the cap, articulating concrete or other type of armament to anchor the cap in place, and a graded sand/stone top layer.

Synthetic cap materials include numerous types of geotextiles offering varying degrees of chemical resistance, permeability, puncture resistance, UV protection, and ability to stretch. Geotextiles are available in both nonwoven and woven fabrics. Woven fabrics are typically used for slope stabilization and shoring applications. Nonwoven geotextiles, having tighter pore sizes, would further act as filters to limit the passage of sediments. For underwater applications, nonwoven geotextiles would better serve as a means of controlling erosion and preventing migration of contaminated marine sediment. Because geotextiles are permeable, they would not prevent the migration of dissolved contaminants through the cap.

A brief discussion of the advantages and disadvantages of capping with a multi-media cap is as follows:

> Advantages of multi-media caps are related to the assurance the engineered components of the cap provide against erosion and particle migration. Use of an engineered armor layer such as an articulating concrete mat may better protect and secure the cap in place in a marine environment affected by heavy tidal and wave action and/or strong localized currents. The mat would provide a contiguous boundary that could be easily anchored. Selection of a geotextile with the appropriate particle filtration properties provides insurance that contaminated sediment will not migrate upward through the cap.
>
> Disadvantages of multi-media caps are related to the difficulty of placement in the marine environment, the higher cost relative to natural caps, and uncertainty about the long-term durability of the synthetic materials in the marine environment. Placing a multi-media cap is more difficult than placing a natural cap because the engineered materials (geotextile and concrete armament) must be precisely placed and connected under water. Synthetic geotextiles are particularly difficult to place underwater because air becomes trapped beneath the large sections, causing them to float. Submerging and properly installing them

underwater can be very difficult. Attaching the geotextile to an articulating concrete mat and installing it using land-based or barge-mounted equipment would make placement easier; however, both land-based and barge-based installation are complicated by the difficult access to the area caused by the shallow water depth and the presence of the landfill and revetment along the shoreline. Care must be exercised when placing geotextile materials to minimize the chances of puncture by debris. Because of the precision required to place the engineered cap materials, installation of a multi-media cap takes longer and is more expensive than a natural cap.

Installation of a cap would result in permanent filling of intertidal and subtidal areas. Since the multi-media cap thickness anticipated for the intertidal zone is expected to be a minimum of 2 feet, installation would decrease the water depth and potentially interfere with navigation close to the existing shoreline. The cap would permanently fill the affected area, covering existing aquatic habitats. Intertidal areas would become upland, and subtidal areas would become intertidal. Restoration and placement of lost habitats may be required off site if losses cannot be mitigated on site. The fill would provide a substrate for some aquatic habitat restoration; however, active restoration of any impacted eel grass beds may be required. Successful restoration of eel grass beds has not been widely demonstrated, and creation of new off-site intertidal and subtidal habitats may be difficult.

Assessment of this option is as follows:

- Effectiveness: As with a natural cap, a multi-media cap would offer no removal or treatment of the contaminated media and, therefore, would not reduce the toxicity or volume of contaminated media. Capping would minimize human and environmental exposures associated with direct exposure to contaminated sediment. A multi-media cap may be more effective than a natural cap in isolating contaminants and preventing contaminant migration, since the geotextile layer would provide an additional means of filtering particles to minimize permeation of contaminated marine sediment. However, there may be limits on the long-term effectiveness of the geotextile layer in the marine environment. Additionally, because the cap is permeable, migration of dissolved contaminants through the cap could occur under the force of an upward groundwater gradient, potentially contaminating the cap materials over time.

The use of concrete armament would provide additional protection from erosional forces and improve the durability of the multi-media cap in high energy areas. The multi-media cap option may also provide greater long-term effectiveness, since it may be more securely anchored in place. Short-term risks to human health and the environment during cap installation could be minimized by the use of PPE and turbidity control measures.

The long-term effectiveness of the multi-media cap could be monitored by periodically inspecting the cap to ensure that the cap thickness has not decreased and by collecting sediment samples to determine whether contaminants have been released from the cap. Periodic maintenance would be required to replace any cap materials that had eroded.

- Implementability: Installation of a multi-media cap is implementable by companies with trained personnel qualified to handle contaminated sediment dredging, grading, capping, and erosion control operations in an aqueous environment. All on-site personnel must be trained in hazardous waste site operations. Fewer companies are available with direct experience in underwater sediment capping techniques involving specialized equipment for the placement of geotextiles and articulating concrete armament; furthermore, qualified companies may not be readily available within the Rhode Island coastal business community. Proper placement must consider wave action, local currents, and tidal fluctuations. Long-term maintenance of the integrity of the cap may be difficult. However, because of the continuous nature and strength of the synthetic material, the integrity of the cap could be more easily maintained and monitored than a natural cap. It may be difficult to restore or replace the aquatic communities disturbed or destroyed by the capping activities, although the cap material would provide habitat structure suitable for regrowth of these aquatic communities. Creation of new off-site habitats may be required to replace permanently altered intertidal or subtidal habitats.

- Cost: The capital costs are moderate and O&M costs are moderate to high for multi-media caps.

Containment using a multi-media cap is retained for further consideration for high energy nearshore areas. Capping would minimize direct contact with contaminated marine sediment and, thereby, provide protection of human health and the environment. The multi-media cap would provide more secure containment of impacted marine sediment than would a natural cap for high

energy areas. For low energy areas, a multi-media cap would provide the same degree of protection as a natural cap, but it would be more expensive to construct. Therefore, multi-media caps are eliminated from consideration for low energy areas of the nearshore and offshore.

3.3.5 Removal

Removal technologies are included as key components of both the removal/disposal and the removal/treatment/disposal GRAs. Removal activities involve excavating and/or dredging contaminated marine sediment to reduce or eliminate on-site toxicity, mobility, and volume. These operations require instituting sediment resuspension/turbidity control measures, transporting removed materials, dewatering sediment, treating water generated during dewatering activities, and restoring altered intertidal and subtidal habitats. Sediment consolidated from dewatering activities would also require disposal or treatment, as discussed in Sections 3.3.7 and 3.3.8.

In general, selection of the most efficient and cost-effective excavation and/or dredging techniques depends on sediment removal rates which, in turn, depend on the following factors:

- Equipment (type and size)
- Volume and depth of contaminated material
- Sediment characteristics (amount of debris, sediment grain size, and water content)
- Location/navigational constraints (bridges, water depth, currents, etc.)
- Weather conditions
- Pretreatment requirements (dewatering, water treatment and disposal, etc.)
- Marine ecological concerns related to resuspension of contaminated sediments during removal and associated turbidity control (silt curtains, booms, etc.)
- Health and safety issues related to handling contaminated sediment
- Transport
- Method of disposal or treatment

Removal of sediment from the nearshore area in the intertidal zone is expected to be conducted from the shoreline in areas where access is possible and there is adequate shallow area in which to work. Land-based removal would be conducted with the assistance of a temporary cofferdam system and continuous dewatering to keep the area relatively dry. Contaminated sediment in the nearshore area that cannot be reached from the shoreline, as well as all contaminated sediment in

the offshore area, would be removed using barge-mounted dredging equipment. The PDI would further evaluate the feasibility of removing sediments from nearshore and offshore areas, either using land-based or barge-mounted equipment.

The sediment removal options may include the following excavation and dredging technology types.

3.3.5.1 Mechanical Dredging and Excavation

Mechanical dredging and excavation may be conducted using a number of techniques including clamshells, dippers, bucket ladders, draglines, and conventional earth-moving equipment. This equipment operates by the direct application of mechanical force to dislodge materials to be removed.

Clamshells. The most commonly used mechanical dredge for removing contaminated soils and sediment is the clamshell dredge. Clamshells can recover all types of material and debris, except highly consolidated sediment. This type of dredge is generally equipped with an open, hinged bucket with a capacity of 1 to 12 cubic yards. The bucket is attached by a cable to a land-based crane or flat-bottomed barge. The clamshell dredge can excavate to practically any depth, restricted only by the crane lifting capacity.

The clamshell dredge is operated by opening the jaws of the bucket, lowering the bucket into the material to be removed, closing the jaws, and hoisting the bucket by means of the crane cable. The dredge removes a heaped bucket of material, part of which is excavated by drag forces during hoisting. If properly operated, conventional clamshell dredges can operate with limited loss of sediment and can efficiently remove a large volume of material. For marine dredging applications, a modified, watertight bucket is sometimes used to minimize the resuspension of solids into the water column. However, the large rocks and debris within the sediment to be dredged would frequently prevent the bucket from closing, thereby reducing the effectiveness of the watertight bucket.

Dippers. The dipper is a powered 8 to 12 cubic yard shovel designed for digging out rock and very hard, compacted material. Their use is suited for excavation of soft rock and highly consolidated sediment within a working depth of 50 feet. Since this technique operates with a violent digging

action and tends to drop small particles, its application for marine dredging is often limited. However, it may be well suited for removing landfill materials and sediment in the nearshore area. It could be operated from the shoreline or a barge to remove contaminated sediment in the nearshore, but its use may not be appropriate for offshore dredging.

Bucket Ladders. A bucket ladder dredge is comprised of a submersible ladder that supports a continuous chain of buckets that rotate around two pivots. When the buckets rotate around the underside of the ladder, they scoop up material and transport it up the ladder for discharge into a storage bin. These dredges are most commonly used in mining operations abroad, such as sand and gravel production. The bucket ladder dredge generates considerable turbidity because of the mechanical agitation of sediment and leakage from the bucket. Therefore, its use is limited to removal of contaminated sediment exposed during low tide.

Draglines. Draglines use the same basic equipment as the clamshell dredge. However, the dragline operates by the use of a drag cable to pull the bucket through the material being excavated toward the crane. Dragline dredges typically provide for a longer reach than clamshell dredges operated by the same crane. Since draglines cause a great deal of mechanical agitation of the material being removed and because the buckets are generally open, their use generally results in excessive sediment resuspension. However, use of dragline dredges may be required to remove materials in hard-to-reach sections of the nearshore. If possible, their use should be limited to removing contaminated sediment exposed during low tide.

Conventional Earth-Moving Equipment. Conventional track-mounted earth-moving equipment (excavators, front-end loaders, backhoes, and bulldozers) have limited application in removing contaminated sediments from underwater locations; however, they may be well suited to removing consolidated sediments and landfill debris from the nearshore area. Front-end loaders and bulldozers are generally used to remove loose or soft materials from a few feet above to a few feet below grade. Since they must be in close proximity (both horizontally and vertically) to the material being removed, shore-based or barge-mounted operations are not practical; however, bulldozers and front-end loaders could be employed to excavate materials behind a cofferdam. Excavators and backhoes, typically used for trenching and other subsurface excavations, consist of a bucket on a fixed arm and have reaches of up to 100 feet. They can be operated from the shoreline or mounted on a barge.

A brief summary of the advantages and disadvantages of mechanical dredging is as follows:

Advantages of mechanical dredging include the fact that excavation can be conducted to maximize the solids content and, thereby, minimize the scale of the dewatering and handling activities. Mechanical dredges are highly maneuverable, can remove many types of debris, and provide dredging accuracy. Clamshell dredges and excavators are further capable of efficiently removing materials with depth. Many techniques are available for shoreline use, while fewer options are suited for barge-mounted operation.

Disadvantages of mechanical dredging include the potential to resuspend large amounts of sediment, as well as offering a lower production capacity and typically higher costs than other dredging techniques. Mechanical dredging operations also require significant rehandling of materials. Debris such as submarine netting, wire, metal, and concrete may limit the efficiency of mechanical dredging.

Assessment of this option is as follows:

- Effectiveness: Mechanical dredging would be effective in removing debris and contaminated sediment from the marine environment. Removal would minimize future exposure risks to human health and the marine environment while preventing contaminant migration within Narragansett Bay. The effectiveness of mechanical dredging is limited by difficulty of achieving complete removal in an underwater environment. Multiple passes over the contaminated area may be required to remove all contaminated materials. The effectiveness can be improved, but not to 100 percent, by state-of-the-art positioning equipment. The use of appropriate turbidity control measures during marine sediment dredging would minimize contaminant migration during implementation. However, preliminary excavation/dredging activities conducted to remove any debris and landfill materials (metal pieces, submarine cables, large boulders, etc.) prior to sediment removal could result in excessive suspension of contaminated sediment that may be difficult to control. Any aquatic habitats that are altered by the remedy would require mitigation measures to offset the aquatic habitat loss. Restoration of the habitat would be accomplished by refilling the excavated area to the existing grade using materials similar to the existing substrate. Additionally, if necessary, active restoration of any impacted eel

grass beds could be attempted. However, successful restoration of eel grass beds has not been widely demonstrated.

- Implementability: Mechanical dredging is readily implementable by companies with trained personnel qualified to handle contaminated sediment dredging operations. Fewer companies are available with direct experience in associated contaminated sediment dewatering and treatment techniques; however, qualified companies are assumed to be available within the Rhode Island coastal business community. All on-site personnel must be trained in hazardous waste site operations because hazardous waste sediments may be present.

  Mechanical dredging is implementable by both shoreline and barge-mounted operations. However, technical issues related to implementation are challenging for both types of operations. Shoreline operations are complicated by difficult access to the area due to the landfill and revetment, and limited shallow water area in which to work. Removal using conventional earth-moving equipment would be possible only if a cofferdam was used to keep the area relatively dry. Barge-mounted operations are limited by the draft requirements of the vessel and the reach of the mechanical dredge (up to 100 feet). Because of the weight and size of the equipment required for dredging and processing the sediment and landfill debris on the barge, the barge is expected to require 6 to 10 feet of water for operation. Because the water near the landfill is relatively shallow, some locations (especially in the nearshore area) may be difficult to access. In addition, excavation/dredging along the shoreline may be complicated, since the integrity of the landfill may be compromised unless adequate engineering controls (installation of sheet pilings, etc.) are implemented. The presence of debris such as submarine netting, wire, metal, and concrete may limit the implementability of installing sheet pile to stabilize the landfill, therefore it may not be possible to excavate all materials close to the revetment. It may be difficult to replace the aquatic communities destroyed by the dredging activities, although the backfill material would provide habitat structure suitable for regrowth of these aquatic communities.

- Cost: The capital costs are moderate to high for dredging of contaminated materials. No O&M costs are associated with dredging, but some O&M would be required in the first

few years following dredging to monitor the aquatic habitat restoration. Overall O&M costs would be low.

Mechanical dredging is a viable removal option for both nearshore and offshore areas and has, therefore, been retained for further consideration for both the nearshore and offshore areas. Within the nearshore intertidal zone, debris and contaminated sediment removal activities may include both conventional earth-moving excavation techniques (behind a temporary cofferdam) and mechanical dredging using barge-mounted equipment for sediment inaccessible from the shoreline. This process option has, therefore, been selected to represent the excavation/dredging technology for the removal/disposal and removal/treatment/disposal GRAs for the nearshore and offshore areas.

3.3.5.2 Hydraulic Dredging

Hydraulic dredges use centrifugal pumps to remove sediment in a liquid slurry form and transport the slurry by suction to a designated location on a barge or along the shoreline. Slurries of 10 to 20 percent solids by weight are typically achieved. A cutterhead, or similar device, is often fitted at the suction end of the dredge to assist in dislodging bottom materials and allowing for transport to the suction pipe. The cutterhead is probably the most efficient and versatile type of hydraulic dredge available. However, new hydraulic dredge designs are available that attempt to increase the solids content of the pumped slurry while minimizing the sediment resuspension caused by the dredging activity.

Both cutterhead and plain suction hydraulic dredges can efficiently remove large volumes of relatively small materials. Typical hydraulic dredges cannot remove stones or debris larger than approximately 4 to 6 inches in diameter because they are limited by the size of the suction head and slurry pipeline. The plain suction dredges are capable of removing relatively free-flowing sediments (sand, gravel, and unconsolidated material), while cutterhead dredges are capable of removing free-flowing as well as very hard and cohesive sediments. Portable dredges (with or without a cutterhead) can be used to remove moderate volumes of materials that are more surficial in nature (depths of up to approximately 18 inches). The cutterhead, plain suction, and portable dredges can all be operated from the shoreline or from barge-mounted equipment in deep water.

A brief summary of the advantages and disadvantages of hydraulic dredging is as follows:

Advantages of hydraulic dredging include limiting the resuspension of sediment and minimizing the handling of dredged material by transporting the dredged slurries by suction through pipelines. The cutterhead can efficiently dredge and pump all types of alluvial materials or compacted deposits, such as clay or hardpan. The cutterhead is also capable of grading and finishing slopes efficiently.

Disadvantages of hydraulic dredging include the fact that large volumes of water, which may require treatment prior to disposal or release, are typically removed along with the sediment (80 to 90 percent water by weight). The slurry pipelines used to transport dredged material may obstruct navigational traffic. Nonhopper dredges cannot be operated in rough water, and hopper dredges may require drafts of over 10 feet. The presence of large stones and debris such as submarine netting, wire, metal, and concrete may limit the effectiveness and suitability of hydraulic dredging in some areas, particularly the inshore areas closest to the landfill. Hydraulic dredges cannot remove material with diameters greater than the diameter of the suction head or slurry pipeline; therefore, their use in the nearshore areas where debris is present may be limited.

Assessment of this option is as follows:

- Effectiveness: Hydraulic dredging would be effective in removing contaminated marine sediment. However, in areas where the marine environment contains obstructions or debris greater than the diameter of the dredge, mechanical excavation and dredging techniques may be required to prepare the area prior to hydraulic dredging. The effectiveness of hydraulic dredging is limited by difficulty of achieving complete removal in an underwater environment. Multiple passes over the contaminated area may be required to remove all contaminated materials. The effectiveness can be improved, but not to 100 percent, by state-of-the-art positioning equipment. Removal of impacted sediment would minimize future exposure risks to human health and the marine environment, and prevent contaminant migration within Narragansett Bay. The use of appropriate turbidity control measures during dredging activities would minimize contaminant migration during implementation. Any aquatic habitats that are altered by the remedy would require mitigation measures to offset the aquatic habitat loss. Restoration of the habitat would be

accomplished by refilling the excavated area to the existing grade using materials similar to the existing substrate. Additionally, if necessary, active restoration of any impacted eel grass beds could be attempted. However, successful restoration of eel grass beds has not been widely demonstrated.

- Implementability: Hydraulic dredging is readily implementable by companies with trained personnel qualified to handle contaminated sediment dredging operations. All on-site personnel must be trained in hazardous waste site operations. Fewer companies are available with direct experience in associated contaminated sediment dewatering and treatment techniques; however, qualified companies are assumed to be available within the Rhode Island coastal business community.

  Hydraulic dredging is implementable by both shoreline and barge-mounted operations. However, technical issues related to implementation are challenging for both types of operations. Shoreline operations are complicated by difficult access to the area due to the landfill and revetment, and limited shallow water area in which to work. Barge-mounted operations are limited by the draft requirements of the vessel (6 to 10 feet) and the reach of the hydraulic dredge. Because the water near the landfill is relatively shallow, some locations (especially in the nearshore area) may be difficult to access. In addition, dredging along the shoreline may be complicated, since the integrity of the landfill may be compromised unless adequate engineering controls (installation of sheet pilings, etc.) are implemented. It may be difficult to replace the aquatic communities destroyed by the dredging activities, although the backfill material would provide habitat structure suitable for regrowth of these aquatic communities.

- Cost: The capital costs are moderate for hydraulic dredging of contaminated materials. No O&M costs are associated with dredging, but some O&M would be required in the first few years following dredging to monitor the aquatic habitat restoration. Overall O&M costs would be low.

Hydraulic dredging using barge-mounted equipment may be viable for the offshore area. However, it may not be favored over mechanical dredging, depending on the type of sediments to be removed, the anticipated severity of sediment suspension, and the cost of dewatering the dredged slurry. Therefore, hydraulic dredging has been retained along with mechanical dredging for further

consideration for use in the offshore areas, pending receipt of additional information on sediment grain size and elutriate quality from the PDI. The final selection of the most appropriate dredging method should be made after evaluation of PDI data. For the purposes of the FS alternatives evaluation and costing, mechanical dredging (see Section 3.3.5.1) has been selected as the representative dredging technology for removal activities in the offshore area.

Hydraulic dredging in the nearshore area has been eliminated from further consideration. Mechanical dredging (see Section 3.3.5.1) has been selected to represent the dredging technology for removal activities in the nearshore area. Mechanical equipment is necessary to remove subsurface debris prior to sediment removal activities, and mechanical excavation/dredging would be more efficient for removing contaminated sediment and landfill debris present at depths of up to 15 feet in this area.

3.3.5.3 Materials Handling

Additional activities associated with excavation/dredging operations are related to materials handling. These activities include transporting excavated/dredged contaminated materials for processing, screening, and dewatering sediment, and treating/disposing of the residual water.

Transportation of Excavated/Dredged Materials. Contaminated marine sediment removed from the impacted areas must be transported for processing (removal of debris, dewatering, etc.) prior to disposal. The type of transport depends on the method of excavation/dredging (mechanical transport for mechanical removal activities and hydraulic transport through suction pipelines for hydraulic dredging). Processing may take place either at a designated shoreline location or on a barge/scow located near the removal activities. Due to the limited amount of land available along the shoreline adjacent to the removal activities, all excavated/dredged materials are expected to be placed directly on a barge or scow using a clamshell dredge. The materials may be processed on the barge or scow, or transported by water for processing at another NSN-owned shoreline property in the vicinity.

Dewatering Activities. Dewatering is generally required to reduce the moisture content of the sediment, enhance the handling characteristics, and prepare the sediment for further treatment and disposal. Typically, dredged material is screened to remove large objects and debris that may plug or foul the dewatering equipment.

Dewatering technologies appropriate for marine sediment include centrifuging, filtration, and gravity thickening. The effectiveness of these technologies can be influenced by the content of clay, silt, and organic matter in the sediment.

Centrifuging techniques use the force developed by the fast rotation of a cylindrical drum or bowl to separate solids and liquids due to differences in densities. They can generally achieve a product composed of 10 to 35 percent solids. The effectiveness of using centrifuges is limited by sediment containing tars, small size particles, low density particles, large objects, or fibrous materials. Centrifuges are generally compact and are, therefore, well-suited for use in areas with space limitations.

Filtration is a physical process whereby liquid is forced through a permeable medium and dewatered solids are retained. Filtration techniques are able to dewater fine-grained sediment over a wide range of solids concentrations. The effectiveness depends on the filter type, the particle size, and the sediment water content. Three commonly used filtration systems include belt press filtration, vacuum filtration, and pressure filtration. The achievable solids content of dewatered sediment is expected to be in the range of 10 to 50 percent.

Gravity thickeners concentrate solids in a tank, similar to a conventional sedimentation tank or clarifier. They can concentrate dredged sediment slurries of nearly any grain size to approximately 2 to 15 percent solids. Larger grained materials will dewater more efficiently than fine grained materials. Thickened material is typically further dewatered by other methods. The use of gravity thickening techniques for dewatering of marine sediment has limited applicability. However, it may be used as a preliminary dewatering technique in cases when the solids content is very low, as in the case of slurries generated from hydraulic dredging operations.

The selection of a dewatering process or combination of processes depends on the sediment volume and solids content (a function of the dredging technique), available land space, and degree of dewatering required. The system may be operated on the barge/scow or at a NSN-owned shoreline property in the vicinity of the removal activities.

Treatment/Disposal of Residual Water. The water generated from sediment dewatering processes may require treatment to remove dissolved and colloidal contaminants prior to disposal. Treatment and disposal could be handled by two options:

Option A - Treatment on the barge/scow, or at a NSN-owned shoreline property, through a skid-mounted clarifier and membrane filter prior to discharge into Narragansett Bay. The clarifier would remove inorganic constituents by metals precipitation. Unsettled metals precipitant and other suspended particles would be removed by sedimentation and/or filtration. Organic constituents (PAHs and PCBs) are expected to be adsorbed onto the surface of the suspended particles, and thereby removed along with these particles. However, should a need arise to further reduce the concentrations of these organic constituents, additional process units may be added to the skid-mounted treatment train. These may include dissolved air flotation (DAF) and/or granulated activated carbon (GAC) process units. The treated effluent would be required to meet specific contaminant concentration limits prior to discharge into the bay.

Option B - Transport for treatment and/or disposal at a publicly-owned treatment works (POTW). Water could be transported by truck or discharged through a constructed pipeline or existing sewer line.

The selection of an appropriate water treatment/disposal scheme depends on the volume of water generated (a function of the dredging technique), and the composition of the wastewater stream (suspended solids content and contaminant concentrations). Available data are inadequate to determine the best dredging and treatment methods. The appropriate dredging technique, and appropriate sediment dewatering and wastewater treatment methods would be determined based on information gathered during the PDI. The investigation would include sediment grain size analysis and elutriate testing that will be used to aid in design.

The volume of water to be treated will be determined based on the dredging equipment to be used and the recovery rate of dredged sediments. The water treatment plant would be designed to keep pace with the dredging schedule, once it is determined. A relatively large volume of water is expected to result from sediment removal and dewatering activities. Based on the relatively large grain size and low contaminant concentrations in the marine sediment, the water is anticipated to require minimal processing that could readily be accomplished by a moderate-sized treatment train. Current estimates indicate that under optimal conditions, dredging could progress at a rate of 295 cubic

yards per day. Assuming the dredge spoils are 65 percent solids (35 percent water), the plant would have to treat and discharge approximately 21,000 gallons per day.

Therefore, on-site treatment and disposal in Narragansett Bay (Option A) has been selected to represent the water treatment and disposal option for the sediment removal and disposal, as well as the removal, treatment, and disposal GRAs. Bench-/pilot-scale testing would be required to determine the most appropriate water treatment train.

3.3.6 Aquatic Habitat Restoration

Aquatic habitat restoration is a required component of any remedial alternative that significantly damages or destroys the existing aquatic habitat. The proposed marine sediment remedial actions expected to cause significant impacts to the aquatic habitat are capping (Section 3.3.4) and dredging/excavation (Section 3.3.5). Capping and dredging would both completely destroy the existing aquatic habitat in the remediation area. Additionally, the aquatic habitat outside the remediation area may be damaged by construction activities associated with capping and dredging.

This section evaluates aquatic restoration options for the two ecological communities at risk of damage from remedial alternatives: the hard bottom community within the intertidal and subtidal areas of the site, and the eelgrass community in a portion of the subtidal area of the site. It is anticipated that restoration of damaged portions of these communities will be required for several of the remedial alternatives described and evaluated in Sections 4 and 5; however, all possible efforts will be made to avoid damage to the aquatic communities during remediation.

3.3.6.1 Assisted Restoration of Hard-bottom Communities

This section describes the hard-bottom habitat and evaluates the measures that can be taken to restore damaged habitat.

Characteristics of the habitat:

An inventory of nearshore hard-bottom communities in Narragansett Bay was prepared by ASA (1992) based on surveys conducted in 1989 and 1990. Habitats surveyed included boulder,

cobble, sand, and bedrock bottoms. Boulder substrates in the intertidal zone were found to be dominated by the macrophytic algae such as irish moss *(Chondrus)*, rockweed *(Fucus)*, wrack *(Ascophyllum)*, and sea lettuce *(Ulva)*. Dominant macroinvertebrates included blue mussels *(Mytilus)*, barnacles *(Balanus)*, periwinkles *(Littorina)*, and slipper clams *(Crepidula)*. In the subtidal zone, the dominant macrophytic algae included *Chondrus* and kelp *(Laminaria)*. Macroinvertebrates in the subtidal areas were similar to those found in the intertidal zone.

Macrophytes, mussels, and barnacles are the main structural components of these communities. They provide additional substrate and shelter for a host of other organisms that serve as prey for demersal fish, crabs, and lobster. These organisms include bryozoans, tunicates, anemones, sponges, urchins, crabs, amphipod and isopod crustaceans, and polychaete worms.

The specific composition of the community depends on several important factors. These include surface roughness, orientation, wave exposure, slope, and wave breaks. The intertidal zone of McAllister Point is currently rocky intertidal beach that is quite similar to that present adjacent to the site to the north. The offshore area is increasingly sandy with distance from the shoreline.

Assisted Restoration of the Hard-Bottom Habitat:

Assisted restoration of the hard-bottom habitat is accomplished by providing an optimal habitat structure for colonization of a diverse and stable hard-bottom community. Once in place, the habitat structure will be colonized by water-borne algal spores and animal larvae that would be swept into the area by tidal currents and wave action.

Provision of an optimal substrate for colonization would involve selection of substrate materials similar to those currently present in the area off McAllister Point Landfill, sized and placed to provide a stable and non-uniform habitat structure that promotes community growth and diversity. These materials (sand, gravel, and stone) would be used as the substrate for any proposed capping and backfilling alternatives.

The primary recolonized surface will be revetment stones large enough to provide a stable surface resistant to strong wave action and tidal currents. These will be natural, not manufactured, stone placed in a non-uniform manner such that surface orientation would be randomized. A non-uniform orientation will result in hard-bottom surfaces that vary in degree of exposure to wave

action and sunlight, which will offer a diversity of habitat that meets recruitment and growth requirements of all types of intertidal and shallow-water organisms indigenous to lower Narragansett Bay. This structural habitat diversity will be a critical element in the development of a diverse and stable hard-bottom community at the site.

In addition to the non-uniform placement of the rock surface, use of a non-uniform size and shape of rock will create crevices, openings, and caves that act as refugia for larger mobile macroinvertebrates and fish. Predator-prey interactions with these organisms will further enhance species and structural diversity of the community.

Colonization of hard substrates in marine and estuarine waters begins with the formation of a microbial and algal film on the new surface. Depending on water temperature, that film will form in a period of days to weeks. Sessile plants and animals will establish themselves through various stages of succession, also depending on the water temperature and the season. Transplantation of sessile organisms to the site would not accelerate colonization of surrounding areas, since the shoreline is open on three sides to unencumbered flow of water that will provide the pelagic spores and zygotes to the entire intertidal and subtidal slope on virtually every tidal cycle. More mobile species could be transplanted to the site but they would not remain due to lack of cover or food source in the beginning stages of colonization.

An assessment of assisted restoration of the hard-bottom community follows:

- Effectiveness: Assisted restoration would effectively restore the hard-bottom community destroyed by capping or dredging actions. Based on the studies described below and observation of the regeneration of the hard-bottom community at the site since it was disrupted in 1996, it is anticipated that an ecological community like that currently present to the north of the site would be restored within 1 to 4 years after completion of remedial actions.

  Although there are no published studies that directly establish the rate of recolonization of hard substrates in lower Narragansett Bay, Jeffries (1979) study of the recruitment process in the West Passage suggests that this process is rapid. Glass plates submerged from April to October, 1971, were successively colonized by microalgae, colonial hydroids, amphipods and polychaetes, and finally, mussels, barnacles, and limpets. Jeffries

hypothesizes that this process will repeat itself with each seasonal and annual recruitment cycle such that after a 1 to 4-year period, the community would stabilize to one dominated by long-lived organisms such as the mussel.

Bertness (1983, 1984) conducted studies on the effects of periwinkle grazing on intertidal communities at a site in upper Narragansett Bay. Periwinkles were removed from experimental sites and colonization over time was monitored. Ten days after snail removal, 21 percent of available space was covered by approximately 5 cm long *Enteromorpha*. Barnacle recruitment occurred in March and April and, by mid-June, covered 65 percent of exposed surfaces. *Chondrus* had grown to approximately 10 cm 6 months after snail removal. The work of Bertness indicates that bare rock surfaces will experience rapid colonization and will be exposed to the larvae of dominant and sub-dominant community components. The progression of colonization, i.e., community structure and diversity, after the first 6-12 months will largely depend on the biotic interaction processes, e.g., predation, competition, and the scale of physical disturbance events such as storm-generated wave disturbance.

Studies currently underway by the University of Rhode Island to evaluate the effectiveness of lobster colonization of cobble habitats also are examining macroinvertebrate and macroalgal recruitment to these hard-bottom habitats (C. Castro, personal communication). By 1 to 2 years after emplacement of clean cobble surfaces, a kelp-coral-sponge community was well established.

It is not expected that the timing in the yearly cycle of the emplacement of the rock cap will have a major impact on the rate or composition of recolonization in this community.

The effectiveness of restoration of the hard-bottom community would be evaluated through a monitoring program that would be established to assess community condition relative to communities of similar general orientation that are present adjacent to the site. A reference condition would be established and progress toward that condition on restored surfaces would be evaluated over a 4-year period.

- Implementability: Assisted restoration of hard-bottom communities affected by capping or dredging actions could be readily implemented. Provision of an optimal substrate for

colonization is easily implementable. The optimum size and type of materials could be easily determined by evaluating and classifying the materials that are present in the intertidal and subtidal slopes at and to the north of the site. Replacement substrate (sand, stone, and gravel) in a wide range of sizes is widely available commercially and can be easily brought to the site and placed on the areas affected by the remedial actions. Non-uniform placement of the material would be easily accomplished using standard earthmoving equipment and techniques. Marine scientists would be available to direct the placement of substrate and monitor the progress of restoration.

- Cost: The capital and O&M costs for placement of substrate for natural colonization are relatively low. The cost of the purchasing, transporting, and placing substrate would be included in the cost of the capping or dredge/backfill alternatives. The additional costs for assisted restoration would be that for determining the optimum substrate materials, directing the placement of substrate materials, and monitoring the progress of recolonization.

Assisted restoration is retained for use in alternatives that would damage the hard-bottom community at the site. The assisted restoration would be limited to placing of adequate material in a way that enhances habitat structural diversity to support the species that are found elsewhere in Narragansett Bay. Other forms of assisted restoration of the hard-bottom communities, e.g., transplantation, are eliminated from further consideration in the FS.

3.3.6.2 Eelgrass Communities

This section describes the eelgrass habitat and evaluates the measures that can be taken to restore damaged habitat.

Characteristics of the Habitat:

Eelgrass (*Zostera marina L*) is one of approximately 50 species of marine vascular plants capable of vegetative and reproductive growth. It is found in coastal and estuarine waters in large meadows or small disjunct beds ranging in size from 1 yard across to acres in area. This species is a true flowering plant, with roots and rhizomes that inhabit sediments ranging from soft mud to coarse sand. The thin, green strap-like leaves range from 6 inches to over a yard long. It grows

in water ranging from 1 meter to 8 meters deep and has been found to exist in a wide salinity range. Eelgrass is a sensitive species that grows where several physical, chemical, and biological parameters are in balance with the needs of the plant.

The availability of light controls the depth of eelgrass and is considered the most critical factor in the maintaining healthy eelgrass beds (Kenworthy and Haunert, 1991). In Narragansett Bay, the most important factor contributing to the continuing decline of seagrass has most likely been light reduction caused by turbidity created by algal blooms and periodic disturbances such as dredging (Kemp et al., 1983; Short et al., 1996 a & b). The algal blooms are the result of increasing amounts of anthropogenic nitrogen since the 1870s (Nixon, 1993; Nixon, 1995; Nixon, 1997). Natural factors such as wave and tidal action and shifting sediment have also contributed significantly to eelgrass bed instability.

As discussed in Section 1.4.1, recent photographic investigations conducted by SAIC found evidence of eelgrass seaward of the north end of the landfill. It appears that eelgrass is present in an area approximately 50 feet wide and 120 feet long in the subtidal area approximately 75 feet west of the landfill, outside the nearshore area proposed for active remediation. However, the extent of the eelgrass has not been fully characterized. No information is available on the vitality of the McAllister Point eelgrass bed with respect to longevity or trends in spatial coverage. Further characterization of the extent and viability of the eelgrass beds will be conducted during the PDIs.

Because the eelgrass beds appear to be confined to the offshore area, they may only be significantly damaged if active remediation exceeding baseline PRGs takes place of the offshore area. Remedial actions such as capping or dredging in the nearshore area may not directly affect the eelgrass beds, but increased turbidity in the area caused by the remedial actions could impair light penetration and/or lead to siltation, which could damage the eelgrass beds.

Natural Restoration of the Eelgrass Habitat:

Natural restoration is an option that could be considered to mitigate minor damage to eelgrass beds resulting from turbidity-related impacts such as decreased light availability or increased siltation. Natural restoration would be limited to the use of sediment resuspension/turbidity controls such as installing floating silt curtains during dredging or capping, implementing a turbidity

monitoring program to ensure the effectiveness of the turbidity controls, and monitoring the restoration of the habitat following completion of the remedial action.

An assessment of the natural restoration of slightly damaged eelgrass communities follows:

- Effectiveness: The natural recovery potential for eelgrass indirectly affected by a remedial action in the nearshore area appears favorable. Because of the presence of existing eelgrass, suitable substrate is available and is not expected to be altered by the nearshore remedial action, which would occur inshore of this habitat. Light availability is not expected to be a significant factor in the long-term, i.e., the period following implementation of the near-shore remediation alternative; however, uncontrolled sediment suspension caused by dredging or cap placement during the remediation may decrease the available light for a short period. Effective dredging management and use of sediment resuspension/turbidity controls should minimize this problem. Shoreline excavation would be conducted at or near low tide using conventional earth-moving equipment. Sediments inaccessible from the shoreline would be removed using barge-mounted clamshell or hydraulic dredges. Under all circumstances, the sediment removal area would be enclosed by floating silt curtains to limit the dispersion of resuspended particulates. A turbidity monitoring program would be implemented to ensure the effectiveness of sediment containment procedures.

  Similarly, wave and current action in the area are not likely to be significantly altered by the nearshore remedial action. Any minor changes in wave and current action are not expected to interfere with natural restoration of damaged eelgrass beds. Because the present stability of the eelgrass bed is unknown, it will be difficult to discern natural from anthropogenic stresses that might result from the remedial action. To address this concern, seagrass bed monitoring would be conducted during remediation in conjunction with turbidity monitoring to provide some insight into whether operation-induced siltation is occurring.

- Implementability: Natural restoration of slightly impacted eelgrass beds is easily implemented. It would principally involve proper use of operational and sediment resuspension/turbidity controls during active remediation of the nearshore areas to limit damage and allow the area to quickly return to its original condition.

- Cost: The capital and O&M costs for natural restoration of slightly impacted eelgrass beds would be low. The costs for minimizing damage to the area would be included as part of the normal dredging or capping costs. Additional costs would include turbidity monitoring and any monitoring associated with the restoration of the habitat.

Natural restoration is a viable option to address eelgrass beds slightly impacted by remedial actions in the nearshore area. It is retained for further consideration for alternatives that could result in slight damage to eelgrass beds.

Assisted Restoration of the Eelgrass Habitat:

Assisted restoration is an option that could be considered to mitigate destruction of the eelgrass community caused by capping or dredging within the limits of the eelgrass beds. Assisted restoration of eelgrass beds consists of providing the optimum habitat structure and transplanting eelgrass into the sediment structure. Seagrass transplanting methods can be grouped into three broad categories: (1) shoots with sediment intact, (2) seeds, and (3) shoots with bare roots. After initial transplanting, the success of the restoration would have to be monitored and additional transplanting would likely be necessary to replace grasses that did not survive.

An assessment of assisted restoration of severely damaged eelgrass communities follows:

- Effectiveness: The potential for accelerating the recovery of eelgrass impacted by a remedial action is evaluated below in light of the success of recent eelgrass restoration projects in Narragansett Bay.

  In 1995, the National Marine Fisheries Service conducted eelgrass restoration projects at 10 sites (Bristol Ferry North, Bristol Ferry South, Sakonnet River (2), Dutch Harbor, Dyer Island, Hog Island, Northern Jamestown, T-Dock, and West Prudence) chosen for their high clarity of water, sandy sediment, and protection from heavy wave action and strong tidal currents. By 1997, only two sites were found to still be supporting any plants (T-dock, Prudence Island, and Dutch Harbor). The loss of sites has been attributed to strong winds that accompanied the passage of a hurricane in 1996, crab bioturbation, and

excessive reduction in light transmission due to macroalgae; one site was probably set too shallow and one too deep.

Further restoration efforts conducted by the University of Rhode Island (URI) in 1995 involved two separate eelgrass restoration projects: one involving eelgrass shoots with bare roots as the transplant media, and another using only eelgrass seeds. For each proposed transplant area, a careful evaluation of environmental variables was conducted, including collecting information on bathymetric data coupled with light extinction data, wave energy, sediment type, i.e., sandy bottom, presence/absence of existing eelgrass, and current human use. In addition, preference was given to areas known to have historically contained eelgrass beds vs. those areas that did not.

Out of 6 sites selected for eelgrass shoot/root transplant by URI in 1995, only 1 site (Hope Island) has persisted to this date. Similarly, of the 4 sites where eelgrass seeding was conducted, only 1 site (Dutch Harbor) was successful. Limited success for both projects is most likely a result of early planting (for seeding the project) and strong wave action. Both URI and NMFS found the higher density plots are more likely to succeed than are those with a lesser density.

In summary, eelgrass restoration projects underway in Narragansett Bay have targeted the most promising locations with respect to environmental conditions believed to favor growth. Despite extensive experimentation in transplantation methods, densities, and locations, very few sites have persisted more than a few years. Those areas that have succeeded do not share similar characteristics with the offshore of McAllister Point; the Dutch Island and Hope Island sites are shallower, flatter, and less exposed to wave and current. Hence, it would appear that the potential for a successful assisted eelgrass restoration off McAllister Point is low to negligible for eelgrass beds that might be harmed by remedial activities in the nearshore or destroyed by capping or dredging in the offshore area.

- Implementability: Assisted restoration of eelgrass beds significantly damaged by remedial activities could be attempted by transplanting eelgrass shoot or seeds and optimizing the habitat structure to encourage eelgrass survival. However, successful restoration may not be possible. As described above, assisted restoration of eelgrass beds has not been widely

successful, even under ideal conditions. It is unlikely the assisted restoration would be successful in the area off McAllister Point, which has less than ideal conditions.

- Cost: The costs of assisted restoration at this site or elsewhere would likely be high due to the need for multiple plantings and extensive monitoring. As noted, little success with assisted restoration of eelgrass in Narragansett Bay has been achieved to date.

Assisted restoration does not appear to be a viable option to enhance restoration of damaged eelgrass beds in the offshore area at McAllister Point. However, if planned remedial actions would severely damage eelgrass beds and some form of mitigation is required, assisted mitigation could be reconsidered to restore the damaged bed or to restore a damaged eelgrass bed in another part of Narragansett Bay.

If assisted eelgrass restoration is considered, it should first be demonstrated that the eelgrass bed found offshore of McAllister Point is viable with respect to cover, bed size, and shoot density, to the extent that these features characterize self-sustaining beds. If the eelgrass bed is characterized as viable and self-sustaining, attempts could be made to restore this bed or to restore a bed in another part of Narragansett Bay. Should this action be necessary, further restoration options would be evaluated employing habitat modifications that would structurally enhance eelgrass restoration, e.g., sand bottom and flatness. This effort would rely on the experience gained in other restoration projects noted above for optimal location and restoration procedures.

3.3.7 Disposal

Disposal technologies are included as key components of both the removal/disposal and the removal/treatment/disposal GRAs. Disposal media include debris removed from the shoreline and sediment excavated and/or dredged from the marine environment. Disposal options may include both on-base and off-base technology types.

3.3.7.1 On-Base Disposal

Materials excavated and dredged from the marine environment would not be appropriate for direct land disposal without containment. Since no land is available adjacent to the existing cap at

McAllister Point Landfill, on-base disposal options would require construction of a containment cell on top of the existing cap or at an alternate on-base location. The on-base location should be easily accessible and able to accept the volumes of marine sediment and debris that require disposal. No suitable locations for construction of a disposal cell have been identified at NSN, other than the existing landfill.

Disposal of the dredged material at the McAllister Point Landfill would involve removing a portion of the cap over the existing landfill, placing the waste, and then recapping the expanded landfill with a configuration similar (in specifications, grades, and materials) to the cap that presently exists at the site. Because the landfill has been closed to meet hazardous waste standards, it would be possible to dispose dredged contaminated material, including any sediment classified as hazardous waste, into the landfill. The viability of this option depends, in part, on the volume of space available within the landfill boundaries and the economics of reopening the landfill cap. It is estimated that the landfill could be expanded with approximately 21,000 to 26,000 cubic yards of dredged materials. A design analysis would be needed to more accurately determine the available capacity and evaluate the viability of the expansion.

Assessment of this option is as follows:

- Effectiveness: On-base disposal would reduce the mobility of contaminants; it would have no effect on volume or toxicity. Expanding the existing landfill would result in significantly increasing the top elevation of the completed landfill cap.

- Implementability: The option may be difficult to implement. On-base disposal capacity outside the McAllister Point Landfill area is limited, and areas offering the required containment may not be available. If disposal in the existing McAllister Point Landfill is selected, significant preparation of the landfill would need to be performed prior to disposal of sediments, including removing portions of the cap to allow placement of the contaminated marine sediment and extending of the existing groundwater monitoring wells and gas vents. There is limited space for staging removed cap materials at the landfill. A design analysis would be needed to fully evaluate the implementability of this option.

  If sediments classified as hazardous wastes require disposal, there may be significant advantages to using the McAllister Point Landfill. Since licensed hazardous waste disposal sites

are limited, finding adequate disposal capacity could be difficult and the costs for transportation to and disposal at these facilities would be high.

- Cost: The capital and O&M costs are expected to be high because of the need to design and construct a new cap on the existing landfill.

On-base disposal in the existing McAllister Point Landfill has been retained as a potentially viable option. It is estimated that there is enough space available at the landfill to dispose of approximately 21,000 to 26,000 cubic yards of materials. A design analysis would be needed to better determine the available capacity and fully evaluate the implementability of this option.

3.3.7.2 Off-Base Disposal

Off-base disposal includes options for disposing of debris removed from the intertidal zone, as well as dredged sediment from both the nearshore and offshore areas. Debris excavated from the intertidal zone may be acceptable for disposal off-base at an unrestricted landfill or recycling facility. All marine sediment dredged from the offshore area is expected to be acceptable for disposal at a RCRA Subtitle D landfill following dewatering. However, due to uncertainties in the characterization of the extent of contamination, it was assumed that a small volume (approximately 10 percent) would require treatment or disposal in a RCRA Subtitle C landfill. The following assumptions were made for the sediment and landfill materials requiring off-base disposal:

- 90 percent by volume would be disposed in a RCRA Subtitle D landfill without any treatment.

- 9 percent by volume would require stabilization (addition of cement or other chemical binding agents) due to elevated metals concentrations, prior to disposal in a RCRA Subtitle D landfill.

- 1 percent by volume would be disposed in a RCRA Subtitle C landfill without treatment.

Assessment of this option is as follows:

- Effectiveness: Off-base disposal offers a full range of disposal and treatment/disposal options depending on the contaminant type and concentration. Disposal at a licensed RCRA Subtitle D/RCRA Subtitle C landfill or TSDF are effective means of off-base disposal. Furthermore, these facilities may be capable of providing treatment of selected materials if required prior to disposal. Debris may effectively be disposed of at a unrestricted landfill or recycling facility, if it meets the disposal requirements.

- Implementability: This option may be difficult to implement. RCRA Subtitle D landfills are available but may not be able to accept the volumes of materials removed from the nearshore and offshore locations. RCRA Subtitle C TSDFs are available for disposal and/or treatment of the small volume that may require such disposal. Proper handling and transport of contaminated materials, complete with bill of lading, would be required. Some stabilization of the materials may be required prior to transport to minimize the presence of free liquids.

- Cost: The capital costs and are expected to be relatively high for off-site disposal. Disposal in a RCRA Subtitle D landfill without treatment would be the least costly of the off-site disposal options; disposal in a RCRA Subtitle D landfill with pre-treatment would be more expensive; and disposal in a RCRA Subtitle C landfill would be the most expensive. No O&M costs are associated with this option.

Off-base disposal is retained for further consideration for both the nearshore and offshore areas. This may be combined with off-base treatment of required materials removed from the nearshore area. No sediment removed from the offshore area is anticipated to require any off-base treatment prior to disposal.

3.3.8 Treatment

Treatment is included as a potentially required component of the removal/treatment/disposal GRA. Contaminated marine sediment removed by excavation and dredging techniques may require treatment, following dewatering and prior to disposal. Treatment would ensure that all contaminated solids are of acceptable quality for disposal either on base or at an off-base facility. On-base treatment options are discussed in Section 3.3.8.1. Off-base treatment options are discussed in Section 3.3.8.2. However, appropriate off-base treatment options would ultimately be determined by the disposal facility accepting the material.

Evaluation of the existing sediment analytical data indicates that contaminant levels are likely low enough to meet disposal requirements in a solid waste or industrial waste landfill without treatment. However, because little data are available regarding contaminant concentrations at depth in the nearshore area or for the identified seep area in the intertidal zone at the toe of the McAllister Point Landfill cap, a contingency has been included to treat that fraction of materials that may not meet RCRA land disposal requirements without treatment. This contingency assumes the need to treat an estimated 9 percent of the volume removed from the nearshore area that requires off-site disposal due to elevated metals and an estimated 20 cubic yards of sediment containing elevated concentrations of organic compounds; however, it is likely that the organics treatment may not be necessary, and the materials contaminated with high concentrations of organic compounds may be disposed in a RCRA Subtitle C facility without treatment. Because of the relatively low volume of sediment that may require treatment according to this contingency, on-base treatment is assumed to be a pilot-sized operation. No sediment removed from the offshore area is assumed to require treatment.

3.3.8.1 On-Base Treatment

On-base treatment may be required for sediment contaminated with elevated concentrations of metals, TPH, PAHs, and/or PCBs that would be disposed off site. Treatment would not be required for sediments disposed on site in the McAllister Point Landfill because they would be consolidated on site in the RCRA Subtitle C landfill. Potential on-base treatment technologies include thermal (thermal desorption) and chemical/physical (stabilization/solidification) options. Additional thermal and physical/chemical options and all biological options were eliminated during preliminary screening.

Thermal Desorption (Thermal Treatment). Thermal desorption may be used to remove organic constituents from contaminated soils and sediment. This process option involves low-temperature heating of a contaminated medium to evaporate or volatilize the organics, while not allowing combustion of non-volatile, naturally occurring organic matter that may be present in the medium. The heating process selectively removes VOCs and TPHs at low temperatures and SVOCs, PAHs, and PCBs at higher temperatures in a rotary type desorption unit fueled by oil or natural gas. The volatile components can either be destroyed in a high-temperature, secondary combustion chamber or recovered by condensation or activated carbon adsorption to ensure compliance with state and federal

air discharge requirements. This treatment option typically creates up to six process residual streams including the treated media, over-sized debris rejected from the process, condensed contaminants and water, emission gas dust, clean off-gas, and spent carbon. This technique is not applicable for removing inorganics.

Assessment of this option is as follows:

- Effectiveness: Thermal desorption is well accepted and commonly employed to remove VOCs and TPH from soils. This technology, while not as commonly applied to treatment of SVOCs, PAHs, and PCBs, may be effective in treating sediment to concentrations acceptable for disposal in a contained area. The performance of a thermal desorption unit is primarily affected by temperature control and residence time; however, the effectiveness is also related to both the particle size and moisture content of the medium being treated. It is anticipated that the small grain-sized and high water content sediment present in the marine environment could reduce the effectiveness of this technology. Initial dewatering of excavated/dredged sediment would be required. Additionally, since this technology does not remove inorganic constituents, thermal desorption treatment residue may require additional processing and/or stabilization prior to final disposal.

  Thermal desorption would remove volatile and semivolatile components from sediment and thereby reduce contaminant volume, toxicity, and mobility through treatment. However, the volume of the sediment would remain essentially the same, since the majority of the sediment is comprised of inert materials unaffected by thermal desorption. In general, pilot-scale testing of thermal desorption would be required to assess removal efficiency for the particular mixture of site contaminants present within the marine sediment at the site.

- Implementability: Implementation of thermal treatment may be compromised by the high water content of the sediment. In addition, large-sized materials such as stones and other debris would typically need to be removed prior to treatment. However, treatment systems can be designed to minimize these concerns. This technology is relatively well developed, with several vendors offering trailer-mounted thermal desorption units for ease in mobilization on and off the base. The procurement, start-up, and trial testing of this process option may represent some difficulties during implementation.

- Cost: The capital costs and short-term O&M are expected to be moderate for thermal desorption.

Although thermal desorption is a viable treatment option, it has been eliminated from further consideration. The efforts associated with procurement and trial testing are prohibitive based on the small amount of material that may require treatment (an estimated 20 cubic yards of organics-contaminated materials from the "southern seep area"). The off-base treatment option (see Section 3.3.8.2) has been selected, since it would provide both a more cost effective treatment and an effective method for treating all contaminants present prior to subsequent off-site disposal.

Solidification/Stabilization (Chemical/Physical Treatment). Solidification/stabilization is a technique that mixes reactive materials with contaminated solids, semi-solids, and sludges to immobilize the contaminants by the formation of a chemically-stable matrix of limited permeability. Volume increases exceeding 20 percent can result. Solidification/stabilization agents may include cement, siliceous materials, lime, or proprietary agents. Selection of the most appropriate agent, the waste-to-additive ratio, mixing variables, and curing conditions all depend on the chemical and physical characteristics of the waste. Solidification/stabilization techniques are most successful in treating wastes containing inorganics; however, some success has been experienced with oily sludges and solvents. Solidification/stabilization is not effective for immobilizing VOCs.

Assessment of this option is as follows:

- Effectiveness: Solidification/stabilization is a well-accepted technique to treat inorganic contaminants. Success in forming a chemically-stable matrix depends on the selection of the stabilizing agents, the mix ratios of waste to agent, and proper mixing and curing. Its effectiveness in treating organics is inconclusive. Treatability studies would be required to confirm the effectiveness in treating organics, as well as in determining the optimum processing to reduce leaching of inorganic constituents from the solidified/stabilized medium. Addition of stabilizing agents are also effectively used to reduce the amount of free liquid present in sediment that may otherwise be of acceptable quality for disposal without additional treatment.

- Implementability: The implementation of the solidification/stabilization process may prove difficult for sediment or sediment slurries with high water content. Initial dewatering of these materials would be necessary to minimize the amount of stabilizing agent required. This

preparatory step would, in turn, reduce the time required to stabilize the contaminants and minimize volume increases associated with bulking the contaminated material.

- Cost: The capital costs are low to moderate and O&M costs are relatively low for solidification/stabilization.

Although on-base solidification/stabilization is a viable treatment option for inorganic contaminants, it has been eliminated from further consideration, because it may not address all contaminants and it would increase the volume of material requiring off-site transport by as much as 20 percent. The off-base treatment option (see Section 3.3.8.2) that uses this treatment option has been selected, because it would be a more easily implementable and more cost effective option for treating sediments prior to off-site disposal.

The use of stabilizers as bulking agents (to reduce free liquids) has been retained for on-base applications.

Soil Washing (Chemical/Physical Treatment). Soil washing is a treatment process that removes contaminants from soils by either dissolving or suspending them in the wash solution (which is later treated by conventional water treatment methods) or by concentrating them into a smaller volume of soil through standard particle size separation techniques. The concept of reducing soil contamination by particle size separation is based on the finding that most organic and inorganic contaminants in soil tend to bind to fine-sized clay and silt particles. By separating highly contaminated fine materials from the relatively clean coarse materials, the soil washing process can significantly decrease the volume of soil that requires aggressive treatment. However, the process can significantly increase the amount of water treatment required.

Soil washing is generally a water-based process; however, chemicals such as surfactants are sometimes added to the wash fluid to enhance removal of specific contaminants. Organic and inorganic compounds can be removed using this process. In the washing process, soils are screened and then scrubbed to break up soil aggregates and liberate fines. The surfaces of coarse particles are "washed" by abrasive action and by desorption of contaminants upon contact with the washing solution. Following treatment, clean coarse particles can generally be re-deposited on site. The contaminated fine particles and the large volume of fluids produced by the washing

process typically require further treatment. Applicable processes for treatment of metal-contaminated fine particles may include solvent extraction or solidification.

- Effectiveness: Soil washing is most applicable for treatment of soils or sediments that contain a relatively small percentage of fine particles and a large percentage of coarse materials that when "washed" could be redeposited on site without further treatment. The presence of large amounts of fine sediment would hinder the process and would not significantly reduce the volume of materials requiring additional treatment and disposal. The presence of large amounts of coarse materials (such as landfill materials) that could not be redeposited on site after washing would reduce the volume-reduction benefit of the process. Additionally, the large volume of washing fluids needed for soil washing would have to be treated prior to disposal, significantly increasing the water treatment component of the project.

  Evaluation of the limited existing sediment data for the site indicates that the marine sediment in the nearshore area may not be suitable for soil washing because it contains a significant fraction of large and small landfill debris that would not be suitable for redeposition on site. Although the large debris could likely be effectively screened from the coarse sediments and disposed off site, the smaller debris such as crushed glass and metal fragments, which are pervasive in sediments throughout the nearshore area, would be much more difficult to separate. If this debris could not be effectively separated, the material would have to be disposed off-site, negating the intended benefits of soil washing. Marine sediment in the offshore area may not be suitable for soil washing because it contains too large a fraction of fine materials.

- Implementability: Soil washing is a well demonstrated technology to treat coarse soils; however, it would likely be less reliable and effective for treating marine sediment with a high proportion of fine materials or coarse landfill debris. Complete treatment of the coarse sediment to allow redeposition would require screening all landfill materials (including small pieces of glass and metal), which may not be possible. The equipment and resources necessary to treat soils that do not contain landfill debris are available for conducting soil washing on site.

- Cost: The capital and O&M costs would be moderate to high, depending on the amount and type of treatment required for the fine particles and washing fluids, the degree of materials

separation required, and the volume of materials requiring dewatering off-site disposal after treatment.

Because of the uncertainty associated with the effectiveness of the process for the marine sediment and landfill materials present at the site, soil washing has been eliminated from further consideration for purposes of costing remedial alternatives. However, soil washing should be retained as an on-base treatment process option for further consideration in the PDI.

Decontamination of Rocks and Debris (Chemical/Physical Treatment): Decontamination may be required to wash contaminated sediment off any large rocks or debris before disposal or reuse. Hazardous waste standards (40 CFR 268.45) require that hazardous debris (rocks or debris containing hazardous waste) must be treated prior to land disposal. Although evaluation of the available analytical data for sediment at the site indicates that the sediment contaminant levels are low enough that most of the sediment and debris at the site would not be classified as hazardous waste, decontamination is being considered as a potential option if hazardous materials are identified. Additionally, decontamination may be desirable to wash any non-hazardous, contaminated sediment off the large rocks that are screened from the dredged material and reused on site. Decontamination methods appropriate for washing contaminated sediment off rocks and debris dredged from the site include high pressure steam or water washing, with or without detergents or surfactants.

- Effectiveness: High pressure steam and water washing methods are effective and commonly used methods for removing contaminated sediment from the surface of removed rock and debris. Pressure washing was effectively used to decontaminate rocks and debris removed during construction of the cap on McAllister Point Landfill.

- Implementability: Decontamination by steam and water washing methods would be readily implementable. They are standard, commonly used techniques that do not require specialized training. The equipment and personnel needed to use these methods would be readily available.

- Cost: The costs for decontamination of rocks and debris by steam and water washing methods would be low.

Decontamination by steam and water washing methods is retained as an option for removing contaminated sediment from the surface of dredged rock and debris that are to be reused or disposed off site.

3.3.8.2 Off-Base Treatment

Off-base treatment may be required to treat sediment contaminated with metals, TPH, PAHs, and/or PCBs. Treatment technologies for off-base treatment include the same general categories described for on-base treatment: thermal and chemical/physical treatment. But different treatment and disposal facilities may employ different process options within these technology types; for example, thermal treatment processes may include thermal desorption and incineration. The appropriate off-base treatment technologies needed to meet the disposal facility's permit requirements would be determined by the disposal facility accepting the material.

For the purpose of this FS, treatment has been included as a contingency for the solidification/stabilization of metals in approximately 9 percent of nearshore marine sediment prior to disposal at a RCRA Subtitle D landfill, and potential treatment of an estimated 20 cubic yards of the sediment containing elevated concentrations of organic compounds (it is likely that the organics treatment may not be necessary, and the materials contaminated with high concentrations of organic compounds may be disposed in a RCRA Subtitle C facility without treatment).

Off-site treatment is only considered for materials that would be disposed at an off-site facility. Sediments disposed on site in the McAllister Point Landfill would not require treatment because they would be consolidated on site in the RCRA Subtitle C landfill.

Assessment of this option is as follows:

- Effectiveness: Treatment at a licensed RCRA Subtitle C/RCRA Subtitle D landfill or TSDF are effective means of rendering the contaminated material acceptable for off-base disposal. Treatment would reduce the toxicity and mobility of the contaminated media. The volume of the media would be increased (typically by up to 20 percent) by solidification/stabilization processes.

- Implementability: This option is implementable at a licensed off-base facility. Many facilities offer stabilization/solidification. Fewer facilities are available for treatment of organics. Proper handling and transport of contaminated materials, complete with bill of lading, would be required. Some stabilization of the materials may be required prior to transport to minimize the presence of free liquids.

- Cost: The capital costs are expected to be relatively low. Materials requiring solidification/ stabilization are expected to be treatable at a RCRA Subtitle D TSDF for minimal cost per cubic yard. The volume of contaminated sediment expected to require treatment for organics is very small (approximately 20 cubic yards). No O&M costs are associated with this option.

Off-base treatment is retained for further consideration for the nearshore area. No sediment removed from the offshore area is anticipated to require any off-base treatment.

3.4 SUMMARY OF SELECTION OF REPRESENTATIVE PROCESS OPTIONS

All remedial technologies and process options retained following the detailed evaluation process discussed in Section 3.3 are summarized in Table 3-3. As discussed in Section 4.0, these technologies will be grouped to formulate a variety of alternatives for consideration in remediation of sediment from both the nearshore and offshore areas.

4.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

Development and screening of alternatives is conducted to assemble an appropriate range of remedial options to achieve the site RAOs. In this phase of the FS, remedial technologies retained for further consideration in Section 3.0 are combined to form remedial alternatives for each medium of concern. The alternatives are then screened to narrow the field of potential alternatives to be selected for subsequent detailed evaluation.

The alternatives are developed to comply with regulatory criteria applicable to the site conditions and the media of concern, as directed by the following regulations and guidance:

- Navy/Marine Corps Installation Restoration Manual (February 1992), which dictates that remedial alternatives be consistent with the procedures outlined in the NCP (40 CFR 300.430).

- National Oil and Hazardous Substance Pollution Contingency Plan (NCP) (40 CFR 300), which establishes the criteria for development and evaluation of remedial alternatives and further suggests consideration of applicable EPA directives and guidance.

- Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA, 1988).

These documents require that a range of alternatives be developed that eliminate, reduce, or control human and ecological risks. The goal is to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste. According to Section 121 of CERCLA, as amended by SARA, the statutory preference is for remedies that will result in a permanent and significant decrease in toxicity, mobility, or volume of contaminants and provide long-term protection. In addition, the NCP requires that certain expectations be considered in developing and screening remedial alternatives. These expectations are as follows:

- Treatment will address the principal threats posed by the site, wherever practical. Principal threats are considered to be liquids, areas contaminated with high concentrations of toxic compounds, and highly mobile materials.

- Engineering controls, such as containment, will be used for waste that poses a relatively low, long-term threat and for which treatment is impractical.

- A combination of methods will be used, as appropriate, to achieve protection of the environment. In appropriate site situations, treatment of principal threats will be combined with engineering and institutional controls for dealing with residuals and relatively low, long-term threats.

- Institutional controls, such as deed restrictions, will supplement engineering controls for short- and long-term management to prevent or limit exposure to hazardous substances, pollutants, or contaminants.

- The use of innovative technologies will be considered when such use offers the potential for comparable or superior treatment performance or implementability, fewer or lesser adverse impacts, or lower costs for similar levels of performance than previously demonstrated technologies.

- Environmental media will be returned to their beneficial uses, when practical, within a reasonable time frame. When restoration of a medium is not practical, actions are expected to prevent further migration and exposure to contaminated media, and to evaluate further risk reduction measures.

The remedial alternatives developed for the marine environment adjacent to the McAllister Point Landfill site are summarized in Table 4-1. The alternatives were developed to apply to marine sediment located nearshore in the intertidal zone, as well as offshore marine sediment at more remote locations. Descriptions of each of these alternatives are provided in the following section. All alternatives developed are evaluated in detail in Section 5.0.

4.1 RATIONALE FOR DEVELOPMENT OF ALTERNATIVES

In selecting remedial options, GRAs and process options chosen to be representative of the various technology types (see Section 3.0) are combined to form remedial alternatives to allow for future remedy selection. The alternatives are developed to address a range of risk reduction

measures, future land use restrictions, and exposure scenarios. Alternatives are also developed that achieve compliance with ARARs and PRGs. Under limited circumstances, waivers may be required if ARARs cannot be satisfied.

The remedial alternatives developed to address nearshore and offshore marine sediment contamination consist of combinations of no action, institutional controls, long-term monitoring, containment, removal, disposal, and treatment technologies. The purpose of each remedial alternative is to prevent migration of and control contact with the contaminated media. A range of remedial alternatives from no action to complete removal and disposal of impacted media is retained for detailed evaluation.

Treatment of contaminated sediment prior to disposal was included as a contingency for a small fraction of the nearshore sediment. As discussed in Section 1.4.1, sediment contaminant concentrations are sufficiently low that the sediment would likely be acceptable for disposal in a solid waste (RCRA Subtitle D) landfill without treatment. However, to accommodate the possibility that highly contaminated sediment classified as hazardous waste may be encountered in the nearshore area during the PDI or implementation of the remedial action, a contingency was included for disposal of a portion of the waste in a Subtitle D landfill with treatment and disposal of a portion of the waste in a hazardous waste (RCRA Subtitle C) landfill without treatment. No such contingency was included for marine sediment removed from the offshore areas, since the contaminant levels are substantially lower in the offshore areas than the nearshore areas.

Nine remedial alternatives have been developed for addressing contamination at the two designated marine areas (nearshore and offshore), including five alternatives for the nearshore and elevated-risk offshore areas, and four alternatives for the remaining offshore areas. The two sets of alternatives were developed and will be evaluated (see Section 5.0) on their own merits because of differences in contaminant concentrations, identified risk receptors, and physical characteristics of the two areas. Implementation concerns and potential cost savings in selecting a combination of nearshore and offshore alternatives have not been considered; these relationships should be considered during the PDI and design stages. The alternatives include:

NEARSHORE AND ELEVATED-RISK OFFSHORE (NS/ER) ALTERNATIVES

- Alternative NS/ER-1: No Action
- Alternative NS/ER-2: Limited Action (Access Restrictions/Long-Term Monitoring)

- Alternative NS/ER-3: Capping (Multi-Media and Natural Cap Above Existing Grade)
- Alternative NS/ER-4: Capping (Multi-Media and Natural Cap) with Dredging to Match Existing Grade
- Alternative NS/ER-5: Dredging and Disposal

OFFSHORE (OS) ALTERNATIVES (LOWER RISK AREAS)

- Alternative OS-1: No Action
- Alternative OS-2: Limited Action (Long-Term Monitoring)
- Alternative OS-3: Capping (Natural Cap Above Existing Grade)
- Alternative OS-4: Dredging and Disposal

A description of the alternatives for the nearshore and offshore areas is provided in Sections 4.2 and 4.3, respectively. Screening of alternatives is presented in Section 4.4.

4.2 NEARSHORE AND ELEVATED-RISK OFFSHORE ALTERNATIVES

The nearshore/elevated-risk offshore alternatives were developed to address sediments in the areas identified as posing the greatest potential risks to humans (through ingestion of contaminated shellfish) and ecological receptors. As discussed in Section 2.2.1, the nearshore and elevated-risk offshore areas were combined for the purposes of remedial alternative development because the areas pose similar risks that would be addressed in a similar manner. As discussed previously, the nearshore area requiring remediation consists of all areas within the -3 ft MLW line that have sediment contamination exceeding recommended PRGs, as well as areas outside the -3 ft MLW line that contain landfill debris beneath the surface and have sediment contamination exceeding recommended PRGs. The elevated-risk offshore area requiring remediation includes the subtidal area in the vicinity of stations MCL-12, S2B, S2C, and OS-28 with sediment contamination exceeding recommended PRGs. The nearshore and elevated-risk offshore areas exceeding recommended PRGs are shown on Figure 4-1.

Much of the nearshore area contains contaminated marine sediments interspersed with landfill materials (scrap metal debris, submarine netting, ash, concrete, etc.). The sediment and landfill materials appear to range in thickness from approximately 1 to 15 feet immediately adjacent to the revetment at the toe of the landfill and to extend westward approximately 60 to 140 feet before reducing in thickness to zero.

The HHRA and marine ERA evaluations identified the marine sediment in the nearshore and elevated-risk offshore area as posing risks to both human health and the environment because of concentrations of PAHs, pesticides/PCBs, butyltins, and select metals. Calculated TEV-HQs in this area are above 3. Additionally, landfill debris in the nearshore area poses a physical hazard to people walking or wading in the intertidal zone.

The nearshore alternatives also address remediation related to a seep identified in the intertidal zone, near the southwest toe of the McAllister Point Landfill. No analytical data have been collected from this location. However, observations during some low tide periods have identified the presence of a surficial oily sheen in the area. The sheen is believed to be the result of a localized subsurface contamination source of landfill material present in the intertidal zone outside of the cap.

4.2.1 Alternative NS/ER-1: No Action

The no action alternative, as required under the NCP, would involve no remedial response activities and would provide no additional protection of human health or the environment. However, it would provide a baseline for comparison to other alternatives. Since contamination would remain and unrestricted future use of the nearshore environment would be allowed, 5-year reviews of the no action decision would be required.

Under this alternative no remedial actions would be performed, no measures would be implemented to restrict access to the marine environment adjacent to the landfill, and no actions would be taken to warn people of the hazards associated with shellfishing or wading in the area. However, measures currently in place would continue to provide limited protection of human health. Existing measures that provide some protectiveness include a shellfishing ban in the area of the site, fencing around the McAllister Point Landfill that limits access to the shoreline from Defense Highway, and restrictions on land use and development of the McAllister Point Landfill site imposed by the source control ROD.

4.2.2 Alternative NS/ER-2: Limited Action

The limited action alternative would involve no direct remedial response activities for contaminated marine sediment or landfill materials adjacent to the McAllister Point Landfill. It would provide no removal or treatment of contaminated material. Therefore, it would provide no protection of the

environment or ecological receptors. However, it would provide some additional protection of human health by employing access restrictions to augment the protection measures currently in place (landfill fencing, shellfishing ban, and land use restrictions), and a long-term monitoring program to allow evaluation of changing conditions at the site. Because contamination would remain, 5-year reviews of the alternative would be required to evaluate the risks to human health and the environment posed by the site in the future.

Access restrictions (shoreline fencing and signs, and nearshore buoys) would discourage public access and recreational use of the shoreline and state-owned land in the intertidal zone, thereby increasing the effectiveness of the existing use restrictions and potentially reducing risks to human health. The shoreline fencing would be connected to the northern and southern corners of the existing fence surrounding the landfill and extend to approximately 20 feet beyond the mean low water line. This fencing would augment the landward fencing installed around the landfill cap. The perimeter buoy system would be placed at 100-foot intervals approximately 10 to 20 feet seaward of the mean low water line, in order to identify areas restricted for recreational use and shellfishing. Warning signs would be posted on the fencing and buoys to warn people of the potential hazards associated with the use of the area. Buoys could also include such features as internal radar reflecting material and reflective markings. Buoy anchoring would likely consist of a triangular placement of ballast to minimize drift and to provide a consistent demarcation of the impacted area. Additional signs would be strategically placed along the shoreline. Proposed locations of these physical deterrents are shown on Figure 4-2. The fencing, signs, and buoys would be inspected quarterly. Repair/replacement would be on an as-needed basis.

The long-term monitoring program would assess the quality of the marine environment over a 30-year period to evaluate changes in human health and ecological risk. The long-term monitoring program would include sediment, biota, and pore water chemistry as well as amphipod and arabacia toxicity. Monitoring would involve measuring parameters that were previously found to contribute to human health or ecological risk. For costing purposes, it is assumed that samples would be collected from 10 locations in the nearshore and elevated-risk offshore areas selected to correspond to sample stations tested in the previous investigations. The analyses would include sediment chemistry (PCBs, PAHs, metals, TOC, and SEM/AVS); biota chemistry (PCBs, PAHs, metals); pore water chemistry (metals); and amphipod and arabacia toxicity.

Given the nature of sediment contamination and the slow changes in sediment quality anticipated, a single sampling event per year was assumed to be sufficient to monitor long-term sediment quality trends. For the purposes of costing, it was assumed that annual monitoring would be conducted for the first 5 years and then, assuming that the sediment quality did not change significantly, the long-term sampling frequency would be reduced from annually to every 5 years. The final long-term monitoring plan, which would specify all the details of the monitoring program, including analytical methods, sampling locations, and sampling frequency, would be developed in coordination with EPA and RIDEM.

The results of the monitoring would be compiled and an evaluation of the contamination and its associated risks would be conducted every 5 years, as required by CERCLA. The results of these 5-year reviews would be used to identify any changes in the contaminant concentrations and to determine the need to implement future response actions at the site or change the required frequency of long-term monitoring events. This monitoring would supplement the groundwater and landfill gas monitoring being conducted as a component of the long-term O&M activities of the McAllister Point Landfill cap.

4.2.3 Alternative NS/ER-3: Capping

This alternative was developed to meet the NCP's requirement for consideration of an alternative that uses containment with little or no treatment. Containment has been considered in areas of contamination exceeding recommended PRGs and presence of landfill debris where RAOs included minimizing potential human exposure due to ingestion of impacted shellfish and contact with landfill debris, and minimizing ecological receptor exposure to contaminated sediment or biota.

Alternative NS/ER-3 would involve capping the nearshore and elevated-risk offshore area with a cover system that would prevent human or ecological receptor exposure to contaminated sediment and resist erosion due to wave action. The cap system would be designed to encourage regeneration of the aquatic habitat to pre-capping conditions. The cap would cover an estimated 6.1 acres of upland, intertidal, and subtidal land in the nearshore/elevated-risk offshore area where sediment concentrations exceed recommended PRGs, as identified in Figure 4-3. Placement of the cap would increase the grade in the capped areas 2 to 3 feet depending on cap thickness, converting approximately 1.12 acres of intertidal to upland area, and converting approximately 2.27 acres of subtidal to intertidal area. This would increase the size of intertidal zone by approximately 1.15 acres, but would result in a net loss of approximately 1.12 acres of subtidal aquatic habitat. (Shoreline change estimates are provided in Appendix E.)

Long-term O&M of the cap would be required to ensure its protectiveness. Because contaminated sediments exceeding recommended PRGs would remain in place, long-term monitoring and 5-year reviews of the effectiveness of the alternative would be required. Major components of Alternative NS/ER-3 are identified and described below.

- Pre-Design investigation
- Sedimentation controls
- Subgrade preparation
- Multi-media and natural cap installation in designated areas
- Long-term O&M of capped areas
- Long-term monitoring
- Five-year reviews

A PDI would be performed to gather information relevant to the cap design and installation. The PDI would include performing an underwater video inspection of the area to be capped and a series of soil borings to confirm the lateral extent of contamination exceeding PRGs, identifying any areas containing hazardous waste, and gathering geotechnical information. The underwater video inspection would locate boulders and debris such as submarine netting, metal, and concrete that would need to be removed prior to cap installation. Approximately 35 soil borings/cores would be advanced to confirm the lateral extent of sediment contamination and define the area for cap placement. Geotechnical testing would be performed to determine the grain size and nature of the sediments in order to select appropriate cap materials. The PDI would also include an evaluation of the existing aquatic communities to determine the extent and quality of any communities that may be damaged and require mitigation as a result of the remedial action.

Subgrade preparation would be required to provide a suitable subbase for cap installation. Materials such as boulders, metal, concrete, submarine netting, and other debris that project above the existing subgrade and could damage the cap during installation or over the long-term would be removed from the surface. Subgrade preparation could include shoreline and/or barge-based operations. Activities are anticipated to be conducted from the shoreline whenever possible. A portable coffer dam system would be used to allow shoreline-based removal activities to occur in relatively dry conditions.

Removed debris would be decontaminated by pressure washing methods, similar to those measures used to clean debris removed during capping of the McAllister Point Landfill or other decontamination methods permitted under applicable hazardous waste standards. It is assumed that the removed debris would be suitable for disposal at a RCRA Subtitle D or approved recycling facility after decontamination. Large rocks and boulders that are suitable for reuse as revetment stone and wave breaks would be decontaminated to remove any contaminated sediments, and staged and reused as part of cap construction.

Sedimentation controls would be installed to control migration of sediment during subgrade preparation and cap installation. A floating silt curtain, temporary coffer dam, or other appropriate particulate resuspension/turbidity control feature would be placed around the perimeter of the construction area during implementation of this alternative. This feature would help minimize potential adverse environmental effects associated with sediment suspension.

Natural cap and multi-media caps would be placed over the impacted sediment. A natural cap would be placed in areas where erosional forces are determined to be low (low energy areas), and a multi-media cap would be placed in areas where there is a high potential for erosion (high energy areas). (Low energy and high energy are qualitative descriptions used in the FS to identify the approximate areas where use of a natural or multi-media cap would be appropriate. The locations and dimensions of the low energy and high energy areas were estimated based on qualitative observations of wave action and substrate size in different areas of the site. The final delineation of areas appropriate for each type of cap would be made based on wave action and current data collected during the PDI, and the final cap designs.) Figure 4-3 shows the proposed locations of the natural and multi-media caps.

The conceptual designs of the natural and multi-media caps are presented below. The caps would be designed to meet federal and state hazardous waste facility washout standards and mitigate loss of aquatic habitat to the extent possible. The caps would be designed and installed to maintain the existing slopes below the high tide line and gradually slope to the natural grade outside the limits of the cap. The final design of the sediment caps would be determined based on the findings of the PDI.

Cap materials would be selected and placed to assist in the natural restoration of the hard-bottom aquatic community that would be destroyed by placement of the cap. The substrate would be sized and placed to provide a stable and non-uniform habitat structure to promote community growth and diversity and to resist erosion of the cap. The cap substrate would consist of graded sand,

gravel, and stone sized similar to the materials located at and north of the site that currently support diverse hard-bottom communities. The primary colonization surface at the top of the cap would consist of non-uniform stones, large enough to provide a stable surface resistant to strong wave action and tidal currents, placed in a non-uniform manner such that surface orientation would be randomized. Use of a non-uniform size and shape of rock will create crevices, openings, and caves that act as refuge for larger mobile macroinvertebrates and fish. A non-uniform orientation will result in hard-bottom surfaces that vary in degree of exposure to wave action and sunlight, which will offer a diversity of habitat for all types of intertidal and shallow-water organisms indigenous to lower Narragansett Bay.

For low energy areas, the proposed natural cap would consist of a 2- to 3-foot thick layer of sand/gravel/ stone over an estimated 2.3 acre area (Figure 4-3). The cover materials would be sized to be similar to the existing substrate, but with a small (10 to 20 percent) coarse component. Such a cover would provide optimum habitat structure to assist in regeneration of the aquatic community in filled areas below the high tide line, and the coarse component would provide erosion resistance. The natural cap would provide isolation of the contaminated sediment and prevent erosion due to wave action and offshore currents. The cap would be of a sufficient thickness to allow benthic organisms to burrow without coming in contact with contaminated sediment. A cross-section of the proposed natural capping option is provided in Figure 4-4.

For high energy areas, the proposed multi-media cap would consist of concrete armament with geotextile pre-attached to both sides, and a 2-foot thick sand/gravel/stone top layer over an estimated 3.9 acre area (Figure 4-3). The geotextile would be a heavy non-woven material with an apparent opening size chosen to prevent sediment migration through the material. The geotextile would prevent the upward migration of fine-grained particles from the impacted sediment into the overlying cap and would provided added protection from erosion. The concrete armament would consist of a system of articulating concrete blocks anchored into the toe of the revetment and into the ocean floor at the limits of the cap. The armament would provide protection of the underlying sediment layers and prevent erosion of the cap due to wave action and offshore currents. The cover layer would be a 2-foot thick layer of sand/gravel/stone similar to that described above for the natural cap. This natural cover would provide erosion protection, assist in regeneration of the aquatic community in filled areas below the high tide line, and be of sufficient thickness to allow benthic organisms to burrow without coming in contact with contaminated sediment. A cross-section of the proposed multi-media cap is provided on Figure 4-5.

Following installation of the natural and multi-media caps, large, irregularly shaped and sized revetment stones would be placed on the cap surface to provide added erosion protection and encourage habitat restoration (Figures 4-4 and 4-5).

For the purposes of the FS, it was assumed that the cap would be installed by a combination of shoreline- and barge-based operations, and that access and staging areas would be constructed at Pier 1 or another pier at Coddington Cove to provide adequate docking and material transfer facilities for all subgrade preparation and cap installation activities. Land-based operations would be performed in the shallow area south of the landfill (the "south depositional area") using conventional equipment such as track-mounted excavators, front-end loaders, bulldozers, and dump trucks. A portable cofferdam would be constructed along the outer limit of the work area (at approximately the -3-foot mean low water line) and dewatering pumps would operate continuously to allow site preparation and cap installation to proceed in relatively dry conditions. The remaining areas (including the entire multi-media cap area) would be accessed using barge-mounted equipment. Because some areas may be difficult to access by either land or water due to the presence of the landfill and revetment and the depth of water, it may be necessary to construct a temporary access road/work area offshore (similar to the one constructed at Allen Harbor); however, for the purposes of this FS, it was assumed that this would not be necessary. (The estimated areas where land-based and barge-based operations would be conducted are shown on Figure E-3 in Appendix E.)

The proposed cap would cover and permanently fill approximately 6 acres of existing rocky intertidal and subtidal aquatic habitat, destroying the hard-bottom aquatic community in the area below the high tide line, and converting approximately 1.12 acres of intertidal aquatic habitat to upland and 2.27 acres of subtidal aquatic habitat to intertidal aquatic habitat. The proposed cap design would mitigate habitat destruction in the areas below the high tide line, as described in the following paragraphs. However, because the filling would result in a net loss of aquatic habitat, to meet the requirements of Section 404 of the Clean Water Act (CWA) it may be necessary to create new intertidal and/or subtidal habitat from uplands somewhere on or off site or to mitigate losses by restoring a larger area of degraded habitat somewhere off site. The habitat mitigation efforts to be required would be determined at the remedial design stage with consultation of relevant federal and state agencies.

The proposed cap design would promote the natural restoration of the remaining intertidal and subtidal portions of the hard-bottom aquatic community by providing an optimal habitat structure to support a

diverse and stable aquatic community. Natural recolonization of the area would occur as water-borne algae spores and animal larvae are swept into the area by tidal currents and wave action. The proposed cap designs would allow burrowing (habitation) of the upper coarse stone layer of the cap while also providing sufficient isolation of landfill contaminants from the surrounding environment. The long-term O&M program would include regular inspection of the capped areas to assess the condition of the habitat. It is anticipated that the ecological community would be reestablished within 1 to 4 years.

Cap installation may also impact eelgrass beds located offshore of the north end of the landfill. However, because existing data indicate that the eelgrass beds are outside the limits of the proposed cap, damage to the eelgrass beds is expected to be slight (principally due to increased turbidity caused by resuspension of sediments during site preparation and capping). Efforts would be taken during site preparation and capping to minimize turbidity that could result in damage to the eelgrass beds. Slight damage to eelgrass beds would be mitigated by natural restoration and monitoring. If the eelgrass beds suffer significant damage, it might be necessary to consider assisted restoration; however, assisted restoration is not proposed as part of this alternative because significant damage is not anticipated and, based on the limited success of other restoration projects in Narragansett Bay (described in Section 3.3.6), there is very low potential for successful eelgrass restoration at McAllister Point. Significant damage to eelgrass beds may require off-site or out-of-kind (replacing or restoring another habitat type) mitigation measures.

Long-term O&M of the cap and long-term monitoring would be necessary to ensure the long-term protectiveness of the cap. Long-term O&M would include quarterly inspection of the cap to ensure its integrity and repair of the cap on an as-needed basis. For costing purposes it was assumed that quarterly inspections of the cap would continue for 30 years and that 325 cubic yards (cy) of cover materials would be used to repair the cap each year.

The long-term monitoring program would be similar to the program developed for Alternative NS/ER-2 (Section 4.2.2) and would include sediment, pore water, and biota chemistry, as well as amphipod and arabacia toxicity. Samples would be collected from approximately 10 locations selected to provide adequate coverage of the capped area. Monitoring would be conducted on an annual basis until it was determined by the Navy and regulatory agencies that the sampling frequency could be reduced. The final long-term monitoring plan, which would specify all the details of the monitoring program, including analytical methods, sampling locations, and sampling frequency, would be developed in coordination with EPA and RIDEM.

For the purposes of costing, it was assumed that annual monitoring would be conducted for the first 5 years and then, provided that the cap remains effective and the sediment quality does not decrease significantly, the long-term sampling frequency would be reduced from annually to every 5 years. The results of the monitoring would be compiled and an evaluation of the contamination and its associated risks would be conducted every 5 years, as required by CERCLA. The results of these 5-year reviews would be used to identify any changes in the contaminant concentrations and to determine the need to implement future response actions at the site or change the required frequency of long-term monitoring events. This monitoring would supplement the groundwater and landfill gas monitoring being conducted as a component of the long-term O&M activities of the McAllister Point Landfill cap.

4.2.4 Alternative NS/ER-4: Capping with Dredging to Match Existing Grade

This alternative has components similar to Alternative NS/ER-3 except that areas to be capped would be excavated/dredged prior to cap placement so that the installed cap would match existing grades. The objective of Alternative NS/ER-4 is to provide containment (capping) of impacted sediment while returning the capped area to its approximate original elevation and topography to minimize potential impacts to the aquatic habitat in the capped area. Components of Alternative NS/ER-4 include:

- Pre-Design investigation
- Sedimentation controls
- Contaminated sediment and debris excavation/dredging to a depth of 2 to 3 feet in the area to be capped
- Excavated sediment dewatering for disposal or reuse
- Dewatering fluids treatment
- Sediment and debris disposal in McAllister Point Landfill
- Natural or multi-media cap installation in designated areas
- Long-term O&M of capped areas
- Long-term monitoring
- Five-year reviews

A PDI would be performed to gather information relevant to the cap design and installation and dredging. The PDI would include a series of soil borings and sampling to confirm the lateral extent of contamination exceeding PRGs, identify any areas containing hazardous waste, and gather geotechnical

information. Approximately 35 soil borings/cores would be advanced to confirm the lateral extent of sediment contamination and define the area for cap placement. Geotechnical testing would be performed to determine the grain size and nature of the sediments in order to select appropriate cap materials and dredging methods, and determine the type and amount of shoring needed to ensure the stability of the landfill during dredging close to the revetment. The PDI would also include elutriate sampling to determine the treatment requirements for fluids to be generated during dredging and dewatering, and evaluating the existing aquatic communities to determine the extent and quality of any communities that may be damaged and require mitigation as a result of the remedial action.

Sedimentation controls would be installed to control migration of sediment during excavation/dredging and cap installation. A floating silt curtain, temporary coffer dam, or other appropriate particulate resuspension/turbidity control features would be placed around the perimeter of the construction area during implementation of this alternative. This feature would help minimize potential adverse environmental effects associated with sediment suspension.

Contaminated sediment and landfill materials in the areas to be capped would be excavated/dredged to a depth equal to the thickness of the proposed cap (approximately 2 to 3 feet). The proposed sediment removal techniques would involve excavating/dredging contaminated sediment using techniques designed to minimize water column turbidity, yet produce a residue of the lowest water content possible. Removal of large boulders and debris would be accomplished during dredging of the contaminated sediment. Due to the proximity of the existing stone revetment to the area to be excavated/dredged, limited shoring may be required to protect the existing revetment during remedial activities. However, because the excavation depth would not exceed 3 feet and would not reach the bottom of the revetment, the excavation may be able to proceed without shoring if shoring is hindered by the presence of landfill debris.

Final determination of the most appropriate excavating/dredging techniques would be accomplished following the PDI. However, for the purpose of the FS, removal activities are anticipated to include both land-based excavation and barge-based mechanical dredging. Land-based operations would be performed in the shallow area south of the landfill (the "south depositional area") using conventional earth-moving equipment such as track-mounted excavators, front-end loaders, bulldozers, and dump trucks. A portable cofferdam would be constructed along the outer limit of the work area (at approximately the -3-foot mean low water line) and dewatering pumps would operate continuously to allow excavation and cap installation to proceed in relatively dry conditions (discharges from the

dewatering pumps would meet applicable state and federal discharge requirements). The work area would be accessed from around the southern limit of the landfill. The remaining areas (including the entire multi-media cap area) would be dredged using barge-mounted mechanical dredging equipment such as clamshell dredges, orange-peel dredges, dipper-dredges, or excavators. Because some areas may be difficult to access by either land or water due to the depth of water and the configuration of the landfill and revetment, it may be necessary to construct a temporary access road/work area offshore to complete the excavation and capping. However, for the purposes of this FS, it was assumed that this would not be necessary. (The estimated areas where land-based and barge-based operations would be conducted are shown on Figure E-3 in Appendix E.)

For the purposes of the FS, it was assumed that Pier 1 or another pier at Coddington Cove would be used as a materials processing, staging, and office area. Materials excavated by land-based methods would be transported over land to Coddington Cove, via the southern tip of the landfill and the railroad right-of-way along the east side of the landfill. Dredged materials would be dewatered on an offshore barge and then transported to Coddington Cove for final processing and staging. Water from sediment dewatering would be treated and discharged to the bay in compliance with applicable state and federal discharge requirements.

An estimated 22,000 cubic yards of contaminated sediment would be excavated as part of Alternative NS/ER-4. The excavated and dredged materials would be screened/degritted to remove any trash or debris and any stones over approximately 6 inches in diameter. The screened material would be segregated as follows:

- For the purposes of this FS, it was assumed that approximately 20 percent of the dredged material (4,400 cubic yards) would be rocks and boulders over 6 inches in diameter and would be suitable for reuse after decontamination. These large rocks and boulders would be decontaminated to remove any contaminated sediments, and staged for reuse during cap construction.

- Screened material less than or equal to 6 inches in diameter (17,600 cubic yards or 80 percent of the excavated material) would be staged separately for disposal. All trash and debris such as steel, concrete, submarine netting, etc. (estimated at 500 tons) would be included with this portion of the excavated material, regardless of size. Any large debris to be sent off site for recycling or disposal would first be decontaminated to remove any contaminated sediments.

Water from the sediment dewatering process would be treated to meet applicable state and federal discharge standards. It is assumed for the purposes of the FS that water generated from the dewatering activities would be treated by means of a skid-mounted clarifier and filtration system on a barge or at Pier 1 prior to discharge into Narragansett Bay. The clarifier would remove inorganic constituents by precipitation. Unsettled metals precipitant and other suspended particles and fines would be removed by filtration. Any organic constituents (PAHs and PCBs) present are expected to be adsorbed onto the surface of the suspended particles, and thereby removed by filtration along with these particles. The need for additional treatment for dissolved contaminants is not anticipated; however, treatment requirements would be evaluated during the PDI. The final design of the water treatment system would be determined following treatability testing during the PDI.

Further processing of the dewatered, screened solids would be conducted at Coddington Cove, if necessary for disposal. Processing may include removal of free liquid, since landfill facilities are prohibited from accepting materials that contain excess free liquid. For the purpose of this FS, removal of free liquid would be accomplished through gravity drainage in addition to stabilization with a "drying" agent such as lime or cement. This activity would be conducted within a contained drainage and mixing location.

Stabilized sediment samples would be collected and analyzed to verify that the material meets land disposal criteria prior to disposal. Analyses for off-site disposal would include those associated with RCRA hazardous waste determinations (toxic characteristic leaching procedure (TCLP), ignitability, corrosivity, and reactivity) as well as those related to federal land ban requirements.

Evaluation of the existing analytical data indicates that sediment contaminant levels are low enough that most of the material would likely meet requirements for disposal in a RCRA Subtitle D landfill without treatment. However, due to uncertainties in characterizing the nature and extent of sediment contamination, it was assumed that approximately 10 percent of the material may be classified as hazardous waste and would require disposal in a RCRA Subtitle C landfill without treatment or a RCRA Subtitle D landfill with treatment. Therefore, two disposal options would be appropriate: 1) off-base disposal in a combination of RCRA Subtitle D and RCRA Subtitle C landfills, or 2) disposal in the McAllister Point Landfill (which meets RCRA Subtitle C standards).

Based on preliminary estimates, the costs for disposal at the McAllister Point Landfill are similar to the costs for off-site transport and disposal at a RCRA Subtitle D facility, but considerably lower than the

costs for off-site transport and disposal at a RCRA Subtitle C facility. The final determination of whether to dispose of the sediments at the McAllister Point Landfill or transport them off site for disposal at RCRA Subtitle D and Subtitle C landfills should be made during the PDI, considering the off-site disposal costs at the time, the technical feasibility of expanding the landfill, and potential community concerns regarding re-opening and expanding the landfill.

For the purposes of this FS, it was assumed that the dredged materials would be placed in the McAllister Point Landfill for final disposal. Based on current estimates, there appears to be sufficient available volume within the McAllister Point Landfill to accommodate disposal of all the dredged material requiring disposal (approximately 17,600 cubic yards). According to preliminary estimates, the existing McAllister Point Landfill has an available capacity of approximately 21,000 to 26,000 cubic yards. If sufficient volume is not available within the McAllister Point Landfill, the surplus sediment would be transported off site for disposal at an appropriate (RCRA Subtitle C or D) landfill. The appropriate off-site disposal facility would be determined based on analysis of the surplus sediment. (Landfill capacity calculations are provided in Appendix E.)

Disposal of contaminated sediments and debris within the McAllister Point Landfill would require removal of a portion of the existing cap prior to placement of the contaminated sediment. The upper layers of the cap, including the vegetative layer, cover layer, and drainage layer would be removed sequentially and stockpiled. Materials such as geotextiles and drainage pipe would not be salvaged and would be disposed of in the landfill.

For the purposes the FS, it was assumed that the existing 40-mil very low density polyethylene liner (VLDPE) would not be removed, but would be perforated in place to allow any gas generated within the existing landfill to migrate upward. Contaminated (dewatered) sediment would be placed on top of the VLDPE layer and graded/compacted until either all sediment is placed or rough grade elevations and contours are achieved. Additional fill material would be placed, if needed, to achieve rough grade elevations prior to cap installation. The final cap over the newly placed contaminated sediment would be similar in configuration to the existing cap and would meet current RCRA Subtitle C hazardous waste standards. The cap would include the following layers in ascending order:

- 6-inch thick cap layer (prepared subbase) over the graded/compacted sediment
- 12-inch thick gas vent layer
- Geosynthetic clay layer (GCL)

- 40-mil VLDPE membrane
- 12-inch thick sand drainage layer
- Non-woven geotextile layer
- 18-inch thick cover layer
- 6-inch thick vegetative layer

The final grade of the newly installed landfill cap would provide adequate drainage, conform to minimum/maximum slope requirements, and minimize erosion potential. It is estimated that the final elevation of the new landfill cap would be approximately 25 feet higher than the existing cap. Details of the landfill expansion and the final cap design would be determined during the pre-design and design phases of the project.

Natural and multi-media caps would be installed over the remaining contaminated sediments in the dredged upland, intertidal, and subtidal areas. A natural cap would be placed in low energy areas (approximately 2.7 acres) and a multi-media cap would be placed in high energy areas (approximately 1.4 acres). In areas where the thickness of contaminated sediments exceeding recommended PRGs is less than or equal to the thickness of the proposed natural cap (2.1 acres), the contaminated sediments would be completely removed and the areas would be backfilled to surrounding grade with clean materials similar to the existing substrate. The excavation depth in these areas would not exceed the depth of the contaminated sediments. The limits of the cap and backfill areas are shown on Figure 4-6.

The caps would be designed and installed to meet federal and state hazardous waste facility washout standards and mitigate loss of subtidal habitat, as described for Alternative NS/ER-3. The natural cap would consist of a 2- to 3-foot thick layer of sand/gravel/ stone. The multi-media cap would consist of concrete armament with geotextile pre-attached to both sides, and a 2-foot thick sand/gravel/stone top layer. The natural fill placed in areas where all sediment exceeding recommended PRGs was removed during excavation/dredging would be similar in grain size to the existing sediments. The elevation and slopes of the completed caps and natural fill would approximately match the pre-excavation grades and contours of the disturbed area. Returning the disturbed areas to existing grades would minimize alteration of the intertidal and subtidal aquatic habitats. Cross sections of the proposed natural and multi-media caps are presented on Figures 4-7 and 4-8.

The proposed dredging and capping would remove and re-cover approximately 6 acres of existing rocky intertidal and subtidal aquatic habitat, temporarily destroying the hard-bottom aquatic community in the

in the area. The proposed cap design would promote the natural restoration of the intertidal and subtidal portions of the hard-bottom aquatic community by providing an optimal habitat structure to support a diverse and stable aquatic community. Natural recolonization of the area would occur as water-borne algae spores and animal larvae are swept into the area by tidal currents and wave action. The proposed cap designs would allow burrowing (habitation) of the upper coarse stone layer of the cap while also providing sufficient isolation of landfill contaminants from the surrounding environment. The long-term O&M program would include regular inspection of the capped areas to assess the condition of the habitat. It is anticipated that the ecological community would be reestablished within 1 to 4 years.

Implementation of this alternative may also impact eelgrass beds located offshore of the north end of the landfill. However, because existing data indicate that the eelgrass beds are outside the limits of the proposed remediation area, damage to the eelgrass beds is expected to be slight (principally due to increased turbidity caused by resuspension of sediments during dredging and capping). Efforts would be taken during dredging and capping to minimize turbidity that could result in damage to the eelgrass beds. Slight damage to eelgrass beds would be mitigated by natural restoration and monitoring. If the eelgrass beds suffer significant damage, it might be necessary to consider assisted restoration; however, assisted restoration is not proposed as part of this alternative because significant damage is not anticipated and, based on the limited success of other restoration projects in Narragansett Bay (described in Section 3.3.6), there is very low potential for successful eelgrass restoration at McAllister Point. Damage to eelgrass beds may require off-site or out-of-kind mitigation measures.

Long-term O&M of the cap and long-term monitoring would be conducted to ensure the long-term effectiveness of the remedial action. Long-term O&M would include quarterly inspection of the cap to ensure its integrity, and repair of the cap on an as-needed basis. For costing purposes, it was assumed that quarterly inspections of the cap would continue for 30 years and that 325 cy of cover materials would be used to repair the cap each year. The complete removal areas that were backfilled with natural fill would not require inspection and maintenance like the capped areas, because no contamination exceeding recommended PRGs would remain beneath the cap in these areas. However, samples would be collected in these areas during long-term monitoring to evaluate migration of contaminants from adjacent capped areas.

The long-term monitoring program would be similar to the program developed for Alternative NS/ER-2 (Section 4.2.2) and would include sediment, pore water, and biota chemistry as well as amphipod and arabacia toxicity. Samples would be collected from approximately 10 locations selected to provide

adequate coverage of the capped area. Monitoring would be conducted on an annual basis until it was determined by the Navy and regulatory agencies that the sampling frequency could be safely reduced. The final long-term monitoring plan, which would specify all the details of the monitoring program, including analytical methods, sampling locations, and sampling frequency, would be developed in coordination with EPA and RIDEM.

For the purposes of costing, it was assumed that annual monitoring would be conducted for the first 5 years and then, provided that the cap remains effective and the sediment quality does not decrease significantly, the long-term sampling frequency would be reduced from annually to every 5 years. The results of the monitoring would be compiled and an evaluation of the contamination and its associated risks would be conducted every 5 years, as required by CERCLA. The results of these 5-year reviews would be used to identify any changes in the contaminant concentrations and to determine the need to implement future response actions at the site or change the required frequency of long-term monitoring events. This monitoring would supplement the groundwater and landfill gas monitoring being conducted as a component of the long-term O&M activities of the McAllister Point Landfill cap.

4.2.5 Alternative NS/ER-5: Dredging and Disposal

This alternative was developed to provide a remedial action that reduces or eliminates the on-site toxicity, mobility, and volume of contaminated landfill materials and marine sediment through removal and disposal. Sediment would be removed from the nearshore and elevated-risk offshore area using a combination of appropriate excavation and dredging techniques. Removal would be conducted over the same nearshore/elevated-risk offshore area as identified for the containment alternatives, presented in Sections 4.2.3 and 4.2.4. The sediment removal area is shown on Figure 4-9. Elements of Alternative NS/ER-5 include:

- Pre-design investigation
- Sedimentation controls
- Contaminated sediment and debris excavation/dredging (all sediment exceeding PRGs)
- Excavated sediment and debris dewatering and processing for disposal or reuse
- Sediment and debris disposal in McAllister Point Landfill, RCRA Subtitle D Landfill (with and/or without treatment), and RCRA Subtitle C Landfill
- Excavated/dredged areas backfilling with natural fill
- Dewatering fluids treatment and discharge

- Monitoring (years 1, 2, and 5 only)
- Five-year review (year 5 only)

The approach for removal and disposal of contaminated sediment would be similar to the approach used to remove sediment as part of the cap installation for Alternative NS/ER-4. The primary difference is that the quantity of contaminated sediment removed as part of NS/ER-5 is considerably larger than for NS/ER-4, making it likely that some of the sediment would have to be disposed off site. In addition, excavation of sediment near the toe of the existing revetment is assumed to be deeper and more extensive, requiring additional shoring. After excavation and dredging activities are complete, the areas would be backfilled with clean materials similar to the existing substrate.

A PDI would be performed to gather information needed to complete the final remedial design. The PDI would include a series of soil borings, and sediment and elutriate samples to confirm the nature and extent of contamination and determine the treatment requirements for fluids to be generated during dredging and dewatering. Approximately 35 soil borings would be advanced to confirm the extent of sediment contamination and define the area for sediment removal. Borings would also be used to gather geotechnical information needed to select the dredging methods best suited for the materials present and determine the type and amount of shoring needed to ensure the stability of the landfill during dredging close to the revetment. The PDI would also include a detailed evaluation of the McAllister Point Landfill as a potential site for disposal of contaminated sediment.

Engineering controls would be installed around the perimeter of the area to be excavated/dredged to minimize sediment migration. Alternative NS/ER-5 would include relatively deep excavation of sediment near the toe of the landfill revetment. Extensive sheeting and shoring would be required to enable deep excavation near the revetment.

Based on review of the As-Built drawings for the McAllister Point Landfill cap, the existing revetment extends to an average depth of approximately 4 to 6 feet below grade. Previous soil borings, which were advanced near the toe of this revetment, indicated landfill materials were present at depths below the lower limit of the revetment at many locations, with landfill materials extending to a depth of as much as 15 feet below grade near the center of the landfill shoreline. In order to remove contaminated sediment and debris below the lower limit of the revetment, it was assumed that sheeting and shoring would be required to protect against potential slope failure.

Due to the shallow depth to bedrock and the potential presence of landfill debris (submarine netting, concrete rubble, boulders, etc.) in the subgrade adjacent to the revetment (which would interfere with placement of sheetpile), it was assumed that standard sheetpile alone could not be used to stabilize and protect the revetment and landfill cap. Instead, the proposed shoring system would consist of H-pile/ soldier beams drilled 10 to 20 feet into the existing bedrock on 5-foot centers and cross braced with steel walers. The sheeting would be driven prior to dredging or, in the event refusal was encountered prior to the desired depth, the sheeting would be installed as the excavation/dredging of the contaminated sediment progresses. The sheeting would be removed after the contaminated sediments were removed and the areas were backfilled, and the H-piles would be cut flush to grade.

Due to access restrictions in the intertidal area, it was assumed that conventional pile driving equipment would not be able to work in the intertidal area and access from the landfill access road would be required. The feasibility of installing the shoring system would need to be thoroughly investigated during the PDI.

Contaminated sediment would be excavated, segregated, and handled in a manner similar to that described for Alternative NS/ER-4. Removal activities are anticipated to include both land-based excavation and barge-based mechanical dredging. Land-based excavation would be performed in the "south depositional area" using conventional earth-moving equipment such as track-mounted excavators, front-end loaders, bulldozers, and dump trucks. A portable cofferdam would be constructed along the outer limit of the work area (at approximately the -3-foot mean low water line) and dewatering pumps would operate continuously to allow excavation to proceed in relatively dry conditions. (Water pumped from the work area would be treated as necessary to meet applicable discharge standards.) The remaining areas would be dredged using barge-mounted mechanical dredging equipment such as clamshell dredges, orange-peel dredges, dipper-dredges, or excavators. Because some areas may be difficult to access by either land or water due to the depth of water and configuration of the landfill and revetment, it may be necessary to construct a temporary access road/work area offshore to reach all areas. However, for the purposes of this FS, it was assumed that this would not be necessary. (The estimated areas where land-based and barge-based operations would be conducted are shown on Figure E-3 in Appendix E.)

All excavated/dredged sediment would be staged and processed as described for Alternative NS/ER-4. Materials excavated by land-based methods would be transported over land to Coddington Cove for staging and processing. Dredged materials would be dewatered on an offshore barge and then

transported to Pier 1 for final processing and staging. Water generated from sediment dewatering would be treated to meet applicable standards and then be discharged to the bay.

An estimated 34,000 cubic yards of contaminated sediment would be excavated as part of Alternative NS/ER-5. The sediment would be screened/degritted to remove any trash or debris. Excavated/dredged sediment would be screened to remove debris and stones over approximately 6 inches in diameter. The screened material would be segregated as follows:

- For the purposes of this FS, it was assumed that approximately 20 percent of the dredged material (6,800 cubic yards) would be over 6 inches in diameter and would be suitable for reuse after decontamination by methods permitted under relevant hazardous waste standards. These large rocks and boulders would be decontaminated to remove any contaminated sediments, and staged for reuse as revetment stone, wave breaks, or backfill.

- Screened material less than or equal to 6 inches in diameter (27,000 cubic yards or 80 percent of the excavated material) would be staged separately for disposal. All trash and debris such as steel, concrete, submarine netting, etc. (estimated at 500 tons) would be included with this portion of the excavated material, regardless of size. Any large debris to be sent off site for recycling or disposal would first be decontaminated to remove any contaminated sediments. Water generated from rock and debris decontamination would be treated to meet applicable standards and then discharged to the bay.

Sediment and solids would be collected and transferred to a land-based staging area at Pier 1. At this staging area, further processing of the solids would be accomplished, if necessary for disposal. Free liquid would be removed from the sediment through gravity drainage and the addition of drying agents such as lime or cement, since landfill facilities are prohibited from accepting materials that contain excess free liquid. Water from the dewatering process would be treated to meet applicable state and federal discharge standards as described for Alternative NS/ER-4. These activities would be conducted within a defined drainage and mixing location at Coddington Cove.

Stabilized sediment samples would be collected and analyzed to verify that the material meets land disposal criteria prior to disposal. Analyses for off-site disposal would include those associated with RCRA hazardous waste determinations (toxic characteristic leaching procedure (TCLP), ignitability, corrosivity, and reactivity), as well as those related to federal land ban requirements.

Evaluation of the existing analytical data indicates that sediment contaminant levels are low enough that the material would likely meet requirements for disposal in a RCRA Subtitle D landfill without treatment. However, due to uncertainties in the characterization of the nature and extent of sediment contamination, it was assumed that approximately 10 percent of the material would need treatment prior to off-base disposal or would require disposal in a RCRA C facility.

As discussed in Alternative NS/ER-4, a preliminary evaluation of the McAllister Point Landfill indicates that there may be sufficient volume available within the landfill to accept approximately 21,000 to 26,000 cubic yards (approximately 78 to 96 percent) of the sediments to be disposed under Alternative NS/ER-5. Based on preliminary analysis, the cost for disposal of the excavated/dredged materials was assumed to be comparable for either the existing McAllister Point Landfill or an off-site RCRA Subtitle D facility. The costs for disposing excavated/dredged materials at a RCRA Subtitle C facility would be substantially higher than disposal at McAllister Point or at a RCRA Subtitle D facility. The final determination of whether to dispose of the sediments at the McAllister Point Landfill or transport them off site for disposal at RCRA Subtitle D and Subtitle C landfills should be made during the PDI, considering the off-site disposal costs at the time, the technical feasibility of expanding the landfill, and potential community concerns regarding re-opening and expanding the landfill.

For the purposes of this FS, it was assumed that the excavated/dewatered sediment would be placed in the existing McAllister Point Landfill (which meets RCRA Subtitle C standards) for final disposal until no further capacity is available, and the remaining materials would be disposed off base at an appropriate facility. Due to the large expected volume of contaminated sediment requiring disposal, the use of McAllister Point Landfill as well as one or more off-site facilities would be required. The plan for disposal of contaminated sediments is outlined as follows:

- Disposal of the majority of contaminated sediment and debris on site at the McAllister Point landfill until there is no further capacity available. For costing purposes, it is assumed that McAllister Point Landfill has an available capacity of approximately 21,000 cubic yards. Effort would be made to dispose any sediment identified as hazardous waste in the McAllister Point Landfill; however, some sediments determined to be hazardous after the landfill capacity has been reached may require off-site disposal.

- Disposal of the remaining sediment and debris off site (6,000 cubic yards) with the following assumptions:
    - 90 percent of the sediment and debris disposed off site (5400 cubic yards) would be placed in a RCRA Subtitle D landfill without treatment. (All large debris - an estimated 500 tons - would be decontaminated by pressure washing before being disposed in a RCRA Subtitle D landfill or recycled.)
    - 9 percent of the sediment and debris disposed off site (540 cubic yards) would require stabilization (addition of cement or other chemical binding agents) due to elevated metals concentrations, prior to disposal in a RCRA Subtitle D landfill.
    - 1 percent of the sediment and debris disposed off site (60 cubic yards) would require disposal at a RCRA Subtitle C landfill due to elevated concentrations of organic contaminants.

Following dredging operations, excavated areas would be backfilled with clean fill materials, and selected and placed to assist in the natural restoration of the hard-bottom aquatic community that would be destroyed by dredging. The proposed dredging and backfilling would remove and replace approximately 6 acres of existing rocky intertidal and subtidal aquatic habitat, temporarily destroying the hard-bottom aquatic community in the area. The proposed backfill would promote the natural restoration of the affected aquatic community by providing an optimal habitat structure to support a diverse and stable aquatic community. Natural recolonization of the area would occur as water-borne algae spores and animal larvae are swept into the area by tidal currents and wave action. The long-term O&M program would include regular inspection of the backfilled areas to assess the condition of the habitat. It is anticipated that the ecological community would be reestablished within 1 to 4 years.

The backfill substrate would be similar to the substrate described for the caps in NS/ER-3 and NS/ER-4. The materials would be sized and placed to provide a stable and non-uniform habitat structure to promote community growth and diversity. The fill substrate would consist of graded sand, gravel, and stone sized similar to the materials located north of the site, which currently support diverse hard-bottom communities. The primary colonization surface would consist of non-uniform stones, large enough to provide a stable surface resistant to strong wave action and tidal currents, placed in a non-uniform manner such that surface orientation would be randomized. Use of a non-uniform size and shape of rock will create crevices, openings, and caves that act as refuge for larger mobile macroinvertebrates and fish. A non-uniform orientation will result in hard-bottom

surfaces that vary in degree of exposure to wave action and sunlight, which will offer a diversity of habitat for all types of intertidal and shallow-water organisms indigenous to lower Narragansett Bay.

Implementation of this alternative may also impact eelgrass beds located offshore of the north end of the landfill. However, because existing data indicate that the eelgrass beds are outside the limits of the proposed remediation area, damage to the eelgrass beds is expected to be slight (principally due to increased turbidity caused by resuspension of sediments during dredging). Efforts would be taken during dredging to minimize turbidity that could result in damage to the eelgrass beds. Slight damage to eelgrass beds would be mitigated by natural restoration and monitoring. If the eelgrass beds suffer significant damage, it might be necessary to consider assisted restoration; however, assisted restoration is not proposed as part of this alternative because significant damage is not anticipated and based on the limited success of other restoration projects in Narragansett Bay (described in Section 3.3.6), there is very low potential for successful eelgrass restoration at McAllister Point. Significant damage to eelgrass beds may require off-site or out-of-kind mitigation measures.

Although this alternative calls for complete removal of contaminated sediment exceeding recommended PRGs, a small amount of sediment would likely remain in the nearshore area due to the natural limitations of dredging in a marine environment with shallow bedrock. Additionally, contaminated sediment and landfill materials would remain under the existing revetment, between the removed nearshore sediment and the landfill cap. Because the dredged areas would be backfilled with clean fill to match the existing grades, any remaining contaminated sediments would be covered with at least 2 to 3 feet of clean fill materials. As a result, they are not expected to be available for exposure to humans or marine biota. However, limited monitoring would be necessary to determine the effectiveness of the remedial action and ensure that PRGs are not exceeded in the top portion of the fill that could be accessed by humans or marine animals.

For the FS, it was assumed that long-term monitoring would include sediment, pore water, and biota chemistry as well as amphipod and arabacia toxicity during the first 5 years after the remedial action is completed. Since nearly all of the contaminated sediment exceeding recommended PRGs would be removed as part of this alternative and any remaining contaminated sediment would be covered by clean fill, for the purposes of the FS, it was assumed for the purposes of the FS that samples would be collected in years 1, 2, and 5 only and only one 5-year review would be conducted. The monitoring program and subsequent 5-year reviews would be terminated based on the conclusions of the first

5-year review, provided that the sediment quality did not change significantly and long-term monitoring of the landfill did not show movement of contamination into the dredged area. Monitoring and 5-year reviews associated with the source control ROD (groundwater and landfill gas monitoring) would continue for the remainder of the 30-year period. The final long-term monitoring plan, which would specify all the details of the monitoring program, including analytical methods, sampling locations, and sampling frequency, would be developed in coordination with EPA and RIDEM.

4.3 OFFSHORE ALTERNATIVES

The offshore alternatives were developed to address sediment contamination exceeding baseline PRGs in the subtidal zone adjacent to the McAllister Point Landfill. This area was designated by the ecological risk assessment as posing risks to marine biota due to concentrations of PAHs, pesticides/PCBs, butyltins, and metals in the marine sediments (see Figure 4-10). Calculated TEV-HQs in this area range between 1 and 3. The contamination in the offshore area is associated with contaminated landfill materials such as ash that migrated into the area from the nearshore, and erosion and migration of contaminants from the landfill materials located in the nearshore. Offshore sediment contamination exceeding baseline PRGs was estimated to cover an area of approximately 40.9 acres to an average depth of 1 foot below the surface. No risks to human health or migratory birds were identified for this offshore area, due to limited access associated with the location of the contaminated sediment in deep water.

4.3.1 Alternative OS-1: No Action

The no action alternative, as required under the NCP, would involve no remedial response activities for impacted sediment in the offshore areas. However, at a minimum, it would provide a baseline for comparison to other offshore alternatives. Under this alternative, no remedial actions would be performed, access to marine sediments offshore of the site would not be restricted, and no direct protection of marine biota would be provided. Since sediment contamination would remain, 5-year reviews of the no action decision would be required.

4.3.2 Alternative OS-2: Limited Action

The limited action alternative would involve no direct remedial response activities for contaminated marine sediment offshore of the McAllister Point Landfill. No institutional controls or access restrictions would prohibit use of the area. However, this alternative would provide a long-term monitoring program to allow evaluation of changing conditions at the site. Since sediment contamination would remain, 5-year reviews of the alternative would be required to evaluate the risks to the marine environment posed by the site in its existing condition.

The long-term monitoring program would assess changes in the marine environment over a 30-year period. The long-term monitoring program would include sediment, biota, and pore water chemistry as well as amphipod and arabacia toxicity. For costing purposes, it was assumed that samples would be collected from 16 locations in the offshore area selected to correspond to the sample stations tested in previous investigations. The proposed analyses would include sediment chemistry (PCBs, PAHs, metals, TOC, and SEM/AVS); biota chemistry (PCBs, PAHs, metals); and amphipod and arabacia toxicity.

Given the nature of sediment contamination and the slow changes in sediment quality anticipated, a single sampling event per year was assumed to be sufficient to monitor long-term sediment quality trends. Monitoring would be conducted on an annual basis until it was determined by the Navy and regulatory agencies that the sampling frequency could be safely reduced. For the purposes of costing, it was assumed that annual monitoring would be conducted for the first 5 years and then, assuming that the sediment quality does not decrease significantly, the long-term sampling frequency would be reduced from annually to every 5 years. The final long-term monitoring plan, which would specify all the details of the monitoring program, including analytical methods, sampling locations, and sampling frequency, would be developed in coordination with EPA and RIDEM.

The results of the monitoring would be compiled and an evaluation of the contamination and its associated risks would be conducted every 5 years, as required by CERCLA. The results of these 5-year reviews would be used to identify any changes in the contaminant concentrations and to determine the need to implement future response actions at the site or change the required frequency of long-term monitoring events. This monitoring would supplement the groundwater and landfill gas monitoring being conducted as a component of the long-term O&M activities for the McAllister Point Landfill cap.

4.3.3 Alternative OS-3: Capping

This alternative was developed to meet the NCP's requirement for consideration of an alternative that uses containment with little or no treatment. Containment has been considered in areas with contamination exceeding the baseline PRGs where RAOs include minimizing ecological receptor exposure to contaminated sediment. For Alternative OS-3, containment would involve capping the offshore sediment with material that would prevent erosion due to wave action and limit future exposure of marine biota to sediment contamination in the marine environment. The cap would cover an estimated 40.9 acres of the offshore area where sediment concentrations exceeded baseline PRGs, as identified in Figure 4-10. Components of Alternative OS-3 include the following:

- Pre-design investigation
- Sedimentation controls
- Natural cap installation
- Long-term O&M of the capped area
- Long-term monitoring
- Five-year reviews

A PDI would be performed to gather information relevant to the cap design. The PDI would include an underwater video inspection of the area to be capped as well as a series of soil borings to confirm the extent of contamination. The underwater video inspection would locate boulders and any debris that would need to be removed prior to cap installation. The PDI would include a series of soil borings to confirm the extent of contamination and gather geotechnical information. Approximately 42 soil borings would be conducted to confirm the extent of sediment contamination and define the area to be capped. The PDI would also include an evaluation of the extent and condition of the aquatic communities present that could be impacted by the remedial action.

Engineering controls would be installed to control migration of contaminated sediment during construction activities. A floating silt curtain or other appropriate particulate resuspension/turbidity control feature would be placed around the perimeter of the construction area during implementation of this alternative. This feature would help minimize potential adverse environmental effects associated with sediment suspension.

A natural cap would be placed over the impacted sediment. The cap would be designed to resist erosion due to wave action, limit exposure of marine biota to offshore sediment contamination, and promote natural regeneration of the hard-bottom aquatic community destroyed by placement of the cap. Cap materials would be selected and placed to assist in the natural restoration of the indigenous aquatic community. The substrate would be sized and placed to provide a stable and non-uniform habitat structure to promote community growth and diversity, and to resist erosion of the cap. The cap substrate would consist of graded sand, gravel, and stone, sized similar to the materials located north of the site, which currently support diverse hard-bottom communities. The primary colonization surface at the top of the cap would consist of non-uniform stones, large enough to provide a stable surface resistant to strong wave action and tidal currents, placed in a non-uniform manner such that surface orientation would be randomized. Use of a non-uniform size and shape of rock will create crevices, openings, and caves that act as refuge for larger mobile macroinvertebrates and fish. A non-uniform orientation will result in hard-bottom surfaces that vary in degree of exposure to wave action and sunlight, which will offer a diversity of habitat for all types of intertidal and shallow-water organisms indigenous to lower Narragansett Bay.

The proposed natural cap would consist of a 2-foot thick layer of sand/gravel/ stone over an estimated 40.9 acre area (shown on Figure 4-10). The cap materials would be sized to be similar to the existing substrate, but with a small (10 to 20 percent) coarse component to resist erosion. Such a cover would provide optimum habitat structure to assist in regenerating the aquatic community, and the coarse component would provide erosion resistance. The natural cap would provide isolation of the contaminated sediment and resist erosion due to wave action and offshore currents. The cap would be of a sufficient thickness to allow benthic organisms to burrow without coming in contact with contaminated sediment. A cross-section of the proposed natural cap is provided in Figure 4-11. Concrete markers would be placed at intervals along the edge of the cap to provide a visible delineation of the capped area for future reference. The locations of the markers will be surveyed using a global positioning system (GPS) or other applicable system.

The proposed cap would cover and temporarily destroy the hard-bottom aquatic community in the capped subtidal area. The proposed cap design would promote natural restoration of the hard-bottom community by providing an optimal habitat structure to support a diverse and stable aquatic community. Natural recolonization of the area would occur as water-borne algae spores and animal larvae are swept into the area by tidal currents and wave action. The proposed cap designs would allow burrowing (habitation) of the upper coarse stone layer of the cap and provide sufficient isolation of

landfill contaminants from the surrounding environment. The long-term O&M program would include regular inspection of the capped areas to assess the condition of the habitat. It is anticipated that the ecological community would be reestablished within 1 to 4 years.

Cap installation in the offshore area would likely destroy approximately 6000 square feet of eelgrass beds located offshore of the north end of the landfill. Because eelgrass beds are classified as special aquatic sites under Section 404 of the CWA, it may be necessary to mitigate of the loss of this habitat by attempting assisted restoration of the lost eelgrass beds, or attempting restoration or creation of eelgrass beds at another location in Narragansett Bay. However, assisted restoration of the damaged eelgrass beds is not proposed as part of this alternative because, based on the limited success of other restoration projects in Narragansett Bay (described in Section 3.3.6), there is very low potential for successful eelgrass restoration at McAllister Point or other locations in the bay. If this alternative is determined to be the least damaging practicable alternative and eelgrass mitigation measures are not possible, other mitigation measures, including off-site or out-of-kind mitigation may be required.

Long-term O&M of the cap and long-term monitoring would be necessary to ensure the long-term protectiveness of the cap. Long-term O&M would include annual inspection of the cap to ensure its integrity and repair of the cap on an as-needed basis. Because the offshore cap is expected to be subject to very little erosion and contaminant concentrations in the offshore sediment are relatively low, for the purposes of costing, it was assumed that annual inspections of the cap would occur during years 1 through 5 and then be reduced to every 5 years. The final long-term O&M plan, which would specify all the details of the O&M program, including inspection frequency, would be developed in coordination with EPA and RIDEM following signing of the ROD.

The long-term monitoring program would be similar to the program developed for Alternative OS-2 (Section 4.3.2) and would include sediment, pore water, and biota chemistry, as well as amphipod and arabacia toxicity. Samples would be collected from approximately 16 locations selected to correspond to the sample stations tested in previous investigations; analyses would be the same as for Alternative OS-2. Monitoring would be conducted on an annual basis until it was determined by the Navy and regulatory agencies that the sampling frequency could be reduced. For the purposes of costing, it was assumed that annual monitoring would be conducted for the first 5 years. Assuming that the sediment quality does not change significantly and monitoring does not indicate that contamination is migrating from the nearshore/elevated-risk offshore area, the long-term sampling frequency would then be reduced from annually to every 5 years. The final long-term monitoring plan, which would specify all the

details of the monitoring program, including analytical methods, sampling locations, and sampling frequency, would be developed in coordination with EPA and RIDEM.

The results of the monitoring would be compiled and an evaluation of the contamination and its associated risks would be conducted every 5 years, as required by CERCLA. The results of these 5-year reviews would be used to identify any changes in the contaminant concentrations and to determine the need to implement future response actions at the site or change the required frequency of long-term monitoring events. This monitoring would supplement the monitoring being conducted as a component of the long-term O&M activities for the McAllister Point Landfill cap and the nearshore and elevated-risk offshore areas.

4.3.4 Alternative OS-4: Dredging and Disposal

This alternative was developed to provide an option that reduces or eliminates the on-site toxicity, mobility, and volume of contaminated sediment through removal and off-base disposal. Sediment would be removed by an appropriate dredging technique selected, in part, by its ability to minimize resuspension of solids into the water column during operation. Removal would be conducted over the same offshore area as that identified for the containment alternative, presented in Section 4.3.3 (See Figure 4-10). Elements of Alternative OS-4 include:

- Pre-design investigation
- Sedimentation controls
- Contaminated sediment excavation/dredging (all sediment exceeding baseline PRGs)
- Excavated sediments dewatering for disposal
- Excavated sediment disposal in an off-site RCRA Subtitle D landfill without treatment
- Dewatering fluids treatment and discharge
- Monitoring (years 1, 2, and 5)
- Five-year review (year 5 only)

A PDI would be performed to better delineate the area to be dredged, as well as to collect additional information to aid in selecting dredging methods and designing dewatering, water treatment, materials handling, and turbidity control measures. The PDI would include a series of soil borings to confirm the extent of contamination and gather geotechnical information. Approximately 42 soil borings would be conducted to confirm the extent of sediment contamination and define the area for sediment removal.

Contaminated sediment would be dredged using a method selected to minimize water column turbidity, yet produce a residue of the lowest water content possible. The final determination of the most appropriate dredging techniques would be made following the PDI. However, for the purposes of the FS, it is assumed that removal would be accomplished by mechanical dredging conducted from a barge.

All dredged sediment would be staged and processed as described for Alternative NS/ER-4. Dredged materials would be dewatered on an offshore barge and then transported to Pier 1 or another pier at Coddington Cove for final processing and staging prior to being transported off site for disposal. Water generated from sediment dewatering would be treated, if necessary, before discharge into the bay.

An estimated 99,000 cubic yards of contaminated sediment would be excavated as part of Alternative OS-4, assuming an average dredge depth of 1.5 feet due to the accuracy limitations of dredging equipment. The sediment would be screened to remove trash and debris, and stones over approximately 6 inches in diameter. The screened material would be segregated as follows:

- For the purposes of this FS, it was assumed that approximately 20 percent of the dredged material (20,000 cubic yards) would be rocks and boulders over 6 inches in diameter and would be suitable for reuse following decontamination. These large stones would be washed to remove any contaminated sediments, and staged for reuse in the nearshore or offshore areas as revetment stone, wave breaks, or backfill. Decontamination fluids would be tested and treated, if necessary, to meet applicable discharge requirements.

- Screened material less than or equal to 6 inches in diameter (79,000 cubic yards or 80 percent of the excavated material) would be staged separately for disposal. Any trash and debris such as steel, concrete, submarine netting, etc. would be included with this portion of the excavated material, regardless of size. The presence of large debris is not expected in the offshore area.

Further processing of the solids would be accomplished prior to disposal, if required by the waste disposal facility. Free liquid would be removed from the sediment, since landfill facilities are prohibited from accepting materials that contain excess free liquid. The liquid would be treated, if necessary, before discharge. For the purpose of this FS, it was assumed that removal of free liquid would be accomplished through gravity draining, in addition to stabilization with a "drying" agent such as lime or cement. This activity would be conducted within a defined drainage and mixing location.

Stabilized sediment samples would be collected and analyzed to verify that the material meets land disposal criteria prior to transport for off-site disposal. Sediment would then be transported off site to an appropriate RCRA Subtitle D or Subtitle C landfill. Evaluation of the existing sediment analytical data indicates that the contaminant levels are low enough that the material would likely meet requirements for disposal in a RCRA Subtitle D landfill without treatment. Therefore, for the purposes of the FS, it is assumed that all the sediment requiring disposal under this alternative would be disposed in an off-site RCRA Subtitle D landfill without treatment. Due to the large estimated volume of dredge material from the offshore areas requiring disposal (99,000 cubic yards), it is likely that multiple facilities would be needed.

It was assumed that space would not be available for disposal of offshore sediment in the existing McAllister Point Landfill because the potential available space within the landfill (an estimated 21,000 to 26,000 cubic yards) is limited and may be used for disposal options under the nearshore alternatives. Disposal options for Alternative OS-4 would depend on the selected alternative for the nearshore areas. If the selected remedial option for the nearshore area requires disposal of contaminated sediment, and the selected disposal site is determined to be the McAllister Point Landfill, then there would not be sufficient space available for the off-shore sediments, and these materials would need to be transported off base to a RCRA Subtitle D facility.

Water from the sediment dewatering process would be treated to meet applicable state and federal discharge standards prior to discharge into Narragansett Bay. For the purposes of the FS, it was assumed that water would be treated by means of a skid-mounted clarifier and filtration system on a barge or at Pier 1 or another pier at Coddington Cove. The clarifier would remove inorganic constituents by precipitation. Unsettled metals precipitant and other suspended particles and fines would be removed by filtration. Any organic constituents (PAHs and PCBs) present are expected to be adsorbed onto the surface of the suspended particles, and thereby removed by filtration along with these particles. The need for additional treatment for dissolved contaminants is not anticipated; however, treatment requirements would be evaluated during the PDI.

A floating silt curtain or other appropriate particulate resuspension/turbidity control feature would be placed around the perimeter of the removal area during implementation of this alternative. This feature would help minimize potential adverse environmental effects associated with sediment suspension.

Based on previous investigations, the unconsolidated material within the area to be dredged is relatively uniform within the upper 2 feet. Therefore, removal of material to a depth of 1.5 feet is not expected to significantly alter the composition of the bay floor. Placement of backfill within the dredged area to match existing grades was not considered warranted and was considered possibly more damaging than allowing natural restoration of the excavated area with no placement of off-site, non-native fill.

Dredging would temporarily destroy the hard-bottom aquatic community in the removal area. The presence of native materials similar to those previously at the surface would allow natural restoration of the hard-bottom community by providing adequate substrate that would support the species indigenous to the area. Natural recolonization of the area would occur as water-borne algae spores and animal larvae are swept into the area by tidal currents and wave action. Regular inspections of the removal areas would be conducted during the first 5 years after implementation to assess the condition of the habitat. It is anticipated that the ecological community would be reestablished within 1 to 4 years.

Dredging in the offshore area would likely destroy approximately 6000 square feet of eelgrass beds located offshore of the north end of the landfill. Because eelgrass beds are classified as special aquatic sites under Section 404 of the CWA, it may be necessary to mitigate of the loss of this habitat by attempting assisted restoration of the lost eelgrass beds or attempting restoration or creation of eelgrass beds at another location in Narragansett Bay. However, assisted restoration of the damaged eelgrass beds is not proposed as part of this alternative because, based on the limited success of other restoration projects in Narragansett Bay (described in Section 3.3.6), there is very low potential for successful eelgrass restoration at McAllister Point or other locations in the bay. If this alternative is determined to be the least damaging practicable alternative and eelgrass mitigation measures are not possible, other mitigation measures, including off-site or out-of-kind mitigation, may be required.

4.4 SCREENING OF ALTERNATIVES

Alternative screening reduces the number of alternatives that will be evaluated in further detail in Section 5.0. This step is conducted to eliminate alternatives that do not achieve protection of human health or the environment. Alternatives discussed in the preceding sections will be eliminated if they are determined to be significantly less effective than other more promising alternatives, not technically or administratively implementable, or have measurably higher costs.

The alternatives developed and described in Sections 4.2 and 4.3 are considered to represent an appropriate range of remediation alternatives for impacted sediment at the nearshore/elevated-risk offshore and offshore locations. Therefore, all eight alternatives are retained for detailed analysis.

5.0 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

The detailed analysis of alternatives provides relevant information to support the future selection of a remedial action. Each alternative remaining following the screening process (see Table 4-1) is more fully developed and further evaluated according to a prescribed set of criteria. The evaluation results are used to compare alternatives and identify key tradeoffs between the options, as well as to provide a basis for regulatory agency and public review of potential remediation alternatives for the site.

Section 5.1 describes the criteria used to support the detailed analysis. Section 5.2 presents a brief description and a detailed evaluation of each nearshore/elevated-risk offshore alternative, based on these criteria, along with a comparative analysis of the developed alternatives. Offshore alternatives are evaluated in Section 5.3. The alternatives for these two areas were developed and evaluated separately because of differences in contaminant concentrations, identified risk receptors, and physical characteristics of the two areas and media, as described in Section 2.2.4. The group of alternatives for each area was evaluated on its own merits. Implementation concerns and potential cost savings in selecting a combination of nearshore and offshore alternatives have not been considered. These relationships should be considered during the PDI and design stages of the remedial activities.

5.1 CRITERIA FOR DETAILED ANALYSIS

In accordance with the NCP and CERCLA guidance, the detailed analysis of alternatives was conducted in accordance with nine evaluation criteria. These criteria are divided into three groups: threshold criteria related to statutory requirements; balancing criteria that are technical in nature; and modifying criteria that are formally assessed following a public review and comment period. The nine evaluation criteria include the following:

Threshold Criteria

- Overall protection of human health and the environment
- Compliance with applicable or relevant and appropriate requirements (ARARs)

Balancing Criteria

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment

- Short-term effectiveness
- Implementability
- Cost

Modifying Criteria

- State acceptance
- Community acceptance

A description of each criterion and a discussion of how each applies to the types of alternatives being evaluated are described as follows:

THRESHOLD CRITERIA

Overall Protection of Human Health and the Environment: The primary concern, and one of the statutory requirements in remedy selection, is the overall protection of human health and the environment. The evaluation of protection is based on the ability of the remedy to eliminate, reduce, or control current and potential future exposure risks to human and ecological receptors through each applicable exposure pathway. This protection may be in the form of treatment, engineering controls, and/or institutional controls. The overall assessment of protection draws on assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. Furthermore, evaluation of protection considers short-term risks or cross-media impacts posed by implementation of a remedy.

This criterion will be used to evaluate the effectiveness of each alternative in eliminating, reducing, or controlling human health and environmental risks at both nearshore and offshore locations. The effectiveness issues related to alternatives for the nearshore locations will be based on human health risks (consumption of contaminated shellfish tissue by subsistent fishermen) and environmental risks to both avian aquatic predators (consumption of prey species tissue) and marine biota (toxicity from contact with porewater impacted by partitioning from contaminated sediment). Alternatives for offshore locations will be evaluated based on risks to marine biota only; no human health or avian aquatic predator risks were determined to be associated with offshore sediment contamination. Protection will also be addressed as it relates to potential migration of contaminated sediments further into Narragansett Bay and connecting waterways, as well as the management of residuals following remedy implementation.

Compliance with ARARs: Compliance with ARARs is one of the statutory requirements for selection of a remedy. This evaluation criterion is used to determine whether each alternative will meet all of its respective ARARs or whether justification exists for one of the six ARAR waivers allowed under CERCLA. Chemical-, location-, and action-specific ARARs are reviewed as they apply to each alternative. Alternatives are refined, as necessary, to ensure compliance with these requirements.

This criterion will be used to evaluate each alternative in complying with chemical- and location-specific federal and state ARARs and TBCs for protection of human health and the environment. Alternatives requiring sediment removal coupled with subsequent disposal or treatment activities will also be evaluated for compliance with action-specific ARARs related to sediment handling, sediment treatment and/or disposal, as well as treatment and discharge of water generated from sediment dewatering activities.

BALANCING CRITERIA

Long-Term Effectiveness and Permanence: Alternatives are assessed in terms of their long-term effectiveness and degree of permanence in offering protection of human health and the environment following implementation. The evaluation focuses on the extent and effectiveness of controls required to manage risks remaining on the site following completion of the remedial action. The analysis considers the magnitude of risks to human and ecological receptors from residuals (untreated waste or treatment by-products) remaining on site at the completion of remedial activities, the adequacy of engineering and/or institutional controls to manage residuals, the reliability of the controls to provide continued protection from residuals, and potential needs to maintain and/or replace technical components of an alternative.

This criterion will be used to evaluate each alternative for its ability to manage risks remaining on site following implementation. The no action, limited action, and capping (containment) alternatives will be evaluated based on future risks associated with leaving contaminated sediment on site. The remaining alternatives will be evaluated in relation to the management of residuals formed as a result of sediment excavation/dredging operations, dewatering activities, and disposal. Evaluation of alternatives will further address potential risks associated with residuals following sediment treatment.

Reduction of Toxicity, Mobility, or Volume through Treatment: Alternatives are evaluated to address the statutory preference for remedies that employ treatment as a principal element to reduce toxicity, mobility, or volume of hazardous substances. The evaluation focuses on the following factors:

- Treatment processes employed by the remedy, as well as the materials they will treat.
- Amount of hazardous materials to be destroyed or treated.
- Degree of expected reduction in toxicity, mobility, or volume, including how the principal threats will be addressed.
- Degree to which the treatment will be irreversible.
- Type and quantity of treatment residuals that remain following treatment.
- Whether the alternative satisfies the statutory preference for treatment as a principal element.

This criterion will be used to evaluate the effectiveness of alternatives that incorporate treatment of sediments, thereby reducing risks by destroying sediment contaminants and generating process residuals, as well as reducing the volume of and prohibiting mobility of sediment contaminants. Other alternatives will be evaluated for their ability to reduce mobility and/or their effectiveness in reducing risks through natural attenuation processes, containment, or removal with off-site disposal.

Short-Term Effectiveness: The short-term effectiveness criterion assesses potential effects to human health and the environment during the construction and implementation phase of a remedy until remedial response objectives are met. The analysis includes considering protection of both the community and on-site workers during remedial activities, environmental impacts that may result from construction or implementation activities, the reliability of measures to be taken to prevent or reduce potential impacts, and an estimation of time required to meet remedial response objectives.

This criterion will be used to evaluate each alternative for its ability to protect human health and the environment during implementation, as well as during any associated long-term monitoring activities. While the no action alternatives require no implementation activities, limited action

alternatives will be evaluated for the protection they offer during implementation of institutional controls, access restrictions, and long-term monitoring. Evaluation of the remaining alternatives will address sediment containment or sediment removal and dewatering activities. The time required for each alternative to reach the sediment cleanup goals will also be assessed.

Implementability: Implementability considerations include the technical and administrative feasibility of implementing an alternative, as well as the availability of goods and services on which the viability of the alternative depends. These considerations often affect the timeliness of undertaking an alternative.

Technical feasibility issues include:

- Ability to construct and operate an alternative as a whole
- Likelihood of a technology to meet specified process efficiencies and performance goals
- Ease of undertaking any required future remedial actions
- Ability to monitor the effectiveness of the remedy

Administrative feasibility deals with the activities needed and time required to coordinate with various federal, state, and local agencies in obtaining any necessary approvals and permits for off-site activities.

Issues related to the availability of goods and services include:

- Accessibility of adequate capacity and location of needed treatment, storage, and disposal services.
- Ease in obtaining necessary equipment and specialists, and provisions to ensure any additional resources.
- Timing and availability of technologies under consideration.
- Availability of services and materials, plus the potential for obtaining competitive bids.

These issues will be reviewed to evaluate the implementability of each remedial alternative. Issues will also be evaluated for both the ease of implementation and associated time frame required to coordinate subcontractors, activities, and required regulatory approvals.

Cost: This criterion encompasses all capital outlays, as well as O&M costs incurred over the lifetime of the remedial action. The detailed analysis of costs associated with each alternative will be based on accurate cost estimates and a net present worth cost analysis for a 30-year performance period. This criterion also includes a cost sensitivity analysis to examine the effect of uncertainties on the detailed cost estimates.

MODIFYING CRITERIA

State Acceptance: State acceptance, an ongoing concern throughout the remedial process, reflects the statutory requirement to provide for substantial and meaningful state involvement. State acceptance must be considered during remedy selection.

This criterion will not be evaluated until RIDEM has reviewed and provided comments on the FS report. Therefore, this criterion will not be included in the detailed analysis.

Community Acceptance: Community acceptance refers to the issues and concerns of "all interested parties", as they relate to each of the alternatives under consideration. Community acceptance must be considered during remedy selection.

This criterion will not be evaluated until the Restoration Advisory Board (RAB) has reviewed and provided comments on the FS report, and the public has been invited to ask questions and share their concerns during the public comment period. Therefore, this criterion will not be included in the detailed analysis.

5.2 INDIVIDUAL ANALYSIS OF NEARSHORE/ELEVATED-RISK OFFSHORE ALTERNATIVES

Five remedial alternatives remain for nearshore and elevated-risk offshore (NS/ER) areas following the screening presented in Section 4. These alternatives were developed to address risks to human health (consumption of shellfish by subsistent fishermen and children) and the environment (consumption of prey by avian aquatic predators; exposure of marine biota to contaminated sediment and porewater) associated with contaminants in the nearshore and elevated-risk offshore sediment. Sections 5.2.1 through 5.2.5, contain a brief description of each alternative (see Section 4.4 for detailed descriptions) and a detailed analysis of each in relation to the two threshold criteria and the five balancing criteria,

described in Section 5.1. A comparative analysis of the alternatives is summarized in Section 5.2.6. Detailed cost estimates and associated assumptions for each alternative are presented in Appendix F.

5.2.1 Alternative NS/ER-1: No Action

Consideration of a no action alternative is required under the NCP. At a minimum, it provides a baseline for comparison with other alternatives. This alternative would involve no remedial response activities with respect to impacted nearshore sediment or landfill materials adjacent to the McAllister Point Landfill site. No containment, removal, or treatment of contaminated sediment would be conducted, and no erosion control actions would be implemented to prevent potential migration of contaminated sediment into Narragansett Bay and connecting waterways. The alternative would provide no mechanism to reduce potential risks to human health or the environment. Because contaminated sediment would remain on site and unlimited use of the nearshore area would be allowed, a 5-year review of site conditions and risks would be required under the NCP.

An analysis of this alternative with respect to the evaluation criteria is as follows:

Overall Protection of Human Health and the Environment: This alternative would not achieve the RAOs for protection of human health and the environment identified in Section 2.2.4.1. It would offer no additional protection of human health and the environment, because it would not address potential risks through the elimination, reduction, or control of exposures to impacted site sediment or landfill debris. Contaminated sediment would not be contained or removed, and no access restrictions would be installed to discourage future access to the area for recreational use or shellfishing. Limited protection of human health is currently provided by the shellfishing ban in effect in the area; RIDEM has designated the area of Narragansett Bay off the NSN as a shellfish closure area due to known and potential sewage discharges in the area. However, the effectiveness of this ban is uncertain; no signs or markers are placed in the area to notify the public of the ban or warn of the hazards associated with contaminated sediment and it is not known whether enforcement of the ban is adequate. Potential risks to human health and the environment remaining at the site would include:

- Subsistent fisherman consuming shellfish (mussels and/or clams) tissue - exposure to an overall cancer risk of 9E-04 to 8E-03 and non-cancer hazard index (HI) of 4E+00 to 4E+01 associated with the presence of several carcinogenic PAHs, total PCBs, and select metals (arsenic, cadmium, copper, mercury, and zinc). Although increased cancer risks were

associated with the entire nearshore area, the highest risks were identified in the vicinity of sampling locations MCL-12, S2B, S2C, and OS-28.

- Recreational fishermen consuming shellfish (mussels and/or clams) tissue - exposure to an overall cancer risk of 2E-04 to 3E-04 associated with the presence of several carcinogenic PAHs, total PCBs, and select metals (arsenic and beryllium). Although increased cancer risks were associated with the entire nearshore area, the highest risks were identified in the vicinity of sampling locations MCL-12, S2B, S2C, and OS-28. Non-cancer His did not exceed 1E+00 for recreational fishermen.

- Children consuming shellfish (mussels and/or clams) tissue - exposure to an overall cancer risk of 2E-05 to 2E-04 or non-cancer HI of 5E-01 to 5E+00 associated with the presence of several carcinogenic PAHs, total PCBs, and select metals (arsenic, cadmium, and copper). The entire nearshore area was determined to exhibit essentially the same (low) increase in cancer risks.

- Avian aquatic predators consuming prey species tissue - exposure to a low to medium probability of risk (maximum threshold effects value-hazard quotients (TEV-HQ) of 1.32 to 5.76) associated with the presence of several PAHs, total PCBs, and select metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc). Although the probability of risk was identified in the entire nearshore area, the highest risks were identified in the vicinity of sampling locations NSB-3, NSB-4, and NSB-6.

- Marine biota impacted by toxicity from sediment contaminants partitioning into porewater - exposure to an intermediate to high probability of risk (maximum TEV-HQs of 1.8 to 16.8) associated with the presence of several PAHs, total PCBs, DDE, and select metals (copper, lead, nickel, and zinc). The probability of risk was identified in the entire nearshore and elevated-risk offshore area. The probability of risk was lowest (TEV-HQ less than 3) at sampling locations NSB-1 and NSB-7 and highest (TEV-HQ = 16.8) at NSB-4.

Because contaminants would remain at the site, a 5-year review would be conducted, as required by CERCLA, to assess changing site conditions and potential risks. Results of the review would be used to determine the need to implement future remedial actions at the site.

Compliance with ARARs: Tables 5-1, 5-2, and 5-3 summarize chemical-, location-, and action-specific ARARs and TBCs, respectively for Alternative NS/ER-1. This alternative fails to meet chemical-specific ARARs because it does not address sediments exceeding PRGs that were derived from federal and state water quality standards. Several non-promulgated criteria (TBCs) were used in assessing human health risks and developing sediment PRGs. Since no action is to be taken under this alternative, there are no state or federal action-specific or location-specific ARARs or TBCs.

Long-Term Effectiveness and Permanence: The area's designation as a shellfish closure area would continue to provide some long-term protection of human health for the foreseeable future, as long as the ban remains in effect. However, the effectiveness of the ban depends on the level of enforcement provided by RIDEM. The adequacy of the enforcement efforts is not known. The no action alternative would offer no additional long-term effectiveness or permanence in addressing sediment contamination at the site. The existing risks to human health and the environment would remain, and no controls would be provided to manage future exposures to sediment contaminants. Potential contaminant migration pathways would not be addressed, and contaminated sediment could migrate to adjacent marine environments. Because of the risk associated with leaving contaminated sediment on site, 5-year reviews would be required.

Reduction of Toxicity, Mobility, or Volume through Treatment: This alternative would not include any sediment treatment processes and would not involve removal of contaminated sediments. Therefore, the alternative would offer no reduction in toxicity, mobility, or volume of contamination through treatment.

Short-Term Effectiveness: Since no remedial activities are associated with implementation of this alternative, no short-term effects would occur. No increase or reduction in short-term risks would be offered to the local community, the personnel at NSN, or the environment. RAOs for protection of human health and the environment would not be achieved by this alternative.

Implementability: This alternative would require no implementation other than completion of the 5-year reviews. This activity would not require any permits, but it may require a minimal amount of coordination between regulatory agencies. Implementation of the no action alternative would not limit future implementation of additional remedial actions at the site, if deemed necessary.

Cost: A detailed estimate of capital, O&M, and present-worth costs for Alternative NS/ER-1 is provided in Appendix F and is summarized below. Present-worth costs were developed for a 30-year period at a 7 percent discount rate.

Cost Description	Estimated Cost
Capital Costs	$0
O&M/Long-Term Monitoring	$0
5-Year Reviews	$21,500/5 yr
Present Worth	$46,000

5.2.2 Alternative NS/ER-2: Limited Action

Alternative NS/ER-2 is a limited action option that would provide no direct remedial response activities. No containment, removal, and/or treatment of contaminated marine sediment would be conducted, and no erosion control actions would prevent potential migration of contaminated sediment into Narragansett Bay and connecting waterways. This alternative would, however, limit potential risks to human health through the placement of shoreline fencing, signs, and nearshore markers (a perimeter buoy system surrounding the contaminated area - see Figure 4-2). The buoys and a portion of the fencing would be installed on state-owned property below the high tide line. A long-term monitoring program and 5-year reviews would be conducted to evaluate risks to human health and the environment posed by the site. For the purposes of costing, it was assumed that annual monitoring would be conducted for the first 5 years and then the sampling frequency would be reduced from annually to every 5 years. The actual monitoring frequency would be determined by the Navy and regulatory agencies based on the monitoring results and 5-year reviews.

An analysis of this alternative with respect to the evaluation criteria is as follows:

Overall Protection of Human Health and the Environment: This alternative would provide a limited degree of protection of human health by discouraging access to, and use of, the impacted nearshore and elevated risk offshore areas. Through the placement of fencing, signs, and a perimeter buoy system, this alternative would increase public awareness of the existing shellfishing ban and the hazards associated with the contaminated sediment in the area, thereby discouraging shellfishing or other marine harvesting operations. The effectiveness of the access restrictions would depend on

individual compliance with the restrictions, and Navy and state enforcement of these restrictions on Navy and state-owned property, respectively. The effectiveness of the existing shellfishing ban would depend on adequate enforcement by RIDEM.

This alternative would provide no protection against potential disruption and/or migration of contaminated sediments due to wave or storm action, and it would not reduce risks to ecological receptors. Potential risks to avian aquatic predators and marine biota would remain, as described for Alternative NS/ER-1. The potential seep area in the intertidal zone south of the landfill would not be addressed under this alternative; however, the long-term monitoring program would be used to assess whether the oily sheen, and oily soil and rock fragments identified in the area result from a continuing seep or, as discussed in Section 1.5.1, from a disposed mass of oily materials. The monitoring program along with the 5-year reviews would be used to assess the need for additional actions to address any identified seeps.

Implementation of the long-term monitoring program would not provide protection of either human health or the environment, although, through annual monitoring, it would document changes in sediment quality that may affect future exposure risks. Because contaminants would remain at the site, 5-year reviews would be conducted to assess changing site conditions and potential risks. Results of the reviews would be used to determine the need to implement future remedial actions at the site or change the required frequency of long-term monitoring events.

This alternative, in conjunction with the state-imposed shellfishing ban, would partially meet RAOs for protection human health by limiting human exposure to the contaminated nearshore and elevated-risk offshore sediments. However, the complete effectiveness of the shellfishing ban and access restrictions cannot be guaranteed. This alternative would not meet the RAOs for the protection of the environment.

Compliance with ARARs: Tables 5-4, 5-5, and 5-6 summarize chemical-, location-, and action-specific ARARs and TBCs, respectively for Alternative NS/ER-2. This alternative fails to meet chemical-specific ARARs because it does not adequately address sediments exceeding PRGs that were derived from federal and state water quality standards. Several non-promulgated criteria (TBCs) were used in assessing human health risks and developing sediment PRGs.

Federal and state location-specific ARARs for this alternative include wetland and floodplain regulations, as well as coastal resource management, endangered species, fish and wildlife protection, and historic

preservation regulations. Alternative NS/ER-2 does not satisfy federal ARARs for the protection of wetlands and floodplains because the action to be taken does not address the risk to the wetland and floodplain environment posed by the contamination. Additionally, state hazardous waste standards for facilities within a floodplain are not satisfied. Any actions taken under this alternative (installation of fencing and buoys, and monitoring) that would affect the resources protected by these regulations would be conducted in accordance with the substantive requirements of the regulations.

Alternative NS/ER-2 does not meet federal and state hazardous waste action-specific standards because waste subject to these regulations will be left in place and exposed to washout. This standard is relevant and appropriate to the waste materials extending into the bay from the onshore landfill because they are part of the landfill, which was closed under RCRA C regulations. Materials that may be classified as hazardous wastes were disposed in the landfill prior to 1980.

Long-Term Effectiveness and Permanence: This alternative would rely on physical barriers, warning signs, and use restrictions to limit access to the impacted sediment and, thereby reduce human risk associated with direct contact and shellfishing activities. Although the shoreline fencing and a perimeter buoy system would help to minimize access, they may not be totally effective in prohibiting access to the area of concern. Regular maintenance and periodic replacement of the fencing and buoys by the Navy would be necessary to ensure their long-term effectiveness in deterring access and warning the public of the potential hazards. Restrictions on shellfishing and recreational use of the shoreline would require long-term enforcement by the state (for shellfishing) and the Navy (for recreational use of the shoreline) to ensure their protectiveness.

The limited action alternative would provide no long-term protection of ecological receptors or the environment. Ecological receptors would continue to be exposed to contaminants in sediment and porewater, potential contaminant migration pathways would not be addressed, and contaminated sediment could migrate to adjacent marine environments. Since contaminated sediments would remain on site above levels allowing for unlimited use and unrestricted exposure, annual monitoring and 5-year reviews of this alternative would be required to evaluate the effectiveness of the alternative.

Reduction in Toxicity, Mobility, or Volume through Treatment: This alternative would not include any sediment treatment processes. Therefore, the limited action alternative would offer no reduction in contaminant toxicity, mobility, or volume through treatment.

Short-Term Effectiveness: A slight increase in short-term risks could potentially result from the implementation of this alternative. Installation of the shoreline fencing and signs could result in minimal suspension and migration of contaminated sediment around the boundaries of the designated nearshore area. However, common engineering controls (the use of silt fences, silt curtains, and/or other features) would serve to minimize any potential short-term impacts to the marine environment. Potential exposures of on-site workers to contaminated sediment during installation activities would be limited through the use of personnel protective equipment (PPE). There would also be potential short-term impacts to workers associated with annual monitoring activities. These would be addressed through proper use of PPE and by using proper handling, storage, and disposal procedures for potentially contaminated sediment samples.

On-site installation activities are estimated to require less than 1 month. Each annual monitoring activity would require less than 1 week. RAOs associated with preventing risks to human health would be partially addressed when installation of fencing, signs, and buoys is complete, but RAOs for protection of the environment would not be achieved.

Implementability: Implementation of this alternative would involve installing shoreline fencing, signs, and a perimeter buoy system; and completing a long-term monitoring program and 5-year reviews.

The purchase and deployment of buoys and installation of shoreline fencing and signs would be easily implemented given the availability of qualified contractors, marine supplies, and boats within the Newport area. Consistent enforcement of the shoreline access restrictions as well as long-term maintenance of the fencing and buoy system by the Navy would be required. Because the buoys and a portion of the fence would be installed on state-owned land below the high tide line, coordination with the State of Rhode Island would be required for placing fencing and buoys, and enforcing access restrictions prohibiting recreational use of the shoreline.

This alternative does not include implementation of an institutional control to prohibit shellfishing in the area because a shellfishing ban instituted by RIDEM is already in place. However, for this alternative to be effective, adequate enforcement of the shellfishing ban by RIDEM would be required. The adequacy of long-term enforcement is uncertain.

The establishment of a long-term monitoring program to assess sediment quality would be easily implemented, given the availability of consulting/environmental firms and laboratories qualified to conduct such activities. These activities may require some coordination with regulatory agencies.

Implementation of the limited action alternative would not impede execution of future remedial actions at the site, if deemed necessary.

Cost: A detailed estimate of capital, O&M, and present-worth costs for Alternative NS/ER-2 is provided in Appendix F and is summarized below. Present-worth costs were developed for a 30-year period at a 7 percent discount rate.

Cost Description	Estimated Cost
Capital Costs	$25,000
O&M/Long-Term Monitoring	$94,600/yr (yrs 1-5 & 5-year intervals) $8,800/yr (rem. yrs)
5-Year Reviews	$21,500/5 yr
Present Worth	$656,000

5.2.3 Alternative NS/ER-3: Capping

Alternative NS/ER-3 meets the NCP's requirement for considering an alternative that uses containment as a remedial action. This alternative, while providing no contaminant removal or treatment, would limit potential risks to human health and the environment through containment of contaminated sediment and landfill debris. The main component of the capping alternative would be construction of a natural and multi-media cap over the impacted sediment in the nearshore and elevated-risk offshore areas (see Figures 4-3, 4-4, and 4-5). The natural cap would be placed in areas where erosional forces are determined to be low (low energy areas), and a multi-media cap would be placed in areas where there is a high potential for erosion (high energy areas). As discussed in Section 4.2.3, the locations and sizes of the low energy and high energy areas were estimated based on qualitative observations; the final delineation of areas appropriate for each type of cap would be made based on results of the PDI.

An appropriately designed and constructed cap would prevent direct human and environmental exposure to contaminated marine sediment, allow for the restoration of marine biota, and restrict movement and control erosion and subsequent migration of contaminated sediment into unimpacted areas of Narragansett Bay. A long-term O&M program, including quarterly inspections and as-needed repair, would be conducted to ensure that the cap remains in good condition and remains protective over the years. A long-term monitoring program and 5-year reviews would be conducted to evaluate potential risks to human health and the environment posed by the site and to evaluate the effectiveness of the remedial alternative. For the purposes of costing, it was assumed that annual monitoring would be conducted for the first 5 years and then the sampling frequency would be reduced from annually to every 5 years. The actual monitoring frequency would be determined by the Navy and regulatory agencies based on the monitoring results and 5-year reviews.

An analysis of this alternative with respect to the evaluation criteria is as follows:

Overall Protection of Human Health and the Environment: Alternative NS/ER-3 would achieve RAOs for protection of human health and the environment by capping and isolating contaminated sediment, thereby preventing potential exposure to and migration of impacted sediments or contaminants of concern. Placement of a cap over the impacted sediment would reduce potential risks to human health and avian aquatic predators from consumption of contaminated shellfish and reduce risks to aquatic receptors posed by exposure to contaminated marine sediment and porewater, provided that the cap remains effective over the long term. Additionally, this alternative would eliminate human risks associated with physical hazards (metal debris, submarine netting, etc.) present at the surface along the shoreline and in the intertidal zone by removing these hazards or covering them with the cap.

To protect human health and the environment and meet RCRA location standards, the cap would have to be designed and constructed to withstand the erosional forces expected during a 100-year storm to prevent washout of hazardous waste that would cause adverse effects on human health or the environment. Additionally, it would have to be shown that contaminants in the sediment remaining below the cap would not migrate through the cap and adversely affect the environment, ecological receptors, or human health.

No specific long-term studies are known to have been conducted that document the long-term effectiveness of intertidal marine sediment caps. Wave action studies would be needed to determine whether the cap could be constructed to withstand a 100-year storm, and to determine the effects of

increasing the bottom elevation of the capped area by 2 to 3 feet. Additionally, there is uncertainty about the rate of dissolved contaminant migration into and through the cap and the associated long-term effects on the cap materials, i.e. would contaminants that migrate into the cap adsorb to cap materials sufficiently to result in cap substrate concentrations exceeding PRGs? Based on the relatively low concentrations of contaminants observed in the porewater, the coarse nature and low organic content of the proposed capping materials (sand, gravel, and stone), and the thickness of the cap, diffusion and bioturbation are not expected to contribute significantly to contaminant deposition in the capping materials. However, additional data are needed to determine whether groundwater discharge through the underlying contaminated sediments and the proposed cap would result in significant advective transport and contamination of the cap materials to concentrations above PRGs.

Implementation of this alternative would result in some increased short-term impacts, including the temporary destruction of the existing aquatic community within the capped area and suspension of contaminated sediment, which could impact the aquatic community in the surrounding area. These impacts would be partially mitigated through proper design and implementation of the alternative; however, installation of the cap would result in the permanent filling of approximately 1.12 acres of existing intertidal aquatic habitat, which would be converted to upland by placement of the 2 to 3 foot thick cap (see shoreline-change estimates in Appendix E). In addition, approximately 2.27 acres of subtidal habitat would be permanently filled and converted to intertidal habitat. To mitigate for the loss of the aquatic habitat, it may be necessary to create new intertidal and/or subtidal habitat from uplands somewhere off site or restore a larger area of degraded habitat somewhere off site. The habitat mitigation efforts to be required would be determined at the remedial design stage with consultation of relevant federal and state agencies.

Capping would temporarily cover and destroy the hard-bottom aquatic community in the filled area below the high tide line. The proposed cap design would assist natural restoration of these communities by providing optimal habitat structure that would support the species indigenous to the area. Natural recolonization of the area would occur as water-borne algae spores and animal larvae are swept into the area by tidal currents and wave action. Based on the studies described in Section 3.3.6 and previous observations of hard-bottom community recovery at the site following construction in 1995 and 1996, it is anticipated that the community would be reestablished within 1 to 4 years.

Cap installation may impact eelgrass beds located offshore of the landfill. However, because existing data indicate that the eelgrass beds are outside the limits of the proposed cap, damage to the eelgrass

beds is expected to be slight (principally due to increased turbidity caused by resuspension of sediments during site preparation and capping). Because the sediments in the nearshore area are relatively coarse and operations in the area adjacent to the eelgrass beds would be conducted over a relatively short duration, standard turbidity control measures such as silt curtains are expected to effectively control turbidity and minimize damage to the eelgrass beds. Natural processes should effectively repair any slight damage to the eelgrass beds resulting from the remedial action. Additional investigation would be needed during the PDI to define the limits of the eelgrass beds and determine whether they would be impacted by placement of the cap. If it is concluded that the eelgrass beds would suffer significant damage, it may be necessary to consider assisted restoration.

Implementation of the long-term O&M and long-term monitoring programs would ensure the integrity of the cap and allow assessment of changes in sediment quality and effectiveness of the cap. Five-year reviews would be conducted to assess site conditions and potential risks. Results would be used to determine whether additional remedial actions are needed at the site.

Compliance with ARARs: Tables 5-7, 5-8, and 5-9 summarize chemical-, location-, and action-specific ARARs and TBCs, respectively for Alternative NS/ER-3. This alternative would comply with federal and state chemical-specific ARARs (water quality standards) used to derive sediment PRGs only if the proposed cap prevents exposure to sediments exceeding the PRGs that were derived from these standards, and contaminants from these sediments do not migrate through the cap.

Implementation of Alternative NS/ER-3 can only satisfy state and federal location standards for hazardous waste facilities if the cap can be constructed and maintained to withstand a 100-year storm event to prevent washout of any hazardous waste that would have adverse effects on human health or the environment. Further, because Alternative NS/ER-3 would cause permanent filling of approximately 1.12 acres of aquatic habitat and conversion of 2.27 acres of subtidal habitat into intertidal habitat, the requirements of the Clean Water Act (CWA) Section 404 would have to be met in order to select this alternative. This section of the CWA requires that the alternative chosen be the least damaging practicable alternative. Because other alternatives are available that would not result in the same degree of habitat loss, this alternative could only be selected if the permanent loss of aquatic habitat is mitigated by creation or restoration of aquatic habitat somewhere off site. Failure to satisfy the CWA would also violate federal ARARs for the protection of wetlands and floodplains.

Alternative NS/ER-3 would meet all other state and federal location-specific ARARs by conducting the activities in accordance with the identified ARARs, and coordinating with appropriate agencies to find ways to minimize adverse effects to fish, wildlife, endangered species, and historic sites.

Alternative NS/ER-3 would meet action-specific ARARs for identifying hazardous wastes, monitoring hazardous wastes facilities, and controlling water pollution. The alternative would meet hazardous waste facility standards if the cap can be constructed and maintained to protect human health and the environment.

Long-Term Effectiveness and Permanence: Alternative NS/ER-3 would eliminate the potential human health and avian aquatic predator risks due to consumption of contaminated shellfish and risks to aquatic receptors (bivalves, etc.) posed by exposure to contaminated marine sediment and porewater, provided that the cap remains effective over the long term. This alternative would also eliminate risks to humans due to direct contact with physical hazards (metal debris, submarine netting, etc.) along the shoreline.

There is some uncertainty about the long-term effectiveness of a subaqueous cap in a high energy shoreline like that at the site. However, inadequate data are available to predict the long-term effectiveness of the proposed cap. Wave action studies are needed to determine whether the cap could be constructed to withstand a 100-year storm, and to determine the effect that increasing the bottom elevation by 2 to 3 feet would have on wave action, currents, and erosion of the existing landfill cap and revetment. Additionally, the potential effects of groundwater discharge from the landfill upward through the cap are not known. More data are needed to determine whether groundwater discharge through the underlying contaminated sediments or other contaminant transport processes such as diffusion or bioturbation would result in contamination of the cap materials to concentrations above PRGs. Pre-design studies would be needed to collect these data and refine the cap design.

The long-term effectiveness of the alternative would be directly related to the adequacy of long-term maintenance of the cap. The long-term O&M program (which would include regular inspection and periodic cap maintenance), and the long-term monitoring program (which would include annual sediment and biota sampling) would be conducted to ensure the physical integrity of the cap over the long term. Since contaminated sediment would remain on site above levels allowing for unlimited use and unrestricted exposure, monitoring and 5-year reviews would be required to evaluate the protectiveness of the remedy.

The long-term protection of the environment would also depend on recovering the disrupted aquatic habitat below the high tide line, and mitigating for the conversion of 1.12 acres of hard-bottom aquatic habitat to upland and 2.27 acres of subtidal habitat to intertidal habitat. Successful natural restoration of the disrupted and converted habitat below the high tide line would be expected in 1 to 4 years. However, the likely success of mitigation for the lost aquatic habitat is unknown.

Reduction in Toxicity, Mobility, or Volume through Treatment: This alternative would not include any sediment treatment processes, therefore it would offer no reduction in toxicity, mobility, or volume through treatment. The containment features of this alternative would, however, provide a reduction in the mobility of contaminated sediment at the site by preventing sediment erosion.

Short-Term Effectiveness: Implementation of this alternative would result in increased short-term risks to human and ecological receptors due to the disruption and handling of contaminated sediment and landfill debris during remedial activities, and the capping of existing aquatic habitat. Potential exposures of on-site workers to impacted sediment and sharp metallic objects during site preparation and capping activities would be minimized through use of PPE and proper workplace safety practices. No increase in short-term risks to the community would be anticipated from implementing this action.

Resuspension of contaminated sediment may occur during the site preparation and capping operations. Migration and resettling of suspended sediment may harm marine biota in the subtidal and intertidal habitats adjacent to the site and enlarge the area impacted by site contaminants. Engineering controls, such as silt curtains, would minimize potential environmental impacts associated with contaminant migration; however, adverse effects may not be completely eliminated. Additional data regarding sediment grain size and dredging techniques would be collected during the PDI to predict the degree of effectiveness of sedimentation controls and determine whether adjacent habitats are likely to be harmed by the remedial action.

Capping would convert approximately 1.12 acres of hard-bottom aquatic habitat to upland, causing permanent loss of aquatic habitat that could only be mitigated through creation of new habitat from uplands somewhere off site or restoration of a degraded or off-site habitat. Capping would also convert approximately 2.27 acres of subtidal habitat into intertidal aquatic habitat. Capping would cover and kill the resident plants and shellfish in the entire capped area and it would temporarily disrupt the aquatic habitat in the capped areas that remain below the high tide line. Some of the habitat functions and values identified in Section 1.4.3 would be temporarily lost as a result of cap placement. Because all

resident plants and shellfish would be covered by the cap, the area would no longer function as a feeding area for some aquatic organisms, birds, and mammals, and it would not serve product export functions such as provision of nutrients for other systems. The lost functions and values of the habitat would not be completely replaced until the aquatic community was fully reestablished. Placement of cap materials similar to the existing sand/gravel/rock substrate of the area would provide a foundation for re-establishment of the aquatic community, serving as a habitat for plants and animals to root and breed. Natural recolonization of the area would occur as water-borne algae spores and animal larvae were continually swept into the area by tidal currents and wave action.

The rehabitation of the area may take several years to complete. However, observations in the intertidal zone after the winter 1996 erosion event (Phase III Remedial Investigation Report, April 1996) indicate that natural rehabitation of the hard-bottom community in the area occurs at a fairly rapid pace. In April 1998, 2 years after the area was significantly altered by erosion (changing it from a sandy to a rocky intertidal zone), a significant, diverse ecological community was present in the intertidal zone. Based on these observations and recovery reported for similar habitats (described in Section 3.3.6), it is anticipated that the community would be reestablished within 1 to 4 years.

Cap installation may impact eelgrass beds located offshore of the landfill. However, because existing data indicate that the eelgrass beds are outside the limits of the proposed cap, damage to the eelgrass beds is expected to be slight. Standard turbidity control measures such as silt curtains are expected to effectively control turbidity and minimize damage the eelgrass beds. Additional investigation would be needed during the PDI to define the limits of the eelgrass beds and determine whether they would be impacted by placement of the cap. If it is concluded that the eelgrass beds would suffer significant damage, it may be necessary to consider assisted restoration.

RAOs for protection of human health from site-related contaminants would be achieved upon completion of the subaqueous cap, approximately 10 months after mobilization on site. RAOs for protection of the environment from site-related contaminants would be achieved within the same time frame. However, complete rehabitation of the capped area below the high tide line by aquatic organisms and complete restoration of lost functions and values of the impacted aquatic habitat may take a few years. Establishment of mitigation areas to replace permanently filled aquatic habitats may take many years, depending on the type and location of mitigation required.

Implementability: Implementation of Alternative NS/ER-3 would require significant site preparation and construction efforts, completion of a long-term monitoring program and 5-year reviews, and establishment of a mitigation area for permanently filled aquatic habitats. The complexity of implementation is a function of the location of the area to be capped in the intertidal zone adjacent to the landfill, and the performance standards that the cap must meet. In particular, the subaqueous cap must be designed, installed, and maintained to withstand a 100-year storm event within a high energy coastline to prevent washout of hazardous waste that would cause adverse effects on human health or the environment. Water depth, wave action, the influence of local currents and tides, and weather conditions could greatly influence the design of the cap and also result in scheduling delays related to site accessibility.

Implementation would be complicated by difficult access to the area due to the landfill and revetment (too steep and uneven to stage land-based equipment) and the depth of the water in the area to be capped (some areas may be too shallow for barge access and too deep for a temporary cofferdam to effectively hold back water.) Site preparation and placement of the cap would have to be implemented by a combination of land-based and barge-mounted equipment; shallow water and the limited reach of barge-mounted equipment make it impossible to access all areas from a barge, and the presence of the landfill and revetment, and the limited reach of land-based equipment, makes it impossible to access all areas from land.

It was assumed that land-based actions would be conducted using conventional earth-moving equipment located within the remediation area, behind cofferdams. Land-based actions would be limited to the shallow portions of the area south of the landfill, where the water is shallow enough to allow effective use of a temporary cofferdam system to keep the area relatively dry. Constant maintenance of the cofferdam would be required to ensure the effectiveness of the cofferdam in the tidal environment. A temporary cofferdam was effectively used during construction of the McAllister Point Landfill cap. The system weathered a number of storms and performed well; however, it was located closer to the landfill revetment, in water approximately 3 feet shallower than the proposed location. A cofferdam installed in deeper water would likely require more maintenance to remain effective.

Barge-mounted operations are limited by the draft requirements of the vessel and the reach of the equipment. Some locations in the nearshore area may be difficult to access because the water near the landfill is relatively shallow and a typical barge that could support the large, heavy

equipment required for dredging and processing the sediment and landfill debris needs 6 to 8 feet of draft (shoreline topography/water depth are shown on Figure 1-4). Equipment with a reach of 100 feet or more may be required, which could limit the ability of the equipment to remove or place large, unwieldy objects such as landfill debris or concrete armament sections.

Implementation of this alternative would require contractors with personnel trained in hazardous waste site operations, who are qualified to handle contaminated sediment dredging, grading, and erosion control operations in an aqueous environment, and who are capable of completing construction in a timely and effective manner. Construction activities associated with shoreline protection and control of sediment resuspension may be difficult to implement due to the wave action in a large portion of the NS/ER area.

Implementation of this alternative would require coordination with regulatory agencies regarding marine dredging and filling operations and potential effects on fisheries, endangered species, and the aquatic habitat. Agreements with regulatory agencies would have to be reached regarding mitigation for alteration of aquatic habitats and establishing the periods for site preparation and capping activities in the bay. Alternative NS/ER-3 includes site preparation and cap placement activities that may result in sediment suspension that could affect sensitive species. The State of Rhode Island generally requires dredging projects to be conducted between November 1 and January 15 to protect sensitive species. The Navy will investigate the use of aquatic habitats on site by sensitive species to determine potential impacts from dredging during different times of the year. It is anticipated that the long-term benefits of conducting the remedial action during a single dredging period (estimated to last 7.5 months) will outweigh any short-term risks to sensitive species. If construction could only occur from November until mid January, it would likely take 3 to 4 years to implement the remedy.

Conducting long-term operation and maintenance of the cap may be difficult. Inspection of the cap could be conducted from land, boats, and from water using divers. Repairs would be conducted by experienced marine contractors using barge-based and land-based equipment. Inspection and repairs of the cap may be difficult due to the equipment access constraints discussed above, and because inspection and repair may have to be conducted during the winter months, when inclement weather and rough seas would make monitoring and repair more difficult. However, effective cap design and construction should limit or prevent the occurrence of severe damage that would necessitate immediate repairs. Routine inspection and maintenance could be planned and implemented during more favorable

weather conditions. Routine maintenance would involve the placement of coarse fill on areas of the cap where erosion had occurred.

Performing long-term monitoring to assess sediment quality would be easily implementable, given the availability of consulting/environmental firms and laboratories qualified to conduct such activities. The results would be compiled with groundwater and landfill gas data collected from the long-term monitoring program conducted for the landfill cap remedy and summarized as part of the 5-year reviews. These activities may require coordination with regulatory agencies.

The containment features of this alternative could be impacted if additional future remedial actions are required. The natural cap would be easily removed if necessary for future actions. The multimedia cap would be somewhat more difficult to remove due to the anchoring of the concrete armament; however, it could be removed if necessary.

Cost: A detailed estimate of capital, O&M, and present-worth costs for Alternative NS/ER-3 is provided in Appendix F and is summarized below. Present-worth costs were developed for a 30-year period at a 7 percent discount rate.

Because there is a high degree of uncertainty in the estimated area of sediment that exceeds PRGs, a cost sensitivity analysis was performed to assess the sensitivity of the cost estimate to a significant change in the area of sediment to be addressed under this alternative. The sensitivity analysis evaluated the costs of the alternative if the area of sediment to be capped was 20 percent greater or 30 percent lower than the estimated area. The detailed cost sensitivity analysis is presented in Appendix G. The results of the detailed cost estimate and cost sensitivity analysis are presented below.

		Sensitivity Analysis	Sensitivity Analysis
Cost Description	Estimated Volume	20% Volume Increase	30% Volume Decrease
Capital Costs	$11,976,000	$13,872,000	$9,131,000
O&M/Long-Term Monitoring	$120,800/yr (yrs 1-5 & 5-year intervals) $35,000 (rem. yrs)	$120,800/yr (yrs 1-5 & 5-year intervals) $35,000 (rem. yrs)	$120,800/yr (yrs 1-5 & 5-year intervals) $35,000 (rem. yrs)
5-Year Reviews	$21,500/5 yr	$21,500/5 yr	$21,500/5 yr
Present Worth	$12,933,000	$14,829,000	$10,088,000

5.2.4 Alternative NS/ER-4: Capping With Dredging to Match Existing Grade

Alternative NS/ER-4 meets the NCP's requirement for considering an alternative that uses containment as a remedial action. This alternative would limit potential risks to human health and the environment through implementation of engineering controls, limited removal and disposal of contaminated sediment, and capping.

As described in Section 4.2.4, Alternative NS/ER-4 is similar to Alternative NS/ER-3 except that areas to be capped would first be excavated to a depth equal to the thickness of the cap. The objective of this alternative is to allow installation of a cap while also returning the area to its natural topography to limit filling and minimize potential impacts to the aquatic habitat. A combination of natural and multi-media caps would be installed in low energy and high energy areas as described for Alternative NS/ER-3. Areas where all contaminated sediments are removed (where the thickness of sediments exceeding PRGs is less than or equal to the thickness of the proposed cap) would be backfilled with natural fill materials, similar to the existing substrate. These areas would not receive a "cap". The cap and fill materials would be selected and placed to provide an optimal habitat structure to promote natural restoration of the hard-bottom aquatic community in the disturbed areas. The limits of the caps and backfill areas, and cap cross-sections are presented in Figures 4-6, 4-7, and 4-8.

Contaminated sediment and debris removed as part of this remedial action would be screened and segregated in a dedicated staging area. Rocks and boulders greater than 6 inches in diameter would be decontaminated and reused during cap construction. All material less than 6 inches in diameter would be disposed in the existing McAllister Point Landfill; the landfill cap would need to be opened to accept the contaminated sediment and debris and then recapped. All trash and debris such as steel, concrete, submarine netting, etc. would be disposed in the McAllister Point Landfill or sent off site for recycling or disposal. Any large debris to be sent off site for recycling or disposal would first be decontaminated in accordance with relevant hazardous waste standards as described in Section 4.2.4.

A long-term O&M program, including quarterly inspections and as-needed repair, would be conducted to ensure that the cap remains in good condition and remains protective over the years. A long-term monitoring program and 5-year reviews would be conducted to evaluate potential risks to human health and the environment posed by the site, and to evaluate the effectiveness of the remedial alternative. For the purposes of costing, it was assumed that annual monitoring would be conducted for the first 5 years and then the sampling frequency would be reduced from annually to every 5 years. The actual

monitoring frequency would be determined by the Navy and regulatory agencies based on the monitoring results and 5-year reviews.

An analysis of this alternative with respect to the evaluation criteria is as follows:

Overall Protection of Human Health and the Environment: Alternative NS/ER-4 would achieve RAOs for protection of human health and the environment by removing and properly disposing of a fraction of the contaminated sediment, and capping and isolating the remaining contaminated sediment. The overall protection provided by Alternative NS/ER-4 would be somewhat better than that provided by Alternative NS/ER-3. The removal of approximately 22,000 cy – or nearly two thirds – of the contaminated sediment and debris exceeding PRGs would decrease the volume and the lateral extent of contaminants remaining in the area, thereby providing some additional protection to human health and the environment. Placement of a cap over the remaining impacted sediment would eliminate potential risks to human health and avian aquatic predators from consumption of contaminated shellfish, and prevent risks to aquatic receptors posed by exposure to contaminated marine sediment and porewater, provided that the cap remains effective over the long term. Human risks associated with physical hazards (metal debris, submarine netting, etc.) would be eliminated by removing these hazards from the shoreline and intertidal zone or covering them with the cap.

The proposed cap for this alternative would have to meet the same design and performance standards as the one proposed for Alternative NS/ER-3, and there are similar questions regarding its long-term effectiveness. No specific studies are known to have been conducted that document the long-term effectiveness of intertidal marine sediment caps. Wave action studies would be needed to determine whether the cap could be constructed to withstand a 100-year storm, and more data would be needed to determine whether groundwater discharge through the underlying contaminated sediments or other contaminant transport processes such as diffusion or bioturbation would result in contamination of the cap materials to concentrations above PRGs.

Because the top elevation of the cap would match the existing grade, there would be little concern about the potential affect the cap would have on wave action, currents, and erosion of the existing landfill cap and revetment. However, removal of sediment from near the toe of the McAllister Point Landfill may compromise the integrity of the landfill cap and revetment and could result in migration of additional landfill contaminants into the marine environment. Excavation activities near the toe of the

revetment would need to be performed carefully and engineering controls would be required to minimize damage to the landfill cap and revetment.

Disposal of dredged materials in the McAllister Point Landfill would ultimately decrease risks associated with these materials, but reopening the cap may result in additional short-term impacts from exposure to or increased leaching of contaminants in the landfill. Assuming that excavated sediment and debris would be placed in the McAllister Point Landfill for disposal, this alternative would also cause an aesthetic impact to the shoreline by increasing the elevation of the landfill by as much as 20 to 25 feet. The top elevation of the landfill would be approximately 45 to 50 feet higher than the adjacent roadway (Defense Highway).

Implementation of this alternative would result in some increased short-term risks, including the destruction of existing biota within the impacted area and suspension of contaminated sediment. However, these impacts would be at least partially mitigated through proper implementation of turbidity control measures and selection of appropriate cap and backfill materials. Dredging and capping would temporarily destroy the hard-bottom aquatic community in the filled area below the high tide line. The proposed cap and fill design would assist natural restoration of these communities by providing a habitat structure that would promote colonization of the species indigenous to the area. Natural recolonization of the area would occur as water-borne algae spores and animal larvae are swept into the area by tidal currents and wave action. Based on the studies described in Section 3.3.6 and previous observations of hard-bottom community recovery at the site following construction in 1995 and 1996, it is anticipated that the hard-bottom community destroyed by the remedial action would be reestablished within 1 to 4 years. In addition, hard-bottom habitats adjacent to the site may be affected by turbidity. These habitats would have to be monitored to determine the need for mitigation measures.

Cap installation may impact eelgrass beds located offshore of the landfill. However, because existing data indicate that the eelgrass beds are outside the limits of the proposed cap, damage to the eelgrass beds is expected to be slight (principally due to increased turbidity caused by resuspension of sediments during dredging and capping). Because the sediments in the nearshore area are relatively coarse and operations in the area adjacent to the eelgrass beds would be conducted over a relatively short duration, standard turbidity control measures such as silt curtains are expected to effectively control turbidity and minimize damage to the eelgrass beds. Additional investigation would be needed during the PDI to define the limits of the eelgrass beds and determine whether they would be impacted by

placement of the cap. If it is concluded that the eelgrass beds would suffer significant damage, it may be necessary to consider assisted restoration.

There would also be increased short-term risks to on-site workers from potential exposures to contaminated sediment and sharp metallic objects during excavation, dredging, and handling activities. There may also be some risks associated with opening McAllister Point Landfill to dispose of the dredged materials. These risks would be minimized through the use of PPE and proper safety procedures.

Implementation of the long-term O&M and long-term monitoring programs would ensure the integrity of the cap and allow assessment of changes in sediment quality and effectiveness of the cap. Five-year reviews would be conducted to assess site conditions and potential risks. Results would be used to determine whether additional remedial actions are needed at the site.

Compliance with ARARs: Tables 5-10, 5-11, and 5-12 summarize chemical-, location-, and action-specific ARARs and TBCs, respectively for Alternative NS/ER-4. This alternative would comply with federal and state chemical-specific ARARs (water quality standards) used to derive sediment PRGs only if the proposed cap prevents exposure to sediments exceeding the PRGs that were derived from these standards, and contaminants from these sediments do not migrate through the cap.

Implementation of Alternative NS/ER-4 can only satisfy state and federal location standards for hazardous waste facilities if the cap can be constructed and maintained to withstand a 100-year storm event to prevent washout of any hazardous waste that would have adverse effects on human health or the environment. ARARs require that the alternative chosen be the least damaging practicable alternative. To satisfy the CWA Section 404 requirements, damaged aquatic habitats would have to be restored.

Implementation of Alternative NS/ER-4 would meet all other state and federal location-specific ARARs by conducting the activities in accordance with applicable and relevant and appropriate floodplain, wetland, coastal resource management, endangered species, fish and wildlife protection, and historic preservation regulations, and coordinating with appropriate agencies to find ways to minimize adverse effects to fish, wildlife, endangered species, and historic sites.

Alternative NS/ER-4 would be conducted in accordance with all identified state and federal action-specific ARARs. The action-specific ARARs identified for this alternative include RCRA requirements for identifying, listing, and disposing of hazardous wastes; CWA requirements for discharges to surface water; and Clean Air Act requirements for emissions monitoring of dewatering processes. The alternative would meet hazardous waste facility standards if the cap can be constructed and maintained to protect human health and the environment.

Long-Term Effectiveness and Permanence: Alternative NS/ER-4 would eliminate the potential human health and avian aquatic predator risks due to consumption of contaminated shellfish and risks to aquatic receptors (bivalves, etc.) posed by exposure to contaminated marine sediment and porewater, provided that the cap remains effective over the long term. This alternative would also eliminate risks to humans due to direct contact with physical hazards (metal debris, submarine netting, etc.) at the surface along the shoreline and intertidal zone.

As discussed for Alternative NS/ER-3, there is some uncertainty about the long-term effectiveness of a subaqueous cap in a high energy shoreline like that at the site. Inadequate data are available to predict the long-term effectiveness of the proposed cap. Wave action studies are needed to determine whether the cap could be constructed to withstand a 100-year storm. Additionally, more data are needed to determine whether groundwater discharge through the underlying contaminated sediments or other contaminant transport processes such as diffusion or bioturbation would result in contamination of the cap materials to concentrations above PRGs. Pre-design studies would be needed to collect these data and refine the cap design.

The long-term effectiveness of the cap would be directly related to the adequacy of the long-term maintenance program. The long-term O&M program (which would include regular inspections and periodic cap maintenance), and the long-term monitoring program (which would include annual sediment and biota monitoring) would be conducted to ensure the physical integrity of the cap and assess the cap's effectiveness over the long term. Since contaminated sediment would remain on site above levels allowing for unlimited use and unrestricted exposure, monitoring and 5-year reviews would be required to evaluate the protectiveness of the remedy.

Assuming that excavated sediment and debris would be placed in the McAllister Point Landfill for disposal, this alternative would cause an aesthetic impact to the shoreline by increasing the elevation of

the landfill by as much as 20 to 25 feet. The top elevation of the landfill would be approximately 45 to 50 feet higher than the adjacent roadway (Defense Highway).

Reduction in Toxicity, Mobility, or Volume through Treatment: Alternative NS/ER-4 would not include treatment, therefore it would provide no reduction in the toxicity, mobility, or volume of contaminants through treatment. However, this alternative would reduce the mobility of impacted sediment in the NS/ER area adjacent to the McAllister Point Landfill through a combination of limited removal activities and capping.

Short-Term Effectiveness: Implementation of Alternative NS/ER-4 could result in increases in short-term risks to human and ecological receptors due to disruption and handling of contaminated sediment and landfill debris during site preparation, sediment removal, and cap installation. Potential exposures of on-site workers to contaminated sediment and sharp metallic objects during excavation, dredging, and handling activities would be minimized through the use of PPE and proper safety procedures.

Resuspension of contaminated sediment would occur during the dredging and capping operations. Migration and resettling of suspended sediment may harm marine biota and enlarge the area impacted by site contaminants. Engineering controls, such as silt curtains, would minimize potential environmental impacts associated with contaminant migration; however, adverse effects may not be completely eliminated. Additional data regarding sediment grain size and dredging techniques are needed to predict the degree of effectiveness of sedimentation controls.

Dredging and capping would remove or cover the resident plants and shellfish, and temporarily disrupt the aquatic habitat in the capped and filled areas below the high tide line. Some of the habitat functions and values identified in Section 1.4.3 would be temporarily lost as a result of sediment removal and cap placement. Because all resident plants and shellfish would be either removed or covered, the area would no longer function as a feeding area for some aquatic organisms, birds, and mammals, and it would not serve product export functions such as provision of nutrients for other systems. The lost functions and values of the habitat would not be completely replaced until the aquatic community was fully reestablished. Placement of cap and fill materials similar to the existing sand/gravel/rock substrate of the area would provide a foundation for re-establishment of the aquatic community, serving as a habitat for plants and animals to root and breed. Natural recolonization of the area would occur as water-borne algae spores and animal larvae were continually swept into the area by tidal currents and wave action.

The rehabitation of the area may take several years to complete. However, observations in the intertidal zone after the winter 1996 erosion event (Phase III Remedial Investigation Report, April 1996) indicate that natural rehabitation of the hard-bottom community in the area occurs at a fairly rapid pace. In April 1998, 2 years after the area was significantly altered by erosion (changing it from a sandy to a rocky intertidal zone), a significant, diverse ecological community was present in the intertidal zone. Based on these observations and recovery reported for similar habitats (described in Section 3.3.6), it is anticipated that the hard-bottom community destroyed by the remedial action would be reestablished within 1 to 4 years. In addition, hard-bottom habitats adjacent to the site may be affected by turbidity. These habitats would have to be monitored to determine the need for mitigation measures.

Sediment removal and cap installation may also impact eelgrass beds located offshore of the landfill. However, because existing data indicate that the eelgrass beds are outside the limits of the remedial action, damage to the eelgrass beds is expected to be slight. Standard turbidity control measures such as silt curtains are expected to effectively control turbidity and minimize damage to the eelgrass beds. Additional investigation would be needed during the PDI to define the limits of the eelgrass beds and determine whether they would be impacted by placement of the cap. If it is concluded that the eelgrass beds would suffer significant damage, it may be necessary to consider assisted restoration.

Disposal of dredged materials in the McAllister Point Landfill would ultimately decrease risks associated with these materials, but reopening the cap may result in additional short-term impacts from exposure to or increased leaching of contaminants in the landfill.

RAOs for protection of human health would be achieved upon completion of the subaqueous cap and closure of the McAllister Point Landfill following sediment disposal, approximately 20 months after mobilization on site. RAOs for protection of the environment would be achieved within approximately 9 months, when the subaqueous cap was complete. However, complete rehabitation of the area by aquatic organisms and complete restoration of lost functions and values of the impacted aquatic habitat may take a few years.

Implementability: Implementation of Alternative NS/ER-4 would require significant efforts, both administratively and technically. The complexity of implementation is a function of the location of the area to be dredged and capped (the intertidal zone adjacent to the landfill), and the performance standards the cap must meet. In particular, the subaqueous cap must be designed, installed, and maintained to withstand a 100-year storm event within a high energy coastline to prevent washout of

hazardous waste that would cause adverse effects on human health or the environment. Wave action, the influence of local currents and tides, and weather conditions could greatly influence the design of the cap and also result in scheduling delays related to site accessibility.

Implementation would be complicated by difficult access to the area due to the landfill and revetment (too steep and uneven to stage land-based equipment) and the depth of the water in the work area (some areas are too shallow for barge access and too deep for a temporary cofferdam to effectively hold back water). Site preparation, dredging, and placement of the cap would have to be implemented by a combination of land-based and barge-mounted equipment because shallow water and the limited reach of barge-mounted equipment make it impossible to access all areas from a barge, and the presence of the landfill and revetment, and limited reach of land-based equipment make it impossible to access all areas from land.

It was assumed that land-based actions would be conducted behind cofferdams using conventional earth-moving equipment located within the remediation area. Land-based actions would be limited to the shallow portions of the area south of the landfill, where the water is shallow enough to allow effective use of a temporary cofferdam system to keep the area relatively dry. Constant maintenance of the cofferdam would be required to ensure the effectiveness of the cofferdam in the tidal environment. A temporary cofferdam was effectively used during construction of the McAllister Point Landfill cap. The system weathered a number of storms and performed well; however, it was located in water approximately 3 feet shallower than the proposed location. A cofferdam installed in deeper water would likely require more maintenance to remain effective.

Barge-mounted operations are limited by the draft requirements of the vessel and the reach of the equipment. Some locations in the nearshore area may be difficult to access because the water near the landfill is relatively shallow and a typical barge that could support the large, heavy equipment required for dredging and processing the sediment and landfill debris needs 6 to 8 feet of draft (shoreline topography/water depth are shown on Figure 1-4). Equipment with a reach of 100 feet or more may be required, which could limit the ability of the equipment to remove or place large, unwieldy objects such as landfill debris or concrete armament sections.

Excavation/dredging operations are also complicated by the subsurface conditions existing within the intertidal zone (presence of rock outcroppings, pockets of sediment on hard rock, thick tangles of submarine cables, and large pieces of metal and concrete debris). Removal of contaminated sediment

from shallow bedrock areas or adjacent to the revetment may be difficult; small pockets of sediment may remain in pockets on top of the shallow bedrock or at the revetment. The removal of submarine cables and large debris (principally from the central portion of the site) is possible, as was demonstrated during landfill cap construction; however, removal of this material from the toe of the revetment may compromise the integrity of the landfill cap and revetment, particularly if submarine netting extends into the nearshore area from beneath the revetment. Extreme care would need to be exercised when excavating near the revetment to prevent migration of landfilled material into the marine environment. Some shoring would likely be needed to protect the revetment and landfill cap; however, because the excavation would not exceed the depth of the revetment, extensive shoring would not be required.

Implementation of this alternative would require qualified contractors with personnel trained in hazardous waste site operations, who are qualified to handle contaminated sediment dredging, grading, and erosion control operations in an aqueous environment and who are capable of completing construction in a timely and effective manner. Construction activities associated with shoreline protection and control of sediment resuspension may be difficult to implement due to the wave action in a large portion of the NS/ER area.

Implementation of this alternative would require coordination with regulatory agencies regarding marine dredging and filling operations; water treatment and discharge from sediment dewatering activities into the bay; materials handling/off-base disposal issues; and potential effects on fisheries, endangered species, and the aquatic habitat. Agreements with regulatory agencies would have to be reached regarding mitigating for altering aquatic habitats, reopening the McAllister Point Landfill cap, and establishing the periods for dredging and filling activities in the bay. Obtaining agreements with regulatory agencies is not expected to pose a problem. Alternative NS/ER-4 includes significant dredging, debris removal, and cap placement activities that may result in sediment suspension that could affect sensitive species. The State of Rhode Island generally requires dredging projects to be conducted between November 1 and January 15 to protect sensitive species. The Navy will investigate the use of aquatic habitats on site by sensitive species to determine potential impacts from dredging during different times of the year. It is anticipated that the long-term benefits of conducting the remedial action during a single dredging period (estimated to last 9 months) will outweigh any short-term risks to sensitive species. If construction could only occur from November until mid January, it would likely take 5 to 6 years to implement the remedy.

Assuming that excavated sediment and debris would be placed in the McAllister Point Landfill for disposal, the PDI would need to evaluate the feasibility of using this facility. A portion of the existing cover would need to be removed and the landfill otherwise prepared to accept the dredged sediment and debris. The PDI would determine the available capacity of the landfill, the strategy for removing the existing cover and stockpiling cover materials for reuse, and the configuration for the rough and final grades and final cap.

Conducting long-term operation and maintenance of the cap may be difficult. Inspection of the cap could be conducted from land, boats, and from water using divers. Repairs would be conducted by experienced marine contractors using barge-based and land-based equipment. Inspection and repairs of the cap may be difficult due to the equipment access constraints discussed above, and because inspection and repair may have to be conducted during the winter months, when inclement weather and rough seas would make monitoring and repair more difficult. However, effective cap design and construction should limit or prevent the occurrence of severe damage that would necessitate immediate repairs. Routine inspection and maintenance could be planned and implemented during more favorable weather conditions. Routine maintenance would involve placing coarse fill on areas of the cap where erosion has occurred.

Performing long-term monitoring to assess sediment quality would be easily implementable, given the availability of consulting/environmental firms and laboratories qualified to conduct such activities. The results would be compiled with groundwater and landfill gas data collected from the long-term monitoring program conducted for the landfill cap remedy and summarized as part of the 5-year reviews. These activities may require coordination with regulatory agencies.

The containment features of this alternative could be impacted if additional future remedial actions are required. The natural cap would be easily removed if necessary for future actions. The multimedia cap would be somewhat more difficult to remove due to the anchoring of the concrete armament; however, it could be removed if necessary.

Cost: A detailed estimate of capital, O&M, and present-worth costs for Alternative NS/ER-4 is provided in Appendix F and is summarized below. Present-worth costs were developed for a 30-year period at a 7 percent discount rate.

Because there is a high degree of uncertainty in the estimated area and volume of sediment exceeding PRGs, a cost sensitivity analysis was performed to assess the sensitivity of the cost estimate to a significant change in the area and volume of sediment to be addressed under this alternative. The sensitivity analysis evaluated the costs of the alternative if the area and volume of sediment to be addressed was 20 percent greater or 30 percent lower than the estimated area and volume. The sensitivity analysis is provided in Appendix G. The results of the detailed cost estimate and cost sensitivity analysis are presented below.

		Sensitivity Analysis	Sensitivity Analysis
Cost Description	Estimated Volume	20% Volume Increase	30% Volume Decrease
Capital Costs	$17,172,000	$19,408,000	$13,817,000
O&M/Long-Term Monitoring	$120,800/yr (yrs 1-5 & 5-year intervals) $35,000 (rem. yrs)	$120,800/yr (yrs 1-5 & 5-year intervals) $35,000 (rem. yrs)	$120,800/yr (yrs 1-5 & 5-year intervals) $35,000 (rem. yrs)
5-Year Reviews	$21,500/5 yr	$21,500/5 yr	$21,500/5 yr
Present Worth	$18,129,000	$20,365,000	$14,775,000

5.2.5 Alternative NS/ER-5: Dredging and Disposal

Alternative NS/ER-5 includes installing a shoring system to protect the landfill cap during sediment removal, removing all contaminated sediment exceeding recommended PRGs, dewatering the removed materials, treating and discharging dewatering fluids to the bay, disposing of the solids in the McAllister Point Landfill and appropriately permitted off-base landfills, and refilling the dredged area back to the original grade. These actions would reduce potential risks to human health and the environment by removing contaminated sediment from the nearshore area and disposing of them in appropriately secured facilities.

Evaluation of the existing analytical data indicates that most of the sediment likely has contaminant levels low enough that it does not meet regulatory criteria requiring its disposal as a hazardous waste. Removed material would be tested to determine whether it should be disposed of in a RCRA Subtitle C hazardous waste facility (including the McAllister Point Landfill) or a RCRA Subtitle D solid waste facility. Since the existing McAllister Point Landfill will likely not have sufficient capacity to accommodate all contaminated sediment and debris excavated/dredged as part of this alternative, the removed materials would be placed in the McAllister Point Landfill until available capacity is exhausted.

Remaining sediment and debris would be transported to an appropriately permitted off-site disposal facility (RCRA Subtitle D or C), as described in Section 4.2.5.

Long-term operation and maintenance would not be required because virtually all contaminants exceeding the PRGs would be removed from the nearshore and elevated-risk offshore area (a small amount of sediment would likely remain in the nearshore area due to the limitations of dredging near the revetment and shallow bedrock). However, because a large volume of contaminated sediment and landfill materials would remain under the existing revetment between the removed nearshore sediment and the landfill cap, monitoring may be needed to evaluate potential contaminant migration into the clean backfill materials. Continued monitoring would be required if it was determined that the remaining materials still posed a risk to human health or the environment. It was assumed for the FS that monitoring would be conducted in years 1, 2, and 5 only, and only one 5-year review would be conducted. The monitoring program and subsequent 5-year reviews would be terminated based on the conclusions of the first 5-year review, provided that the sediment quality did not change significantly, long-term monitoring of the landfill did not show movement of contamination into the dredged area, and it was determined that the remaining sediment did not pose a risk. An inspection of the area to verify aquatic habitat recovery would be included in the long-term monitoring program.

An analysis of this alternative with respect to the evaluation criteria is as follows:

Overall Protection of Human Health and the Environment: Alternative NS/ER-5 would achieve RAOs for protection of human health and the environment by removing and appropriately disposing of contaminated sediment, thereby preventing potential exposure to and migration of impacted sediments. Removal activities would eliminate potential risks to human health and avian aquatic predators from consumption of contaminated shellfish and prevent risks to aquatic receptors posed by exposure to contaminated marine sediment and porewater. Additionally, this alternative would eliminate human risks associated with physical hazards (metal debris, submarine netting, etc.) by removing these hazards from the shoreline and intertidal zone or covering them with the cap. However, removal of sediment from the toe of McAllister Point Landfill may compromise the integrity of the landfill cap and could result in migration of landfilled contaminants into the marine environment as well as cause failure of the adjacent side slope and revetment. Additionally, due to the limitations of dredging and the presence of contaminated sediment beneath the landfill revetment (between the removed nearshore sediment and the landfill cap), residual contamination would remain in the area. Total removal of all contaminated materials outside the landfill cap would not be possible with existing technology, without

damaging the revetment and landfill cap. However, any remaining contaminated sediment would be contained under the revetment or under at least 2 to 3 feet of backfill materials.

Because all sediment with contaminant concentrations exceeding the recommended PRGs would be removed from the nearshore and elevated-risk offshore areas and disposed in a secure landfill, long-term protection and permanence of the alternative would ultimately depend on maintenance of the disposal facilities, presumed to be the existing McAllister Point Landfill as well as one or more off-site facilities. If any sediment contamination exceeding PRGs is left in place, monitoring and 5-year reviews would be required until it was determined that the remaining sediments did not pose an unacceptable risk to human health or the environment.

Disposal of dredged materials in the McAllister Point Landfill and off-site landfills would ultimately decrease risks associated with these materials, but reopening the cap may result in additional short-term impacts from exposure to or increased leaching of contaminants in the landfill. Assuming that excavated sediment and debris would be placed in the McAllister Point Landfill for disposal, this alternative would also cause an aesthetic impact to the shoreline by increasing the elevation of the landfill by approximately 20 to 25 feet. The top elevation of the landfill would be approximately 45 to 50 feet higher than the adjacent roadway (Defense Highway).

Implementation of this alternative would result in some increased short-term risks, including the temporary destruction of the existing aquatic community within the removal area and suspension of contaminated sediment, which could impact the aquatic community in the surrounding area. These impacts may be partially mitigated through proper implementation of turbidity control measures and selection of appropriate backfill materials. Sediment removal and backfilling would temporarily destroy the hard-bottom aquatic community in the area below the high tide line. The proposed backfill material would assist natural restoration of these communities by providing habitat structure that would promote colonization by the species indigenous to the area. Natural recolonization of the area would occur as water-borne algae spores and animal larvae are swept into the area by tidal currents and wave action. Based on the studies described in Section 3.3.6 and previous observations of hard-bottom community recovery at the site, it is anticipated that the hard-bottom community destroyed by the remedial action would be reestablished within 1 to 4 years. In addition, hard-bottom habitats adjacent to the site may be affected by turbidity. These habitats would have to be monitored to determine the need for mitigation measures.

Removal activities may impact eelgrass beds located offshore of the landfill. However, because existing data indicate that the eelgrass beds are outside the limits of the proposed remedial action, damage to the eelgrass beds is expected to be slight (principally due to increased turbidity caused by resuspension of sediments during dredging and capping). Because the sediments in the nearshore area are relatively coarse and operations in the area adjacent to the eelgrass beds would be conducted over a relatively short duration, standard turbidity control measures such as silt curtains are expected to effectively control turbidity and minimize damage the eelgrass beds. Additional investigation would be needed during the PDI to define the limits of the eelgrass beds and determine whether they would be impacted by placement of the cap. If it is concluded that the eelgrass beds would suffer significant damage, it may be necessary to consider assisted restoration.

There would also be increased short-term risks to on-site workers from potential exposures to contaminated sediment and sharp metallic objects during excavation, dredging, and handling activities. There may also be some risks associated with opening McAllister Point Landfill to dispose of the dredged materials. These risks would be minimized through the use of PPE and proper safety procedures.

If it was determined that any contaminated sediment left in place did not pose a risk, then annual monitoring and 5-year reviews would not be necessary except for a limited period to assess the success of habitat restoration. For the FS, it was assumed that monitoring would be necessary during the first five years (years 1, 2, and 5). Implementation of the long-term monitoring program would allow assessment of the restoration of the aquatic habitat and any changes in sediment quality and a 5-year review would allow assessment of site conditions and potential risks. The results of monitoring and 5-year reviews would be used to determine whether additional remedial actions are needed at the site, and whether long-term monitoring and 5-year reviews may be discontinued.

Compliance with ARARs: Tables 5-13, 5-14, and 5-15 summarize chemical-, location-, and action-specific ARARs and TBCs, respectively for Alternative NS/ER-5. This alternative would comply with federal and state chemical-specific ARARs (water quality standards) used to derive sediment PRGs because sediments exceeding the PRGs derived from these standards would be removed by dredging.

Implementation of Alternative NS/ER-5 would meet all state and federal location-specific ARARs by conducting the activities in accordance with floodplain and wetland regulations, as well as coastal

resource management, endangered species, fish and wildlife protection, and historic preservation regulations, and coordinating with appropriate agencies to find ways to minimize adverse effects to fish, wildlife, endangered species, and historic sites.

Alternative NS/ER-5 would be conducted in accordance with all identified state and federal action-specific ARARs. The action-specific ARARs identified for this alternative include: RCRA requirements for identifying, listing, and disposing of hazardous wastes; CWA requirements for discharging to surface water; and CAA requirements for monitoring emissions of dewatering processes.

Long-Term Effectiveness and Permanence: Alternative NS/ER-5 would eliminate the potential human health and avian aquatic predator risks due to consumption of contaminated shellfish and risks to aquatic receptors (bivalves, etc.) posed by exposure to contaminated marine sediment and porewater. This alternative would also eliminate risks to humans due to direct contact with physical hazards (metal debris, submarine netting, etc.) at the surface along the shoreline and intertidal zone. The risk reduction offered by this alternative would be accomplished through removing the contaminated sediment and debris from the NS/ER area, thereby permanently eliminating the risks posed by these materials. Disposal, or treatment and disposal, of contaminated sediment at the existing McAllister Point Landfill and off-site facilities would eliminate the need for long-term management of untreated sediment within the intertidal area; the long-term effectiveness of this alternative would depend on the long-term management and integrity of the disposal facilities.

Assuming that a portion of the excavated sediment and debris would be placed in the McAllister Point Landfill for disposal, this alternative would cause an aesthetic impact to the shoreline by increasing the elevation of the landfill by approximately 20 to 25 feet. The top elevation of the landfill would be approximately 45 to 50 feet higher than the adjacent roadway (Defense Highway).

Reduction in Toxicity, Mobility, or Volume Through Treatment: Alternative NS/ER-5 would use treatment to reduce the toxicity, mobility, or volume of the small fraction of the contaminated sediment removed that required treatment prior to land disposal. It is assumed that approximately 9 percent of the total sediment volume disposed off site (an estimated 540 cy) would require stabilization for treatment of metals prior to disposal in a RCRA Subtitle D facility. This treatment would reduce the toxicity and mobility of contaminants, but the volume may increase slightly due to bulking affects related to solidification/stabilization techniques.

Since a majority of the contaminated sediment (approximately 99 percent) would not receive treatment, very little overall reduction in contaminant toxicity, mobility, or volume through treatment would be offered. However, this alternative would reduce the toxicity, mobility, and volume of impacted sediment present in the NS/ER area through sediment removal. A reduction in overall contaminant mobility in the environment would also be expected through placing the contaminated sediment and debris in the McAllister Point Landfill and one or more approved off-site facilities.

Short-Term Effectiveness: Implementation of Alternative NS/ER-5 would result in increased short-term risks to human and ecological receptors due to the disruption of the contaminated sediment and landfill debris during remedial activities. Potential exposures of on-site workers to impacted sediment and sharp metallic objects during excavating, dredging, and handling activities, and opening McAllister Landfill would be minimized through use of PPE and proper workplace safety practices. Ecological risks are not as easily mitigated.

Excessive resuspension of contaminated sediment may occur during the excavation/dredging operations. Migration and resettling of suspended sediment may harm marine biota and would enlarge the area impacted by site contaminants. Engineering controls, such as erosion containment measures (silt curtains, etc.), would be implemented to reduce potential environmental impacts associated with contaminant migration; however, detrimental effects may not be completely eliminated. Additional data regarding sediment grain size and dredging techniques are needed to predict the degree of effectiveness of sedimentation controls.

Dredging would remove the resident plants and shellfish and temporarily disrupt the aquatic habitat in the dredged and filled areas below the high tide line. Some of the habitat functions and values identified in Section 1.4.3 would be temporarily lost as a result of the remedial actions. The remediation area would temporarily cease to function as a feeding area for some aquatic organisms, birds, or mammals, and it would not serve product export functions such as provision of nutrients for other systems. The lost functions and values of the habitat would not be completely replaced until the aquatic community was fully reestablished. Placement of backfill materials similar to the existing sand/gravel/rock substrate of the area would provide a foundation for re-establishment of the aquatic community, serving as a habitat for plants and animals to root and breed. Natural recolonization of the area would occur as water-borne algae spores and animal larvae were continually swept into the area by tidal currents and wave action.

The rehabitation of the area may take several years to complete. However, observations in the intertidal zone after the winter 1996 erosion event (Phase III Remedial Investigation Report, April 1996) indicated that natural rehabitation of the intertidal zone occurs at a fairly rapid pace. In April 1998, 2 years after the nature of the area was significantly altered by erosion (changing it from a sandy to a rocky intertidal zone), a significant, diverse ecological community was present in the intertidal zone. Based on these observations and recovery reported for similar habitats (described in Section 3.3.6), it is anticipated that the hard-bottom community would be reestablished within 1 to 4 years.

Sediment removal activities may also impact eelgrass beds and the hard-bottom community located outside the remediation area. However, damage to the eelgrass beds and other adjacent habitat is expected to be slight. Standard turbidity control measures such as silt curtains are expected to effectively control turbidity and minimize damage to the adjacent habitats. Additional investigation would be needed during the PDI to define the limits of the eelgrass beds and determine whether the adjacent habitat would be impacted by placement of the cap. If it is concluded that the eelgrass beds would suffer significant damage, it may be necessary to consider assisted restoration. Monitoring of adjacent areas would be conducted to determine the need for any mitigation measures.

Disposal of dredged materials in the McAllister Point Landfill would ultimately decrease risks associated with these materials, but reopening the cap may result in additional short-term impacts from exposure to or increased leaching of contaminants in the landfill.

RAOs for protection of human health would be achieved upon completion of dredging, backfilling, and closing the McAllister Point Landfill following sediment disposal, approximately 23 months after mobilization on site. RAOs for protection of the environment would be achieved within approximately 8 months, when the dredging and backfilling were complete; however, rehabitation of the area by aquatic organisms, and complete restoration of lost functions and values of the impacted aquatic habitat, may take a few years.

Implementability: Implementation of Alternative NS/ER-5 would require significant efforts, both administratively and technically. The complexity of implementation is a function of the location of the area to be dredged and backfilled (in the intertidal zone adjacent to the landfill) and the depth and nature of the materials to be removed. Implementation is complicated by difficult access to the area due to the configuration of the landfill and revetment (too steep and uneven to stage land-based equipment), the depth of the water in the work area (some areas are too shallow for barge access

and too deep for a temporary cofferdam to effectively hold back water), and the presence of contaminated sediment and debris below the bottom of the revetment. These conditions may make it difficult or impossible to remove all the contaminated sediment and debris in the NS/ER area without compromising the stability of the landfill cap.

Dredging would have to be implemented by a combination of land-based and barge-mounted equipment because shallow water and the limited reach of barge-mounted excavation equipment make it impossible to access all areas from a barge, and the presence of the landfill and revetment and limited reach of land-based equipment make it impossible to access all areas from land. It was assumed that land-based actions would be conducted behind cofferdams using conventional earth-moving equipment located within the remediation area.

Land-based actions would be limited to the shallow portions of the area south of the landfill, where the water is shallow enough to allow effective use of a temporary cofferdam system to keep the area relatively dry. Constant maintenance of the cofferdam would be required to ensure the effectiveness of the cofferdam in the tidal environment. A temporary cofferdam was effectively used during construction of the McAllister Point Landfill cap. The system weathered a number of storms and performed well; however, it was located in water approximately 3 feet shallower than the proposed location. A cofferdam installed in deeper water would likely require more maintenance to remain effective.

Barge-mounted operations are limited by the draft requirements of the vessel and the reach of the equipment. Some locations in the nearshore area may be difficult to access because the water near the landfill is relatively shallow and a typical barge that could support the large, heavy equipment required for dredging and processing the sediment and landfill debris needs 6 to 8 feet of draft (shoreline topography/water depth is shown on Figure 1-4). Equipment with a reach of 100 feet or more may be required, which could limit the ability of the equipment to remove or place large, unwieldy objects such as landfill debris or concrete armament sections.

Excavation/dredging operations are further complicated by the subsurface conditions existing within the intertidal zone (presence of rock outcroppings, sediment pockets on hard rock, thick tangles of submarine cables, and large pieces of metal and concrete debris) and the need to remove up to 15 feet of sediment from the toe of the landfill revetment near the center of the site. The presence of shallow bedrock and the location of the area to be dredged (adjacent to the revetment) would make complete

removal of contaminated sediment difficult or impossible; small pockets of sediment would likely remain. The removal of submarine cables and large debris (principally from the central portion of the site) is difficult, but possible, as was demonstrated during landfill cap construction. However, removal of this material from the toe of the revetment may compromise the integrity of the landfill cap and revetment and could result in migration of landfilled material into the marine environment, particularly if the material extends into the nearshore area from beneath the revetment.

Based on review of As-Built Drawings for the McAllister Point Landfill cap, the existing revetment extends an average depth of approximately 4 to 6 feet below the surrounding grade. Boring logs from the Phase III investigation indicate that waste materials extend well below the bottom of the revetment in the central portion of the landfill, to an estimated depth of approximately 15 feet. Therefore, extensive sheeting and shoring would be required in the central portion of the site to allow complete excavation of the contaminated sediment and debris in this area, without compromising the slope stability of the landfill cap. However, shoring of the revetment would be difficult and may not be possible due to the shallow depth to bedrock, the presence of landfill debris, and the difficult access to the area.

The presence of landfill debris (submarine netting, concrete rubble, boulders, etc.) in the subgrade adjacent to the revetment, would interfere with placement of sheetpile and make it difficult or impossible to use standard sheetpile alone to stabilize (protect) the revetment. Instead, the proposed shoring system would consist of H-pile/soldier beams drilled 10 to 20 feet into the existing bedrock on 5 foot centers and cross braced with steel walers. The sheeting would be driven prior to dredging, or in the event refusal is encountered before the desired depth is reached, the sheeting would have to be installed behind the beams as the excavation/dredging of the contaminated sediment progresses. Due to access restrictions in the intertidal area, it was assumed that conventional pile driving equipment would not be able to work in the intertidal area and installation from the landfill access road above the revetment would be required. However, equipment may not be available that could install the soldier beams or sheeting from the top of the revetment. An alternate possibility would be to construct a temporary road in the intertidal zone to allow access by conventional equipment. The feasibility of installing the shoring system is highly uncertain and would need to be thoroughly investigated during the PDI. If it is not possible to construct adequate shoring, it may be necessary to leave some waste in place adjacent to the revetment to prevent damage to the landfill cap. If contamination is left in place, continued monitoring and 5-year reviews will be required to determine whether the contamination poses an unacceptable risk to human health and the environment.

Wave action, the influence of local currents and tides, and weather conditions could result in scheduling delays related to site accessibility. Implementation of this alternative would require qualified contractors with personnel trained in hazardous waste site operations, who are qualified to handle contaminated sediment dredging, grading, and erosion control operations in an aqueous environment and who are capable of completing construction in a timely and effective manner. Construction activities associated with control of sediment resuspension may be difficult to implement due to the wave action in a large portion of the NS/ER area.

Implementation of the sediment dewatering and water treatment operations may also increase the complexity of implementing this alternative. The nature and grain size distribution of the sediment could greatly impact the success of the proposed gravity separation process.

Implementation of this alternative would require coordinating with regulatory agencies regarding: marine dredging and filling operations; discharging water from sediment dewatering activities into the bay; materials handling/off-base disposal issues; and determining potential effects on fisheries, endangered species, and the aquatic habitat. Agreements with regulatory agencies would have to be reached regarding mitigating for altering aquatic habitats, reopening the McAllister Point Landfill cap, and establishing the periods for dredging and filling activities in the bay. Obtaining agreements with regulatory agencies is not expected to pose a problem.

Alternative NS/ER-5 includes significant dredging and debris removal activities within the NS/ER area that may result in sediment suspension that could affect sensitive species. The State of Rhode Island generally requires dredging projects to be conducted between November 1 and January 15 to protect sensitive species. The Navy will investigate the use of aquatic habitats on site by sensitive species to determine potential impacts from dredging during different times of the year. It is anticipated that the long-term benefits of conducting the remedial action during a single dredging period (estimated to last 7.5 months) will outweigh any short-term risks to sensitive species. If construction could only occur from November until mid-January it would likely take 3 to 4 years to implement the remedy.

Assuming that excavated sediment and debris would be placed in the McAllister Point Landfill for disposal, the PDI would need to evaluate the feasibility of using this facility. A portion of the existing cover would need to be removed and the landfill otherwise prepared to accept the dredged sediment and debris. The PDI would determine the available landfill capacity, the strategy for removing the existing cover and stockpiling cover materials for reuse, and the configuration of the rough and final

grades, and final cap. Provided that the majority of sediment is disposed in the McAllister Point Landfill, off-site disposal of the remaining small volume of material is not expected to pose a problem. If disposal in McAllister Point Landfill was determined to be infeasible and all materials had to be disposed off site, transportation and off-site disposal would be more complicated. However, because it is anticipated that most of the material would be suitable for disposal in RCRA Subtitle D solid waste facilities, multiple facilities, including local landfills such as Central Landfill in Johnston, Rhode Island, would likely be able to accept the material.

Performing long-term monitoring to assess sediment quality would be easily implementable, given the availability of consulting/environmental firms and laboratories qualified to conduct such activities. The results would be compiled with groundwater and landfill gas data collected from the long-term monitoring program conducted for the landfill cap remedy and summarized as part of the 5-year review. These activities may require coordination with regulatory agencies.

Implementation of the removal and disposal alternative would not limit future implementation of additional remedial actions at the site.

Cost: A detailed estimate of capital, O&M, and present-worth costs for Alternative NS/ER-5 is provided in Appendix F and is summarized below. Present-worth costs were developed for a 30-year period at a 7 percent discount rate. This estimate assumes that a small amount of waste is left in place that would require limited annual monitoring and one 5-year review. If no wastes are left in place that are determined to pose an unacceptable risk, the monitoring and 5-year reviews would not be needed.

Because there is a high degree of uncertainty in the estimated volume of sediment exceeding PRGs, a cost sensitivity analysis was performed to assess the sensitivity of the cost estimate to a significant change in the volume of sediment to be addressed under this alternative. The sensitivity analysis evaluated the costs of the alternative if the volume of sediment to be removed was 20 percent greater or 30 percent lower than the estimated volume. The sensitivity analysis is provided in Appendix G. The results of the detailed cost estimate and cost sensitivity analysis are presented below.

		Sensitivity Analysis	Sensitivity Analysis
Cost Description	Estimated Volume	20% Volume Increase	30% Volume Decrease
Capital Costs	$22,339,000	$26,325,000	$17,140,000
O&M/Long-Term Monitoring	$105,280/yr (Years 1,2, & 5 Only)	$105,280/yr (Years 1,2, & 5 Only)	$105,280/yr (Years 1,2, & 5 Only)
5-Year Reviews	$21,500/5 yr (Year 5 Only)	$21,500/5 yr (Year 5 Only)	$21,500/5 yr (Year 5 Only)
Present Worth	$22,619,000	$26,606,000	$17,420,000

5.2.6 Comparative Analysis of Nearshore Alternatives

A comparative analysis is conducted to evaluate the significant differences between the nearshore/ elevated-risk offshore alternatives based on the threshold and balancing criteria. This analysis is provided below and summarized in Table 5-16.

Overall Protection of Human Health and the Environment: Because no actions would be taken under Alternative NS/ER-1, this alternative would provide no additional protection of human health or the environment. Existing risks would remain to human health and avian predators from consumption of impacted shellfish and to marine biota from contact with sediment contaminants partitioning into the porewater. In addition, no mechanism would be in place to prevent erosion and subsequent migration of the contaminants into Narragansett Bay and connecting waterways. Enforcement of the existing ban on shellfishing in the area would reduce human health risks to less than 1E-06.

Alternative NS/ER-2 would provide limited protection of human health through implementation of access restrictions to discourage use of the site for shellfishing, while providing no protection to the avian aquatic and marine receptors. In addition, no erosion control measures would be provided to prevent contaminant migration. Enforcement of the existing ban on shellfishing in the area would reduce human health risks to less than 1E-06.

Alternative NS/ER-3 would provide protection of both human health and the environment by containing (isolating) the contaminated marine sediment. Human risks associated with physical hazards (metal debris, submarine netting, etc.) would also be eliminated. Provided that the cap can be designed, constructed, and maintained to withstand the erosional forces expected during a 100-year storm to prevent washout of hazardous wastes, the cap would reduce human health risks to less than 1E-06 and prevent risks to avian aquatic predators and marine biota by eliminating exposure to sediment with

contaminant concentrations above PRGs and containing migration of contaminants. Implementation of this alternative would temporarily destroy the existing hard-bottom aquatic community within the impacted area below the high tide line and potentially result in short-term impacts to the environment due to increased suspension of contaminated sediment in the water column during site preparation and cap construction. Additionally, placement of the cap would permanently fill intertidal and subtidal areas and convert approximately 1.12 acres of existing hard-bottom aquatic habitat to upland and convert approximately 2.27 acres of subtidal habitat to intertidal habitat. These effects would be mitigated by using appropriate turbidity control measures, assisting the natural restoration of filled intertidal and subtidal aquatic habitats through placement of appropriate substrate materials, and by mitigating the loss of aquatic habitat that was converted to upland by placement of the cap.

Alternative NS/ER-4 would provide similar overall protection to Alternative NS/ER-3, except that approximately 22,000 cubic yards of contaminated sediments would be dredged and disposed in a secured landfill, resulting in a smaller area and volume of contaminated sediments remaining in the NS/ER area. The overall reduction of long-term risks to human health and the environment would be approximately the same for both alternatives, provided that the caps remain effective over the long-term. If the caps were not effective, NS/ER-4 would provide greater reduction in risk by permanently removing a large volume of contaminants from the bay. It may be somewhat easier to ensure the long-term integrity of the capped area under NS/ER-4, because it would be somewhat smaller than under NS/ER-3; however, the difference is not expected to be significant. Like NS/ER-3, implementation of this alternative would temporarily destroy the hard-bottom aquatic community within the impacted area below the high tide line, and potentially result in short-term impacts to the environment due to increases in suspension of contaminated sediment in the water column during site preparation and cap construction. Short-term impacts from sediment suspension would be greater under NS/ER-4 because of the extensive sediment dredging. Unlike NS/ER-3, implementation of NS/ER-4 would not permanently fill intertidal and subtidal areas, and convert intertidal habitat to upland and subtidal habitat to intertidal, because the capped and filled areas would be restored to their original grade.

Alternative NS/ER-5 would provide greater overall protection of human health and the environment than that provided by NS/ER-3 and NS/ER-4 because contaminants would be permanently removed from the bay. Risks to human health and the environment associated with contaminated sediments would be permanently reduced to acceptable levels through sediment removal. Human risks associated with physical hazards (metal debris, submarine netting, etc.) would also be eliminated. The major difference between the overall protection provided by the three action alternatives is that the removal alternative

(NS/ER-5) would permanently remove the contaminated sediments from the environment, ensuring that the remedial action will be effective over time and eliminating the need for long-term O&M. The short-term impacts to the aquatic environment would be somewhat greater for NS/ER-5 than NS/ER-4 because of the additional dredging required. Habitat restoration would likely occur in the same time frame for these two alternatives. The overall impacts to the aquatic environment would be lower for NS/ER-5 than NS/ER-3 because NS/ER-3 would permanently fill and convert intertidal aquatic habitat to upland. Overall protection from future exposures to the removed material would depend on the maintenance of the selected disposal facility and the effectiveness of the treatment process (if required).

RAOs would not be achieved under NS/ER-1. RAOs associated with preventing risks to human health would be partially addressed by installing fencing, signs, and buoys under NS/ER-2, but RAOs for protection of the environment would not be achieved. Alternatives NS/ER-3 and NS/ER-4 will only achieve RAOs if the underwater cap that is constructed can prevent the washout of contamination under a 100-year storm event. NS/ER-5 will achieve RAOs for the protection of human health and the environment.

Compliance with ARARs: Alternatives NS/ER-1 and NS/ER-2 fail to meet chemical-specific ARARs (water quality standards) used to derive sediment PRGs because they do not adequately address sediments exceeding PRGs.

Alternatives NS/ER-3 and NS/ER-4 would comply with federal and state chemical-specific ARARs used to derive sediment PRGs only if the proposed cap prevents exposure to sediments exceeding the PRGs derived from these standards, and contaminants from these sediments do not migrate through the cap.

Alternative NS/ER-5 would comply with federal and state chemical-specific ARARs used to derive sediment PRGs because sediments exceeding the PRGs derived from these standards would be removed by dredging. For all five alternatives, several non-promulgated criteria (TBCs) were used in assessing human health risks and developing sediment PRGs.

There are no location-specific or action-specific ARARs for Alternative NS/ER-1.

Alternative NS/ER-2 does not satisfy federal location-specific ARARs for the protection of wetlands and floodplains. Additionally, state hazardous waste standards for facilities within a floodplain are not satisfied.

Implementation of Alternative NS/ER-3 can only satisfy state and federal location standards for hazardous waste facilities if the cap can be constructed and maintained to withstand a 100-year storm event to prevent washout of any hazardous waste that would have adverse effects on human health or the environment. It is unclear from the existing information whether a subaqueous cap can be constructed to meet this performance standard in the high energy marine environment at the site. Further, because Alternative NS/ER-3 would cause the permanent conversion of approximately 1.12 acres of aquatic habitat to upland and 2.27 acres of subtidal habitat to intertidal habitat, in order to comply with Section 404 of the CWA, the permanent loss of the intertidal habitat would have to be mitigated by creation or restoration of aquatic habitat somewhere off site. If the permanent habitat loss was not mitigated, this alternative would have a greater overall impact to the environment than Alternatives NS/ER-4 and NS/ER-5, which would not result in permanent habitat loss. This alternative could only be selected if it can be demonstrated that no practicable alternative exists that would have less effect on aquatic resources.

Alternative NS/ER-3 would meet all other state and federal location-specific ARARs only if a cap can be constructed and maintained to prevent washout of contamination and degradation of aquatic and flood plain resources. Alternative NS/ER-3 would meet all identified state and federal action-specific ARARs by conducting the activities in accordance with the identified requirements.

Like Alternative NS/ER-3, Alternative NS/ER-4 can only satisfy state and federal location standards for hazardous waste facilities if the cap can be constructed and maintained to withstand a 100-year storm event. It is unclear from the existing information whether a subaqueous cap can be constructed at the site to meet this performance standard. Because this alternative would not result in permanent loss of aquatic habitat, it would not have to meet as stringent CWA mitigation standards. However, to satisfy the CWA Section 404 requirements, damaged aquatic habitats would have to be restored. Alternative NS/ER-4 would meet all other state and federal location-specific ARARs and all identified state and federal action-specific ARARs by conducting the activities in accordance with the identified requirements.

Alternative NS/ER-5 would meet all state and federal location-specific ARARs and all state and federal action-specific ARARs by conducting the activities in accordance with the identified requirements. To satisfy the CWA Section 404 requirements, damaged aquatic habitats would have to be restored; no permanent losses would be anticipated.

Long-Term Effectiveness and Permanence: Alternative NS/ER-1 would provide no additional long-term effectiveness and permanence in addressing sediment contamination at the site. Enforcement of the existing ban on shellfishing in the area would reduce human health risks to less than 1E-06. But risks to environmental receptors would not be reduced. This no action alternative, along with the limited action (NS/ER-2) and capping (NS/ER-3 and NS/ER-4) alternatives, would require 5-year reviews since the contaminated sediments would remain on site.

Alternative NS/ER-2 would provide limited effectiveness in minimizing human health risks by discouraging/deterring site access due to the placement of physical barriers and use restrictions. However, it would not be effective in preventing human health risks without proper enforcement of the existing use and access restrictions. Properly enforced, Alternative NS/ER-2 would be effective in limiting human health exposure pathways, but it would not be effective in limiting any potentially adverse environmental impacts or potential migration of contamination.

Alternatives NS/ER-3 and NS/ER-4 would provide a higher level of long-term effectiveness than would NS/ER-2. By preventing direct contact with contaminated sediment through containment/capping, future risks to human health and the ecological receptors would be minimized. The containment alternatives can only be effective if the caps can be designed, constructed, and maintained to withstand a 100-year storm event to prevent washout of hazardous wastes that would adversely affect human health or the environment. Since limited removal of contaminated sediment under Alternative NS/ER-4 would decrease the area and volume of contaminated sediments remaining, long-term risks would be lower than for capping alone (Alternative NS/ER-3).

Alternative NS/ER-5 would be the most effective alternative in eliminating long-term risks to human health and the environment by removing the contaminated media from the marine environment. Provided that all sediment with contaminant concentrations above the PRGs is removed from the NS/ER area, this alternative would not require long-term monitoring and 5-year reviews over a 30-year period. However, because contaminated sediment would remain beneath the landfill revetment, it is assumed that monitoring would be conducted in years 1, 2, and 5 to ensure the effectiveness of the remedy,

and a review would be conducted in year 5 to assess whether additional actions or continued monitoring are necessary. If it was necessary to leave some waste in place adjacent to the revetment to prevent damage to the landfill cap, additional monitoring may be required.

Reduction in Toxicity, Mobility, or Volume through Treatment: Alternatives NS/ER-1, NS/ER-2, NS/ER-3, and NS/ER-4 would not provide any reduction of toxicity, mobility, or volume through treatment. Alternative NS/ER-5 would reduce the toxicity and mobility through treatment of a small fraction (approximately 9 percent) of the contaminated sediment that is disposed off site (approximately 1 percent of total dredged volume). The overall volume of contaminated sediment would not be reduced, and may actually be increased by treatment under Alternative NS/ER-5 due to bulking associated with stabilization treatment.

Alternatives NS/ER-3 and NS/ER-4 would reduce the mobility of contaminants present at the site by capping and preventing erosion of the contaminated media. Alternative NS/ER-4 would reduce the mobility of site contaminants through limited removal and containment. Alternative NS/ER-5 would reduce the toxicity, mobility, and volume of contaminants present at the site through their removal.

Short-Term Effectiveness: The no action alternative would offer no change in short-term risks. For Alternative NS/ER-2, a minimal increase in short-term risks would result because of disturbances to subsurface conditions during fencing and buoy system installation in the intertidal zone and long-term monitoring activities. Installation of buoys and fencing is expected to require less than 1 month, however, regular maintenance will likely be required to maintain the fencing and buoy system within the intertidal zone. Use of personnel protective equipment would protect on-site workers from potential exposures during sampling. Following implementation (1 month), RAOs associated with minimizing human health risks would be partially achieved, but issues related to environmental impacts would not be addressed.

Alternative NS/ER-3 would potentially result in increases in short-term risks due to disruption and suspension of contaminated sediment during site preparation and cap construction activities, estimated to require 7.5 months. However, measures to minimize and/or contain sediment suspension would reduce short-term risks to the marine environment by limiting discharge to offshore waters, and the use of personnel protective equipment would protect on-site workers from potential exposures. There would be both permanent and temporary losses of aquatic habitats. Some of the functions and values of the hard-bottom aquatic community below the high tide line would be temporarily lost during cap

construction and would not be completely replaced until the aquatic community in the area is fully re-established through natural recolonization, assisted by the placement of appropriate substrate (an estimated 1 to 4 years). The permanent loss of aquatic habitat converted to upland and subtidal habitat converted to intertidal habitat by capping could only be mitigated through creation of new habitat or restoration of a degraded habitat somewhere off site. The lost habitat mitigation process may take several years to complete. Following completion of the cap (10 months), RAOs associated with minimizing risks to human health would be achieved. RAOs associated with protection of the environment would be achieved after restoration and replacement of filled habitats.

Alternative NS/ER-4 would potentially result in increases in short-term risks due to disruption and suspension of contaminated sediment during site preparation, limited sediment removal, and cap construction activities, estimated to require 9 months. However, measures to minimize and/or contain sediment suspension would reduce short-term risks to the marine environment by limiting discharge to offshore waters, and the use of personnel protective equipment would protect on-site workers from potential exposures. Intertidal and subtidal aquatic habitat functions and values would be temporarily lost during sediment removal and cap construction. The lost functions and values would not be completely replaced until the aquatic community in the area is fully re-established through natural recolonization, assisted by the placement of appropriate substrate (an estimated 1 to 4 years). Following implementation (20 months), RAOs associated with minimizing risks to human health would be achieved. RAOs associated with protecting the environment would be achieved after disturbed habitats were restored.

Implementation of Alternative NS/ER-5 would result in short-term human and environmental risks from excavation/dredging and handling operations. Proper use of PPE would minimize human risks from direct contact with contaminated media and physical hazards associated with removal of metallic debris. Engineering controls would minimize, but may not eliminate, environmental impacts caused by sediment resuspension during removal of contaminated sediment and landfill materials. Additional environmental risks may result if the integrity of the McAllister Point Landfill cap is compromised during removal activities at the toe of the landfill. Due to the depth of contaminated sediment near the revetment, extensive shoring would be required to protect the landfill cap. Intertidal and subtidal aquatic habitat functions and values would be temporarily lost during dredging and filling, and would not be completely replaced until the aquatic community in the area is fully re-established through natural recolonization, assisted by placement of appropriate substrate (an estimated 1 to 4 years). Following implementation

(23 months), RAOs associated with minimizing risks to human health would be achieved. RAOs associated with protecting the environment would be achieved after disturbed habitats were restored.

Implementability: The no action alternative is the most readily implementable. It would require no construction activities. Implementation would include completing the 5-year reviews only. Furthermore, implementation would not limit the ease of undertaking future remedial actions at the site, if deemed necessary.

Limited actions associated with Alternative NS/ER-2 would also be readily implemented. Technical feasibility issues would be minimal, since they would include sampling activities for long-term monitoring and limited construction activities for installation of fencing and placement of buoys. Administrative feasibility would require some initial coordination/agreement with the owner of the intertidal zone, the State of Rhode Island, to establish access restrictions. Perhaps, however, the most cumbersome component in implementing this alternative is providing continual enforcement of the access and use restrictions on state-owned land, and the continued maintenance of the fencing and buoy system, which would be required to ensure protection of human health. Implementation would not limit conducting future remedial actions at the site, if deemed necessary.

Implementation of Alternative NS/ER-3 would require significant efforts, both administratively and technically. The complexity of implementation is a function of the location of the area to be dredged and capped in the intertidal zone adjacent to the landfill, and of the performance standards the cap must meet (the cap must be designed, constructed, and maintained to withstand a 100-year storm within a high energy coastline). Implementation is complicated by difficult access to the area due to the landfill and revetment (too steep and uneven to stage land-based equipment) and the depth of the water in the work area (some areas may be too shallow for barge access and too deep for a temporary cofferdam to effectively hold back water.) Both site preparation and capping would be affected by access limitations. In addition, the alternative would result in filling and converting approximately 1.12 acres of aquatic habitat to upland and 2.27 acres of subtidal habitat to intertidal, and temporarily losing aquatic habitat in areas remaining below the high tide line. The permanent loss of aquatic habitat would require mitigation measures that may be difficult to implement, such as the creation of new intertidal habitat from uplands off site. Restoration of the disturbed habitat below the high tide line is not expected to be difficult; natural recolonization should occur within a few years with only minimal assistance.

Implementation of Alternative NS/ER-4 would be more difficult than Alternative NS-ER-3, because in addition to subaqueous capping, limited removal of contaminated sediment and landfill debris is required. Dredging, like site preparation and capping, would be affected by access limitations. Additionally, the excavation/dredging operations are also complicated by the subsurface conditions existing within the intertidal zone (presence of rock outcroppings, sediment pockets on hard rock, thick tangles of submarine cables, and large pieces of metal and concrete debris). In addition, removal of sediment from the toe of McAllister Point Landfill may compromise the integrity of the landfill cap and revetment. Extreme care would need to be exercised when excavating near the revetment to prevent slope failure and resulting migration of landfilled material into the marine environment. Some shoring would likely be needed to protect the revetment and landfill cap; however, sheetpile alone may not be adequate.

Alternative NS/ER-4 would also result in temporary loss of aquatic habitat that would require restoration. Natural restoration, assisted by placement of appropriate substrate, would be similar to that proposed for Alternative NS/ER-3, but there is greater certainty of its effectiveness because the area would be restored to its original grade. An additional implementability concern for Alternative NS/ER-4 would be the feasibility of disposing excavated sediment and debris in the McAllister Point Landfill. The PDI would need to evaluate the feasibility of using this facility.

Implementation of Alternative NS/ER-5 would be significantly more difficult than Alternative NS/ER-4. Access limitations would pose the same difficulties for dredging operations under Alternatives NS/ER-4 and NS/ER-5, but the additional depth of excavation under Alternative NS/ER-5 would make implementation significantly more difficult because of the need to install an extensive shoring system to prevent slope failure of the landfill cap. The presence of landfill debris (submarine netting, concrete rubble, boulders, etc.) in the subgrade adjacent to the revetment would interfere with placement of sheetpile and make it difficult or impossible to use standard sheetpile alone to stabilize (protect) the revetment. Instead, an alternate system was proposed, consisting of H-pile/soldier beams drilled 10 to 20 feet into the existing bedrock on 5-foot centers and cross braced with steel walers, with sheeting driven behind the beam supports prior to dredging. However, equipment may not be available that could install the soldier beams or sheeting from the top of the revetment. It may be necessary to construct a temporary road in the intertidal zone to bring in the equipment. The feasibility of installing the shoring system is highly uncertain and would need to be thoroughly investigated during the PDI. If it was not possible to construct adequate shoring, complete removal would not be possible; it would be

necessary to leave some waste in place adjacent to the revetment to prevent damage to the landfill cap.

Implementation of Alternative NS/ER-3, NS/ER-4, and NS/ER-5 would all require similar coordination with regulatory agencies regarding: marine filling operations; potential effects on fisheries, endangered species, and the aquatic habitat; and marine dredging (NS/ER-4 and NS/ER-5 only). Agreements would have to be reached with regulatory agencies regarding mitigating for alterating aquatic habitats, establishing the periods for dredging and filling activities in the bay, and reopening the McAllister Point Landfill (NS/ER-4 and NS/ER-5 only).

Cost: Capital, O&M, present worth costs, and cost sensitivity analyses for the five nearshore/elevated-risk offshore alternatives are summarized as follows:

Costs	Alt. NS/ER-1: No Action	Alt. NS/ER-2: Limited Action	Alt. NS/ER-3: Capping	Alt. NS/ER-4: Capping with Dredging	Alt. NS/ER-5: Dredging and Disposal
Capital ($)	0	$25,000	$11,976,000	$17,172,000	$22,339,000
O&M and Monitoring ($/yr)	0	$94,600 (yrs 1-5) and 5-yr intervals $8,800 (yrs 6-30)	$120,800 (yrs 1-5) and 5-yr intervals $35,000 (rem. yrs)	$120,800 (yrs 1-5) and 5-yr intervals $35,000 (rem. yrs)	$105,300 (yrs 1, 2, & 5)
5-Year Reviews	$21,500/ 5 yr	$21,500/5 yr	$21,500/5 yr	$21,500/5 yr	$21,500/5 yr (Year 5 Only)
NET PRESENT WORTH	**$46,000**	**$656,000**	**$12,933,000**	**$18,129,000**	**$22,619,000**
SENSITIVITY ANALYSIS					
Net Present Worth: +20% Vol.	No Change	No Change	$14,829,000	$20,365,000	$26,606,000
Net Present Worth: -30% Vol.	No Change	No Change	$10,088,000	$14,775,000	$17,420,000

5.3 INDIVIDUAL ANALYSIS OF OFFSHORE ALTERNATIVES

Four remedial alternatives remain for offshore (OS) site locations following screening. These alternatives were developed to address risks to the environment (exposure of marine biota to contaminated sediment and porewater); no risks to human health or migratory birds were identified for these locations. In Sections 5.3.1 through 5.3.4, each of these alternatives is described and analyzed in relation to the two threshold criteria and the five balancing criteria, as described in Section 5.1. A

comparative analysis of the alternatives is summarized in Section 5.3.5. Detailed cost estimates and associated assumptions for each alternative are presented in Appendix F.

5.3.1 Alternative OS-1: No Action

Consideration of a no action alternative is required under the NCP. At a minimum, it provides a baseline for comparison with other alternatives. This alternative would involve no remedial response activities with respect to impacted sediment offshore of the McAllister Point Landfill site. No containment, removal, or treatment of contaminated sediment would be conducted, and no erosion control actions would prevent potential migration of contaminated sediment into Narragansett Bay and connecting waterways. The alternative would provide no mechanism to minimize potential risks to ecological receptors (marine biota). Because contaminated sediment would remain on site, a 5-year review of site conditions and risks would be required under the NCP.

An analysis of this alternative with respect to the evaluation criteria is as follows:

Overall Protection of Human Health and the Environment: Alternative OS-1 would not meet the RAOs for the protection of the environment. This alternative would offer no protection of the environment because it would not address potential risks through eliminating, reducing, or controlling exposures to impacted site sediment. Contaminated sediment would not be contained or removed, and no institutional controls or use restrictions would prohibit future access to the area. No risks to human health were identified for the area. Potential risks to the environment would include marine biota impacted by toxicity from sediment contaminants partitioning into porewater resulting in exposure to a relatively low probability of risk (maximum TEV-HQs of 1.04 to 2.17) associated with the presence of several PAHs, total PCBs, DDE, and select metals (copper, nickel, and zinc).

Because contaminants would remain at the site, 5-year reviews would be conducted, as required by CERCLA, to assess changing site conditions and potential risks. Results of the reviews would be used to determine the need to implement future remedial actions at the site.

Compliance with ARARs: Tables 5-17, 5-18, and 5-19 summarize chemical-, location-, and action-specific ARARs and TBCs, respectively for Alternative OS-1. This alternative would meet chemical-specific ARARs (state and federal water quality criteria) only if sediments in the offshore area do not exceed the recommended PRGs derived from these standards. Limited data indicate that these

areas exceed the baseline PRGs, but do not exceed the recommended PRGs. Additional monitoring is needed to determine compliance, but no monitoring is included in this alternative.

Since no action is taken under this alternative, there are no federal or state location-specific or action-specific ARARs for this alternative.

Long-Term Effectiveness and Permanence: The no action alternative would offer no long-term effectiveness or permanence in addressing sediment contamination at the site. The existing risks to marine biota would remain, and no controls would be provided to manage future exposures to sediment contaminants. Potential contaminant migration pathways would not be addressed, and contaminated sediment could migrate to adjacent marine environments. Because of the risk associated with leaving contaminated sediment on site, 5-year reviews would be required.

Reduction of Toxicity, Mobility, or Volume through Treatment: This alternative would not include any sediment treatment processes and, furthermore, would not involve removal of contaminated sediments. Therefore, the alternative would offer no reduction in toxicity, mobility, or volume of contamination through treatment.

Short-Term Effectiveness: Since no on-site activities are associated with implementation of this alternative, no short-term effects would occur. No increase or reduction in short-term risks would be offered to the local community, the personnel at NSN, or the environment. RAOs would not be achieved.

Implementability: This alternative would require no implementation other than completing 5-year reviews. This activity would not require any permits, but it may require a minimal amount of coordination with regulatory agencies. Implementation of the no action alternative would not limit future implementation of additional remedial actions at the site.

Cost: A description of estimated capital, O&M, and present-worth costs for Alternative OS-1 is provided in Appendix F and is summarized below. Present-worth costs were developed for a 30-year period at a 7 percent discount rate.

Cost Description	Estimated Cost
Capital Costs	$0
O&M/Long-Term Monitoring	$0
5-Year Reviews	$21,500/5 yr
Present Worth	$46,000

5.3.2 Alternative OS-2: Limited Action

Alternative OS-2 is a limited action option that would provide no direct remedial response activities. No containment, removal, and/or treatment of contaminated marine sediments would be conducted, and no erosion control actions would prevent potential migration of contaminated sediment into Narragansett Bay and connecting waterways. This alternative would provide no use restrictions, since no risk to human health was identified. A long-term monitoring program and 5-year reviews would be conducted to evaluate risks to the environment posed by the site. For the purposes of costing, it was assumed that annual monitoring would be conducted for the first 5 years and then the sampling frequency would be reduced from annually to every 5 years. The actual monitoring frequency would be determined by the Navy and regulatory agencies based on the monitoring results and 5-year reviews.

An analysis of this alternative with respect to the evaluation criteria is as follows:

Overall Protection of Human Health and the Environment: Alternative OS-2 would offer no reduction in risk to the ecological receptors or the environment, but would monitor contaminant levels to assess compliance with RAOs. Potential risks to marine biota would remain, as described for Alternative OS-1. However, the limited action alternative would provide limited protection of the environment through implementation of the long-term monitoring program. Long-term monitoring would provide a means of assessing changes in sediment quality and identifying changes in ecological risks. Five-year reviews would be conducted to assess changing site conditions and evaluate whether the alternative remains protective. Results of the reviews would be used to determine the need to implement future remedial actions at the site.

Compliance with ARARs: Tables 5-20, 5-21, and 5-22 summarize chemical-, location-, and action-specific ARARs and TBCs, respectively for Alternative OS-2. This alternative would meet chemical-specific ARARs (state and federal water quality criteria) if sediments in the offshore area do not

exceed the recommended PRGs derived from these standards. Limited data indicate that these areas exceed the baseline PRGs, but do not exceed the recommended PRGs. This alternative includes monitoring to determine whether any contaminated sediment exceeding the recommended PRGs is present.

Federal and state location-specific ARARs for this alternative include aquatic habitat, coastal resource management, endangered species, fish and wildlife protection, and historic preservation regulations. Available data indicate that the aquatic habitat in the offshore area includes eelgrass beds located offshore of the landfill. Monitoring activities would be conducted in accordance with the requirements of federal CWA and Coastal Resource Management Act Standards to minimize damage to aquatic habitats. All other state and federal location-specific ARARs would be achieved by coordinating with appropriate agencies to find ways to minimize adverse effects to fish, wildlife, protected species, and historical and coastal resources; and conducting activities in accordance with applicable regulations.

Action-specific ARARs for Alternative OS-2 include hazardous waste standards for conducting monitoring activities. This alternative would meet all action-specific ARARs.

Long-Term Effectiveness and Permanence: This alternative would offer no reduction in risk to the ecological receptors or the environment from sediment contamination at the site. The existing risks to marine biota would remain. Potential contaminant migration pathways would not be addressed, and contaminated sediment could migrate to adjacent marine environments. However, long-term monitoring would provide limited long-term protection by providing a means of identifying changes in site conditions that may cause increased risk to ecological receptors or the environment. Five-year reviews would be conducted to assess changing site conditions and evaluate whether the alternative remains protective. Results of the long-term monitoring and 5-year reviews would be used to determine the need to implement future remedial actions at the site.

Reduction in Toxicity, Mobility, or Volume through Treatment: This alternative would not include any sediment treatment processes other than naturally occurring degradation or attenuation processes. Therefore, the limited action alternative would offer no reduction in contaminant toxicity, mobility, or volume through treatment.

Short-Term Effectiveness: Since direct remedial actions are limited to sampling, few short-term risks to the local community or the environment would result from implementing this alternative. Potential

exposures of on-site workers during sample collection for the long-term monitoring program would be limited through the use of PPE.

Implementability: Implementation of this alternative would involve completion of a long-term monitoring program and 5-year reviews. The establishment of a long-term monitoring program to assess sediment quality would be easily implementable given the availability of area services. The results of the sediment sampling would be compiled with sediment, groundwater, and landfill gas data collected from the long-term monitoring programs conducted for the NS/ER area and the landfill cap remedy, and summarized as part of the 5-year reviews. These activities would require limited coordination between regulatory agencies. Implementation of the limited action alternative would not limit future implementation of additional remedial actions at the site.

Cost: A description of estimated capital, O&M, and present-worth costs for Alternative OS-2 is provided in Appendix F and is summarized below. Present-worth costs were developed for a 30-year period at a 7 percent discount rate.

Cost Description	Estimated Cost
Capital Costs	$0
O&M/Long-Term Monitoring	$110,200/yr (yrs 1-5 & 5-year intervals)
5-Year Reviews	$21,500/5 yr
Present Worth	$657,000

5.3.3 Alternative OS-3: Capping

Alternative OS-3 meets the NCP's requirement for consideration of an alternative that uses containment as a remedial action. This alternative, while providing no contaminant removal or treatment, would limit potential risks to the environment by implementing engineering controls. The main component of the containment alternative would be construction of a natural cap to be placed over the impacted sediment in the designated offshore areas, as shown in Figure 4-10. The cap would minimize direct environmental exposure to contaminated marine sediment; allow for the restoration of marine biota; and restrict movement and control erosion, and subsequent migration of contaminated sediment into unimpacted areas of Narragansett Bay. A long-term O&M program, including annual inspections and as-needed repair, would be conducted to ensure that the cap remains in good condition and remains protective over the years. A long-term monitoring program and 5-year reviews would be

conducted to evaluate potential risks to the environment posed by the site and to evaluate the effectiveness of the remedial alternative. For the purposes of costing, it was assumed that annual monitoring would be conducted for the first 5 years and then the sampling frequency would be reduced from annually to every 5 years. The actual monitoring frequency would be determined by the Navy and regulatory agencies based on the monitoring results and 5-year reviews.

An analysis of this alternative with respect to the evaluation criteria is as follows:

Overall Protection of Human Health and the Environment: Alternative OS-3 would meet the RAOs for the protection of the environment if the proposed cap can be constructed to achieve and maintain containment and isolation of contaminated sediments exceeding PRGs. The containment alternative would provide protection of the environment by preventing potential exposures to impacted site sediment and minimizing the potential migration of contaminants due to erosion processes. Placement of a cap over the impacted sediment would eliminate potential risks to marine biota posed by exposure to contaminated marine sediment and porewater. However, the protectiveness of the remedy depends on the cap being designed, constructed, and maintained to withstand washing out within a dynamic marine environment.

Implementation of this alternative would result in some increased short-term risks, including the permanent covering of the hard-bottom aquatic community within the capped area and suspension of contaminated sediment, which could impact the aquatic community in the surrounding area. However, these impacts would be at least partially mitigated through proper design and implementation (use of turbidity control measures and selection of appropriate cap materials). The proposed cap design would assist natural restoration of the aquatic community by providing substrate that would promote the colonization of species indigenous to the area. Natural recolonization of the area would occur as water-borne algae spores and animal larvae were swept into the area by tidal currents and wave action. Based on previous observations of hard-bottom community recovery at the site, it is anticipated that the community would be reestablished within 1 to 4 years.

Implementation of Alternative OS-3 would permanently destroy approximately 6000 square feet of eelgrass beds located offshore of the landfill. Because eelgrass beds are classified as special aquatic sites under Section 404 of the CWA, it may be necessary to mitigate the loss of this habitat by attempting assisted restoration of the lost eelgrass beds or attempting restoration or creation of eelgrass beds at another location in Narragansett Bay. However, as discussed in Section 3.3.6, based

on the limited success of other restoration projects in Narragansett Bay, there is very low potential for successful eelgrass restoration at McAllister Point or other locations in the bay. If this alternative is determined to be the least damaging practicable alternative and eelgrass mitigation measures are not possible, it may be necessary to undertake off-site or out-of-kind mitigation measures or avoid capping the portion of the offshore where the eelgrass beds are located.

Because this alternative would fill subtidal aquatic habitats and permanently destroy eelgrass beds, it may not satisfy aquatic habitat protection requirements that the least damaging practicable alternative be implemented to avoid alteration of aquatic habitats, unless some other form of mitigation is achieved.

Long-term monitoring and 5-year reviews would be conducted to assess site conditions and potential risks. Results of the review would be used to determine the need to implement additional remedial actions at the site.

Compliance with ARARs: Tables 5-23, 5-24, and 5-25 summarize chemical-, location-, and action-specific ARARs and TBCs, respectively for Alternative OS-3. Alternative OS-3 would comply with federal and state chemical-specific ARARs (water quality standards) used to derive sediment PRGs if the proposed cap prevents exposure to sediments exceeding the recommended PRGs derived from these standards.

Federal and state location-specific ARARs for this alternative include aquatic habitat, coastal resource management, endangered species, fish and wildlife protection, and historic preservation regulations. Available data indicate that the aquatic habitat in the offshore area includes eelgrass beds located offshore of the landfill. Implementation of this alternative is expected to destroy the eelgrass beds located in the remediation area. Restoration of the eelgrass beds destroyed by capping may not be possible. Therefore, it may be necessary to modify the alternative to avoid capping the eelgrass beds or to conduct off-site or out-of-kind mitigation measures. For this alternative to be selected, the capping of subtidal habitats must be the least damaging practicable alternative. All other state and federal location-specific ARARs would be achieved by coordinating with appropriate agencies to find ways to minimize adverse effects to fish, wildlife, protected species, and historical and coastal resources; and conducting activities in accordance with applicable regulations.

Action-specific ARARs for Alternative OS-3 include hazardous waste and solid waste standards for conducting capping and monitoring activities, including water pollution control and waste handling requirements. This alternative would meet all action-specific ARARs provided that the cap can be designed, constructed, and maintained to remain protective of human health and the environment.

Long-Term Effectiveness and Permanence: The containment alternative would eliminate the potential environmental risk to marine biota associated with exposure to contaminated sediment and porewater, provided that the cap remains effective over the long term. However, some uncertainty exists regarding the long-term effectiveness of the cap to contain sediment contaminants. No specific long-term studies are known to have been conducted to document the effectiveness of marine sediment caps, therefore it is not possible to determine whether the cap would satisfy long-term protectiveness standards and be able to withstand washing out within the dynamic marine environment of the bay. The long-term effectiveness of the cap would also be directly related to periodic cap maintenance that would be necessary to limit sediment erosion and subsequent cap disruption. Since contaminated sediment would remain on site above levels allowing for unrestricted exposure, long-term monitoring and 5-year reviews of this alternative would be required to evaluate the effectiveness of the alternative.

Reduction in Toxicity, Mobility, or Volume Through Treatment: Alternative OS-3 would not include any sediment treatment processes other than naturally occurring degradation or attenuation processes, therefore it would not provide a reduction in toxicity, mobility, or volume through treatment. The containment features of this alternative would, however, reduce the mobility of contaminated sediments.

Short-Term Effectiveness: Implementation of Alternative OS-3 would result in some increased short-term risks, including the destruction of existing biota within the impacted area and suspension of contaminated sediment. However, these impacts may be at least partially mitigated through proper implementation (turbidity control measures and appropriate cap materials selection). Potential exposures of on-site workers to contaminated sediment during dredging, handling, maintenance, and monitoring activities would be minimized through the use of PPE.

Resuspension of contaminated sediment may occur during the capping operations. Migration and resettling of suspended sediment may harm marine biota and enlarge the area impacted by site contaminants. Engineering controls, such as silt curtains, would minimize potential environmental impacts associated with contaminant migration; however, detrimental effects may not be completely

eliminated. Additional data regarding sediment grain size and dredging techniques are needed to predict the degree of effectiveness of sedimentation controls.

This alternative would result in the filling of approximately 40 acres of subtidal habitat. Capping would cover and temporarily destroy the subtidal aquatic habitat in the entire capped area. Some of the habitat functions and values identified in Section 1.4.3 would be temporarily lost as a result of cap placement. Because all resident plants and shellfish would be temporarily covered by the cap, the area would no longer function as a feeding area for some aquatic organisms, birds, or mammals, and it would not serve product export functions such as provision of nutrients for other systems. The lost functions and values of the habitat would not be completely replaced until the aquatic community was fully reestablished. Placement of cap materials similar to the existing substrate of the area would provide a foundation for re-establishment of the aquatic community, serving as a habitat for plants and animals to root and breed. Natural recolonization of the area would occur as water-borne algae spores and animal larvae are continually swept into the area by tidal currents and wave action. Based on observations of habitat recovery at the site after construction in 1995 and 1996, and recovery reported for similar habitats, it is anticipated that the community would be reestablished within 1 to 4 years.

Based on existing sediment contaminant and eelgrass characterization/location data, cap installation in the offshore area would permanently destroy approximately 6000 square feet of eelgrass beds located offshore of the landfill. Because eelgrass beds are classified as special aquatic sites under Section 404 of the CWA, it may be necessary to mitigate of the loss of this habitat by attempting assisted restoration of the lost eelgrass beds or attempting restoration or creation of eelgrass beds at another location in Narragansett Bay. There may be low potential for successful eelgrass restoration at McAllister Point or other locations in the bay. If this alternative is determined to be the least damaging practicable alternative and eelgrass mitigation measures are not possible, it may be necessary to conduct off-site or out-of-kind mitigation measures or avoid capping the portion of the offshore where the eelgrass beds are located.

Implementation of the long-term O&M and long-term monitoring programs would ensure the integrity of the cap and allow assessment of changes in sediment quality and effectiveness of the cap. The long-term monitoring and 5-year reviews would be conducted to assess site conditions and potential risks. Results would be used to determine whether additional remedial actions are needed at the site.

Implementability: Implementation of Alternative OS-3 would require implementing significant construction efforts, as well as completing of a long-term monitoring program and 5-year reviews. Construction efforts would be readily implementable once access activities are complete and appropriate agreements are obtained from regulatory agencies (for work in the subtidal zone). The complexity of implementation is a function of the location (in the marine environment) of the remedial action, and the performance standards the cap must meet. The cap must be designed, constructed, and maintained to provide long-term containment of contaminants in the dynamic marine environment of the bay. Mitigation for the destruction of the eelgrass beds would be difficult or impossible, so off-site or out-of-kind mitigation measures may be required. The actual area to be covered would be refined based on a PDI. Wave action, the influence of local currents and tides, and weather conditions could result in scheduling delays related to site accessibility.

Implementation of this alternative would require hiring qualified contractors with personnel trained in hazardous waste site operations, who are qualified to handle contaminated sediment dredging, grading, and erosion control operations in an aqueous environment and who are capable of completing construction in a timely and effective manner. Construction activities associated with control of sediment resuspension may be difficult to implement.

Implementation of this alternative would require coordination with regulatory agencies regarding marine dredging and filling operations and potential effects on fisheries, endangered species and the aquatic habitat, and historical and coastal resources. Agreements with regulatory agencies would have to be reached regarding mitigation for alteration of aquatic habitats and establishing the periods for site preparation and capping activities in the bay. The State of Rhode Island generally requires dredging projects to be conducted between November 1 and January 15 to protect sensitive species. The Navy will investigate the use of aquatic habitats on site by sensitive species to determine potential impacts from dredging during different times of the year. It is anticipated that the long-term benefits of conducting the remedial action during a single dredging period will outweigh any short-term risks to sensitive species. If construction could only occur from November until mid-January it would likely take several years to implement the remedy.

Conducting long-term operation and maintenance of the cap may be difficult. Inspection of the cap would be conducted from boats and from water using divers. Repairs would be conducted by experienced marine contractors using barge-based equipment. Inspection and repairs of the cap may be difficult because inspection and repair may have to be conducted during the winter months, when

inclement weather and rough seas would make monitoring and repair more difficult. However, effective cap design and construction should limit or prevent the occurrence of severe damage that would necessitate immediate repairs. Routine inspection and maintenance could be planned and implemented during more favorable weather conditions. Routine maintenance would involve placing coarse fill on areas of the cap where erosion has occurred.

The establishment of a long-term monitoring program to assess the effectiveness and integrity of the cap would be easily implementable, given the availability of area services. The results of the offshore sediment sampling would be compiled with sediment, groundwater, and landfill gas data collected from the long-term monitoring programs conducted for the NS/ER area and landfill cap remedy, and summarized as part of the 5-year reviews. These activities may require coordination with regulatory agencies.

The containment features of this alternative could be impacted if implementation of additional future remedial actions is required.

Cost: A description of estimated capital, O&M, and present-worth costs for Alternative OS-3 is provided in Appendix F and is summarized below. Present-worth costs were developed for a 30-year period at a 7 percent discount rate.

Because there is a high degree of uncertainty in the estimated area and volume of sediment exceeding PRGs, a cost sensitivity analysis was performed to assess the sensitivity of the cost estimate to a significant change in the area of sediment to be addressed under this alternative. The sensitivity analysis evaluated the costs of the alternative if the area of sediment was either increased or decreased by 30 percent. The results of the sensitivity analysis are presented in Appendix G. The results of the detailed cost estimate and cost sensitivity analysis are summarized below.

		Sensitivity Analysis	Sensitivity Analysis
Cost Description	Estimated Cost	30% Area Increase	30% Area Decrease
Capital Costs	$20,246,000	$25,700,000	$14,793,000
O&M/Long-Term Monitoring	$110,200/yr (yrs 1-5 & 5-yr intervals)	$110,200/yr (yrs 1-5 & 5-yr intervals)	$110,200/yr (yrs 1-5 & 5-yr intervals)
5-Year Reviews	$21,500/5 yr	$21,500/5 yr	$21,500/5 yr
Present Worth	$20,904,000	$26,357,000	$15,450,000

5.3.4 Alternative OS-4: Dredging and Disposal

Alternative OS-4 would involve removing contaminated sediment, dewatering the removed materials, treating discharge water, restoring disturbed habitats, and disposing of the solids at an approved disposal facility. Although no treatment is provided, this alternative would reduce potential risks to marine biota by removing contaminated sediment from the offshore area and disposing it in an appropriately secured landfill. This alternative would include treating and disposing of dewatering liquids and restoring the marine environment impacted by the sediment removal operations. Since no contaminants exceeding the PRGs would remain on site, a long-term monitoring program and 5-year reviews would not be required. Mitigation of subtidal aquatic habitat alteration would require monitoring to evaluate the success of restoration measures.

An analysis of this alternative with respect to the evaluation criteria is as follows:

Overall Protection of Human Health and the Environment: Alternative OS-4 would meet the RAOs for the protection of the environment through removal and appropriate disposal of contaminated sediments exceeding PRGs. The removal and disposal alternative would provide protection of the environment through removal of contaminated media. Because all sediment with contaminant concentrations exceeding the PRGs would be removed and disposed, long-term protection and permanence of the alternative would ultimately depend on the maintenance of the disposal facility.

Implementation of this alternative would result in increased short-term impacts, including the temporary destruction of the hard-bottom aquatic community within the dredged area and suspension of contaminated sediment, which could impact the aquatic community in the surrounding area. However, these impacts would be at least partially mitigated through proper implementation (use of turbidity control measures and controlled dredging to avoid excessive removal). Available data indicate that the unconsolidated material within the area to be dredged is relatively uniform within the upper 2 feet. Therefore, removal of material to a depth of 1.0 to 1.5 feet is not expected to significantly alter the composition of the bay floor. The presence of native materials similar to those previously at the surface would allow natural restoration of the hard-bottom community by providing adequate substrate that would support the species indigenous to the area. Natural recolonization of the area would occur as water-borne algae spores and animal larvae were swept into the area by tidal currents and wave action. It is anticipated the hard-bottom community would be reestablished within 1 to 4 years.

Implementation of Alternative OS-4 would permanently destroy approximately 6000 square feet of eelgrass beds located offshore of the landfill. It may be necessary to mitigate the loss of this habitat by attempting assisted restoration of the lost eelgrass beds or attempting restoration or creation of eelgrass beds at another location in Narragansett Bay. However, as discussed in Section 3.3.6, based on the limited success of other restoration projects in Narragansett Bay, there is low potential for successful eelgrass restoration at McAllister Point or other locations in the bay. If this alternative is determined to be the least damaging practicable alternative and eelgrass mitigation measures are not possible, it may be necessary to conduct off-site or out-of-kind mitigation measures.

Compliance with ARARs: Tables 5-26, 5-27, and 5-28 summarize chemical-, location-, and action-specific ARARs and TBCs, respectively for Alternative OS-4. Alternative OS-4 would comply with federal and state chemical-specific ARARs (water quality standards) used to derive sediment PRGs because any sediments exceeding the recommended PRGs derived from these standards would be removed by dredging.

Federal and state location-specific ARARs for this alternative include aquatic habitat; coastal resource management; endangered species, fish, and wildlife protection; and historic preservation regulations.

Available data indicate that the aquatic habitat in the offshore area includes eelgrass beds located offshore of the landfill. Implementation of this alternative is expected to destroy the eelgrass beds located within the remediation area. Restoration of the eelgrass beds destroyed by dredging may not be possible. Therefore, it may be necessary to modify the alternative to avoid dredging the eelgrass beds or conduct off-site or out-of-kind mitigation measures. For this alternative to be selected, the dredging of subtidal habitats must be the least damaging practicable alternative. All other state and federal location-specific ARARs would be achieved by coordinating with appropriate agencies to find ways to minimize adverse effects to fish, wildlife, and protected species, and historical and coastal resources; and conducting activities in accordance with applicable regulations.

Alternative OS-4 would be conducted in accordance with all identified state and federal action-specific ARARs. The action-specific ARARs identified for this alternative include state hazardous waste requirements for identifying, listing, and disposing hazardous wastes; CWA requirements for discharging to surface water, and CAA requirements for monitoring emissions for dewatering and treatment processes.

Long-Term Effectiveness and Permanence: The removal and disposal alternative would permanently eliminate potential risks to marine biota due to direct contact with contaminated sediment and associated porewater. Disposal of contaminated sediment at an off-site landfill would eliminate the need for long-term management of untreated sediments or residuals on site.

Reduction in Toxicity, Mobility, or Volume through Treatment: Alternative OS-4 would not include any treatment, therefore it would not reduce the toxicity, mobility, or volume through treatment. The alternative would reduce the toxicity, mobility, and volume of impacted sediment present in the offshore area through complete removal of contaminated sediment. Depending on the construction and operation of the disposal facility accepting the contaminated sediments, a reduction in overall contaminant mobility in the environment would be expected. However, since this alternative would not include any sediment treatment, no ultimate reduction in contaminant toxicity or volume would be offered.

Short-Term Effectiveness: Implementation of Alternative OS-4 would result in some increased short-term risks, including the temporary destruction of existing aquatic community within the impacted area and suspension of contaminated sediment that may impact the aquatic community in the surrounding area. However, these impacts may be at least partially mitigated through proper implementation (turbidity control measures and controlled dredging to avoid excessive sediment removal). Potential exposures of on-site workers to contaminated sediment during dredging and handling activities would be minimized through the use of PPE.

Resuspension of contaminated sediment would occur during the dredging operations. Migration and resettling of suspended sediment may harm marine biota and enlarge the area impacted by site contaminants. Engineering controls, such as silt curtains, would minimize potential environmental impacts associated with contaminant migration; however, adverse effects may not be completely eliminated. Additional data regarding sediment grain size and dredging techniques are needed to predict the degree of effectiveness of sedimentation controls.

This alternative would result in the temporary destruction of approximately 40 acres of subtidal aquatic habitat. Some of the habitat functions and values identified in Section 1.4.3 would be temporarily lost as a result of cap placement. Because all resident plants and shellfish would be removed by dredging, the area would temporarily cease to function as a feeding area for some aquatic organisms, birds, or mammals, and it would not serve product export functions such as provision of nutrients for other

systems. The lost functions and values of the habitat would not be completely replaced until the aquatic community was fully reestablished. The presence of native materials similar to those previously at the surface would promote natural restoration of the hard-bottom community by providing adequate substrate that would serve as a habitat for indigenous plants and animals to root and breed. Natural recolonization of the area would occur as water-borne algae spores and animal larvae were continually swept into the area by tidal currents and wave action. Based on observations of habitat recovery at the site and recovery reported for similar habitats, it is anticipated that the community would be reestablished within 1 to 4 years.

Based on existing sediment contaminant and eelgrass characterization/location data, dredging in the offshore area would permanently destroy approximately 6000 square feet of eelgrass beds located offshore of the landfill. Because eelgrass beds are classified as special aquatic sites under Section 404 of the CWA, it may be necessary to mitigate the loss of this habitat by attempting assisted restoration of the lost eelgrass beds or attempting restoration or creation of eelgrass beds at another location in Narragansett Bay. There may be low potential for successful eelgrass restoration at McAllister Point or other locations in the bay. If this alternative is determined to be the least damaging practicable alternative and eelgrass mitigation measures are not possible, it may be necessary to conduct off-site or out-of-kind mitigation measures or avoid dredging of the portion of the offshore where the eelgrass beds are located.

Implementability: Implementation of Alternative OS-4 would require a significant effort, both administratively and technically. Factors affecting ease of implementation include securing site access and a shoreline staging area, and obtaining appropriate sediment characterization and landfill disposal pre-approvals.

The technical complexity of implementation primarily focuses on sediment dredging operations and the large size and location (in the marine environment) of the remedial action. The actual area to be covered would be refined based on a PDI. Wave action, the influence of local currents and tides, and weather conditions could result in scheduling delays related to site accessibility. Implementation of the sediment dewatering and water treatment operations may also increase the complexity of implementation of this alternative. The nature and grain size distribution of the sediment could greatly impact the success of the proposed gravity separation process.

Implementation of this alternative would require hiring qualified contractors with personnel trained in hazardous waste site operations who are qualified to handle contaminated sediment dredging, grading, and erosion control operations in an aqueous environment and who are capable of completing construction in a timely and effective manner. Construction activities associated with control of sediment resuspension may be difficult to implement.

Implementing this alternative would require coordination with regulatory agencies regarding marine dredging operations and potential effects on fisheries, endangered species, aquatic habitat, and historical and coastal resources. Agreements with regulatory agencies would have to be reached regarding mitigating for altering aquatic habitats and establishing the periods for dredging activities in the bay. The State of Rhode Island generally requires dredging projects to be conducted between November 1 and January 15 to protect sensitive species. The Navy will investigate the use of aquatic habitats on site by sensitive species to determine potential impacts from dredging during different times of the year. It is anticipated that the long-term benefits of conducting the remedial action during a single dredging period will outweigh any short-term risks to sensitive species. If construction could only occur from November until mid-January it would likely take several years to implement the remedy.

It is unlikely that the McAllister Point Landfill would be available because it was proposed to be used for disposal of material from the more contaminated NS/ER area and it would be unable to handle the entire volume of offshore dredge material (approximately 79,000 cubic yards). It may be difficult to find an off-site disposal facility capable of handling the large volume of dredged material requiring disposal (58,000 - 79,000 cubic yards), whether or not McAllister Point Landfill is used. Materials would have to be shipped to multiple off-base facilities.

Implementation of the removal and disposal alternative would not limit future implementation of additional remedial actions at the site.

Cost: A description of estimated capital, O&M, and present-worth costs for Alternative OS-4 is provided in Appendix F and is summarized below. Present-worth costs were developed for a 30-year period at a 7 percent discount rate.

Because there is a high degree of uncertainty in the estimated volume of sediment exceeding PRGs, a cost sensitivity analysis was performed to assess the sensitivity of the cost estimate to a significant change in the volume of sediment to be addressed under this alternative. The sensitivity analysis

evaluated the costs of the alternative if the volume of sediment was either increased or decreased by 30 percent. The results of the sensitivity analysis are presented in Appendix G. The results of the detailed cost estimate and cost sensitivity analysis are summarized below.

		Sensitivity Analysis	Sensitivity Analysis
Cost Description	Estimated Cost	30% Volume Increase	30% Volume Decrease
Capital Costs	$43,994,000	$56,703,000	$31,286,000
O&M/Long-Term Monitoring	$19,440 (yrs 1, 2, and 5)	$19,440 (yrs 1, 2, and 5)	$19,440 (yrs 1, 2, and 5)
5-Year Reviews	none	none	none
Present Worth	$44,043,000	$56,752,000	$31,335,000

5.3.5 Comparative Analysis of Offshore Alternatives

A comparative analysis is conducted to evaluate the significant differences between the offshore alternatives based on the threshold and balancing criteria. This analysis is provided below and summarized in Table 5-29.

Overall Protection of Human Health and the Environment: The no action (OS-1) alternative would provide no protection of ecological receptors (no human health receptors were determined to be associated with offshore contamination). Contaminants would remain on site posing a risk to marine biota; however, the estimated risk associated with exposure to the offshore sediments is relatively low (maximum TEV-HQs of 1.04 to 2.17) and contaminant concentrations are below the recommended PRGs. In addition, no mechanism would be in place to prevent erosion and subsequent migration of the contaminants into Narragansett Bay and connecting waterways.

Alternative OS-2 would provide limited protection through long-term monitoring and 5-year reviews. Sediment with contaminant concentrations above baseline PRGs, but below the recommended PRGs, would remain on site and would pose a relatively low risk to marine biota. Long-term monitoring would provide a means to evaluate changes in contaminant concentrations and any associated changes in ecological risks. Five-year reviews would be conducted to assess changing site conditions and evaluate whether the alternative remains protective. Results of the long-term monitoring and 5-year reviews would be used to determine whether future remedial actions were needed.

Alternative OS-3 would provide protection to the environment by containing the contaminated marine sediment, provided that the cap can be designed, constructed, and maintained to withstand washing out within a dynamic marine environment. Long-term monitoring would evaluate the protectiveness of the cap. Implementation of this alternative would temporarily destroy the hard-bottom aquatic community within the impacted area and potentially result in contaminant migration due to increases in suspension of contaminated sediment in the water column during site preparation and cap construction. However, these effects would be mitigated through turbidity control measures and assisted natural restoration of capped subtidal aquatic habitats. Implementation of this alternative would also result in the permanent destruction of eelgrass beds offshore of the landfill. Mitigation for the loss of the eelgrass beds would be difficult or impossible. If this alternative is determined to be the least damaging practicable alternative and eelgrass mitigation measures are not possible, it may be necessary to conduct off-site or out-of-kind mitigation measures or avoid capping in the portion of the offshore where the eelgrass beds are located (leaving contamination that poses risk would require long-term monitoring). This alternative is more damaging to the environment in the short term, and the long term than Alternatives OS-1 and OS-2.

Alternative OS-4 would prevent potential risks to the environment through contaminant removal activities. Following removal, risks to marine biota would be eliminated by preventing exposure to contaminants above PRGs. The overall protection from future exposures to the removed material would depend on the maintenance of the off-base disposal facility. The short-term impacts of this alternative would be similar to that of Alternative OS-3, except that short-term impacts from sediment suspension may be greater due to the large amount of dredging. The long-term impacts would be the same as for Alternative OS-3; the eelgrass beds offshore of the landfill would be permanently destroyed by dredging. If this alternative is determined to be the least damaging practicable alternative and eelgrass mitigation measures are not possible, it may be necessary to conduct off-site or out-of-kind mitigation measures or avoid dredging in the portion of the offshore where the eelgrass beds are located (leaving contamination that poses risk would require long-term monitoring). This alternative would be more damaging to the environment in the short-end and long-term than Alternatives OS-1 and OS-2. It would be more damaging than Alternative OS-3 in the short term, but the same in the long term.

Alternatives OS-1 would not meet RAOs for protection of the environment. Alternative OS-2 would monitor contaminant levels to determine whether RAOs are met. Alternative OS-3 would meet RAOs for protection of the environment through containment and isolation of sediments with contaminant

concentrations exceeding PRGs, provided that the cap can be designed, constructed, and maintained to withstand washing out within the dynamic marine environment of the bay. Alternative OS-4 would meet RAOs for protection of the environment through removal and disposal of sediments with contaminant concentrations exceeding PRGs.

Although Alternatives OS-3 and OS-4 directly address the contaminated sediment in the offshore area by containing or removing it, these alternative may actually provide less overall protection of the environment than the other alternatives because the impacts to the environment caused by the remedial actions may be greater than the reductions in contaminant-related risk. Because the sediment contaminant levels in the offshore area are relatively low (below the recommended PRGs) and the contamination that exists does not appears to be uniformly present throughout the area, the actual risks posed by offshore sediments to the environment and ecological receptors appear to be very low. The remedial actions taken under Alternatives OS-3 and OS-4 would result in excessive sediment resuspension, which may increase the area impacted by contaminated sediment and damage sensitive aquatic receptors. Additionally, the remedial actions would temporarily destroy the hard-bottom aquatic habitat in the remediation area and permanently destroy the eelgrass beds on site. Mitigation efforts would reduce the overall damage to aquatic resources, but the total damage caused by the remedial actions would likely be greater than the environmental benefits resulting from the remedial actions.

Compliance with ARARs: Alternatives OS-1 and OS-2 would meet chemical-specific ARARs (state and federal water quality criteria) only if sediments in the offshore area do not exceed the recommended PRGs derived from these standards. Limited data indicate that these areas do not exceed the recommended PRGs, but additional monitoring is needed to determine compliance. OS-1 does not include monitoring. OS-2 includes annual monitoring to determine whether PRGs are exceeded.

Alternative OS-1 does not have any state or federal location-specific or action-specific ARARs.

Alternative OS-2 would meet all location-specific and action-specific ARARs by conducting monitoring activities in accordance with the identified regulations and coordinating with appropriate agencies to find ways to minimize adverse effects to fish, wildlife, and endangered species from monitoring activities.

Alternative OS-3 would comply with federal and state chemical-specific ARARs (water quality standards) if the proposed cap prevents exposure to sediments exceeding the recommended PRGs derived from these standards. Alternative OS-4 would comply with these ARARs (water quality standards) because any sediments exceeding the recommended PRGs derived from these standards would be removed by dredging.

OS-3 would meet all action-specific ARARs provided that the cap can be designed, constructed, and maintained to remain protective of the environment. OS-4 would meet all action-specific ARARs.

Alternatives OS-3 and OS-4 would meet all state and federal location-specific ARARs by conducting activities in accordance with applicable regulations and coordinating with appropriate agencies to find ways to minimize adverse effects to fish, wildlife, and protected species, and historical and coastal resources. However, both alternatives would destroy the eelgrass beds offshore of the landfill. Because restoration of the destroyed eelgrass beds may not be possible, it may be necessary to modify the alternatives to avoid impacting the eelgrass beds or conduct off-site or out-of-kind mitigation measures. For either of these alternatives to be selected, it would have to be the least damaging practicable alternative. Alternatives OS-3 and OS-4 would result in approximately the same degree of overall environmental damage. Both would be more damaging than Alternatives OS-1 and OS-2.

Long-Term Effectiveness and Permanence: Alternative OS-1 would provide no long-term effectiveness and permanence in addressing sediment contamination at the site. This alternative would require 5-year reviews since the contaminated sediments would remain on site.

Alternative OS-2 would provide limited long-term effectiveness and permanence by monitoring changes in site conditions and risks, and assessing whether the changes dictate the need for further remedial actions.

Alternative OS-3 would provide a higher level of long-term effectiveness than would OS-1 and OS-2. By limiting direct contact with contaminated sediment through containment/capping, future risks to the marine biota would be minimized, provided that the cap can be designed, constructed, and maintained to withstand washing out within a dynamic marine environment. No information is available to determine whether the containment alternative would be effective in the long term. This alternative would require long-term monitoring and 5-year reviews, since the contaminated sediment would remain on site.

Alternative OS-4 would provide a higher level of long-term effectiveness than the other three offshore alternatives. By removing the contaminated sediment from the marine environment, Alternative OS-4 would permanently eliminate long-term risks to the marine biota due to direct contact with contaminated sediment and associated porewater. Disposal of contaminated sediment at an off-site landfill would eliminate the need for long-term management of untreated sediments or residuals on site.

Reduction in Toxicity, Mobility or Volume through Treatment: None of the alternatives would provide reduction of toxicity, mobility, or volume through treatment.

Short-Term Effectiveness: The no action (OS-1) alternative would offer no change in short-term risks. Furthermore, RAOs would not be achieved. Alternative OS-2 would have short-term risks only from long-term monitoring activities. These risks to on-site workers would be minimized through the use of PPE.

Alternative OS-3 could potentially result in increases in short-term risks due to disruption and suspension of contaminated sediment during site preparation and cap construction activities, and during maintenance and monitoring activities. However, measures to minimize and/or contain sediment suspension would reduce short-term risks to the marine environment by limiting discharge to offshore waters, while the use of PPE would protect on-site workers from potential exposures. Short-term destruction of hard-bottom habitat would be mitigated by assisted natural restoration of the capped subtidal aquatic habitats. Implementation of this alternative would permanently destroy the eelgrass beds offshore of the landfill. Mitigation for the loss of the eelgrass beds would be difficult or impossible and may require off-site or out-of-kind mitigation measures. Following implementation, RAOs associated with minimizing risks to marine biota would be achieved.

Implementation of Alternative OS-4 would result in somewhat greater short-term impacts and the same degree of long-term impacts to the environment as those resulting from Alternative OS-3. Short-term human and environmental risks from dredging and handling operations would be similar to those from capping, except that the impacts from sediment suspension may be greater under Alternative OS-4 due to the large amount of dredging. Proper use of PPE would minimize human risks from direct contact with contaminated media. Engineering controls would minimize, but may not eliminate, environmental risks caused by resuspension during sediment dredging operations. Like Alternative OS-3, Alternative OS-4 would permanently destroy the eelgrass beds offshore of the landfill. Mitigation for the loss of the eelgrass beds would be difficult or impossible and may require off-site or out-of-kind mitigation

measures. Following implementation, RAOs associated with minimizing risks to marine biota would be achieved.

Implementability: Both the no action and limited action alternatives are readily implementable. They would require no construction activities. Implementation would include completion of the 5-year reviews for Alternative OS-1, and both annual sediment monitoring and 5-year reviews for Alternative OS-2. Implementation would not limit conducting future remedial actions at the site.

Implementation of Alternative OS-3 would be difficult because of the location of the contaminated marine sediment to be contained/capped and the performance standards the cap must meet (it must be designed, constructed, and maintained to withstand washing out within the dynamic marine environment of the bay). Implementing destroyed habitat mitigation measures may also be difficult. Cap construction activities would be challenged by wave action and local currents, however the alternative would be implementable by qualified contractors familiar with general marine dredging operations.

The implementability of Alternative OS-4 is somewhat more difficult than for OS-3 because of the difficulty in finding adequate disposal capacity for the large volume of sediments that would be removed. Alternative OS-4 would also be challenged by the location and nature of the offshore area. Implementing destroyed habitat mitigation measures may also be difficult. As with the containment alternative, implementation of Alternative OS-4 would be possible using qualified marine contractors to conduct offshore dredging of potentially contaminated material using barge-mounted equipment. Removal activities are limited by the draft of the barge and reach of the mechanical dredge.

Alternatives OS-3 and OS-4 would require coordination with regulatory agencies regarding marine dredging and filling operations and potential effects on fisheries, endangered species, aquatic habitat, and historical and coastal resources. Agreements with regulatory agencies would have to be reached regarding mitigating for alterating aquatic habitats and establishing the periods for capping and dredging activities in the bay.

Cost: Capital, O&M, present worth costs, and cost sensitivity analyses for the four offshore alternatives is summarized as follows:

Costs	Alternative OS-1: No Action	Alternative OS-2: Limited Action	Alternative OS-3: Capping	Alternative OS-4: Dredging and Disposal
Capital ($)	0	0	$20,246,000	$43,994,000
O&M ($/yr)	$21,500/5 yr	$110,200 (yrs 1-5 and 5-yr intervals)	$110,200 (yrs 1-5 and 5-yr intervals)	$19,440 (yrs 1, 2, and 5)
Five Year Reviews	$21,500/5 yr	$21,500/5 yr	$21,500/5 yr	0
NET PRESENT WORTH ($)	**$46,000**	**$657,000**	**$20,904,000**	**$44,043,000**
SENSITIVITY ANALYSIS				
Net Present Worth ($): +30% Vol.	No Change	No Change	$26,357,000	$56,752,000
Net Present Worth ($): -30% Vol.	No Change	No Change	$15,450,000	$31,335,000

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TABLE 2-1
PRG DEVELOPMENT APPROACH FOR MARINE SEDIMENT
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

PROCEDURE	EXPOSURE PATHWAY		
	Aquatic	Avian Predator	Human Health
1 - Select benchmarks; Express CoC- and pathway-specific risk as Hazard Quotients (HQs).	Benchmark = Water Quality Screening Values (WQSV); PW-HQ = Porewater (PW) concentration/WQSV.	Benchmark = Toxicity Reference Value (TRV); TRV-HQ = Tissue concentration of prey species/TRV.	Benchmark = minimum Reasonable Maximum Exposure (RME) value; RME-HQ = Shellfish tissue concentration / RME.
2 - Evaluate CoC bioavailability under site-specific conditions.	Estimate 95% Upper Confidence Limit (95% UCL) of PW-HQs associated with non-toxic samples; set NOEQ = 1 where 95% UCL < 1.	TRV based on avian predator exposure model for species living in the New England region.	RME based on human health exposure model for recreational shellfishing characteristics in the New England region.
3 - Retain CoCs substantially contributing to risk at the site.	Retain CoCs for which the Maximum PW-HQ associated with toxic samples > NOEQ.	Retain CoCs with TRV-HQ > 1.	Retain carcinogenic CoCs with risk > $1x10^{-6}$; Retain non-carcinogenic CoCs with HQ > 1.
4 - Evaluate feasibility of pathway/CoC-specific PRG as a long-term remedial goal.	Compare Aquatic NOEC[1] and Reference Screening Value (RSV) for CoCs in porewater; select greater of two values as aquatic Threshold Effects Value (TEV).	Compare Avian Predator TRV and Reference Screening Value (RSV) for CoCs in prey species tissues; select greater of two values as avian predator Threshold Effects Value (TEV).	Compare human health RME and Reference Screening Value (RSV) for CoCs in shellfish species tissues; select greater of two values as human health Threshold Effects Value (TEV).
5 - Rank pathway-specific TEV-HQs and select CoCs with maximum HQs by station and pathway as "limiting" CoCs.	Calcluate Aquatic TEV-HQs as station-specific PW conc./TEV; identify maximum TEV-HQ by station; compile resulting list as "limiting" Aquatic CoCs for PRG development.	Calcluate Avian Predator TEV-HQs as station-specific prey tissue conc./TEV; identify maximum TEV-HQ by station; compile resulting list as "limiting" Avian Predator CoCs for PRG development.	Calcluate Human Health TEV-HQs as station-specific shellfish tissue conc./TEV; identify maximum TEV-HQ by station; compile resulting list as "limiting" Human Health CoCs for PRG development.
6 - Determine PRGs for "limiting" CoCs, I.e., convert TEV values in concentration-based units to be used during remediation.	For metal CoCs, use aquatic TEVs as PRGs (units = µg/L); derive organic PRGs (units = ng/g dry wt sediment) from TEV using EqP model.	Calculate PRGs (units = ng/g dry wt sediment) from avian TEVs using BAF (metals) and BSAF (organics) models.	Calculate PRGs (units = ng/g dry wt sediment) from human health TEVs using BAF (metals) and BSAF (organics) models.
7 - Evaluate practicality of pathway-specific PRGs for effective risk reduction.	Compare PRG exceedance to aquatic risk distribution.	Compare PRG exceedance to avian predator risk distribution.	Compare PRG exceedance to human health risk distribution.

1 - No observed effect concentration (NOEC) = No observed effect quotient (NOEQ) x water quality screening value (WQSV)
2 - Source: Preliminary Remediation Goals for NETC McAllister Point Landfill, SAIC, November 1997 (Table 1)

TABLE 2-2
SUMMARY OF PRGs FOR MARINE SEDIMENT
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RHODE ISLAND

Class	Chemical of Concern[1]	PATHWAY SPECIFIC PRG[2]							
		Aquatic		Avian Predator		Human Health		Combined Exposure Pathway[3]	
		Baseline	Recommended	Baseline	Recommended	Baseline	Recommended	Baseline	Recommended
METAL	Arsenic[a]					0.13	0.39		
METAL	Copper[a]	17.6	52.9					17.6	52.9
METAL	Nickel[a]	11.2	33.7					11.2	33.7
METAL	Lead[c]			518	NR				
PAH	Anthracene[b]	171	513					171	513
PAH	Chrysene[b]	589	1767						
PAH	Fluorene[b]	67.7	203					67.7	203
PAH	Pyrene[b]	997	2992					997	2992
PCB	Total PCBs[b]	1211	3634	134	NR	40.24	121	1211	3634

NOTES:

Baseline PRG equivalent to TEV-HQ=1 concentration
Recommended PRG equivalent to 3 times the baseline concentration
NR - Not recommended (see Section 2.2.3)

1- List includes only limiting COCs (COCs with maximum TEV-HQs by station and pathway -- See Table 15 Appendix D).

2- Pathway-specific limiting PRG expressed in concentration units to be used during remediation. See Appendix D, Section 2 and Table 16 for derivation.
a - concentration units = µg/L in porewater.
b- concentration units = ug/kg dry weight sediment.
c- concentration units = mg/kg dry weight sediment.

3- Proposed PRGs for implementation identified using a spacial analysis of the limiting PRGs for the combined exposure pathway (see Figures 2-1 and 2-2). Implementing these six PRGs would achieve site-wide risk reduction to TEV-HQs<1 under the baseline option and TEV-HQs<3 under the recommended option. Avian and human health PRGs were excluded from selection due to the conservativeness of the PRG values and low likelihood of impact. See text Section 2.2.3 and Appendix D, Section 3.3 and Table 16 for additional details on PRG selection.

Source: Preliminary Remediation Goals for NETC McAllister Point Landfill, SAIC, January 1999 (Table 16)

TABLE 3-1
IDENTIFICATION AND PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	DESCRIPTION	COMMENTS
No Action	None	Not Applicable	No activities conducted to address contamination.	Retained. Use for baseline comparison, as required by NCP.
Limited Action	Institutional Controls	Use Restrictions/ Shellfishing Ban	Implementation of administrative action to restrict recreational use. Ban on shellfishing already in place.	Potentially applicable for protection of human health. Not protective of ecological receptors.
	Access Restrictions	Fencing/Signs/ Buoys	Placement of fencing and buoys, and posting of warning signs to inform public of use restrictions and to deter access.	Potentially applicable for protection of human health. Not protective of ecological receptors.
	Long-Term Monitoring	Sediment Monitoring	Periodic sediment sampling and analysis to assess potential contaminant migration. Provides information to evaluate existing exposure risks.	Potentially applicable. Can be combined with other GRAs for assessment of existing site conditions and exposure risks.
Containment	Permeable Cap	Natural Cap	Placement of natural materials (silts, fill, sand, gravel, and/or crushed stone) over contaminated sediment to prevent direct contact and minimize erosion/ contaminant migration.	Use of coarse cap materials is potentially applicable. Eliminated use of less dense materials since they do not match existing substrate and they have poor settleability.
		Multi-Media Cap	Placement of multi-media cap (natural materials, geotextile, and bedding material) over contaminated sediment. Provides greater protection than does natural cap in areas of high wave action and localized currents.	Potentially applicable.

TABLE 3-1
IDENTIFICATION AND PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	DESCRIPTION	COMMENTS
Containment (Cont'd)	Impermeable Cap	Natural (Clay) Cap	Placement of natural materials (clay) and stone/rock bedding over contaminated sediment to prevent direct contact and minimize erosion and contaminant migration.	Eliminated. Impermeable (low permeability and transmissivity) cap not appropriate for underwater application. Any water movement and gas formation under the cap could become trapped and stress the integrity of the cap. Placement of cap would cause excessive turbulence in water column because of low settleability of fine clay particles.
		Multi-Media Cap	Placement of multi-media cap (natural material, geomembrane, and bedding material) over contaminated sediment. Provides greater protection than would natural cap, especially in areas of high wave action and localized currents.	Eliminated. Impermeable (low permeability and transmissivity) cap not appropriate for underwater application. Any water movement and gas formation under the cap could become trapped and stress the integrity of the cap. Placement of the geomembrane would difficult; it would tend to float on the water surface.
Removal (in combination with Disposal or Treatment and Disposal)	Excavation/Dredging	Mechanical Excavation/ Dredging	Use of mechanical force to dislodge contaminated sediment. Includes conventional earth-moving equipment and/or clamshell, dipper, bucket ladder, or dragline dredges. Also applicable for removal of debris from nearshore area.	Potentially applicable.
		Hydraulic Dredging	Use of centrifugal force to remove contaminated sediment in a slurry. Includes suction, cutterhead, and/or portable hydraulic dredges.	Potentially applicable.

TABLE 3-1
IDENTIFICATION AND PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	DESCRIPTION	COMMENTS
Disposal (in combination with Removal or Removal and Treatment (Cont'd)	Excavation/Dredging (Cont'd)	Pneumatic Dredging	Use of compressed air and/or hydraulic pressure to remove contaminated sediment in a slurry. Includes Airlift, Pneuma, and Oozer dredges.	Eliminated. Not widely available in USA.
	On-Site/On-Base Disposal	Confined Aquatic Disposal	Disposal of dredged sediment in deep water disposal site.	Eliminated. Must be combined with containment to prevent marine biota exposure risks.
		Upland On-Site or On-Base Disposal	Disposal of dredged sediment at on-site location adjacent to McAllister Point Landfill cap or at other on-base location.	Potentially applicable. Material would not be appropriate for direct land disposal without containment. Would require opening and expanding existing landfill or constructing landfill at alternate on-base location.
	Off-Base Disposal	Off-Base Landfill or TSDF	Transport and disposal of dredged sediment at off-base landfill or TSDF licensed to accept the contaminant types detected.	Potentially applicable.
Treatment (In-Situ)	Chemical Treatment	Neutralization/ Precipitation/ Oxidation	Injection of treatment reagents into contaminated media to convert the contaminants to a less toxic form through chemical reactions. Reagents are typically chosen for treatment of specific contaminants. Toxic byproducts may form.	Eliminated. Containment of treated area and/or diversion of water required for the duration of the treatment. Difficult to ensure treatment reagents are thoroughly mixed with contaminated sediment. Reagents are not typically suited for treatment of all contaminants present.

TABLE 3-1
IDENTIFICATION AND PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	DESCRIPTION	COMMENTS
Treatment (In-Situ) (Cont'd)	Biological Treatment	Aerobic/Anaerobic Treatment	Biodegradation of contaminants by injection of nutrients and/or organisms into contaminated media. Effective for destruction of VOCs and SVOCs. Ineffective for inorganics.	Eliminated. Containment of treated area and/or diversion of water required. Difficult to ensure complete mixing of nutrients. Not effective in treating all site contaminants. Lack of nutrients and low temperature may impede degradation process.
	Physical Treatment	Solidification/ Stabilization	Immobilization of sediment and contaminants by treatment with reagents to solidify/fix them. Most suitable for treatment of inorganics in a controlled environment.	Eliminated. Difficult to accurately place reagents and adjust solidification mixtures in aqueous environments. Not feasible in area where solidified mass cannot be tolerated.
Treatment (Ex-Situ; On-Site/On-Base) (in combination with Removal and Disposal)	Thermal Treatment	Thermal Desorption	Volatilization of organic contaminants by an externally-fired rotary dryer and removal as a condensed liquid. Proven for treatment of VOCs and TPH. Limited applicability to remove SVOCs, PAHs, and PCBs. Not applicable for inorganics or contaminants with low vapor pressures.	Potentially applicable for treatment of TPH, PAHs, and PCBs. Does not address inorganic contaminants. Dredged sediment may require significant dewatering prior to treatment. May require bench-scale testing. Eliminate on-site location; no land available adjacent to existing landfill cap.
		Infrared Incineration	Pyrolysis of organic contaminants using near infrared radiation. Not effective for treating inorganics. Most applicable to low BTU soils and homogeneous waste streams.	Eliminated. Does not address inorganic contaminants. Not cost effective; simpler processes available to treat contaminants.
		Vitrification	Contaminated sediment is melted into a glassy, crystalline monolith using electric current. Applicable to treatment of both inorganics and organics.	Eliminated. Inefficient for high water content material. Performance may be affected by high concentrations of organics.

TABLE 3-1
IDENTIFICATION AND PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	DESCRIPTION	COMMENTS
Treatment (Ex-Situ; On-Site/On-Base) (in combination with Removal and Disposal) (Cont'd)	Chemical/Physical Treatment	Soil Washing	Particle-size separation process to reduce volume of materials requiring aggressive treatment. Fraction containing fines is separated from coarse by washing process; fines containing majority of contaminants requires additional treatment. Contaminant removal using extractant solution. Solutions used include water, surfactants, acids, bases, and/or oxidizing or reducing agents. Can remove both organics and inorganics in multiple extraction process.	Potentially applicable.
		Solvent Extraction	Preferential dissolution of contaminants from sediment into solvent. Most effective for organic contaminants. Can treat sediments in slurry form. Solvent requires further processing or disposal. Treated material requires dewatering prior to disposal.	Eliminated. Residual solvents may be difficult to remove from treated sediment. Requires bench-scale testing. Not cost effective; simpler processes available to treat contaminants.
		Wet Air Oxidation	Oxidation of organic and inorganic contaminants in an aqueous reactor using molecular oxygen at elevated temperatures/ pressures. Effectiveness proportional to sediment particle size; less effective on large grain sizes and heterogeneous waste streams.	Eliminated. Most effective on concentrated waste streams.
		Solidification/ Stabilization	Mixing of sediment with Portland cement, siliceous materials, lime, and/or proprietary agents, to form a chemically-stable matrix of limited permeability. Most suitable for immobilizing inorganics. Not proven effective for many organic contaminants. May be used for bulking agents to reduce free liquids in dewatered sediment.	Potentially applicable for treatment of inorganics and/or for use as a bulking agent. May not address TPH, PAHs, and/or PCBs. Eliminate on-site location; no land available adjacent to existing landfill cap.

TABLE 3-1
IDENTIFICATION AND PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	DESCRIPTION	COMMENTS
Treatment (Ex-Situ; On-Site/On-Base) (in combination with Removal and Disposal) (Cont'd)	Chemical/Physical Treatment (Cont'd)	Rock and debris decontamination	Decontamination of rock or debris using high pressure steam or water washing, with or without detergents or surfactants. Suitable for washing contaminated sediments from rocks or debris prior to disposal or reuse.	Potentially applicable for decontamination of rock and debris removed during dredging.
		Acid Extraction	Washing of sediment with acid, and processing of effluent through a membrane or ion exchange system. Most effective for inorganics. Not effective for organic wastes or waste materials.	Eliminated. Similar to solvent extraction, but for treatment of inorganics only. Requires bench-scale testing. Not cost effective; simpler processes available to treat contaminants.
		Dechlorination	Stripping of chlorine atoms from hazardous halogenated hydrocarbons using alkali metals or alkali metal/polyethylene glycol. Effective for destruction of chlorinated organics, dioxin, and PCBs. Ineffective for treatment of inorganics.	Eliminated. Not effective for treatment of TPH, PAHs, or metals. Effective for treatment of PCBs only.
	Biological Treatment	Slurry Phase Biodegradation	Preparation of dredged sediment into a pumpable slurry to which a nutrient-rich bacteria is added for degradation in a reactor system. Most effective for organic contaminants. Treated material requires dewatering prior to disposal.	Eliminated. Presence of heavy metals and chlorides may prohibit microbial metabolism. Requires bench scale studies.
		Landfarming	Aerobic biodegradation of contaminants in sediment applied to the ground surface and amended with nutrients. Effective for destruction of VOCs. Ineffective for inorganics.	Eliminated. Not effective in treating all site contaminants. Limited by available NETC-owned land for use.

TABLE 3-1
IDENTIFICATION AND PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	DESCRIPTION	COMMENTS
Treatment (Ex-Situ; Off-Base) (in combination with Removal and Disposal)	Thermal/Physical/ Chemical/Biological Treatment	Multiple Processes	Treatment to be determined by off-site disposal facility, as necessary for acceptance in licensed landfill.	Potentially applicable. Estimated 10% of dredged material requiring stabilization of metal contaminants and approximately 20 cubic yards requiring treatment to remove TPH, PAHs, and/or PCBs prior to disposal at RCRA Subtitle C or D landfill/ TSDF.
Aquatic Habitat Restoration	Hard-Bottom Habitat Restoration	Assisted Restoration	Providing optimal habitat structure to promote colonization of a diverse and stable hard-bottom community. Involves selection and placement of substrate in a way that enhances colonization.	Potentially applicable.
	Eelgrass Habitat Restoration	Natural Restoration	Use of sedimentation controls and monitoring during remediation to monitor/minimize damage to habitat. Allow natural processes to repair slight damage.	Potentially applicable for slight damage to eelgrass beds.
		Assisted Restoration	Providing optimal habitat structure and transplanting eelgrass to restore damaged beds.	Potentially applicable to mitigate severe damage to eelgrass beds.

Eliminated on Basis of Technology Screening (see "Comments").

TABLE 3-2
EVALUATION OF TECHNOLOGIES AND PROCESS OPTIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COST	CONCLUSION
No Action	None	Not Applicable	Not effective in achieving remedial action objectives.	No implementation required.	Capital: none O&M: low	Retained.
Limited Action	Institutional Controls	Use Restrictions/ Shellfishing Ban	Effectiveness in preventing human health risks depends on continued future enforcement. Not effective in minimizing ecological risks or preventing contaminant migration. No contaminant reduction.	Readily implementable. However, may require state or local enforcement. Shellfishing ban currently in effect.	Capital: low O&M: low	Eliminated for Nearshore and Offshore. Ban already in place. Additional restrictions would provide no more protection.
	Access Restrictions	Fencing/Signs/Buoys	Would deter, but not prevent, site access by humans. Not effective in minimizing ecological risks or preventing contaminant migration. No contaminant reduction.	Readily implementable.	Capital: low O&M: low	Retained for Nearshore. Eliminated for Offshore.
	Long-Term Monitoring	Sediment Monitoring	Not effective in achieving remedial action objectives. Would provide data for assessment of long-term exposure risks and contaminant migration. No contaminant reduction. Short-term human health risks during implementation minimized by use of PPE.	Readily implementable.	Capital: low O&M: low for Nearshore; low to moderate for Offshore	Retained. May be combined with other process options.

TABLE 3-2
EVALUATION OF TECHNOLOGIES AND PROCESS OPTIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COST	CONCLUSION
Containment	Permeable Cap	Natural Cap	Would limit contaminant migration. Would prevent exposure to contaminated marine sediment. No contaminant reduction. Long-term effectiveness depends on ability resist erosion. Short-term risks associated with implementation mitigated by use of PPE and turbidity control measures.	Readily implementable. Design and proper placement of capping materials depends on wave action and local currents. Implementation may interfere with local navigation.	Capital: moderate O&M: moderate	Retained. Potentially viable for low energy Nearshore and Offshore areas.
		Multi-Media Cap	Would limit contaminant migration. Would prevent exposure to contaminated marine sediment. No contaminant reduction. May be more effective than natural cap in marine environment highly affected by wave action and localized currents.	Implementable by fewer qualified companies than for natural caps. Design and proper installation/ anchoring depends on wave action and local currents. Long-term integrity easier to maintain and monitor than natural cap. Implementation may interfere with local navigation.	Capital: moderate to high O&M: low to moderate	Retained. Potentially viable for high energy Nearshore areas.
Removal (in combination with Disposal or Treatment and Disposal)	Excavation/Dredging	Mechanical Excavation/Dredging	Effectively removes debris and contaminated sediment from marine environment. Would eliminate future exposure risks at the site. Requires aggressive turbidity control measures to minimize contaminant migration during implementation.	Implementable by both shoreline and barge-mounted operations. However, access to nearshore area limited by tidal action and barge draft requirements. Shoreline excavation/dredging may compromise integrity of landfill.	Capital: moderate to high O&M: none	Retained for Nearshore and Offshore areas.

TABLE 3-2
EVALUATION OF TECHNOLOGIES AND PROCESS OPTIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COST	CONCLUSION
Removal (in combination with Disposal or Treatment and Disposal) (Cont'd)	Excavation/Dredging (Cont'd)	Hydraulic Dredging	Effectively removes contaminated sediment, but not able to remove debris >6 inches in diameter Would eliminate future exposure risks at the site. Less sediment resuspension during implementation than mechanical dredging.	Implementable by both shoreline and barge-mounted operations. However, access to Nearshore may be limited by tidal action and barge draft requirements. Shoreline dredging may compromise integrity of landfill.	Capital: moderate to high O&M: none	Eliminated from Nearshore in favor of mechanical dredging. Retained for Offshore, pending PDI results.
Disposal (in combination with Removal or Removal and Treatment)	On-Base Disposal	Upland On-Base Disposal	Effective if able to find or construct a location offering containment.	May be difficult to implement due to limited available space on-base. Would require construction of containment cell at an on-base location.	Capital: moderate to high O&M: moderate	Eliminated. Limited available space on base to handle large volume of sediment. Construction of containment cell not cost effective.
	On-Base Disposal	McAllister Point Landfill	Effective if sufficient volume is available within the existing landfill boundaries.	The existing cap can be removed using standard earthwork equipment. Upon placement of the contaminated material, the cap would be reinstalled with similar components to the existing cap.	Capital: moderate to high O&M: moderate	Retained.

TABLE 3-2
EVALUATION OF TECHNOLOGIES AND PROCESS OPTIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COST	CONCLUSION
Disposal (in combination with Removal or Removal and Treatment (Cont'd)	Off-Base Disposal	Off-Base Landfill	Offers full range of disposal and treatment/disposal options for all types of materials.	RCRA Subtitle D landfills may not have capacity to accept large volumes. RCRA Subtitle C TSDFs are available to accept the small volume anticipated to require such disposal and/or treatment.	Capital: high O&M: none	Retained.
Treatment (Ex-Situ; On-Site/ On-Base) (in combination with Removal and Disposal)	Thermal Treatment	Thermal Desorption	Well accepted for removal of VOCs and TPH. May be effective in treating PAHs and PCBs at higher temperatures. Requires initial dewatering. Not as effective in treating inorganics.	Requires initial dewatering of sediment and removal of stones and other debris. May require bench-scale testing using site-specific materials.	Capital: moderate O&M: moderate	Potentially viable, but eliminated in favor of off-base treatment and disposal.
	Physical/Chemical Treatment	Solidification/ Stabilization	Widely demonstrated as effective in immobilizing metals and for use as bulking agent to reduce free liquid content.	Requires initial dewatering of sediment. May require bench-scale testing using site-specific materials.	Capital: low to moderate O&M: low	Potentially viable for treatment of inorganics, but eliminated in favor of off-base treatment and disposal. Retained for reducing free liquids prior to off-base disposal.

TABLE 3-2
EVALUATION OF TECHNOLOGIES AND PROCESS OPTIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COST	CONCLUSION
Treatment (Ex-Situ; On-Site/ On-Base) (in combination with Removal and Disposal) (Cont'd)	Physical/Chemical Treatment (Cont'd)	Soil Washing	Material at site may not be suitable for soil washing because it contains a large fraction of landfill debris that would not be suitable for redeposition onsite and would not be easily separated from clean coarse fraction. If the debris could not be separated, the washed fraction would have to be disposed off-site.	May not be implementable due to difficulty of screening small landfill debris from coarse fraction.	Capital: moderate to high O&M: moderate to high	Eliminated pending results of predesign investigation and possible treatability study.
		Rock and Debris Decontamination	Effective for washing contaminated sediment from dredged rocks and debris.	Readily implementable. Materials and equipment and personnel available.	Capital: low O&M: low	Retained.
Treatment (Ex-Situ; Off-Base) (in combination with Removal and Disposal)	Thermal/Physical/ Chemical/Biological Treatment	Multiple Processes	Effective treatment at properly licensed facility to render the contaminated media acceptable for off-base disposal.	Readily implementable at licensed disposal facility. Requires proper handling transport, complete with bill of lading.	Capital: low O&M: none	Retained.
Aquatic Habitat Restoration	Hard-Bottom Habitat Restoration	Assisted Hard-bottom Habitat Restoration	Effective for restoration of hard-bottom communities damaged by remedial actions.	Readily implementable, Materials and equipment and personnel available.	Capital: low O&M: none	Retained.
	Eelgrass Habitat Restoration	Natural Restoration	Effective for mitigation of slight damage to eelgrass beds. Not effective for significant damage.	Readily implementable.	Capital: low O&M: none	Retained for mitigation of slight damage.

TABLE 3-2
EVALUATION OF TECHNOLOGIES AND PROCESS OPTIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION	EFFECTIVENESS	IMPLEMENTABILITY	COST	CONCLUSION
Aquatic Habitat Restoration	Eelgrass Habitat Restoration (Cont'd)	Assisted Restoration	Not likely to be effective at site. Potential, but uncertain effectiveness for restoring off-site beds elsewhere in Narragansett Bay.	Could be attempted, but successful restoration may not be possible.	Capital: high O&M: High	Eliminated for FS. May be reconsidered if severe damage expected.

TABLE 3-3
SUMMARY OF SELECTION OF REPRESENTATIVE PROCESS OPTIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTION
No Action	None	• Not Applicable
Limited Action	Access Restrictions	• Fencing (Nearshore only) • Buoys (Nearshore only) • Posting of Signs (Nearshore only)
	Long-Term Monitoring	• Sediment Monitoring
Containment	Permeable Cap	• Natural Cap • Multi-Media Cap (Nearshore only)
Removal (in combination with Disposal or Treatment/Disposal)	Excavation/Dredging	• Mechanical Excavation/Dredging (Nearshore only) • Mechanical Dredging (Offshore only) • *Hydraulic Dredging (Offshore only)*
Disposal (in combination with Removal or Removal/Treatment)	On-Base Disposal	• Re-open and expand McAllister Point Landfill
Disposal (in combination with Removal or Removal/Treatment)	Off-Base Disposal	• Off-Base RCRA Subtitle D Landfill • Off-Base Unrestricted Landfill or Recycling Facility (Nearshore only, partial/debris) • Off-Base RCRA Subtitle C TSDF (Nearshore only, partial)
Treatment (On-Base) (in combination with Removal/Disposal)	Thermal Treatment	• *Thermal Desorption (Nearshore only)*
	Physical/Chemical Treatment	• *Stabilization/Solidification for treatment of metals (Nearshore only)* • Stabilization/Solidification for Bulking • Decontamination of Rocks and Debris
Treatment (Off-Base)	Thermal/Physical/ Chemical/Biological Treatment	• Multiple Processes (Nearshore only)

Notes:
Italics - Process option viable but not selected for consideration for development of alternatives.

TABLE 4-1
SUMMARY OF REMEDIAL ALTERNATIVES AND THEIR COMPONENTS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

AREA	ALTERNATIVE	KEY COMPONENTS
NEARSHORE/ ELEVATED RISK OFFSHORE	NS/ER-1: No Action	• Five-Year Reviews
	NS/ER-2: Limited Action	• Access Restrictions • Long-Term O&M of Access Restrictions • Long-Term Monitoring • Five-Year Reviews
	NS/ER-3: Capping	• Pre-design Investigation • Installation of Engineering Controls to Minimize Erosion and Sediment Migration During Construction • Removal and Disposal of Debris from the Subgrade • Installation of Multi-Media Cap in High Energy Areas • Installation of Natural Cap in Low Energy Areas • Assisted Restoration of Hard-bottom Aquatic Community • Natural Restoration of Eelgrass Beds • Long-Term O&M of Cap • Long-Term Monitoring • Five-Year Reviews
	NS/ER-4: Capping w/Dredging to Match Existing Grade	• Pre-design Investigation • Installation of Engineering Controls to Minimize Erosion and Sediment Migration During Construction • Excavate/Dredge Sediment Depth Equal to Cap Thickness • Sediment Screening and Segregation • Sediment Dewatering and Disposal at MPLF • Treatment of Dewatering Fluids and Discharge to Bay • Installation of Multi-Media Cap in High Energy Areas • Installation of Natural Cap in Low Energy Areas • Assisted Restoration of Hard-bottom Aquatic Community • Natural Restoration of Eelgrass Beds • Long-Term O&M of Cap • Long-Term Monitoring • Five-Year Reviews
	NS/ER-5: Dredging and Disposal	• Pre-Design Investigation • Installation of Engineering Controls to Minimize Erosion and Sediment Migration During Construction • Installation of Sheetpile or Shoring to Protect Toe of MPLF During Excavation and Dredging • Excavation/Dredging of Contaminated Sediment and Debris • Sediment Dewatering • Treatment of Dewatering Fluids and Discharge to Bay • Disposal of 90% of Sediment at MPLF or RCRA D Landfill • Stabilization/Disposal of 9% of Sediment at RCRA D Landfill • Disposal of 1% of Sediment at RCRA C Landfill • Backfill With Natural Fill • Assisted Restoration of Hard-bottom Aquatic Community • Natural Restoration of Eelgrass Beds • Long-Term Monitoring (Years 1,2, and 5 Only) • Five-Year Review (One Time)

TABLE 4-1
SUMMARY OF REMEDIAL ALTERNATIVES AND THEIR COMPONENTS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

AREA	ALTERNATIVE	KEY COMPONENTS
OFFSHORE (REMOTE)	OS-1: No Action	• Five-Year Reviews
	OS-2: Limited Action	• Long-Term Monitoring • Five-Year Reviews
	OS-3: Capping	• Pre-Design Investigation • Installation of Engineering Controls to Minimize Erosion and Sediment Migration During Construction • Installation of Natural Cap • Assisted Restoration of Hard-bottom Aquatic Community • Potential off-site or out-of-kind mitigation (eelgrass bed damage) • Long-Term O&M of Cap • Long-Term Monitoring • Five-Year Reviews
	OS-4: Dredging and Disposal	• Pre-Design Investigation • Installation of Engineering Controls to Minimize Erosion and Sediment Migration During Construction • Mechanical and Hydraulic Dredging • Sediment Dewatering • Treatment of Dewatering Fluids and Discharge to Bay • Disposal of Sediment at MPLF or RCRA Subtitle C/D Landfills • Assisted Restoration of Hard-bottom Aquatic Community • Potential off-site or out-of-kind mitigation (eelgrass bed damage) • Inspection at Years 1, 2, and 5 • Five-Year Review (One Time)

TABLE 5-1
ASSESSMENT OF CHEMICAL-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-1 - NO ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
EPA Human Health Assessment Cancer Slope Factors (CSFs).		To Be Considered	These are guidance values used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	Used to compute the individual incremental cancer risk resulting from exposure to carcinogenic contaminants in site media.
EPA Risk Reference Doses (RfDs)		To Be Considered	Toxicity values for evaluating non-carcinogenic hazards from exposures to contamination.	Used to characterize human health risks due to non-carcinogens in site media.
Clean Water Act, Section 304	40 USC 1314; 40 CFR 122.44	Relevant and Appropriate	Establish Ambient Water Quality Criteria (AWQC): Guidelines established for the protection of human health and/or the aquatic organisms.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. This alternative fails to meet this standard because sediments exceeding PRGs are not adequately addressed.

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Water Pollution Control	RIGL 46-12 *et seq.*; ENVM 112-88.97-1	Relevant and Appropriate	Establishes water use classification and water quality criteria for waters of the state. Also establishes acute and chronic water quality criteria for the protection of aquatic life.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. This alternative fails to meet this standard because sediments exceeding PRGs are not adequately addressed.

TABLE 5-2
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-1: NO ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
There are no federal location-specific ARARS.				

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
There are no state location-specific ARARs				

TABLE 5-3
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-1 - NO ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
There are no federal action-specific ARARs.				

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
There are no state action-specific ARARs.				

TABLE 5-4
ASSESSMENT OF CHEMICAL-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-2: LIMITED ACTION
NEARSHORE/ELEVATED RISK OFFSHORE AREA
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
EPA Human Health Assessment Cancer Slope Factors (CSFs).		To Be Considered	These are guidance values used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	Used to compute the individual incremental cancer risk resulting from exposure to carcinogenic contaminants in site media.
EPA Risk Reference Doses (RfDs)		To Be Considered	Toxicity values for evaluating non-carcinogenic hazards from exposures to contamination.	Used to characterize human health risks due to non-carcinogens in site media.
Clean Water Act, Section 304	40 USC 1314; 40 CFR 122.44	Relevant and Appropriate	Establish Ambient Water Quality Criteria (AWQC): Guidelines established for the protection of human health and/or the aquatic organisms.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. This alternative fails to meet this standard because sediments exceeding PRGs are not adequately addressed.

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Water Pollution Control	RIGL 46-12 *et seq.*; ENVM 112-88.97-1	Relevant and Appropriate	Establishes water use classification and water quality criteria for waters of the state. Also establishes acute and chronic water quality criteria for the protection of aquatic life.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. This alternative fails to meet this standard because sediments exceeding PRGs are not adequately addressed.

TABLE 5-5
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-2: LIMITED ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Executive Order 11990 RE: Protection of Wetlands	40 CFR Part 6, Appendix A	Applicable	This Order requires Federal agencies to take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction and to preserve the values of wetlands, and to prescribe procedures to implement the policies and procedures of this Executive Order.	Fails to comply with this standard because the action to be taken does not address the risk to the wetland environment posed by the contamination. Installation of fencing and buoys would be conducted to minimize damage of the wetlands.
Executive Order 11988 RE: Floodplain Management	40 CFR Part 6, Appendix A	Applicable	The Order requires Federal agencies to evaluate the potential effects of actions it may take within a designated 100-year floodplain of a waterway to avoid adversely impacting floodplains wherever possible.	Fails to comply with this standard because the action to be taken does not address the risk to the floodplain environment posed by the contamination.
Fish and Wildlife Coordination Act	16 USC Part 661 *et. seq.*; 40 CFR 122.49	Applicable	This statute requires consultation with appropriate agencies to protect fish and wildlife when federal actions result in control or structural modification of a body of water or to critical habitat upon which endangered or threatened species depends.	Appropriate agencies will be consulted to find ways to minimize adverse effects to fish and wildlife from installation of fencing and buoys.

TABLE 5-5
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-2: LIMITED ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Endangered Species Act	16 USC 1531 *et seq.*, 50 CFR Part 200, 50 CFR Part 402	Applicable	If a location contains a federal endangered or threatened species or its critical habitat, and an action may impact the species or its habitat, the U.S. Fish & Wildlife Service or the National Marine Fisheries Service must be consulted.	The federally endangered loggerhead turtle (*Caretta caretta*) and federally threatened Kemp's ridley turtle (*Lepidochelys kempii*) occur in the waters of Narragansett Bay. Appropriate agencies will be consulted to find ways to minimize adverse effects to the listed species and its habitat from installation of fencing and buoys.
Coastal Zone Management Act	16 USC Parts 1451 *et. seq.*	Applicable	Requires that any actions must be conducted in a manner consistent with state approved management programs.	The entire site is located in a coastal zone management area, therefore, applicable coastal zone management requirements need to be addressed.
National Historic Preservation Act	16 USC 470 *et seq.*, 26 CFR Part 800	Applicable	Requires action to take into account effects on properties included on or eligible for the National Register of Historic Places and minimizes harm to National Historic Landmarks	Historic vessels may be sunken in the area. Monitoring and installation of fencing and buoys will be carried out to minimize potential harm to historic sites.

TABLE 5-5
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-2: LIMITED ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Coastal Resources Management	RIGL 46-23-1 *et seq.*	Applicable	Sets standards for management and protection of coastal resources.	The entire Site is located in a coastal resource management area, therefore, applicable coastal resource management requirements need to be addressed.
Endangered Species Act	RIGL 20-37-1 *et seq.*	Applicable	Regulates activities affecting state-listed endangered or threatened species or their critical habitat.	The state listed loggerhead turtle (*Caretta caretta*) and Kemp's ridley turtle (*Lepidochelys kempii*) occur in the waters of Narragansett Bay. Appropriate agencies will be consulted to find ways to minimize adverse effects to the listed species and its habitat from installation of fencing and buoys.

TABLE 5-5
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-2: LIMITED ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Hazardous Waste Management – Location Standards for Hazardous Waste Facilities	RIGL 23-19.1-7; CRIR 12-030-003(10.00)	Relevant and Appropriate	RI is delegated to administer the federal Resource Conservation and Recovery Act (RCRA) statute through its state regulations. The standards of 40 CFR 264.18(b) are incorporated by reference. A facility, including existing landfill, located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood, unless the owner or operator can demonstrate to the Regional Administrator's satisfaction that no adverse effects on human health or the environment will result if washout occurs.	Fails to meet this standard since waste subject to the regulation will be left in place and exposed to washout. This standard is relevant and appropriate to the waste materials extending into the bay from the onshore landfill because they are part of the landfill, which was closed under RCRA C regulations. Materials that may be classified as hazardous wastes were disposed in the landfill prior to 1980.
Coastal Resources Management	RIGL 46-23-1 et seq.	Applicable	Sets standards for management and protection of coastal resources	The entire Site is located in a coastal resource management area, therefore, applicable coastal resource management requirements need to be addressed.

TABLE 5-6
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-2: LIMITED ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Resource Conservation and Recovery Act (RCRA), Subtitle C - Standards for Hazardous Waste Facilities	42 USC 6291 *et seq.*; 40 CFR Part 264	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR Part 264 are incorporated by reference.	Fails to meet this standard since waste subject to the regulation will be left in place and exposed to washout. This standard is relevant and appropriate to the waste materials extending into the bay from the onshore landfill because they are part of the landfill, which was closed under RCRA C regulations. Materials that may be classified as hazardous wastes were disposed in the landfill prior to 1980.
STATE OF RHODE ISLAND REQUIREMENTS				
Hazardous Waste Management - Standards for Treatment, Storage, and Disposal Facilities	RIGL 23-19.1; *et seq.*; CRIR 12-030-003 (10.00)	Relevant and Appropriate	Outlines specifications and standards for design, operation, closure, and monitoring of performance for hazardous waste storage, treatment, and disposal facilities. The standards of 40 CFR Part 264 are incorporated by reference.	Fails to meet this standard since waste subject to the regulation will be left in place and exposed to washout. This standard is relevant and appropriate to the waste materials extending into the bay from the onshore landfill because they are part of the landfill, which was closed under RCRA C regulations. Materials that may be classified as hazardous wastes were disposed in the landfill prior to 1980.

TABLE 5-6
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-2: LIMITED ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Hazardous Waste Management - Identification and Listing of Hazardous Wastes	RIGL 23-19.1; CRIR 12-030-003 (3.25)	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR Part 261 regarding RCRA identification and listing are incorporated by reference.	Fails to meet this standard since waste subject to the regulation will be left in place and exposed to washout. This standard is relevant and appropriate to the waste materials extending into the bay from the onshore landfill because they are part of the landfill, which was closed under RCRA C regulations. Materials that may be classified as hazardous wastes were disposed in the landfill prior to 1980.
Water Pollution Control - Water Quality	RIGL 42-16 *et seq.*; CRIR 12-190-001	Applicable	Establishes water use classification and water quality criteria for waters of the state.	Monitoring and installation of access restrictions will not cause degradation of surface water quality in Narragansett Bay.

TABLE 5-7
ASSESSMENT OF CHEMICAL-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-3: CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
EPA Human Health Assessment Cancer Slope Factors (CSFs).		To Be Considered	These are guidance values used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	Used to compute the individual incremental cancer risk resulting from exposure to carcinogenic contaminants in site media.
EPA Risk Reference Doses (RfDs)		To Be Considered	Toxicity values for evaluating non-carcinogenic hazards from exposures to contamination.	Used to characterize human health risks due to non-carcinogens in site media.
Clean Water Act, Section 304	40 USC 1314; 40 CFR 122.44	Relevant and Appropriate	Establish Ambient Water Quality Criteria (AWQC): Guidelines for the protection of human health and/or the aquatic organisms.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. Sediments exceeding PRGs must be adequately addressed to meet these standards.

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Water Pollution Control	RIGL 46-12 *et seq.*; ENVM 112-88.97-1	Relevant and Appropriate	Establishes water use classification and water quality criteria for waters of the state. Also establishes acute and chronic water quality criteria for the protection of aquatic life.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. Sediments exceeding PRGs must be adequately addressed to meet these standards.

TABLE 5-8
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-3 - CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Executive Order 11990 RE: Protection of Wetlands	40 CFR Part 6, Appendix A	Applicable	This Order requires Federal agencies to take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction and to preserve the values of wetlands, and to prescribe procedures to implement the policies and procedures of this Executive Order.	Restoration and preservation of the wetlands that will be altered by the construction of the cap will be conducted so that the wetlands' natural and beneficial values can be realized. Implementation of the Order will be considered and incorporated into any plan or action, wherever feasible.
Clean Water Act, Section 404	33 USC 1344; 40 CFR Part 230 and 33 CFR Parts 320-323	Applicable	This statute regulates the discharge of dredge and fill materials into Waters of the United States, including special aquatic sites - such as wetlands, intertidal habitats, and vegetated shallows. Such discharges are not allowed if practicable alternatives are available.	Filling of intertidal habitats to construct the cap will only satisfy this requirement if no practicable alternative that has less effect is available. Impacts to aquatic habitats will be mitigated by assisted natural restoration as part of this alternative.
Rivers and Harbors Act, Section 10	33 USC 403; 33 CFR Parts 320-323	Applicable	Sets forth criteria for obstructions or alterations of navigable waters.	Installation of the cap will comply with the Act's environmental standards.

TABLE 5-8
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-3 - CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Executive Order 11988 RE: Floodplain Management	40 CFR Part 6, Appendix A	Applicable	The Order requires Federal agencies to evaluate the potential effects of actions it may take within a designated 100-year floodplain of a waterway to avoid adversely impacting floodplains wherever possible.	The potential for restoring and preserving floodplains so that their natural and beneficial values can be realized will be considered and incorporated into any plan or action wherever feasible. The capping alternative will address the continuing contamination of 100-year floodplain areas on site.
Fish and Wildlife Coordination Act	16 USC Part 661 *et. seq.*; 40 CFR 122.49	Applicable	This statute requires consultation with appropriate agencies to protect fish and wildlife when federal actions result in control or structural modification of a body of water or to critical habitat upon which endangered or threatened species depends.	The appropriate agencies will be consulted to find ways to minimize adverse effects to fish and wildlife from the implementation of the proposed capping remedy.

TABLE 5-8
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-3 - CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Endangered Species Act	16 USC 1531 *et seq.*, 50 CFR Part 200, 50 CFR Part 402	Applicable	If a location contains a federal endangered or threatened species or its critical habitat, and an action may impact the species or its habitat, the U.S. Fish & Wildlife Service or the National Marine Fisheries Service must be consulted.	The federally endangered loggerhead turtle (*Caretta caretta*) and federally threatened Kemp's Ridley turtle (*Lepidochelys kempii*) occur in the waters of Narragansett Bay. Appropriate agencies will be consulted to find ways to minimize adverse effects to the listed species from the capping and monitoring remedy.
Coastal Zone Management Act	16 USC Parts 1451 *et. seq.*	Applicable	Requires that any actions must be conducted in a manner consistent with state approved management programs.	The entire site is located in a coastal zone management area, therefore, applicable coastal zone management requirements need to be addressed.
National Historic Preservation Act	16 USC 470 *et seq.*, 26 CFR Part 800	Applicable	Requires action to take into account effects on properties included on or eligible for the National Register of Historic Places and minimizes harm to National Historic Landmarks	Historic vessels may be sunken in the area. Capping and monitoring activities will be carried out to minimize potential harm to historic sites.

TABLE 5-8
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-3 - CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Hazardous Waste Management - Location Standards for Hazardous Waste Facilities	RIGL 23-19.1-7; CRIR 12-030-003 (10.00)	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR 264.18(b) are incorporated by reference. A facility, including an existing landfill, located in a 100 year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood, unless the owner can demonstrate to the Regional Administrator's satisfaction that no adverse effects on human health or the environment will result if washout occurs.	Some of the waste in the nearshore area may be classified as hazardous waste. To meet this standard the proposed cap must be designed, constructed, and maintained to prevent washout of any hazardous waste.
Coastal Resources Management	RIGL 46-23-1 *et seq.*	Applicable	Sets standards for management and protection of coastal resources.	The entire site is located in a coastal resource management area, therefore, applicable coastal resource management requirements need to be addressed.

TABLE 5-8
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-3 - CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Endangered Species Act	RIGL 20-37-1 *et seq.*	Applicable	Regulates activities affecting state-listed endangered or threatened species or their critical habitat.	The state listed loggerhead turtle (*Caretta caretta*) and Kemp's Ridley turtle (*Lepidochelys kempii*) occur in the waters of Narragansett Bay. Appropriate state agencies will be consulted to find ways to minimize adverse effects to the listed species from the implementation of the capping and monitoring remedy.

TABLE 5-9
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-3: CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NETC, NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Resource Conservation and Recovery Act (RCRA), Subtitle C - Standards for Hazardous Waste Facilities	42 USC 6291 *et seq.*; 40 CFR Part 264	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR Part 264 are incorporated by reference.	Landfill debris and sediments that may constitute hazardous waste will be capped. Monitoring will assess whether hazardous wastes are being released from the cap. The standard is "relevant and appropriate" since wastes that may be classified as hazardous were disposed in the landfill prior to 1980.

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Hazardous Waste Management - Identification and Listing of Hazardous Wastes	RIGL 23-19.1; CRIR 12-030-003 (3.25)	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR Part 261 regarding RCRA identification and listing are incorporated by reference.	Landfill debris and sediments that may constitute hazardous waste continue out from the landfill. These wastes will be capped and monitored. Monitoring will assess whether hazardous wastes are being released from the cap. The standard is "relevant and appropriate" since wastes that may be classified as hazardous were disposed in the landfill prior to 1980.

TABLE 5-9
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-3: CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NETC, NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Hazardous Waste Management - Standards for Treatment, Storage, and Disposal Facilities	RIGL 23-19.1; *et seq.*; CRIR 12-030-003 (10.00)	Relevant and Appropriate	Outlines specifications and standards for design, operation, closure, and monitoring of performance for hazardous waste storage, treatment, and disposal facilities. The standards of 40 CFR Part 264 are incorporated by reference.	Capping of landfill debris and hazardous waste sediments will only satisfy the substantive requirements of these provisions if the cap is protective of human health and the environment.
Water Pollution Control - Water Quality	RIGL 42-16 *et seq.*; CRIR 12-190-001	Applicable	Establishes water use classification and water quality criteria for waters of the state.	Cap construction and long-term monitoring will be conducted so that degradation of surface water quality in Narragansett Bay will not occur.

TABLE 5-10
ASSESSMENT OF CHEMICAL-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-4: DREDGING AND CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
EPA Human Health Assessment Cancer Slope Factors (CSFs).		To Be Considered	These are guidance values used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	Used to compute the individual incremental cancer risk resulting from exposure to carcinogenic contaminants in site media.
EPA Risk Reference Doses (RfDs)		To Be Considered	Toxicity values for evaluating non-carcinogenic hazards from exposures to contamination.	Used to characterize human health risks due to non-carcinogens in site media.
Clean Water Act, Section 304	40 USC 1314; 40 CFR 122.44	Relevant and Appropriate	Establish Ambient Water Quality Criteria (AWQC): Guidelines for the protection of human health and/or the aquatic organisms.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. Sediments exceeding PRGs must be adequately addressed to meet these standards.

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Water Pollution Control	RIGL 46-12 *et seq.*; ENVM 112-88.97-1	Relevant and Appropriate	Establishes water use classification and water quality criteria for waters of the state. Also establishes acute and chronic water quality criteria for the protection of aquatic life.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. Sediments exceeding PRGs must be adequately addressed to meet these standards.

TABLE 5-11
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-4 - DREDGING AND CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Executive Order 11990 RE: Protection of Wetlands	40 CFR Part 6, Appendix A	Applicable	This Order requires Federal agencies to take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction and to preserve the values of wetlands, and to prescribe procedures to implement the policies and procedures of this Executive Order.	Restoration and preservation of the wetlands altered by the removal and containment action will be conducted so that the wetlands' natural and beneficial values can be realized. Implementation of the Order will be considered and incorporated into any plan or action, wherever feasible.
Clean Water Act, Section 404	33 USC 1344; 40 CFR Part 230 and 33 CFR Parts 320-323	Applicable	This statute regulates the discharge of dredge and fill materials into Waters of the United States, including special aquatic sites - such as wetlands, intertidal habitats, and vegetated shallows. Such discharges are not allowed if practicable alternatives are available.	Refilling and capping of the excavated/dredged intertidal habitats will only satisfy this requirement if no practicable alternative that has less effect is available. Impacts to aquatic habitats would be mitigated as part of this alternative.
Rivers and Harbors Act, Section 10	33 USC 403; 33 CFR Parts 320-323	Applicable	Sets forth criteria for obstructions or alterations of navigable waters.	Excavation, dredging, capping, and habitat restoration will comply with the Act's environmental standards.

TABLE 5-11
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-4 - DREDGING AND CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Executive Order 11988 RE: Floodplain Management	40 CFR Part 6, Appendix A	Applicable	The Order requires Federal agencies to evaluate the potential effects of actions it may take within a designated 100-year floodplain of a waterway to avoid adversely impacting floodplains wherever possible.	The potential for restoring and preserving floodplains so that their natural and beneficial values can be realized will be considered and incorporated into any plan or action wherever feasible. This alternative will permanently remove contamination in 100-year floodplain areas on site.
Fish and Wildlife Coordination Act	16 USC Part 661 *et. seq.*; 40 CFR 122.49	Applicable	This statute requires consultation with appropriate agencies to protect fish and wildlife when federal actions result in control or structural modification of a body of water or to critical habitat upon which endangered or threatened species depends.	The appropriate agencies will be consulted to find ways to minimize adverse effects to fish and wildlife from the implementation of the proposed removal, containment, and restoration remedy.

TABLE 5-11
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-4 - DREDGING AND CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Endangered Species Act	16 USC 1531 *et seq.*, 50 CFR Part 200, 50 CFR Part 402	Applicable	If a location contains a federal endangered or threatened species or its critical habitat, and an action may impact the species or its habitat, the U.S. Fish & Wildlife Service or the National Marine Fisheries Service must be consulted.	The federally endangered loggerhead turtle (*Caretta caretta*) and federally threatened Kemp's ridley turtle (*Lepidochelys kempii*) occur in the waters of Narragansett Bay. Appropriate agencies will be consulted to find ways to minimize adverse effects to the listed species from the removal, containment, and restoration remedy.
Coastal Zone Management Act	16 USC Parts 1451 *et. seq.*	Applicable	Requires that any actions must be conducted in a manner consistent with state approved management programs.	The entire site is located in a coastal zone management area, therefore, applicable coastal zone management requirements need to be addressed.
National Historic Preservation Act	16 USC 470 *et seq.*, 26 CFR Part 800	Applicable	Requires action to take into account effects on properties included on or eligible for the National Register of Historic Places and minimizes harm to National Historic Landmarks	Historic vessels may be sunken in the area. Excavation/dredging, containment, and restoration activities will be carried out to minimize potential harm to historic sites.

TABLE 5-11
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-4 - DREDGING AND CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Hazardous Waste Management - Location Standards for Hazardous Waste Facilities	RIGL 23-19.1-7; CRIR 12-030-003 (10.00)	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR 264.18(b) are incorporated by reference. A facility, including an existing landfill, located in a 100 year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood, unless the owner can demonstrate to the Regional Administrator's satisfaction that no adverse effects on human health or the environment will result if washout occurs.	Some of the landfill wastes in the nearshore area may be classified as hazardous waste. Removal of these materials will permanently eliminate the risk of washout. To meet this standard the proposed cap must be designed to prevent washout of any remaining hazardous waste. The standard is "relevant and appropriate" because materials that may be classified as hazardous were disposed in the landfill prior to 1980.
Coastal Resources Management	RIGL 46-23-1 *et seq.*	Applicable	Sets standards for management and protection of coastal resources.	The entire site is located in a coastal resource management area, therefore, applicable coastal resource management requirements need to be addressed.

TABLE 5-11
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-4 - DREDGING AND CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Endangered Species Act	RIGL 20-37-1 *et seq.*	Applicable	Regulates activities affecting state-listed endangered or threatened species or their critical habitat.	The state listed loggerhead turtle (*Caretta caretta*) and Kemp's ridley turtle (*Lepidochelys kempii*) occur in the waters of Narragansett Bay. Appropriate state agencies will be consulted to find ways to minimize adverse effects to the listed species from the implementation of the removal, containment, and restoration remedy.

TABLE 5-12
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-4: DREDGING AND CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Resource Conservation and Recovery Act (RCRA), Subtitle C - Standards for Hazardous Waste Facilities	42 USC 6291 *et seq.*; 40 CFR Part 264	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR Part 264 are incorporated by reference.	Landfill debris and sediments that may constitute hazardous waste will be permanently removed from the site or capped. Monitoring will assess whether hazardous wastes are present in discharges from the removal and dewatering activities or the cap. The standard is "relevant and appropriate" since wastes that may be classified as hazardous were disposed in the landfill prior to 1980.
Clean Water Act (CWA), Section 402, National Pollutant Discharge Elimination System (NPDES)	33 USC 1342; 40 CFR 122-125, 131	Applicable	These standards govern discharge of water into surface waters. Regulated discharges must meet ambient water quality criteria (AWQC).	Any drainage from the temporary debris/sediment storage area and any dewatering discharge will be treated by as necessary to meet this requirement and discharged into Narragansett Bay.
Clean Air Act (CAA), National Emission Standards for Hazardous Air Pollutants (NESHAPS)	42 USC 7411, 7412; 40 CFR Part 61	Applicable	NESHAPS are a set of emission standards for specific chemicals, including naphthalene, arsenic, cadmium, chromium, lead, mercury, nickel, PCBs, DDE, and hexachlorobenzene. Certain activities are regulated including site remediation.	Monitoring of air emissions from the dewatering facility will be used to assess compliance with these standards if threshold levels are reached. Operation and maintenance activities will be carried out in a manner which will minimize potential air releases.

TABLE 5-12
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-4: DREDGING AND CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Hazardous Waste Management - Identification and Listing of Hazardous Wastes	RIGL 23-19.1; CRIR 12-030-003 (3.25)	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR Part 261 regarding RCRA identification and listing are incorporated by reference.	Landfill debris and sediments that may constitute hazardous waste continue out from the landfill. These wastes will be removed or capped, and monitored. Monitoring will assess whether hazardous wastes are being released from the cap. The standard is "relevant and appropriate" since wastes that may be classified as hazardous were disposed in the landfill prior to 1980.
Hazardous Waste Management - Standards for Treatment, Storage, and Disposal Facilities	RIGL 23-19.1; *et seq.*; CRIR 12-030-003 (10.00)	Relevant and Appropriate	Outlines specifications and standards for design, operation, closure, and monitoring of performance for hazardous waste storage, treatment, and disposal facilities. The standards of 40 CFR Part 264 are incorporated by reference.	Landfill debris and sediments that may constitute hazardous waste will be permanently removed from the site or capped. Removal, dewatering, and treatment dewatering fluids will satisfy these provisions for any hazardous wastes excavated. Capping will only satisfy the substantive requirements of these provisions if the cap can be designed, constructed, and maintained to protect human health and the environment.

TABLE 5-12
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-4: DREDGING AND CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Refuse Disposal - Solid Waste Management Facilities	RIGL 23-18.9 *et seq.*; CRIR 12-030-003(10.00)	Applicable	Rules and regulations more stringent than the federal standards under 40 CFR Part 258 are applicable. The standards require minimization of environmental hazards associated with the operation of solid waste facilities.	Removal of non-hazardous sediments and using waste piles for dewatering prior to disposal in a RCRA Subtitle D facility will satisfy the substantive requirements of these provisions.
Clean Air Act - Fugitive Dust Control	RIGL 23-23 *et seq.*; CRIR 12-31-05	Applicable	Requires that reasonable precaution be taken to prevent particulate matter from becoming airborne.	Removal, processing, and temporary storage of debris and sediments during dewatering and before shipment would be implemented to prevent material from becoming airborne.
Clean Air Act - Emissions Detrimental to Persons or Property	RIGL 23-23 *et seq.*; CRIR 12-31-07	Applicable	Prohibits emissions of contaminants which may be injurious to humans, plant or animal life or cause damage to property or which reasonably interferes with the enjoyment of life and property.	Removal, processing, and temporary storage of debris and sediments during dewatering and before shipment would be implemented to prevent emissions of contaminants. Monitoring of air emissions from the dewatering facility will be used to assess compliance with these standards if threshold levels are reached.
Clean Air Act - Air Pollution Control	RIGL 23-23 *et seq.*; CRIR 12-31-09	Applicable	Establishes guidelines for the construction, installation, or operation of potential air emission units. Establishes permissible emission rates for some contaminants.	Site processing of debris and sediment and treatment of dewatering liquid will meet the substantive provisions of the standards if threshold levels are reached.

TABLE 5-12
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-4: DREDGING AND CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Clean Air Act - Odors	RIGL 23-23 *et seq.*; CRIR 12-31-17	Applicable	Prohibits the release of objectionable odors across property lines.	Site processing of debris and sediment and treatment of dewatering liquid will meet the substantive provisions of the standards.
Clean Air Act - Air Toxics	RIGL 23-23 *et seq.*; CRIR 12-31-22	Applicable	Prohibits the emission of specified contaminants at rates which would result in ground level concentrations greater than acceptable ambient levels or acceptable ambient levels as set in the regulations	Monitoring of air emissions from the dewatering facility will be used to assess compliance with these standards if threshold levels are reached. Operation and maintenance activities will be carried out in a manner which will minimize potential air releases.
Water Pollution Control - Water Quality	RIGL 42-16 *et seq.*; CRIR 12-190-001	Applicable	Establishes water use classification and water quality criteria for waters of the state. Also establishes criteria for discharge to a water body.	Capping and monitoring operations must not cause degradation of surface water quality in Narragansett Bay. Any drainage off the temporary debris/sediment storage area and any dewatering discharge will be treated as necessary to meet these requirements and discharged into Narragansett Bay.
Water Pollution Control - Pollution Discharge Elimination Systems	RIGL 42-16 *et seq.*; CRIR 12-190-003	Applicable	Contains applicable effluent monitoring requirements, and standards and special conditions for discharges.	The substantive provisions of these standards will be satisfied through on-site treatment of all discharges prior to being released into the Bay.

TABLE 5-13
ASSESSMENT OF CHEMICAL-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
EPA Human Health Assessment Cancer Slope Factors (CSFs).		To Be Considered	These are guidance values used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	Used to compute the individual incremental cancer risk resulting from exposure to carcinogenic contaminants in site media.
EPA Risk Reference Doses (RfDs)		To Be Considered	Toxicity values for evaluating non-carcinogenic hazards from exposures to contamination.	Used to characterize human health risks due to non-carcinogens in site media.
Clean Water Act, Section 304	40 USC 1314; 40 CFR 122.44	Relevant and Appropriate	Establish Ambient Water Quality Criteria (AWQC): Guidelines for the protection of human health and/or the aquatic organisms.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. Sediments exceeding PRGs must be adequately addressed to meet these standards.

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Water Pollution Control	RIGL 46-12 *et seq.*; ENVM 112-88.97-1	Relevant and Appropriate	Establishes water use classification and water quality criteria for waters of the state. Also establishes acute and chronic water quality criteria for the protection of aquatic life.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. Sediments exceeding PRGs must be adequately addressed to meet these standards.

TABLE 5-14
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-5 - DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Executive Order 11990 RE: Protection of Wetlands	40 CFR Part 6, Appendix A	Applicable	This Order requires Federal agencies to take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction and to preserve the values of wetlands, and to prescribe procedures to implement the policies and procedures of this Executive Order.	Restoration and preservation of the intertidal wetlands altered by the remedial action will be conducted so that the wetlands' natural and beneficial values can be realized. Implementation of the Order will be considered and incorporated into any plan or action, wherever feasible.
Clean Water Act, Section 404	33 USC 1344; 40 CFR Part 230 and 33 CFR Parts 320-323	Applicable	This statute regulates the discharge of dredge and fill materials into Waters of the United States, including special aquatic sites - such as wetlands, intertidal habitats, and vegetated shallows. Such discharges are not allowed if practicable alternatives are available.	Refilling of the excavated/dredged aquatic habitats will only satisfy this requirement if no practicable alternative that has less effect is available. Impacts to aquatic habitats would be mitigated as part of this alternative.
Rivers and Harbors Act, Section 10	33 USC 403; 33 CFR Parts 320-323	Applicable	Sets forth criteria for obstructions or alterations of navigable waters.	Excavation/dredging and habitat restoration will comply with the Act's environmental standards.

TABLE 5-14
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-5 - DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Executive Order 11988 RE: Floodplain Management	40 CFR Part 6, Appendix A	Applicable	The Order requires Federal agencies to evaluate the potential effects of actions it may take within a designated 100-year floodplain of a waterway to avoid adversely impacting floodplains wherever possible.	The potential for restoring and preserving floodplains so that their natural and beneficial values can be realized will be considered and incorporated into any plan or action wherever feasible.
Fish and Wildlife Coordination Act	16 USC Part 661 *et. seq.*; 40 CFR 122.49	Applicable	This statute requires consultation with appropriate agencies to protect fish and wildlife when federal actions result in control or structural modification of a body of water or to critical habitat upon which endangered or threatened species depends.	The appropriate agencies will be consulted to find ways to minimize adverse effects to fish and wildlife from the implementation of the proposed removal and restoration remedy.

TABLE 5-14
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-5 - DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Endangered Species Act	16 USC 1531 *et seq.*, 50 CFR Part 200, 50 CFR Part 402	Applicable	If a location contains a federal endangered or threatened species or its critical habitat, and an action may impact the species or its habitat, the U.S. Fish & Wildlife Service or the National Marine Fisheries Service must be consulted.	The federally endangered loggerhead turtle (*Caretta caretta*) and federally threatened Kemp's ridley turtle (*Lepidochelys kempii*) occur in the waters of Narragansett Bay. Appropriate agencies will be consulted to find ways to minimize adverse effects to the listed species from the removal and restoration remedy.
Coastal Zone Management Act	16 USC Parts 1451 *et. seq.*	Applicable	Requires that any actions must be conducted in a manner consistent with state approved management programs.	The entire site is located in a coastal zone management area, therefore, applicable coastal zone management requirements need to be addressed.
National Historic Preservation Act	16 USC 470 *et seq.*, 26 CFR Part 800	Applicable	Requires action to take into account effects on properties included on or eligible for the National Register of Historic Places and minimizes harm to National Historic Landmarks	Historic vessels may be sunken in the area. Excavation/dredging, and restoration activities will be carried out to minimize potential harm to historic sites.

TABLE 5-14
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-5 - DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Hazardous Waste Management - Location Standards for Hazardous Waste Facilities	RIGL 23-19.1-7; CRIR 12-030-003 (10.00)	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR 264.18(b) are incorporated by reference. A facility, including an existing landfill, located in a 100 year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood, unless the owner can demonstrate to the Regional Administrator's satisfaction that no adverse effects on human health or the environment will result if washout occurs.	Some of the landfill wastes in the nearshore area may be classified as hazardous waste. Removal of these materials will permanently eliminate the risk of washout. The standard is "relevant and appropriate" because materials that may be classified as hazardous were disposed in the landfill prior to 1980.
Coastal Resources Management	RIGL 46-23-1 *et seq.*	Applicable	Sets standards for management and protection of coastal resources.	The entire site is located in a coastal resource management area, therefore, applicable coastal resource management requirements need to be addressed.

TABLE 5-14
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-5 - DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Endangered Species Act	RIGL 20-37-1 *et seq.*	Applicable	Regulates activities affecting state-listed endangered or threatened species or their critical habitat.	The state listed loggerhead turtle (*Caretta caretta*) and Kemp's ridley turtle (*Lepidochelys kempii*) occur in the waters of Narragansett Bay. Appropriate state agencies will be consulted to find ways to minimize adverse effects to the listed species from the implementation of the removal and restoration remedy.

TABLE 5-15
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Resource Conservation and Recovery Act (RCRA), Subtitle C - Standards for Hazardous Waste Facilities	42 USC 6291 *et seq.*; 40 CFR Part 264	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR Part 264 are incorporated by reference.	Landfill debris and sediments that may constitute hazardous waste will be permanently removed from the site. Monitoring will assess whether hazardous wastes are present in discharges from the excavation/dredging and dewatering activities. The standard is "relevant and appropriate" since wastes that may be classified as hazardous were disposed in the landfill prior to 1980.
Clean Water Act (CWA), Section 402, National Pollutant Discharge Elimination System (NPDES)	33 USC 1342; 40 CFR 122-125, 131	Applicable	These standards govern discharge of water into surface waters. Regulated discharges must meet ambient water quality criteria (WQC).	Any drainage off the temporary debris/sediment storage area and any dewatering discharge will be treated by an on-site treatment plant and discharged into Narragansett Bay.
Clean Air Act (CAA), National Emission Standards for Hazardous Air Pollutants (NESHAPS)	42 USC 7411, 7412; 40 CFR Part 61	Applicable	NESHAPS are a set of emission standards for specific chemicals, including naphthalene, arsenic, cadmium, chromium, lead, mercury, nickel, PCBs, DDE, and hexachlorobenzene. Certain activities are regulated including site remediation.	Monitoring of air emissions from the dewatering facility will be used to assess compliance with these standards if threshold levels are reached. Operation and maintenance activities will be carried out in a manner which will minimize potential air releases.

TABLE 5-15
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Hazardous Waste Management - Identification and Listing of Hazardous Wastes	RIGL 23-19.1; CRIR 12-030-003(3.25)	Relevant and Appropriate	RI is delegated to administer the federal Resource Conservation and Recovery Act (RCRA) statute through its state regulations. The standards of 40 CFR Part 261 regarding RCRA identification and listing are incorporated by reference.	Landfill debris and sediments that may constitute hazardous waste continue out from the landfill. These wastes will be removed. Monitoring will assess whether hazardous wastes are being released from the the excavation/dredging. The standard is "relevant and appropriate" since wastes that may be classified as hazardous were disposed in the landfill prior to 1980.
Hazardous Waste Management - Standards for Treatment, Storage, and Disposal Facilities	RIGL 23-19.1 *et seq.*; CRIR 12-030-003(10.00)	Applicable	Outlines specifications and standards for design, operation, closure, and monitoring of performance for hazardous waste storage, treatment, and disposal facilities. The standards of 40 CFR Part 264 are incorporated by reference.	Landfill debris and sediments that may constitute hazardous waste will be permanently removed from the site. Removal, dewatering, and treatment dewatering fluids will satisfy these provisions for any hazardous wastes excavated.
Refuse Disposal - Solid Waste Management Facilities	RIGL 23-18.9 *et seq.*; CRIR 12-030-003(10.00)	Applicable	Rules and regulations more stringent than the federal standards under 40 CFR Part 258 are applicable. The standards require minimization of environmental hazards associated with the operation of solid waste facilities.	Removal of non-hazardous sediments and using waste piles for dewatering prior to disposal in a RCRA Subtitle D facility will satisfy the substantive requirements of these provisions.
Clean Air Act - Fugitive Dust Control	RIGL 23-23 *et seq.*; CRIR 12-31-05	Applicable	Requires that reasonable precaution be taken to prevent particulate matter from becoming airborne.	Removal, processing, and temporary storage of debris and sediments during dewatering and before shipment would be implemented to prevent material from becoming airborne.

TABLE 5-15
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS (CONT'D)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Clean Air Act - Emissions Detrimental to Persons or Property	RIGL 23-23 *et seq.*; CRIR 12-31-07	Applicable	Prohibits emissions of contaminants which may be injurious to humans, plant or animal life or cause damage to property or which reasonably interferes with the enjoyment of life and property.	Removal, processing, and temporary storage of debris and sediments during dewatering and before shipment would be implemented to prevent emissions of contaminants. Monitoring of air emissions from the dewatering facility will be used to assess compliance with these standards if threshold levels are reached.
Clean Air Act - Air Pollution Control	RIGL 23-23 *et seq.*; CRIR 12-31-09	Applicable	Establishes guidelines for the construction, installation, or operation of potential air emission units. Establishes permissible emission rates for some contaminants.	Site processing of debris and sediment and treatment of dewatering liquid will meet the substantive provisions of the standards if threshold levels are reached.
Clean Air Act - Odors	RIGL 23-23 *et seq.*; CRIR 12-31-17	Applicable	Prohibits the release of objectionable odors across property lines.	Site processing of debris and sediment and treatment of dewatering liquid will meet the substantive provisions of the standards.
Clean Air Act - Air Toxics	RIGL 23-23 *et seq.*; CRIR 12-31-22	Applicable	Prohibits the emission of specified contaminants at rates which would result in ground level concentrations greater than acceptable ambient levels or acceptable ambient levels as set in the regulations	Monitoring of air emissions from the dewatering facility will be used to assess compliance with these standards if threshold levels are reached. Operation and maintenance activities will be carried out in a manner which will minimize potential air releases.

TABLE 5-15
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS (CONT'D)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Water Pollution Control - Water Quality	RIGL 42-16 *et seq.*; CRIR 12-190-001	Applicable	Establishes water use classification and water quality criteria for waters of the state. Also establishes criteria for discharge to a water body.	Any drainage from the temporary debris/sediment storage area and any dewatering discharge will be treated as required to meet this ARAR and discharged into Narragansett Bay.
Water Pollution Control - Pollution Discharge Elimination Systems	RIGL 42-16 *et seq.*; CRIR 12-190-003	Applicable	Contains applicable effluent monitoring requirements, and standards and special conditions for discharges.	The substantive provisions of these standards will be satisfied through on-site treatment of all discharges prior to being released into the Bay.

TABLE 5-16
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
NEARSHORE AND ELEVATED RISK OFFSHORE AREAS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE NS/ER-1: NO ACTION	ALTERNATIVE NS/ER-2: LIMITED ACTION	ALTERNATIVE NS/ER-3: CAPPING	ALTERNATIVE NS/ER-4: CAPPING WITH DREDGING	ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
Overall Protection of Human Health and the Environment:					
Human Health	No reduction in risk is anticipated. Risks associated with shellfish consumption would exceed $1x10^{-4}$ ($9x10^{-4}$ to $8\ x10^{-3}$ for subsistent fishermen and from $2\ x10^{-5}$ to $2\ x10^{-4}$ for children), unless existing shellfishing ban is enforced. RAOs for protection of human health would not be achieved.	Limited risk reduction would be provided by deterring recreational use and shellfishing. Enforcement of existing shellfishing ban would reduce risk associated with consumption of impacted shellfish to less than 1 x10. RAOs for protection of human health would be partially addressed by the installation of fencing, signs and buoys.	Would provide protection by placement of cap over contaminated sediment. Properly constructed and maintained cap would reduce risk to less than $1x10^{-6}$ by preventing exposure to contaminants above PRGs. Human risk associated with physical hazards would be eliminated. Inadequate data are available to predict the long-term effectiveness of the proposed cap. RAOs for protection of human health would be achieved.	Would provide protection by placement of cap over contaminated sediment while also providing for removal of approximately two thirds of the sediment exceeding PRGs. Properly constructed and maintained cap would reduce risk to less than $1x10^{-6}$ by preventing exposure to contaminants above PRGs. Human risk associated with physical hazards would be eliminated. Inadequate data are available to predict the long-term effectiveness of the proposed cap. RAOs for protection of human health would be achieved.	Would provide protection by removal and disposal of contaminated sediment. Risk would be reduced to less than $1x10^{-6}$ by preventing exposure to contaminants above PRGs. Human risk associated with physical hazards would be eliminated. RAOs for protection of human health would be achieved.

TABLE 5-16
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR NEARSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE NS/ER-1: NO ACTION	ALTERNATIVE NS/ER-2: LIMITED ACTION	ALTERNATIVE NS/ER-3: CAPPING	ALTERNATIVE NS/ER-4: CAPPING WITH DREDGING	ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
Environment	No reduction in risk is anticipated. Low to medium probability of risk to avian aquatic predators (consumption of prey species) would remain. Low to high probability of risk to marine biota (contact with sediment contaminants partitioning into porewater) would remain. PAHs, PCBs, and metals contaminants would continue to migrate. RAOs for protection of the environment would not be achieved.	Same as NS/ER-1. RAOs for protection of the environment would not be achieved.	Would prevent risk to ecological receptors and migration of site contaminants provided that effective cap can be constructed and maintained to prevent washout and adverse impacts from migration of dissolved contaminants through the cap from underlying sediment. Short-term effects associated with resuspension of sediment and cap installation would be mitigated by use of silt curtains, etc. Assisted natural ecological restoration, encouraged by selection and placement of cap materials in a way that would promote recolonization of the hard-bottom aquatic community below the high tide line. Filling would permanently convert approximately 1.12 acres of intertidal habitat to upland and approximately 2.27 acres of subtidal habitat to intertidal habitat. These losses would require mitigation. RAOs for protection of the environment would be achieved.	Similar to NS/ER-3, but possible greater short-term impacts from sediment resuspension during dredging and no long-term impacts from filling. Capped area would match existing grades, allowing no net-filling of the area. Approximately 2/3 of the contaminated sediment would be removed and disposed in a secure landfill. RAOs for protection of the environment would be achieved.	Similar to NS/ER-4, but possible greater short-term impacts from sediment resuspension during dredging. Total removal of contaminated sediment would ensure long-term protection. Possibility of sediment migration from landfill if dredging adjacent to landfill revetment causes landfill cap failure. RAOs for protection of the environment would be achieved.

TABLE 5-16
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR NEARSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE NS/ER-1: NO ACTION	ALTERNATIVE NS/ER-2: LIMITED ACTION	ALTERNATIVE NS/ER-3: CAPPING	ALTERNATIVE NS/ER-4: CAPPING WITH DREDGING	ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
Compliance with ARARs/TBCs:					
Chemical-Specific	Fails to meet sediment PRGs that were derived from federal and state water quality standards.	Same as NS/ER-1	Would meet chemical-specific ARARs only if the proposed cap prevents exposure to sediments exceeding the PRGs derived from state and federal water quality criteria, and contaminants from these sediments do not migrate through the cap.	Same as NS/ER-3	Would meet chemical-specific ARARs because sediments exceeding the PRGs derived from state and federal water quality criteria would be removed.
Location-Specific	No Location-Specific ARARs/TBCs	Fails to meet wetland and floodplain standards since it will leave contaminated waste in place and would not address the risk to the wetland and floodplain environments posed by the contamination.	Would only satisfy hazardous waste facility standards if the cap can be constructed and maintained to prevent washout of hazardous wastes that would adversely affect human health or the environment. Temporary and permanent habitat losses would have to be mitigated to meet CWA requirements. Would be conducted in accordance with all other identified ARARs/TBCs.	Same as NS/ER-3, except there would be no permanent loss of habitat to mitigate.	Temporary habitat losses would have to be mitigated to meet CWA requirements. Would be conducted in accordance with all other identified ARARs/TBCs.
Action-Specific	No Action-Specific ARARs/TBCs.	Would be conducted in accordance with identified ARARs/TBCs.	Would be conducted in accordance with identified ARARs/TBCs if the cap can be constructed and maintained to protect human health and the environment.	Same as NS/ER-3.	Would be conducted in accordance with identified ARARs/TBCs.

TABLE 5-16
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR NEARSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE NS/ER-1: NO ACTION	ALTERNATIVE NS/ER-2: LIMITED ACTION	ALTERNATIVE NS/ER-3: CAPPING	ALTERNATIVE NS/ER-4: CAPPING WITH DREDGING	ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
Long-Term Effectiveness and Permanence:					
Magnitude of Residual Risk	All existing risks to human health and the environment would remain.	Use and access restrictions would discourage/deter continued human health risk, while enforcement would be required to prevent risk. No reduction in risk to ecological receptors would occur.	Contaminated marine sediment would remain on site untreated, but capped.. Residual risk associated with effectiveness of cap in containing the sediment in the long-term would remain.	Contaminated marine sediment would remain on site untreated, but capped. Removal of large volume of sediment for cap installation will reduce long-term risks. Some residual risk associated with effectiveness of cap in containing the sediment in the long-term would remain.	Contaminants would be removed. No residual risks would remain on site. Permanent solution.
Adequacy and Reliability of Controls	Not applicable.	Would require enforcement of use and access restrictions. Adequacy of current enforcement of shellfishing ban is uncertain. Long-term adequate enforcement of state-imposed ban in state waters difficult to ensure.	Long-term effectiveness would be directly related to integrity of the cap in containing contaminated marine sediment on site. Long-term O&M would be conducted to ensure integrity of cap. However, it is unclear whether a cap can be constructed and maintained to remain protective over the long term.	Same as NS/ER-3, except somewhat easier to ensure reliability due to smaller area of cap and the cap matching the existing grade.	No on-site controls needed to ensure reliability because all sediment exceeding PRGs would be disposed off site.

TABLE 5-16
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR NEARSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE NS/ER-1: NO ACTION	ALTERNATIVE NS/ER-2: LIMITED ACTION	ALTERNATIVE NS/ER-3: CAPPING	ALTERNATIVE NS/ER-4: CAPPING WITH DREDGING	ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
Reduction of Toxicity, Mobility, or Volume Through Treatment:					
Need for 5-Year Review	Review would be required since contaminants would remain on site.	Same as NS/ER-1.	Same as NS/ER-1.	Same as NS/ER-1.	All contaminants exceeding PRGs in NS/ER area would be removed. Assumed 1 review would be conducted in year 5 to assess impact of sediments remaining beneath revetment. Additional 5-year reviews would be required if remaining sediment determined to pose risk.
Treatment Process Used and Materials Treated	None.	None.	None.	Multiple processes may be required to treat any excavated/dredged marine sediment disposed off-site. Stabilization of metals most likely required for off-site disposal of some sediment.	Same as NS/ER-4
Amount of Hazardous Materials Destroyed or Treated	None.	None.	None.	None if all material disposed at McAllister Point Landfill as anticipated. Approximately 9% of excavated/dredged sediment requiring off-site disposal.	Approximately 9% of excavated/dredged sediment requiring off-site disposal (9% of 1,000 to 6,000 cubic yards).

TABLE 5-16
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR NEARSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE NS/ER-1: NO ACTION	ALTERNATIVE NS/ER-2: LIMITED ACTION	ALTERNATIVE NS/ER-3: CAPPING	ALTERNATIVE NS/ER-4: CAPPING WITH DREDGING	ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
Degree of Expected Reductions in Toxicity, Mobility, or Volume Through Treatment	No reduction is anticipated.	Same as NS/ER-1.	Would provide no reduction through treatment.	Would provide reduction in toxicity and mobility through treatment for the small volume treated if sediment disposed off site. May result in increase in volume associated with solidification/ stabilization of the treated portion.	Same as NS/ER-4.
Degree to Which Treatment is Irreversible	Not applicable.	Not applicable.	Not applicable.	Irreversible for sediment receiving treatment.	Irreversible for sediment receiving treatment.
Type and Quantity of Residuals Remaining after Treatment	Not applicable.	Not applicable.	Not applicable.	Residuals from treatment would depend on process(es) used. Residuals would be handled by TSDF or landfill. Residual water from sediment dewatering would require treatment prior to discharge; volume depends on sediment removal technique.	Same as NS/ER-4.

TABLE 5-16
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR NEARSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE NS/ER-1: NO ACTION	ALTERNATIVE NS/ER-2: LIMITED ACTION	ALTERNATIVE NS/ER-3: CAPPING	ALTERNATIVE NS/ER-4: CAPPING WITH DREDGING	ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
Statutory Preference for Treatment	Not achieved.	Not achieved.	Not achieved.	Achieved for that portion of excavated/ dredged sediment receiving treatment.	Same as NS/ER-4.
Short-Term Effectiveness:					
Community Protection	No short-term risks are anticipated.	Same as NS/ER-1.	Same as NS/ER-1.	Same as NS/ER-1.	Same as NS/ER-1.
Worker Protection	No short-term risks are anticipated.	Exposure risks (direct contact) associated with monitoring activities and installation of fencing and buoy system in intertidal zone would be minimized by use of PPE.	Exposure risks (direct contact) associated with site preparation, cap installation, and monitoring would be minimized by use of PPE.	Exposure risks associated with excavation/dredging, capping, monitoring, reopening and expanding landfill, and physical hazards associated with debris removal activities would be minimized by use of PPE.	Exposure risks associated with excavation/dredging, reopening and expanding landfill, and physical hazards associated with debris removal activities would be minimized by use of PPE.

TABLE 5-16
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR NEARSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE NS/ER-1: NO ACTION	ALTERNATIVE NS/ER-2: LIMITED ACTION	ALTERNATIVE NS/ER-3: CAPPING	ALTERNATIVE NS/ER-4: CAPPING WITH DREDGING	ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
Environmental Impacts	Not applicable.	Minimal impacts (sediment resuspension) associated with installation of fencing and buoy system in intertidal zone would be minimized by use of silt curtains, silt fences, etc.	Short-term risks (sediment resuspension) associated with site preparation and cap installation would be minimized by use of silt curtains, silt fences, etc. Short-term destruction of existing hard-bottom aquatic habitat would be mitigated by assisted natural restoration. Filling would permanently convert approximately 1.12 acres of intertidal habitat to upland and 2.27 acres of subtidal to intertidal habitat. This loss may be mitigated by off-site habitat restoration or replacement.	Similar to NS/ER-3, except greater short-term risks (sediment resuspension) associated with dredging operations and no long-term impacts associated with filling.	Similar to NS/ER-4, except greater short term risks (sediment resuspension) associated with extensive dredging operations. These would be minimized (but may not eliminated) by use of silt curtains, silt fences, etc. Potential impact to the integrity of the McAllister Point Landfill cap from dredging adjacent to the revetment could result in release of landfill materials into the Bay. These impacts may be mitigated by extensive shoring of the revetment.
Time Until RAOs are Achieved	Not achieved.	One month to meet human health RAOs only. RAOs for protection of the environment would not be achieved	10 months (assuming no interruption of alternative implementation).	20 months (assuming no interruption of alternative implementation).	23 months (assuming no interruption of alternative implementation).

TABLE 5-16
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR NEARSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE NS/ER-1: NO ACTION	ALTERNATIVE NS/ER-2: LIMITED ACTION	ALTERNATIVE NS/ER-3: CAPPING	ALTERNATIVE NS/ER-4: CAPPING WITH DREDGING	ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
Implementability:					
Ability to Construct and Operate	Not applicable.	Buoy system would be easily constructable. Fencing may be challenging to secure in intertidal zone.	Difficult to implement. Implementation is complicated by the location to be capped (dynamic intertidal shoreline adjacent to the landfill) and the performance standards the cap must meet. It is unclear whether a sub-aqueous cap can be constructed and maintained in this location to provide long-term protection. Uncertainties exist associated with sediment washout and migration of dissolved contaminants through the cap. Both site preparation and capping would be affected by access limitations. Some areas of the nearshore may be difficult to access from a barge or by land.	Same as NS/ER-3 for capping portion. Cap may be easier to maintain because removal of large volume of sediment would decrease size of capped area. Uncertainties about long-term effectiveness same as Alt. NS/ER-3. More difficult to implement than NS/ER-3 because in addition to sub-aqueous capping, limited removal of contaminated sediment and landfill debris is required. Dredging would be affected by access limitations and further complicated by the subsurface conditions (presence of rock outcroppings, pockets of sediment on hard rock, thick tangles of submarine cables, and large pieces of metal and concrete debris) in the intertidal zone. Removal of sediment from the toe of the landfill may compromise the integrity of the landfill cap and revetment . Some shoring would likely be needed to protect the landfill cap and revetment. The feasibility of disposing excavated sediment and debris in the McAllister Point Landfill would have to be evaluated in the PDI.	Significantly more difficult than NS/ER-4. Access limitations would pose the same difficulties, but the additional depth of excavation under NS/ER-5 would make implementation significantly more difficult because of the need to install a substantial shoring system to prevent slope failure of the landfill cap. The feasibility of the shoring system is highly uncertain due to access limitations and the subsurface conditions; it would need to be thoroughly investigated during the pre-design investigation. Complete removal of contaminated sediment and landfill materials adjacent to the revetment would be difficult or impossible without damaging the landfill cap and revetment. The feasibility of disposing excavated sediment and debris in the McAllister Point Landfill would have to be evaluated in the PDI.

TABLE 5-16
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR NEARSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE NS/ER-1: NO ACTION	ALTERNATIVE NS/ER-2: LIMITED ACTION	ALTERNATIVE NS/ER-3: CAPPING	ALTERNATIVE NS/ER-4: CAPPING WITH DREDGING	ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
Reliability of Technology	Not applicable.	Monitoring is widely used and reliable. No scheduling delays are anticipated.	Inadequate data are available to predict the long-term effectiveness and reliability of the proposed sub-aqueous cap. Wave actions and local currents could result in scheduling delays associated with placement of the cap.	Same as NS/ER-3 for capping portion. Wave actions and local currents could result in scheduling delays associated with excavation/dredging and placement of the cap. Land disposal in an approved facility is widely used and reliable.	Land disposal in an approved facility is widely used and reliable. Wave actions and local currents could result in scheduling delays associated with excavation/dredging.
Ease of Undertaking Additional Remedial Action, if Necessary	Would not limit implementation of future remedial action.	Same as NS/ER-1.	Containment features may be impacted if implementation of additional future remedial actions are required. Additional actions easily implemented in areas with natural cap; more difficult but implementable in areas with multi-media cap.	Containment features may be impacted if implementation of additional future remedial actions are required. Additional actions easily implemented in areas with natural cap or backfill; more difficult but implementable in areas with multi-media cap.	Same as NS/ER-1.
Ability to Monitor Effectiveness of Remedy	Not applicable.	Effectiveness easily evaluated with annual long-term sediment and biota sampling.	Same as NS/ER-2.	Same as NS/ER-2.	Effectiveness easily evaluated with sediment and biota sampling.

TABLE 5-16
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR NEARSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE NS/ER-1: NO ACTION	ALTERNATIVE NS/ER-2: LIMITED ACTION	ALTERNATIVE NS/ER-3: CAPPING	ALTERNATIVE NS/ER-4: CAPPING WITH DREDGING	ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
Ability to Obtain Approvals and Coordinate with Other Agencies	May require minimal coordination between NSN, State, and local agencies (5-year reviews only).	Would require coordination/agree ment between regulatory agencies for installation of access restrictions and enforcement of existing shellfishing ban.	Would require coordination with regulatory agencies regarding marine filling; potential effects on fisheries, endangered species, and the aquatic habitat.	Similar to NS/ER-3, except also requires coordination with regulatory agencies for marine dredging.	Similar to NS/ER-3, except requires coordination with regulatory agencies for marine dredging, but not capping.
Availability of Off-Site TSDF Services and Capacity	Not applicable.	Not applicable.	Not applicable.	May be difficult to find disposal facility that can accept large volume of marine sediment to be disposed off-site if disposal in McAllister Point Landfill is not viable.	May be difficult to find disposal facility that can accept large volume of marine sediment to be disposed off-site if disposal in McAllister Point Landfill is not viable.
Availability of Necessary Equipment and Specialists	Not applicable.	Contractors, marine supplies, and boats are readily available in area. Would require continual enforcement of access and use restrictions to be effective.	Capping materials readily available from numerous suppliers. Many contractors available with general marine dredging, grading, and erosion control experience. Fewer available with underwater capping experience or training in hazardous waste site operations.	Same as NS/ER-3. Many contractors available with experience in landfill design and construction.	Many contractors available with general marine dredging experience for shoreline excavation and barge-mounted dredging operations. Fewer available with training in hazardous waste site operations. Many contractors available with experience in landfill design and construction.

TABLE 5-16
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR NEARSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE NS/ER-1: NO ACTION	ALTERNATIVE NS/ER-2: LIMITED ACTION	ALTERNATIVE NS/ER-3: CAPPING	ALTERNATIVE NS/ER-4: CAPPING WITH DREDGING	ALTERNATIVE NS/ER-5: DREDGING AND DISPOSAL
Availability of Prospective Technologies	Not applicable.	Readily available.	Natural cap materials readily available. Multi-media cap materials available. Very little information available regarding capping in intertidal zone. However, information for shoreline stabilization (a very similar process) is readily available.	Same as NS/ER-3 for capping portion. Dredging and disposal information, equipment, and specialists readily available.	Backfill materials readily available. Dredging and disposal information, equipment, and specialists readily available.
Cost:					
Capital ($)	0	25,000	11,976,000	17,172,000	22,339,000
O&M ($/yr)	0	$94,600 (yrs 1-5) and 5 yr intervals $8,800 (yrs 6-30)	$120,800 (yrs 1-5) and 5 yr intervals $35,000 (rem. yrs)	$120,800 (yrs 1-5) and 5 yr intervals $35,000 (rem. yrs)	$105,300 (yrs 1, 2, & 5)
Net Present Worth ($)	46,000	656,000	12,933,000	18,129,000	22,619,000
SENSITIVITY ANALYSIS					
NPW Sensitivity: +20% Area/Volume	NA	NA	14,829,000	20,365,000	26,606,000
NPW Sensitivity: -30% Area/Volume	NA	NA	10,088,000	14,775,000	17,420,000

TABLE 5-17
ASSESSMENT OF CHEMICAL-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-1: NO ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RHODE ISLAND

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Clean Water Act, Section 304	40 USC 1314; 40 CFR 122.44	Relevant and Appropriate	Establish Ambient Water Quality Criteria (AWQC): Guidelines for the protection of human health and/or the aquatic organisms.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. This alternative would meet these standards only if sediments in the offshore area do not exceed recommended PRGs. Limited data indicate that these areas exceed baseline PRGs, but do not exceed recommended PRGs. More data are needed to determine contaminant concentrations throughout the area.

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Water Pollution Control	RIGL 46-12 *et seq.*; ENVM 112-88.97-1	Relevant and Appropriate	Establishes water use classification and water quality criteria for waters of the state. Also establishes acute and chronic water quality criteria for the protection of aquatic life.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. This alternative would meet these standards only if sediments in the offshore area do not exceed recommended PRGs. Limited data indicate that these areas exceed baseline PRGs, but do not exceed recommended PRGs. More data are needed to determine contaminant concentrations throughout the area.

TABLE 5-18
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-1: NO ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
There are no federal location-specific ARARs				

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
There are no state location-specific ARARs.				

TABLE 5-19
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-1: NO ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
There are no federal action-specific ARARs.				

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
There are no state action-specific ARARs.				

TABLE 5-20
ASSESSMENT OF CHEMICAL-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-2: LIMITED ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Clean Water Act, Section 304	40 USC 1314; 40 CFR 122.44	Relevant and Appropriate	Establish Ambient Water Quality Criteria (AWQC): Guidelines for the protection of human health and/or the aquatic organisms.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. Sediments exceeding PRGs must be adequately addressed to meet these standards.

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Water Pollution Control	RIGL 46-12 *et seq.*; ENVM 112-88.97-1	Relevant and Appropriate	Establishes water use classification and water quality criteria for waters of the state. Also establishes acute and chronic water quality criteria for the protection of aquatic life.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. Sediments exceeding PRGs must be adequately addressed to meet these standards.

TABLE 5-21
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-2: LIMITED ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Executive Order 11990 RE: Protection of Wetlands	40 CFR Part 6, Appendix A	Applicable	This Order requires Federal agencies to take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction and to preserve the values of wetlands, and to prescribe procedures to implement the policies and procedures of this Executive Order.	The potential for restoring and preserving subtidal wetlands so that their natural and beneficial values can be realized will be considered wherever feasible if subtidal wetlands are identified on site.
Fish and Wildlife Coordination Act	16 USC Part 661 *et. seq.*; 40 CFR 122.49	Applicable	This statute requires consultation with appropriate agencies to protect fish and wildlife when federal actions result in control or structural modification of a body of water or to critical habitat upon which endangered or threatened species depends.	Appropriate agencies will be consulted to find ways to minimize adverse effects to fish and wildlife from monitoring activities.

TABLE 5-21
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-2: LIMITED ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Endangered Species Act	16 USC 1531 *et seq.*, 50 CFR Part 200, 50 CFR Part 402	Applicable	If a location contains a federal endangered or threatened species or its critical habitat, and an action may impact the species or its habitat, the U.S. Fish & Wildlife Service or the National Marine Fisheries Service must be consulted..	The federally endangered loggerhead turtle (*Caretta caretta*) and federally threatened Kemp's ridley turtle (*Lepidochelys kempii*) occur in the waters of Narragansett Bay. Appropriate agencies will be consulted to find ways to minimize adverse effects to the listed species and its habitat from monitoring activities.
Coastal Zone Management Act	16 USC Parts 1451 *et. seq.*	Applicable	Requires that any actions must be conducted in a manner consistent with state approved management programs.	The entire site is located in a coastal zone management area, therefore, applicable coastal zone management requirements need to be addressed.
National Historic Preservation Act	16 USC 470 *et seq.*, 26 CFR Part 800	Applicable	Requires action to take into account effects on properties included on or eligible for the National Register of Historic Places and minimizes harm to National Historic Landmarks	Historic vessels may be sunken in the area. Monitoring activities will be carried out to minimize potential harm to historic sites.

TABLE 5-21
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-2: LIMITED ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Coastal Resources Management	RIGL 46-23-1 *et seq.*	Applicable	Sets standards for management and protection of coastal resources.	The entire Site is located in a coastal resource management area, therefore, applicable coastal resource management requirements need to be addressed.
Endangered Species Act	RIGL 20-37-1 *et seq.*	Applicable	Regulates activities affecting state-listed endangered or threatened species or their critical habitat.	The state listed loggerhead turtle (*Caretta caretta*) and Kemp's ridley turtle (*Lepidochelys kempii*) occur in the waters of Narragansett Bay. Appropriate agencies will be consulted to find ways to minimize adverse effects to the listed species and its habitat from monitoring activities.

TABLE 5-22
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-2: LIMITED ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Resource Conservation and Recovery Act (RCRA), Subtitle C - Standards for Hazardous Waste Facilities	42 USC 6291 *et seq.*; 40 CFR Part 264	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR Part 264 are incorporated by reference.	Wastes derived from monitoring will be tested to determine if they are hazardous waste. Monitoring will determine whether any contamination present poses a risk to the environment.
Resource Conservation and Recovery Act (RCRA), Subtitle D - Standards for Solid Waste Facilities	40 CFR Part 258	Applicable	Sets standards for location restrictions, operating criteria, monitoring, closure, and post-closure.	Areas of offshore sediments that are not classified as hazardous waste will be monitored in accordance with the substantive provisions of these standards.
STATE OF RHODE ISLAND REQUIREMENTS				
Hazardous Waste Management - Identification and Listing of Hazardous Wastes	RIGL 23-19.1; CRIR 12-030-003 (3.25)	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR Part 261 regarding RCRA identification and listing are incorporated by reference.	Wastes derived from monitoring will be tested to determine if they are hazardous waste. Monitoring will determine whether any contamination present poses a risk to the environment.
Hazardous Waste Management - Standards for Treatment, Storage, and Disposal Facilities	RIGL 23-19.1; *et seq.*; CRIR 12-030-003 (10.00)	Relevant and Appropriate	Outlines specifications and standards for design, operation, closure, and monitoring of performance for hazardous waste storage, treatment, and disposal facilities. The standards of 40 CFR Part 264 are incorporated by reference.	Monitoring activities within areas containing hazardous waste will comply with these standards.

TABLE 5-22
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-2: LIMITED ACTION
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
STATE OF RHODE ISLAND REQUIREMENTS (cont'd)				
Refuse Disposal - Solid Waste Management Facilities	RIGL 23-18.9 *et seq.*; CRIR 12-030-21	Applicable	Rules and regulations more stringent than the federal standards under 40 CFR Part 258 are applicable. The standards require minimization of environmental hazards associated with the operation of solid waste facilities.	Monitoring of non-hazardous sediments will satisfy the substantive requirements of these provisions.
Water Pollution Control - Water Quality	RIGL 42-16 *et seq.*; CRIR 12-190-001	Applicable	Establishes water use classification and water quality criteria for waters of the state.	Monitoring and institutional control measures will not cause degradation of surface water quality in Narragansett Bay.

TABLE 5-23
ASSESSMENT OF CHEMICAL-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-3: CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Clean Water Act, Section 304	40 USC 1314; 40 CFR 122.44	Relevant and Appropriate	Establish Ambient Water Quality Criteria (AWQC): Guidelines for the protection of human health and/or the aquatic organisms.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. Sediments exceeding PRGs must be adequately addressed to meet these standards.

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Water Pollution Control	RIGL 46-12 *et seq.*; ENVM 112-88.97-1	Relevant and Appropriate	Establishes water use classification and water quality criteria for waters of the state. Also establishes acute and chronic water quality criteria for the protection of aquatic life.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. Sediments exceeding PRGs must be adequately addressed to meet these standards.

TABLE 5-24
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-3 - CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Executive Order 11990 RE: Protection of Wetlands	40 CFR Part 6, Appendix A	Applicable	This Order requires Federal agencies to take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction and to preserve the values of wetlands, and to prescribe procedures to implement the policies and procedures of this Executive Order.	The potential for restoring and preserving subtidal wetlands so that their natural and beneficial values can be realized will be considered wherever feasible if subtidal wetlands are identified on site.
Clean Water Act, Section 404	33 USC 1344; 40 CFR Part 230 and 33 CFR Parts 320-323	Applicable	This statute regulates the discharge of dredge and fill materials into Waters of the United States, including special aquatic sites - such as wetlands, intertidal habitats, and vegetated shallows. Such discharges are not allowed if practicable alternatives are available.	Filling of subtidal habitats to construct the cap will only satisfy this requirement if no practicable alternative that has less effect is available. Impacts to the hard-bottom subtidal habitats would be mitigated as part of this alternative. However, restoration of eelgrass beds destroyed by capping may not be possible and off-site or out-of-kind mitigation may be required.

TABLE 5-24
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-3 - CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Rivers and Harbors Act, Section 10	33 USC 403; 33 CFR Parts 320-323	Applicable	Sets forth criteria for obstructions or alterations of navigable waters.	Installation of the cap will comply with the Act's environmental standards.
Fish and Wildlife Coordination Act	16 USC Part 661 *et. seq.*; 40 CFR 122.49	Applicable	This statute requires consultation with appropriate agencies to protect fish and wildlife when federal actions result in control or structural modification of a body of water or to critical habitat upon which endangered or threatened species depends.	The appropriate agencies will be consulted to find ways to minimize adverse effects to fish and wildlife from the implementation of the proposed capping remedy.
Endangered Species Act	16 USC 1531 *et seq.*, 50 CFR Part 200, 50 CFR Part 402	Applicable	If a location contains a federal endangered or threatened species or its critical habitat, and an action may impact the species or its habitat, the U.S. Fish & Wildlife Service or the National Marine Fisheries Service must be consulted.	The federally endangered loggerhead turtle (*Caretta caretta*) and federally threatened Kemp's ridley turtle (*Lepidochelys kempii*) occur in the waters of Narragansett Bay. Appropriate agencies will be consulted to find ways to minimize adverse effects to the listed species from the capping and monitoring remedy.

TABLE 5-24
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-3 - CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Coastal Zone Management Act	16 USC Parts 1451 *et. seq.*	Applicable	Requires that any actions must be conducted in a manner consistent with state approved management programs.	The entire site is located in a coastal zone management area, therefore, applicable coastal zone management requirements need to be addressed.
National Historic Preservation Act	16 USC 470 *et seq.*, 26 CFR Part 800	Applicable	Requires action to take into account effects on properties included on or eligible for the National Register of Historic Places and minimizes harm to National Historic Landmarks	Historic vessels may be sunken in the area. Capping and monitoring activities will be carried out to minimize potential harm to historic sites.

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Coastal Resources Management	RIGL 46-23-1 *et seq.*	Applicable	Sets standards for management and protection of coastal resources.	The entire site is located in a coastal resource management area, therefore, applicable coastal resource management requirements need to be addressed.

TABLE 5-24
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-3 - CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Endangered Species Act	RIGL 20-37-1 *et seq.*	Applicable	Regulates activities affecting state-listed endangered or threatened species or their critical habitat.	The state listed loggerhead turtle (*Caretta caretta*) and Kemp's ridley turtle (*Lepidochelys kempii*) occur in the waters of Narragansett Bay. Appropriate state agencies will be consulted to find ways to minimize adverse effects to the listed species from the implementation of the capping and monitoring remedy.

TABLE 5-25
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-3: CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Resource Conservation and Recovery Act (RCRA), Subtitle C - Standards for Hazardous Waste Facilities	42 USC 6291 *et seq.*; 40 CFR Part 264	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR Part 264 are incorporated by reference.	Materials classified as hazardous waste have not been identified, but may be present in the offshore area. Any hazardous wastes present will be capped. Monitoring will assess whether hazardous wastes are being released from beneath the cap. The standard is "relevant and appropriate" since wastes that may be classified as hazardous were disposed in the landfill prior to 1980.
Resource Conservation and Recovery Act (RCRA), Subtitle D - Standards for Solid Waste Facilities	40 CFR Part 258	Applicable	Sets standards for location restrictions, operating criteria, monitoring, closure, and post-closure.	Areas of offshore sediments that are not classified as hazardous waste will be capped and monitored in accordance with the substantive provisions of these standards.

TABLE 5-25
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-3: CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Hazardous Waste Management - Identification and Listing of Hazardous Wastes	RIGL 23-19.1; CRIR 12-030-003 (3.25)	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR Part 261 regarding RCRA identification and listing are incorporated by reference.	Sediments in the offshore area will be tested to determine whether they are hazardous waste. Areas of sediments classified as hazardous waste will be capped. Monitoring will assess whether hazardous wastes are being released from beneath the cap. The standard is "relevant and appropriate" since wastes that may be classified as hazardous were disposed in the landfill prior to 1980.
Hazardous Waste Management - Standards for Treatment, Storage, and Disposal Facilities	RIGL 23-19.1; *et seq.*; CRIR 12-030-003 (10.00)	Relevant and Appropriate	Outlines specifications and standards for design, operation, closure, and monitoring of performance for hazardous waste storage, treatment, and disposal facilities. The standards of 40 CFR Part 264 are incorporated by reference.	This alternative will only satisfy the substantive requirements of these provisions if the cap can be designed, constructed, and maintained to protect human health and the environment.
Refuse Disposal - Solid Waste Management Facilities	RIGL 23-18.9 *et seq.*; CRIR 12-030-21	Applicable	Rules and regulations more stringent than the federal standards under 40 CFR Part 258 are applicable. The standards require minimization of environmental hazards associated with the operation of solid waste facilities.	Capping, maintenance, and monitoring of non-hazardous sediments will satisfy the substantive requirements of these provisions.

TABLE 5-25
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-3: CAPPING
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Water Pollution Control - Water Quality	RIGL 42-16 *et seq.*; CRIR 12-190-001	Applicable	Establishes water use classification and water quality criteria for waters of the state.	Monitoring and institutional control measures will not cause degradation of surface water quality in Narragansett Bay.

TABLE 5-26
ASSESSMENT OF CHEMICAL-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-4: DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Clean Water Act, Section 304	40 USC 1314; 40 CFR 122.44	Relevant and Appropriate	Establish Ambient Water Quality Criteria (AWQC): Guidelines for the protection of human health and/or the aquatic organisms.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. Sediments exceeding PRGs must be adequately addressed to meet these standards.

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Water Pollution Control	RIGL 46-12 *et seq.*; ENVM 112-88.97-1	Relevant and Appropriate	Establishes water use classification and water quality criteria for waters of the state. Also establishes acute and chronic water quality criteria for the protection of aquatic life.	These standards are relevant and appropriate for sediment PRGs derived using these water quality criteria. Sediments exceeding PRGs must be adequately addressed to meet these standards.

TABLE 5-27
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-4 - DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Executive Order 11990 RE: Protection of Wetlands	40 CFR Part 6, Appendix A	Applicable	This Order requires Federal agencies to take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction and to preserve the values of wetlands, and to prescribe procedures to implement the policies and procedures of this Executive Order.	The potential for restoring and preserving subtidal wetlands so that their natural and beneficial values can be realized will be considered wherever feasible if subtidal wetlands are identified on site.
Clean Water Act, Section 404	33 USC 1344; 40 CFR Part 230 and 33 CFR Parts 320-323	Applicable	This statute regulates the discharge of dredge and fill materials into Waters of the United States, including special aquatic sites - such as wetlands, intertidal habitats, and vegetated shallows. Such discharges are not allowed if practicable alternatives are available.	Dredging of subtidal habitats will only satisfy this requirement if no practicable alternative that has less effect is available. Impacts to the hard-bottom subtidal habitats would be mitigated as part of this alternative. However, restoration of eelgrass beds destroyed by dredging may not be possible and off-site or out-of-kind mitigation may be required.

TABLE 5-27
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-4 - DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Rivers and Harbors Act, Section 10	33 USC 403; 33 CFR Parts 320-323	Applicable	Sets forth criteria for obstructions or alterations of navigable waters.	Excavation/dredging and habitat restoration will comply with the Act's environmental standards.
Fish and Wildlife Coordination Act	16 USC Part 661 *et. seq.*; 40 CFR 122.49	Applicable	This statute requires consultation with appropriate agencies to protect fish and wildlife when federal actions result in control or structural modification of a body of water or to critical habitat upon which endangered or threatened species depends.	The appropriate agencies will be consulted to find ways to minimize adverse effects to fish and wildlife from the implementation of the proposed removal and restoration remedy.
Endangered Species Act	16 USC 1531 *et seq.*, 50 CFR Part 200, 50 CFR Part 402	Applicable	If a location contains a federal endangered or threatened species or its critical habitat, and an action may impact the species or its habitat, the U.S. Fish & Wildlife Service or the National Marine Fisheries Service must be consulted.	The federally endangered loggerhead turtle (*Caretta caretta*) and federally threatened Kemp's ridley turtle (*Lepidochelys kempii*) occur in the waters of Narragansett Bay. Appropriate agencies will be consulted to find ways to minimize adverse effects to the listed species from the removal and restoration remedy.

TABLE 5-27
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-4 - DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

FEDERAL REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Coastal Zone Management Act	16 USC Parts 1451 *et. seq.*	Applicable	Requires that any actions must be conducted in a manner consistent with state approved management programs.	The entire site is located in a coastal zone management area, therefore, applicable coastal zone management requirements need to be addressed.
National Historic Preservation Act	16 USC 470 *et seq.*, 26 CFR Part 800	Applicable	Requires action to take into account effects on properties included on or eligible for the National Register of Historic Places and minimizes harm to National Historic Landmarks	Historic vessels may be sunken in the area. Excavation/dredging, and restoration activities will be carried out to minimize potential harm to historic sites.

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Coastal Resources Management	RIGL 46-23-1 *et seq.*	Applicable	Sets standards for management and protection of coastal resources.	The entire site is located in a coastal resource management area, therefore, applicable coastal resource management requirements need to be addressed.

TABLE 5-27
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-4 - DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN - NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Endangered Species Act	RIGL 20-37-1 *et seq.*	Applicable	Regulates activities affecting state-listed endangered or threatened species or their critical habitat.	The state listed loggerhead turtle (*Caretta caretta*) and Kemp's ridley turtle (*Lepidochelys kempii*) occur in the waters of Narragansett Bay. Appropriate state agencies will be consulted to find ways to minimize adverse effects to the listed species from the implementation of the removal and restoration remedy.

TABLE 5-28
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-4: DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

FEDERAL REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Resource Conservation and Recovery Act (RCRA), Subtitle C - Standards for Hazardous Waste Facilities	42 USC 6291 *et seq.*; 40 CFR Part 264	Relevant and Appropriate	RI is delegated to administer the federal RCRA statute through its state regulations. The standards of 40 CFR Part 264 are incorporated by reference.	Materials classified as hazardous waste have not been identified, but may be present in the offshore area. Any hazardous wastes present will be permanently removed. Monitoring will assess whether hazardous wastes are present in discharges from the dredging and dewatering activities. The standard is "relevant and appropriate" since wastes that may be classified as hazardous were disposed in the landfill prior to 1980.
Resource Conservation and Recovery Act (RCRA), Subtitle D - Standards for Solid Waste Facilities	40 CFR Part 258	Applicable	Sets standards for location restrictions, operating criteria, monitoring, closure, and post-closure.	Areas of offshore sediments that are not classified as hazardous waste will be permanently removed. As long as sediments are not mixed with hazardous waste they will be shipped to a RCRA Subtitle D solid waste facility.
Clean Water Act (CWA), Section 402, National Pollutant Discharge Elimination System (NPDES)	33 USC 1342; 40 CFR 122-125, 131	Applicable	These standards govern discharge of water into surface waters. Regulated discharges must meet ambient water quality criteria (WQC).	Any drainage off the temporary debris/sediment storage area and any dewatering discharge will be treated by an on-site treatment plant and discharged into Narragansett Bay.

TABLE 5-28
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-4: DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

FEDERAL REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Clean Air Act (CAA), National Emission Standards for Hazardous Air Pollutants (NESHAPS)	42 USC 7411, 7412; 40 CFR Part 61	Applicable	NESHAPS are a set of emission standards for specific chemicals, including naphthalene, arsenic, cadmium, chromium, lead, mercury, nickel, PCBs, DDE, and hexachlorobenzene. Certain activities are regulated including site remediation.	Monitoring of air emissions from the dewatering facility will be used to assess compliance with these standards if threshold levels are reached. Operation and maintenance activities will be carried out in a manner which will minimize potential air releases.

STATE OF RHODE ISLAND REQUIREMENTS

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Hazardous Waste Management - Identification and Listing of Hazardous Wastes	RIGL 23-19.1; CRIR 12-030-003(3.25)	Relevant and Appropriate	RI is delegated to administer the federal Resource Conservation and Recovery Act (RCRA) statute through its state regulations. The standards of 40 CFR Part 261 regarding RCRA identification and listing are incorporated by reference.	Excavated sediment will be analytically tested according to the requirements of this regulation. If sediment is determined to be hazardous waste, it will be properly disposed of as such.
Hazardous Waste Management - Standards for Treatment, Storage, and Disposal Facilities	RIGL 23-19.1 *et seq.*; CRIR 12-030-003(10.00)	Applicable	Outlines specifications and standards for design, operation, closure, and monitoring of performance for hazardous waste storage, treatment, and disposal facilities. The standards of 40 CFR Part 264 are incorporated by reference.	Dewatering of materials classified as RCRA hazardous wastes would be conducted in accordance with these requirements.

TABLE 5-28
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-4: DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Refuse Disposal - Solid Waste Management Facilities	RIGL 23-18.9 *et seq.*; CRIR 12-030-21	Applicable	Rules and regulations more stringent than the federal standards under 40 CFR Part 258 are applicable. The standards require minimization of environmental hazards associated with the operation of solid waste facilities.	Removal of non-hazardous sediments and using waste piles for dewatering prior to disposal in a RCRA Subtitle D facility will satisfy the substantive requirements of these provisions.
Clean Air Act - Fugitive Dust Control	RIGL 23-23 *et seq.*; CRIR 12-31-05	Applicable	Requires that reasonable precaution be taken to prevent particulate matter from becoming airborne.	Removal, processing, and temporary storage of debris and sediments during dewatering and before shipment would be implemented to prevent material from becoming airborne.
Clean Air Act - Emissions Detrimental to Persons or Property	RIGL 23-23 *et seq.*; CRIR 12-31-07	Applicable	Prohibits emissions of contaminants which may be injurious to humans, plant or animal life or cause damage to property or which reasonably interferes with the enjoyment of life and property.	Removal, processing, and temporary storage of debris and sediments during dewatering and before shipment would be implemented to prevent emissions of contaminants. Monitoring of air emissions from the dewatering facility will be used to assess compliance with these standards if threshold levels are reached.
Clean Air Act - Air Pollution Control	RIGL 23-23 *et seq.*; CRIR 12-31-09	Applicable	Establishes guidelines for the construction, installation, or operation of potential air emission units. Establishes permissible emission rates for some contaminants.	Site processing of debris and sediment and treatment of dewatering liquid will meet the substantive provisions of the standards if threshold levels are reached.

TABLE 5-28
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
ALTERNATIVE OS-4: DREDGING AND DISPOSAL
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
MCALLISTER POINT LANDFILL, NSN, NEWPORT, RI

STATE OF RHODE ISLAND REQUIREMENTS (Cont'd)

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Clean Air Act - Odors	RIGL 23-23 *et seq.*; CRIR 12-31-17	Applicable	Prohibits the release of objectionable odors across property lines.	Site processing of debris and sediment and treatment of dewatering liquid will meet the substantive provisions of the standards.
Clean Air Act - Air Toxics	RIGL 23-23 *et seq.*; CRIR 12-31-22	Applicable	Prohibits the emission of specified contaminants at rates which would result in ground level concentrations greater than acceptable ambient levels or acceptable ambient levels as set in the regulations	Monitoring of air emissions from the dewatering facility will be used to assess compliance with these standards if threshold levels are reached. Operation and maintenance activities will be carried out in a manner which will minimize potential air releases.
Water Pollution Control - Water Quality	RIGL 42-16 *et seq.*; CRIR 12-190-001	Applicable	Establishes water use classification and water quality criteria for waters of the state. Also establishes criteria for discharge to a water body.	Any drainage from the temporary debris/sediment storage area and any dewatering discharge will be treated as required to meet this ARAR and discharged into Narragansett Bay.
Water Pollution Control - Pollution Discharge Elimination Systems	RIGL 42-16 *et seq.*; CRIR 12-190-003	Applicable	Contains applicable effluent monitoring requirements, and standards and special conditions for discharges.	The substantive provisions of these standards will be satisfied through on-site treatment of all discharges prior to being released into the Bay.

TABLE 5-29
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR OFFSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION FEASIBILITY STUDY
McALLISTER POINT LANDFILL, NSN, NEWPORT, RI

CRITERIA	ALTERNATIVE OS-1: NO ACTION	ALTERNATIVE OS-2: LIMITED ACTION	ALTERNATIVE OS-3: CAPPING	ALTERNATIVE OS-4: REMOVAL AND DISPOSAL
Overall Protection of Human Health and the Environment:				
Human Health	No human health risk.	Same as OS-1.	Same as OS-1.	Same as OS-1.
Environment	No reduction in risk is anticipated. Relatively low probability of risk to marine biota would remain. Sediments contaminated with PAHs, PCBs, and metal contaminants would continue to migrate. Contaminant concentrations in offshore sediment are relatively low (above baseline PRGs but below recommended PRGs). Would not achieve RAOs for baseline PRGs.	Limited protection provided by long-term monitoring and 5-year reviews. Any change in site conditions that caused increased risk would be identified and need for additional remedial actions would be assessed. Monitoring would be conducted to assess compliance with RAOs. If recommended PRGs selected as cleanup goals, would achieve RAOs without monitoring.	Would prevent risk to marine biota through containment and migration of site contaminants provided that cap remained effective in long term. Inadequate data exist to predict the long-term effectiveness of the cap. Short-term effects associated with resuspension of sediment and cap installation would be mitigated by use of silt curtains, etc. Assisted natural restoration of the hard-bottom aquatic habitat, encouraged by selection of cap materials similar to existing substrate, would reestablish aquatic habitat of area after cap is installed. Eelgrass beds would be permanently destroyed. On-site mitigation may not be possible. Off-site or out-of-kind mitigation may be required. Would achieve RAOs by isolating and containing contaminated sediments. May provide less overall protection of the environment than OS-1 and OS-2 because short-term and long-term impacts to the environment and sensitive aquatic habitat from the remedial action may be greater than the benefits provided by containing sediments with relatively low contaminant concentrations.	Would prevent risk to marine biota through removal and off-base disposal of contaminated sediment. Short-term effects associated with resuspension of sediment during dredging would be excessive, but would be reduced by use of silt curtains, etc. Natural restoration of the hard-bottom aquatic habitat, encouraged by presence of materials similar to existing substrate, would reestablish aquatic habitat of area after dredging is complete. Eelgrass beds would be permanently destroyed. On-site mitigation may not be possible. Off-site or out-of-kind mitigation may be required. Would achieve RAOs by removing contaminated sediments. May provide less overall protection of the environment that OS-1 and OS-2 because short-term and long-term impacts to the environment and sensitive aquatic habitat from the remedial action may be greater than the benefits provided by removing sediments with relatively low contaminant concentrations.

TABLE 5-29
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR OFFSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE OS-1: NO ACTION	ALTERNATIVE OS-2: LIMITED ACTION	ALTERNATIVE OS-3: CAPPING	ALTERNATIVE OS-4: REMOVAL AND DISPOSAL
Compliance with ARARs/TBCs:				
Chemical-Specific	Would meet chemical-specific ARARs only if sediments in the offshore area do not exceed recommended PRGs derived from state and federal water quality criteria. Additional monitoring is needed to determine compliance, but no monitoring is included.	Would meet chemical-specific ARARs if sediments in the offshore area do not exceed recommended PRGs derived from state and federal water quality criteria. Additional monitoring would be conducted to determine compliance	Would meet chemical-specific ARARs if the proposed cap prevents exposure to sediments exceeding recommended PRGs derived from state and federal water quality criteria, and contaminants from these sediments do not migrate through the cap.	Would meet chemical-specific ARARs because any sediments exceeding recommended PRGs derived from state and federal water quality criteria would be removed.
Location-Specific	No Location-Specific ARARs/TBCs	Would be conducted in accordance with identified ARARs/TBCs.	Implementation would destroy the eelgrass beds in the offshore area. To meet CWA requirements, this loss would have to be mitigated. However, restoration or replacement of the eelgrass beds may not be possible. Off-site of out-of-kind mitigation may be required. To select this alternative, it may be necessary to modify the alternative to avoid destruction of eelgrass beds. It could only be selected if it was determined to be the least damaging, practicable alternative. The alternative would be conducted in accordance with all other identified location-specific ARARs/TBCs.	Same as OS-3.
Action-Specific	No Action-Specific ARARs/TBCs.	Would be conducted in accordance with identified ARARs/TBCs.	Would be conducted in accordance with identified ARARs/TBCs if the cap can be constructed and maintained to provide long term protection of the environment.	Would be conducted in accordance with identified ARARs/TBCs.

TABLE 5-29
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR OFFSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE OS-1: NO ACTION	ALTERNATIVE OS-2: LIMITED ACTION	ALTERNATIVE OS-3: CAPPING	ALTERNATIVE OS-4: REMOVAL AND DISPOSAL
Long-Term Effectiveness and Permanence:				
Magnitude of Residual Risk	All existing risks to marine biota would remain.	Same as OS-1.	Contaminated marine sediment would remain on site untreated, but capped. Residual risk associated with effectiveness of cap in containing the sediment and contaminants of concern in the long-term would remain.	Contaminants would be removed. No residual risks would remain on site. Permanent solution.
Adequacy and Reliability of Controls	Not applicable.	Not applicable.	Long-term effectiveness would be directly related to integrity of the cap in containing contaminated marine sediment on site. Inadequate data are available to determine whether the cap would be effective in the long-term	None needed since contaminated marine sediment is removed and disposed off base.
Need for 5-Year Review	Review would be required since contaminants would remain on site.	Same as OS-1.	Same as OS-1.	No review would be required. All marine sediment with contaminant concentrations above PRGs would be removed from site.
Reduction of Toxicity, Mobility, or Volume through Treatment:				
Treatment Process Used and Materials Treated	None.	None.	None.	None for sediments. Conventional water treatment for dewatering fluids.
Amount of Hazardous Materials Destroyed or Treated	None.	None.	None.	None.
Degree of Expected Reductions in Toxicity, Mobility, or Volume Through Treatment	No reduction is anticipated.	Same as OS-1.	Same as OS-1.	Same as OS-1.

TABLE 5-29
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR OFFSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

CRITERIA	ALTERNATIVE OS-1: NO ACTION	ALTERNATIVE OS-2: LIMITED ACTION	ALTERNATIVE OS-3: CAPPING	ALTERNATIVE OS-4: REMOVAL AND DISPOSAL
Reduction of Toxicity, Mobility, or Volume through Treatment (cont'd):				
Degree to Which Treatment is Irreversible	Not applicable.	Not applicable.	Not applicable.	Residual water treatment would be irreversible.
Type and Quantity of Residuals Remaining after Treatment	Not applicable.	Not applicable.	Not applicable.	Residual water from sediment dewatering would require treatment prior to discharge; volume depends on sediment removal technique.
Statutory Preference for Treatment	Not achieved.	Not achieved.	Not achieved.	For dewatering fluids only.
Short-Term Effectiveness:				
Community Protection	Not applicable.	No short-term risks are anticipated.	Same as OS-2.	Same as OS-2.
Worker Protection	Not applicable.	Exposure risks (direct contact) associated with site long-term monitoring would be minimized by use of PPE.	Exposure risks (direct contact) associated with site preparation, cap installation, and monitoring would be minimized by use of PPE.	Exposure risks (direct contact) associated with excavation/dredging and monitoring activities would be minimized by use of PPE.

TABLE 5-29
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR OFFSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

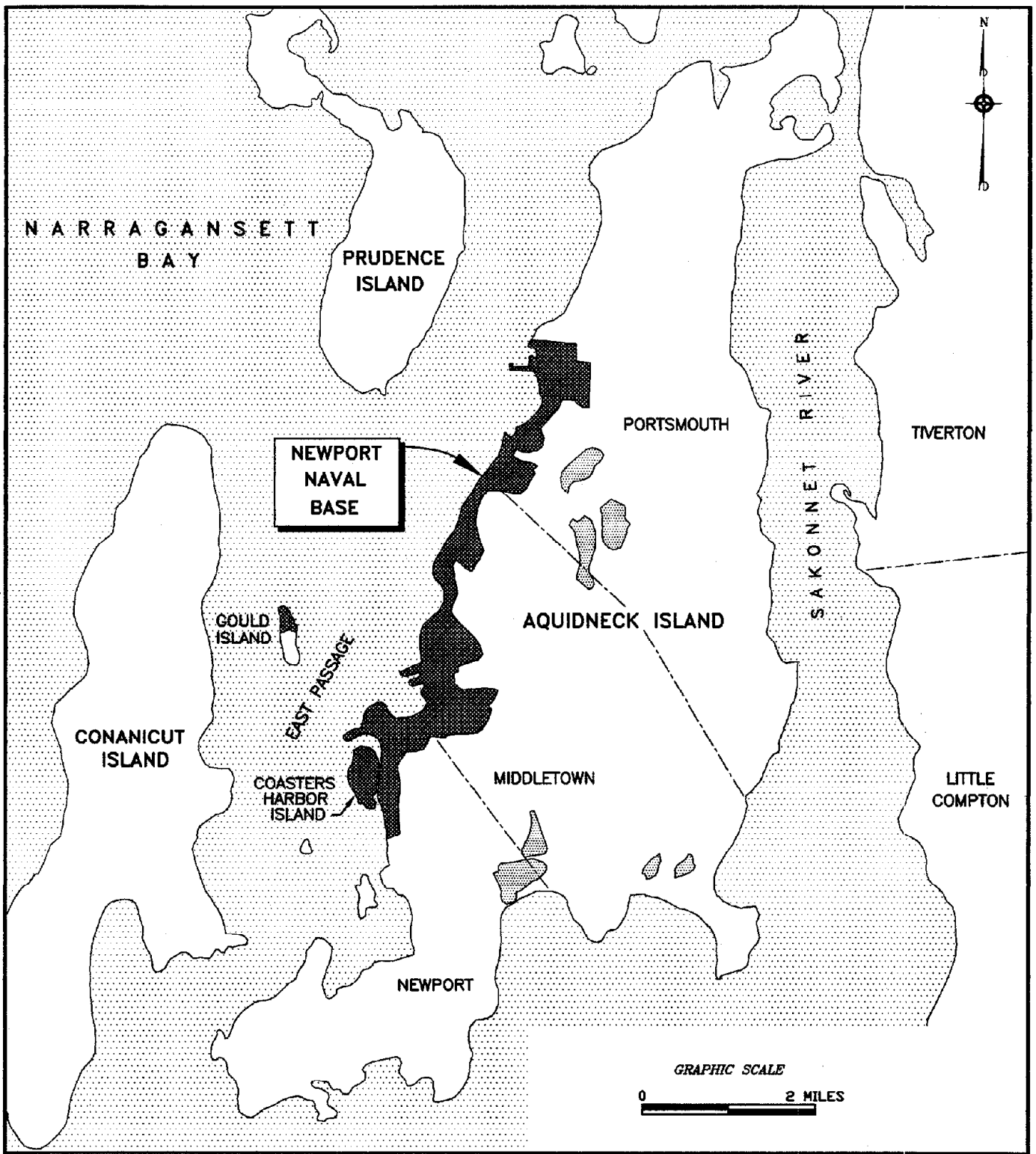
CRITERIA	ALTERNATIVE OS-1: NO ACTION	ALTERNATIVE OS-2: LIMITED ACTION	ALTERNATIVE OS-3: CAPPING	ALTERNATIVE OS-4: REMOVAL AND DISPOSAL
Short-Term Effectiveness:				
Environmental Impacts	Not applicable.	No impacts are anticipated.	Short-term risks (sediment resuspension) associated with site preparation and cap installation would be minimized by use of silt curtains, silt fences, etc. Short-term destruction of existing hard-bottom habitat would be mitigated by assisted natural ecological restoration. Long-term impacts would result from destruction of eelgrass beds. Restoration or replacement of the eelgrass beds may not be possible. Off-site or out-of-kind mitigation may be required.	Short-term risks (sediment resuspension) associated with site preparation and dredging operations would be minimized by use of silt curtains, silt fences, etc. Short-term destruction of existing hard-bottom habitat would be mitigated by natural ecological restoration. Long-term impacts would result from destruction of eelgrass beds. Restoration or replacement of the eelgrass beds may not be possible. Off-site or out-of-kind mitigation may be required.
Time Until RAOs are Achieved	Uncertain.	Uncertain.	Approximately 21 months.	Approximately 14 months.
Implementability:				
Ability to Construct and Operate	Not applicable.	Not applicable.	Underwater cap installation would require significant site preparation and construction efforts. Control of sediment resuspension expected to be accomplished by proper engineering controls. It is unclear whether a cap can be constructed and maintained to provide long-term protection of the environment.	Off-shore dredging implementable using qualified marine contractors and barge-mounted equipment. Control of sediment resuspension expected to be accomplished by proper engineering controls.

TABLE 5-29
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR OFFSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

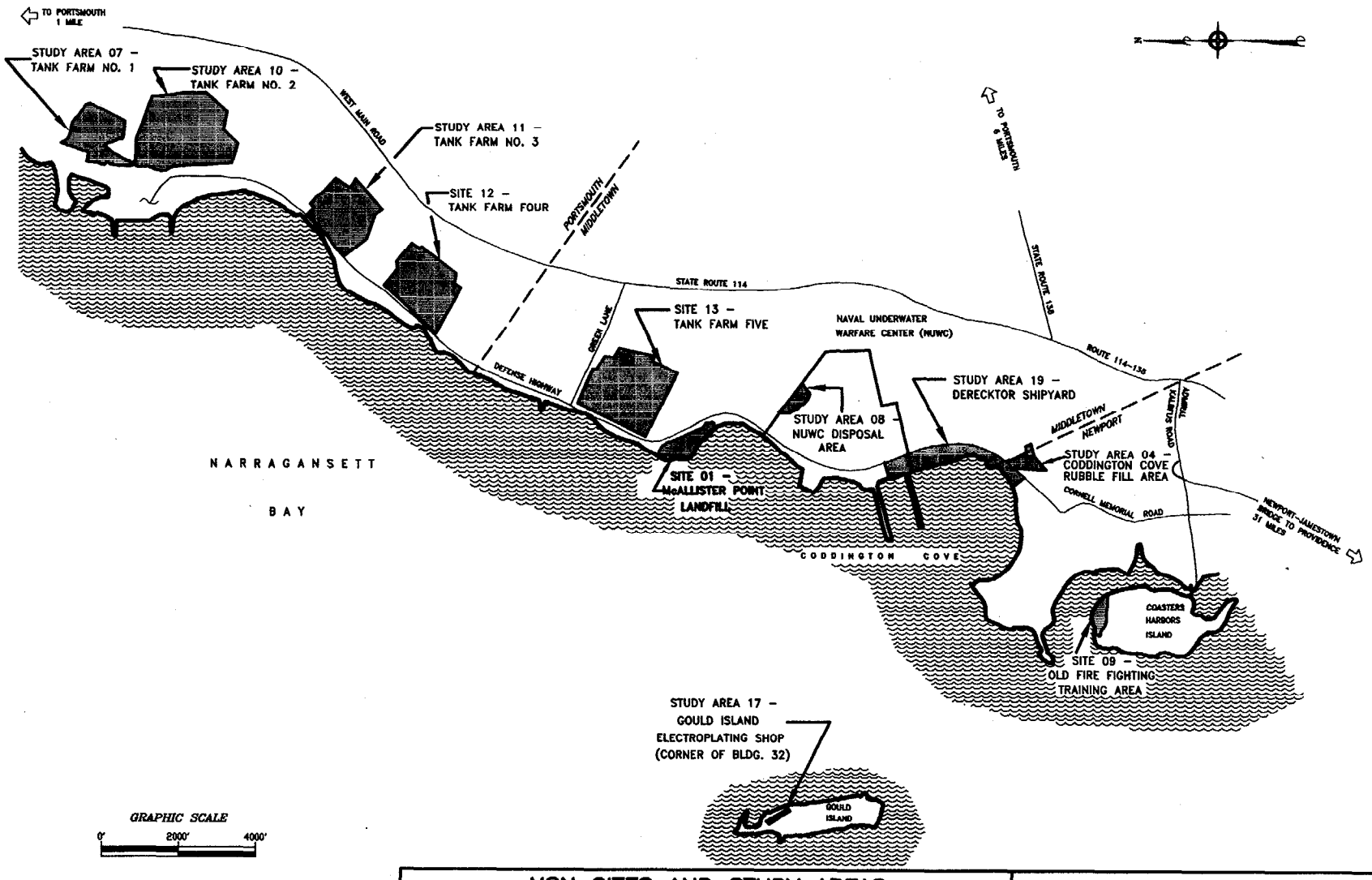
CRITERIA	ALTERNATIVE OS-1: NO ACTION	ALTERNATIVE OS-2: LIMITED ACTION	ALTERNATIVE OS-3: CAPPING	ALTERNATIVE OS-4: REMOVAL AND DISPOSAL
Implementability (cont'd):				
Reliability of Technology	Not applicable.	Not applicable.	Inadequate data are available to predict the long-term effectiveness of the proposed cap. Wave actions and local currents could result in scheduling delays associated with placement of the cap.	Land disposal in an approved facility is widely used and reliable. Wave actions and local currents could result in scheduling delays associated with dredging.
Ease of Undertaking Additional Remedial Action, if Necessary	Would not limit implementation of future remedial action.	Same as OS-1.	Containment features may be impacted if implementation of additional future remedial actions are required. Future action could be easily undertaken if damage of the cap was not a concern.	Same as OS-1.
Ability to Monitor Effectiveness of Remedy	Not applicable.	Able to monitor effectiveness through annual long-term sediment sampling.	Same as OS-2.	Contamination would be removed resulting in no need to monitor.
Ability to Obtain Approvals and Coordinate with Other Agencies	May require minimal coordination between NSN, State, and local agencies (5-year reviews only).	May require minimal coordination between NSN, State, and local agencies (monitoring and 5-year reviews only).	Would require coordination with regulatory agencies regarding marine filling; potential effects on fisheries, endangered species, and the aquatic habitat.	Similar to OS-3, except requires coordination with regulatory agencies for marine dredging, not capping.
Availability of Off-Site TSDF Services and Capacity	Not applicable.	Not applicable.	Not applicable.	May be difficult to find disposal facilities that can accept large volume of marine sediment to be removed.

TABLE 5-29
SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR OFFSHORE LOCATIONS
MARINE SEDIMENT/MANAGEMENT OF MIGRATION
FEASIBILITY STUDY REPORT
McALLISTER POINT LANDFILL, NSN - NEWPORT, RI

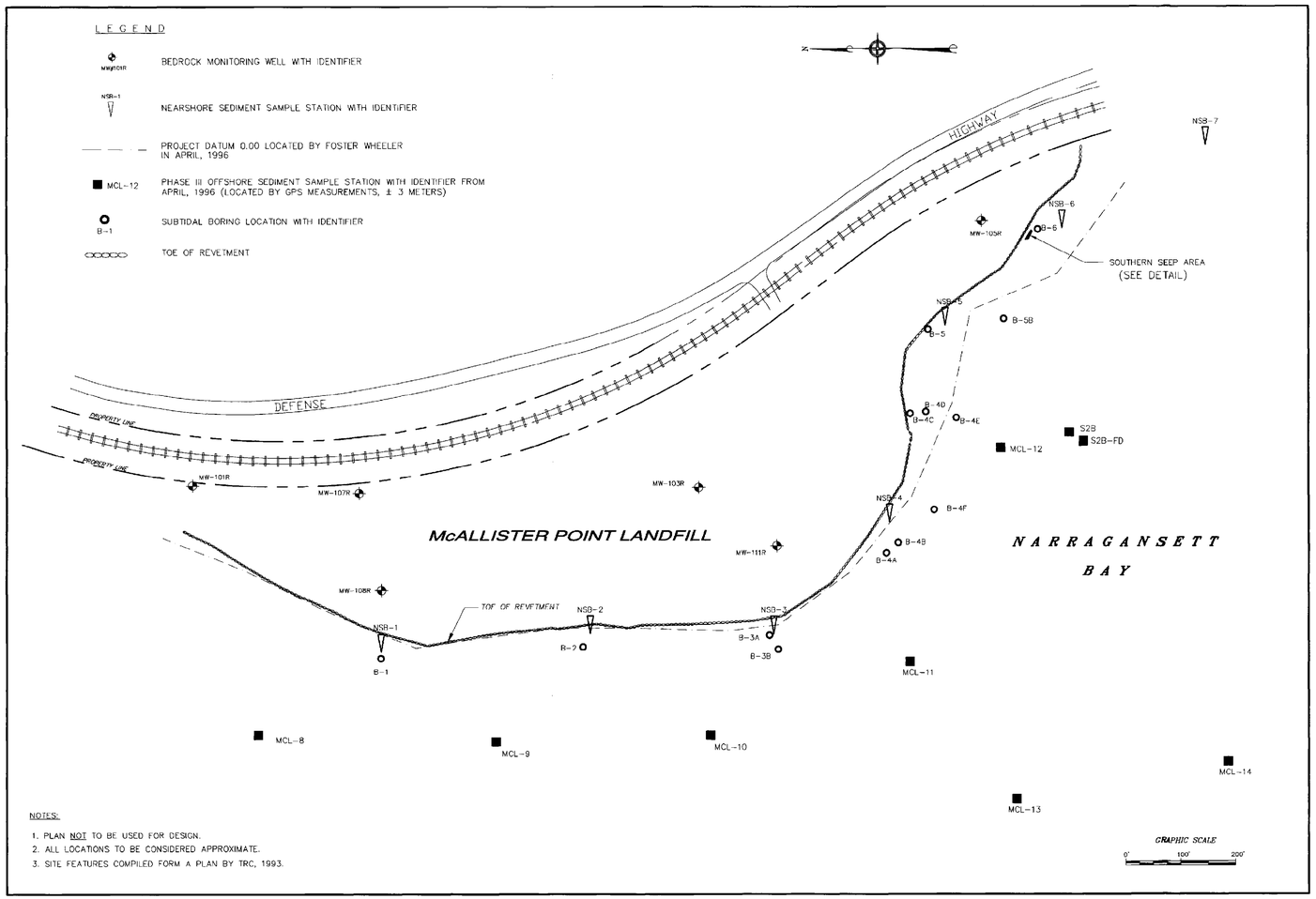
CRITERIA	ALTERNATIVE OS-1: NO ACTION	ALTERNATIVE OS-2: LIMITED ACTION	ALTERNATIVE OS-3: CAPPING	ALTERNATIVE OS-4: REMOVAL AND DISPOSAL
Implementability:				
Availability of Necessary Equipment and Specialists	Not applicable.	Not applicable.	Capping materials readily available from numerous suppliers. Many contractors available with general marine dredging, grading, and erosion control experience. Fewer available with underwater capping experience or training in hazardous waste site operations.	Many contractors available with general marine dredging experience for barge-mounted dredging operations. Fewer available with training in hazardous waste site operations
Availability of Prospective Technologies	Not applicable.	Not applicable.	Available.	Readily available.
Cost:				
Capital	0	0	$20,246,000	$43,994,000
O&M	$21,500/5 yr	$110,200 (yrs 1-5 and 5 yr intervals)	$110,200 (yrs 1-5 and 5 yr intervals)	$19,440 (yrs 1, 2, and 5)
Five Year Reviews	$21,500/5 yr	$21,500/5 yr	$21,500/5 yr	0
NET PRESENT WORTH	**$46,000**	**$657,000**	**$20,904,000**	**$44,043,000**
SENSITIVITY ANALYSIS				
NPW Sensitivity: +30% Area/Volume	No Change	No Change	$26,357,000	$56,752,000
NPW Sensitivity: -30% Area/Volume	No Change	No Change	$15,450,000	$31,335,000



SITE LOCUS			FIGURE 1–1
NAVAL STATION NEWPORT			TETRA TECH NUS, INC.
NEWPORT, RHODE ISLAND			55 Jonspin Road Wilmington, MA 01887 (978)658–7899
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	S. PARKER	DATE:	FEBRUARY 04, 1999
SCALE:	AS NOTED	ACAD NAME:	C:\DWG\NAVY\MC_PT\SITE_LOC

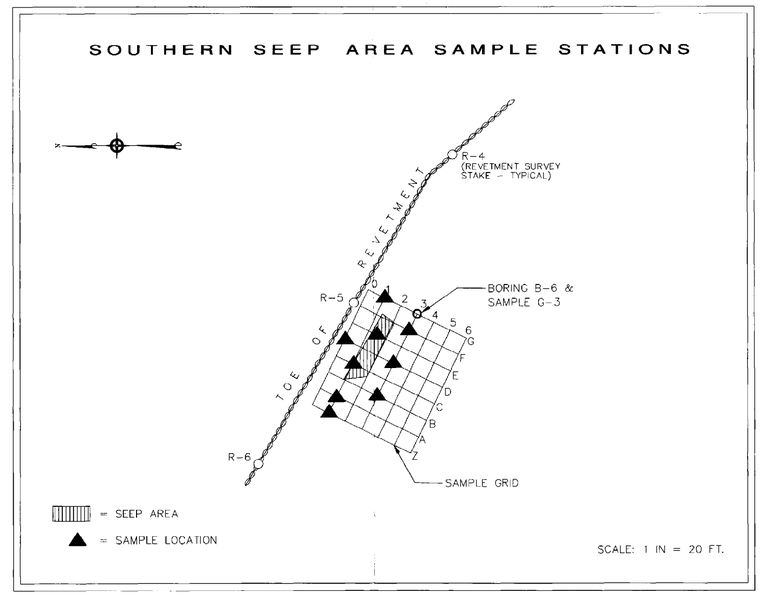


NSN SITES AND STUDY AREAS			FIGURE 1–2
McALLISTER POINT LANDFILL			
NAVAL STATION NEWPORT – NEWPORT, RHODE ISLAND			TETRA TECH NUS, INC.
DRAWN BY:	D.W. MACDOUGALL	REV.: 0	55 Jonspin Road Wilmington, MA 01887 (978)658–7899
CHECKED BY:	P. SVETAKA	DATE: JANUARY 04, 1999	
SCALE:	AS NOTED	FILE NO.: C:\DWG\NAVY\MC_PT\SITE_MAP	



NOTES:

1. PLAN NOT TO BE USED FOR DESIGN.
2. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
3. SITE FEATURES COMPILED FORM A PLAN BY TRC, 1993.



D E T A I L

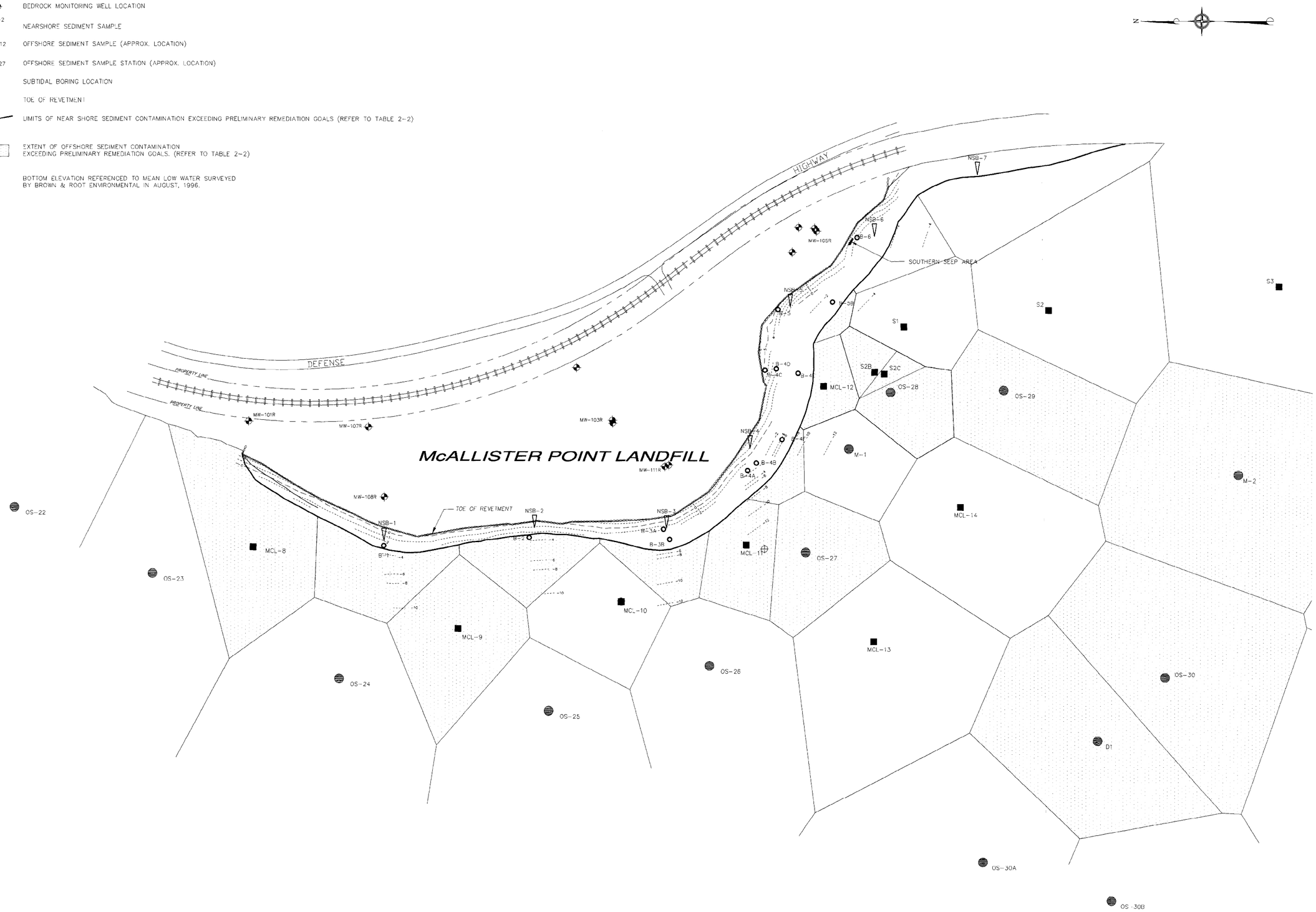
NOTES:

1. PLAN NOT TO BE USED FOR DESIGN.
2. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.

DRAWN BY: R.G. DEWSNAP	TITLE: SITE MAP McALLISTER POINT LANDFILL NEWPORT, RHODE ISLAND		TETRA TECH NUS, INC.
PREPARED BY: S. PARKER			
CHECKED BY: S. PARKER			
	SOURCE: BASE PLAN BY: SAI SURVEYING CO., JAMESTOWN, RI, DATED: 11/06/96		55 JONSPIN ROAD WILMINGTON, MASSACHUSETTS 01887 (978)658-7899
	SCALE: AS SHOWN	DATE: OCTOBER 1, 1998	PROJ. NO: 5278 CTO: 218
PROJECT MANAGER: D. McKENNA	DRAWING NO: 1-3	ACFILE NAME: C:\DWG\NAVY\MC_PT\SO_SEEP.DWG	REV: 0
PROGRAM MANAGER: J. TREPANOWSKI			

LEGEND

MW-103R	BEDROCK MONITORING WELL LOCATION
NSB-2	NEARSHORE SEDIMENT SAMPLE
MCL-12	OFFSHORE SEDIMENT SAMPLE (APPROX. LOCATION)
OS-27	OFFSHORE SEDIMENT SAMPLE STATION (APPROX. LOCATION)
B-2	SUBTIDAL BORING LOCATION
	TOE OF REVETMENT
	LIMITS OF NEAR SHORE SEDIMENT CONTAMINATION EXCEEDING PRELIMINARY REMEDIATION GOALS (REFER TO TABLE 2-2)
	EXTENT OF OFFSHORE SEDIMENT CONTAMINATION EXCEEDING PRELIMINARY REMEDIATION GOALS. (REFER TO TABLE 2-2)
— — 0 — —	BOTTOM ELEVATION REFERENCED TO MEAN LOW WATER SURVEYED BY BROWN & ROOT ENVIRONMENTAL IN AUGUST, 1996.



GRAPHIC SCALE

100 0 100 200 300

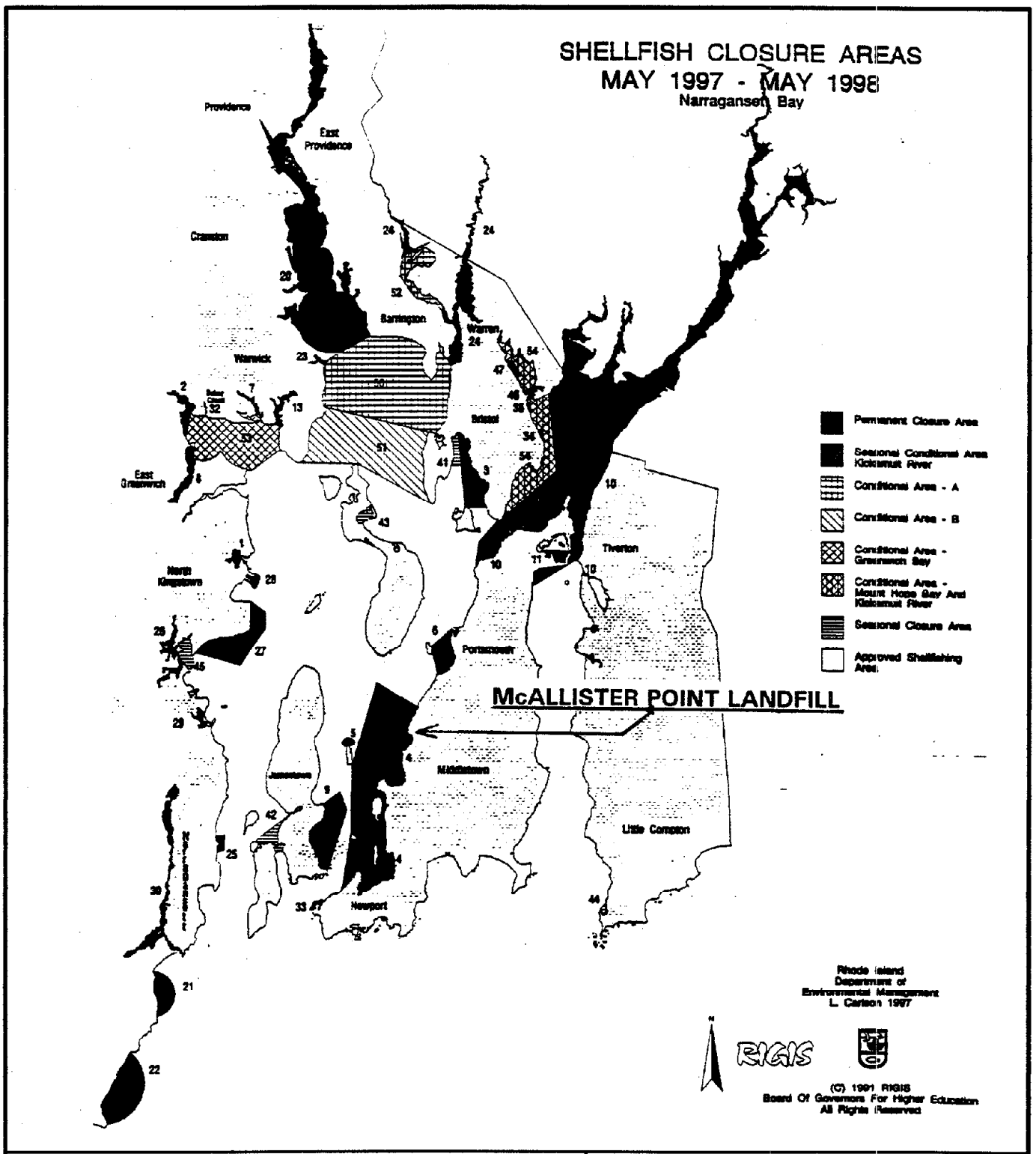
1 INCH = 100 FEET

NOTES:

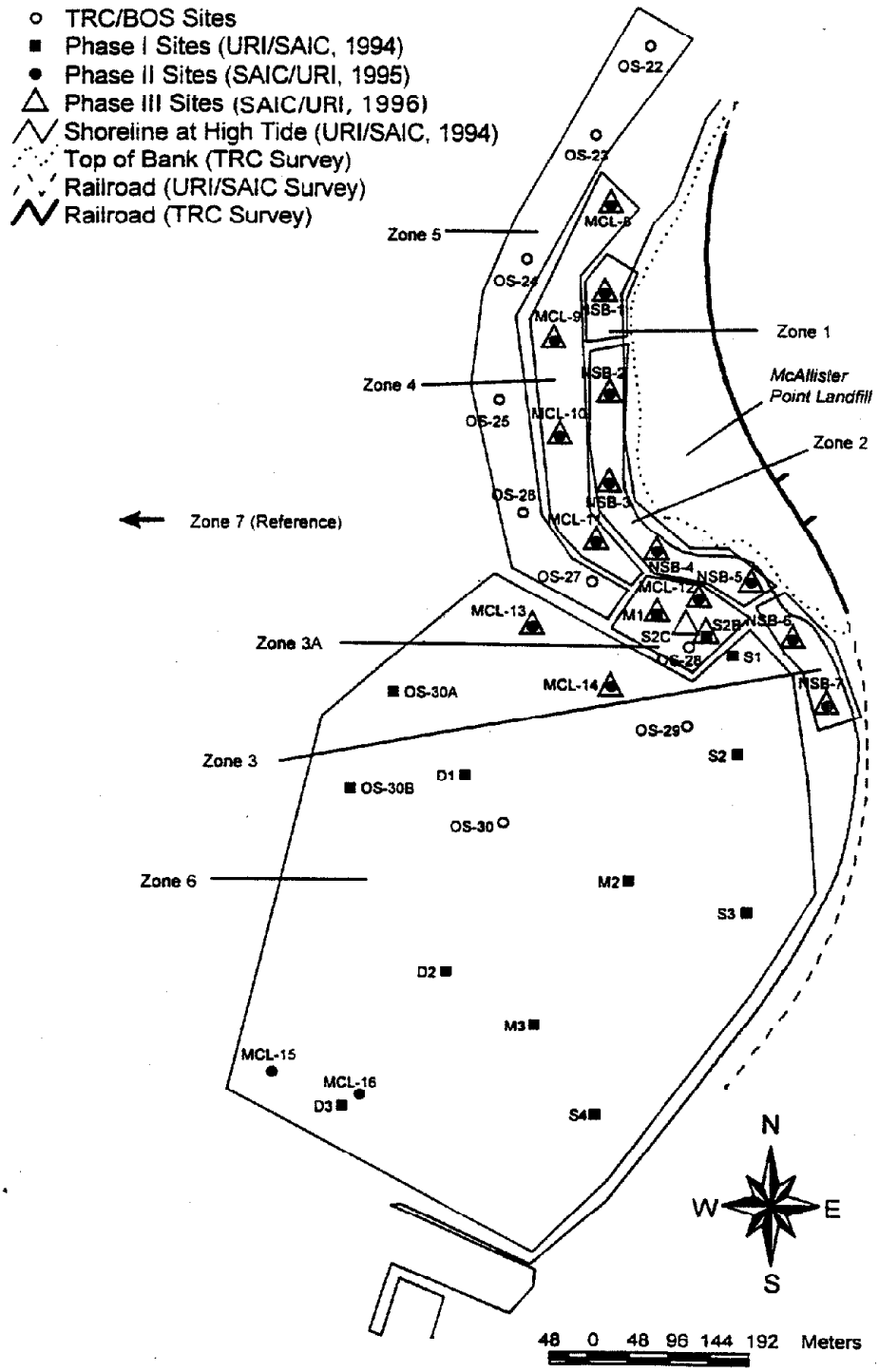
1. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. SITE FEATURES ADAPTED AND COMPILED FROM A PLAN BY TRC, 1993.

DRAWN BY: R.G. DEWSNAP	TITLE: SHORELINE TOPOGRAPHY McALLISTER POINT FEASIBILITY STUDY NEWPORT, RHODE ISLAND
PREPARED BY: G.H. BULLARD	
CHECKED BY: D. McKENNA	
	SOURCE: BASE PLAN BY SAI SURVEYING CO., JAMESTOWN, RI, DATED: 11/06/96
	SCALE: 1" = 100' / DATE: OCTOBER 01, 1998 / PROJ. NO: 5278 CTO: 218
PROJECT MANAGER: D. McKENNA	DRAWING NO: 1-4 / ACFILE NAME: DWG\NAVY\MC_PTVS\SH_TOPO.DWG / REV. 0
PROGRAM MANAGER: J. TREPANOWSKI	

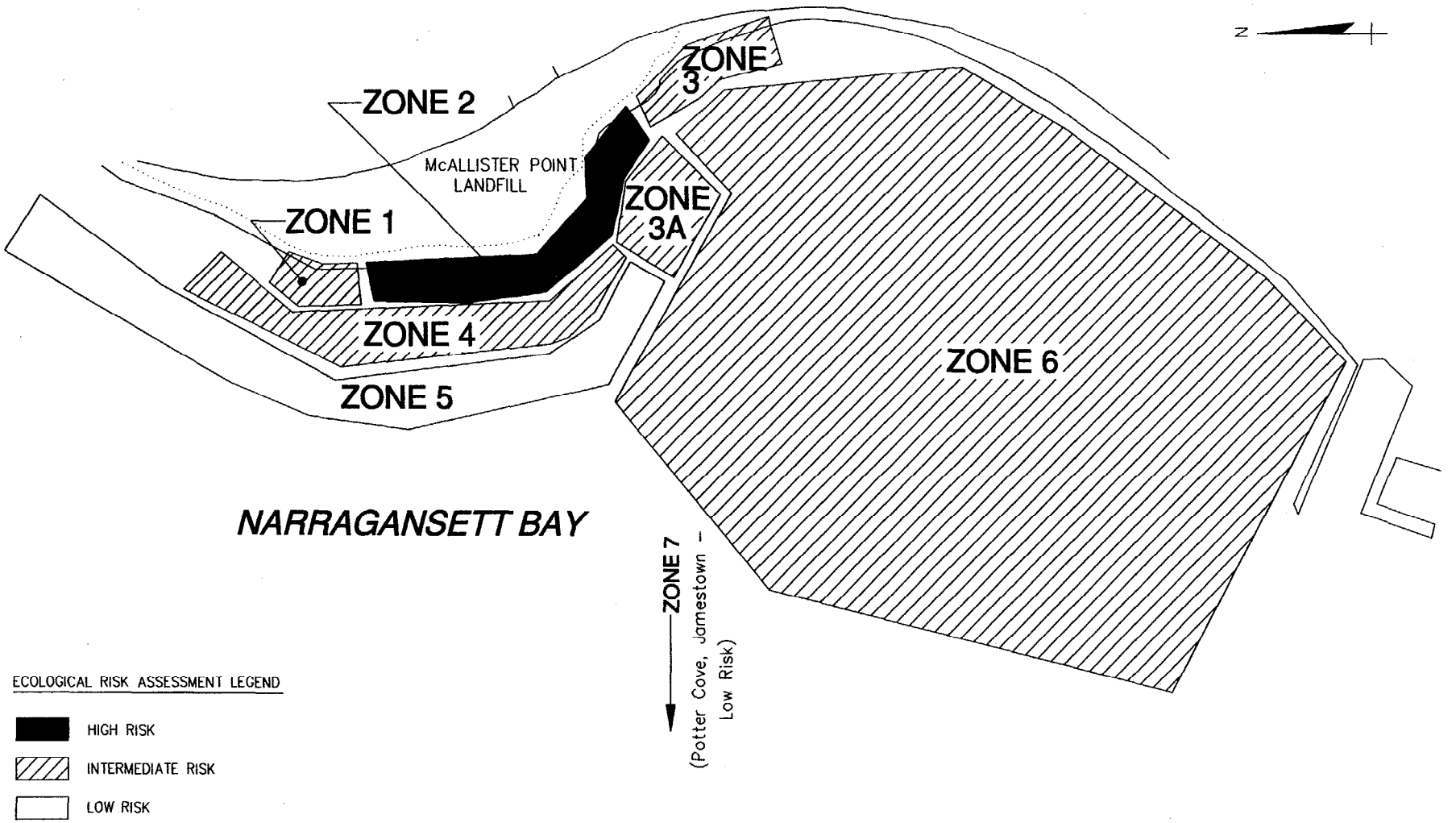
TETRA TECH NUS, INC.
55 JONSPIN ROAD
WILMINGTON, MASSACHUSETTS 01887
(978)658-7899



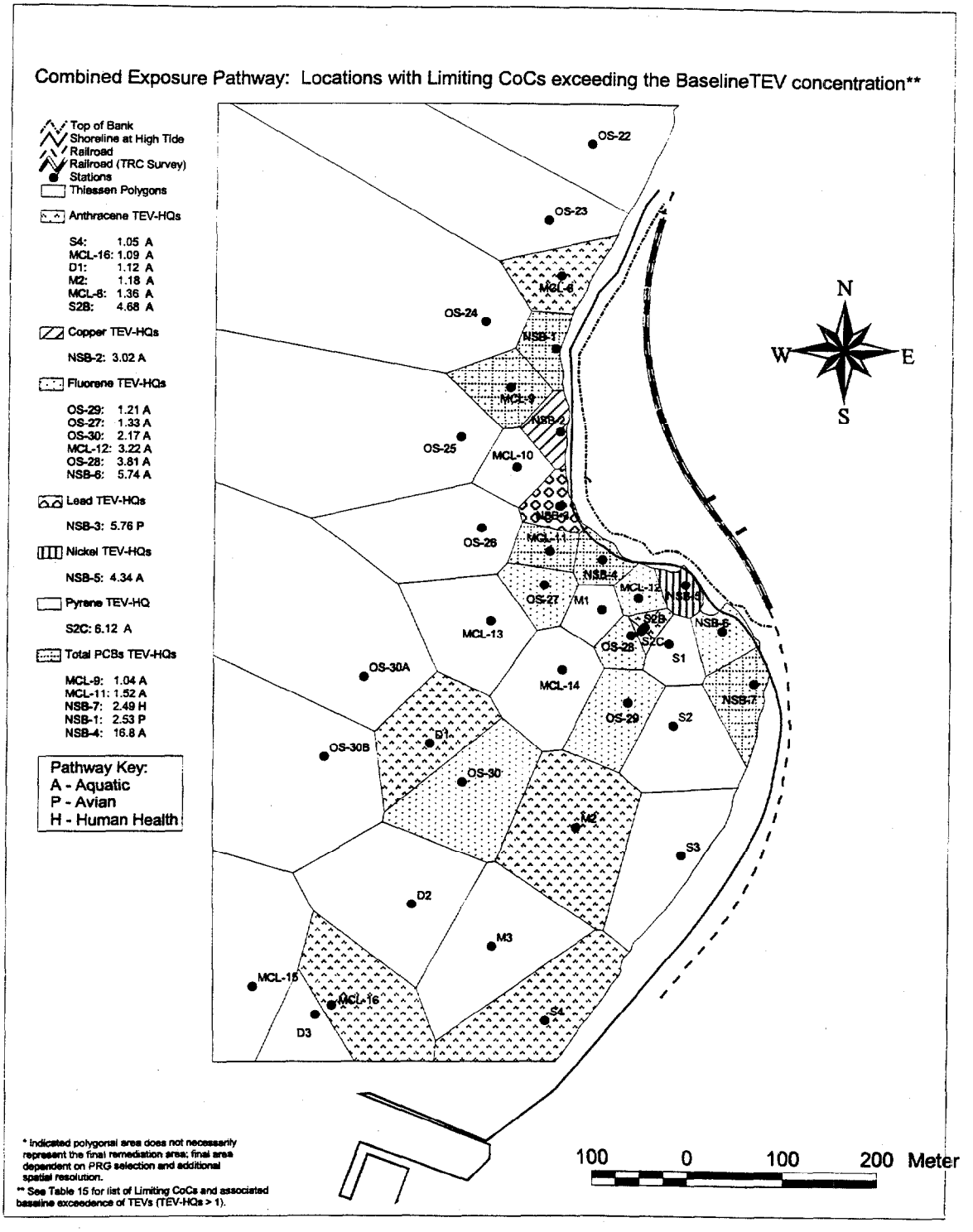
RIDEM SHELLFISH CLOSURE AREAS	FIGURE 1-5
McALLISTER POINT FEASIBILITY STUDY	TETRA TECH NUS, INC.
NEWPORT, RHODE ISLAND	
DRAWN BY: R.G. DEWSNAP — REV.: 0	
CHECKED BY: D. McKENNA — DATE: 1 OCT 98	55 Jonspin Road Wilmington, MA 01887 (978)658-7899
SCALE: 1" = 100' — ACAD NAME: DWG\NAVY\MC_PT\FS\CLOSAREA.DWG	



RISK ASSESSMENT ZONES				FIGURE 1-6
McALLISTER POINT FEASIBILITY STUDY				TETRA TECH NUS, INC.
NEWPORT, RHODE ISLAND				55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	R.G. DEWSNAP	REV.:	0	
CHECKED BY:	D. McKENNA	DATE:	02 OCT 98	
SCALE:	NONE	ACAD NAME:	DWG\NAVY\MC_PT\FS\RISKZONE.DWG	

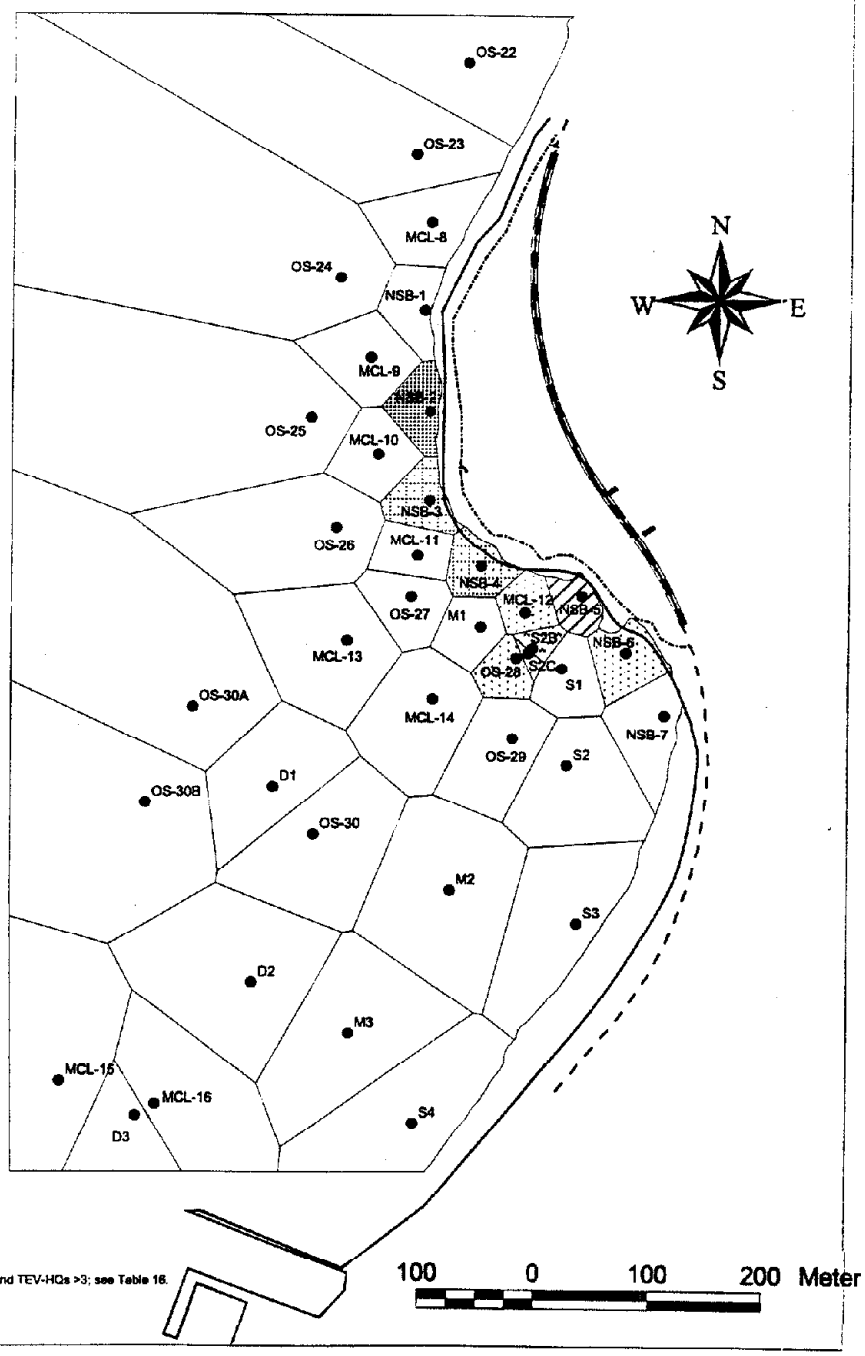


SUMMARY OF ECOLOGICAL RISK BY ZONE				FIGURE 1-7
McALLISTER POINT FEASIBILITY STUDY				TETRA TECH NUS, INC.
NETC – NEWPORT, RI				55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	R.G. DEWSNAP	REV.:	0	
CHECKED BY:	D. McKENNA	DATE:	OCTOBER 02, 1998	
SCALE:	NO SCALE	FILE NO.:	DWG\NAVY\MC_PT\FS\MC_PTSUM.DWG	



AREAS EXCEEDING BASELINE PRGs	FIGURE 2-1
McALLISTER POINT FEASIBILITY STUDY	
NEWPORT, RHODE ISLAND	TETRA TECH NUS, INC.
Source: Preliminary Remediation Goals for NETC McAllister Point Landfill SAIC Corp., May, 1998	REV.: 0 DATE: 02 OCT 98 ACAD NAME: DWG\NAVY\MC_PT\FS\TEV_HQ1.DWG
	55 Jonspin Road Wilmington, MA 01887 (978)658-7899

Combined Exposure Pathway: Locations with Limiting CoCs exceeding the Recommended TEV concentration**



* Indicated polygonal area does not necessarily represent the final remediation area; final area dependent on PRG selection and additional spatial resolution.

**Data reflects the Recommended Limiting CoCs and TEV-HQs >3; see Table 16.

AREAS EXCEEDING RECOMMENDED PRGs	FIGURE 2-2
McALLISTER POINT FEASIBILITY STUDY	
NEWPORT, RHODE ISLAND	TETRA TECH NUS, INC.
Source: Preliminary Remediation Goals for NETC McAllister Point Landfill SAIC Corp., May, 1998	REV.: 0 DATE: 02 OCT 98 ACAD NAME: DWG\NAVY\MC_PT\FS\TEV_HQ3.DWG
	55 Jonspin Road Wilmington, MA 01887 (978)658-7899

LEGEND

- MW-103R — BEDROCK MONITORING WELL LOCATION
- NSB-2 — NEARSHORE SEDIMENT SAMPLE
- MCL-12 — OFFSHORE SEDIMENT SAMPLE (APPROX. LOCATION)
- OS-27 — OFFSHORE SEDIMENT SAMPLE STATION (APPROX. LOCATION)
- B-2 — SUBTIDAL BORING LOCATION
- TOE OF REVETMENT
- NEARSHORE AREA – SEDIMENT CONTAMINATION EXCEEDING BASELINE AND RECOMMENDED PRGs (REFER TO TABLE 2-2)
- ELEVATED-RISK OFFSHORE AREA – SEDIMENT CONTAMINATION EXCEEDING BASELINE AND RECOMMENDED PRGs (REFER TO TABLE 2-2)
- OFFSHORE AREA WITH SEDIMENT CONTAMINATION EXCEEDING BASELINE PRGs ONLY (REFER TO TABLE 2-2)
- OFFSHORE AREA NOT EXCEEDING PRGs

NOTES:

1. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. SITE FEATURES ADAPTED AND COMPILED FROM A PLAN BY TRC, 1993.

GRAPHIC SCALE

150' 0' 150' 300'

1 INCH = 150 FEET

DRAWN BY: D.W. MACDOUGALL	TITLE: SEDIMENT CONTAMINATION AREAS McALLISTER POINT LANDFILL NEWPORT, RHODE ISLAND
PREPARED BY: P. SVETAKA	SOURCE: BASE PLAN BY SAI SURVEYING CO., JAMESTOWN, RI, DATED: 11/06/96
CHECKED BY: D. McKENNA	SCALE: 1" = 150' / DATE: OCTOBER 02, 1998 / PROJ. NO: 5278 CTO: 218
PROJECT MANAGER: D. McKENNA	DRAWING NO: 2-3 / ACFILE NAME: DWG\NAVY\MC_PT\FS\FIG_2-3.DWG / REV: 1
PROGRAM MANAGER: J. TREPANOWSKI	

TETRA TECH NUS, INC.
55 JONSPIN ROAD
WILMINGTON, MASSACHUSETTS 01887
(978)658-7899

LEGEND

MW-103R — BEDROCK MONITORING WELL LOCATION

NSB-2 — NEARSHORE SEDIMENT SAMPLE

S2C-FD — OFFSHORE SEDIMENT SAMPLE (APPROX. LOCATION)

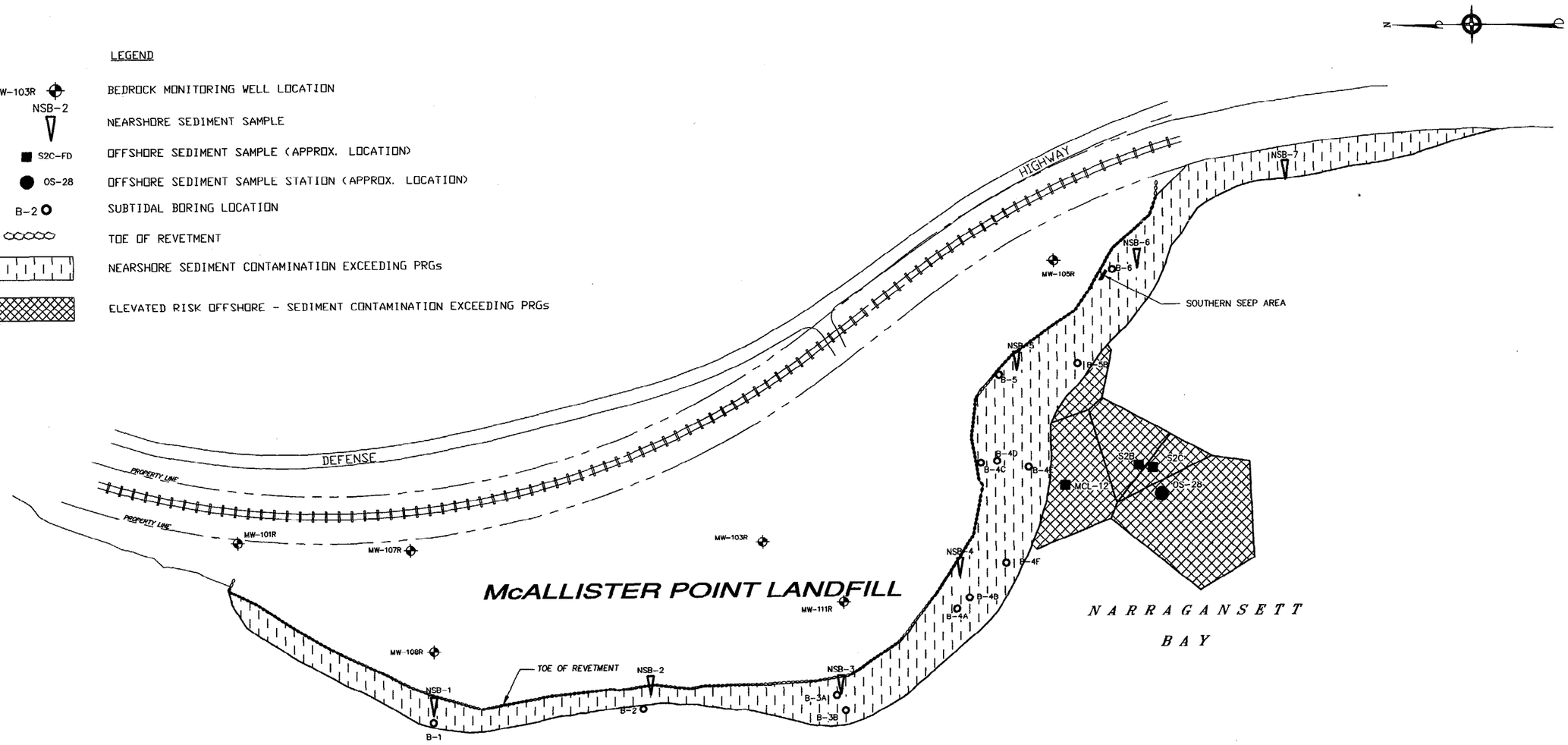
OS-28 — OFFSHORE SEDIMENT SAMPLE STATION (APPROX. LOCATION)

B-2 — SUBTIDAL BORING LOCATION

TOE OF REVETMENT

NEARSHORE SEDIMENT CONTAMINATION EXCEEDING PRGs

ELEVATED RISK OFFSHORE - SEDIMENT CONTAMINATION EXCEEDING PRGs



NOTES:

1. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. SITE FEATURES ADAPTED AND COMPILED FROM A PLAN BY TRC, 1993.

GRAPHIC SCALE

0' 200' 400'

1 INCH = 200 FEET

NEARSHORE/ ELEVATED RISK OFFSHORE: AREAL EXTENT OF SEDIMENT CONTAMINATION			FIGURE 4-1
McALLISTER POINT LANDFILL			TETRA TECH NUS, INC.
NEWPORT, RHODE ISLAND			55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY: R.G. DEWSNAP	REV.: 3		
CHECKED BY: P. SVETAKA / G. BULLARD	DATE: 02 OCT 98		
SCALE: 1" = 200'	FILE NO.: \DWG\NAVY\MC_PT\FS\EL_RISK.DWG		

00112LB32

LEGEND

MW-103R — BEDROCK MONITORING WELL LOCATION

NSB-2 — NEARSHORE SEDIMENT SAMPLE

MCL-12 — OFFSHORE SEDIMENT SAMPLE (APPROX. LOCATION)

OS-28 — OFFSHORE SEDIMENT SAMPLE STATION (APPROX. LOCATION)

B-2 — SUBTIDAL BORING LOCATION

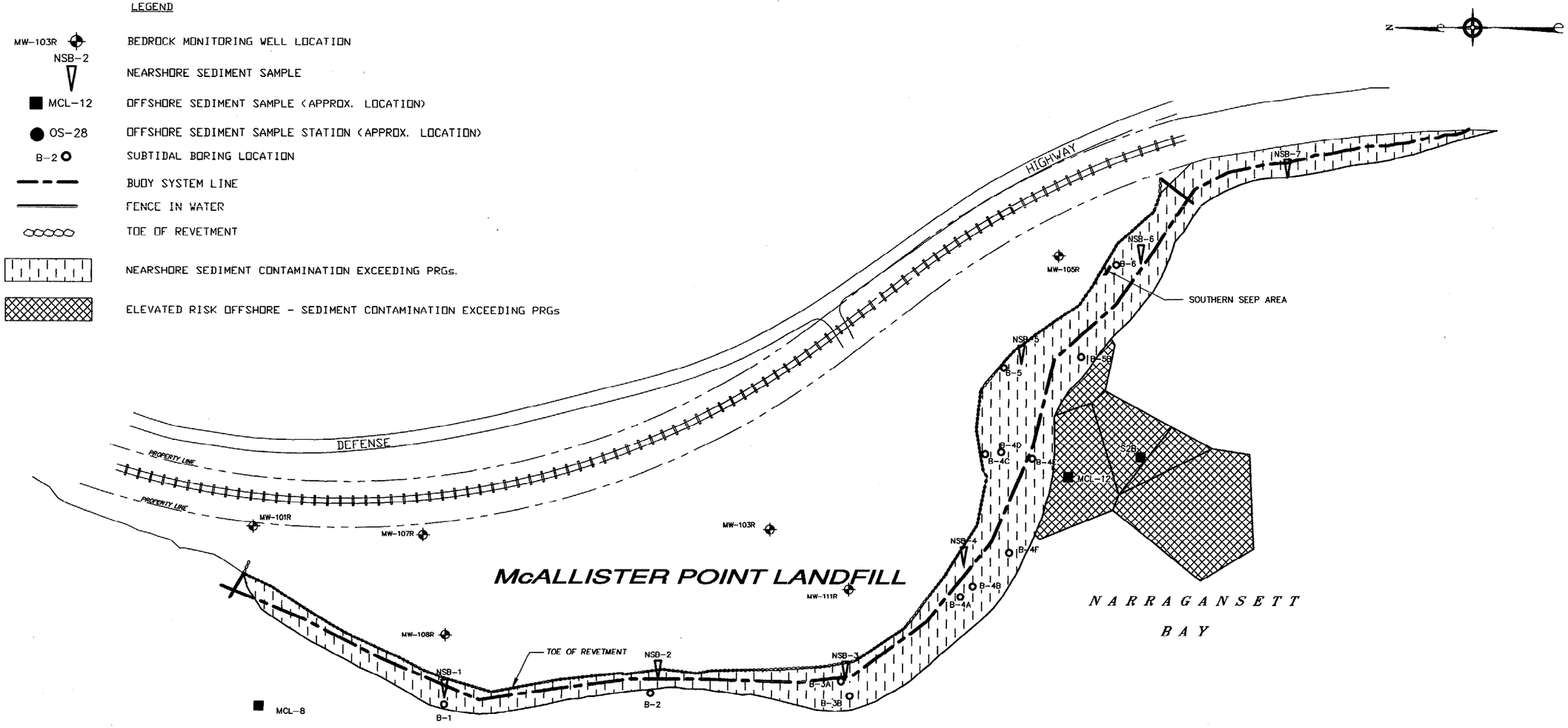
BUOY SYSTEM LINE

FENCE IN WATER

TOE OF REVETMENT

NEARSHORE SEDIMENT CONTAMINATION EXCEEDING PRGs.

ELEVATED RISK OFFSHORE - SEDIMENT CONTAMINATION EXCEEDING PRGs



NOTES:

1. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. SITE FEATURES ADAPTED AND COMPILED FROM A PLAN BY TRC, 1993.

GRAPHIC SCALE

0' 200' 400'

1 INCH = 200 FEET

ALTERNATIVE NS/ ER-2: FENCING & USE RESTRICTION MARKINGS	FIGURE 4-2
McALLISTER POINT LANDFILL	TETRA TECH NUS, INC.
NEWPORT, RHODE ISLAND	55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY: R.G. DEWSNAP / REV.: 2	
CHECKED BY: P. SVETAKA / G. BULLARD / DATE: 02 OCT 98	
SCALE: 1" = 200' / FILE NO.: \DWG\NAVY\MC_PT\FS\ALT_NS2.DWG	

LEGEND

MW-103R — BEDROCK MONITORING WELL LOCATION

NSB-2 — NEARSHORE SEDIMENT SAMPLE

MCL-12 — OFFSHORE SEDIMENT SAMPLE (APPROX. LOCATION)

OS-28 — OFFSHORE SEDIMENT SAMPLE STATION (APPROX. LOCATION)

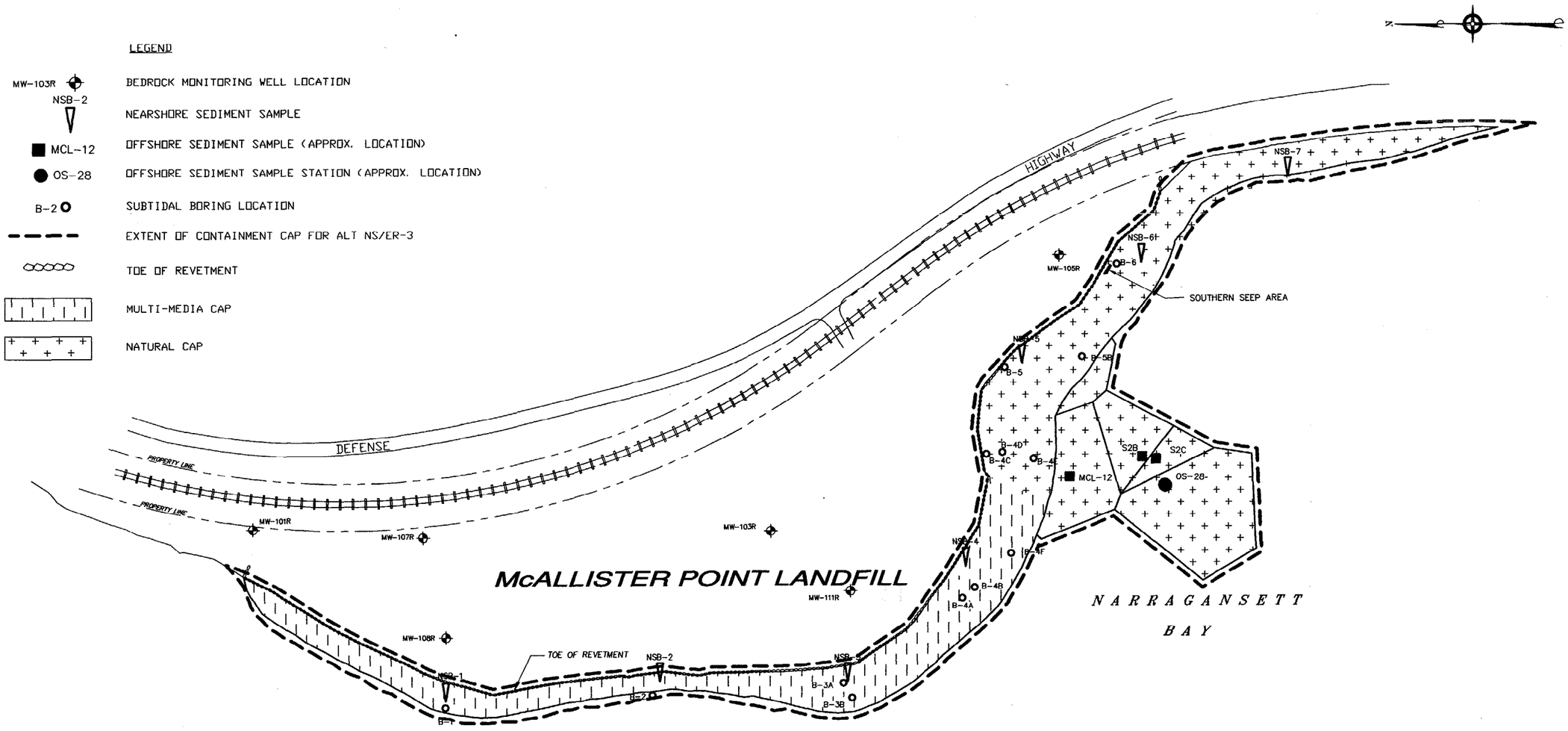
B-2 — SUBTIDAL BORING LOCATION

EXTENT OF CONTAINMENT CAP FOR ALT NS/ER-3

TOE OF REVETMENT

MULTI-MEDIA CAP

NATURAL CAP



NOTES:

1. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. SITE FEATURES ADAPTED AND COMPILED FROM A PLAN BY TRC, 1993.

GRAPHIC SCALE

0' 200' 400'

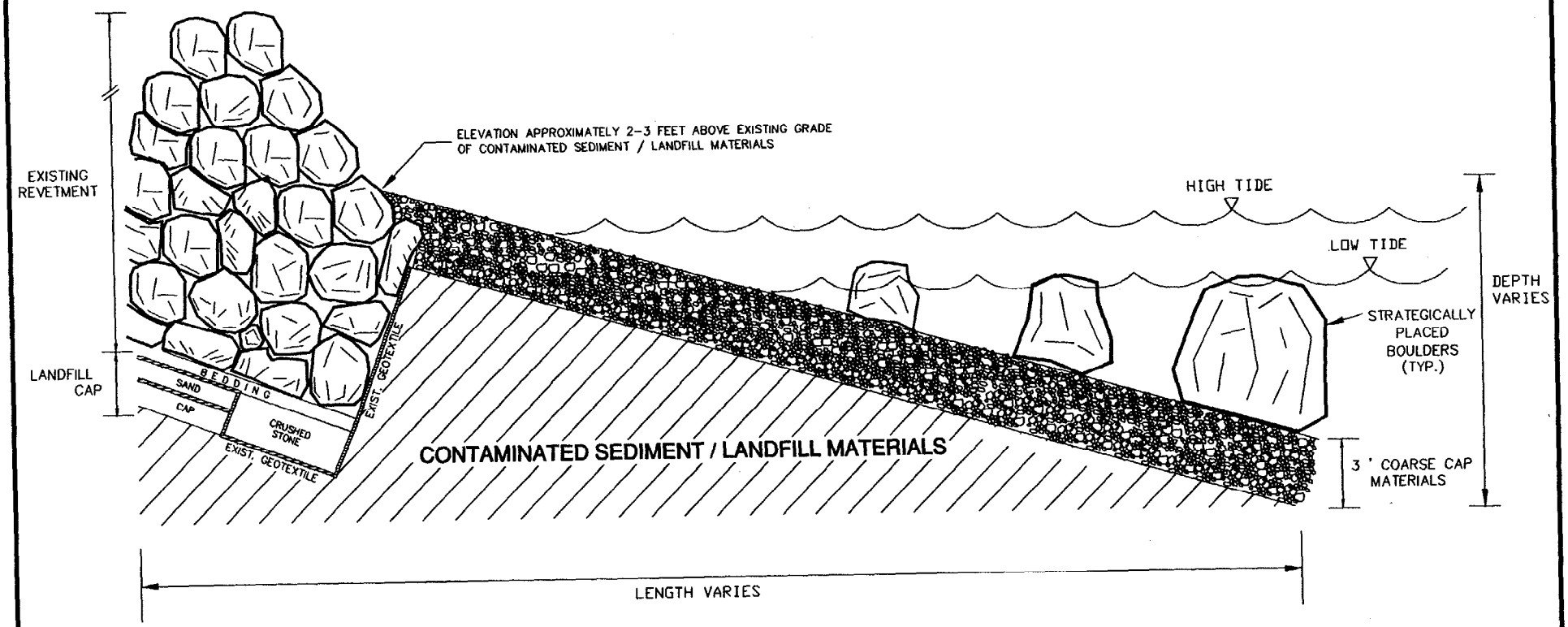
1 INCH = 200 FEET

ALTERNATIVE NS/ER-3 – LIMITS OF NATURAL AND MULTI-MEDIA CAPS			
McALLISTER POINT LANDFILL			
NEWPORT, RHODE ISLAND			
DRAWN BY:	R.G. DEWSNAP	REV.:	1
CHECKED BY:	P. SVETAKA	DATE:	02 OCT 98
SCALE:	1" = 200'	FILE NO.:	\DWG\NAVY\MC_PT\FS\ALT_NS3.DWG

FIGURE 4-3

TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658-7899



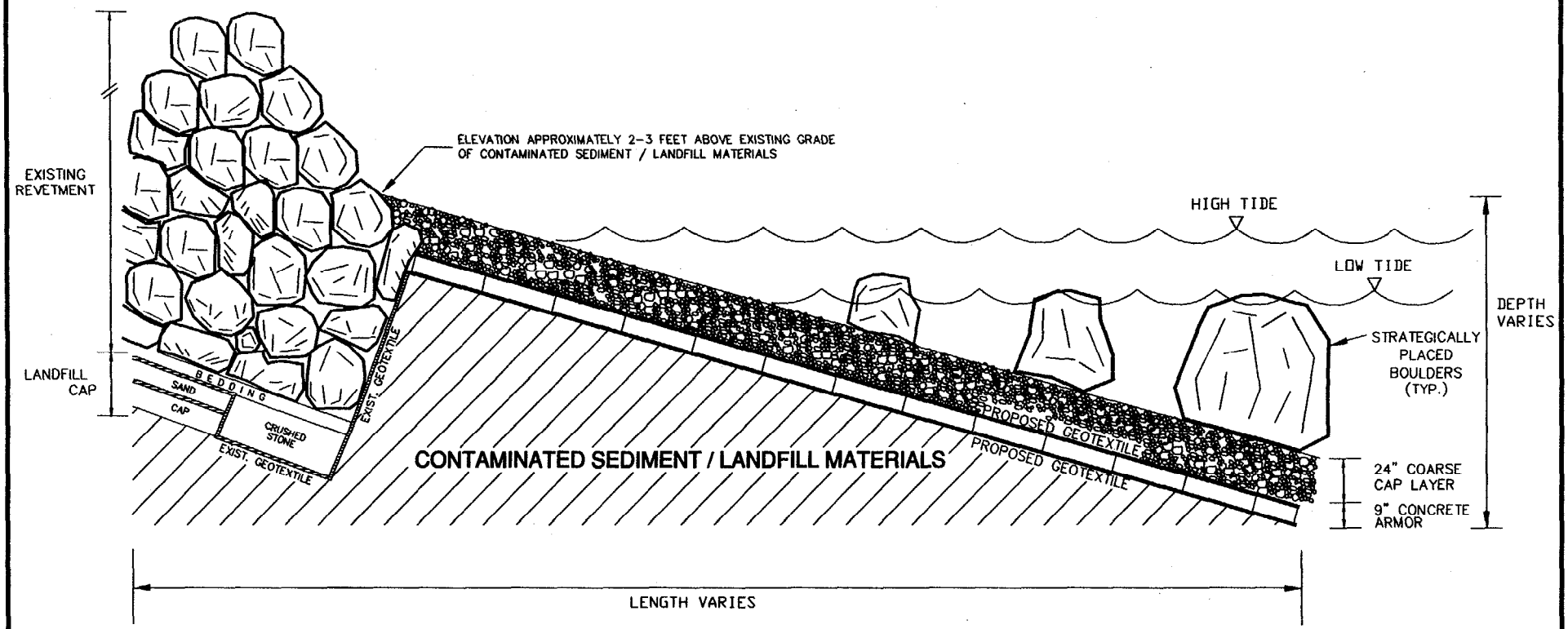
NOTES:

1. COARSE CAP MATERIALS (3') IS COMPOSED OF COARSE SAND, GRAVEL, AND ROCK, SIMILAR TO EXISTING SUBSTRATE BUT WITH 10 – 20% COARSER COMPONENTS TO RESIST EROSION.

ALTERNATIVE NS/ER-3			
NATURAL CAP CROSS-SECTION			
McALLISTER POINT LANDFILL			
NETC – NEWPORT, RHODE ISLAND			
DRAWN BY:	R. G. DEWSNAP	REV.:	0
CHECKED BY:	D. McKENNA	DATE:	02 OCT 98
SCALE:	NOT TO SCALE	FILE NO.:	c:\DWG\NAVY\MC_PT\CAPPING\NAT_CAP.DWG

FIGURE 4-4

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899



NOTES:

1. COARSE CAP LAYER (24") IS COMPOSED OF COARSE SAND, GRAVEL, AND ROCK, SIMILAR TO EXISTING SUBSTRATE BUT WITH 10 - 20% COARSER COMPONENTS TO RESIST EROSION.

ALTERNATIVE NS/ER-3			FIGURE 4-5
MULTI-MEDIA CAP CROSS SECTION			
McALLISTER POINT LANDFILL			
NETC - NEWPORT, RHODE ISLAND			
DRAWN BY:	R. G. DEWSNAP	REV.:	0
CHECKED BY:	D. McKENNA	DATE:	02 OCT 98
SCALE:	NOT TO SCALE	FILE NO.: C:\DWG\NAVY\MC_PT\CAPPING\NS_MMCAP.DWG	

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899

LEGEND

MW-103R — BEDROCK MONITORING WELL LOCATION

NSB-2 — NEARSHORE SEDIMENT SAMPLE

MCL-12 — OFFSHORE SEDIMENT SAMPLE (APPROX. LOCATION)

OS-28 — OFFSHORE SEDIMENT SAMPLE STATION (APPROX. LOCATION)

B-2 — SUBTIDAL BORING LOCATION

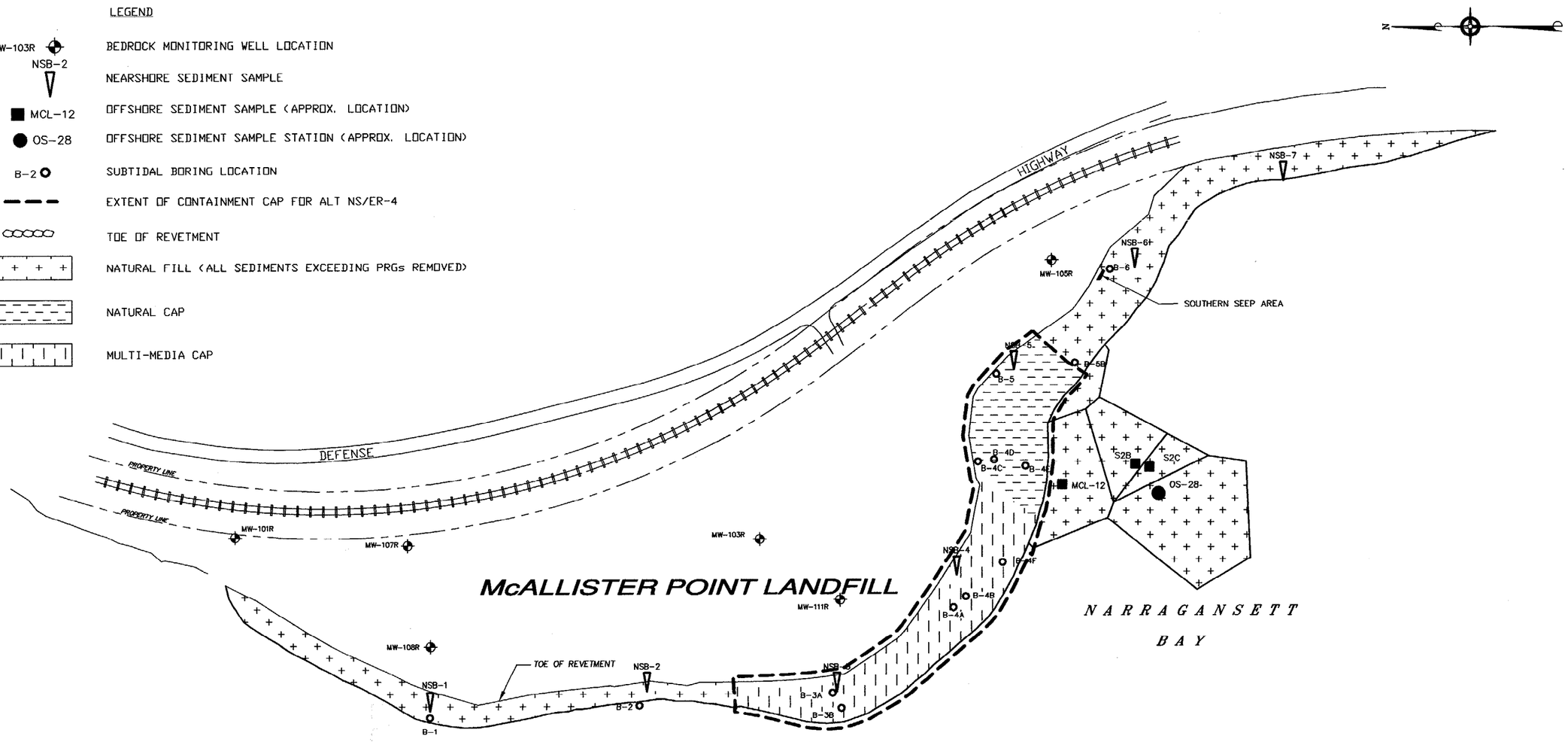
EXTENT OF CONTAINMENT CAP FOR ALT NS/ER-4

TOE OF REVETMENT

NATURAL FILL (ALL SEDIMENTS EXCEEDING PRGs REMOVED)

NATURAL CAP

MULTI-MEDIA CAP



NOTES:

1. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. SITE FEATURES ADAPTED AND COMPILED FROM A PLAN BY TRC, 1993.

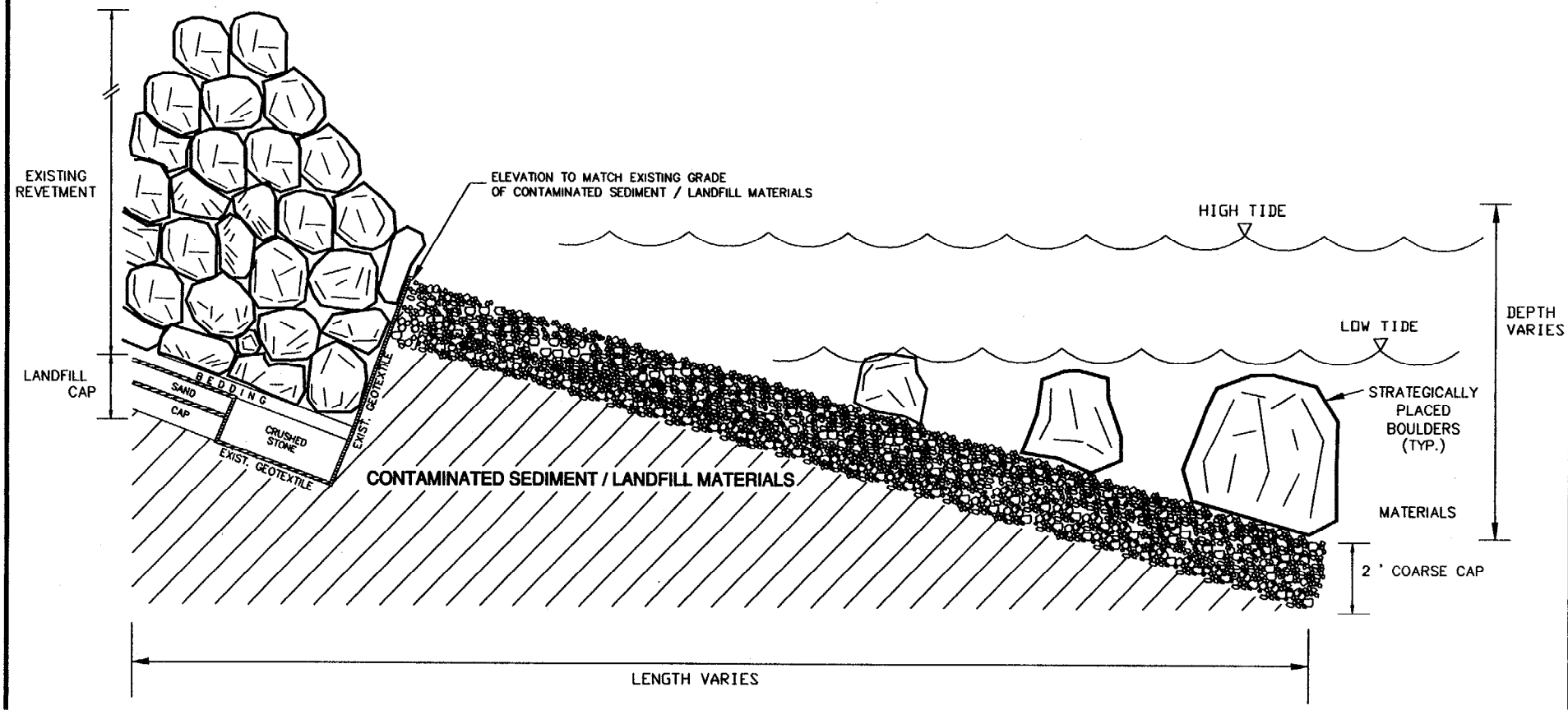
GRAPHIC SCALE

0' 200' 400'

1 INCH = 200 FEET

ALTERNATIVE NS/ER-4 – LIMITS OF NATURAL AND MULTI-MEDIA CAPS			FIGURE 4-6
McALLISTER POINT LANDFILL			TETRA TECH NUS, INC.
NEWPORT, RHODE ISLAND			55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	R.G. DEWSNAP	REV.:	1
CHECKED BY:	P. SVETAKA	DATE:	02 OCT 98
SCALE:	1" = 200'	FILE NO.:	\DWG\NAVY\MC_PT\FS\ALT_NS4.DWG

00112L042

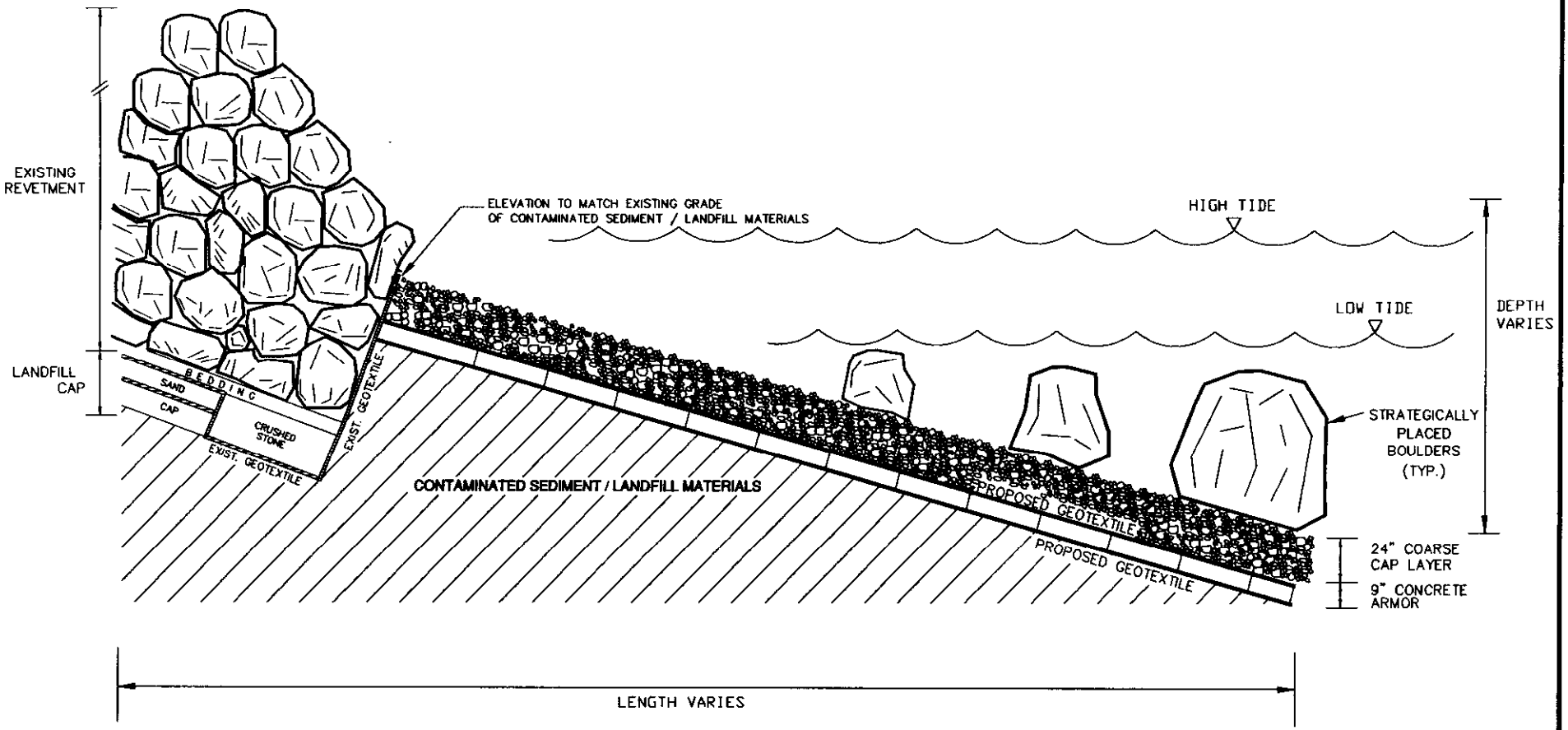


NOTES:

1. COARSE CAP MATERIALS (2–3') IS COMPOSED OF COARSE SAND, GRAVEL, AND ROCK, SIMILAR TO EXISTING SUBSTRATE BUT WITH 10 – 20% COARSER COMPONENTS TO RESIST EROSION.

ALTERNATIVE NS/ER–4			FIGURE 4–7
NATURAL CAP CROSS SECTION			
McALLISTER POINT LANDFILL			
NETC – NEWPORT, RHODE ISLAND			
DRAWN BY:	R. G. DEWSNAP	REV.:	2
CHECKED BY:	D. McKENNA	DATE:	02 OCT 98
SCALE:	NOT TO SCALE	FILE NO.: C:\DWG\NAVY\MC_PT\CAPPING\NTCP_W_D.DWG	

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658–7899



NOTES:

1. COARSE CAP LAYER (24") IS COMPOSED OF COARSE SAND, GRAVEL, AND ROCK, SIMILAR TO EXISTING SUBSTRATE BUT WITH 10 - 20% COARSER COMPONENTS TO RESIST EROSION.

ALTERNATIVE NS/ER-4			FIGURE 4-8
MULTI-MEDIA CAP CROSS SECTION			
McALLISTER POINT LANDFILL			
NETC - NEWPORT, RHODE ISLAND			
DRAWN BY:	R. G. DEWSNAP	REV.:	0
CHECKED BY:	D. McKENNA	DATE:	02 OCT 98
SCALE:	NOT TO SCALE	FILE NO.: C:\DWG\NAVY\MC_PT\CAPPING\MMDREDGE.DWG	

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899

LEGEND

MW-103R — BEDROCK MONITORING WELL LOCATION

NSB-2 — NEARSHORE SEDIMENT SAMPLE

MCL-12 — OFFSHORE SEDIMENT SAMPLE (APPROX. LOCATION)

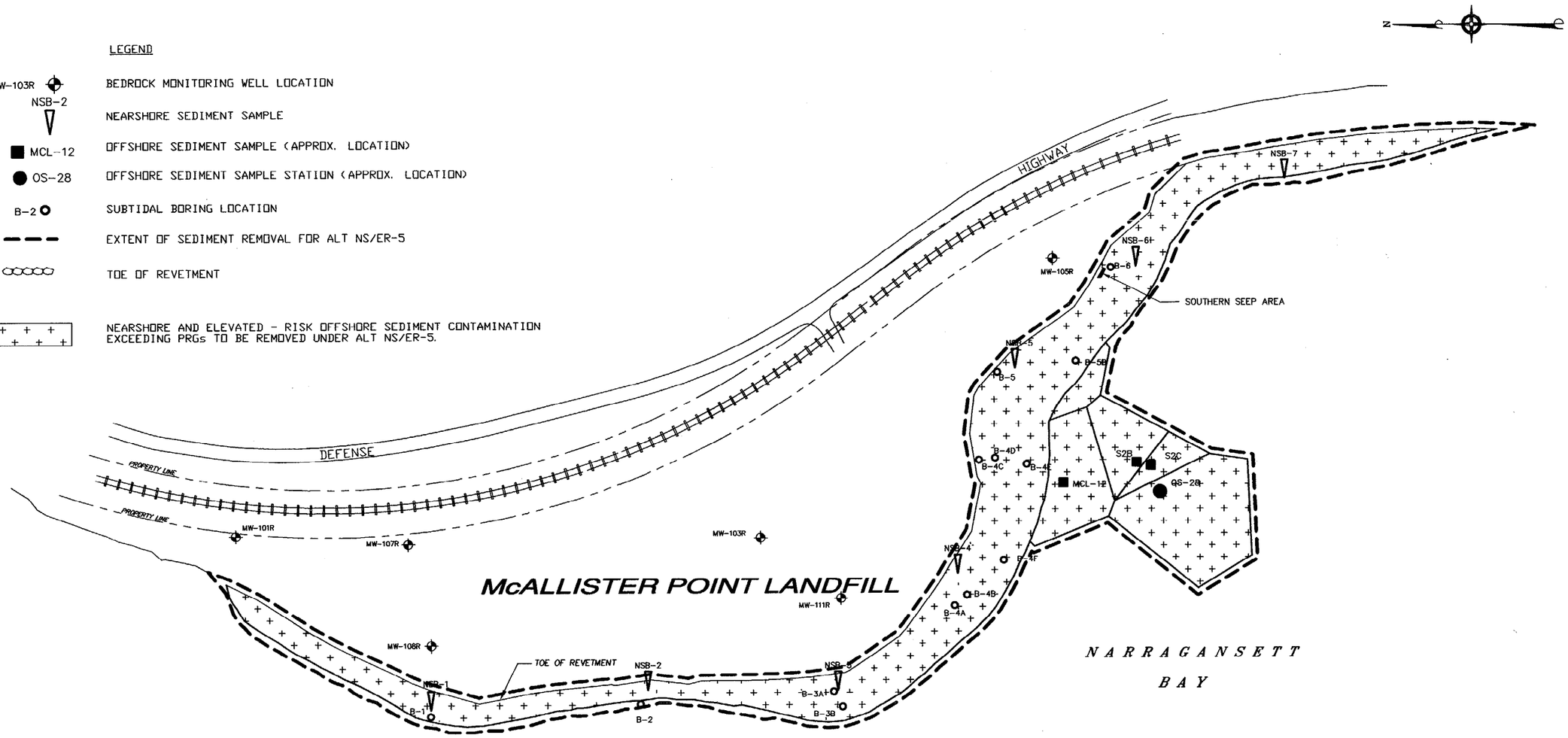
OS-28 — OFFSHORE SEDIMENT SAMPLE STATION (APPROX. LOCATION)

B-2 — SUBTIDAL BORING LOCATION

EXTENT OF SEDIMENT REMOVAL FOR ALT NS/ER-5

TOE OF REVETMENT

NEARSHORE AND ELEVATED - RISK OFFSHORE SEDIMENT CONTAMINATION EXCEEDING PRGs TO BE REMOVED UNDER ALT NS/ER-5.



NOTES:

1. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. SITE FEATURES ADAPTED AND COMPILED FROM A PLAN BY TRC, 1993.

GRAPHIC SCALE

0' 200' 400'

1 INCH = 200 FEET

ALTERNATIVE NS/ER-5 – LIMITS OF SEDIMENT REMOVAL			
McALLISTER POINT LANDFILL			
NEWPORT, RHODE ISLAND			
DRAWN BY:	R.G. DEWSNAP	REV.:	0
CHECKED BY:	P. SVETAKA	DATE:	02 OCT 98
SCALE:	1" = 200'	FILE NO.:	\DWG\NAVY\MC_PT\FS\ALT_NS5.DWG

FIGURE 4-9

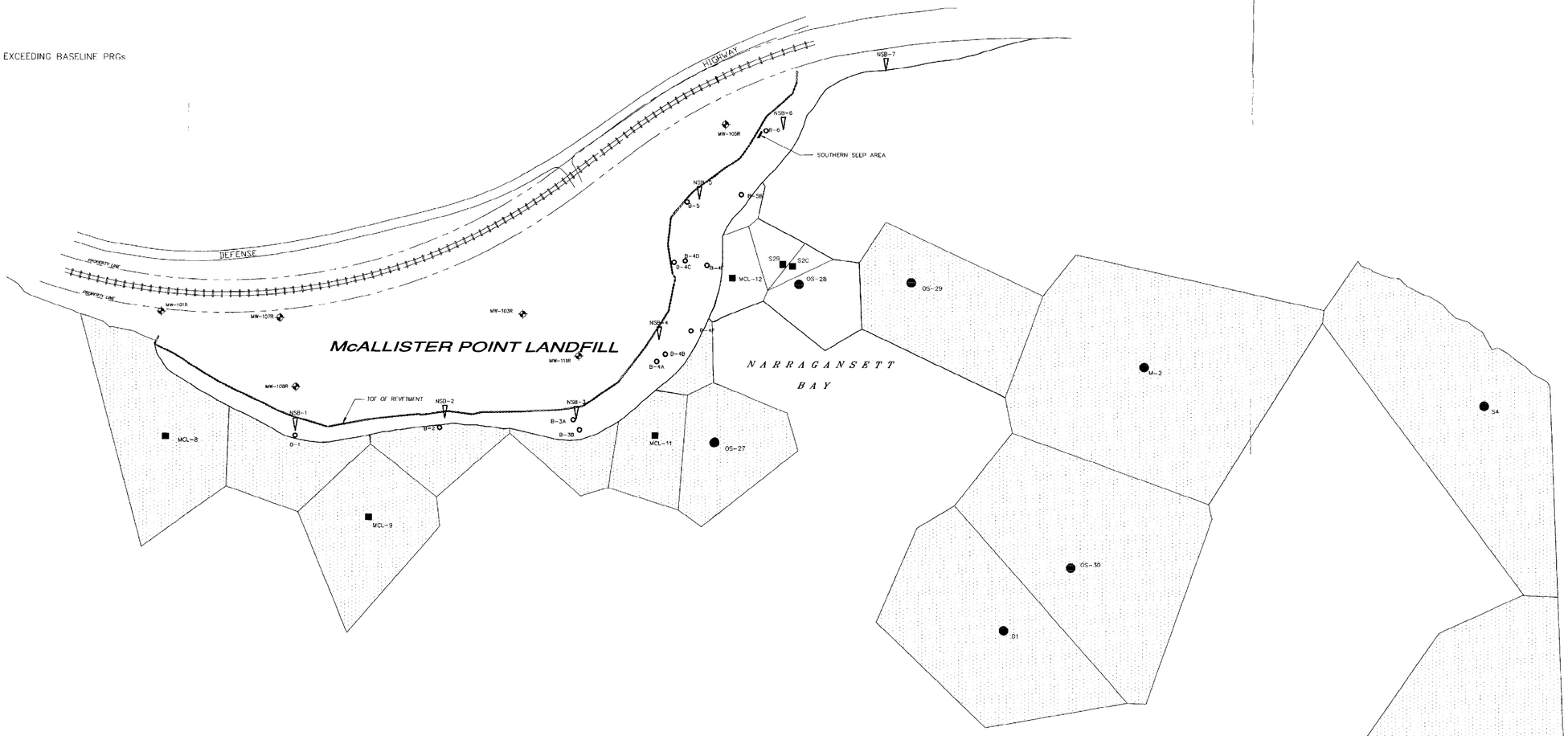
TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658-7899

00112L052

LEGEND

- MW-103R — BEDROCK MONITORING WELL LOCATION
- NSR-2 — NEARSHORE SEDIMENT SAMPLE
- MCL-12 — OFFSHORE SEDIMENT SAMPLE (APPROX. LOCATION)
- OS-27 — OFFSHORE SEDIMENT SAMPLE STATION (APPROX. LOCATION)
- B-2 — SUBTIDAL BORING LOCATION
- TOE OF REVETMENT
- OFFSHORE SEDIMENT CONTAMINATION EXCEEDING BASELINE PRGs



NOTES:

1. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. SITE FEATURE SADAPTED AND COMPILED FROM A PLAN BY TRC, 1993.

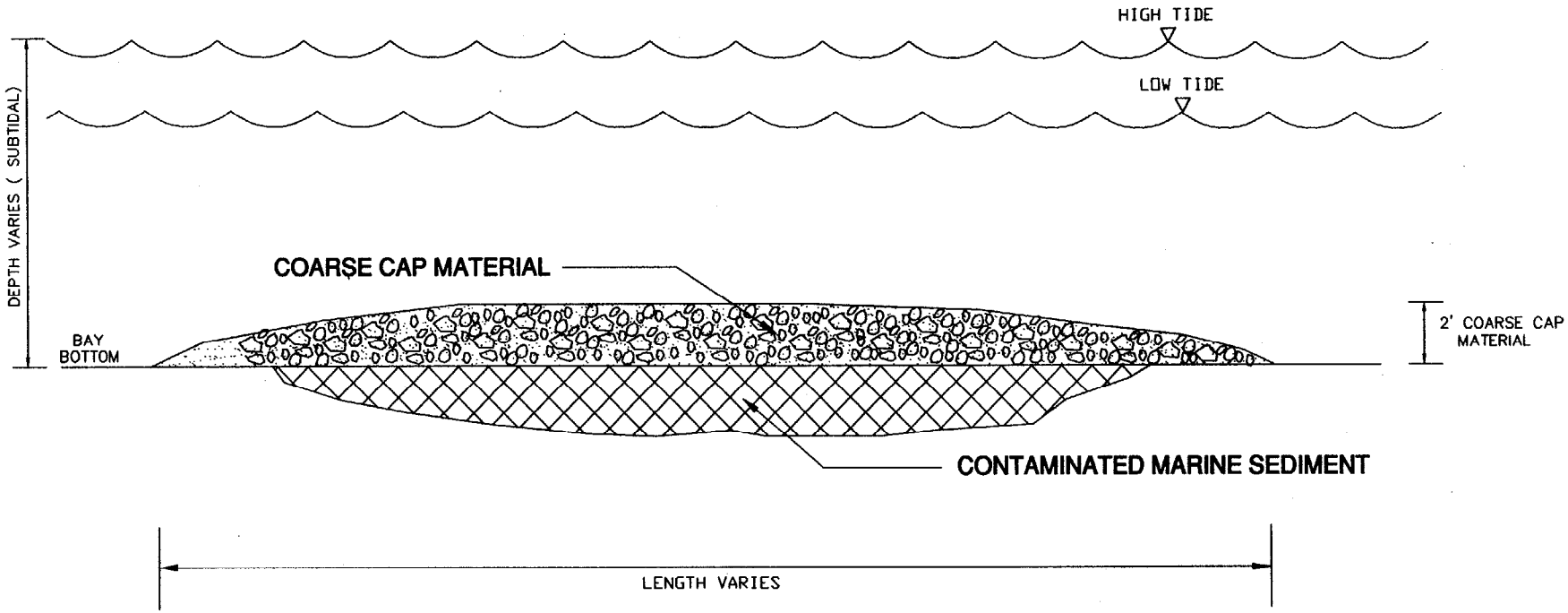
GRAPHIC SCALE

150' 0' 150' 300'

1 INCH = 150 FEET

DRAWN BY: R.G. DEWSNAP	TITLE: OFFSHORE: AERIAL EXTENT OF SEDIMENT CONTAMINATION McALLISTER POINT LANDFILL NEWPORT, RHODE ISLAND
PREPARED BY: P. SVETAKA	
CHECKED BY: P. SVETAKA	
	SOURCE: BASE PLAN BY SAI SURVEYING CO., JAMESTOWN, RI, DATED: 11/06/96
	SCALE: 1" = 150' / DATE: OCTOBER 02, 1998 / PROJ. NO: 5278 CTO: 218
PROJECT MANAGER: D. McKENNA	FIGURE: 4-10 / ACFILE NAME: C:\DWG\NAVY\MC_PT\FS\SED_CONT.DWG / REV: 0
PROGRAM MANAGER: J. TREPANOWSKI	

TETRA TECH NUS, INC.
55 JONSPIN ROAD
WILMINGTON, MASSACHUSETTS 01887
(978)658-7899



NOTES:

1. COARSE CAP MATERIAL (2') IS COMPOSED OF COARSE SAND, GRAVEL, AND ROCK, SIMILAR TO EXISTING SUBSTRATE BUT WITH 10 – 20% COARSER COMPONENTS TO RESIST EROSION.

ALTERNATIVE OS–3			FIGURE 4–11
NATURAL CAP CROSS–SECTION			
McALLISTER POINT LANDFILL			
NETC – NEWPORT, RHODE ISLAND			
DRAWN BY:	R. G. DEWSNAP	REV.:	0
CHECKED BY:	D. McKENNA	DATE:	02 OCT 98
SCALE:	NOT TO SCALE	FILE NO.: C:\DWG\NAVY\MC_PT\CAPPING\NAT_CAP2.DWG	

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
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APPENDIX A
GROUNDWATER AND LANDFILL GAS DATA EVALUATION

Brown & Root *Services*

55 Jonspin Road / Wilmington, MA 01887-1020 / 978-658-7899 / Fax: 978-658-7870

C-NAVY-4-98-1153W

April 22, 1998

Project Number 4725

Mr. James Shafer
Remedial Project Manager
Northern Division, Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop 82
Lester, Pennsylvania 19113

Reference: CLEAN Contract No. N62472-90-D-1298
Contract Task Order No. 0197

Subject: McAllister Point Landfill Quarterly Monitoring
Performed January 1998

Dear Mr. Shafer:

Groundwater samples were collected from existing wells at McAllister Point Landfill in January 1998. This was performed as a part of the Operations and Maintenance (O&M) Monitoring at this site, as described in the O&M Plan, McAllister Point Landfill, prepared by Foster Wheeler Environmental Corporation (FWENC) and submitted as Draft in March 1997. This letter-report describes the data collected during this effort and compares the data collected to ecological criteria.

Attached to this report are the data validation memoranda that describe the chemistry analysis of the samples collected. Figure 1 presents the locations of groundwater monitoring wells sampled and groundwater contaminant concentrations which exceed the referenced ecological criteria.

On February 9, 1998 the Rhode Island Department of Environmental Management (RIDEM) provided a comment in reference to the Draft Final, Revision 1 Feasibility Study Report for McAllister Point Landfill (B&R Environmental, 1997) that called attention to Figure 1 of a previous version of this quarterly report. The comment indicated that some of the TRC wells on this figure were incorrectly labeled. While Table 1 provided a cross-reference for well identifiers, the figure alone did show labels that reviewers were unfamiliar with. Therefore, Figure 1 of this quarterly report has been revised from previous versions to be more clear, and to show well identifiers that are consistent with the RI report.

In addition, the RIDEM requested that well screen elevations be provided for the TRC wells destroyed during construction and the replacement wells. As a result of this comment, a new Table (1A) has been added to this report to depict this information.

GROUNDWATER SAMPLING AND ANALYSIS

Groundwater samples were collected from existing wells by FWENC between January 7 and January 9, 1998. Samples were collected using a low-stress sampling methodology in accordance with U.S. EPA Region I SOP # GW0001 Low Stress (Low Flow) Revision 2 (7/30/96).

The low stress method uses dedicated pneumatic bladder pumps to draw water from each of the wells while minimizing the change in water level or "head". Laboratory analysis of samples was conducted for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), dissolved metals, total (TAL) metals, total petroleum hydrocarbons (TPH), alkalinity, chemical oxygen demand (COD), conductivity, sulfates, total organic carbon (TOC), turbidity, ammonia, chloride, fluoride, nitrate/nitrite, phenols, and pH. Analytical results were provided to B&R Environmental for validation in accordance with USEPA Tier II validation criteria.

After validation, the data for VOCs, SVOCs, and total metals were compiled onto summary tables and compared with chronic ambient water quality criteria (CAWQC) per request of the U.S. EPA and RIDEM. If CAWQC were not available for compounds detected, other criteria were used, as noted in the attached Table 3. Figure 1 presents the locations of the wells sampled, and the former locations of the wells that were installed by TRC Environmental Corp. (TRC) prior to the construction of the landfill cap.

The TRC wells were abandoned during the initial phase of cap construction in 1995 and replacement wells were installed as a part of the cap completion in 1996. Replacement wells were designated with similar identifiers that were used for the former wells, for instance, MW-1R was abandoned and replaced during construction with MW-101R. New wells were generally located within the approximate area of the TRC wells. However, due to access restrictions caused by the cap construction, some wells were located some distance from the former TRC well (MW1/MW101: 75 feet, and MW11/MW111: 130 feet; refer to Figure 1). The well screens were installed at the same elevations as the corresponding wells (refer to Table 1A). The boring logs and well construction logs for the replacement wells are presented in the construction documents for the landfill cap. Boring logs and well construction logs for the original TRC wells are presented in the Remedial Investigation report.

Table 1 presents a summary of water levels measured during sample collection in 1997 and 1998 by FWENC, and water levels measured in 1993 and 1994 by TRC. Water levels are expressed in elevation in feet above mean low water. The water levels were measured with electronic water level measuring instruments prior to activation of the dedicated sampling equipment for sample collection. This table also describes the horizontal distance of the replacement well from the corresponding TRC well reported in the TRC Remedial Investigation report and groundwater modeling report. Table 1A expresses the vertical distances between corresponding wells.

Table 2 presents a summary of the water chemistry measured during sample collection. This table presents the dissolved oxygen (DO) and pH of the water after stabilization criteria were met during low-stress pumping. The water chemistry measured during the groundwater sample collection efforts performed by TRC in 1993 is also presented on Table 2 for comparative purposes. However, the sample collection performed in 1993 was performed using bailers, which cause wells to be purged more aggressively, providing samples containing silt, other particulates, and possibly a higher DO. The low-stress sampling methodology used in 1997 and 1998 sampling events provides samples with little-to-no silt and suspended solids and should provide data more reflective of the aquifer conditions. Consequently, the water chemistry readings from 1993 may not correspond well to the readings from the 1997 and 1998 sampling events.

Table 3 presents concentrations of analytes detected during the March 1997, June 1997, September 1997, and January 1998 rounds of sample collection, and during the remedial investigation (December 1993). In accordance with the request of the U.S. EPA and RIDEM, these detected values are compared to ambient water quality criteria (USEPA, 1992, revised for metals, 1995) and other ecological effects criteria. Shaded values are those which exceed the criteria indicated. This comparison was made in order to provide a rapid determination of whether there is potential for adverse effects to marine organisms. Such a comparison assumes a worst case scenario where the contaminant concentrations present in the groundwater are equivalent to the contaminant concentrations at the exposure point, namely the intertidal zone at the toe of the revetment. However, the concentrations observed in the wells are not necessarily representative of what may be present in porewater in the intertidal zone; actual exposure concentrations in the intertidal zone are subject to dilution, adsorption to sediments, and chemical transformation, due to mixing with seawater.

Overall, most metals concentrations detected in the January 1998 sampling event are comparable to the metals concentrations detected in the three previous 1997 low-stress sampling events. Additionally, the groundwater analytical results for most metals in most wells from the four 1997-1998 sampling events indicate slightly lower concentrations of metals detected in groundwater, as compared to the 1993 metals concentrations, although this may be an effect of the low-stress sampling methodology used in the 1997-1998 sampling events.

In general, metals at concentrations in excess of AWQC have remained relatively constant or slightly decreased in concentration and number of this period. These slight variations noted within the 1997-1998 sampling events may be due to seasonal variations.

Similarly, VOC/SVOC concentrations detected in the January 1998 sampling event are comparable to the VOC/SVOC concentrations detected in the three previous 1997 sampling events. However, the analytical results for the four 1997-1998 sampling events indicate that groundwater samples generally contain more VOC and/or SVOC compounds and/or generally higher concentrations of VOC and/or SVOC compounds, as compared to the 1993 VOC/SVOC results.

This is most evident in samples from MW-103S/R, 107R and 108R. This trend may also be related to the use of low-stress sampling techniques in the 1997-1998 sampling events. Finally, the concentrations and number of VOC/SVOC contaminants in excess of AWQC have decreased or shown steady-state conditions throughout the quarterly monitoring period.

One of the purposes of this effort was to identify changes in contaminant concentrations in groundwater that might affect ecological receptors. Data shown on Table 3 indicates that contaminants in groundwater that are in excess of the ecological criteria have not dramatically increased since monitoring began, and in general have remained constant or shown slight decreases (xylene, MW-105S and PAHs, MW-103S).

Based on this information, it is recommended that quarterly monitoring be discontinued, and semiannual monitoring be initiated as planned in the Operations and Maintenance Plan for the Post

Cap Construction at McAllister Point Landfill. This semiannual monitoring will evaluate changes over the longer period.

If you have any questions about this material, please do not hesitate to contact me.

Very truly yours,

Stephen S. Parker
Project Manager

SSP/rt

attachment

c: K. Coyle, NETC Newport - 4 (w/encl)
K. Keckler, EPA - 3 (w/encl)
P. Kulpa, RIDEM - 4 (w/encl)
J. Stump, Gannet Flemming - 2 (w/encl.)
K. Finkelstein, NOAA - 1 (w/encl)
D. Egan, TAG - 1 (w/encl)
Restoration Advisory Board - 4 (w/encl)
J. Trepanowski/G. Glenn, B&RE (w/encl)
File 4725-3.2 (w/o encl), 4725-8.0 (w/encl)

TABLE 1
SUMMARY OF GROUND WATER ELEVATIONS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

TRC [1] MONITORING WELL	PHASE II RI WATER ELEVATIONS [1]			FWENC [2] MONITORING WELL	HORIZONTAL DISTANCE FROM TRC WELL	O & M PERIOD WATER ELEVATIONS [3]			
	12/20/93	12/29/93	4/29/94			3/19/97	6/23/97	9/8/97	1/6/98
MW-1R	7.19	7.95	7.04	MW-101R	75.00	15.95	10.78	13.24	14.12
MW-3S	12.01	12.24	13.65	MW-103S	18.00	14.62	13.95	11.53	11.43
MW-3R	10.20	11.58	14.48	MW-103R	16.00	10.44	9.53	9.53	9.73
MW-4S	20.42	21.38	22.01	MW-104S	20.00	19.30	17.19	17.38	17.56
MW-5S	10.47	11.65	13.06	MW-105S	12.00	17.04	10.22	10.41	10.74
MW-5R	5.51	6.20	6.98	MW-105R	12.00	12.02	9.89	10.4	10.83
MW-7S	19.66	21.33	19.72	MW-107R	22.00	19.53	14.00	17.14	17.67
MW-8R	7.46	3.47	3.94	MW-108R	18.00	2.74	2.59	3.07	2.98
MW-11S	DRY	DRY	4.06	MW-111S [4]	130.00	DRY	DRY	DRY	DRY
MW-11R	3.40	3.11	3.76	MW-111R [4]	140.00	2.71	2.70	3.00	2.99
MW-21S	3.52	N/A	3.96	MW-111S [4]	35.00	DRY	DRY	DRY	DRY
MW-12S	10.06	11.17	12.97	MW-112S	9.00	12.35	10.23	10.58	10.94
MW-13S	10.56	12.11	14.17	MW-113S	8.00	12.82	10.55	10.97	11.41

NOTES:

1. Wells installed and data collected by TRC Environmental Corporation (TRC) as presented in: "Remedial Investigation, Draft Final Report for the McAllister Point Landfill, NETC-Newport, Rhode Island", July 1994.
2. Wells installed by Foster Wheeler Environmental Corporation (FWENC) as described in: "Operations and Maintenance Manual", May 1997.
3. Data compiled from FWENC field logbook.
4. FWENC well locations MW-111S & 111R are proximal to the former location of TRC well MW-21S (see Figure 1).

N/A - Not Analyzed; water level in well was not measured on this date.
DRY - Well was dry on this date.

All elevations and distances are reported in feet. Elevations are reported relative to Mean Low Water (MLW).

TABLE 1-A
SUMMARY OF WELL SCREEN ELEVATIONS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

TRC [1] MONITORING WELL	WELL SCREEN ELEVATIONS		FWENC [2] MONITORING WELL	WELL SCREEN ELEVATIONS [3]		HORIZONTAL DISTANCE FROM TRC WELL
	FROM	TO		FROM	TO	
MW-1R	9.66	-5.34	MW-101R	10.62	0.62	75.00
MW-3S	19.09	9.09	MW-103S	18.41	8.41	18.00
MW-3R	4.76	-10.24	MW-103R	-0.85	-10.85	16.00
MW-4S	22.90	18.40	MW-104S	20.12	15.62	20.00
MW-5S	13.75	3.75	MW-105S	14.95	4.95	12.00
MW-5R	-9.41	-24.41	MW-105R	-9.37	-19.37	12.00
MW-7S	20.16	0.16	MW-107R	19.39	9.39	22.00
MW-8R	2.04	-7.96	MW-108R	2.40	-7.6	18.00
MW-11S	12.01	2.01	MW-111S (3)	11.12	1.12	130.00
MW-11R	-1.63	-11.63	MW-111R (3)	-4.41	-14.41	140.00
MW-21S	-2.96	-12.96	MW-111S (3)	11.12	1.12	35.00
MW-12S	13.07	3.07	MW-112S	14.42	4.42	9.00
MW-13S	12.67	2.67	MW-113S	14.95	4.95	8.00

NOTES:

1. Wells installed and data collected by TRC Environmental Corporation (TRC) as presented in: "Remedial Investigation, Draft Final Report for the McAllister Point Landfill, NETC-Newport, Rhode Island", July 1994, Table 2-9.
2. Wells installed by Foster Wheeler Environmental Corporation (FWENC) as described in: "Certification Report for Remedial Action, Appendix C2 Volume II" and Sheet C15, B&R Environmental , February 1997.
3. FWENC well locations MW-111S & 111R are proximal to the former location of TRC well MW-21S (see Figure 1).

All elevations and distances are reported in feet. Elevations are reported relative to Mean Low Water (MLW).

TABLE 2
WATER QUALITY PARAMETERS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

TRC [1] MONITORING WELL	PHASE II RI GW PARAMETERS [1] Dec-93			FWENC [2] MONITORING WELL	O & M PERIOD GW PARAMETERS [3] Mar-97			Jun-97			Sep-97			Jan-98		
	Salinity	pH	DO		Salinity	pH	DO	Salinity	pH	DO	Salinity	pH	DO	Salinity	pH	DO
MW-1R	< 0.01	5.21	6.90	MW-101R	0.23	5.43	7.78	N/A	5.32	6.90	N/A	5.32	7.58	N/A	5.43	7.89
MW-3S	0.40	6.42	3.03	MW-103S	0.40	5.96	0.34	N/A	6.08	0.21	N/A	6.31	0.19**	N/A	6.63	2.64
MW-3R	0.20	5.97	3.92	MW-103R	0.41	5.98	0.41	N/A	5.93	0.23	N/A	5.97	0.45	N/A	6.03	1.31
MW-4S	0.20	5.96	2.34	MW-104S	0.20	6.3	0.33	N/A	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
MW-5S	< 0.01	5.60	3.45	MW-105S	0.49	6.53	4.5	N/A	6.2	1.92	N/A	6.10	1.01	N/A	6.1	0.43
MW-5R	< 0.01	5.84	5.67	MW-105R	1.10	5.9	7.45	N/A	5.88	6.57	N/A	5.94	5.38	N/A	5.81	6.13
MW-7S	0.10	5.70	5.21	MW-107R	0.12	6.34	2.45	N/A	6.29	0.29	N/A	5.91	0.14	N/A	6.02	0.83
MW-8R	1.70	6.40	5.10	MW-108R	1.51	6.54	0.41	N/A	6.53	0.48	N/A	6.47	0.79	N/A	6.54	3.87
MW-11S	DRY	DRY	DRY	MW-111S [4]	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	N/A	DRY	DRY
MW-11R	0.50	6.32	2.49	MW-111R [4]	1.61	7.36	3.42	N/A	7.25	0.19	N/A	7.08	1.31	N/A	7.16	0.54
MW-21S	0.60	6.84	4.00	MW-111S [4]	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	N/A	DRY	DRY
MW-12S	0.10	6.20	2.36	MW-112S	0.12	6.4	5.18	N/A	6.28	0.57	N/A	6.53	1.94	N/A	6.29	2.17
MW-13S	< 0.01	5.65	5.47	MW-113S	0.13	5.68	7.2	N/A	5.93	5.70	N/A	5.70	4.10	N/A	5.61	5.49

NOTES:

1. Wells installed and data collected by TRC Environmental Corporation (TRC) as presented in: "Remedial Investigation Report, Draft Final for McAllister Point Landfill, NETC-Newport, Rhode Island", July 1994.
2. Wells installed by Foster Wheeler Environmental Corporation (FWENC) as described in: "Operations and Maintenance Manual", May 1997.
3. Data compiled from FWENC field logbook.
4. FWENC well locations MW-111S & 111R are proximal to the former location of TRC well MW-21S (see Figure 1).

N/A - Not Analyzed.
DRY - Well was dry on this date.
** - Air bubbles noted in flow-through cell: D.O. readings may not be valid.
DO units = mg/l, Salinity units = ppt
All data collected during time of quarterly sampling.

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 1R	FWENC [6] MONITORING WELL - 101R							
			Dec-93	Mar-97		Jun-97		Sep-97		Jan-98	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
1,1,1-Trichloroethane	31200	c	ND	ND		ND	5	ND	5	ND	5
1,2,4-Trimethylbenzene	NA		--------	--------		--------		ND	5	--------	
Acetone	NA		ND	ND	5.82	ND	5	ND	5	ND	5
Benzene	700		ND	ND	0.18	ND	5	ND	5	ND	5
Bromodichloromethane	NA		ND	ND		ND	5	ND	5	ND	5
Chlorobenzene	129		ND	ND	0.27	ND	5	ND	5	ND	5
Chloroethane	NA		ND	ND	0.56	ND	5	ND	5	ND	5
Chloromethane	NA		ND	ND		ND	5	ND	5	ND	5
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5	ND	5	ND	5
Ethylbenzene	430	c	ND	ND	0.19	ND	5	ND	5	ND	5
Isopropylbenzene	NA		--------	--------		--------		ND	5	--------	
Toluene	5000		ND	ND	0.31	ND	5	ND	5	ND	5
Trichloroethene	2000	a	ND	ND	1.61	ND	5	ND	5	ND	5
Xylene (total)	1.8	d	ND	ND	0.54	ND	5	ND	5	ND	5
Semivolatile Organic Compounds (ug/l)											
1,2-Dichlorobenzene	129		ND	ND		ND	10	ND	10	ND	10
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10	ND	10	ND	10
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10	ND	10	ND	10
2,4-Dimethylphenol	2120	a	ND	ND	2.37	ND	10	ND	10	ND	10
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10	ND	10	ND	10
2-Chlorophenol	4380	a	ND	ND		ND	10	ND	10	ND	10
2-Methylnaphthalene	300	c	ND	ND	2.36	ND	10	ND	10	ND	10
2-Methylphenol	NA		ND	ND	2.54	ND	10	ND	10	ND	10
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10	ND	10	ND	10
4-Methylphenol	NA		ND	ND	2.54	ND	10	ND	10	ND	10
Acenaphthene	710		ND	ND	2.53	ND	10	ND	10	ND	10
Acenapthylene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Anthracene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Carbazole	NA		ND	ND	5.25	ND	10	ND	10	ND	10
Chrysene	300	c	ND	ND	0.17	ND	10	ND	10	ND	10
Dibenzofuran	20	d	ND	ND	2.55	ND	10	ND	10	ND	10
Diethylphthalate	3.4		ND	ND	2.94	ND	10	ND	10	ND	10
Fluoranthene	16		ND	ND	3.05	ND	10	ND	10	ND	10
Fluorene	300	c	ND	ND	2.61	ND	10	ND	10	ND	10
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10	ND	10	ND	10
Naphthalene	620	b	ND	ND	2.22	3 J		ND	10	ND	10
Phenanthrene	4.6	P	ND	ND	2.7	ND	10	ND	10	ND	10
Phenol	2560	b	ND	ND	2.27	ND	10	ND	10	ND	10
Pyrene	300	c	ND	ND	3.13	ND	10	ND	10	ND	10
Di-n-butylphthalate	3.4		ND	ND	2.86	ND	10	ND	10	ND	10
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10	ND	10	ND	10
Benzo(b)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(k)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(a)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Indeno (1,2,3-cd)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(g,h,i)perylene	300	c	ND	ND		ND	10	ND	10	ND	10
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10	ND	10	ND	10
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	ND	3.1	ND	3	ND	3
Arsenic	36		27.9 J	ND	2	ND	2.0	ND	2	ND	2
Barium	3.9	d	**114**	ND	0.7	ND	2.9	ND	2.3	ND	14.5
Beryllium	5.3	b	4.1	ND	0.2	ND	0.50	ND	1	ND	1
Cadmium	9.3		1.2 J	ND	0.2	0.87		ND	0.6	ND	0.6
Chromium [4]	50		**176 J**	ND	0.7	ND	0.60	ND	0.5	ND	0.5
Cobalt	3	d	**129 J**	ND	0.7	ND	0.70	ND	1.2	ND	1
Copper	2.4		**189 J**	ND	2	ND	2.0	ND	3	ND	12
Iron	1000	b	**262000 J**	30.7	12	ND	33.0	ND	28.5	ND	29.2
Lead	8.1		**275 J**	ND	1.5	**19.8 J**		ND	8	ND	2
Magnesium	NA		45700 J	4510	5	4830		4040 J		3740	
Manganese	80	d	**2540 J**	79.6 J	0.5	--------		**87.8**		--------	
Mercury	0.025		ND	ND	0.08	ND	0.12	ND	0.09	ND	0.1
Nickel	8.2		**256**	ND	0.7	**8.7**		7.6		5.1 J	
Potassium	NA		5250	ND	460	ND	3300	1320		ND	1300
Selenium	71		--------	ND	5	ND	5.0	ND	5	ND	5
Silver	0.92	P	0.4	ND	0.6	ND	4.1	ND	2	ND	2
Sodium	NA		27300	26100	800	30300		25800		24700	
Vanadium	19	d	**14.3 J**	ND	0.6	1.4 J		3		3	
Zinc	81		**550 J**	11.2 J	5	10.4 J		ND	8.4	ND	17

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 3S	FWENC [5] MONITORING WELL - 103S							
			Dec-93	Mar-97		Jun-97		Sep-97		Jan-98	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
1,1,1-Trichloroethane	31200	c	ND	ND		ND	5	ND	5	ND	5
1,2,4-Trimethylbenzene	NA		———	———		———		ND	5	———	
Acetone	NA		ND	5	5.82	ND	7	49 J		35	
Benzene	700		2 J	12	0.18	9		4 J		ND	6
Bromodichloromethane	NA		ND	ND		ND	5	ND	5	ND	5
Chlorobenzene	129		ND	ND	0.27	ND	5	ND	5	ND	5
Chloroethane	NA		ND	ND	0.56	ND	5	ND	5	ND	5
Chloromethane	NA		ND	ND		ND	5	ND	5	ND	5
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5	ND	5	ND	5
Ethylbenzene	430	c	ND	12	0.19	9		ND	5	4 J	
Isopropylbenzene	NA		———	———		———		ND	5	———	
Toluene	5000		ND	8	0.31	9		2 J		3 J	
Trichloroethene	2000	a	ND	ND	1.61	ND	5	ND	5	ND	5
Xylene (total)	1.8	d	ND	**23**	0.54	**19**		ND	7	**10**	
Semivolatile Organic Compounds (ug/l)											
1,2-Dichlorobenzene	129		ND	ND		ND	10	ND	10	ND	10
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10	ND	10	ND	10
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10	ND	10	ND	10
2,4-Dimethylphenol	2120	a	1 J	15	2.37	22 J		14		ND	10
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	12 J	10	ND	10	ND	10
2-Chlorophenol	4380	a	ND	ND		ND	10	ND	10	ND	10
2-Methylnaphthalene	300	c	9 J	210 *	2.36	240 *		100		63	
2-Methylphenol	NA		3 J	6 J	2.54	4 J		1 J		ND	10
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10	ND	10	ND	10
4-Methylphenol	NA		ND	44	2.54	17		4 J		3 J	
Acenaphthene	710		28	170 *	2.53	180 J*		130		140	
Acenaphthylene	300	c	ND	10 *	2.59	8 J		ND	10	10	
Anthracene	300	c	3 J	19	2.59	18		12		17	
Carbazole	NA		24	120	5.25	120 J*		95 J		120	
Chrysene	300	c	ND	ND	0.17	1 J		ND	10	4 J	
Dibenzofuran	20	d	15	**130 ***	2.55	**150 J***		**76**		ND	10
Diethylphthalate	3.4		ND	ND	2.94	ND	10	ND	10	ND	10
Fluoranthene	16		5 J	**23**	3.05	**23**		**18**		**29**	
Fluorene	300	c	20	150 *	2.61	170 J*		100		120	
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	4 J		ND	10	ND	10
Naphthalene	620	b	98	**1400 ***	2.22	**1400 ***		**1800 (VOC)**		530	
Phenanthrene	4.6	P	**23**	**160 ***	2.7	**160 J***		**100**		**80**	
Phenol	2560	b	ND	3 J	2.27	ND	10	ND	10	ND	10
Pyrene	300	c	4 J	10 J	3.13	14		10		17	
Di-n-butylphthalate	3.4		1 J	ND	2.86	ND	10	ND	10	ND	10
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10	ND	10	4 J	
Benzo(b)fluoranthene	300	c	ND	ND		ND	10	ND	10	3 J	
Benzo(k)fluoranthene	300	c	ND	ND		ND	10	ND	10	2 J	
Benzo(a)pyrene	300	c	ND	ND		ND	10	ND	10	2 J	
Indeno (1,2,3-cd)pyrene	300	c	ND	ND		ND	10	ND	10	1 J	
Benzo(g,h,i)perylene	300	c	ND	ND		ND	10	ND	10	1 J	
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10	ND	10	ND	10
Total Metals (ug/l)											
Antimony	500	P	176 J	ND	5	ND	3.0	6.1		ND	7.1
Arsenic	36		**176 J**	ND	2	5.0		**76.4**		**37**	
Barium	3.9	d	**959 J**	**119**	0.7	**146**		**213**		**381**	
Beryllium	5.3	b	**5.9**	ND	0.2	ND	0.50	ND	1	ND	1
Cadmium	9.3		**28 J**	ND	0.2	ND	0.40	ND	0.6	ND	0.6
Chromium [4]	50		**256 J**	ND	0.7	3.0		3.4 J		6.8	
Cobalt	3	d	**205 J**	ND	0.7	**4.5**		**44.4**		**6.9**	
Copper	2.4		**1730 J**	ND	2	ND	2.0	ND	22.3	ND	44.8
Iron	1000	b	**341000 J**	**59500**	12	**63500**		**29000**		**53500**	
Lead	8.1		**4060**	ND	1.5	ND	6.0	**31**		**44.3**	
Magnesium	NA		57000 J	15200	5	17000		20100 J		24800	
Manganese	80	d	**7990 J**	**12000 J**	0.5	———		**5090**		NA	
Mercury	0.025		**4.51**	ND	0.08	ND	0.08	ND	0.27	**0.12 J**	
Nickel	8.2		**386**	4.2	0.7	**10.8**		**346**		**43.1**	
Potassium	NA		25900	10500	460	15100 J		14700		20000	
Selenium	71		———	13.1 J	5	ND	8.8	ND	5	ND	5
Silver	0.92	P	**25 J**	ND	0.6	ND	1.7	ND	2	ND	2
Sodium	NA		91600 J	43900	800	49100		61700		78600	
Vanadium	19	d	**432**	ND	0.6	3.6		**19.5**		**29.5**	
Zinc	81		**6800 J**	ND	5	16.7 J		**156**		**229**	

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 3R	FWENC [6] MONITORING WELL - 103R							
			Dec-93	Mar-97		Jun-97		Sep-97		Jan-98	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
1,1,1-Trichloroethane	31200	c	ND	ND		ND	5	ND	5	ND	5
1,2,4-Trimethylbenzene	NA		---------	---------		---------		ND	5	---------	
Acetone	NA		ND	ND	5.82	ND	5	ND	5	ND	26
Benzene	700		ND	ND	0.18	ND	5	ND	5	ND	5
Bromodichloromethane	NA		ND	ND		ND	5	ND	5	ND	5
Chlorobenzene	129		ND	ND	0.27	ND	5	ND	5	ND	5
Chloroethane	NA		ND	ND	0.56	ND	5	ND	5	ND	5
Chloromethane	NA		ND	ND		ND	5	ND	5	ND	5
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5	ND	5	ND	5
Ethylbenzene	430	c	ND	ND	0.19	ND	5	ND	5	4 J	
Isopropylbenzene	NA		---------	---------		---------		ND	5	---------	
Toluene	5000		ND	ND	0.31	ND	5	ND	5	3 J	
Trichloroethene	2000	a	ND	ND	1.61	ND	5	ND	5	ND	5
Xylene (total)	1.8	d	ND	ND	0.54	ND	5	ND	5	**9**	
Semivolatile Organic Compounds (ug/l)											
1,2-Dichlorobenzene	129		ND	ND		ND	10	ND	10	ND	10
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10	ND	10	ND	10
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10	ND	10	ND	10
2,4-Dimethylphenol	2120	a	ND	ND	2.37	R		ND	10	ND	10
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10	ND	10	ND	10
2-Chlorophenol	4380	a	ND	ND		ND	10	ND	10	ND	10
2-Methylnaphthalene	300	c	ND	ND	2.36	ND	10	ND	10	ND	10
2-Methylphenol	NA		ND	ND	2.54	R		ND	10	ND	10
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10	ND	10	ND	10
4-Methylphenol	NA		ND	ND	2.54	R		ND	10	ND	10
Acenaphthene	710		ND	2 J	2.53	1 J		2 J		2 J	
Acenapthylene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Anthracene	300	c	ND	1 J	2.59	ND	10	1 J		1 J	
Carbazole	NA		ND	1 J	5.25	1 J		1 J		ND	10
Chrysene	300	c	ND	ND	0.17	ND	10	ND	10	ND	10
Dibenzofuran	20	d	ND	1 J	2.55	1 J		1 J		1 J	
Diethylphthalate	3.4		ND	ND	2.94	ND	10	ND	10	ND	10
Fluoranthene	16		1 J	2 J	3.05	2 J		2 J		2 J	
Fluorene	300	c	ND	2 J	2.61	2 J	10	2 J		2 J	
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10	ND	10	ND	10
Naphthalene	620	b	ND	3 J	2.22	2 J		2 J		ND	10
Phenanthrene	4.6	P	1 J	**7 J**	2.7	**7 J**		**7 J**		**6 J**	
Phenol	2560	b	ND	ND	2.27	R		ND	10	ND	10
Pyrene	300	c	9 J	1 J	3.13	2 J		1 J		1 J	
Di-n-butylphthalate	3.4		1 J	ND	2.86	ND	10	ND	10	ND	10
Benzo(a)anthracene	300	c	7 J	ND	3.13	ND	10	ND	10	ND	10
Benzo(b)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(k)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(a)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Indeno (1,2,3-cd)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(g,h,i)perylene	300	c	ND	ND		ND	10	ND	10	ND	10
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10	ND	10	ND	10
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	ND	3.0	ND	3	ND	3
Arsenic	36		34.4 J	ND	2	3.3 J		ND	10.1	7.8	
Barium	3.9	d	**34.1**	ND	0.7	**23.0**		**23.1**		ND	31.7
Beryllium	5.3	b	1.1	ND	0.2	ND	0.50	ND	1	ND	1
Cadmium	9.3		3.6 J	ND	0.2	ND	0.40	ND	0.6	ND	0.6
Chromium [4]	50		ND	ND	0.7	0.92 J		0.94 J		0.97 J	
Cobalt	3	d	**44.5 J**	**20.5**	0.7	**22.2**		**24.1**		**24.5**	
Copper	2.4		**58.6 J**	ND	2	ND	2.0	ND	9.9	ND	6.3
Iron	1000	b	**42400 J**	**24800**	12	**24800**		**26600**		**27100**	
Lead	8.1		**91.2**	ND	1.5	ND	2.0	ND	6.2	ND	2
Magnesium	NA		15800 J	12300	5	12700		13200 J		13500	
Manganese	80	d	**2400 J**	**1760 J**	0.5	---------		**1870**		NA	
Mercury	0.025		**0.12**	ND	0.08	ND	0.08	ND	0.09	**0.2 J**	
Nickel	8.2		**106**	ND	0.7	**47.8**		**48**		**49.3**	
Potassium	NA		5890	ND	460	3420 J		2190 J		1980 J	
Selenium	71		---------	7 J	5	ND	5.0	ND	5	ND	5
Silver	0.92	P	0.5 J	ND	0.6	ND	2.0	ND	2	ND	2
Sodium	NA		46200 J	31300	800	31500		32300		32600	
Vanadium	19	d	15.8 J	ND	0.6	2.5		10		10.5	
Zinc	81		**1000 J**	22.2	5	19.9		58.7 J		ND	41

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 4S	FWENC [6] MONITORING WELL - 104S							
			Dec-93	Mar-97		Jun-97		Sep-97		Jan-98	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)						DRY WELL		DRY WELL		DRY WELL	
1,1,1-Trichloroethane	31200	c	ND	ND		--------		--------		--------	
1,2,4-Trimethylbenzene	NA		--------	--------		--------		--------		--------	
Acetone	NA		ND	94	5.82	--------		--------		--------	
Benzene	700		2 J	ND	0.18	--------		--------		--------	
Bromodichloromethane	NA		ND	ND		--------		--------		--------	
Chlorobenzene	129		ND	22	0.27	--------		--------		--------	
Chloroethane	NA		ND	ND	0.56	--------		--------		--------	
Chloromethane	NA		ND	ND		--------		--------		--------	
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	--------		--------		--------	
Ethylbenzene	430	c	6 J	54	0.19	--------		--------		--------	
Isopropylbenzene	NA		--------	--------		--------		--------		--------	
Toluene	5000		ND	6	0.31	--------		--------		--------	
Trichloroethene	2000	a	ND	ND	1.61	--------		--------		--------	
Xylene (total)	1.8	d	**7 J**	**110**	0.54	--------		--------		--------	
Semivolatile Organic Compounds (ug/l)											
1,2-Dichlorobenzene	129		ND	ND		--------		--------		--------	
1,3-Dichlorobenzene	129		ND	ND	2.06	--------		--------		--------	
1,4-Dichlorobenzene	129		12	9 J	2.16	--------		--------		--------	
2,4-Dimethylphenol	2120	a	ND	ND	2.37	--------		--------		--------	
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	--------		--------		--------	
2-Chlorophenol	4380	a	ND	ND		--------		--------		--------	
2-Methylnaphthalene	300	c	1 J	3 J	2.36	--------		--------		--------	
2-Methylphenol	NA		11	ND	2.54	--------		--------		--------	
4-Chloro-3-methylphenol [3]	29700	e	ND	8 J	2.61	--------		--------		--------	
4-Methylphenol	NA		ND	ND	2.54	--------		--------		--------	
Acenaphthene	710		ND	ND	2.53	--------		--------		--------	
Acenapthylene	300	c	ND	ND	2.59	--------		--------		--------	
Anthracene	300	c	ND	ND	2.59	--------		--------		--------	
Carbazole	NA		ND	1 J	5.25	--------		--------		--------	
Chrysene	300	c	ND	ND	0.17	--------		--------		--------	
Dibenzofuran	20	d	ND	ND	2.55	--------		--------		--------	
Diethylphthalate	3.4		1 J	2 J	2.94	--------		--------		--------	
Fluoranthene	16		ND	ND	3.05	--------		--------		--------	
Fluorene	300	c	ND	ND	2.61	--------		--------		--------	
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	--------		--------		--------	
Naphthalene	620	b	3 J	15	2.22	--------		--------		--------	
Phenanthrene	4.6	P	ND	1 J	2.7	--------		--------		--------	
Phenol	2560	b	ND	ND	2.27	--------		--------		--------	
Pyrene	300	c	ND	ND	3.13	--------		--------		--------	
Di-n-butylphthalate	3.4		**4 J**	ND	2.86	--------		--------		--------	
Benzo(a)anthracene	300	c	ND	ND	3.13	--------		--------		--------	
Benzo(b)fluoranthene	300	c	ND								
Benzo(k)fluoranthene	300	c	ND								
Benzo(a)pyrene	300	c	ND								
Indeno (1,2,3-cd)pyrene	300	c	ND								
Benzo(g,h,i)perylene	300	c	ND								
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	--------		--------		--------	
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	--------		--------		--------	
Arsenic	36		11.7 J	19.4	2	--------		--------		--------	
Barium	3.9	d	**67.6**	**73.2**	0.7	--------		--------		--------	
Beryllium	5.3	b	ND	ND	0.2	--------		--------		--------	
Cadmium	9.3		6.2 J	ND	0.2	--------		--------		--------	
Chromium [4]	50		5.4 J	ND	0.7	--------		--------		--------	
Cobalt	3	d	**21**	ND	0.7	--------		--------		--------	
Copper	2.4		**59.6 J**	ND	2	--------		--------		--------	
Iron	1000	b	**69100 J**	**120000**	12	--------		--------		--------	
Lead	8.1		**42.3 J**	ND	1.5	--------		--------		--------	
Magnesium	NA		4580 J	32000	5	--------		--------		--------	
Manganese	80	d	**2180 J**	**1440 J**	0.5	--------		--------		--------	
Mercury	0.025		**0.19 J**	ND	0.08	--------		--------		--------	
Nickel	8.2		**48**	ND	0.7	--------		--------		--------	
Potassium	NA		6290	31800	460	--------		--------		--------	
Selenium	71		--------	9.4 J	5	--------		--------		--------	
Silver	0.92	P	0.4	ND	0.6	--------		--------		--------	
Sodium	NA		8920 J	53000	800	--------		--------		--------	
Vanadium	19	d	ND	17.4	0.6	--------		--------		--------	
Zinc	81		**1030 J**	11.4 J	5	--------		--------		--------	

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 5S	FWENC [6] MONITORING WELL - 105S							
			Dec-93	Mar-97		Jun-97		Sep-97		Jan-98	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
1,1,1-Trichloroethane	31200	c	ND	ND		ND	5	ND	5	ND	5
1,2,4-Trimethylbenzene	NA		----------	----------		----------		32		----------	5
Acetone	NA		ND	51	5.82	ND	5	4 J		ND	5
Benzene	700		ND	ND	0.18	ND	5	ND	5	ND	5
Bromodichloromethane	NA		ND	ND		ND	5	ND	5	ND	5
Chlorobenzene	129		ND	ND	0.27	ND	5	ND	5	ND	5
Chloroethane	NA		ND	ND	0.56	ND	5	ND	5	ND	5
Chloromethane	NA		ND	ND		ND	5	ND	5	ND	5
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5	ND	5	ND	5
Ethylbenzene	430	c	ND	12	0.19	ND	5	ND	5	ND	5
Isopropylbenzene	NA		----------	----------		----------		1 J		----------	5
Toluene	5000		ND	ND	0.31	ND	5	ND	5	ND	5
Trichloroethene	2000	a	ND	ND	1.61	2 J		ND	5	ND	5
Xylene (total)	1.8	d	ND	260	0.54	18		ND	8	2 J	
Semivolatile Organic Compounds (ug/l)											
1,2-Dichlorobenzene	129		ND	ND		ND	10	ND	10	ND	10
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10	ND	10	ND	10
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10	ND	10	ND	10
2,4-Dimethylphenol	2120	a	ND	ND	2.37	ND	10	ND	10	ND	10
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10	ND	10	ND	10
2-Chlorophenol	4380	a	ND	ND		ND	10	ND	10	ND	10
2-Methylnaphthalene	300	c	ND	8 J	2.36	ND	10	1 J		ND	10
2-Methylphenol	NA		ND	ND	2.54	ND	10	ND	10	ND	10
4-Chloro-3-methylphenol [3]	29700	e	ND	1 J	2.61	ND	10	ND	10	ND	10
4-Methylphenol	NA		ND	ND	2.54	ND	10	ND	10	ND	10
Acenaphthene	710		ND	ND	2.53	ND	10	ND	10	ND	10
Acenapthylene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Anthracene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Carbazole	NA		ND	ND	5.25	ND	10	ND	10	ND	10
Chrysene	300	c	ND	ND	0.17	ND	10	ND	10	ND	10
Dibenzofuran	20	d	ND	ND	2.55	ND	10	ND	10	ND	10
Diethylphthalate	3.4		ND	2 J	2.94	2 J		ND	10	ND	10
Fluoranthene	16		ND	ND	3.05	ND	10	ND	10	ND	10
Fluorene	300	c	ND	ND	2.61	ND	10	ND	10	ND	10
n-Nitrosodiphenylamine	5850	a	ND	1 J	2.81	ND	10	ND	10	ND	10
Naphthalene	620	b	ND	13	2.22	ND	10	1 J		ND	10
Phenanthrene	4.6	P	ND	ND	2.7	ND	10	ND	10	ND	10
Phenol	2560	b	ND	ND	2.27	ND	10	ND	10	ND	10
Pyrene	300	c	ND	ND	3.13	ND	10	ND	10	ND	10
Di-n-butylphthalate	3.4		ND	ND	2.86	ND	10	ND	10	ND	10
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10	ND	10	ND	10
Benzo(b)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(k)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(a)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Indeno (1,2,3-cd)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(g,h,i)perylene	300	c	ND	ND		ND	10	ND	10	ND	10
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	3 J		ND	10	ND	10
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	ND	3.0	ND	3	ND	3
Arsenic	36		12 J	ND	2	2.5 J		ND	4	3.2 J	
Barium	3.9	d	23.9	163	0.7	43.9		42.5		ND	40.2
Beryllium	5.3	b	ND	ND	0.2	ND	0.50	ND	1	ND	1
Cadmium	9.3		ND	ND	0.2	ND	0.40	ND	0.6	ND	0.6
Chromium [4]	50		ND	ND	0.7	0.77 J		ND	0.5	0.86 J	
Cobalt	3	d	4.7 J	ND	0.7	1.1 J		ND	3.8	ND	2.8
Copper	2.4		3.8 J	ND	2	ND	2.0	8.2		ND	4.6
Iron	1000	b	19300 J	46800	12	12400		13800		12200	
Lead	8.1		ND	ND	1.5	ND	5.6	ND	4.2	ND	2
Magnesium	NA		5060 J	9730	5	4940		5000 J		3950	
Manganese	80	d	679 J	303 J	0.5	----------		390		NA	
Mercury	0.025		0.14 J	ND	0.08	ND	0.18	ND	0.09	ND	0.09
Nickel	8.2		10.7	ND	0.7	3.8 J		5.1 J		3.4 J	
Potassium	NA		6060	9030	460	4090 J		3690		3260	
Selenium	71		----------	10.4 J	5	ND	5.0	ND	5	ND	5
Silver	0.92	P	ND	ND	0.6	ND	3.9	ND	2	ND	2
Sodium	NA		15900 J	17900	800	13400		12700		9110	
Vanadium	19	d	ND	ND	0.6	1.9 J		5.1		4.3	
Zinc	81		50.3 J	21.6	5	24.7		ND	31.9	ND	30.4

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 5R	FWENC [6] MONITORING WELL - 105R							
			Dec-93	Mar-97		Jun-97		Sep-97		Jan-98	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
1,1,1-Trichloroethane	31200	c	ND	ND		ND	5	2 J		2J	
1,2,4-Trimethylbenzene	NA		----------	----------		----------		ND	5	----------	5
Acetone	NA		ND	ND	5.82	ND	5	5 J		ND	5
Benzene	700		ND	ND	0.18	ND	5	ND	5	ND	5
Bromodichloromethane	NA		ND	ND		ND	5	ND	5	ND	5
Chlorobenzene	129		ND	ND	0.27	ND	5	ND	5	ND	5
Chloroethane	NA		ND	ND	0.56	ND	5	ND	5	ND	5
Chloromethane	NA		ND	ND		ND	5	ND	5	ND	5
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5	ND	5	ND	5
Ethylbenzene	430	c	ND	ND	0.19	ND	5	ND	5	ND	5
Isopropylbenzene	NA		----------	----------		----------		ND	5	----------	5
Toluene	5000		ND	ND	0.31	ND	5	ND	5	ND	5
Trichloroethene	2000	a	ND	ND	1.61	ND	5	ND	5	ND	5
Xylene (total)	1.8	d	ND	ND	0.54	ND	5	ND	5	ND	5
Semivolatile Organic Compounds (ug/l)											
1,2-Dichlorobenzene	129		ND	ND		ND	10	ND	10	ND	10
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10	ND	10	ND	10
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10	ND	10	ND	10
2,4-Dimethylphenol	2120	a	ND	ND	2.37	ND	10	ND	10	ND	10
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10	ND	10	ND	10
2-Chlorophenol	4380	a	ND	ND		ND	10	ND	10	ND	10
2-Methylnaphthalene	300	c	ND	ND	2.36	ND	10	ND	10	ND	10
2-Methylphenol	NA		ND	ND	2.54	ND	10	ND	10	ND	10
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10	ND	10	ND	10
4-Methylphenol	NA		ND	ND	2.54	ND	10	ND	10	ND	10
Acenaphthene	710		ND	ND	2.53	ND	10	ND	10	ND	10
Acenapthylene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Anthracene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Carbazole	NA		ND	ND	5.25	ND	10	ND	10	ND	10
Chrysene	300	c	ND	ND	0.17	ND	10	ND	10	ND	10
Dibenzofuran	20	d	ND	ND	2.55	ND	10	ND	10	ND	10
Diethylphthalate	3.4		ND	ND	2.94	ND	10	ND	10	ND	10
Fluoranthene	16		ND	ND	3.05	ND	10	ND	10	ND	10
Fluorene	300	c	ND	ND	2.61	ND	10	ND	10	ND	10
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10	ND	10	ND	10
Naphthalene	620	b	ND	ND	2.22	ND	10	ND	10	ND	10
Phenanthrene	4.6	P	ND	ND	2.7	ND	10	ND	10	ND	10
Phenol	2560	b	ND	ND	2.27	ND	10	ND	10	ND	10
Pyrene	300	c	ND	ND	3.13	ND	10	ND	10	ND	10
Di-n-butylphthalate	3.4		ND	ND	2.86	ND	10	ND	10	ND	10
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10	ND	10	ND	10
Benzo(b)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(k)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(a)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Indeno (1,2,3-cd)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(g,h,i)perylene	300	c	ND	ND		ND	10	ND	10	ND	10
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10	ND	10	ND	10
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	ND	3.0	ND	3	ND	3
Arsenic	36		19.2 J	**43.7**	2	ND	2.0	ND	2.5	ND	2
Barium	3.9	d	**17.6**	ND	0.7	ND	1.0	2.8 J		ND	12.5
Beryllium	5.3	b	1.1	ND	0.2	ND	0.50	ND	1	ND	1
Cadmium	9.3		ND	ND	0.2	ND	0.40	ND	0.6	ND	0.6
Chromium [4]	50		ND	ND	0.7	ND	0.60	ND	0.5	ND	0.5
Cobalt	3	d	**43.5 J**	ND	0.7	0.81		ND	2.3	ND	2.3
Copper	2.4		**6.7 J**	ND	2	ND	2.0	**5.5 J**		ND	9.2
Iron	1000	b	**25600 J**	355	12	ND	46.7	130		266	
Lead	8.1		ND	ND	1.5	ND	7.0	ND	2	ND	2
Magnesium	NA		8520 J	4240	5	3610		3460 J		3550	
Manganese	80	d	**1200 J**	**190 J**	0.5	----------		**92**		NA	
Mercury	0.025		0.17	ND	0.08	ND	0.08	ND	0.13	ND	0.09
Nickel	8.2		**61.2**	ND	0.7	8.1		**9.9**		**8.2**	
Potassium	NA		2340	ND	460	ND	3300	ND	1300	2150	
Selenium	71		----------	17.9	5	ND	5.0	ND	5	ND	5
Silver	0.92	P	ND	ND	0.6	ND	5.2	ND	2	ND	2
Sodium	NA		9340 J	9360	800	9320		7820		7080	
Vanadium	19	d	7.7 J	ND	0.6	ND	1.0	2.6		2.9	
Zinc	81		39.9 J	13.7 J	5	10.6 J		ND	9.5	ND	13.9

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 7S	FWENC [6] MONITORING WELL - 107R							
			Dec-93	Mar-97		Jun-97		Sep-97		Jan-98	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
1,1,1-Trichloroethane	31200	c	ND	ND		ND	5	ND	5	ND	5
1,2,4-Trimethylbenzene	NA		———	———		———		ND	5	ND	5
Acetone	NA		ND	6	5.82	ND	5	5 J		ND	5
Benzene	700		ND	ND	0.18	ND	5	2 J		ND	5
Bromodichloromethane	NA		ND	ND		ND	5	ND	5	ND	5
Chlorobenzene	129		ND	ND	0.27	1 J		6		3 J	
Chloroethane	NA		ND	ND	0.56	ND	5	ND	5	ND	5
Chloromethane	NA		ND	ND		ND	5	ND	5	ND	5
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5	2 J		2 J	
Ethylbenzene	430	c	ND	ND	0.19	ND	5	ND	5	ND	5
Isopropylbenzene	NA		———	———		———		ND	5	ND	5
Toluene	5000		ND	ND	0.31	ND	5	ND	5	ND	5
Trichloroethene	2000	a	ND	ND	1.61	ND	5	ND	5	ND	5
Xylene (total)	1.8	d	ND	ND	0.54	ND	5	ND	5	ND	5
Semivolatile Organic Compounds (ug/l)											
1,2-Dichlorobenzene	129		ND	ND		ND	10	ND	10	8 J	
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10	ND	10	ND	10
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10	ND	10	ND	10
2,4-Dimethylphenol	2120	a	ND	ND	2.37	ND	10	ND	10	ND	10
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10	ND	10	ND	10
2-Chlorophenol	4380	a	ND	ND		ND	10	ND	10	2 J	
2-Methylnaphthalene	300	c	ND	ND	2.36	ND	10	ND	10	ND	10
2-Methylphenol	NA		ND	ND	2.54	ND	10	ND	10	ND	10
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10	ND	10	ND	10
4-Methylphenol	NA		ND	ND	2.54	ND	10	2 J		ND	10
Acenaphthene	710		ND	ND	2.53	ND	10	ND	10	ND	10
Acenapthylene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Anthracene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Carbazole	NA		ND	ND	5.25	ND	10	ND	10	ND	10
Chrysene	300	c	ND	ND	0.17	ND	10	ND	10	ND	10
Dibenzofuran	20	d	ND	ND	2.55	ND	10	ND	10	ND	10
Diethylphthalate	3.4		ND	4 J	2.94	2 J		5 J		ND	10
Fluoranthene	16		ND	ND	3.05	ND	10	ND	10	ND	10
Fluorene	300	c	ND	ND	2.61	ND	10	ND	10	ND	10
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10	ND	10	ND	10
Naphthalene	620	b	ND	ND	2.22	ND	10	ND	10	7 J	
Phenanthrene	4.6	P	ND	ND	2.7	ND	10	ND	10	ND	10
Phenol	2560	b	ND	ND	2.27	ND	10	ND	10	12	
Pyrene	300	c	ND	ND	3.13	ND	10	ND	10	ND	10
Di-n-butylphthalate	3.4		ND	ND	2.86	ND	10	ND	10	ND	10
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10	ND	10	ND	10
Benzo(b)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(k)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(a)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Indeno (1,2,3-cd)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(g,h,i)perylene	300	c	ND	ND		ND	10	ND	10	ND	10
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10	ND	10	ND	10
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	ND	5.0	ND	3	ND	3
Arsenic	36		114 J	311	2	237		276		189	
Barium	3.9	d	131	ND	0.7	ND	12.8	42 J		ND	43
Beryllium	5.3	b	4.3	ND	0.2	ND	0.50	ND	1	ND	1
Cadmium	9.3		2.8 J	ND	0.2	ND	0.40	2.9 J		ND	0.6
Chromium [4]	50		153 J	ND	0.7	1.6		7.5 J		6.3	
Cobalt	3	d	743 J	ND	0.7	20.5		325		247	
Copper	2.4		285 J	ND	2	ND	2.0	ND	15.3	ND	4
Iron	1000	b	216000 J	71200	12	59700		115000		102000	
Lead	8.1		190 J	ND	1.5	ND	6.3	ND	2	ND	2
Magnesium	NA		39400 J	11700	5	7960		15100 J		15000	
Manganese	80	d	17400 J	9260 J	0.5	———		17200		NA	
Mercury	0.025		0.12	ND	0.08	ND	0.08	ND	0.09	ND	0.1
Nickel	8.2		501	ND	0.7	10.2		51.4		34.4	
Potassium	NA		7310	11300	460	8260 J		14600 J		13200	
Selenium	71		———	20.6	5	ND	12.7	ND	5	12.6	
Silver	0.92	P	ND	ND	0.6	ND	3.2	ND	2	ND	2
Sodium	NA		14600 J	22400	800	19900		25800		25200	
Vanadium	19	d	37.2 J	ND	0.6	ND	1.0	12.1 J		13	
Zinc	81		679 J	ND	5	ND	10.0	58.6 J		ND	35.5

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 8R	FWENC [6] MONITORING WELL - 108R							
			Dec-93	Mar-97		Jun-97		Sep-97		Jan-98	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
1,1,1-Trichloroethane	31200	c	ND	ND		ND	5	ND	5	ND	5
1,2,4-Trimethylbenzene	NA		--------	--------		--------		ND	5	ND	5
Acetone	NA		ND	9	5.82	ND	5	3 J		ND	5
Benzene	700		ND	ND	0.18	2 J		2 J		ND	5
Bromodichloromethane	NA		ND	ND		ND	5	ND	5	ND	5
Chlorobenzene	129		ND	7	0.27	ND	5	6		6	
Chloroethane	NA		ND	5 J	0.56	ND	5	ND	5	4 J	
Chloromethane	NA		ND	ND		ND	5	ND	5	ND	5
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5	ND	5	ND	5
Ethylbenzene	430	c	ND	ND	0.19	ND	5	ND	5	ND	5
Isopropylbenzene	NA		--------	--------		--------		ND	5	ND	5
Toluene	5000		ND	ND	0.31	6		ND	5	ND	5
Trichloroethene	2000	a	ND	ND	1.61	ND	5	ND	5	ND	5
Xylene (total)	1.8	d	ND	ND	0.54	ND	5	ND	5	ND	5
Semivolatile Organic Compounds (ug/l)											
1,2-Dichlorobenzene	129		ND	ND		ND	10	ND	10	ND	10
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10	ND	10	ND	10
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10	ND	10	ND	10
2,4-Dimethylphenol	2120	a	ND	ND	2.37	R		ND	10	ND	10
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10	ND	10	ND	10
2-Chlorophenol	4380	a	ND	ND		ND	10	ND	10	ND	10
2-Methylnaphthalene	300	c	ND	ND	2.36	ND	10	ND	10	ND	10
2-Methylphenol	NA		ND	ND	2.54	R		ND	10	ND	10
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10	ND	10	ND	10
4-Methylphenol	NA		ND	ND	2.54	R		ND	10	ND	10
Acenaphthene	710		ND	ND	2.53	ND	10	ND	10	ND	10
Acenapthylene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Anthracene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Carbazole	NA		ND	ND	5.25	ND	10	ND	10	ND	10
Chrysene	300	c	ND	ND	0.17	ND	10	ND	10	ND	10
Dibenzofuran	20	d	ND	ND	2.55	ND	10	ND	10	ND	10
Diethylphthalate	3.4		ND	ND	2.94	ND	10	ND	10	ND	10
Fluoranthene	16		ND	ND	3.05	ND	10	ND	10	ND	10
Fluorene	300	c	ND	ND	2.61	ND	10	ND	10	ND	10
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10	ND	10	ND	10
Naphthalene	620	b	ND	ND	2.22	ND	10	ND	10	ND	10
Phenanthrene	4.6	P	ND	ND	2.7	ND	10	ND	10	ND	10
Phenol	2560	b	ND	ND	2.27	R		ND	10	ND	10
Pyrene	300	c	ND	ND	3.13	ND	10	ND	10	ND	10
Di-n-butylphthalate	3.4		ND	ND	2.86	ND	10	ND	10	ND	10
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10	ND	10	ND	10
Benzo(b)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(k)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(a)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Indeno (1,2,3-cd)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(g,h,i)perylene	300	c	ND	ND		ND	10	ND	10	ND	10
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10	ND	10	ND	10
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	ND	5.2	ND	3	ND	6.4
Arsenic	36		24.4 J	65	2	40.4		31.9		16.8	
Barium	3.9	d	179	ND	0.7	35.1		32.4		ND	43.6
Beryllium	5.3	b	1.8	ND	0.2	ND	0.50	ND	1	ND	1
Cadmium	9.3		1.4 J	ND	0.2	ND	0.40	ND	0.6	ND	0.6
Chromium [4]	50		24.1 J	ND	0.7	2.2		2 J		1.2	
Cobalt	3	d	258 J	73.8	0.7	67.7		70.9		76.1	
Copper	2.4		91.8 J	ND	2	ND	2.0	ND	6	ND	11.2
Iron	1000	b	38900 J	14900	12	10500		8120		6160	
Lead	8.1		26.9	ND	1.5	ND	9.2	ND	2	ND	2
Magnesium	NA		118000 J	42100	5	42500		38500 J		35600	
Manganese	80	d	6330 J	3730 J	0.5	--------		3710		NA	
Mercury	0.025		ND	ND	0.08	ND	0.80	ND	0.09	ND	0.09
Nickel	8.2		235	66.7	0.7	65.8		64.9		61.5	
Potassium	NA		110000	86200	460	83200 J		78400		71800	
Selenium	71		--------	7.8 J	5	ND	5.0	ND	5	ND	5
Silver	0.92	P	ND	ND	0.6	ND	3.5	ND	2	ND	2
Sodium	NA		721000 J	198000	800	198000		183000		193000	
Vanadium	19	d	28.7 J	17.8	0.6	10.3		25.4		24.1	
Zinc	81		156 J	16.7 J	5	ND	10.0	ND	9.6	ND	11.8

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 11S	FWENC [6] MONITORING WELL - 111S							
			Dec-93	Mar-97		Jun-97		Sep-97		Jan-98	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)			DRY WELL	DRY WELL		DRY WELL		DRY WELL		DRY WELL	
1,1,1-Trichloroethane	31200	c	---------	---------		---------		---------		---------	
1,2,4-Trimethylbenzene	NA		---------	---------		---------		---------		---------	
Acetone	NA		---------	---------		---------		---------		---------	
Benzene	700		---------	---------		---------		---------		---------	
Bromodichloromethane	NA		---------	---------		---------		---------		---------	
Chlorobenzene	129		---------	---------		---------		---------		---------	
Chloroethane	NA		---------	---------		---------		---------		---------	
Chloromethane	NA		---------	---------		---------		---------		---------	
1,2-Dichloroethene (total)	11600	a	---------	---------		---------		---------		---------	
Ethylbenzene	430	c	---------	---------		---------		---------		---------	
Isopropylbenzene	NA		---------	---------		---------		---------		---------	
Toluene	5000		---------	---------		---------		---------		---------	
Trichloroethene	2000	a	---------	---------		---------		---------		---------	
Xylene (total)	1.8	d	---------	---------		---------		---------		---------	
Semivolatile Organic Compounds (ug/l)											
1,2-Dichlorobenzene	129		---------	---------		---------		---------		---------	
1,3-Dichlorobenzene	129		---------	---------		---------		---------		---------	
1,4-Dichlorobenzene	129		---------	---------		---------		---------		---------	
2,4-Dimethylphenol	2120	a	---------	---------		---------		---------		---------	
2,6-Dinitrotoluene [2]	370	e	---------	---------		---------		---------		---------	
2-Chlorophenol	4380	a	---------	---------		---------		---------		---------	
2-Methylnaphthalene	300	c	---------	---------		---------		---------		---------	
2-Methylphenol	NA		---------	---------		---------		---------		---------	
4-Chloro-3-methylphenol [3]	29700	e	---------	---------		---------		---------		---------	
4-Methylphenol	NA		---------	---------		---------		---------		---------	
Acenaphthene	710		---------	---------		---------		---------		---------	
Acenapthylene	300	c	---------	---------		---------		---------		---------	
Anthracene	300	c	---------	---------		---------		---------		---------	
Carbazole	NA		---------	---------		---------		---------		---------	
Chrysene	300	c	---------	---------		---------		---------		---------	
Dibenzofuran	20	d	---------	---------		---------		---------		---------	
Diethylphthalate	3.4		---------	---------		---------		---------		---------	
Fluoranthene	16		---------	---------		---------		---------		---------	
Fluorene	300	c	---------	---------		---------		---------		---------	
n-Nitrosodiphenylamine	5850	a	---------	---------		---------		---------		---------	
Naphthalene	620	b	---------	---------		---------		---------		---------	
Phenanthrene	4.6	P	---------	---------		---------		---------		---------	
Phenol	2560	b	---------	---------		---------		---------		---------	
Pyrene	300	c	---------	---------		---------		---------		---------	
Di-n-butylphthalate	3.4		---------	---------		---------		---------		---------	
Benzo(a)anthracene	300	c	---------	---------		---------		---------		---------	
Benzo(b)fluoranthene	300	c	---------	---------		---------		---------		---------	
Benzo(k)fluoranthene	300	c	---------	---------		---------		---------		---------	
Benzo(a)pyrene	300	c	---------	---------		---------		---------		---------	
Indeno (1,2,3-cd)pyrene	300	c	---------	---------		---------		---------		---------	
Benzo(g,h,i)perylene	300	c	---------	---------		---------		---------		---------	
bis(2-Ethylhexyl)phthalate	360	P	---------	---------		---------		---------		---------	
Total Metals (ug/l)											
Antimony	500	P	---------	---------		---------		---------		---------	
Arsenic	36		---------	---------		---------		---------		---------	
Barium	3.9	d	---------	---------		---------		---------		---------	
Beryllium	5.3	b	---------	---------		---------		---------		---------	
Cadmium	9.3		---------	---------		---------		---------		---------	
Chromium [4]	50		---------	---------		---------		---------		---------	
Cobalt	3	d	---------	---------		---------		---------		---------	
Copper	2.4		---------	---------		---------		---------		---------	
Iron	1000	b	---------	---------		---------		---------		---------	
Lead	8.1		---------	---------		---------		---------		---------	
Magnesium	NA		---------	---------		---------		---------		---------	
Manganese	80	d	---------	---------		---------		---------		---------	
Mercury	0.025		---------	---------		---------		---------		---------	
Nickel	8.2		---------	---------		---------		---------		---------	
Potassium	NA		---------	---------		---------		---------		---------	
Selenium	71		---------	---------		---------		---------		---------	
Silver	0.92	P	---------	---------		---------		---------		---------	
Sodium	NA		---------	---------		---------		---------		---------	
Vanadium	19	d	---------	---------		---------		---------		---------	
Zinc	81		---------	---------		---------		---------		---------	

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 11R	FWENC [6] MONITORING WELL - 111R							
			Dec-93	Mar-97		Jun-97		Sep-97		Jan-98	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)								DUPLICATES (AVERAGED)			
1,1,1-Trichloroethane	31200	c	ND	ND		ND	5	ND	5	ND	5
1,2,4-Trimethylbenzene	NA		---------	---------		---------		ND	5	ND	5
Acetone	NA		ND	6	5.82	ND	5	6.5 J		ND	5
Benzene	700		ND	ND	0.18	ND	5	ND	5	ND	5
Bromodichloromethane	NA		ND	ND		ND	5	ND	5	ND	5
Chlorobenzene	129		ND	ND	0.27	ND	5	ND	5	ND	5
Chloroethane	NA		ND	ND	0.56	ND	5	ND	5	ND	5
Chloromethane	NA		ND	ND		ND	5	ND	5	ND	5
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5	ND	5	ND	5
Ethylbenzene	430	c	ND	ND	0.19	ND	5	ND	5	ND	5
Isopropylbenzene	NA		---------	---------		---------		ND	5	ND	5
Toluene	5000		ND	ND	0.31	ND	5	ND	5	ND	5
Trichloroethene	2000	a	ND	ND	1.61	ND	5	ND	5	ND	5
Xylene (total)	1.8	d	ND	ND	0.54	ND	5	ND	5	ND	5
Semivolatile Organic Compounds (ug/l)											
1,2-Dichlorobenzene	129		ND	ND		ND	10	ND	10	ND	10
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10	ND	10	ND	10
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10	ND	10	ND	10
2,4-Dimethylphenol	2120	a	ND	ND	2.37	R		ND	10	ND	10
2,6-Dinitrotoluene [2]	370	e	ND	ND		ND	10	ND	10	ND	10
2-Chlorophenol	4380	a	ND	ND		ND	10	ND	10	ND	10
2-Methylnaphthalene	300	c	1 J	ND	2.36	ND	10	ND	10	ND	10
2-Methylphenol	NA		ND	ND	2.54	R		ND	10	ND	10
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10	ND	10	ND	10
4-Methylphenol	NA		ND	ND	2.54	R		ND	10	ND	10
Acenaphthene	710		2 J	ND	2.53	ND	10	ND	10	ND	10
Acenapthylene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Anthracene	300	c	1 J	ND	2.59	ND	10	ND	10	ND	10
Carbazole	NA		ND	ND	5.25	ND	10	ND	10	ND	10
Chrysene	300	c	ND	ND		ND	10	ND	10	ND	10
Dibenzofuran	20	d	2 J	ND	2.55	ND	10	ND	10	ND	10
Diethylphthalate	3.4		ND	ND	2.94	ND	10	ND	10	ND	10
Fluoranthene	16		2 J	ND	3.05	ND	10	ND	10	ND	10
Fluorene	300	c	2 J	ND	2.61	ND	10	ND	10	ND	10
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10	ND	10	ND	10
Naphthalene	620	b	8 J	2 J	2.22	ND	10	ND	10	ND	10
Phenanthrene	4.6	P	**5 J**	ND	2.7	ND	10	ND	10	ND	10
Phenol	2560	b	ND	ND	2.27	R		ND	10	ND	10
Pyrene	300	c	1 J	ND	3.13	ND	10	ND	10	ND	10
Di-n-butylphthalate	3.4		1 J	ND	2.86	ND	10	ND	10	ND	10
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10	ND	10	ND	10
Benzo(b)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(k)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(a)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Indeno (1,2,3-cd)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(g,h,i)perylene	300	c	ND	ND		ND	10	ND	10	ND	10
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10	ND	10	ND	10
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	ND	3.2	ND	3	ND	3.8
Arsenic	36		22.5 J	**67.1**	2	**120**		**114**		**112**	
Barium	3.9	d	**154**	**68.5**	0.7	**55.3**		**53.4**		ND	57.4
Beryllium	5.3	b	2	ND	0.2	ND	0.50	ND	1	ND	1
Cadmium	9.3		1.8 J	ND	0.2	ND	0.40	ND	0.6	ND	0.6
Chromium [4]	50		**82.8 J**	ND	0.7	1.6		1.95 J		ND	0.5
Cobalt	3	d	**116 J**	ND	0.7	**8.9**		**13.45**		**7.2**	
Copper	2.4		**267 J**	ND	2	ND	2.0	ND	5.9	ND	7
Iron	1000	b	**128000 J**	**3770**	12	**3850**		**4200**		**3000**	
Lead	8.1		**548**	ND	1.5	**14.7 J**		ND	5.2	ND	2
Magnesium	NA		53100 J	58100	5	60100		55200 J		52100	
Manganese	80	d	**15900 J**	**2590 J**	0.5	---------		**2060**		NA	
Mercury	0.025		**0.33**	ND	0.08	ND	0.80	ND	0.09	ND	0.1
Nickel	8.2		**122**	ND	0.7	ND	2.0	5.15 J		ND	3
Potassium	NA		33500	36300	460	26300 J		20600		25000	
Selenium	71		---------	9 J	5	ND	5.0	5.7 J		9 J	
Silver	0.92	P	**1.3 J**	ND	0.6	ND	1.8	ND	2	ND	2
Sodium	NA		76800 J	213000	800	208000		197000		212000	
Vanadium	19	d	**45.8 J**	**23.5**	0.6	12.0		**35.4**		**32.3**	
Zinc	81		**1060 J**	15.3 J	5	ND	10.0	ND	17.1	ND	15.8

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 12S	FWENC [6] MONITORING WELL - 112S							
			Dec-93	Mar-97		Jun-97		Sep-97		Jan-98	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)								DUPLICATES (AVERAGED)			
1,1,1-Trichloroethane	31200	c	ND	ND		ND	5	ND	5	ND	5
1,2,4-Trimethylbenzene	NA		---------	---------		---------		ND	5	ND	5
Acetone	NA		ND	6	5.82	ND	5	ND	5	ND	5
Benzene	700		ND	ND	0.18	ND	5	ND	5	ND	5
Bromodichloromethane	NA		ND	ND		ND	5	ND	5	ND	5
Chlorobenzene	129		29	ND	0.27	5		ND	5	ND	5
Chloroethane	NA		ND	ND	0.56	ND	5	ND	5	ND	5
Chloromethane	NA		ND	ND		ND	5	ND	5	ND	5
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5	ND	5	ND	5
Ethylbenzene	430	c	4 J	ND	0.19	ND	5	ND	5	ND	5
Isopropylbenzene	NA		---------	---------		---------		ND	5	ND	5
Toluene	5000		ND	ND	0.31	ND	5	ND	5	ND	5
Trichloroethene	2000	a	ND	ND	1.61	ND	5	ND	5	ND	5
Xylene (total)	1.8	d	**14**	ND	0.54	1 J		ND	5	ND	5
Semivolatile Organic Compounds (ug/l)											
1,2-Dichlorobenzene	129		ND	ND		ND	10	ND	10	ND	10
1,3-Dichlorobenzene	129		2 J	ND	2.06	ND	10	ND	10	ND	10
1,4-Dichlorobenzene	129		13	ND	2.16	1 J		ND	10	ND	10
2,4-Dimethylphenol	2120	a	ND	ND	2.37	ND	10	ND	10	ND	10
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10	ND	10	ND	10
2-Chlorophenol	4380	a	ND	ND		ND	10	ND	10	ND	10
2-Methylnaphthalene	300	c	1 J	ND	2.36	ND	10	ND	10	ND	10
2-Methylphenol	NA		ND	ND	2.54	ND	10	ND	10	ND	10
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10	ND	10	ND	10
4-Methylphenol	NA		ND	ND	2.54	ND	10	ND	10	ND	10
Acenaphthene	710		ND	ND	2.53	ND	10	ND	10	ND	10
Acenapthylene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Anthracene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Carbazole	NA		ND	ND	5.25	ND	10	ND	10	ND	10
Chrysene	300	c	ND	ND	0.17	ND	10	ND	10	ND	10
Dibenzofuran	20	d	ND	ND	2.55	ND	10	ND	10	ND	10
Diethylphthalate	3.4		ND	ND	2.94	ND	10	ND	10	ND	10
Fluoranthene	16		ND	ND	3.05	ND	10	ND	10	ND	10
Fluorene	300	c	ND	ND	2.61	ND	10	ND	10	ND	10
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10	ND	10	ND	10
Naphthalene	620	b	3 J	ND	2.22	ND	10	ND	10	1 J	
Phenanthrene	4.6	P	ND	ND	2.7	ND	10	ND	10	ND	10
Phenol	2560	b	ND	ND	2.27	ND	10	ND	10	ND	10
Pyrene	300	c	1 J	ND	3.13	ND	10	ND	10	ND	10
Di-n-butylphthalate	3.4		ND	ND	2.86	ND	10	ND	10	ND	10
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10	ND	10	ND	10
Benzo(b)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(k)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(a)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Indeno (1,2,3-cd)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(g,h,i)perylene	300	c	ND	ND		ND	10	ND	10	ND	10
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10	ND	10	ND	10
Total Metals (ug/l)											
Antimony	500	P	26.5 J	ND	5	ND	3.0	ND	3.0	ND	3
Arsenic	36		**51.6 J**	24.5	2	26.7		32.45		27.6	
Barium	3.9	d	**112**	ND	0.7	**30.9**		**23.6**		ND	32.8
Beryllium	5.3	b	1	ND	0.2	ND	0.50	ND	1.0	ND	1
Cadmium	9.3		**10 J**	ND	0.2	ND	0.40	ND	0.60	ND	0.6
Chromium [4]	50		**67.9 J**	ND	0.7	ND	0.60	ND	0.50	0.56 J	
Cobalt	3	d	**43.8**	ND	0.7	1.8		**4.35**		ND	3
Copper	2.4		**97.2 J**	ND	2	ND	2.0	ND	4.2	ND	3.9
Iron	1000	b	**87300 J**	**21000**	12	**23200**		**24750**		**18300**	
Lead	8.1		**375 J**	ND	1.5	ND	8.1	ND	2.85	ND	2
Magnesium	NA		10000 J	3220	5	3350		3125 J		2570	
Manganese	80	d	**2730 J**	**495 J**	0.5	---------		**544**		NA	
Mercury	0.025		**1.7**	ND	0.08	ND	0.08	ND	0.09	ND	0.1
Nickel	8.2		**97**	ND	0.7	2.8 J		5.9 J		3.2 J	
Potassium	NA		3070	ND	460	ND	3300	2610 J		1940 J	
Selenium	71		---------	ND	5	ND	6.5	ND	5.0	ND	5
Silver	0.92	P	**11.6**	ND	0.6	ND	4.2	ND	2.0	ND	2
Sodium	NA		7590 J	10700	800	12300		10350		7720	
Vanadium	19	d	**189**	ND	0.6	ND	1.0	3.55		3.3	
Zinc	81		**1440 J**	23.3	5	12.3 J		ND	13.95	ND	9.3

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 13S	FWENC [6] MONITORING WELL - 113S							
			Dec-93	Mar-97		Jun-97		Sep-97		Jan-98	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)										DUPLICATES (AVERAGED)	
1,1,1-Trichloroethane	31200	c	ND	ND		ND	5	2 J		2 J	
1,2,4-Trimethylbenzene	NA		--------	--------		--------		ND	5	ND	5
Acetone	NA		ND	ND	5.82	ND	5	11 J		ND	5
Benzene	700		ND	ND	0.18	ND	5	ND	5	ND	5
Bromodichloromethane	NA		ND	ND		ND	5	ND	5	ND	5
Chlorobenzene	129		3 J	ND	0.27	ND	5	ND	5	ND	5
Chloroethane	NA		ND	ND	0.56	ND	5	ND	5	ND	5
Chloromethane	NA		ND	ND		ND	5	ND	5	ND	5
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5	ND	5	ND	5
Ethylbenzene	430	c	ND	ND	0.19	ND	5	ND	5	ND	5
Isopropylbenzene	NA		--------	--------		--------		ND	5	ND	5
Toluene	5000		ND	ND	0.31	ND	5	ND	5	ND	5
Trichloroethene	2000	a	ND	ND	1.61	ND	5	ND	5	ND	5
Xylene (total)	1.8	d	ND	ND	0.54	ND	5	ND	5	ND	5
Semivolatile Organic Compounds (ug/l)											
1,2-Dichlorobenzene	129		ND	ND		ND	10	ND	10	ND	10
1,3-Dichlorobenzene	129		0.5 J	ND	2.06	ND	10	ND	10	ND	10
1,4-Dichlorobenzene	129		2 J	ND	2.16	ND	10	ND	10	ND	10
2,4-Dimethylphenol	2120	a	ND	ND	2.37	ND	10	ND	10	ND	10
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10	ND	10	ND	10
2-Chlorophenol	4380	a	ND	ND		ND	10	ND	10	ND	10
2-Methylnaphthalene	300	c	1 J	ND	2.36	ND	10	ND	10	ND	10
2-Methylphenol	NA		ND	ND	2.54	ND	10	ND	10	ND	10
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10	ND	10	ND	10
4-Methylphenol	NA		1 J	ND	2.54	ND	10	ND	10	ND	10
Acenaphthene	710		ND	ND	2.53	ND	10	ND	10	ND	10
Acenapthylene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Anthracene	300	c	ND	ND	2.59	ND	10	ND	10	ND	10
Carbazole	NA		ND	ND	5.25	ND	10	ND	10	ND	10
Chrysene	300	c	ND	ND	0.17	ND	10	ND	10	ND	10
Dibenzofuran	20	d	ND	ND	2.55	ND	10	ND	10	ND	10
Diethylphthalate	3.4		ND	ND	2.94	ND	10	ND	10	4 J	
Fluoranthene	16		ND	ND	3.05	ND	10	ND	10	ND	10
Fluorene	300	c	ND	ND	2.61	ND	10	ND	10	ND	10
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10	ND	10	ND	10
Naphthalene	620	b	0.9 J	ND	2.22	ND	10	ND	10	ND	10
Phenanthrene	4.6	P	ND	ND	2.7	ND	10	ND	10	ND	10
Phenol	2560	b	ND	ND	2.27	ND	10	ND	10	ND	10
Pyrene	300	c	ND	ND	3.13	ND	10	ND	10	ND	10
Di-n-butylphthalate	3.4		ND	ND	2.86	ND	10	ND	10	ND	10
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10	ND	10	ND	10
Benzo(b)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(k)fluoranthene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(a)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Indeno (1,2,3-cd)pyrene	300	c	ND	ND		ND	10	ND	10	ND	10
Benzo(g,h,i)perylene	300	c	ND	ND		ND	10	ND	10	ND	10
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10	ND	10	ND	10
Total Metals (ug/l)											
Antimony	500	P	34.1	ND	5	ND	6.5	ND	3.0	ND	4.3
Arsenic	36		117	ND	2	ND	2.0	ND	2.0	ND	2.0
Barium	3.9	d	228	ND	0.7	34.9		12.4		ND	19
Beryllium	5.3	b	4.9	ND	0.2	ND	0.50	ND	1.0	ND	1.0
Cadmium	9.3		9.9	ND	0.2	ND	0.40	ND	0.60	ND	0.60
Chromium [4]	50		146	ND	0.7	ND	0.60	ND	0.50	ND	0.50
Cobalt	3	d	127	ND	0.7	ND	0.70	2.1		ND	1.75
Copper	2.4		241	ND	2	ND	2.0	ND	14.7	ND	8.3
Iron	1000	b	227000	305	12	3640		414		622	
Lead	8.1		1860	ND	1.5	ND	7.8	ND	3.4	2.5 J	
Magnesium	NA		32700	2960	5	3210		3200 J		2990	
Manganese	80	d	4020	58.3 J	0.5	--------		130		NA	
Mercury	0.025		0.23	ND	0.08	ND	0.80	ND	0.09	ND	0.09
Nickel	8.2		250	ND	0.7	2.4 J		3.9 J		ND	3.0
Potassium	NA		8840	ND	460	ND	3300	1870 J		1590	
Selenium	71		--------	ND	5	ND	5.0	ND	5.0	ND	5.0
Silver	0.92	P	2	ND	0.6	ND	5.4	ND	2.0	ND	2.0
Sodium	NA		11600	8010	800	10700		9540		6635	
Vanadium	19	d	107	ND	0.6	ND	1.0	2.4		2.4	
Zinc	81		856	27.2	5	26.0		50.1 J		ND	18.3

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUNDWATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

NOTES:

1. Ambient Water Quality Criteria (AWQC) from 40 FR 79318, "Quality Criteria for Water", December 1992 (with revisions for metals: May 1995). Marine chronic values used unless not available, in which case the lowest of a, b, c, d, or e were used as available.
   a - AWQC acute freshwater value.
   b - AWQC chronic freshwater value.
   c - AWQC acute marine value.
   d - Ecotox Tier II freshwater value (US EPA, ECO Update, Intermittent Bulletin Volume 3, Number 2, January 1996).
   e - Canadian MEQ marine acute value (Environment Canada, The Development of Canadian Marine Environmental Quality (MEQ) Guidelines, 1992.
   P - Value is proposed.

2. Criteria presneted for Dinitrotoluene. No criteria established for 2,6-Dinitrotoluene.

3. Criteria presented for 4-Chlorophenol. No criteria established for 4-Chloro-3-methylphenol.

4. Criteria presented for Chromium as Chromium +6. No criteria established for Chromium +3 or Chromium (total).

5. Data collected by TRC Environmental Corporation as presented in: "Remedial Investigation, Draft Final Report for McAllister Point Landfill, NETC-Newport, Rhode Island", July 1994.

6. Wells installed and sampled by Foster Wheeler Environmental Corporation (FWENC) as described in: "Operations and Maintenance Manual", May 1997.

J - Value estimated due to exceeding quality control criteria.

NA - AWQC value for contaminant was not available.

ND - Not detected above QL/DL reported by analytical laboratory.

MDL - Method Detection Limit reported by analytical laboratory.

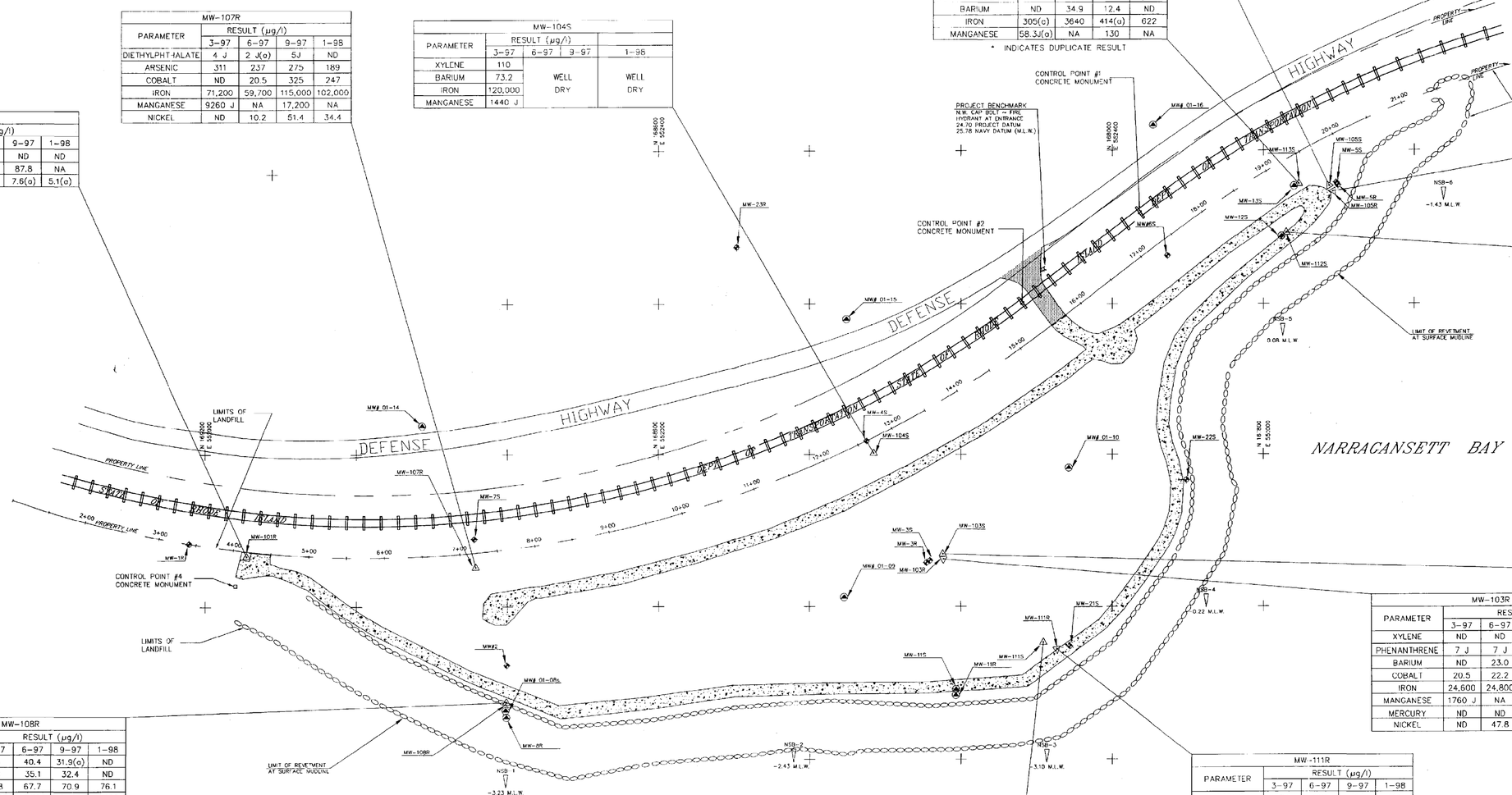
QL/DL - Quanitation Limit (for organics) and Detection Limit (for metals) reported by analytical laboratory.

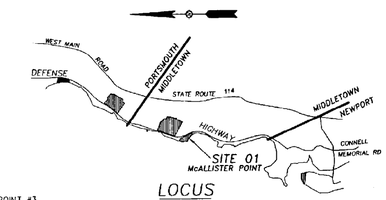
R - Value was rejected due to exceeding quality control criteria.

Shaded values exceed the indicated AWQC value.

---------- - Not analyzed.

RAILROAD BASELINE MONUMENTATION				SAI SURVEYING MONUMENTATATION				
CP1	167963.267	552318.969	---	CP3	167456.9024	552498.7751	6.25 P.D.	5.17 M.L.W.
CP2	168119.063	552200.989	---	CP4	169159.7207	551827.4420	25.11 P.D.	24.03 M.L.W.





LOCUS
(NOT TO SCALE)

MW-101R				
PARAMETER	RESULT (µg/l)			
	3-97	6-97	9-97	1-98
LEAD	ND	19.8	ND	ND
MANGANESE	79.6(a)	NA	87.8	NA
NICKEL	ND	8.7	7.6(a)	5.1(a)

MW-107R				
PARAMETER	RESULT (µg/l)			
	3-97	6-97	9-97	1-98
DIETHYLPHTHALATE	4 J	2 J(a)	5J	ND
ARSENIC	311	237	275	189
COBALT	ND	20.5	325	247
IRON	71,200	59,700	115,000	102,000
MANGANESE	9260 J	NA	17,200	NA
NICKEL	ND	10.2	51.4	34.4

MW-104S				
PARAMETER	RESULT (µg/l)			
	3-97	6-97	9-97	1-98
XYLENE	110	WELL DRY		WELL DRY
BARIUM	73.2			
IRON	120,000			
MANGANESE	1440 J			

MW-113S				
PARAMETER	RESULT (µg/l)			
	3-97	6-97	9-97	1-98
DIETHYLPHTHALATE	ND	ND	ND	4J/10U*
BARIUM	ND	34.9	12.4	ND
IRON	305(a)	3640	414(a)	622
MANGANESE	58.3J(a)	NA	130	NA

* INDICATES DUPLICATE RESULT

MW-105S				
PARAMETER	RESULT (µg/l)			
	3-97	6-97	9-97	1-98
XYLENE	260	18	ND	2J
BARIUM	163	43.9	42.5	ND
COPPER	ND	ND	8.2	ND
IRON	46,800	12,400	13,800	12,200
MANGANESE	303 J	NA	390	NA

MW-105R				
PARAMETER	RESULT (µg/l)			
	3-97	6-97	9-97	1-98
ARSENIC	43.7	ND	ND	ND
COPPER	ND	ND	5.5J	ND
MANGANESE	190 J	NA	92	NA
NICKEL	ND	8.1(a)	9.9	8.2

MW-112S				
PARAMETER	RESULT (µg/l)			
	3-97	6-97	9-97	1-98
BARIUM	ND	30.9	23.6	ND
COBALT	ND	1.8(a)	4.35	ND
IRON	21,000	23,200	24,750	18,300
MANGANESE	495 J	NA	544	NA

MW-103S				
PARAMETER	RESULT (µg/l)			
	3-97	6-97	9-97	1-98
XYLENE	23	19	ND	10
DIBENZOFURAN	130	150 J	76	ND
FLUORANTHENE	23	23	18	29
NAPHTHALENE	1400	1400	1800	530
PHENANTHRENE	160	160 J	100	80
ARSENIC	ND	5.0(a)	76.4	37.0
BARIUM	119	146	213	361
COBALT	ND	4.5	44.4	6.9
IRON	59,500	63,500	29,000	53,500
LEAD	ND	ND	31	44.3
MANGANESE	12,000 J	NA	5,090	NA
MERCURY	ND	ND	ND	0.12J
NICKEL	4.2(a)	10.8	346	43.1
VANADIUM	ND	3.6(a)	19.9	29.5
ZINC	ND	16.7	156	229

MW-103R				
PARAMETER	RESULT (µg/l)			
	3-97	6-97	9-97	1-98
XYLENE	ND	ND	ND	9
PHENANTHRENE	7 J	7 J	7J	6J
BARIUM	ND	23.0	23.1	ND
COBALT	20.5	22.2	24.1	24.5
IRON	24,600	24,800	26,600	27,100
MANGANESE	1760 J	NA	1,870	NA
MERCURY	ND	ND	ND	0.20J
NICKEL	ND	47.8	48	49.3

MW-10BR				
PARAMETER	RESULT (µg/l)			
	3-97	6-97	9-97	1-98
ARSENIC	65	40.4	31.9(a)	ND
BARIUM	ND	35.1	32.4	ND
COBALT	73.8	67.7	70.9	76.1
IRON	14,900	10,500	8,120	6,160
MANGANESE	3730 J	NA	3,710	NA
NICKEL	66.7	65.8	64.9	61.5
VANADIUM	17.8(a)	10.3(a)	25.4	24.1

MW-111S				
PARAMETER	RESULT (µg/l)			
	3-97	6-97	9-97	1-98
N/A	DRY	DRY	DRY	DRY

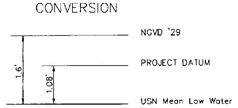
MW-111R				
PARAMETER	RESULT (µg/l)			
	3-97	6-97	9-97	1-98
ARSENIC	67.1	120	114	112
BARIUM	68.5	55.3	53.4	ND
COBALT	ND	8.9	13.45	7.2
IRON	3770	3850	4,200	3,000
LEAD	ND	14.7 J	ND	ND
MANGANESE	2590 J	NA	2,060	NA
VANADIUM	23.5	2.0(a)	35.4	32.3

LEGEND

- LIMIT OF REVETMENT STONE
- EDGE OF ROADWAYS
- MW-103R — MONITORING WELLS CIRCA 1996 (FWEC)
- NSB-5 0.08 M.L.W. — NSB SAMPLE POINTS CIRCA 1996 (B&R)
- MW# 01-09 — MONITORING WELLS CIRCA 1994 (TRC)
- MW#35 — MONITORING WELLS CIRCA 1990 (TRC)

ND – NOT DETECTED ABOVE MDL (SEE TABLE 3)
NA – NOT ANALYZED
N/A – NOT APPLICABLE
J – QUANTITATION ESTIMATED. (SEE TABLE 3)
(a) – CONCENTRATIONS BELOW REFERENCED CRITERIA (SEE TABLE 3)

DATUM CONVERSION



NOTES:

REFERENCE PLAN

1) PLAT SHOWING LAND IN CITY OF NEWPORT & TOWNS OF MIDDLETWON & PORTSMOUTH, ACQUIRED FOR RAILROAD PURPOSES ON BEHALF OF THE STATE OF RHODE ISLAND & PROVIDENCE PLANTATIONS, BY THE DIRECTOR OF TRANSPORTATION, RAILROAD PLAT NO. 1
2) SAI SURVEYING CO. INC. 5-22-97 SITE PLAN, MCALLISTER POINT LANDFILL, NAVAL EDUCATION AND TRAINING CENTER, MIDDLETOWN, RHODE ISLAND FOR BROWN AND ROOT ENVIRONMENTAL

GENERAL NOTE

1) NSB SAMPLE POINTS ELEVATIONS ARE LISTED AS NAVY MEAN LOW WATER.
2) DATUM USED FOR PLAN = PROJECT DATUM, HORIZONTAL COORDINATES BASED ON REFERENCE PLAN NO. 1.

GRAPHIC SCALE
80' 0' 80' 160'
1 INCH = 80 FEET

DRAWN BY: D.W. MACDOUGALL	TITLE: CONTAMINANT CONCENTRATIONS IN GROUNDWATER EXCEEDING ECOLOGICAL CRITERIA
PREPARED BY: S. PARKER	MCALLISTER POINT LANDFILL
CHECKED BY: S. PARKER	MIDDLETOWN, RHODE ISLAND
	SOURCE: BASE PLAN BY SAI SURVEYING COMPANY (5-22-97)
	SCALE: 1" = 80' / DATE: MARCH 31, 1998 / PROJ. NO: 4725 CTO: 197
PROJECT MANAGER: S. PARKER	DRAWING NO: FIGURE 1 / ACFILE NAME: DWG\NAVY\MC_PT\AQ_RES.DWG / REV: 1
PROGRAM MANAGER: J. TREPANOWSKI	

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C-NAVY-9-97-1054W

October 1, 1997

Project Number 4725

Mr. James Shafer
Remedial Project Manager
Northern Division, Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop 82
Lester, Pennsylvania 19113

Reference: CLEAN Contract No. N62472-90-D-1298
Contract Task Order No. 0197

Subject: McAllister Point Landfill Second Quarterly Monitoring
Performed June and July 1997 Report

Dear Mr. Shafer:

Environmental samples were collected from existing wells and vents at McAllister Point Landfill between June 23 and July 9, 1997. This was performed as a part of the Operations and Maintenance (O&M) Monitoring at this site, as described in the O&M Plan, McAllister Point Landfill, prepared by Foster Wheeler Environmental Corporation (FWENC). This letter-report describes the data collected during this effort and compares the data collected to pertinent standards for these media.

Attached to this report are the data validation memoranda that describe the chemistry analysis of the samples collected and two figures. Figure 1 presents the locations of groundwater monitoring wells sampled and Figure 2 presents locations of the air sample collection stations.

GROUNDWATER:

Groundwater samples were collected from existing wells by FWENC between June 23 and July 9, 1997. Samples were collected using a low-stress sampling methodology in accordance with U.S. EPA Region I SOP # GW0001 Low Stress (Low Flow) Revision 2 (7/30/96). The low stress method uses dedicated pneumatic bladder pumps to draw water from each of the wells while minimizing the change in water level or "head". Samples were analyzed for volatile organic compounds, semivolatile organic compounds, dissolved metals and total (TAL) metals. Analytical results were provided to B&R Environmental for validation in accordance with USEPA Tier II validation criteria. After validation, the data were compiled onto summary tables and compared with chronic ambient

water quality criteria (CAWQC) per request of the U.S. EPA and RIDEM. When CAWQC were not available for compounds detected, other criteria were used as are noted on the attached tables.

Figure 1 presents the locations of the wells sampled, and the former locations of the wells that were installed by TRC Environmental Corp. (TRC) prior to the construction of the landfill cap. The TRC wells were abandoned during the initial phase of cap construction in 1995 and replacement wells were installed as a part of the cap completion in 1996. Replacement wells were designated with similar identifiers that were used for the former wells, for instance, MW1R was abandoned and replaced during construction with MW101R. New wells were generally located within the approximate area as the TRC wells. However, due to access restrictions caused by the cap construction, some wells were located further from the former TRC well (MW1, 75 feet, and MW11 cluster, 130 feet; refer to Figure 1). The well screens were installed at the same elevations as the corresponding wells. The boring logs and well construction logs for the replacement wells are presented in the construction documents for the landfill cap. Boring logs and well construction logs for the original TRC wells are presented in the Remedial Investigation report.

Table 1 presents a summary of water levels measured during sample collection in 1997 by FWENC and water levels measured in 1993 and 1994 by TRC. Water levels are expressed in elevation in feet above mean low water. The water levels were measured with electronic water level measuring instruments prior to activation of the dedicated sampling equipment installed in March 1997. This table also describes the distance of the replacement well from the corresponding TRC well reported in the TRC Remedial Investigation report and groundwater modeling report. Significant differences in groundwater elevations between 1994 and 1997 are observed in wells screened in bedrock. These differences could be related to the large distance between the original TRC wells and the replacement wells but also could be related to changed groundwater conditions resulting from completion of the landfill cap.

Table 2 presents a summary of the water chemistry measured during sample collection. This table presents the dissolved oxygen (DO) and pH of the water after stabilization criteria were met during low-stress pumping. The water chemistry measured during the groundwater sample collection efforts performed by TRC in 1993 is also presented on Table 2 for comparative purposes. However, the sample collection performed in 1993 was performed using bailers, which cause wells to be purged more aggressively, providing samples containing silt, other particulates, and possibly a higher DO. The low-stress sampling methodology provides samples with little-to-no silt and suspended solids and should provide data more reflective of the aquifer conditions. Consequently the water chemistry readings may not correspond well.

Table 3 presents concentrations of analytes detected during the June 1997 round of sample collection, the March 1997 round of sample collection, and during the remedial investigation. In accordance with the request of the U.S. EPA and RIDEM, these detected values are compared to ambient water quality criteria (USEPA, 1992, revised for metals, 1995). Shaded values are those

which exceed the criteria indicated. This comparison was made in order to provide a rapid determination of whether there is potential for adverse effects to marine organisms. This assumes a worst case scenario where the contaminant concentrations present in the groundwater are equivalent to the contaminant concentrations at the exposure point, namely the intertidal zone at the toe of the revetment. However, the concentrations observed in the wells are not necessarily representative of what may be present in porewater in the intertidal zone; actual exposure concentrations in the intertidal zone are subject to dilution, adsorption to sediments, and chemical transformation, due to mixing with seawater.

Overall, the results from the June 1997 sampling effort shows that the concentrations of contaminants detected in groundwater are lower than those measured in 1993, and comparable to those measured in March 1997. Conclusions regarding trends in the groundwater elevations and chemistry should not be based only on these first two quarterly monitoring efforts.

AIR:

Air samples were collected from gas monitoring wells located along the eastern perimeter and throughout the plateau of the landfill by FWENC between July 7 and July 9, 1997. Field notes indicate that the weather conditions during sample collection were humid, 75-85° F, with strong west- south-west winds. Gas vent risers were prepared by tapping a hole in the side of the vent pipe, inserting a permanent sampling port, sealing the vent screen with plastic to reduce introduction of ambient air. Air was then drawn through the port from the vent for ten minutes using a low volume air sampling pump while measuring lower explosive limit (LEL), Methane (CH_4), carbon dioxide (CO_2), oxygen (O_2), and hydrogen sulfide (H_2S). After purging the vent pipe in this manner, sample gas was drawn into a tedlar bag via a vacuum pump chamber.

Samples were collected from nine perimeter gas monitoring wells (Sample IDs "ML-GV-## + ##"), eighteen gas vent risers (Sample IDs "ML-GVR-118" through "ML-GVR-101"), and three ambient stations (Sample IDs "ML-Station 1" through "ML-Station 3"). After sample collection, the vent pipes were reopened, but sample ports were left in place. Figure 2 presents the locations of the perimeter gas monitoring wells, gas vent risers and ambient stations.

Samples were analyzed for volatile organic compounds and methane by Cigna Analytical laboratories using a modified method T-01 specified by FWENC. Analytical results were provided to B&R Environmental for validation in accordance with USEPA Tier II validation criteria. After validation, the data were compiled onto summary tables and compared with various criteria. Table 4 presents a summary of detected compounds in air samples collected. This table also presents the National Institute for Occupational Safety and Health (NIOSH) recommended limits, the Occupational Safety and Health Administration (OSHA) standards, and Rhode Island DEM Acceptable Ambient Levels (RIDEM 2/97) for the compounds that were tested for. Compounds detected in all samples collected were compared to NIOSH and OSHA criteria. Only samples collected from the perimeter stations were compared to RIDEM AALs, as is appropriate for these

limits. Exceedances of these standards would be highlighted on the tables using bold text and shading, however, there were no exceedances noted.

Table 5 presents air quality parameters (LEL, CH_4 , CO_2 , O_2 , and H_2S) that were measured in each vent riser and gas monitoring well immediately prior to sample collection.

Data from future sampling events will be compared to the results from this sampling round in order to identify trends in air quality venting from the landfill.

If you have any questions about this material, please do not hesitate to contact me.

Very truly yours,

Stephen S. Parker
Project Manager

SSP/pmp

attachment

c: B. Wheeler, NETC Newport - 4 (w/encl)
J. Trepanowski/G. Glenn, B&RE (w/encl)
K. Keckler, EPA - 3 (w/encl.)
P. Kulpa, RIDEM - 4 (w/encl.)
J. Hayes, Gannet Flemming - 1 (w/encl.)
K. Finkelstein, NOAA - 1 (w/encl.)
D. Egan, TAG - 1 (w/encl.)
Restoration Advisory Board - 4 (w/encl.)
File 4725-3.2 (w/o encl), 4725-8.0 (w/encl)

bc: D. McKenna w/ encl
G. Tracey, SAIC w/encl-2
J. Quinn, URI w/encl-2

ATTACHMENT A

DATA SUMMARY TABLES

TABLE 1
SUMMARY OF GROUND WATER ELEVATIONS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

WELL ID (Figure 1)	TRC [1] MONITORING WELL	PHASE II RI WATER ELEVATIONS [1]			FWENC [2] MONITORING WELL	HORIZONTAL DISTANCE FROM TRC WELL	O & M PERIOD WATER ELEVATIONS [3]			
		12/20/93	12/29/93	4/29/94			3/19/97	6/23/97		
MW#1	MW-1R	7.19	7.95	7.04	MW-101R	75.00	15.95	10.78		
MW#3S	MW-3S	12.01	12.24	13.65	MW-103S	18.00	14.62	13.95		
MW#3D	MW-3R	10.20	11.58	14.48	MW-103R	16.00	10.44	9.53		
MW#4	MW-4S	20.42	21.38	22.01	MW-104S	20.00	19.30	17.19		
MW#5	MW-5S	10.47	11.65	13.06	MW-105S	12.00	17.04	10.22		
MW#5D	MW-5R	5.51	6.20	6.98	MW-105R	12.00	12.02	9.89		
MW#7S	MW-7S	19.66	21.33	19.72	MW-107R	22.00	19.53	14.00		
MW# 01-08D	MW-8R	7.46	3.47	3.94	MW-108R	18.00	2.74	2.59		
MW# 01-11S	MW-11S	DRY	DRY	4.06	MW-111S [4]	130.00	DRY	DRY		
MW# 01-11D	MW-11R	3.40	3.11	3.76	MW-111R [4]	140.00	2.71	2.70		
MW#EW	MW-21S	3.52	N/A	3.96	MW-111S [4]	35.00	DRY	DRY		
MW# 01-12	MW-12S	10.06	11.17	12.97	MW-112S	9.00	12.35	10.23		
MW# 01-13	MW-13S	10.56	12.11	14.17	MW-113S	8.00	12.82	10.55		

NOTES:

1. Wells installed and data collected by TRC Environmental Corporation (TRC) as presented in: "Remedial Investigation, Draft Final Report for the McAllister Point Landfill, NETC-Newport, Rhode Island", July 1994.
2. Wells installed by Foster Wheeler Environmental Corporation (FWENC) as described in: "Operations and Maintenance Manual", May 1997.
3. Data compiled from FWENC field logbook.
4. FWENC well locations MW-111S & 111R are proximal to the former location of TRC well MW-21S (see Figure 1).

N/A - Not Analyzed; water level in well was not measured on this date.
DRY - Well was dry on this date.

All elevations and distances are reported in feet. Elevations are reported relative to Mean Low Water (MLW).

TABLE 2
WATER QUALITY PARAMETERS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

TRC [1] MONITORING WELL	PHASE II RI GW PARAMETERS [1] Dec-93			FWENC [2] MONITORING WELL	O & M PERIOD GW PARAMETERS [3] Mar-97			Jun-97			Round 3			Round 4		
	Salinity	pH	DO		Salinity	pH	DO	Salinity	pH	DO	Salinity	pH	DO	Salinity	pH	DO
MW-1R	< 0.01	5.21	6.90	MW-101R	0.23	5.43	7.78	N/A	5.32	6.90						
MW-3S	0.40	6.42	3.03	MW-103S	0.40	5.96	0.34	N/A	6.08	0.21						
MW-3R	0.20	5.97	3.92	MW-103R	0.41	5.98	0.41	N/A	5.93	0.23						
MW-4S	0.20	5.96	2.34	MW-104S	0.20	6.3	0.33	N/A	DRY	DRY						
MW-5S	< 0.01	5.60	3.45	MW-105S	0.49	6.53	4.5	N/A	6.2	1.92						
MW-5R	< 0.01	5.84	5.67	MW-105R	1.10	5.9	7.45	N/A	5.88	6.57						
MW-7S	0.10	5.70	5.21	MW-107R	0.12	6.34	2.45	N/A	6.29	0.29						
MW-8R	1.70	6.40	5.10	MW-108R	1.51	6.54	0.41	N/A	6.53	0.48						
MW-11S	DRY	DRY	DRY	MW-111S [4]	DRY	DRY	DRY	DRY	DRY	DRY						
MW-11R	0.50	6.32	2.49	MW-111R [4]	1.61	7.36	3.42	N/A	7.25	0.19						
MW-21S	0.60	6.84	4.00	MW-111S [4]	DRY	DRY	DRY	DRY	DRY	DRY						
MW-12S	0.10	6.20	2.36	MW-112S	0.12	6.4	5.18	N/A	6.28	0.57						
MW-13S	< 0.01	5.65	5.47	MW-113S	0.13	5.68	7.2	N/A	5.93	5.70						

NOTES:

1. *Wells installed and data collected by TRC Environmental Corporation (TRC) as presented in:* "Remedial Investigation Report, Draft Final for McAllister Point Landfill, NETC-Newport, Rhode Island", July 1994.
2. Wells installed by Foster Wheeler Environmental Corporation (FWENC) as described in: "Operations and Maintenance Manual", May 1997.
3. Data compiled from FWENC field logbook.
4. FWENC well locations MW-111S & 111R are proximal to the former location of TRC well MW-21S (see Figure 1).

N/A - Not Analyzed.
DRY - Well was dry on this date.

DO units = mg/l, Salinity units = ppt
All data collected during time of quarterly sampling.

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 1R	FWENC [6] MONITORING WELL - 101R							
			Dec-93	Mar-97		Jun-97		Round 3		Round 4	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
Acetone	NA		ND	ND	5.82	ND	5				
Benzene	700		ND	ND	0.18	ND	5				
Chlorobenzene	129		ND	ND	0.27	ND	5				
Chloroethane	NA		ND	ND	0.56	ND	5				
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5				
Ethylbenzene	430	c	ND	ND	0.19	ND	5				
Toluene	5000		ND	ND	0.31	ND	5				
Trichloroethene	2000	a	ND	ND	1.61	ND	5				
Xylene (total)	1.8	d	ND	ND	0.54	ND	5				
Semivolatile Organic Compounds (ug/l)											
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10				
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10				
2,4-Dimethylphenol	2120	a	ND	ND	2.37	ND	10				
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10				
2-Methylnaphthalene	300	c	ND	ND	2.36	ND	10				
2-Methylphenol	NA		ND	ND	2.54	ND	10				
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10				
4-Methylphenol	NA		ND	ND	2.54	ND	10				
Acenaphthene	710		ND	ND	2.53	ND	10				
Acenapthylene	300	c	ND	ND	2.59	ND	10				
Anthracene	300	c	ND	ND	2.59	ND	10				
Carbazole	NA		ND	ND	5.25	ND	10				
Chrysene	300	c	ND	ND	0.17	ND	10				
Dibenzofuran	20	d	ND	ND	2.55	ND	10				
Diethylphthalate	3.4		ND	ND	2.94	ND	10				
Fluoranthene	16		ND	ND	3.05	ND	10				
Fluorene	300	c	ND	ND	2.61	ND	10				
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10				
Naphthalene	620	b	ND	ND	2.22	3 J					
Phenanthrene	4.6	P	ND	ND	2.7	ND	10				
Phenol	2560	b	ND	ND	2.27	ND	10				
Pyrene	300	c	ND	ND	3.13	ND	10				
Di-n-butylphthalate	3.4		ND	ND	2.86	ND	10				
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10				
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10				
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	ND	3.1				
Arsenic	36		27.9 J	ND	2	ND	2.0				
Barium	3.9	d	**114**	ND	0.7	ND	2.9				
Beryllium	5.3	b	4.1	ND	0.2	ND	0.50				
Cadmium	9.3		1.2 J	ND	0.2	0.87					
Chromium [4]	50		**176 J**	ND	0.7	ND	0.60				
Cobalt	3	d	**129 J**	ND	0.7	ND	0.70				
Copper	2.4		**189 J**	ND	2	ND	2.0				
Iron	1000	b	**262000 J**	30.7	12	ND	33.0				
Lead	8.1		**275 J**	ND	1.5	**19.8 J**					
Magnesium	NA		45700 J	4510	5	4830					
Manganese	80	d	**2540 J**	79.6 J	0.5	--------					
Mercury	0.025		ND	ND	0.08	ND	0.12				
Nickel	8.2		**256**	ND	0.7	**8.7**					
Potassium	NA		5250	ND	460	ND	3300				
Selenium	71		--------	ND	5	ND	5.0				
Silver	0.92	P	0.4	ND	0.6	ND	4.1				
Sodium	NA		27300	26100	800	30300					
Vanadium	19	d	**14.3 J**	ND	0.6	1.4 J					
Zinc	81		**550 J**	11.2 J	5	10.4 J					

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 3S	FWENC [6] MONITORING WELL - 103S							
			Dec-93	Mar-97		Jun-97		Round 3		Round 4	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
Acetone	NA		ND	5	5.82	ND	7				
Benzene	700		2 J	12	0.18	9					
Chlorobenzene	129		ND	ND	0.27	ND	5				
Chloroethane	NA		ND	ND	0.56	ND	5				
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5				
Ethylbenzene	430	c	ND	12	0.19	9					
Toluene	5000		ND	8	0.31	9					
Trichloroethene	2000	a	ND	ND	1.61	ND	5				
Xylene (total)	1.8	d	ND	**23**	0.54	**19**					
Semivolatile Organic Compounds (ug/l)											
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10				
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10				
2,4-Dimethylphenol	2120	a	1 J	15	2.37	22 J					
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	12 J	10				
2-Methylnaphthalene	300	c	9 J	210 *	2.36	240 *					
2-Methylphenol	NA		3 J	6 J	2.54	4 J					
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10				
4-Methylphenol	NA		ND	44	2.54	17					
Acenaphthene	710		28	170 *	2.53	180 J*					
Acenapthylene	300	c	ND	10 *	2.59	8 J					
Anthracene	300	c	3 J	19	2.59	18					
Carbazole	NA		24	120	5.25	120 J*					
Chrysene	300	c	ND	ND	0.17	1 J					
Dibenzofuran	20	d	15	**130 ***	2.55	**150 J***					
Diethylphthalate	3.4		ND	ND	2.94	ND	10				
Fluoranthene	16		5 J	**23**	3.05	**23**					
Fluorene	300	c	20	150 *	2.61	**170 J***					
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	4 J					
Naphthalene	620	b	98	**1400 ***	2.22	**1400 ***					
Phenanthrene	4.6	P	**23**	**160 ***	2.7	**160 J***					
Phenol	2560	b	ND	3 J	2.27	ND	10				
Pyrene	300	c	4 J	10 J	3.13	14					
Di-n-butylphthalate	3.4		1 J	ND	2.86	ND	10				
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10				
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10				
Total Metals (ug/l)											
Antimony	500	P	176 J	ND	5	ND	3.0				
Arsenic	36		**178 J**	ND	2	5.0					
Barium	3.9	d	**969 J**	**119**	0.7	**146**					
Beryllium	5.3	b	**5.9**	ND	0.2	ND	0.50				
Cadmium	9.3		**28 J**	ND	0.2	ND	0.40				
Chromium [4]	50		**256 J**	ND	0.7	3.0					
Cobalt	3	d	**205 J**	ND	0.7	**4.5**					
Copper	2.4		**1730 J**	ND	2	ND	2.0				
Iron	1000	b	**341000 J**	**59500**	12	**63500**					
Lead	8.1		**4060**	ND	1.5	ND	6.0				
Magnesium	NA		57000 J	15200	5	17000					
Manganese	80	d	**7990 J**	**12000 J**	0.5	--------					
Mercury	0.025		**4.51**	ND	0.08	ND	0.08				
Nickel	8.2		**386**	4.2	0.7	**10.8**					
Potassium	NA		25900	10500	460	15100 J					
Selenium	71		--------	13.1 J	5	ND	8.8				
Silver	0.92	P	**25 J**	ND	0.6	ND	1.7				
Sodium	NA		91600 J	43900	800	49100					
Vanadium	19	d	**432**	ND	0.6	3.6					
Zinc	81		**6800 J**	ND	5	16.7 J					

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 3R	FWENC [6] MONITORING WELL - 103R							
			Dec-93	Mar-97		Jun-97		Round 3		Round 4	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
Acetone	NA		ND	ND	5.82	ND	5				
Benzene	700		ND	ND	0.18	ND	5				
Chlorobenzene	129		ND	ND	0.27	ND	5				
Chloroethane	NA		ND	ND	0.56	ND	5				
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5				
Ethylbenzene	430	c	ND	ND	0.19	ND	5				
Toluene	5000		ND	ND	0.31	ND	5				
Trichloroethene	2000	a	ND	ND	1.61	ND	5				
Xylene (total)	1.8	d	ND	ND	0.54	ND	5				
Semivolatile Organic Compounds (ug/l)											
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10				
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10				
2,4-Dimethylphenol	2120	a	ND	ND	2.37	R					
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10				
2-Methylnaphthalene	300	c	ND	ND	2.36	ND	10				
2-Methylphenol	NA		ND	ND	2.54	R					
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10				
4-Methylphenol	NA		ND	ND	2.54	R					
Acenaphthene	710		ND	2 J	2.53	1 J					
Acenapthylene	300	c	ND	ND	2.59	ND	10				
Anthracene	300	c	ND	1 J	2.59	ND	10				
Carbazole	NA		ND	1 J	5.25	1 J					
Chrysene	300	c	ND	ND	0.17	ND	10				
Dibenzofuran	20	d	ND	1 J	2.55	1 J					
Diethylphthalate	3.4		ND	ND	2.94	ND	10				
Fluoranthene	16		1 J	2 J	3.05	2 J					
Fluorene	300	c	ND	2 J	2.61	2 J	10				
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10				
Naphthalene	620	b	ND	3 J	2.22	2 J					
Phenanthrene	4.6	P	1 J	**7 J**	2.7	**7 J**					
Phenol	2560	b	ND	ND	2.27	R					
Pyrene	300	c	9 J	1 J	3.13	2 J					
Di-n-butylphthalate	3.4		1 J	ND	2.86	ND	10				
Benzo(a)anthracene	300	c	7 J	ND	3.13	ND	10				
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10				
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	ND	3.0				
Arsenic	36		34.4 J	ND	2	3.3 J					
Barium	3.9	d	**34.1**	ND	0.7	23.0					
Beryllium	5.3	b	1.1	ND	0.2	ND	0.50				
Cadmium	9.3		3.6 J	ND	0.2	ND	0.40				
Chromium [4]	50		ND	ND	0.7	0.92 J					
Cobalt	3	d	**44.6 J**	**20.5**	0.7	**22.2**					
Copper	2.4		**58.6 J**	ND	2	ND	2.0				
Iron	1000	b	**42400 J**	**24600**	12	**24800**					
Lead	8.1		**91.2**	ND	1.5	ND	2.0				
Magnesium	NA		15800 J	12300	5	12700					
Manganese	80	d	**2400 J**	**1760 J**	0.5	-------					
Mercury	0.025		**0.12**	ND	0.08	ND	0.08				
Nickel	8.2		**106**	ND	0.7	**47.8**					
Potassium	NA		5890	ND	460	3420 J					
Selenium	71		-------	7 J	5	ND	5.0				
Silver	0.92	P	0.5 J	ND	0.6	ND	2.0				
Sodium	NA		46200 J	31300	800	31500					
Vanadium	19	d	15.8 J	ND	0.6	2.5					
Zinc	81		**1000 J**	22.2	5	19.9					

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 4S	FWENC [6] MONITORING WELL - 104S							
			Dec-93	Mar-97		Jun-97		Round 3		Round 4	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)						DRY WELL					
Acetone	NA		ND	94	5.82	--------					
Benzene	700		2 J	ND	0.18	--------					
Chlorobenzene	129		ND	22	0.27	--------					
Chloroethane	NA		ND	ND	0.56	--------					
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	--------					
Ethylbenzene	430	c	6 J	54	0.19	--------					
Toluene	5000		ND	6	0.31	--------					
Trichloroethene	2000	a	ND	ND	1.61	--------					
Xylene (total)	1.8	d	7 J	110	0.54	--------					
Semivolatile Organic Compounds (ug/l)											
1,3-Dichlorobenzene	129		ND	ND	2.06	--------					
1,4-Dichlorobenzene	129		12	9 J	2.16	--------					
2,4-Dimethylphenol	2120	a	ND	ND	2.37	--------					
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	--------					
2-Methylnaphthalene	300	c	1 J	3 J	2.36	--------					
2-Methylphenol	NA		11	ND	2.54	--------					
4-Chloro-3-methylphenol [3]	29700	e	ND	8 J	2.61	--------					
4-Methylphenol	NA		ND	ND	2.54	--------					
Acenaphthene	710		ND	ND	2.53	--------					
Acenapthylene	300	c	ND	ND	2.59	--------					
Anthracene	300	c	ND	ND	2.59	--------					
Carbazole	NA		ND	1 J	5.25	--------					
Chrysene	300	c	ND	ND	0.17	--------					
Dibenzofuran	20	d	ND	ND	2.55	--------					
Diethylphthalate	3.4		1 J	2 J	2.94	--------					
Fluoranthene	16		ND	ND	3.05	--------					
Fluorene	300	c	ND	ND	2.61	--------					
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	--------					
Naphthalene	620	b	3 J	15	2.22	--------					
Phenanthrene	4.6	P	ND	1 J	2.7	--------					
Phenol	2560	b	ND	ND	2.27	--------					
Pyrene	300	c	ND	ND	3.13	--------					
Di-n-butylphthalate	3.4		4 J	ND	2.86	--------					
Benzo(a)anthracene	300	c	ND	ND	3.13	--------					
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	--------					
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	--------					
Arsenic	36		11.7 J	19.4	2	--------					
Barium	3.9	d	67.6	73.2	0.7	--------					
Beryllium	5.3	b	ND	ND	0.2	--------					
Cadmium	9.3		6.2 J	ND	0.2	--------					
Chromium [4]	50		5.4 J	ND	0.7	--------					
Cobalt	3	d	21	ND	0.7	--------					
Copper	2.4		59.6 J	ND	2	--------					
Iron	1000	b	69100 J	120000	12	--------					
Lead	8.1		42.3 J	ND	1.5	--------					
Magnesium	NA		4580 J	32000	5	--------					
Manganese	80	d	2180 J	1440 J	0.5	--------					
Mercury	0.025		0.19 J	ND	0.08	--------					
Nickel	8.2		48	ND	0.7	--------					
Potassium	NA		6290	31800	460	--------					
Selenium	71		--------	9.4 J	5	--------					
Silver	0.92	P	0.4	ND	0.6	--------					
Sodium	NA		8920 J	53000	800	--------					
Vanadium	19	d	ND	17.4	0.6	--------					
Zinc	81		1030 J	11.4 J	5	--------					

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 5S	FWENC [6] MONITORING WELL - 105S							
			Dec-93	Mar-97		Jun-97		Round 3		Round 4	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
Acetone	NA		ND	51	5.82	ND	5				
Benzene	700		ND	ND	0.18	ND	5				
Chlorobenzene	129		ND	ND	0.27	ND	5				
Chloroethane	NA		ND	ND	0.56	ND	5				
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5				
Ethylbenzene	430	c	ND	12	0.19	ND	5				
Toluene	5000		ND	ND	0.31	ND	5				
Trichloroethene	2000	a	ND	ND	1.61	2 J					
Xylene (total)	1.8	d	ND	**260**	0.54	**18**					
Semivolatile Organic Compounds (ug/l)											
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10				
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10				
2,4-Dimethylphenol	2120	a	ND	ND	2.37	ND	10				
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10				
2-Methylnaphthalene	300	c	ND	8 J	2.36	ND	10				
2-Methylphenol	NA		ND	ND	2.54	ND	10				
4-Chloro-3-methylphenol [3]	29700	e	ND	1 J	2.61	ND	10				
4-Methylphenol	NA		ND	ND	2.54	ND	10				
Acenaphthene	710		ND	ND	2.53	ND	10				
Acenapthylene	300	c	ND	ND	2.59	ND	10				
Anthracene	300	c	ND	ND	2.59	ND	10				
Carbazole	NA		ND	ND	5.25	ND	10				
Chrysene	300	c	ND	ND	0.17	ND	10				
Dibenzofuran	20	d	ND	ND	2.55	ND	10				
Diethylphthalate	3.4		ND	2 J	2.94	2 J					
Fluoranthene	16		ND	ND	3.05	ND	10				
Fluorene	300	c	ND	ND	2.61	ND	10				
n-Nitrosodiphenylamine	5850	a	ND	1 J	2.81	ND	10				
Naphthalene	620	b	ND	13	2.22	ND	10				
Phenanthrene	4.6	P	ND	ND	2.7	ND	10				
Phenol	2560	b	ND	ND	2.27	ND	10				
Pyrene	300	c	ND	ND	3.13	ND	10				
Di-n-butylphthalate	3.4		ND	ND	2.86	ND	10				
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10				
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	3 J					
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	ND	3.0				
Arsenic	36		12 J	ND	2	2.5 J					
Barium	3.9	d	**23.9**	**163**	0.7	**43.9**					
Beryllium	5.3	b	ND	ND	0.2	ND	0.50				
Cadmium	9.3		ND	ND	0.2	ND	0.40				
Chromium [4]	50		ND	ND	0.7	0.77 J					
Cobalt	3	d	**4.7 J**	ND	0.7	1.1 J					
Copper	2.4		**3.8 J**	ND	2	ND	2.0				
Iron	1000	b	**19300 J**	**46800**	12	**12400**					
Lead	8.1		ND	ND	1.5	ND	5.6				
Magnesium	NA		5060 J	9730	5	4940					
Manganese	80	d	**679 J**	**303 J**	0.5	-------					
Mercury	0.025		**0.14 J**	ND	0.08	ND	0.18				
Nickel	8.2		**10.7**	ND	0.7	3.8 J					
Potassium	NA		6060	9030	460	4090 J					
Selenium	71		-------	10.4 J	5	ND	5.0				
Silver	0.92	P	ND	ND	0.6	ND	3.9				
Sodium	NA		15900 J	17900	800	13400					
Vanadium	19	d	ND	ND	0.6	1.9 J					
Zinc	81		50.3 J	21.6	5	24.7					

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 5R	FWENC [6] MONITORING WELL - 105R							
			Dec-93	Mar-97		Jun-97		Round 3		Round 4	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
Acetone	NA		ND	ND	5.82	ND	5				
Benzene	700		ND	ND	0.18	ND	5				
Chlorobenzene	129		ND	ND	0.27	ND	5				
Chloroethane	NA		ND	ND	0.56	ND	5				
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5				
Ethylbenzene	430	c	ND	ND	0.19	ND	5				
Toluene	5000		ND	ND	0.31	ND	5				
Trichloroethene	2000	a	ND	ND	1.61	ND	5				
Xylene (total)	1.8	d	ND	ND	0.54	ND	5				
Semivolatile Organic Compounds (ug/l)											
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10				
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10				
2,4-Dimethylphenol	2120	a	ND	ND	2.37	ND	10				
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10				
2-Methylnaphthalene	300	c	ND	ND	2.36	ND	10				
2-Methylphenol	NA		ND	ND	2.54	ND	10				
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10				
4-Methylphenol	NA		ND	ND	2.54	ND	10				
Acenaphthene	710		ND	ND	2.53	ND	10				
Acenapthylene	300	c	ND	ND	2.59	ND	10				
Anthracene	300	c	ND	ND	2.59	ND	10				
Carbazole	NA		ND	ND	5.25	ND	10				
Chrysene	300	c	ND	ND	0.17	ND	10				
Dibenzofuran	20	d	ND	ND	2.55	ND	10				
Diethylphthalate	3.4		ND	ND	2.94	ND	10				
Fluoranthene	16		ND	ND	3.05	ND	10				
Fluorene	300	c	ND	ND	2.61	ND	10				
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10				
Naphthalene	620	b	ND	ND	2.22	ND	10				
Phenanthrene	4.6	P	ND	ND	2.7	ND	10				
Phenol	2560	b	ND	ND	2.27	ND	10				
Pyrene	300	c	ND	ND	3.13	ND	10				
Di-n-butylphthalate	3.4		ND	ND	2.86	ND	10				
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10				
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10				
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	ND	3.0				
Arsenic	36		19.2 J	**43.7**	2	ND	2.0				
Barium	3.9	d	**17.6**	ND	0.7	ND	1.0				
Beryllium	5.3	b	1.1	ND	0.2	ND	0.50				
Cadmium	9.3		ND	ND	0.2	ND	0.40				
Chromium [4]	50		ND	ND	0.7	ND	0.60				
Cobalt	3	d	**43.5 J**	ND	0.7	0.81					
Copper	2.4		**6.7 J**	ND	2	ND	2.0				
Iron	1000	b	**25600 J**	355	12	ND	46.7				
Lead	8.1		ND	ND	1.5	ND	7.0				
Magnesium	NA		8520 J	4240	5	3610					
Manganese	80	d	**1200 J**	**190 J**	0.5	--------					
Mercury	0.025		0.17	ND	0.08	ND	0.08				
Nickel	8.2		**61.2**	ND	0.7	8.1					
Potassium	NA		2340	ND	460	ND	3300				
Selenium	71		--------	17.9	5	ND	5.0				
Silver	0.92	P	ND	ND	0.6	ND	5.2				
Sodium	NA		9340 J	9360	800	9320					
Vanadium	19	d	7.7 J	ND	0.6	ND	1.0				
Zinc	81		39.9 J	13.7 J	5	10.6 J					

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 7S	FWENC [6] MONITORING WELL - 107R							
			Dec-93	Mar-97		Jun-97		Round 3		Round 4	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
Acetone	NA		ND	6	5.82	ND	5				
Benzene	700		ND	ND	0.18	ND	5				
Chlorobenzene	129		ND	ND	0.27	1 J					
Chloroethane	NA		ND	ND	0.56	ND	5				
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5				
Ethylbenzene	430	c	ND	ND	0.19	ND	5				
Toluene	5000		ND	ND	0.31	ND	5				
Trichloroethene	2000	a	ND	ND	1.61	ND	5				
Xylene (total)	1.8	d	ND	ND	0.54	ND	5				
Semivolatile Organic Compounds (ug/l)											
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10				
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10				
2,4-Dimethylphenol	2120	a	ND	ND	2.37	ND	10				
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10				
2-Methylnaphthalene	300	c	ND	ND	2.36	ND	10				
2-Methylphenol	NA		ND	ND	2.54	ND	10				
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10				
4-Methylphenol	NA		ND	ND	2.54	ND	10				
Acenaphthene	710		ND	ND	2.53	ND	10				
Acenapthylene	300	c	ND	ND	2.59	ND	10				
Anthracene	300	c	ND	ND	2.59	ND	10				
Carbazole	NA		ND	ND	5.25	ND	10				
Chrysene	300	c	ND	ND	0.17	ND	10				
Dibenzofuran	20	d	ND	ND	2.55	ND	10				
Diethylphthalate	3.4		ND	4 J	2.94	2 J					
Fluoranthene	16		ND	ND	3.05	ND	10				
Fluorene	300	c	ND	ND	2.61	ND	10				
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10				
Naphthalene	620	b	ND	ND	2.22	ND	10				
Phenanthrene	4.6	P	ND	ND	2.7	ND	10				
Phenol	2560	b	ND	ND	2.27	ND	10				
Pyrene	300	c	ND	ND	3.13	ND	10				
Di-n-butylphthalate	3.4		ND	ND	2.86	ND	10				
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10				
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10				
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	ND	5.0				
Arsenic	36		114 J	311	2	237					
Barium	3.9	d	131	ND	0.7	ND	12.8				
Beryllium	5.3	b	4.3	ND	0.2	ND	0.50				
Cadmium	9.3		2.8 J	ND	0.2	ND	0.40				
Chromium [4]	50		153 J	ND	0.7	1.6					
Cobalt	3	d	743 J	ND	0.7	20.5					
Copper	2.4		285 J	ND	2	ND	2.0				
Iron	1000	b	216000 J	71200	12	69700					
Lead	8.1		190 J	ND	1.5	ND	6.3				
Magnesium	NA		39400 J	11700	5	7960					
Manganese	80	d	17400 J	9260 J	0.5	--------					
Mercury	0.025		0.12	ND	0.08	ND	0.08				
Nickel	8.2		501	ND	0.7	10.2					
Potassium	NA		7310	11300	460	8260 J					
Selenium	71		--------	20.6	5	ND	12.7				
Silver	0.92	P	ND	ND	0.6	ND	3.2				
Sodium	NA		14600 J	22400	800	19900					
Vanadium	19	d	37.2 J	ND	0.6	ND	1.0				
Zinc	81		679 J	ND	5	ND	10.0				

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 8R	FWENC [6] MONITORING WELL - 108R							
			Dec-93	Mar-97		Jun-97		Round 3		Round 4	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
Acetone	NA		ND	9	5.82	ND	5				
Benzene	700		ND	ND	0.18	2 J					
Chlorobenzene	129		ND	7	0.27	ND	5				
Chloroethane	NA		ND	5 J	0.56	ND	5				
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5				
Ethylbenzene	430	c	ND	ND	0.19	ND	5				
Toluene	5000		ND	ND	0.31	6					
Trichloroethene	2000	a	ND	ND	1.61	ND	5				
Xylene (total)	1.8	d	ND	ND	0.54	ND	5				
Semivolatile Organic Compounds (ug/l)											
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10				
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10				
2,4-Dimethylphenol	2120	a	ND	ND	2.37	R					
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10				
2-Methylnaphthalene	300	c	ND	ND	2.36	ND	10				
2-Methylphenol	NA		ND	ND	2.54	R					
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10				
4-Methylphenol	NA		ND	ND	2.54	R					
Acenaphthene	710		ND	ND	2.53	ND	10				
Acenapthylene	300	c	ND	ND	2.59	ND	10				
Anthracene	300	c	ND	ND	2.59	ND	10				
Carbazole	NA		ND	ND	5.25	ND	10				
Chrysene	300	c	ND	ND	0.17	ND	10				
Dibenzofuran	20	d	ND	ND	2.55	ND	10				
Diethylphthalate	3.4		ND	ND	2.94	ND	10				
Fluoranthene	16		ND	ND	3.05	ND	10				
Fluorene	300	c	ND	ND	2.61	ND	10				
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10				
Naphthalene	620	b	ND	ND	2.22	ND	10				
Phenanthrene	4.6	P	ND	ND	2.7	ND	10				
Phenol	2560	b	ND	ND	2.27	R					
Pyrene	300	c	ND	ND	3.13	ND	10				
Di-n-butylphthalate	3.4		ND	ND	2.86	ND	10				
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10				
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10				
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	ND	5.2				
Arsenic	36		24.4 J	65	2	40.4					
Barium	3.9	d	179	ND	0.7	35.1					
Beryllium	5.3	b	1.8	ND	0.2	ND	0.50				
Cadmium	9.3		1.4 J	ND	0.2	ND	0.40				
Chromium [4]	50		24.1 J	ND	0.7	2.2					
Cobalt	3	d	258 J	73.8	0.7	67.7					
Copper	2.4		91.8 J	ND	2	ND	2.0				
Iron	1000	b	38900 J	14900	12	10500					
Lead	8.1		26.9	ND	1.5	ND	9.2				
Magnesium	NA		118000 J	42100	5	42500					
Manganese	80	d	6330 J	3730 J	0.5	--------					
Mercury	0.025		ND	ND	0.08	ND	0.80				
Nickel	8.2		235	66.7	0.7	65.8					
Potassium	NA		110000	86200	460	83200 J					
Selenium	71		--------	7.8 J	5	ND	5.0				
Silver	0.92	P	ND	ND	0.6	ND	3.5				
Sodium	NA		721000 J	198000	800	198000					
Vanadium	19	d	28.7 J	17.8	0.6	10.3					
Zinc	81		156 J	16.7 J	5	ND	10.0				

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 11S	FWENC [6] MONITORING WELL - 111S							
			Dec-93	Mar-97		Jun-97		Round 3		Round 4	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)			DRY WELL	DRY WELL		DRY WELL					
Acetone	NA		--------	--------		--------					
Benzene	700		--------	--------		--------					
Chlorobenzene	129		--------	--------		--------					
Chloroethane	NA		--------	--------		--------					
1,2-Dichloroethene (total)	11600	a	--------	--------		--------					
Ethylbenzene	430	c	--------	--------		--------					
Toluene	5000		--------	--------		--------					
Trichloroethene	2000	a	--------	--------		--------					
Xylene (total)	1.8	d	--------	--------		--------					
Semivolatile Organic Compounds (ug/l)											
1,3-Dichlorobenzene	129		--------	--------		--------					
1,4-Dichlorobenzene	129		--------	--------		--------					
2,4-Dimethylphenol	2120	a	--------	--------		--------					
2,6-Dinitrotoluene [2]	370	e	--------	--------		--------					
2-Methylnaphthalene	300	c	--------	--------		--------					
2-Methylphenol	NA		--------	--------		--------					
4-Chloro-3-methylphenol [3]	29700	e	--------	--------		--------					
4-Methylphenol	NA		--------	--------		--------					
Acenaphthene	710		--------	--------		--------					
Acenapthylene	300	c	--------	--------		--------					
Anthracene	300	c	--------	--------		--------					
Carbazole	NA		--------	--------		--------					
Chrysene	300	c	--------	--------		--------					
Dibenzofuran	20	d	--------	--------		--------					
Diethylphthalate	3.4		--------	--------		--------					
Fluoranthene	16		--------	--------		--------					
Fluorene	300	c	--------	--------		--------					
n-Nitrosodiphenylamine	5850	a	--------	--------		--------					
Naphthalene	620	b	--------	--------		--------					
Phenanthrene	4.6	P	--------	--------		--------					
Phenol	2560	b	--------	--------		--------					
Pyrene	300	c	--------	--------		--------					
Di-n-butylphthalate	3.4		--------	--------		--------					
Benzo(a)anthracene	300	c	--------	--------		--------					
bis(2-Ethylhexyl)phthalate	360	P	--------	--------		--------					
Total Metals (ug/l)											
Antimony	500	P	--------	--------		--------					
Arsenic	36		--------	--------		--------					
Barium	3.9	d	--------	--------		--------					
Beryllium	5.3	b	--------	--------		--------					
Cadmium	9.3		--------	--------		--------					
Chromium [4]	50		--------	--------		--------					
Cobalt	3	d	--------	--------		--------					
Copper	2.4		--------	--------		--------					
Iron	1000	b	--------	--------		--------					
Lead	8.1		--------	--------		--------					
Magnesium	NA		--------	--------		--------					
Manganese	80	d	--------	--------		--------					
Mercury	0.025		--------	--------		--------					
Nickel	8.2		--------	--------		--------					
Potassium	NA		--------	--------		--------					
Selenium	71		--------	--------		--------					
Silver	0.92	P	--------	--------		--------					
Sodium	NA		--------	--------		--------					
Vanadium	19	d	--------	--------		--------					
Zinc	81		--------	--------		--------					

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 11R	FWENC [6] MONITORING WELL - 111R							
			Dec-93	Mar-97		Jun-97		Round 3		Round 4	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
Acetone	NA		ND	6	5.82	ND	5				
Benzene	700		ND	ND	0.18	ND	5				
Chlorobenzene	129		ND	ND	0.27	ND	5				
Chloroethane	NA		ND	ND	0.56	ND	5				
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5				
Ethylbenzene	430	c	ND	ND	0.19	ND	5				
Toluene	5000		ND	ND	0.31	ND	5				
Trichloroethene	2000	a	ND	ND	1.61	ND	5				
Xylene (total)	1.8	d	ND	ND	0.54	ND	5				
Semivolatile Organic Compounds (ug/l)											
1,3-Dichlorobenzene	129		ND	ND	2.06	ND	10				
1,4-Dichlorobenzene	129		ND	ND	2.16	ND	10				
2,4-Dimethylphenol	2120	a	ND	ND	2.37	R					
2,6-Dinitrotoluene [2]	370	e				ND	10				
2-Methylnaphthalene	300	c	1 J	ND	2.36	ND	10				
2-Methylphenol	NA		ND	ND	2.54	R					
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10				
4-Methylphenol	NA		ND	ND	2.54	R					
Acenaphthene	710		2 J	ND	2.53	ND	10				
Acenapthylene	300	c	ND	ND	2.59	ND	10				
Anthracene	300	c	1 J	ND	2.59	ND	10				
Carbazole	NA		ND	ND	5.25	ND	10				
Chrysene	300	c				ND	10				
Dibenzofuran	20	d	2 J	ND	2.55	ND	10				
Diethylphthalate	3.4		ND	ND	2.94	ND	10				
Fluoranthene	16		2 J	ND	3.05	ND	10				
Fluorene	300	c	2 J	ND	2.61	ND	10				
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10				
Naphthalene	620	b	8 J	2 J	2.22	ND	10				
Phenanthrene	4.6	P	5 J	ND	2.7	ND	10				
Phenol	2560	b	ND	ND	2.27	R					
Pyrene	300	c	1 J	ND	3.13	ND	10				
Di-n-butylphthalate	3.4		1 J	ND	2.86	ND	10				
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10				
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10				
Total Metals (ug/l)											
Antimony	500	P	ND	ND	5	ND	3.2				
Arsenic	36		22.5 J	67.1	2	120					
Barium	3.9	d	154	68.6	0.7	56.3					
Beryllium	5.3	b	2	ND	0.2	ND	0.50				
Cadmium	9.3		1.8 J	ND	0.2	ND	0.40				
Chromium [4]	50		82.8 J	ND	0.7	1.6					
Cobalt	3	d	116 J	ND	0.7	8.9					
Copper	2.4		267 J	ND	2	ND	2.0				
Iron	1000	b	128000 J	3770	12	3850					
Lead	8.1		548	ND	1.5	14.7 J					
Magnesium	NA		53100 J	58100	5	60100					
Manganese	80	d	15900 J	2590 J	0.5	---------					
Mercury	0.025		0.33	ND	0.08	ND	0.80				
Nickel	8.2		122	ND	0.7	ND	2.0				
Potassium	NA		33500	36300	460	26300 J					
Selenium	71		---------	9 J	5	ND	5.0				
Silver	0.92	P	1.3 J	ND	0.6	ND	1.8				
Sodium	NA		76800 J	213000	800	208000					
Vanadium	19	d	45.8 J	23.5	0.6	12.0					
Zinc	81		1060 J	15.3 J	5	ND	10.0				

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUND WATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 12S	FWENC [6] MONITORING WELL - 112S							
			Dec-93	Mar-97		Jun-97		Round 3		Round 4	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
Acetone	NA		ND	6	5.82	ND	5				
Benzene	700		ND	ND	0.18	ND	5				
Chlorobenzene	129		29	ND	0.27	5					
Chloroethane	NA		ND	ND	0.56	ND	5				
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5				
Ethylbenzene	430	c	4 J	ND	0.19	ND	5				
Toluene	5000		ND	ND	0.31	ND	5				
Trichloroethene	2000	a	ND	ND	1.61	ND	5				
Xylene (total)	1.8	d	**14**	ND	0.54	1 J					
Semivolatile Organic Compounds (ug/l)											
1,3-Dichlorobenzene	129		2 J	ND	2.06	ND	10				
1,4-Dichlorobenzene	129		13	ND	2.16	1 J					
2,4-Dimethylphenol	2120	a	ND	ND	2.37	ND	10				
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10				
2-Methylnaphthalene	300	c	1 J	ND	2.36	ND	10				
2-Methylphenol	NA		ND	ND	2.54	ND	10				
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10				
4-Methylphenol	NA		ND	ND	2.54	ND	10				
Acenaphthene	710		ND	ND	2.53	ND	10				
Acenapthylene	300	c	ND	ND	2.59	ND	10				
Anthracene	300	c	ND	ND	2.59	ND	10				
Carbazole	NA		ND	ND	5.25	ND	10				
Chrysene	300	c	ND	ND	0.17	ND	10				
Dibenzofuran	20	d	ND	ND	2.55	ND	10				
Diethylphthalate	3.4		ND	ND	2.94	ND	10				
Fluoranthene	16		ND	ND	3.05	ND	10				
Fluorene	300	c	ND	ND	2.61	ND	10				
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10				
Naphthalene	620	b	3 J	ND	2.22	ND	10				
Phenanthrene	4.6		ND	ND	2.7	ND	10				
Phenol	2560	b	ND	ND	2.27	ND	10				
Pyrene	300	c	1 J	ND	3.13	ND	10				
Di-n-butylphthalate	3.4		ND	ND	2.86	ND	10				
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10				
bis(2-Ethylhexyl)phthalate	360		ND	ND	3.56	ND	10				
Total Metals (ug/l)											
Antimony	500		26.5 J	ND	5	ND	3.0				
Arsenic	36		**51.6 J**	24.5	2	26.7					
Barium	3.9	d	**112**	ND	0.7	**30.9**					
Beryllium	5.3	b	1	ND	0.2	ND	0.50				
Cadmium	9.3		**10 J**	ND	0.2	ND	0.40				
Chromium [4]	50		**67.9 J**	ND	0.7	ND	0.60				
Cobalt	3	d	**43.8**	ND	0.7	1.8					
Copper	2.4		**97.2 J**	ND	2	ND	2.0				
Iron	1000	b	**87300 J**	**21000**	12	**23200**					
Lead	8.1		**375 J**	ND	1.5	ND	8.1				
Magnesium	NA		10000 J	3220	5	3350					
Manganese	80	d	**2730 J**	**495 J**	0.5	--------					
Mercury	0.025		**1.7**	ND	0.08	ND	0.08				
Nickel	8.2		**97**	ND	0.7	2.8 J					
Potassium	NA		3070	ND	460	ND	3300				
Selenium	71		--------	ND	5	ND	6.5				
Silver	0.92		**11.6**	ND	0.6	ND	4.2				
Sodium	NA		7590 J	10700	800	12300					
Vanadium	19	d	**189**	ND	0.6	ND	1.0				
Zinc	81		**1440 J**	23.3	5	12.3 J					

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

COMPOUND	AWQC [1]		TRC [5] MONITORING WELL - 13S	FWENC [6] MONITORING WELL - 113S							
			Dec-93	Mar-97		Jun-97		Round 3		Round 4	
				Result	MDL	Result	QL/DL	Result	QL/DL	Result	QL/DL
Volatile Organic Compounds (ug/l)											
Acetone	NA		ND	ND	5.82	ND	5				
Benzene	700		ND	ND	0.18	ND	5				
Chlorobenzene	129		3 J	ND	0.27	ND	5				
Chloroethane	NA		ND	ND	0.56	ND	5				
1,2-Dichloroethene (total)	11600	a	ND	ND	0.7	ND	5				
Ethylbenzene	430	c	ND	ND	0.19	ND	5				
Toluene	5000		ND	ND	0.31	ND	5				
Trichloroethene	2000	a	ND	ND	1.61	ND	5				
Xylene (total)	1.8	d	ND	ND	0.54	ND	5				
Semivolatile Organic Compounds (ug/l)											
1,3-Dichlorobenzene	129		0.5 J	ND	2.06	ND	10				
1,4-Dichlorobenzene	129		2 J	ND	2.16	ND	10				
2,4-Dimethylphenol	2120	a	ND	ND	2.37	ND	10				
2,6-Dinitrotoluene [2]	370	e	ND	ND	0.52	ND	10				
2-Methylnaphthalene	300	c	1 J	ND	2.36	ND	10				
2-Methylphenol	NA		ND	ND	2.54	ND	10				
4-Chloro-3-methylphenol [3]	29700	e	ND	ND	2.61	ND	10				
4-Methylphenol	NA		1 J	ND	2.54	ND	10				
Acenaphthene	710		ND	ND	2.53	ND	10				
Acenapthylene	300	c	ND	ND	2.59	ND	10				
Anthracene	300	c	ND	ND	2.59	ND	10				
Carbazole	NA		ND	ND	5.25	ND	10				
Chrysene	300	c	ND	ND	0.17	ND	10				
Dibenzofuran	20	d	ND	ND	2.55	ND	10				
Diethylphthalate	3.4		ND	ND	2.94	ND	10				
Fluoranthene	16		ND	ND	3.05	ND	10				
Fluorene	300	c	ND	ND	2.61	ND	10				
n-Nitrosodiphenylamine	5850	a	ND	ND	2.81	ND	10				
Naphthalene	620	b	0.9 J	ND	2.22	ND	10				
Phenanthrene	4.6	P	ND	ND	2.7	ND	10				
Phenol	2560	b	ND	ND	2.27	ND	10				
Pyrene	300	c	ND	ND	3.13	ND	10				
Di-n-butylphthalate	3.4		ND	ND	2.86	ND	10				
Benzo(a)anthracene	300	c	ND	ND	3.13	ND	10				
bis(2-Ethylhexyl)phthalate	360	P	ND	ND	3.56	ND	10				
Total Metals (ug/l)											
Antimony	500	P	34.1	ND	5	ND	6.5				
Arsenic	36		**117**	ND	2	ND	2.0				
Barium	3.9	d	**228**	ND	0.7	**34.9**					
Beryllium	5.3	b	4.9	ND	0.2	ND	0.50				
Cadmium	9.3		9.9	ND	0.2	ND	0.40				
Chromium [4]	50		**146**	ND	0.7	ND	0.60				
Cobalt	3	d	**127**	ND	0.7	ND	0.70				
Copper	2.4		**241**	ND	2	ND	2.0				
Iron	1000	b	**227000**	305	12	**3640**					
Lead	8.1		**1860**	ND	1.5	ND	7.8				
Magnesium	NA		32700	2960	5	3210					
Manganese	80	d	**4020**	58.3 J	0.5	--------					
Mercury	0.025		**0.23**	ND	0.08	ND	0.80				
Nickel	8.2		**250**	ND	0.7	2.4 J					
Potassium	NA		8840	ND	460	ND	3300				
Selenium	71		--------	ND	5	ND	5.0				
Silver	0.92	P	**2**	ND	0.6	ND	5.4				
Sodium	NA		11600	8010	800	10700					
Vanadium	19	d	**107**	ND	0.6	ND	1.0				
Zinc	81		**856**	27.2	5	26.0					

TABLE 3
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY GROUNDWATER MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

NOTES:

1. Ambient Water Quality Criteria (AWQC) from 40 FR 79318, "Quality Criteria for Water", December 1992 (with revisions for metals: May 1995). Marine chronic values used unless not available, in which case the lowest of a, b, c, d, or e were used as available.
   a - AWQC acute freshwater value.
   b - AWQC chronic freshwater value.
   c - AWQC acute marine value.
   d - Ecotox Tier II freshwater value (US EPA, ECO Update, Intermittent Bulletin Volume 3, Number 2, January 1996).
   e - Canadian MEQ marine acute value (Environment Canada, The Development of Canadian Marine Environmental Quality (MEQ) Guidelines, 1992.
   P - Value is proposed.

2. Criteria presneted for Dinitrotoluene. No criteria established for 2,6-Dinitrotoluene.

3. Criteria presented for 4-Chlorophenol. No criteria established for 4-Chloro-3-methylphenol.

4. Criteria presented for Chromium as Chromium +6. No criteria established for Chromium +3 or Chromium (total).

5. Data collected by TRC Environmental Corporation as presented in: "Remedial Investigation, Draft Final Report for McAllister Point Landfill, NETC-Newport, Rhode Island", July 1994.

6. Wells installed and sampled by Foster Wheeler Environmental Corporation (FWENC) as described in: "Operations and Maintenance Manual", May 1997.

J - Value estimated due to exceeding quality control criteria.

NA - AWQC value for contaminant was not available.

ND - Not detected above QL/DL reported by analytical laboratory.

MDL - Method Detection Limit reported by analytical laboratory.

QL/DL - Quanitation Limit (for organics) and Detection Limit (for metals) reported by analytical laboratory.

R - Value was rejected due to exceeding quality control criteria.

Shaded values exceed the indicated AWQC value.

---------- - Not analyzed.

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GV-21+25					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.033				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0094				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0077				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0099				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	ND	0.014	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0081				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0089				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0063	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.012	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.013	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.015	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	0.0006	-	-				
Styrene	50	100	50	100	-	0.0069	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0072				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0072				
Toluene	100	150	100	150	0.52	0.10	ND	0.037				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0089				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0090				
Trichloroethylene	25	-	50	200	-	-	ND	0.0090				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0089	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.34	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	6.0				
Methane (ppmv)	-	-	-	-	-	-	8.90	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GV-19+25					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.033				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0093				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0076				
Chlorobenzene	-	-	75	-	-	-	ND	0.010				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0098				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	ND	0.014	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0080				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.0010				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0089				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0063	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.012	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.0086	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0098	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0071				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0071				
Toluene	100	150	100	150	0.52	0.10	ND	0.027				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0088				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0089				
Trichloroethylene	25	-	50	200	-	-	ND	0.0089				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0098	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0098	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0089	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.27	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	3.1				
Methane (ppmv)	-	-	-	-	-	-	389	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GV-17+25					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.030				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0030				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0015	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0025				
Chlorobenzene	-	-	75	-	-	-	ND	0.0034				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	0.076					
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.0060	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.095	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0026				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.0039				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.0034				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0029				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0020	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.021	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.012	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0087	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	0.025 [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.0043	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.0037				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0023				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0023				
Toluene	100	150	100	150	0.52	0.10	ND	0.024				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0032				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0029				
Trichloroethylene	25	-	50	200	-	-	ND	0.0029				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0032	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0032	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.0061	-			
o-Xylene	100	150	100	150	-	-	ND	0.0029	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.099	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	0.0095	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	23				
Methane (ppmv)	-	-	-	-	-	-	102,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GV-15+25					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.040				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0094				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0077				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	0.062	-				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.20 J	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0081				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0089				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0063	-			
n-Heptane	85	440 c	400	500	-	-	0.067	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.012	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	0.021				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0072				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0072				
Toluene	100	150	100	150	0.52	0.10	ND	0.044				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0089				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0090				
Trichloroethylene	25	-	50	200	-	-	ND	0.0090				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0089	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.19	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	0.013	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	41				
Methane (ppmv)	-	-	-	-	-	-	124,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GV-13+25					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.047				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0088				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0044	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0072				
Chlorobenzene	-	-	75	-	-	-	ND	0.0099				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0093				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.018	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.17 J	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0076				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.011				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.0098				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0084				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0059	-			
n-Heptane	85	440 c	400	500	-	-	0.049	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.0098	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0092	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND	0.024				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0067				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0067				
Toluene	100	150	100	150	0.52	0.10	ND	0.042				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0083				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0084				
Trichloroethylene	25	-	50	200	-	-	ND	0.0085				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0093	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0093	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.017	-			
o-Xylene	100	150	100	150	-	-	ND	0.0084	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.35	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	24				
Methane (ppmv)	-	-	-	-	-	-	74,100	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1] REL (10-hr)	NIOSH [1] STEL (15-min)	OSHA [2] PEL (8-hr)	OSHA [2] STEL (15-min)	RIDEM [3] AAL (24-hr)	RIDEM [3] AAL (1-yr)	FWENC [4] MONITORING LOCATION: ML-GV-13+25-D Jul-97 Result [5]	Jul-97 QL	Sep-97 Result [5]	Sep-97 QL	Dec-97 Result [5]	Dec-97 QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.038				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0096				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0048	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0079				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	0.035 J	-				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.22	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0082				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0091				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0064	-			
n-Heptane	85	440 c	400	500	-	-	0.064	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.014	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	0.033 [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.014	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.012				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0073				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0073				
Toluene	100	150	100	150	0.52	0.10	ND	0.042				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0091				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0092				
Trichloroethylene	25	-	50	200	-	-	ND	0.0092				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0091	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.53	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	0.019 [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	32				
Methane (ppmv)	-	-	-	-	-	-	90,900	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GV-11+25					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.031				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0095				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0078				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.010				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	ND	0.017	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0082				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0090				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0064	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.012	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.012	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.014	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.012				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0072				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0072				
Toluene	100	150	100	150	0.52	0.10	ND	0.024				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0090				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0091				
Trichloroethylene	25	-	50	200	-	-	ND	0.0091				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0090	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.20	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	5.7				
Methane (ppmv)	-	-	-	-	-	-	10,100	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GV-9+25					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.076				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0094				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0077				
Chlorobenzene	-	-	75	-	-	-	0.16	-				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	0.028	-				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.30 J	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0081				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	0.021	-				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0063	-			
n-Heptane	85	440 c	400	500	-	-	0.11	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.024	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0072				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0072				
Toluene	100	150	100	150	0.52	0.10	ND	0.087				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0089				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0090				
Trichloroethylene	25	-	50	200	-	-	ND	0.0090				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.028	-			
o-Xylene	100	150	100	150	-	-	ND	0.016	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	0.062 [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.045	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	0.011	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	59				
Methane (ppmv)	-	-	-	-	-	-	204,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GV-7+25					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.086				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0093				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0076				
Chlorobenzene	-	-	75	-	-	-	0.069	-				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	0.034	-				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.43 J		-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0080				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.010				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	0.040	-				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0063	-			
n-Heptane	85	440 c	400	500	-	-	0.31	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	0.013	-	-			
1-Methylethylbenzene	-	-	-	-	-	-	0.025	-	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0071				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0071				
Toluene	100	150	100	150	0.52	0.10	ND	0.24				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	0.010	-				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0089				
Trichloroethylene	25	-	50	200	-	-	0.013	-				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0098	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0098	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	0.060	-	-			
o-Xylene	100	150	100	150	-	-	0.025	-	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.015	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	0.032 [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	96				
Methane (ppmv)	-	-	-	-	-	-	280,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GV-5+25					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.18				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0079				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0040	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0065				
Chlorobenzene	-	-	75	-	-	-	ND	0.0089				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0084				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.016	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	ND	0.40	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0068				
1,1-Dichloroethane	100	-	100	-	-	-	0.012 [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.010				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	0.074	-				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.011				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0053	-			
n-Heptane	85	440 c	400	500	-	-	0.11	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.014	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0083	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.011	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.0096				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0060				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.018				
Toluene	100	150	100	150	0.52	0.10	ND	0.065				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0089				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0076				
Trichloroethylene	25	-	50	200	-	-	ND	0.0090				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0083	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0083	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.019	-			
o-Xylene	100	150	100	150	-	-	ND	0.010	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	0.013 [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.12	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	0.060 [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	55				
Methane (ppmv)	-	-	-	-	-	-	70,700	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-118					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.067				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0091				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0046	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0075				
Chlorobenzene	-	-	75	-	-	-	ND	0.010				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0097				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.018	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.20	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	-	50 c	-	50 c	-	-	ND	0.0078				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.010				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0087				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0061	-			
n-Heptane	85	440 c	400	500	-	-	0.14	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.014	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0096	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0069				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0070				
Toluene	100	150	100	150	0.52	0.10	ND	0.041				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0086				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0087				
Trichloroethylene	25	-	50	200	-	-	ND	0.0088				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0096	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0096	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.017	-			
o-Xylene	100	150	100	150	-	-	ND	0.0087	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.025	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	37				
Methane (ppmv)	-	-	-	-	-	-	406,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-117					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.031				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0095				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0078				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.010				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	ND	0.014	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0082				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0090				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0064	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.012	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.010	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	0.020 [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.014	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.012				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0072				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0072				
Toluene	100	150	100	150	0.52	0.10	ND	0.025				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0090				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0091				
Trichloroethylene	25	-	50	200	-	-	ND	0.0091				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0090	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.035	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	5.7				
Methane (ppmv)	-	-	-	-	-	-	34,100	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-116					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.036				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0095				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0078				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.010				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	ND	0.014	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0082				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0090				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0064	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.017	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.0088	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.014	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	0.026	-				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0072				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0072				
Toluene	100	150	100	150	0.52	0.10	ND	0.28				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0090				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0091				
Trichloroethylene	25	-	50	200	-	-	ND	0.0091				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0090	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	-	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	5.7				
Methane (ppmv)	-	-	-	-	-	-	152,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-115					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.033				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0094				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0077				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0099				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	ND	0.014	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0081				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichloroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0089				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0063	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.012	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.0087	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0072				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0072				
Toluene	100	150	100	150	0.52	0.10	ND	0.022				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0089				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0090				
Trichloroethylene	25	-	50	200	-	-	ND	0.0090				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0089	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	-	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	6.0				
Methane (ppmv)	-	-	-	-	-	-	152,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-114					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.24				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0088				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0044	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0072				
Chlorobenzene	-	-	75	-	-	-	ND	0.010				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0093				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.018	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.12	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	-	50 c	-	50 c	-	-	ND	0.0076				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.011				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.0098				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0084				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0059	-			
n-Heptane	85	440 c	400	500	-	-	0.20	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.014	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0092	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	0.027				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0067				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0067				
Toluene	100	150	100	150	0.52	0.10	ND	0.055				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0083				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0084				
Trichloroethylene	25	-	50	200	-	-	ND	0.0085				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0093	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0093	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.023	-			
o-Xylene	100	150	100	150	-	-	ND	0.0084	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	-	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	250	-				
Methane (ppmv)	-	-	-	-	-	-	429,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-113					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.062				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0094				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0077				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0099				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	ND	0.014	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	-	50 c	-	50 c	-	-	ND	0.0081				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichloroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0089				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0063	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.013	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.015	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0072				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0072				
Toluene	100	150	100	150	0.52	0.10	ND	0.048				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0089				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0090				
Trichloroethylene	25	-	50	200	-	-	ND	0.0090				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0089	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	-	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	43				
Methane (ppmv)	-	-	-	-	-	-	379,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-112					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.034				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0094				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0077				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0099				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	ND	0.014	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	-	50 c	-	50 c	-	-	ND	0.0081				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0089				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0063	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.012	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	0.014	-	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0072				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0072				
Toluene	100	150	100	150	0.52	0.10	ND	0.045				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0089				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0090				
Trichloroethylene	25	-	50	200	-	-	ND	0.0090				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0089	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.040	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	14				
Methane (ppmv)	-	-	-	-	-	-	112,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-111					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.109				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0094				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0076				
Chlorobenzene	-	-	75	-	-	-	ND	0.010				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0098				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.11		-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0081				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichloroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.010				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0089				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0063	-			
n-Heptane	85	440 c	400	500	-	-	0.12	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	0.013	-	-			
1-Methylethylbenzene	-	-	-	-	-	-	0.015	-	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0072				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0071				
Toluene	100	150	100	150	0.52	0.10	0.045	-				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0088				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0089				
Trichloroethylene	25	-	50	200	-	-	ND	0.0089				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0089	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	-	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	56				
Methane (ppmv)	-	-	-	-	-	-	387,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-110					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.10				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0093				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0076				
Chlorobenzene	-	-	75	-	-	-	ND	0.010				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0098				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	ND	0.033	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0080				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.010				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0089				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0063	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.032	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.0094	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0098	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0071				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0071				
Toluene	100	150	100	150	0.52	0.10	ND	0.049				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0088				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0089				
Trichloroethylene	25	-	50	200	-	-	ND	0.0089				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0098	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0098	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0089	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	-	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	29				
Methane (ppmv)	-	-	-	-	-	-	112,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-109					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.057				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0082				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0041	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0067				
Chlorobenzene	-	-	75	-	-	-	ND	0.0092				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0087				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.016	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.17 J	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0070				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.011				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.0092				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0078				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0055	-			
n-Heptane	85	440 c	400	500	-	-	0.086	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.011	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0086	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	0.017 [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.012	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.010				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0062				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0062				
Toluene	100	150	100	150	0.52	0.10	ND	0.077				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	-				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0079				
Trichloroethylene	25	-	50	200	-	-	ND	0.0079				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0086	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0086	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0078	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.023	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	37				
Methane (ppmv)	-	-	-	-	-	-	431,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-108					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.049				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0097				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0048	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0079				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.010				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	ND	0.056	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	-	50 c	-	50 c	-	-	ND	0.0083				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0092				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0065	-			
n-Heptane	85	440 c	400	500	-	-	0.040	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.010	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.014	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.012				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0074				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0074				
Toluene	100	150	100	150	0.52	0.10	ND	0.032				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0092				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0093				
Trichloroethylene	25	-	50	200	-	-	ND	0.0093				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0092	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.027	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	23				
Methane (ppmv)	-	-	-	-	-	-	290,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-107					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.058				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0095				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0078				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.010				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	ND	0.070	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0082				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0090				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0064	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.037	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.011	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	0.018 [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.014	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.012				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0072				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0072				
Toluene	100	150	100	150	0.52	0.10	ND	0.033				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0090				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0091				
Trichloroethylene	25	-	50	200	-	-	ND	0.0091				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0090	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.022	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	42				
Methane (ppmv)	-	-	-	-	-	-	296,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-106					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.076				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0090				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0045	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0074				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.010				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.018	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.12 J	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0078				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0086				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0061	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.036	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.013	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0095	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	0.035				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0069				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0069				
Toluene	100	150	100	150	0.52	0.10	ND	0.040				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0086				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0087				
Trichloroethylene	25	-	50	200	-	-	ND	0.0087				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0095	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0095	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.017	-			
o-Xylene	100	150	100	150	-	-	ND	0.0086	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.041	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	36				
Methane (ppmv)	-	-	-	-	-	-	298,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-106-D					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.070				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0094				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0077				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0099				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.12	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0081				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0089				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0063	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.032	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.010	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	0.022 [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0072				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0072				
Toluene	100	150	100	150	0.52	0.10	ND	0.037				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0089				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0090				
Trichloroethylene	25	-	50	200	-	-	ND	0.0090				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0099	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0089	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.030	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	38				
Methane (ppmv)	-	-	-	-	-	-	315,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-105					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.13				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0095				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0078				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.010				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.11 J	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0082				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0090				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0064	-			
n-Heptane	85	440 c	400	500	-	-	0.058	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.014	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	0.017 [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.014	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.012				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0072				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0072				
Toluene	100	150	100	150	0.52	0.10	ND	0.031				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0090				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0091				
Trichloroethylene	25	-	50	200	-	-	ND	0.0091				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0090	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.021	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	56				
Methane (ppmv)	-	-	-	-	-	-	277,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-104					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.14				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0096				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0048	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0079				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.010				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.095	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0082				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0091				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0064	-			
n-Heptane	85	440 c	400	500	-	-	0.10	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.012	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.014	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.012				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0073				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0073				
Toluene	100	150	100	150	0.52	0.10	ND	0.044				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0091				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0092				
Trichloroethylene	25	-	50	200	-	-	ND	0.0092				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.021	-			
o-Xylene	100	150	100	150	-	-	ND	0.0091	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	-	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	79				
Methane (ppmv)	-	-	-	-	-	-	256,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-103					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.049				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0095				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0078				
Chlorobenzene	-	-	75	-	-	-	ND	0.011				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.010				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.18	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	-	50 c	-	50 c	-	-	ND	0.0082				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.011				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0090				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0064	-			
n-Heptane	85	440 c	400	500	-	-	0.048	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.010	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	0.018 [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.014	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0072				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0072				
Toluene	100	150	100	150	0.52	0.10	ND	0.032				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0090				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0091				
Trichloroethylene	25	-	50	200	-	-	ND	0.0091				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.010	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0090	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.018	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	37				
Methane (ppmv)	-	-	-	-	-	-	282,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-102					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.041				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0092				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0046	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0076				
Chlorobenzene	-	-	75	-	-	-	ND	0.010				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0098				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.018	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.090	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0079				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.010				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0088				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0062	-			
n-Heptane	85	440 c	400	500	-	-	0.062	-	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.010	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0097	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0070				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0071				
Toluene	100	150	100	150	0.52	0.10	ND	0.031				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0087				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0088				
Trichloroethylene	25	-	50	200	-	-	ND	0.0089				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0097	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0097	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0088	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.029	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	31				
Methane (ppmv)	-	-	-	-	-	-	160,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-GVR-101					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.039				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.0093				
Bromoform	0.5	-	0.5	-	-	-	ND	0.0047	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0076				
Chlorobenzene	-	-	75	-	-	-	ND	0.010				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.0098				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.019	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.12	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.0080				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.012				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.010				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	ND	0.0089				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.0063	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.030	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.013	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.0098	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.013	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.0071				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.0092				
Toluene	100	150	100	150	0.52	0.10	ND	0.031				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0088				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.0089				
Trichloroethylene	25	-	50	200	-	-	ND	0.0089				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	ND	0.0098	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.0098	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.018	-			
o-Xylene	100	150	100	150	-	-	ND	0.0089	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	0.023	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	-	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	47				
Methane (ppmv)	-	-	-	-	-	-	113,000	-				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-Station3					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.0072				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.00028				
Bromoform	0.5	-	0.5	-	-	-	ND	0.00014	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	ND	0.0054				
Chlorobenzene	-	-	75	-	-	-	ND	0.00032				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.00030				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.00057	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	ND	0.0037	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.00024				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.00037				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.00032				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	0.00062	-				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.00019	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.00036	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.0075	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.00030	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.00061	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	0.00037	-				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.00022				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.00055				
Toluene	100	150	100	150	0.52	0.10	0.0054	-				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.0011				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.00027				
Trichloroethylene	25	-	50	200	-	-	ND	0.00027				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	0.00061	-	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.00030	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.0021	-			
o-Xylene	100	150	100	150	-	-	ND	0.00079	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	ND [6]	0.0016	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	-	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	0.00099	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	0.40				
Methane (ppmv)	-	-	-	-	-	-	ND	4.92				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-Station2					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.011				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.00035				
Bromoform	0.5	-	0.5	-	-	-	ND	0.00017	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	0.00044	-				
Chlorobenzene	-	-	75	-	-	-	ND	0.00039				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.00037				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.00070	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	ND	0.0012	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.00030				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.00045				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.00039				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	0.00067	-				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.00023	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.00044	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.011	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.00037	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.00079	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	0.00045	-				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.00027				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.00051				
Toluene	100	150	100	150	0.52	0.10	ND	0.0096				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	ND	0.00083				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.00033				
Trichloroethylene	25	-	50	200	-	-	ND	0.00034				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	0.00070	-	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.00037	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.0022	-			
o-Xylene	100	150	100	150	-	-	ND	0.00083	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	0.0016 [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	-	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	0.00084	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	0.50				
Methane (ppmv)	-	-	-	-	-	-	ND	4.92				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

ANALYTE	NIOSH [1]		OSHA [2]		RIDEM [3]		FWENC [4] MONITORING LOCATION: ML-Station1					
	REL (10-hr)	STEL (15-min)	PEL (8-hr)	STEL (15-min)	AAL (24-hr)	AAL (1-yr)	Jul-97		Sep-97		Dec-97	
							Result [5]	QL	Result [5]	QL	Result [5]	QL
Volatile Organic Compounds (ppmv)												
Acrylonitrile	1	10 c	2	10 c	-	5E-06	-	-				
Benzene	0.1	1	1	5	-	3E-05	ND	0.010				
Benzyl Chloride	-	1 c	1	-	0.004 b	4E-06	ND	0.00032				
Bromoform	0.5	-	0.5	-	-	-	ND	0.00016	-			
1,3-Butadiene	-	-	1000	-	-	-	-	-				
Carbon Disulfide	1	10	4	12	-	-	-	-				
Carbon Tetrachloride	-	2 a	2	-	-	1E-05	0.00031	-				
Chlorobenzene	-	-	75	-	-	-	ND	0.00036				
Chloroethane	-	-	1000	-	-	-	-	-				
Chloroform	-	2 a	2	-	-	8E-06	ND	0.00034				
Chloromethane	-	-	50	100	-	-	-	-				
1,2-Chlorotoluene	-	-	-	-	-	-	ND	0.00064	-			
Cumene	50	-	50	-	-	-	-	-				
Cyclohexane	300	-	300	-	-	-	0.0014	-	-			
Dibromoethane	-	-	-	-	-	-	-	-				
1,2-Dichlorobenzene	- -	50 c	- -	50 c	-	-	ND	0.00028				
1,1-Dichloroethane	100	-	100	-	-	-	ND [6]	-				
1,2-Dichloroethane	-	-	-	-	-	1E-05	ND	0.00041				
1,1-Dichoroethylene	-	-	-	-	-	-	-	-				
1,2-Dichloropropane	-	-	75	110	-	-	ND	0.00036				
1,3-Dichloropropane	-	-	-	-	-	-	-	-				
Ethylbenzene	100	125	100	125	-	-	0.00074	-				
Ethylene Dibromide	0.045	0.13 c	20	30 c	-	-	ND	0.00022	-			
n-Heptane	85	440 c	400	500	-	-	ND	0.00041	-			
Hexane	50	-	50	-	-	-	-	-				
d-Limonene	-	-	-	-	-	-	ND	0.012	-			
1-Methylethylbenzene	-	-	-	-	-	-	ND	0.00034	-			
Methyl Ethyl Ketone (2-Butanone)	200	300	200	300	-	-	ND [6]	-				
Methyl Isobutyl Ketone	50	75	50	75	-	-	-	-				
Methyl-tert-butyl Ether	-	-	-	-	-	-	ND	0.00065	-			
Methylene Chloride	-	-	500	1000 c	-	6E-04	-	-				
Styrene	50	100	50	100	-	0.007	ND	0.011				
1,1,2,2-Tetrachloroethane	1	-	1	-	-	-	ND	0.00024				
Tetrachloroethylene	-	-	25	-	-	7E-06	ND	0.00059				
Toluene	100	150	100	150	0.52	0.10	ND	0.0093				
1,1,1-Trichloroethane	-	350 c	350	450	-	-	0.00059	-				
1,1,2-Trichloroethane	10	-	10	-	-	0.001	ND	0.00031				
Trichloroethylene	25	-	50	200	-	-	ND	0.00031				
1,2,4-Trimethylbenzene	-	-	-	-	-	-	0.00082	-	-			
1,3,5-Trimethylbenzene	-	-	-	-	-	-	ND	0.00034	-			
Vinyl Chloride	-	-	1	5 c	-	-	-	-				
m&p-Xylene	100	150	100	150	-	-	ND	0.0025	-			
o-Xylene	100	150	100	150	-	-	ND	0.00094	-			
Xylene (total)	100	150	100	150	0.16	-	-	-				
Tentatively Identified Compounds (ppmv)												
Butanoic acid, ethyl ester	-	-	-	-	-	-	ND [6]	-	-			
2-Butanol	100	150	100	-	-	-	ND [6]	-	-			
1-Ethyl-2-methylbenzene	-	-	-	-	-	-	ND [6]	-	-			
alpha-Pinene	-	-	-	-	-	-	0.0018 [6]	-	-			
n-Propanol	200	250	200	250	-	-	ND [6]	-	-			
Tetrahydrofuran	200	250	200	250	-	-	ND [6]	-	-			
Trichlorofluoromethane (Freon-11)	-	1000 c	-	1000 c	-	-	ND [6]	0.00045	-			
Total Hydrocarbons (mg/m3)	-	-	-	-	-	-	ND	0.52				
Methane (ppmv)	-	-	-	-	-	-	ND	4.92				

TABLE 4
COMPARISON OF ANALYTICAL RESULTS
QUARTERLY AIR MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

NOTES:

1. NIOSH values are TWAs from: U.S. Department of Health and Human Services, "NIOSH Pocket Guide to Chemical Hazards", June 1990.
2. OSHA values are TWAs from: U.S. Department of Health and Human Services, "NIOSH Pocket Guide to Chemical Hazards", June 1990.
3. AAL values for site boundaries are averages from: Rhode Island Department of Environmental Management (RIDEM), "Air Pollution Control Regulation No. 22", February 1997: Applicable to perimeter ambient stations only.
4. Locations sampled by Foster Wheeler Environmental Corporation (FWENC) as described in Quarterly Operations & Maintenance Report.
5. Samples analyzed by EPA Method TO-1 in July 1997
6. Analyte is TIC; no QL provided by analytical laboratory. If QL is reported, it was generated as a result of blank contamination identified during data validation.

a - Value based on 60-minute TWA
b - Value based on 1-hour average
c - Ceiling value not to be exceeded at any time
AAL - Acceptable Ambient Levels (based on 24-hour and 1-year averages)
ND - Not Detected above QL reported by analytical laboratory
NIOSH - National Institute for Occupational Safety and Health
OSHA - Occupational Safety and Health Administration
PEL - Permissible Exposure Limit (based on 8-hour TWA workday during 40-hour workweek, except as noted)
QL - Quantitation Limit reported by analytical laboratory
REL - Recommended Exposure Limit (based on 10-hour TWA for workday during 40-hour workweek, except as noted)
STEL - Short-Term Exposure Limit (based on 15-minute TWA, except as noted)
TIC - Tentatively Identified Compound
TWA - Time Weighted Average
- - Analyte was not analyzed and/or does not have established NIOSH, OSHA, or RIDEM AAL criteria
Shaded values exceed indicated RIDEM AAL value.

TABLE 5
REAL-TIME GAS PARAMETERS
QUARTERLY LANDFILL GAS MONITORING
McALLISTER POINT LANDFILL
NETC NEWPORT, RHODE ISLAND

FWENC [1] SAMPLING LOCATION	O & M PERIOD AIR MONITORING PARAMETERS [2]														
	Jul-97					Round 2					Round 3				
	CH_4 (%)	O_2 (%)	CO_2 (%)	H_2S (%)	LEL (%)	CH_4 (%)	O_2 (%)	CO_2 (%)	H_2S (%)	LEL (%)	CH_4 (%)	O_2 (%)	CO_2 (%)	H_2S (%)	LEL (%)
Gas Monitoring Well ID:															
GV-21+25	0.0	21.2	0.1	6	0										
GV-19+25	0.0	15.5	3.5	10	0										
GV-17+25	12.0	0.6	14.4	16	246										
GV-15+25	18.1	2.0	16.1	13	360										
GV-13+25	8.0	11.3	8.5	17	166										
GV-11+25	0.4	21.0	0.3	8	8										
GV-9+25	25.5	20.4	0.8	11	512										
GV-7+25	33.1	23.7	0.3	14	670										
GV-5+25	25.7	3.0	18.0	10	515										
Gas Vent ID:															
GVR-118	62.1	1.4	13.6	11	>1000										
GVR-117	5.7	2	11.6	6	112										
GVR-116	21.6	4.6	7.1	6	434										
GVR-115	29.6	3.2	8.4	8	580										
GVR-114	68.5	0.2	2	8	>1000										
GVR-113	55.6	1.2	8.3	8	>1000										
GVR-112	22.8	4	10.8	9	458										
GVR-111	67.4	0.6	6.3	10	>1000										
GVR-110	41	4	6.18	8	876										
GVR-109	57.8	1.6	14.9	5	>1000										
GVR-108	51.7	2.2	12.3	10	>1000										
GVR-107	53.2	1.2	13.1	11	>1000										
GVR-106	58.9	1.5	16.8	12	>1000										
GVR-105	57.7	0.6	15.3	11	>1000										
GVR-104	58	0.4	10	10	>1000										
GVR-103	56.6	1.6	10.8	10	>1000										
GVR-102	49.3	0.9	15.8	11	980										
GVR-101	39.1	2.4	19.4	10	792										

NOTES:

1. Sample collection by Foster Wheeler Environmental Corporation (FWENC) as described in: "Operations and Maintenance Manual", May 1997.
2. Data compiled from FWENC field logbook.

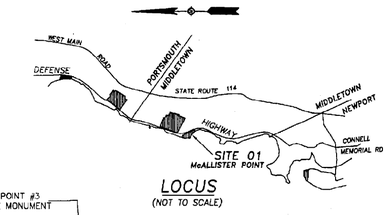
LEL - Lower Explosive Limit

All data collected during time of quarterly sampling.

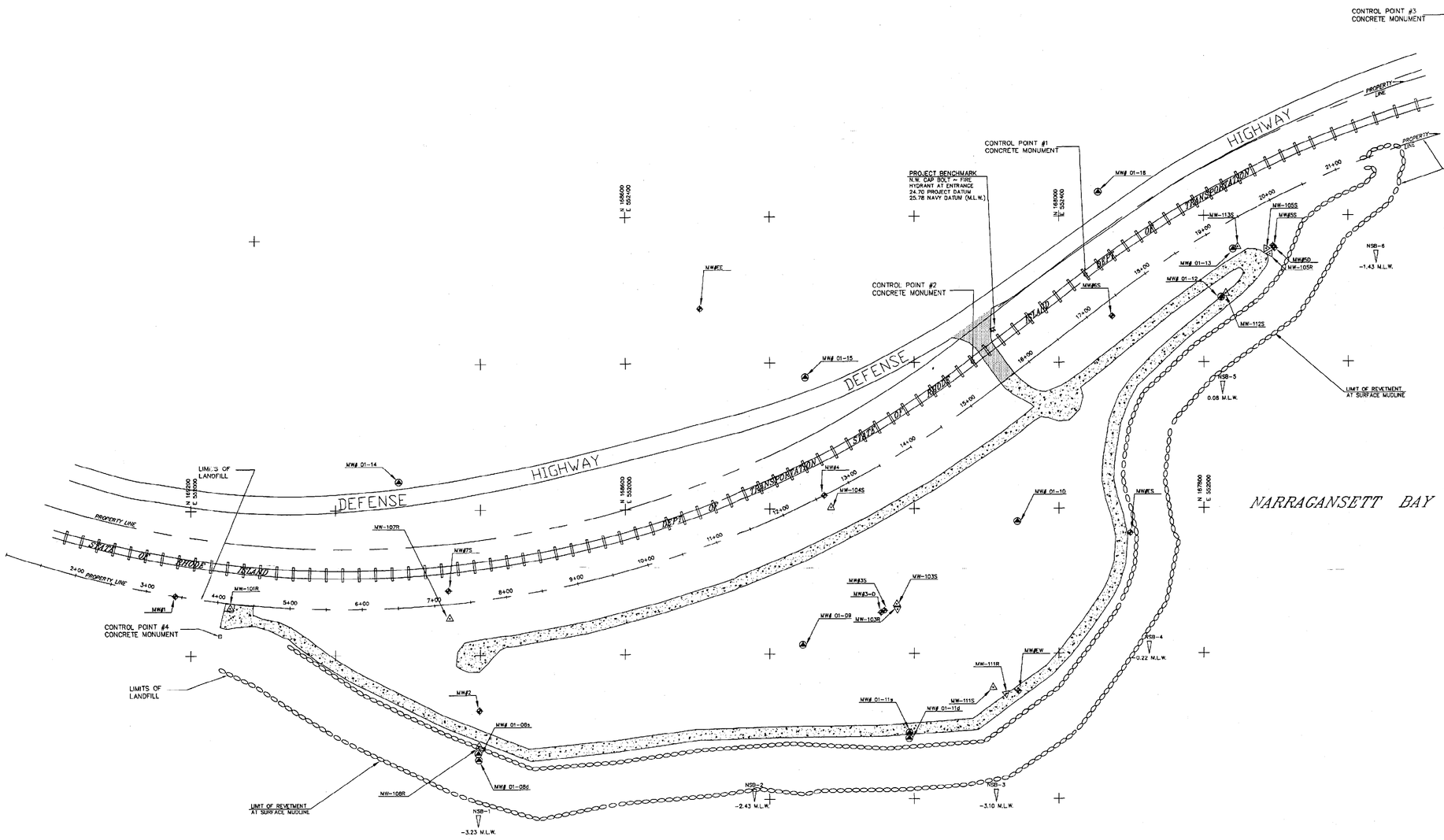
ATTACHMENT B

FIGURES

RAILROAD BASELINE MONUMENTATION				SAI SURVEYING MONUMENTATATION				
CP1	167963.267	552318.969	---	CP3	167456.9024	552498.7751	6.25 P.D.	5.17 M.L.W.
CP2	168119.063	552200.989	---	CP4	169159.7207	551827.4420	25.11 P.D.	24.03 M.L.W.



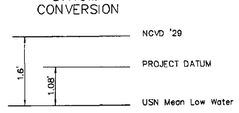
LOCUS
(NOT TO SCALE)



LEGEND

- LIMIT OF REVETMENT STONE
- EDGE OF ROADWAYS
- MW-101R — MONITORING WELLS CIRCA 1996 (FWEC)
- NSB-5, 0.08 M.L.W. — NSB SAMPLE POINTS CIRCA 1996 (B&R)
- MW# 01-09 — MONITORING WELLS CIRCA 1994 (TRC)
- MW#3S — MONITORING WELLS CIRCA 1990 (TRC)

DATUM CONVERSION



NOTES:

REFERENCE PLAN

1) PLAT SHOWING LAND IN CITY OF NEWPORT & TOWNS OF MIDDLETWON & PORTSMOUTH, ACQUIRED FOR RAILROAD PURPOSES ON BEHALF OF THE STATE OF RHODE ISLAND & PROVIDENCE PLANTATIONS, BY THE DIRECTOR OF TRANSPORTATION, RAILROAD PLAT NO. 1.

2) SAI SURVEYING CO. INC. 5-22-97 SITE PLAN, MCALLISTER POINT LANDFILL, NAVAL EDUCATION AND TRAINING CENTER, MIDDLETOWN, RHODE ISLAND FOR BROWN AND ROOT ENVIRONMENTAL

GENERAL NOTE

1) NSB SAMPLE POINTS ELEVATIONS ARE LISTED AS NAVY MEAN LOW WATER.

2) DATUM USED FOR PLAN = PROJECT DATUM, HORIZONTAL COORDINATES BASED ON REFERENCE PLAN NO. 1.

GRAPHIC SCALE

80' 0' 80' 160'

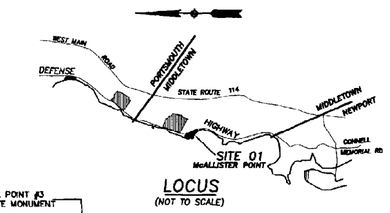
1 INCH = 80 FEET

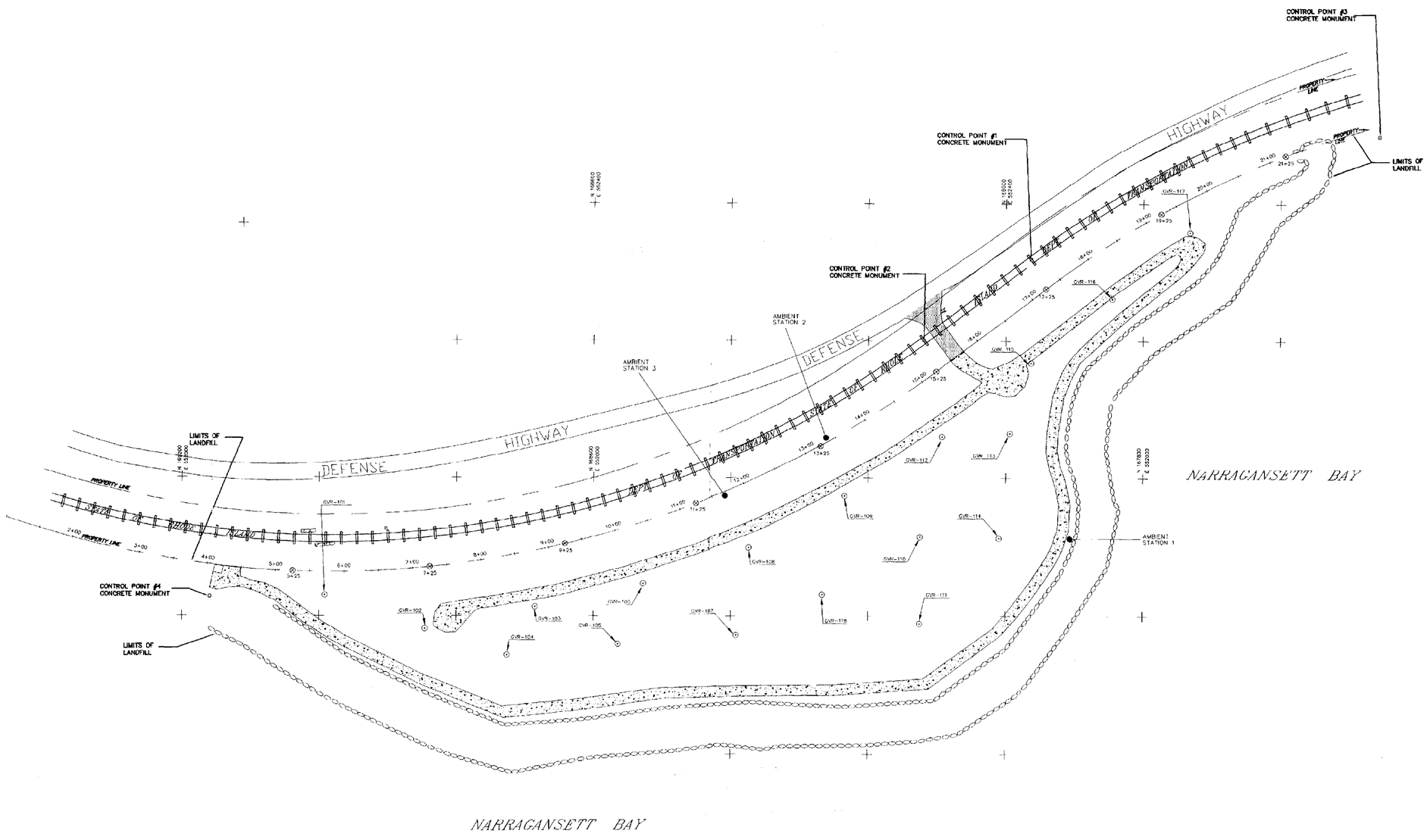
DRAWN BY: SAI SURVEYING COMPANY	TITLE: MONITORING WELL LOCATIONS MCALLISTER POINT LANDFILL MIDDLETOWN, RHODE ISLAND
PREPARED BY: D.W. MACDOUGALL	
CHECKED BY: S. PARKER	
	SOURCE: BASE PLAN BY SAI SURVEYING COMPANY (5-22-97)
	SCALE: 1" = 80' / DATE: AUGUST 7, 1997 / PROJ. NO: 4725 CTO: 197
PROJECT MANAGER: S. PARKER	DRAWING NO: FIGURE 1 / ACFILE NAME: DWG\NAVY\MC_PT\MWS.DWG / REV: 0
PROGRAM MANAGER: J. TREPANOWSKI	

Brown & Root Environmental
A Division of Halliburton NUS Corporation
55 JONSPIN ROAD
WILMINGTON, MASSACHUSETTS 01887
(508)658-7899

00112L88X

RAILROAD BASELINE MONUMENTATION				SAI SURVEYING MONUMENTATATION				
CP1	167963.267	552318.969	---	CP3	167456.9024	552498.7751	6.25 P.D.	5.17 M.L.W.
CP2	168119.063	552200.989	---	CP4	169159.7207	551827.4420	25.11 P.D.	24.03 M.L.W.

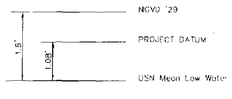




LEGEND

- LIMIT OF REVETMENT STONE
- EDGE OF ROADWAYS
- GVR-108 — GAS VENT RISERS CIRCA 1996 (FWEC)
- 5+25 — PERIMETER GAS MONITORING WELL (FWEC)
- AMBIENT AIR SAMPLE STATIONS

DATUM CONVERSION



NOTES:

REFERENCE PLAN

1) PLAT SHOWING LAND IN CITY OF NEWPORT & TOWNS OF MIDDLETWON & PORTSMOUTH, ACQUIRED FOR RAILROAD PURPOSES ON BEHALF OF THE STATE OF RHODE ISLAND & PROVIDENCE PLANTATIONS, BY THE DIRECTOR OF TRANSPORTATION, RAILROAD PLAT NO. 1.
2) SAI SURVEYING CO. INC. 5-22-97 SITE PLAN, MCALLISTER POINT LANDFILL, NAVAL EDUCATION AND TRAINING CENTER, MIDDLETOWN, RHODE ISLAND FOR BROWN AND ROOT ENVIRONMENTAL

GENERAL NOTE

1) NSB SAMPLE POINTS ELEVATIONS ARE LISTED AS NAVY MEAN LOW WATER.
2) DATUM USED FOR PLAN = PROJECT DATUM, HORIZONTAL COORDINATES BASED ON REFERENCE PLAN NO. 1.

GRAPHIC SCALE

80' 0' 80' 160'

1 INCH = 80 FEET

DRAWN BY: SAI SURVEYING COMPANY	TITLE: LANDFILL GAS SAMPLE COLLECTION STATIONS MCALLISTER POINT LANDFILL MIDDLETOWN, RHODE ISLAND
PREPARED BY: D.W. MACDOUGALL	
CHECKED BY: S. PARKER	
	SOURCE: BASE PLAN BY SAI SURVEYING COMPANY (5-22-97)
	SCALE: 1" = 80' / DATE: SEPTEMBER 3, 1997 / PROJ. NO: 4725 CTO: 197
PROJECT MANAGER: S. PARKER	DRAWING NO: FIGURE 2 / ACFILE NAME: DWG\NAVY\MC_PT\GVR.DWG / REV: 0
PROGRAM MANAGER: J. TREPANOWSKI	

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APPENDIX B
AQUATIC HABITAT CHARACTERIZATION

APPENDIX B-1
AQUATIC HABITAT ASSESSMENT AND FUNCTIONAL ANALYSIS

Habitat Assessment/Functional Analysis for

Coastal Waters of McAllister Point Landfill

May 1998

Prepared for:

Tetra Tech NUS
55 Jonspin Road
Wilmington, MA 01887

Prepared by:

Science Applications International Corporation
165 Dean Knauss Drive
Narragansett, RI 02882

The Feasibility Study for McAllister Point Landfill Offshore Sediment/Management of Migration presents various options for remediation of contaminated sediments found to pose risks to aquatic, terrestrial, and human health receptors. Some of the factors which bear upon the acceptability of proposed remedial designs involve the present status and future trends of aquatic habitat quality and function in the affected area, particularly in relation to present use and potential sustainability/re-use by these receptors. This section of the report summarizes recent (Section 1.0) and historical information (Section 2.0) as well as Functional Analysis of the habitat (Section 3.0) in order to support the selection of the preferred alternative for the site.

1.0 Recent Habitat Investigations

This section of the report summarizes recent acoustic (Section 1.1) and photographic (Section 1.2) surveys conducted to support the design and selection of preferred alternatives for the site.

1.1. McAllister Point seafloor topography characterization study.

A side-scan sonar survey was recently performed in Narragansett Bay offshore of the McAllister Point Landfill. The purpose of the survey was to characterize seafloor topography in relation to potential hazards to vessels or equipment which might be employed for purposes of sediment remediation. This report summarizes information extracted to date from the side scan records, focusing primarily on the distribution of large boulders which would interfere with capping or dredging operations.

Survey Design. Side scan sonar operations were performed over three separate survey grids on 21 and 22 February as well as 17 March 1998 to provide images of the seafloor up to 280 m west of the McAllister Point Landfill Area. Water depths in the survey areas ranged from 16 m at the western margin to approximately 2 m in close proximity to the landfill. A 300 kHz Sea Scan PC system, manufactured by Marine Sonic Technology, Ltd., was used to produce enhanced-resolution images of the seafloor to aid in target differentiation and identification. Survey lanes in deeper water were spaced at 40 m intervals and side scan sonar data were collected over a 100 m swath to provide bottom coverage in excess of 150%. As water depths decreased, the survey lanes spacing was also reduced to maintain comprehensive coverage of the seafloor.

Navigation. Differential Global Positioning System (DGPS) data in conjunction with SAIC's Portable Integrated Navigation and Survey System (PINSS) were used to position the survey vessel and side scan towfish along predetermined survey lanes. The broadcasted US Coast Guard differential beacon corrections at Montauk Point, New York (293 kHz) were utilized for satellite corrections due to its geographic position relative to Narragansett Bay. When merged with the satellite data, the correctors provide differential GPS positions to an accuracy of ± 3 m with an update rate of 1 Hz.

Data Processing. All side scan sonar data were collected and stored within the Sea Scan PC system as modified Tagged Image File (*.TIF) with navigation information embedded within the file format. The data were post-processed through Marine Sonic Technology's Sea Scan PC review program to extract position, as well as to permit identification and measurement of sonar contacts. The locations and heights of targets were determined via slant range calculations (triangulation) based on the position and altitude of the towfish as well as the relative length of sonar shadows. Upon completion of data processing activities, all pertinent modified *.TIF files were exported to a standard *.TIF format for incorporation into an ARCVIEW project.

Survey results. Figure 1.1-1 shows the center trackline plots for each of 17 lanes along which the side scan sonar was towed over three survey days; as noted above, a fairly complete coverage of the

seafloor for the region is provided by these specifications. Representative side scan sonar images collected in the survey area inshore and offshore of McAllister Point are shown in Figure 1.1-2a and Figure 1.1-2b, respectively. Complete sidescan sonar imagery is available upon request as an ARCVIEW project on CD-ROM medium. From this imagery, the distribution of seafloor targets (assumed to be boulders) and their associated heights were determined. Target size varied from small boulders < 0.5 m in height, to very large boulders up to 2.5 m tall (Figure 1.1-3). The maps show that the presence of boulders < 1m is common for the study area, and this distribution does not appear to have been affected by landfill construction or capping activities. The implication of the apparent surface roughness will be addressed further in the discussion of remedial alternatives.

1.2. McAllister Point photographic characterization study.

A plan view photographic survey of the McAllister Point subtidal environment was recently performed in order to characterize benthic habitat type as well as to search for the surficial expression of landfill debris which might be a potential hazard to site visitors or otherwise indicate landfill deposits which might serve as a source of CoCs for ecological and human health receptors. This section summarizes information extracted to date from the photographic records, focusing primarily on the distribution of habitat type and landfill debris as input in to the remedial alternative design.

Survey Methods. Photographic survey operations were performed on 6 April 1998. A Photosea camera system including two submersible flash units and 100-frame film packs was deployed in a weighted PVC frame and electronically tethered to a topside computer for camera control and collection of positioning data (See Section 1.1.2 for description of the navigation system). The Photosea system was used to collect approximately 150 1 m^2 plan view images of the seafloor in water depths of 1.5 - 20 m to the west of the McAllister Point Landfill study area. Nine survey transects, covering the full latitudinal range of the McAllister Point coastline and extending from shore into deeper water, were occupied at 5m spacing (increasing with water depth).

Data Processing. All photographic data were collected and stored on 35 mm color film, processed as slides, scanned at 600 x 800 pixel resolution, stored as JPEG images and brought into an image editing software (Photoshop) for minor contrast and brightness adjustments. Subsequently, imagery was integrated with navigation data into a PC ARCVIEW project and images were reviewed for habitat characteristics and classified as to habitat type. Complete Photosea imagery is available upon request as an ARCVIEW project on CD-ROM medium.

Survey results. Figure 1.2-1 shows the location of Photosea images and inferred benthic cover in the vicinity of McAllister Point. From this imagery, seven representative classes of habitat were observed, including 1) macrophytic algae (Figure 1.2-2a), 2) shell lag and macrophytic algae (Figure 1.2-2b), 3) rock/cobble (Figure 1.2-2c), 4) rock with macrophytic algae (Figure 1.2-2d), 5) sand/shell bottom (Figure 1.2-2e), and 7) eelgrass bed (Figure 1.2-2f). A general pattern of rocky and rock-algal habitat in the nearshore areas is observed, and increasingly sandy/algal habitat is apparent for deeper offshore waters. Eelgrass beds were also observed in the northern region of the study area. Careful review of the images failed to reveal evidence of landfill debris at the surface anywhere in the surveyed area. Additional details on photography taken from shore at low tide (landward of the Photosea study area) are discussed elsewhere in the FS report.

2.0. Historical Information supporting Habitat Characterization

2.1. Historical shoreline stability investigations.

Shoreline change measurements conducted by Prof. John Boothroyd, URI (in ASA, 1992) are reviewed here to characterize the expected pattern of deposition and/or erosion in the nearshore environment adjacent to McAllister Point Landfill. The study relied upon aerial photographic analysis, and characterized change for two index periods covering the year intervals 1938-1975 and 1975-1988. For the present discussion of the URI findings, a shoreline change was considered significant if two or more contiguous segments changed and did so in a similar manner. Also, only the westward-facing shoreline of the bay was included as the point of comparison for interpretation of expected conditions at McAllister Point since this coast would have similar northwesterly exposure to the prevailing wind direction during winter storms.

During the period 1975-1988, only two areas of net deposition were observed for Narragansett Bay, Prudence Island (segment 478-479) and McAllister Point (679-681), while the 12 remaining areas were all erosional (Figure 2.1-1). For the Prudence Island depositional area, the added material may have come from the area of erosion immediately to the south. In contrast, the deposition observed at McAllister Point is assumed to be related to landfill construction; the large boulders placed at the edge of the landfill and intertidal zone likely absorbed wave energy thereby minimizing erosion while additional sloughing of landfill soil into the intertidal area is likely contributed most of the net deposition. A more detailed site-specific shoreline change analysis described in the Marine ERA concluded that the pattern of shoreline accretion was related to landfill construction. Subsequently, a significant shoreline erosion event occurred in the winter 1995-1996and was attributed to the removal of the intertidal boulders during landfill cap construction. Evidence of shoreline erosion to the north of the landfill revetment has been noted during recent surveys.

In summary, conditions favoring shoreline weathering at McAllister Point are similar to that of other westward facing locations in Narragansett Bay. Except for the time period where McAllister Point intertidal area was artificially armored with large boulders, it can be concluded that environmental conditions in the vicinity of McAllister Point landfill are expected to have supported a high energy rocky intertidal habitat in the past and will continue to do so into the future. Since there is no evidence to suggest that alternate habitat types could be sustained over the long term (such as sand beach or fringing marsh), remedial designs requiring habitat reconstruction should include surface cover consistent with the rocky intertidal conditions typical of the western-facing shorelines of Narragansett Bay.

2.2. Historical habitat descriptions.

Benthic Community. As part of the Narragansett Bay Project , the near- and offshore area in the vicinity the McAllister Point Landfill were characterized by ASA (1992) as part of the Lower Bay Complex. This complex is described as mixed sediments predominated by sands with shell lag and live specimens of the bivalve *Mytilus edulis* and the gastropod *Crepidula fornicata.* This habitat type grades into deeper water into the Mid-Bay Complex with finer sediments inhabited by the common *Nephtys-Nucula* assemblage. The coarser, shelly, shallower areas are more erosional in character and the deeper silt/clay habitats are depositional.

The recent characterization of the intertidal zone of McAllister point (discussed in Section 1.0) as rock/cobble in nature is a reflection of a fairly constant exposure to wave action and erosional currents. The ASA study characterized the intertidal zone of Dyer Island, to the north of McAllister Point, and found it dominated by the macroalgae *Fucus, Ulva*, and *Ralfsia*, and the mussel *Mytilus* and periwinkle *Littorina.* It is expected that the Aquidneck Island shoreline south to the Landfill be inhabited by a similar flora and

fauna. Rocky bottom with macroalgal beds were concluded to be the predominant feature of this shoreline, probably as a consequence of the hydrodynamic regime in this region of the Bay. A similar finding was reported by Metcalf and Eddy (1985) who characterized this section of the coastline in support of studies related to the Newport Water Pollution Control Plant discharge.

Menzie-Cura and Associates (1994) conducted a study of the benthic environment adjacent to and near the Landfill. Epifaunal and epifloral transects from the shoreline to 100m offshore were surveyed and the bottom was described as sand and silty sand facies to sand/rock, shell and boulder bottom. The predominant bottom type was rocky. The most frequently observed epibenthos included a number of crab species and starfish, who prey upon *Crepidula*. The predominance of this assemblage was attributed to the exposed, turbulent habitat.

Finally, studies supporting the ecological risk characterization (SAIC/URI, 1997) examined intertidal and subtidal benthic communities adjacent to the landfill. In the intertidal zone, mussel (*Mytilus*) beds and interspersed, shallow sediment deposits were present which were dominated by the presence of oligochaetes and mussel spat; sessile anenomes, tube-dwelling amphipods, and periwinkles also were abundant. Sediment samples also contained high densities of polychaetes. It was concluded that the soft intertidal sediments in the intertidal zone likely originated from erosion of McAllister Point landfill. In contrast, the subtidal habitat was characterized as predominately sand and gravel facies admixed with shell and cobble, with the benthic community being composed of polychaete and oligochaete worms, blue and black mussels, and some amphipods. The hard clam *Mercenaria* and bivalve *Pitar* were observed to coexist with the mussel as the likely biomass dominants of the community.

Fisheries. The demersal fish community was surveyed in the area off McAllister Point in the spring, summer, and fall of 1984 (M&E, 1985). Winter flounder was the most common and abundant species in trawls at two stations off McAllister Point (70-100' water depth). Also abundant were skate and hake. It is expected that, in addition to some level of trawl fishing, the area is subject to recreational fishing. Before the decline of the oyster in Narragansett Bay, the area off McAllister Point was a leased oyster culture bed, and the area is still recognized as an active trap fishery for conch (Olsen et al., 1980). There is an active lobster fishery in the lower part of the East Passage to the south of McAllister Point, however the extent to which the McAllister Point area affects that fishery is unknown.

3.0 Habitat Function and Value

The process for habitat function and value evaluations is most formalized and well-defined for wetlands. The USACE has developed two approaches to address wetland evaluations: a process to characterize function based upon hydrogeomorphic conditions (Brinson, 1993); and a process that relies upon the functional relationship between the wetland and aquifers (ACOE NED). In the latter approach, the importance of factors such as groundwater recharge/discharge, flood flow alteration, fish and shellfish habitat, nutrient removal, and wildlife habitat among others are considered. No analogous guidance for the evaluation of intertidal and subtidal marine and estuarine habitats is available.

The USACE approaches however do provide a template of functions and values that may apply to marine/estuarine habitats. These attributes include the following: 1) fish/shellfish habitat; 2) wildlife habitat; 3) production export; 4) sediment/shoreline stabilization; 5) recreation; 6) education/scientific value; 7) visual quality/esthetics; 8) endangered species habitat; 9) uniqueness/heritage. Each of these items are addressed below. It is intended that these attributes be used in an objective sense to evaluate the function and value of this system in its present state.

Fish/shellfish Habitat: The various studies cited above indicate that the existing habitat at McAllister Point does serve as fish and shellfish habitat, at a minimum for winter flounder, hard shell clam, mussels, and conch.

Wildlife Habitat: Specific wildlife utilization of the intertidal zone at McAllister Point is at present unknown. However, it is expected that shore and wading birds would feed on mussel beds in the area, and that these beds would be frequented by local mammal (e.g., raccoon) populations.

Product Export: This function in the context of wetlands refers to the habitat as a producers of nutrients/carbon to other systems or as producers of food or useable products for human or other living systems. The McAllister Point area, as populated by macrophytes, does produce detritus that is distributed to other systems. As noted above, it also produces food products for human consumption, although the area is within a section of the bay designated as a permanent shellfish closure area by the RIDEM..

Sediment/Shoreline Stabilization: The rocky intertidal and shallow subtidal sand/cobble habitat by definition provide for shoreline stabilization by mere presence of rock outcrop.

Recreation: The shoreline itself, were it not subject to restricted access, would be a recreational attraction. However, the presence of the fenced landfill and landfill revetment limits its utility for shoreline recreation. The subtidal fishery is subject to recreational fishing, and all coastal areas in Narragansett Bay are considered a recreational resource.

Education/Scientific Value: No current educational or scientific value can be ascribed to this area except that associated with scientific studies related to the landfill itself.

Visual Quality/Aesthetics: None.

Endangered Species: Three species of endangered marine turtle, Kemp's ridley, leatherback, and hawksbill, are known to migrate along the RI coastline. A fourth species, the loggerhead, which also migrates along the shoreline is in the threatened status. The extent to which any of these species enter Narragansett Bay and come in contact with the McAllister Point area is unknown.

Uniqueness/heritage: The Narragansett Bay Comprehensive Conservation and Management Plan (CCMP) (RIDEM, 1992) in its role of protecting critical areas, identifies ecologically critical resources in the Bay. Three of these resource types occur off McAllister Point: rocky intertidal zone; current and historic shellfish beds; and subtidal and intertidal areas of high biotic diversity.

4.0. References

Applied Sciences Associates. 1992. Habitat inventory/resource mapping for Narragansett Bay and associated coastline. Prepared for Narragansett Bay Project, ASA-89-33.

Brinson, M. M. 1993. A hydrogeomorphic classification for wetlands, Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A270 053.

Menzie-Cura and Associates. 1994. Assessment of marine benthic infauna and epifauna in vicinity of Naval Education and Training Center (NETC) sites. Prepared for TRC Environmental Corp.

Metcalf and Eddy. 1985. Application to the U.S. Environmental Protection Agency for modification of secondary treatment requirements for discharge into marine waters of the east passage of Narragansett Bay for its water pollution control plant by the city of Newport, Rhode Island.

Olsen, S., D.D. Robadue, Jr., and V. Lee. 1980. An interpretative atlas of Narragansett Bay. CRC Mar. Bull. 40.

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SAIC/URI. 1997. McAllister Point Landfill: marine ecological risk assessment report. Prepared for Brown and Root Environmental and Department of Navy Northern Division.

U.S. ACE-New England District. Wetland functions and values, a descriptive approach, Supplement to the Highway Methodology Workbook.

Figure 1.1-1 Side Scan Sonar Survey Lanes, McAllister Point

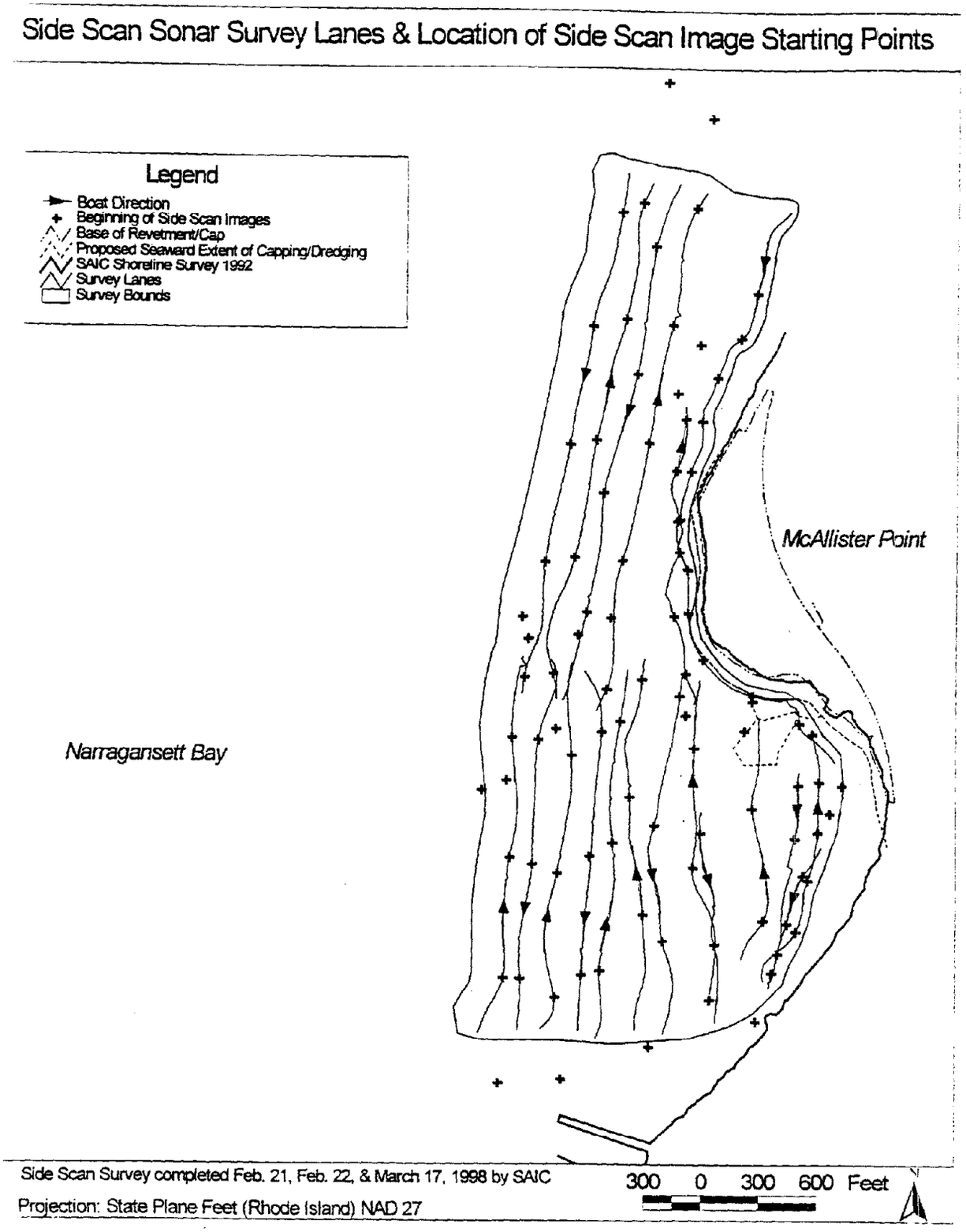


Figure 1.1-2a Side Scan Sonar Image, McAllister Point Inshore

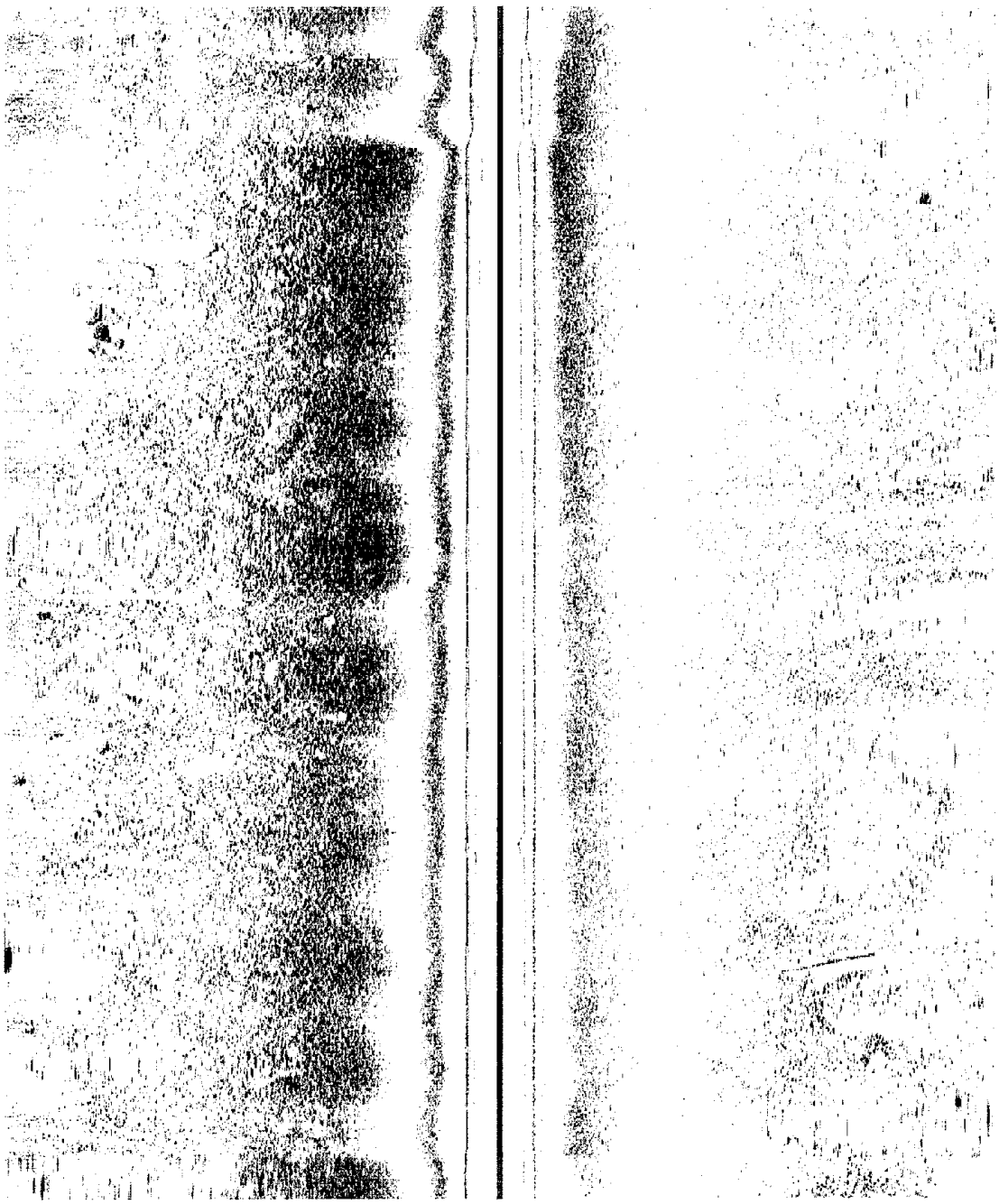


Figure 1.1-2b Side Scan Sonar Image, McAllister Point Offshore

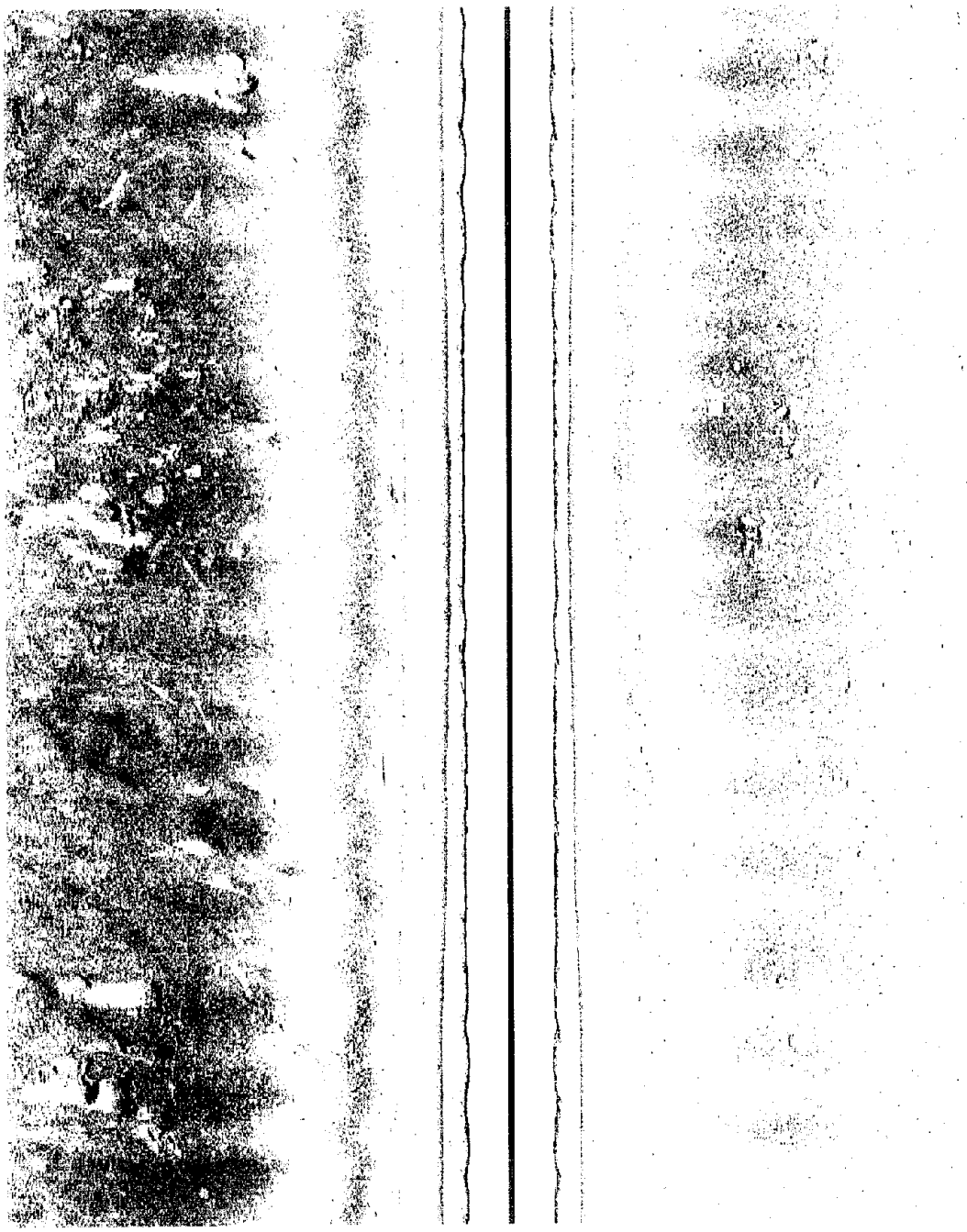
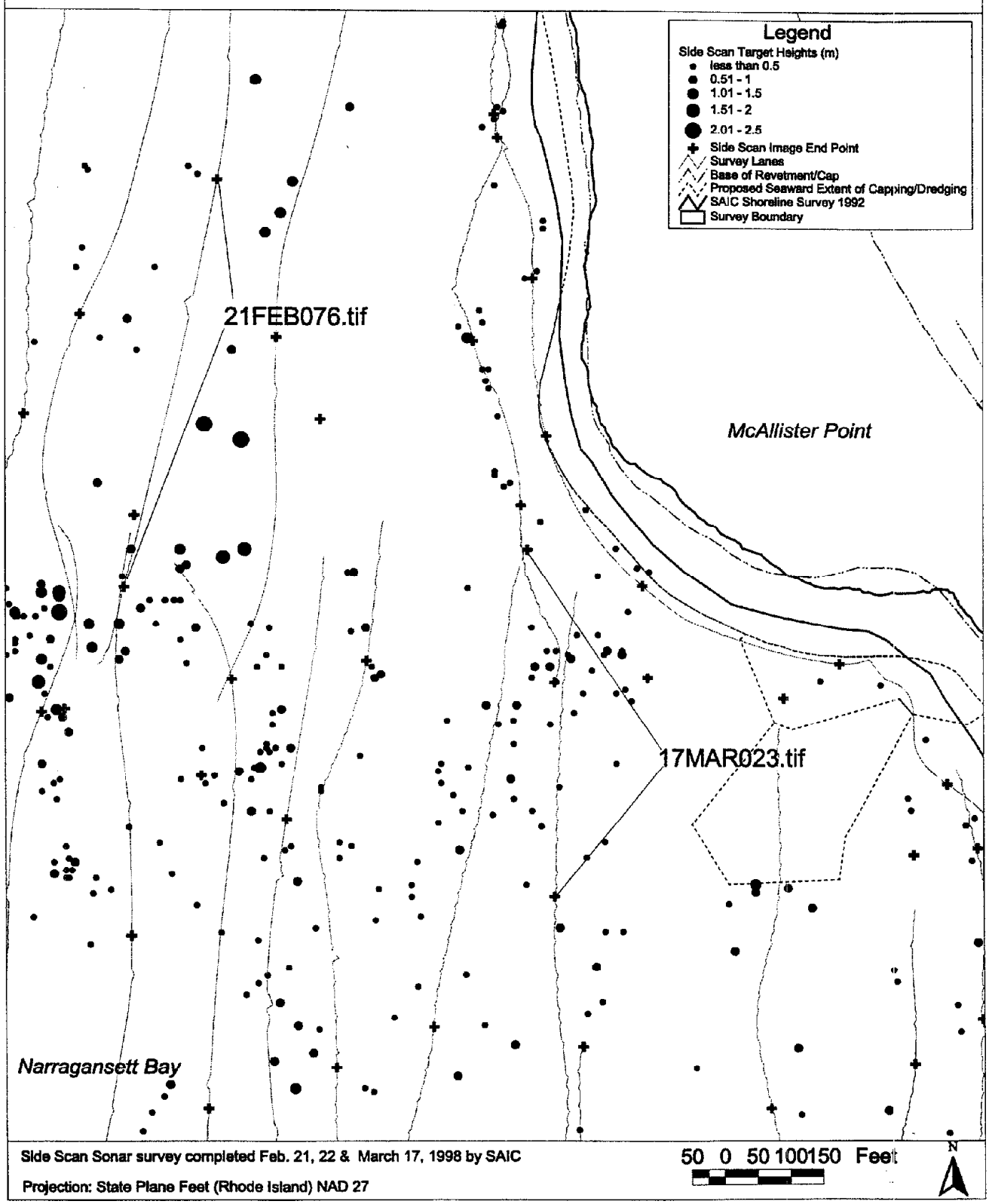


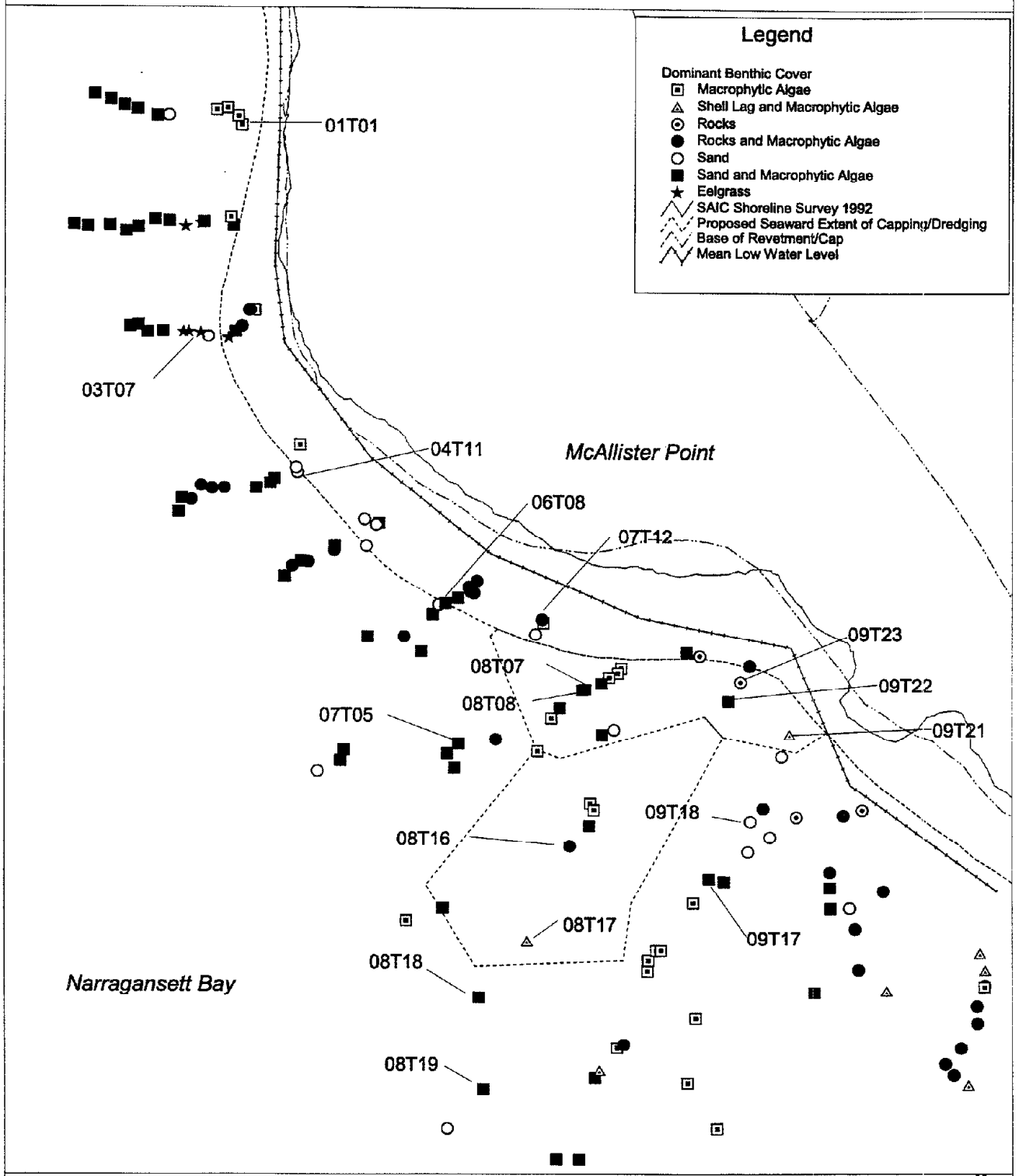
Figure 1.1-3 Side Scan Sonar Target Locations, McAllister Point



Side Scan Sonar survey completed Feb. 21, 22 & March 17, 1998 by SAIC

Projection: State Plane Feet (Rhode Island) NAD 27

Figure 1.2-1 Benthic Cover in Vicinity of McAllister Point



Data from Photoseas camera survey completed April 6, 1998 by SAIC

Projection: State Plane Feet (Rhode Island) NAD 27

50 0 50 100 Feet

N

Figure1.2-2a Benthic Photograph of Macrophytic Algae, McAllister Point

Figure1.2-2b Benthic Photograph of Shell Lag and Macrophytic Algae, McAllister Point

Figure1.2-2c Benthic Photograph of Rock/Cobble, McAllister Point

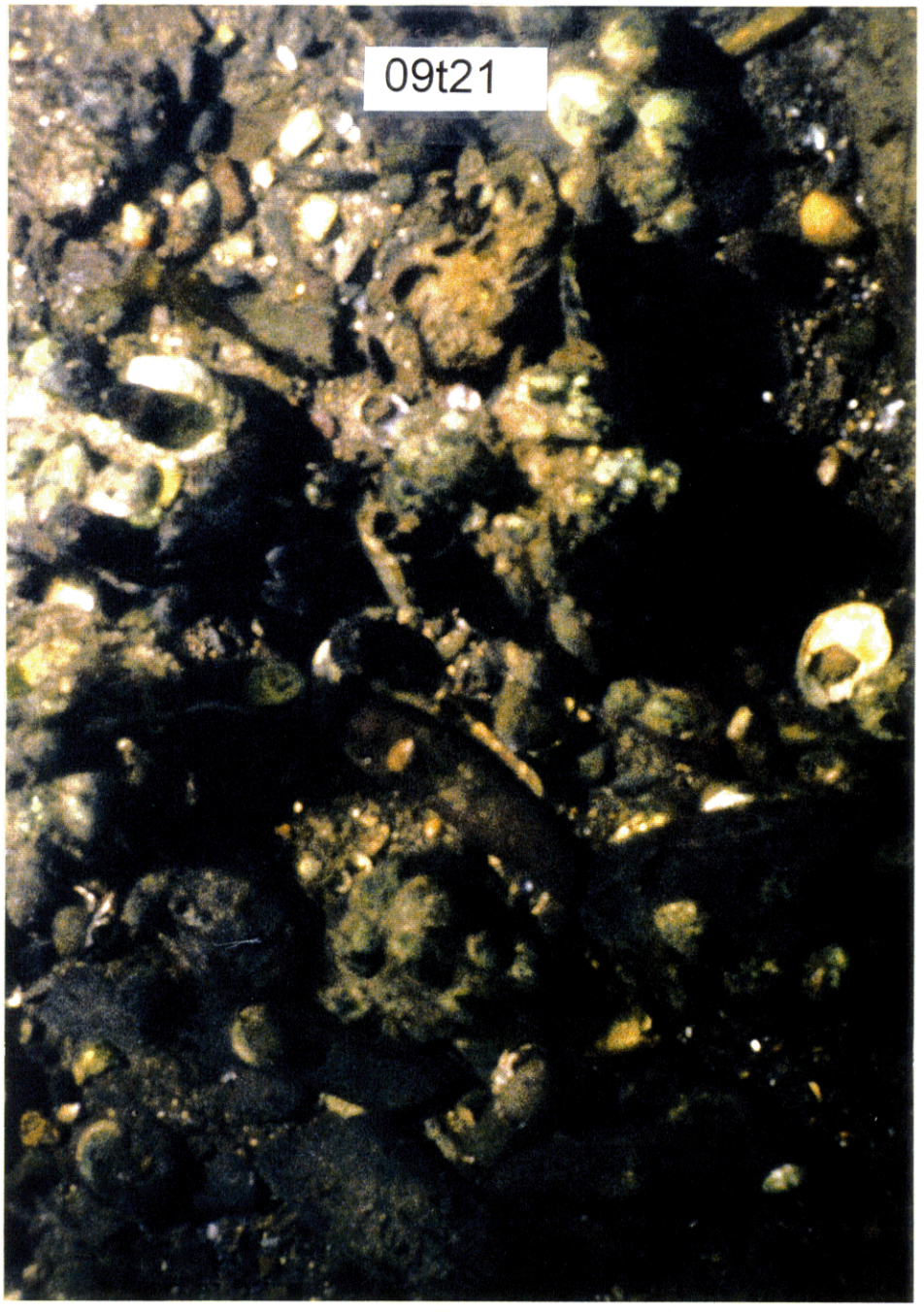


Figure1.2-2d Benthic Photograph of Rock Bottom with Macrophytic Algae, McAllister Point

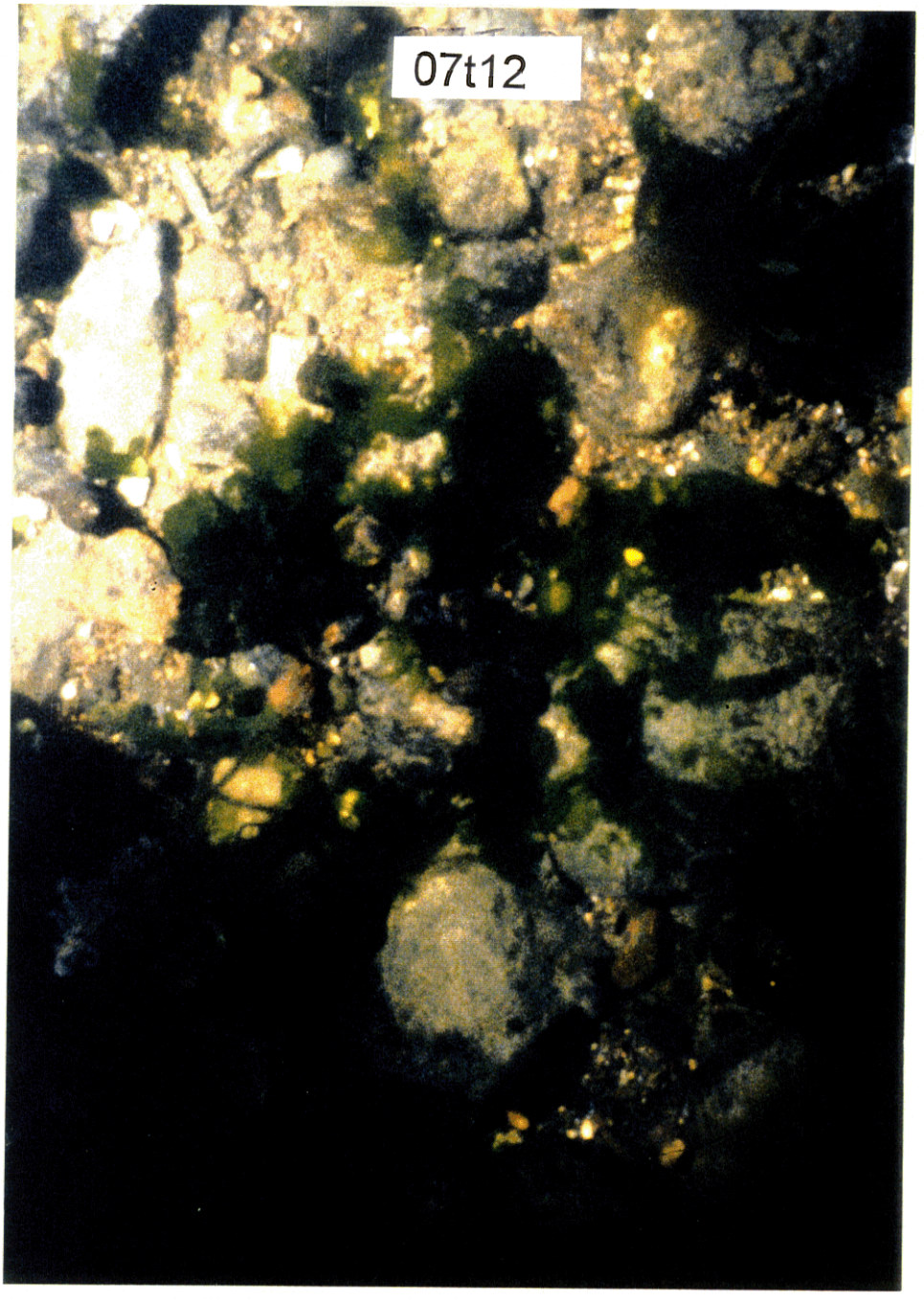


Figure1.2-2e Benthic Photograph of Sand/Shell Bottom, McAllister Point

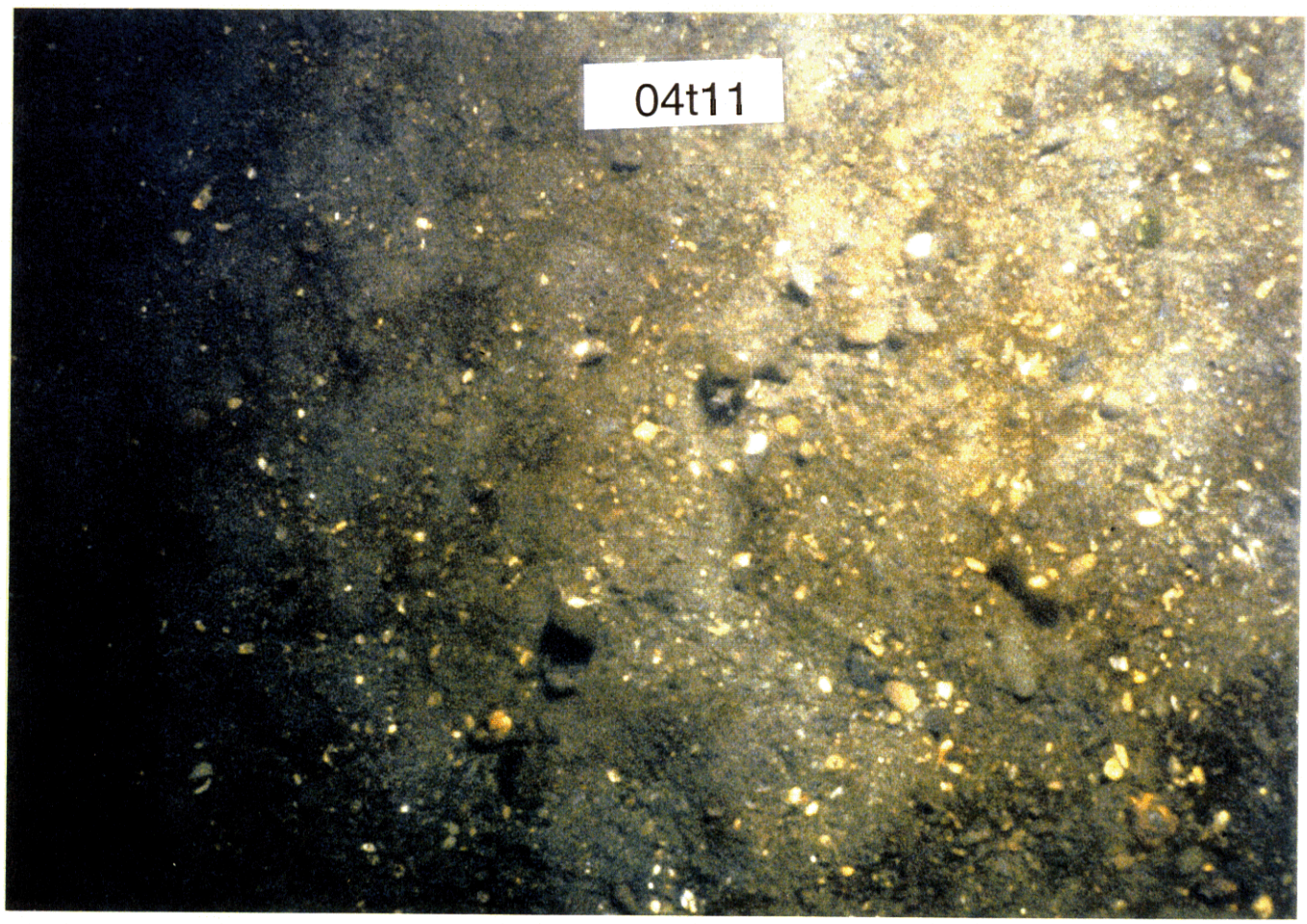


Figure1.2-2f Benthic Photograph of Eelgrass, McAllister Point

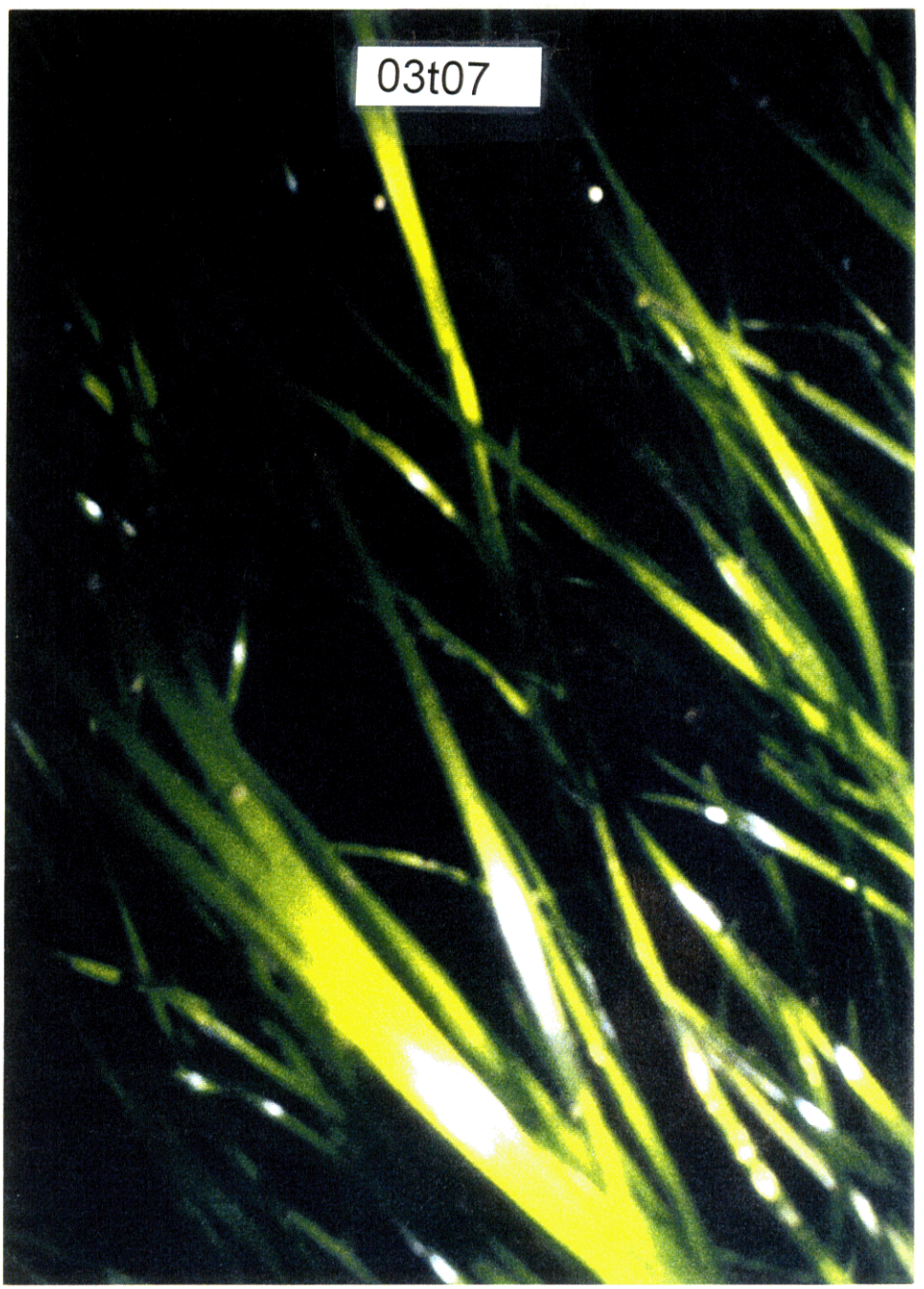
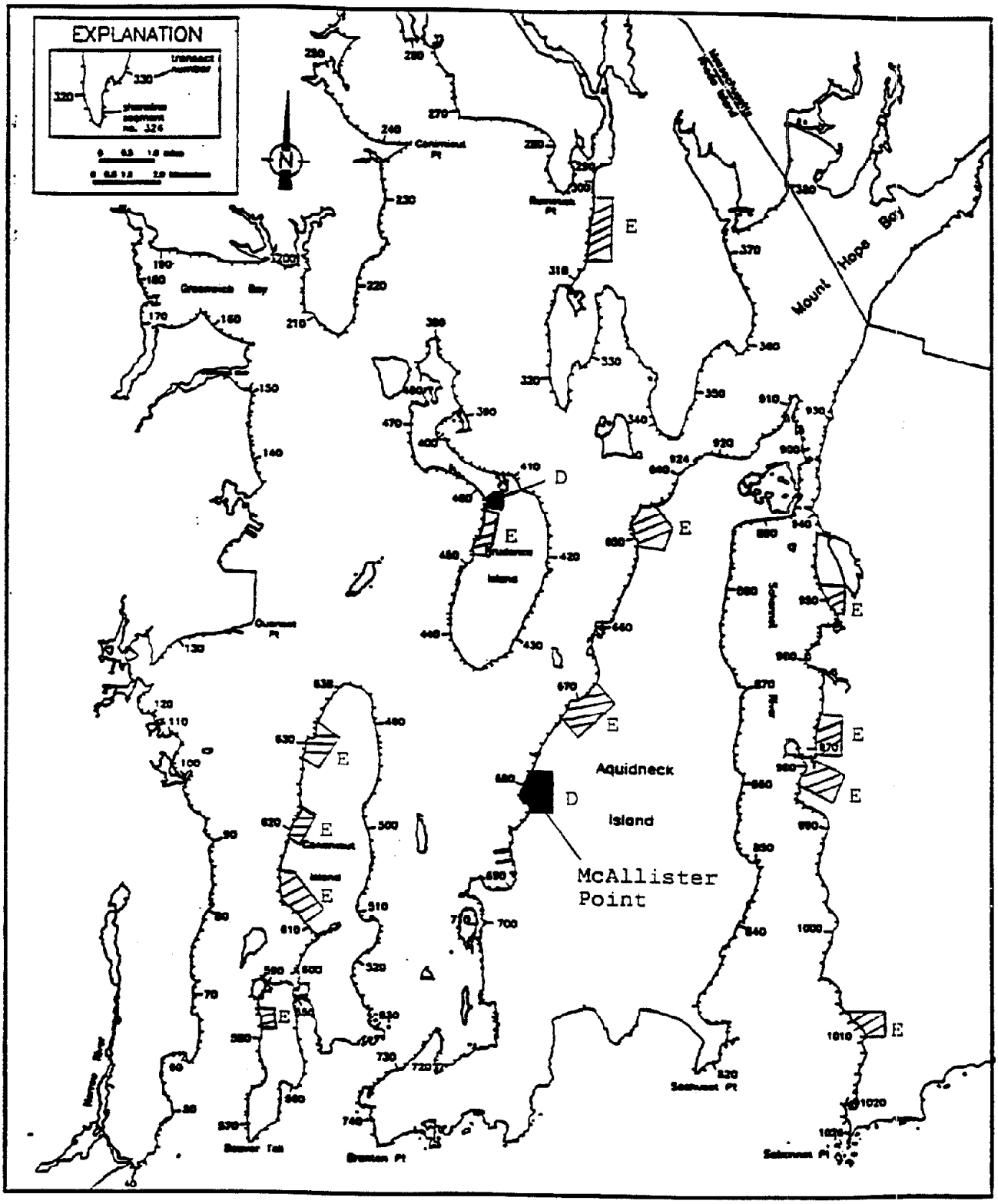


Figure 2.1-1 Narragansett Bay Shoreline Change Measurements 1975-1988. (D=Depositional, E=Erosional)



APPENDIX B-2
INTERTIDAL ZONE PHOTOGRAPHS

McAllister Point Landfill, NETC Middletown, Rhode Island
Station NSB 2, Intertidal Zone, Photo 1 of 1
April 7, 1998, 0930 hrs.
Direction of view: Down (North is to the right)

Gravely sand with cobbles to six inches. Most stones are one to four inches on surface. Below surface (to 4"BGS) material is dominated by coarse sand (shale fragments) which is typical of the beach to the north. Some silt in porewater and mixed with sand. Some metal debris present, but very little. Blue detergent bottle is placed for scale.

00112 LBIOY

McAllister Point Landfill, NETC Middletown, Rhode Island
Station NSB 3, Intertidal Zone, Photo 1 of 2
April 7, 1998, 0940 hrs.
Direction of view: Down (North is to the right)

Stone and sand much like that at NSB2. However, there is much more metal debris evident. Photo of submarine net tangle, which consists of ¼" steel wire: eight strands woven/twisted together. This material pervades the intertidal area (about eight feet wide) for a stretch of approximately 50* feet. Mixed with and underlying this material is other metal debris (pipe, fire hose, aluminum scrap, miscellaneous steel pieces greater than three feet in length) and brick, concrete pieces about one to two feet in diameter. Rockweed and barnacles have colonized larger stones and concrete pieces. Mussels are also growing in areas protected from wave action. Blue detergent bottle is placed for scale.

* 2 photos together are representative of this distance.

McAllister Point Landfill, NETC Middletown, Rhode Island
Station NSB 3, Intertidal Zone, Photo 2 of 2
April 7, 1998, 0940 hrs.
Direction of view: North

Refer to photo 1 (Previous page). Detergent bottles placed in field of view for scale.

McAllister Point Landfill, NETC Middletown, Rhode Island
Between Stations NSB 3 and NSB 4, Intertidal Zone, Photo 1 of 3
April 7, 1998, 0950 hrs.
Direction of view: West

Fire hose linings (stainless steel) mixed with other pipe. Solidified metal mass (unknown size and shape) in the intertidal area about six feet (see photo) bottle is on top of metal mass, placed for scale.

McAllister Point Landfill, NETC Middletown, Rhode Island
Between Stations NSB 3 and NSB 4, Intertidal Zone, Photo 2 of 3
April 7, 1998, 1000 hrs.
Direction of view: West

Area containing more submarine netting, pipe, metal masses and debris. Pipes are one to four inches in diameter, and up to five feet long at least. Also present are bricks, concrete, tile, but the largest percentage is metal debris. Much more silt and fines present under the surface mixed with stone and gravel. Blue detergent bottle is placed for scale.

McAllister Point Landfill, NETC Middletown, Rhode Island
Between Stations NSB 3 and NSB 4, Intertidal Zone, Photo 3 of 3
April 7, 1998, 1000 hrs.
Direction of view: West

Close up of area between Stations NSB-3 and NSB-4 photo 2. Refer to previous pages for site description.

McAllister Point Landfill, NETC Middletown, Rhode Island
Station NSB 4, Intertidal Zone, Photo 1 of 2
April 7, 1998, 1010 hrs.
Direction of view: North

Less bulky material evident, although more sand and silt due to lower wave action. Present in this area is more small material, pottery, glass, bricks, asphalt, lots of metal debris (smaller than that at NSB-3) aluminum and copper. Gravel and sand is much more like a protected beach. Sessile brown algae prolific here also.

McAllister Point Landfill, NETC Middletown, Rhode Island
Station NSB 4, Intertidal Zone, Photo 2 of 2
April 7, 1998, 1010 hrs.
Direction of view: Down

Close up of Station NSB-4 photo 1. See NSB-4 photo 1 for site description. Writing pen is placed at center for scale.

McAllister Point Landfill, NETC Middletown, Rhode Island
Station NSB 5, Intertidal Zone, Photo 1 of 2
April 7, 1998, 1020 hrs.
Direction of view: North from shoreline toward revetment

Stone, asphalt, lots of glass, very little metal evident. All surface material is six inches or smaller. Brown algae is less successful here since there is less to root on, periwinkle snails are abundant, also indicating lower wave action. Small oysters here as well.

McAllister Point Landfill, NETC Middletown, Rhode Island
Station NSB 5, Intertidal Zone, Photo 2 of 2
April 7, 1998, 1020 hrs.
Direction of view: Down

Close up of Station NSB-~~4~~ 5 photo 1. See NSB-~~4~~ 5 photo 1 for site description. Writing pen is placed at center for scale.

McAllister Point Landfill, NETC Middletown, Rhode Island
Northern Limit of Revetment and Adjacent Bluff
April 7, 1998, 1100 hrs.
Direction of view: East

Shale bluff showing slow erosion.

McAllister Point Landfill, NETC Middletown, Rhode Island
Intertidal Shoreline North of Landfill, Photo 1 of 2
April 7, 1998, 1110 hrs.
Direction of view: North

Photo of rocky intertidal shoreline, typical of the natural condition at western Aquidneck Island. Note the eroded bedrock (shale) bluff formation, the stony beach, and occasional large boulders (about 3 feet in diameter standing in the water in the distance). Spring high tide comes almost to the foot of the bluff, condition at the time of photo is within one hour of average low tide. Tide change is 3 to 4 feet vertically. Stones visible at surface are approximately 0.5 – 1.0 foot in diameter.

McAllister Point Landfill, NETC Middletown, Rhode Island
Intertidal Shoreline North of Landfill, Photo 2 of 2
April 7, 1998, 1110 hrs.
Direction of view: North

This photo has the same features as the previous photo but it also shows the exposed bedrock at the toe of the revetment stone in the foreground.

APPENDIX C
SEDIMENT AND TISSUE ANALYTICAL DATA

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APPENDIX C

C-1 PHASE 1 SEDIMENT DATA
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C-5 PHASE I TISSUE DATA
C-6 SEDIMENT SEM/AVS DATA

C-1

PHASE I SEDIMENT DATA

TABLE 1
PHASE 1 - NEAR SHORE INVESTIGATION
SEDIMENT SAMPLES - METALS RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
mg/kg

COMPOUNDS	JCC-D1	JCC-M1	JCC-S1	OS-30A	OS-30B	SDA-D1	SDA-D2	SDA-D3	SDA-M1
Aluminum	45100	45100	45200	43800	46700	43900	48900	50500	49000
Arsenic	2.01	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J
Cadmium	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J
Chromium	27.7	31.011	38.148	34.962	37.838	30.26	34.184	48.208	45.204
Copper	1.875 J	1.875 J	7.518	4.811	14.972	1.875 J	6.538	13.262	14.531
Iron	21200	30600	28400	22400	18800	16500	21100	34800	24800
Lead	23.1756	23.1756	28.4024	29.968	35.5747	31.1665	25.462	36.76	49.6027
Manganese	625.07	1018.4	861.86	457.61	386.21	388.18	269.64	654.62	460.67
Mercury	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J
Nickel	10.5675	14.0248	16.6548	11.7478	11.2559	10.5572	17.6251	23.1333	16.6474
Silver	0.15	0.3314	0.065 J	0.065 J	0.1374	0.065 J	0.065 J	0.065 J	0.065 J
Zinc	45.721	45.721	62.467	54.467	52.77	35.204	46.581	99.722	76.832

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 1
PHASE 1 - NEAR SHORE INVESTIGATION
METALS RESULTS - mg/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
Page 2 of 2

COMPOUNDS	SDA-M2	SDA-M3	SDA-S1	SDA-S2B	SDA-S3	SDA-S4
Aluminum	52800	43600	47700	53600	44000	44800
Arsenic	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J
Cadmium	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J
Chromium	44.091	33.048	38.531	50.358	67.006	36.558
Copper	10.627	6.167	6.187	19.003	4.494	7.803
Iron	25700	20400	24500	27200	32200	26400
Lead	31.9601	27.2643	25.0079	42.6438	28.4738	30.0763
Manganese	400.17	412.7	352.94	364.6	887.85	514.09
Mercury	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J	0.1 J
Nickel	15.4056	13.9898	19.3247	22.6539	13.6435	15.7379
Silver	0.065 J	0.065 J	0.065 J	0.065 J	0.065 J	0.065 J
Zinc	58.831	43.466	69.899	122.52	60.633	65.862

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 2
PHASE 1 - NEAR SHORE INVESTIGATION
SEDIMENT SAMPLES - SEMIVOLITILE ORGANIC COMPOUND RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
ug/kg

COMPOUNDS	JCC-D1	JCC-M1	JCC-S1	OS-30A	OS-30B	SDA-D1	SDA-D2	SDA-D3
1,6,7-Trimethylnaphthalene	0.7037	1.02	1.24	1.97	4.17	2.6	3.25	4.13
1-Methylnaphthalene	0.3	0.3	2.38	3.71	11.31	10.24	9.92	9.9
1-Methylphenanthrene	8.258	10.4	5.51	11.37	19.31	19.97	26.23	26.54
2,6-Dimethylnaphthalene	2.1089	4.96	8.38	5.83	7.9	5.61	6.18	8.93
2-Methylnaphthalene	1.63	1.63	5.7	6.57	18.3	12.3	15.09	15.18
Acenaphthene	0.958	1.01	3.1	8.06	14.24	24.73	19.81	22.93
Acenaphthylene	3.2244	4.17	4.62	10.58	20.89	7.02	9.36	9.01
Anthracene	6.27	6.27	19.54	37.48	83.51	104.4	104.25	111.8
Benzo(a)anthracene	10.43	10.43	44.55	62.19	200.09	182.47	182.93	182.01
Benzo(a)pyrene	10.14	10.14	33.66	42.07	98.7	104.43	111.29	102.81
Benzo(b + k)fluoranthene	70.6566	19.95	64.81	76.98	199.44	184.85	183.23	180.37
Benzo(e)pyrene	9.92	9.92	26.99	34.41	89.46	73.06	80.55	74.11
Benzo(g,h,i)perylene	16.01	16.01	62.33	47.38	152.46	140.49	137.05	118.6
Biphenyl	0.781	1.42	2.98	2.51	7.34	4.43	4.97	5.78
Chrysene	10.24	10.24	36.25	40.38	112.14	112.77	115.88	128.62
Dibenz(a,h)anthracene	0.76	0.76	9.7	9.61	34.79	27.45	29.02	26.01
Fluoranthene	43.2	43.2	136.49	177.59	575.2	552.1	573.25	572.47
Fluorene	0.18	0.18	3.54	10.59	18.28	19.25	20.46	23.12
Indeno(1,2,3-cd)pyrene	8.41	8.41	44.17	32.37	108.43	101.22	95.34	85.43
Naphthalene	1.92	1.92	9.12	11.74	27.27	19.34	17.65	29.49
Perylene	7.52	7.52	19.87	22.93	50.54	49.08	56.37	46.37
Phenanthrene	13.27	13.27	36.51	79.67	228.87	279.37	274.44	304.63
Pyrene	41.86	41.86	129.99	161.48	509.08	483.75	498.04	496.84
Low Molecular Weight PAHs	27.4524	28.45	82.13	164.69	411.36	466.41	461.06	516.16
High Molecular Weight PAHs	116.63	116.63	390.64	493.32	1530	1462.97	1510.41	1508.76
Total PAHs	268.7505	224.99	711.43	897.47	2591.72	2520.93	2574.56	2585.08

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 2
PHASE 1 - NEAR SHORE INVESTIGATION
SEMIVOLITILE ORGANIC COMPOUND RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUNDS	SDA-M1	SDA-M2	SDA-M3	SDA-S1	SDA-S2B	SDA-S3	SDA-S4
1,6,7-Trimethylnaphthalene	4.59	5.92	1.63	2.06	28.18	0.5	3.02
1-Methylnaphthalene	15.48	7.26	5.4	3.61	116.32	0.42	15.44
1-Methylphenanthrene	32.99	28.47	14.74	8.6	419.05	2.715 U	39.48
2,6-Dimethylnaphthalene	15.41	24.29	5.32	3.38	89.07	2.3	1.69
2-Methylnaphthalene	23.86	7.02	6.18	4.73	153.44	0.79	17.5
Acenaphthene	33.43	22.68	17.04	3.03	329.89	0.74	25.51
Acenaphthylene	9.78	25.17	5.47	3.53	30.82	1.8	4.85
Anthracene	203.62	116.79	76.84	27.6	1170	4.01	89.18
Benzo(a)anthracene	566.16	234.58	117.56	70.09	1340	9.1	174.33
Benzo(a)pyrene	267.33	115.39	64.07	40.09	711.52	5.49	86.16
Benzo(b+k)fluoranthene	463.28	184.09	122.71	89.2	1264.93	11.87	155.93
Benzo(e)pyrene	182.69	72.39	53.17	33.59	452.29	5.81	54.92
Benzo(g,h,i)perylene	257.66	116.45	92.32	42.22	475.61	9.64	60.34
Biphenyl	8.12	3.6	4.08	2.03	41.42	0.81	3.67
Chrysene	347.97	100.08	86.75	46.8	925.72	5.68	96.25
Dibenz(a,h)anthracene	57.23	24.32	12.14	10.8	179.22	2.18	18.27
Fluoranthene	1200	757.52	440.24	189.9	3720	25.61	481.83
Fluorene	33.12	23.8	16.42	6.88	331.69	1	26.6
Indeno(1,2,3-cd)pyrene	187.17	87	57.21	31.8	417.57	5.74	47.78
Naphthalene	22.67	13.29	16.29	4.04	287.73	1.43	1.96
Perylene	116.57	47.9	33.29	16.68	263.81	2.64	35.68
Phenanthrene	455.62	332.37	214.58	53.81	3140	7.36	292.98
Pyrene	1060	618.06	376.41	169.58	2950	21.68	357.62
Low Molecular Weight PAHs	782.1	541.12	352.82	103.62	5443.57	17.13	458.58
High Molecular Weight PAHs	3498.69	1849.95	1097.17	527.26	9826.46	69.74	1214.46
Total PAHs	5564.75	2968.44	1839.86	864.05	18838.28	129.315	2090.99

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 3
PHASE 1 - NEAR SHORE INVESTIGATION
POLYCHLORINATED BIPHENYL RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
ug/kg

COMPOUND	JCC-D1	JCC-M1	JCC-S1	OS-30A	OS-30B	SDA-D1	SDA-D2	SDA-D3
101 (2,2',4,4',6')	0.323	0.104	0.442	0.384	1.071	0.512	0.756	0.688
104 (2,2',4,6,6')	0.2049	0.05 U	0.0826	0.05	0.05	0.05	0.05	0.05
105 (2,3,3'4,4')	0.0992	0.035 U	0.357	0.338	0.564	0.268	0.393	0.385
118 (2,3'4,4',5)	0.552	0.15 U	0.68	0.135 U	1.487	0.831	1.281	0.894
126 (3,3'4,4',6)	0.02 U	0.02 U	0.02 U	0.02	1.494	0.02	0.02	0.02
128 (2,2',3,3'4,4')	0.0716	0.035 U	0.193	0.0931	0.163	0.0695	0.145	0.0987
138 (2,2',3,4,4',5)	0.483	0.235	1.162	1.342	1.9	0.947	1.436	1.711
153 (2,2',4,4',5,5')	0.67	0.216	1.211	0.989	1.899	0.972	1.494	1.406
170 (2,2',3,3'4,4',5)	0.465	1.863	0.556	0.618	1.125	0.592	0.778	0.818
18 (2,2',5)	0.18	0.015 U	0.015 U	0.015 U	0.373	0.015 U	0.216	0.277
180 (2,2'3,4,4',5,5')	0.577	0.696	0.882	1.042	1.922	0.829	1.14	1.48
187 (2,2',3,4',5,5',6)	0.124	0.531	0.402	0.349	0.621	0.371	0.518	0.589
188 (2,2',3,4',5,6,6')	0.025 U	0.025 U	0.0866	0.0864	0.135	0.0704	0.0929	0.0908
195 (2,2',3,3',4,4',5,6)	0.227	0.208	0.367	0.39	0.72	0.335	0.484	0.469
200 (2,2',3,3',4,5',6,6')	0.234	0.0521	0.01 U	0.01	0.181	0.01	0.0934	0.0652
206 (2,2'3,3'4,4'5,5'6)	0.374	0.188	0.595	0.564	1.031	0.466	0.841	0.569
209 (2,2',3,3',4,4',5,5',6,6')	0.161	0.117	0.294	0.194	0.569	0.149	0.189	0.269
28 (2,4,4')	0.0766	0.005 U	0.005 U	2.643	2.308	2.004	2.537	0.005 U
29 (2,4,5)	0.05 U	0.05 U	0.05 U	1.114	0.6	0.05	0.05	0.05
44 (2,2'3,5')	0.0863	0.03 U	0.0681	0.0817	0.301	0.146	0.192	0.178
50 (2,2,4,6)	0.035 U	0.035 U	0.035 U	0.035	0.035	0.035	0.035	0.035
52 (2,2',5,5)	0.164	0.115 U	0.33	0.174	0.614	0.211	0.282	0.281
66 (2,3'4,4')	0.529	0.153	0.545	1.143	2.093	1.181	1.543	1.401
8 (2,4)	0.0759	0.055 U	0.484	1.343	1.838	0.055 U	1.516	0.055 U
87 (2,2',3,4,5')	0.103	0.1 U	0.155	0.303	0.512	0.339	1.19	0.315
Total PCBs (Sum Congenersx2)	15.3836	10.8382	23.5386	35.5134	61.797	29.8605	47.223	34.7211

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 3
PHASE 1 - NEAR SHORE INVESTIGATION
POLYCHLORINATED BIPHENYL RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	SDA-M1	SDA-M2	SDA-M3	SDA-S1	SDA-S2B	SDA-S3	SDA-S4
101 (2,2',4,4',6')	1.073	0.556	0.398	0.747	2.967	0.079	0.8489
104 (2,2',4,6,6')	0.192	0.05	0.0517	0.05	0.163	0.05	0.05
105 (2,3,3'4,4')	0.596	0.336	0.296	0.452	0.938	0.035 U	0.2789
118 (2,3'4,4',5)	1.258	0.599	0.739	1.115	2.314	0.135 U	0.8212
126 (3,3'4,4',6)	1.851	0.02	0.02	0.02	0.02	0.02	0.02
128 (2,2',3,3'4,4')	0.47	0.108	0.0602	0.567	0.452	0.155	0.2329
138 (2,2',3,4,4',5)	1.772	1.153	0.93	0.987	3.456	0.379	1.6578
153 (2,2',4,4',5,5')	2.009	0.819	0.75	0.811	3.273	0.491	1.2304
170 (2,2',3,3'4,4',5)	1.134	0.552	0.71	0.725	2.256	0.255	1.9494
18 (2,2',5)	0.533	0.015 U	0.015 U	0.357	1.829	0.182	0.1043
180 (2,2'3,4,4',5,5')	1.603	0.752	0.712	0.895	2.605	0.384	3.1875
187 (2,2',3,4',5,5',6)	0.609	0.311	0.315	0.196	1.375	0.0811	1.1183
188 (2,2',3,4',5,6,6')	0.124	0.0707	0.0552	0.0807	0.445	0.025	0.025
195 (2,2',3,3',4,4',5,6)	0.655	0.425	0.368	0.541	0.02 U	0.11	0.6426
200 (2,2',3,3',4,5',6,6')	0.421	0.01	0.01	0.204	0.152	0.01	0.1393
206 (2,2'3,3'4,4'5,5'6)	1.05	0.546	0.284	0.341	1.703	0.163	0.4646
209 (2,2',3,3',4,4',5,5',6,6')	0.291	0.151	0.1	0.265	2.4	0.0637	0.174
28 (2,4,4')	2.685	1.163	1.441	0.886	3.658	0.166	0.2853
29 (2,4,5)	0.05	1.466	1.316	0.05	0.332	0.454	0.05
44 (2,2'3,5')	0.327	0.0914	0.252	0.189	1.311	0.03 U	0.343
50 (2,2,4,6)	0.035	0.035	0.071	0.035	1.6347	0.035	0.1293
52 (2,2',5,5)	0.705	0.255	0.26	0.465	2.174	0.0681	0.5476
66 (2,3'4,4')	0.025 U	1.206	1.059	1.183	4.26	0.124	1.0875
8 (2,4)	0.751	0.055 U	0.055 U	0.835	2.117	0.055 U	0.1959
87 (2,2',3,4,5')	0.467	0.513	0.297	0.423	1.045	0.0765	0.4539
Total PCBs (Sum Congenersx2)	52.638	27.2802	26.2326	34.671	117.324	8.8677	45.5105

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 4
PHASE 1 - NEAR SHORE INVESTIGATION
PESTICIDE RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
ug/kg

ANAL FULL	JCC-D1	JCC-M1	JCC-S1	OS-30A	OS-30B	SDA-D1	SDA-D2	SDA-D3
Aldrin	0.1 U	U	0.1 U	NC	NC	NC	NC	NC
Hexachlorobenzene	0.338	0.08 U	0.08 U	0.437	0.356	0.313	0.387	0.33
Mirex	0.1 U	0.1	0.1 U	0.578	0.318	0.538	0.32	0.214
o,p'-DDE	0.245	0.709	0.355	NC	NC	NC	NC	NC
p,p'-DDE	0.479	0.384	0.721	0.595	1.49	0.57	0.82	0.79

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 4
PHASE 1 - NEAR SHORE INVESTIGATION
PESTICIDE RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
Page 2 of 2

ANAL FULL	SDA-M1	SDA-M2	SDA-M3	SDA-S1	SDA-S2B	SDA-S3	SDA-S4
Aldrin	NC	NC	NC	NC	NC	NC	NC
Hexachlorobenzene	0.4564	0.75	0.621	0.392	0.433	0.08 U	0.08 U
Mirex	0.318	0.95	0.675	0.277	0.62	0.636	0.1 U
o,p'-DDE	NC	NC	NC	NC	NC	NC	NC
p,p'-DDE	1.8	0.716	0.553	0.756	1.9	0.33	0.3232

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 5
PHASE 1 - NEAR SHORE INVESTIGATION
BUTYLTIN RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
ng tin/g dry weight

COMPOUND	JCC-D1	JCC-M1	JCC-S1	OS-30A	OS-30B	SDA-D1	SDA-D2	SDA-D3
Dibutyltin	0.5 U	0.5 U	2.3	0.5 U	2.3	0.5 U	1.1	0.5 U
Monobutyltin	0.5 U	0.16	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetraibutyltin	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Tributyltin	0.5 U	0.5 U	4.8	0.5 U	4.6	0.5 U	2	0.8

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 5
PHASE 1 - NEAR SHORE INVESTIGATION
BUTYLTIN RESULTS - ng tin/g dry weight
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	SDA-M1	SDA-M2	SDA-M3	SDA-S1	SDA-S2B	SDA-S3	SDA-S4
Dibutyltin	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Monobutyltin	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetraibutyltin	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Tributyltin	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

C-2

PHASE 2 SEDIMENT DATA

TABLE 6
PHASE 2 - OFF SHORE INVESTIGATION
METALS RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
mg/kg

COMPOUND	JCC-D1-BOT	JCC-D1-MID	MCL-10	MCL-10-BOT	MCL-10-MID	MCL-11	MCL-11-BOT	MCL-11-MID	MCL-12
Aluminum	22108	24684.5	50302.5	23630.5	57625	50882.5	35180	33607.5	39900.5
Arsenic	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J
Cadmium	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J
Chromium	31.25	33.75	48	57	37.5	40.5	58.5	52	36
Copper	1.875 J	1.875 J	36.25	14.5	35	15.5	17.5	18	93
Iron	21466.75	22408.25	27450	29562.5	36707.5	32283	33322.5	29472.5	29154.5
Lead	16.6	25.3	58.2	16.2	58.9	54.1	16.8	44	67.4
Manganese	372.5	314	382.75	330.75	421.75	469.25	322.25	332.25	289.75
Mercury	0.015 J	0.1 J	0.2218	0.015 J	0.1 J	0.1 J	0.015 J	0.1 J	0.3225
Nickel	12.75	34.5	17.25	25.75	51.25	21.25	24.75	31.75	19.75
Silver	0.065 J	0.065 J	0.48	0.065 J	0.41	0.31	0.065 J	0.24	0.52
Zinc	42	56	141	66.25	175.5	119.5	68.25	84	175.75

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 6
PHASE 2 - OFF SHORE INVESTIGATION
METALS RESULTS - mg/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	MCL-12-BOT	MCL-12-MID	MCL-13	MCL-13-BOT	MCL-13-MID	MCL-14	MCL-14-BOT	MCL-14-MID	MCL-15
Aluminum	41685	37277.5	39357.5	23498.5	33430	35806	23780	24666.5	56642
Arsenic	14.3	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	28.3
Cadmium	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J
Chromium	58.5	47.25	34.5	42.75	49.5	33.75	39.75	43.5	54
Copper	17.25	29.25	10.25	1.875 J	12.5	10.25	1.875 J	11.5	22
Iron	32437.5	26635	22485.75	18897.5	21577.25	25591.5	18750.25	19505.25	52372
Lead	27.6	44.2	31.6	17.6	38.2	31.8	23.5	30.6	41.4
Manganese	283.5	236.75	374	156.25	229.5	373.5	212	289	707.75
Mercury	0.1 J	0.1 J	0.1 J	0.015 J	0.1 J	0.1 J	0.015 J	0.1 J	0.1 J
Nickel	22.5	31.75	20.75	59.5	60	14	61.5	13	15.75
Silver	0.065 J	0.29	0.28	0.065 J	0.22	0.28	0.065 J	0.17	0.19
Zinc	76.75	113.5	72.25	42.75	75.75	82.25	42.25	70	133

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 6
PHASE 2 - OFF SHORE INVESTIGATION
METALS RESULTS - mg/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
Page 3 of 4

COMPOUND	MCL-15-BOT	MCL-15-MID	MCL-16	MCL-8	MCL-9	MCL-9-BOT	MCL-9-MID	NSB-1	NSB-2
Aluminum	34135	45692.5	45610	40210.5	48360	19384.75	31080	22547	23640.25
Arsenic	42.4	28.1	0.65 J	0.65 J	0.65 J	27.9	0.65 J	0.65 J	0.65 J
Cadmium	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J
Chromium	106.5	75	42	50.33	45	40.5	45	36	38.25
Copper	7.75	22	24.5	18.975	23.25	25.25	26	50	49
Iron	27577.5	34392.5	28592.5	21325.98	23262	39750	23528	37570	29807.5
Lead	12.5	47.1	35.3	47.025	51.1	18.3	44.3	51.9	52.3
Manganese	242	338.5	436.25	379.225	382	1231	232.75	300.25	273
Mercury	0.015 J	0.1 J	0.1 J	0.1 J	0.1 J	0.015 J	0.1 J	0.1 J	0.1 J
Nickel	22.5	14.5	31	168.75	46.75	116.25	31.25	30.5	25.25
Silver	0.065 J	0.24	0.28	0.4125	0.34	0.065 J	0.38	1.1	0.29
Zinc	47	96.5	123.5	94.325	95.25	97.5	93.25	145.75	139.5

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 6
PHASE 2 - OFF SHORE INVESTIGATION
METALS RESULTS - mg/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
Page 4 of 4

COMPOUND	NSB-3	NSB-4	NSB-5	NSB-6	NSB-7	SDA-S2B-BOT	SDA-S2B-BT2	SDA-S2B-MID	SDA-S2B:0-8
Aluminum	36982.5	34507.5	24873.25	26370	23215.25	29002.5	23296.75	48890	27292.5
Arsenic	16.2	18.3	18.6	14	21.8	0.65 J	0.65 J	11.1	0.65 J
Cadmium	2.59	2.52	1.39	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J
Chromium	124.5	195	15.8	83.25	79.5	43.5	52.5	42.75	61.25
Copper	261.25	1173	1298.75	183.25	250.75	17.25	24.75	58.75	48
Iron	84130	77242.5	72405	43855	68537.5	32995	38955	30557.5	32672.5
Lead	595	505	352.5	142	222.7	28.7	30.6	78.1	100.9
Manganese	731.25	404.25	373.5	525.25	385	259.25	177.5	304.5	227.75
Mercury	1.22	1.0675	1.165	0.3275	0.3075	0.1 J	0.1 J	0.2525	0.3
Nickel	56.75	81.5	81.5	113.25	62	28.25	30	25	19.75
Silver	1.28	2.54	8.5	0.65	0.95	0.19	0.065 J	1.34	0.53
Zinc	2590	1252	976.5	298.75	603.5	81.25	118	176.5	209.75

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 7
PHASE 2 - OFF SHORE INVESTIGATION
SEMIVOLATILE ORGANIC COMPOUND RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
ug/kg

COMPOUND	JCC-D1-BOT	JCC-D1-MID	MCL-10	MCL-10-BOT	MCL-10-MID	MCL-11	MCL-11-BOT	MCL-11-MID
1,6,7-Trimethylnaphthalene	0.54 U	116	7.0377	0.5856	6.5983	6.7176	0.54 U	4.357
1-Methylnaphthalene	3.255 U	39.42	NC	2.1266	17.6577	NC	0.2796	12.9172
1-Methylphenanthrene	0.2126	995	81.781	2.4331	166.7191	NC	0.4814	56.799
2,6-Dimethylnaphthalene	3.6	171	6.1611	1.4754	14.3354	1.0201	0.3445	9.6305
2-Methylnaphthalene	5.3 U	30.53	NC	3.5678	25.1108	NC	0.3677	10.9562
Acenaphthene	0.398	109	49.4008	0.4767	32.9763	11.6512	0.3656	43.9991
Acenaphthylene	0.77 U	296	29.0361	1.7024	15.6	13.0713	0.3789	14.1
Anthracene	0.4234	2370	226.1641	7.3479	104.6275	60.4295	1.7057	140.8274
Benzo(a)anthracene	0.4941	3420	291.2748	5.5482	167.225	97.6775	1.3555	193.2701
Benzo(a)pyrene	1.1865	3000	290.3866	8.2002	154.8767	103.5253	1.6535	176.195
Benzo(b+k)fluoranthene	3.5037	4740	569.2283	17.878	319.8195	232.5458	5.6362	327.7123
Benzo(e)pyrene	1.4628	1700	241.8494	7.7245	126.4918	86.2562	2.7503	128.4144
Benzo(g,h,i)perylene	1.279	1570	166.8014	6.6684	78.3989	52.4321	1.7252	88.4163
Biphenyl	0.2393	NC	7.1224	2.1331	11.4088	5.8287	0.2332	6.2702
Chrysene	0.6097	2650	386.3137	5.6891	143.4	108.7607	1.0496	170
Dibenz(a,h)anthracene	0.0954	283	39.2833	1.7672	25.4556	3.9727	0.1106	28.0515
Fluoranthene	2.6609	8190	692.241	15.2833	332.5215	275.7851	3.2835	424.1812
Fluorene	1.34 U	597	71.2606	0.6961	42.1	20.1264	0.0888	63.6
Indeno(1,2,3-cd)pyrene	0.9539	1550	117.6158	5.6161	80.7169	48.6095	1.3143	90.0752
Naphthalene	0.3674	328	18.9133	21.54	31.4129	18.5786	0.7094	21.0681
Perylene	16.6805	994	81.4383	5.7183	43.794	35.0699	1.8199	50.4193
Phenanthrene	1.3695	4290	579.6998	13.4204	219.163	137.8563	1.8724	366.0043
Pyrene	3.2604	7160	593.529	15.8861	323.8302	233.6376	2.6205	365.1412
Low Molecular Weight PAHs	9.9683	8020.53	974.4747	48.7512	470.9905	261.7133	5.4885	660.5552
High Molecular Weight PAHs	8.307	24703	2293.028	52.3742	1147.309	823.3589	10.0732	1356.839
Total PAHs	50.0022	44598.95	4546.539	153.4844	2484.24	1553.552	30.6862	2792.406

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 7
PHASE 2 - OFF SHORE INVESTIGATION
SEMIVOLATILE ORGANIC COMPOUND RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	MCL-12	MCL-12-BOT	MCL-12-MID	MCL-13	MCL-13-BOT	MCL-13-MID	MCL-14	MCL-14-BOT
1,6,7-Trimethylnaphthalene	6.8844	3.9417	4.7331	0.0938	0.3911	2.541	0.6991	0.2464
1-Methylnaphthalene	NC	6.9355	9.0977	NC	0.6433	8.2847	NC	0.9181
1-Methylphenanthrene	43.6045	2.715 U	NC	37.2884	4.1186	21.7157	30.5535	0.9553
2,6-Dimethylnaphthalene	3.6466	6.7046	6.9802	0.9672	2.0646	6.2013	0.2512	0.2987
2-Methylnaphthalene	NC	8.1099	11.4891	NC	1.0755	8.9779	NC	0.9113
Acenaphthene	25.0526	0.8617	17.0736	19.4811	0.2907	8.2242	11.8569	0.166
Acenaphthylene	27.2039	3.6897	7.2	11.3403	2.2774	11.9	10.5048	1.0144
Anthracene	127.5769	7.1731	45.8174	85.4066	5.7498	47.1427	59.1634	2.5039
Benzo(a)anthracene	298.5961	13.355	71.1701	113.0315	8.0865	68.2465	78.4979	3.0625
Benzo(a)pyrene	224.3463	14.4251	68.8212	130.0208	9.6999	78.1602	93.9409	4.1858
Benzo(b+k)fluoranthene	536.9622	35.4414	146.532	264.1863	16.4334	160.2194	191.9567	9.4108
Benzo(e)pyrene	200.468	17.2548	60.2773	103.0782	7.8776	66.8365	80.2095	4.7488
Benzo(g,h,i)perylene	101.0792	12.73	39.6551	70.1571	7.9711	59.0533	54.3076	4.4745
Biphenyl	8.6964	2.6903	4.0117	2.935	0.6034	3.9754	3.3101	0.3201
Chrysene	344.9795	20.7019	76.7	138.5014	9.069	67.4	102.0643	4.4511
Dibenz(a,h)anthracene	20.8473	3.453	12.158	4.0479	1.5415	14.4406	6.0113	0.4474
Fluoranthene	646.2995	30.0823	170.7962	319.3901	17.3619	140.8054	215.4821	7.1592
Fluorene	22.1178	3.8468	20.7	9.2907	0.8183	14.2	6.562	0.2591
Indeno(1,2,3-cd)pyrene	91.3429	11.3203	39.7798	60.8881	6.1011	53.3841	48.8466	3.5449
Naphthalene	26.7462	8.8459	11.8495	12.0662	1.5962	17.4926	12.739	1.892
Perylene	55.189	4.5348	20.239	45.546	7.9059	26.1778	34.0357	3.0203
Phenanthrene	253.4642	26.4874	125.6682	208.8657	7.4742	82.4036	117.0056	3.4074
Pyrene	536.6193	29.39	155.8213	289.0777	22.285	141.645	209.0391	8.4622
Low Molecular Weight PAHs	482.1616	59.0144	239.7978	346.4506	19.282	190.341	217.8317	10.1541
High Molecular Weight PAHs	2071.688	111.4073	555.4668	994.0695	68.0438	510.6977	705.0356	27.7683
Total PAHs	3601.723	274.6901	1126.571	1925.66	141.4359	1109.428	1367.037	65.8601

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 7
PHASE 2 - OFF SHORE INVESTIGATION
SEMIVOLATILE ORGANIC COMPOUND RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	MCL-14-MID	MCL-15	MCL-15-BOT	MCL-15-MID	MCL-16	MCL-8	MCL-9	MCL-9-BOT
1,6,7-Trimethylnaphthalene	2.3385	1.7123	0.1479	1.7938	2.7432	6.5255	7.6656	0.54 U
1-Methylnaphthalene	7.3121	NC	0.5192	4.5103	NC	19.0082	NC	3.255 U
1-Methylphenanthrene	14.9336	13.8877	0.8585	7.4571	62.5462	119.4032	34.1435	0.7
2,6-Dimethylnaphthalene	4.932	0.2698	0.4361	2.3466	1.7541	13.2236	13.1213	1.78 U
2-Methylnaphthalene	9.2687	NC	0.6884	5.1173	NC	14.4164	NC	5.3 U
Acenaphthene	9.7953	4.702	0.5407	2.8827	63.7699	21.4464	24.2085	0.52
Acenaphthylene	19.9	7.0892	0.5153	7.1	22.0492	40.9117	27.0062	0.45
Anthracene	48.9817	29.7242	1.315	24.9532	195.6512	366.3192	101.9069	NC
Benzo(a)anthracene	88.0312	34.8658	1.1366	30.1993	309.1784	358.7093	94.2902	3.02
Benzo(a)pyrene	90.7722	41.4045	1.0778	38.4224	294.6966	378.9158	167.0241	2.46
Benzo(b+k)fluoranthene	172.102	112.5927	5.6349	87.1874	549.8934	671.5221	330.4283	6.92
Benzo(e)pyrene	72.723	48.1149	3.773	40.269	213.9121	236.0949	130.5143	4.16
Benzo(g,h,i)perylene	59.2775	27.7391	1.2057	33.8457	132.4396	208.1543	113.844	1.22
Biphenyl	3.9516	1.2754	0.4643	2.358	9.1353	7.9964	4.1844	0.64 U
Chrysene	92.1	48.5663	1.2236	39.1	306.0113	405.9759	164.1068	3.4
Dibenz(a,h)anthracene	15.9076	2.5166	1.39 U	11.8353	25.6538	52.0595	20.4361	1.39 U
Fluoranthene	166.7456	108.0061	4.4595	66.2071	711.2156	664.2368	281.4443	8.41
Fluorene	14.1	1.34 U	0.3905	4.7	77.1343	63.3723	32.8135	1.34 U
Indeno(1,2,3-cd)pyrene	54.7323	24.5083	0.249	27.1067	112.1185	188.4068	98.7721	1.645 U
Naphthalene	16.3202	6.1528	1.1344	10.6024	7.4316	44.833	25.6297	0.4
Perylene	25.0791	25.0871	0.8216	14.5018	75.9898	87.9972	50.3826	3.69
Phenanthrene	99.9969	43.035	2.9988	30.7166	575.373	452.1413	208.4286	4.7
Pyrene	173.2044	109.0792	3.4207	67.9354	604.8151	645.2937	234.5069	8.67
Low Molecular Weight PAHs	218.3628	92.0432	7.5832	86.0722	941.4092	1003.44	419.9933	12.71
High Molecular Weight PAHs	626.7609	344.4385	12.7082	253.6996	2251.571	2505.191	961.8084	27.35
Total PAHs	1262.505	691.6692	34.4015	561.1482	4353.512	5066.964	2164.858	64.61

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 7
PHASE 2 - OFF SHORE INVESTIGATION
SEMIVOLATILE ORGANIC COMPOUND RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	MCL-9-MID	NSB-1	NSB-2	NSB-3	NSB-4	NSB-5	NSB-6	NSB-7
1,6,7-Trimethylnaphthalene	10.8419	3.0936	0.8627	38.7078	12.5535	13.6235	6.6861	11.0194
1-Methylnaphthalene	36.094	4.4647	3.7793	69.5247	56.726	44.5946	25.8167	48.6217
1-Methylphenanthrene	54.4873	12.4973	3.2825	137.3379	39.6845	37.2465	48.6537	62.9735
2,6-Dimethylnaphthalene	25.9773	1.4218	1.5743	49.4019	26.7119	22.0117	7.3834	13.7982
2-Methylnaphthalene	38.1014	7.3823	3.9511	90.9281	47.3545	53.6249	0.4071	30.8355
Acenaphthene	32.8072	10.4547	2.7345	98.0283	39.2714	18.1702	21.0403	68.7175
Acenaphthylene	54	3.7265	0.704	50.035	36.176	55.8381	15.0407	19.5972
Anthracene	190	33.5978	6.5971	391.2664	179.9505	142.9785	118.0712	200.8049
Benzo(a)anthracene	315.6983	44.587	28.3479	308.6755	232.4621	243.1881	181.9835	264.7428
Benzo(a)pyrene	326.8847	46.0512	23.9529	890.5215	279.4303	306.1835	224.7549	564.9619
Benzo(b+k)fluoranthene	621.3318	93.5954	82.9166	1700	564.9295	601.7569	418.141	1250
Benzo(e)pyrene	273.2867	37.043	32.5172	659.1573	240.517	247.2987	169.8637	377.0948
Benzo(g,h,i)perylene	228.0117	20.2232	5.3778	181.743	124.5318	114.3451	125.8452	164.3638
Biphenyl	14.4937	1.2737	1.0416	38.8675	37.8846	36.9185	13.911	12.6272
Chrysene	318.2	59.3988	103.1865	1970	443.4662	483.0279	219.0024	948.7257
Dibenz(a,h)anthracene	62.6297	4.7943	1.7838	75.6743	51.6324	44.0853	41.1373	59.6133
Fluoranthene	555	127.8742	43.701	1340	613.1142	547.3359	417.0942	638.0958
Fluorene	52.7	12.3277	0.5573	139.0661	61.3731	42.7236	29.8058	94.0001
Indeno(1,2,3-cd)pyrene	211.4476	16.3616	4.4484	209.3913	113.5463	116.0412	121.2968	174.8443
Naphthalene	67.5385	7.7895	2.8349	141.7224	113.0527	96.6214	57.9678	49.0183
Perylene	101.0378	12.3392	5.6523	140.5881	57.6116	66.1985	49.7136	122.9652
Phenanthrene	360	83.3602	20.8673	1100	522.5728	317.1296	258.4188	666.6502
Pyrene	594	114.1884	49.6687	1060	509.4642	520.5391	450.516	528.0157
Low Molecular Weight PAHs	795.1472	158.6388	38.2463	2011.046	999.751	727.0863	500.7517	1129.624
High Molecular Weight PAHs	2172.413	396.8939	250.6409	5644.871	2129.569	2144.36	1534.488	3004.155
Total PAHs	4544.57	757.8463	430.3399	10880.64	4404.017	4171.481	3022.551	6372.087

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 7
PHASE 2 - OFF SHORE INVESTIGATION
SEMIVOLATILE ORGANIC COMPOUND RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	SDA-S2B-BOT	SDA-S2B-BT2	SDA-S2B-MID	SDA-S2B:0-8
1,6,7-Trimethylnaphthalene	8.9073	1.7351	44.6113	67.4227
1-Methylnaphthalene	27.5271	4.1738	77.927	235.003
1-Methylphenanthrene	2.715 U	6.7947	397.766	602.5704
2,6-Dimethylnaphthalene	16.8763	0.7911	125.7317	113.725
2-Methylnaphthalene	26.2001	2.2078	114.3204	220.1118
Acenaphthene	62.5462	6.881	219.3325	548.3875
Acenaphthylene	11.8689	2.4932	56.1	43.3126
Anthracene	154.4963	25.4583	752.6943	1260
Benzo(a)anthracene	222.2181	27.9072	1640	1700
Benzo(a)pyrene	226.6394	41.6255	1319.784	1630
Benzo(b+k)fluoranthene	396.9515	82.947	2550	2930
Benzo(e)pyrene	149.0966	33.2849	1010	1060.136
Benzo(g,h,i)perylene	114.6403	19.6375	653.259	685.2539
Biphenyl	7.6712	1.0199	41.9093	71.7601
Chrysene	205.7014	27.7898	1180	1510.297
Dibenz(a,h)anthracene	34.39	5.0173	233.4846	262.5156
Fluoranthene	488.8473	72.826	2640	3660
Fluorene	80.1358	7.9426	264.2	759.3879
Indeno(1,2,3-cd)pyrene	116.2111	17.309	697.1129	762.3853
Naphthalene	31.6814	5.8699	155.3571	275.2072
Perylene	60.3419	13.2972	356.6799	400.4682
Phenanthrene	427.5238	54.7182	1610	3820
Pyrene	417.501	69.1043	2310	3010.346
Low Molecular Weight PAHs	794.4524	105.571	3172.004	6926.407
High Molecular Weight PAHs	1595.297	244.2702	9323.268	11773.16
Total PAHs	3290.688	530.8314	18450.27	25628.29

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 8
PHASE 2 - OFF SHORE INVESTIGATION
POLYCHLORINATED BIPHENYL RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
ug/kg

COMPOUND	JCC-D1-BOT	JCC-D1-MID	MCL-10	MCL-10-BOT	MCL-10-MID	MCL-11	MCL-11-BOT	MCL-11-MID
101 (2,2',4,4',6')	0.323	0.907	5.493	0.455	4.573	2.2229	0.156	1.538
104 (2,2',4,6,6')	0.05	0.6488	0.4031	0.1368	0.2971	0.5847	0.0784	0.2854
105 (2,3,3'4,4')	0.035 U	0.2762	2.1874	0.3749	2.4549	0.8708	0.1364	0.5312
118 (2,3'4,4',5)	0.1189	0.319	4.5897	0.2227	6.8832	2.2902	0.0549	1.6052
126 (3,3'4,4',6)	0.0606	0.1744	1.3746	0.02 U	0.02	0.3611	0.02	0.02
128 (2,2',3,3'4,4')	0.0798	0.2017	1.2999	0.1426	1.3242	0.5474	0.035 U	0.5008
138 (2,2',3,4,4',5)	0.13	0.4422	7.6805	0.3113	4.8541	2.5566	0.0635	1.9176
153 (2,2',4,4',5,5')	0.1727	0.5	6.9353	0.2588	3.6897	2.2272	0.0564	1.8494
170 (2,2',3,3'4,4',5)	0.035 U	0.0689	3.5259	0.035 U	1.3564	0.728	0.035 U	0.8567
18 (2,2',5)	0.015 U	0.3285	3.782	0.2012	4.0122	24.5547	0.0557	0.4572
180 (2,2'3,4,4',5,5')	0.0825	0.335	6.1718	0.1449	1.5566	1.2132	0.0535	1.05
187 (2,2',3,4',5,5',6)	0.0575	0.2988	3.6588	0.1524	1.2802	0.9225	0.01 U	0.8528
188 (2,2',3,4',5,6,6')	0.0685	0.363	1.2726	0.0838	0.8448	0.6229	0.025	0.4227
195 (2,2',3,3',4,4',5,6)	0.02 U	0.02 U	0.833	0.02 U	0.1892	0.0512	0.02 U	0.1171
200 (2,2',3,3',4,5',6,6')	0.01	0.1074	0.5915	0.01 U	0.316	0.1922	0.01	0.1747
206 (2,2'3,3'4,4'5,5'6)	0.015 U	0.5197	1.422	0.2111	0.8445	5.1044	0.0681	0.8216
209 (2,2',3,3',4,4',5,5',6,6')	0.0577	0.6515	1.2143	0.2664	0.609	1.9446	0.0968	0.7185
28 (2,4,4')	0.005 U	0.1292	4.393	0.1058	6.3858	2.9914	0.064	1.0104
29 (2,4,5)	0.05	0.5787	0.05	0.05 U	0.05	0.05	0.05	0.05
44 (2,2'3,5')	0.03 U	0.79	3.8182	0.0858	3.5321	1.779	0.03 U	0.5361
50 (2,2,4,6)	0.035	0.1354	3.5591	0.0708	3.6316	1.9203	0.035	0.5023
52 (2,2',5,5)	0.115 U	1.3751	4.7657	0.1218	3.7188	2.4082	0.0611	0.656
66 (2,3'4,4')	0.1119	0.4376	3.3467	0.025 U	4.1657	1.82	0.025 U	0.8668
8 (2,4)	0.055 U	0.055 U	3.9108	0.1357	3.8617	7.8802	0.055 U	0.4152
87 (2,2',3,4,5')	0.0834	0.1863	2.5457	0.0643	2.1878	0.7032	0.1	0.5752
Total PCBs (Sum Congenersx2)	4.3774	20.3913	207.0839	7.5918	165.8743	186.338	3.2287	48.902

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 8
PHASE 2 - OFF SHORE INVESTIGATION
POLYCHLORINATED BIPHENYL RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
Page 2 of 5

COMPOUND	MCL-12	MCL-12-BOT	MCL-12-MID	MCL-13	MCL-13-BOT	MCL-13-MID	MCL-14	MCL-14-BOT
101 (2,2',4,4',6')	4.478	0.298	1.986	1.121	0.253	1.407	1.265	0.141
104 (2,2',4,6,6')	0.4003	0.1062	0.3238	0.1983	0.05	0.3828	0.1822	0.0779
105 (2,3,3'4,4')	2.3258	0.3659	0.7332	0.431	0.1803	0.4105	0.4393	0.2123
118 (2,3'4,4',5)	4.2174	0.2835	1.61	1.1227	0.099	1.1465	1.1617	0.1248
126 (3,3'4,4',6)	0.7272	0.0806	0.02	0.238	0.02	0.02	0.2444	0.02
128 (2,2',3,3'4,4')	1.3299	0.1328	0.5826	0.3364	0.035 U	0.451	0.3805	0.0584
138 (2,2',3,4,4',5)	4.9215	0.306	1.9986	1.7485	0.0514	1.7642	1.8978	0.1534
153 (2,2',4,4',5,5')	3.6225	0.2659	1.6017	1.7508	0.0882	1.725	1.8951	0.1207
170 (2,2',3,3'4,4',5)	1.0939	0.035 U	0.6911	0.5288	0.035 U	0.4549	0.695	0.035 U
18 (2,2',5)	3.7195	0.0726	0.5386	0.761	0.1182	0.3253	0.1694	0.1695
180 (2,2'3,4,4',5,5')	1.7749	0.1175	0.8151	0.9763	0.0668	1.0136	1.1888	0.0968
187 (2,2',3,4',5,5',6)	1.2281	0.219	0.8098	0.7464	0.0507	0.8786	0.8217	0.1036
188 (2,2',3,4',5,6,6')	0.747	0.1222	0.3305	0.3127	0.025	0.3368	0.3285	0.0524
195 (2,2',3,3',4,4',5,6)	0.2153	0.0651	0.1215	0.1188	0.02 U	0.1285	0.02 U	0.02 U
200 (2,2',3,3',4,5',6,6')	0.26	0.1193	0.22	0.1394	0.01	0.1998	0.1289	0.01
206 (2,2'3,3'4,4'5,5'6)	0.8391	0.4652	0.495	0.7644	0.1347	0.7993	0.6851	0.1466
209 (2,2',3,3',4,4',5,5',6,6')	0.4766	0.6637	0.4456	0.6291	0.1724	0.9302	0.851	0.1853
28 (2,4,4')	3.8866	0.0669	0.775	0.5372	0.005 U	0.4708	0.3768	0.005 U
29 (2,4,5)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
44 (2,2'3,5')	2.2286	0.03 U	0.7338	0.2801	0.03 U	0.3303	0.2396	0.0563
50 (2,2,4,6)	2.8027	0.051	0.4574	0.3226	0.035	0.2423	0.2279	0.035
52 (2,2',5,5)	3.0753	0.0969	0.994	0.5217	0.115 U	0.4185	0.4424	0.0882
66 (2,3'4,4')	2.4251	0.025 U	0.8623	0.674	0.1414	0.5661	0.6792	0.1136
8 (2,4)	2.5194	0.0734	0.2262	0.2948	0.0706	0.2716	0.1451	0.1038
87 (2,2',3,4,5')	2.148	0.0882	0.7355	0.3197	0.1	0.3014	0.3221	0.1
Total PCBs (Sum Congenersx2)	133.133	10.7474	48.0605	40.0295	5.0002	40.4758	40.06	5.8028

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 8
PHASE 2 - OFF SHORE INVESTIGATION
POLYCHLORINATED BIPHENYL RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	MCL-14-MID	MCL-15	MCL-15-BOT	MCL-15-MID	MCL-16	MCL-8	MCL-9	MCL-9-BOT
101 (2,2',4,4',6')	1.252	1.039	0.165	0.802	1.927	2.325	2.334	0.115 U
104 (2,2',4,6,6')	0.3765	0.2884	0.0674	0.3578	0.3128	0.2839	0.8772	0.1837
105 (2,3,3'4,4')	0.5278	0.3173	0.035 U	0.1962	0.6232	0.9096	0.7503	0.2522
118 (2,3'4,4',5)	1.0905	0.7666	0.0569	0.5939	1.6372	1.9759	2.0643	0.0848
126 (3,3'4,4',6)	0.02	0.228	0.02	0.02	0.3639	0.1463	0.0941	0.02
128 (2,2',3,3'4,4')	0.3392	0.2454	0.0584	0.2358	0.521	0.7351	0.6371	0.035 U
138 (2,2',3,4,4',5)	1.502	1.7197	0.0715	0.8994	2.718	3.494	3.2701	0.0622
153 (2,2',4,4',5,5')	1.6208	1.739	0.1545	0.8685	2.5054	3.2185	3.2232	0.0735
170 (2,2',3,3'4,4',5)	0.3343	0.6464	0.035 U	0.1986	1.2077	1.2287	1.1209	0.035 U
18 (2,2',5)	0.3326	0.0795	0.1373	0.2109	0.2762	0.2995	23.5658	0.0996
180 (2,2'3,4,4',5,5')	1.0418	1.1653	0.045 U	0.5136	1.7008	1.92	1.9144	0.0957
187 (2,2',3,4',5,5',6)	0.8417	0.7861	0.0522	0.4764	1.0964	1.436	1.3026	0.01 U
188 (2,2',3,4',5,6,6')	0.4171	0.2779	0.025	0.167	0.4387	0.634	0.6426	0.025
195 (2,2',3,3',4,4',5,6)	0.1277	0.0991	0.02 U	0.0583	0.235	0.2744	0.2314	0.02 U
200 (2,2',3,3',4,5',6,6')	0.1466	0.1371	0.01	0.1031	0.1782	0.2501	0.209	0.01
206 (2,2'3,3'4,4'5,5'6)	1.2119	0.6495	0.0768	0.8136	0.873	1.1221	0.96	0.0933
209 (2,2',3,3',4,4',5,5',6,6')	0.9065	0.6957	0.1267	0.9754	1.2064	1.4552	1.0852	0.1448
28 (2,4,4')	0.4044	0.194	0.005 U	0.1541	0.6582	0.664	0.7195	0.1
29 (2,4,5)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
44 (2,2'3,5')	0.3196	0.1563	0.03 U	0.1502	0.4396	0.4668	0.9046	0.03 U
50 (2,2,4,6)	0.183	0.1331	0.035	0.0933	0.3916	0.3817	0.4026	0.035
52 (2,2',5,5)	0.3789	0.2662	0.115 U	0.203	0.6294	0.8584	0.8305	0.0733
66 (2,3'4,4')	0.025 U	0.3762	0.1195	0.025 U	0.7304	0.9545	1.1461	0.025 U
8 (2,4)	0.1956	0.0935	0.1098	0.055 U	0.294	0.2564	4.0312	0.0674
87 (2,2',3,4,5')	0.3183	0.2179	0.1	0.2178	0.4725	0.6685	0.6288	0.1
Total PCBs (Sum Congenersx2)	37.3569	33.1042	4.2409	22.2897	57.8365	70.7827	150.2735	4.2501

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 8
PHASE 2 - OFF SHORE INVESTIGATION
POLYCHLORINATED BIPHENYL RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	MCL-9-MID	NSB-1	NSB-2	NSB-3	NSB-4	NSB-5	NSB-6	NSB-7
101 (2,2',4,4',6')	2.045	2.759	1.592	13.318	12.14	17.7078	13.0493	8.4777
104 (2,2',4,6,6')	0.3007	0.1246	0.1605	1.1744	0.3358	0.3383	0.2094	0.2061
105 (2,3,3'4,4')	0.6733	0.8748	0.6426	6.0731	5.6277	13.484	11.3646	3.2823
118 (2,3'4,4',5)	2.0027	1.7416	1.3517	11.4179	10.2219	22.9164	21.0677	9.4402
126 (3,3'4,4',6)	0.02	0.1389	0.1592	1.6443	2.2223	3.5123	2.5795	2.2559
128 (2,2',3,3'4,4')	0.6242	0.313	0.6064	2.8883	3.2215	5.4126	5.3003	2.7942
138 (2,2',3,4,4',5)	2.7097	1.4202	1.3769	12.4072	12.9211	20.2421	18.9773	13.2774
153 (2,2',4,4',5,5')	2.6404	1.0842	1.2584	9.4679	9.4071	11.8387	10.7856	8.0765
170 (2,2',3,3'4,4',5)	1.0752	0.1607	0.2622	2.7926	3.4089	3.8838	2.6722	2.0814
18 (2,2',5)	0.4046	0.3666	0.5118	12.2313	10.6262	6.4488	1.3159	1.2433
180 (2,2'3,4,4',5,5')	1.3229	0.2957	0.4722	5.499	7.3717	7.8509	3.9968	4.5724
187 (2,2',3,4',5,5',6)	1.3885	0.2756	0.3604	3.2867	7.871	5.0734	2.0936	3.2507
188 (2,2',3,4',5,6,6')	0.655	0.1932	0.2029	1.786	1.9512	2.1354	1.8176	1.6554
195 (2,2',3,3',4,4',5,6)	0.2901	0.02 U	0.08	0.5076	0.02 U	0.8504	0.3193	0.3782
200 (2,2',3,3',4,5',6,6')	0.2877	0.0719	0.01	0.6384	2.477	1.0667	0.6874	0.6937
206 (2,2'3,3'4,4'5,5'6)	1.8032	0.015 U	0.5309	0.9545	33.5854	5.8686	2.8215	1.7183
209 (2,2',3,3',4,4',5,5',6,6')	2.1906	0.5557	0.4451	0.5907	8.5924	1.5413	1.0156	0.5252
28 (2,4,4')	0.7533	0.6308	1.1502	15.7378	17.1674	18.8498	4.8435	3.5479
29 (2,4,5)	0.05	0.05	0.05	0.1898	0.1607	0.1405	0.05	0.05
44 (2,2'3,5')	0.5206	1.6271	0.7414	9.888	9.6472	11.2951	3.9105	2.6585
50 (2,2,4,6)	0.3984	0.4743	0.888	12.9197	12.9344	8.739	2.3146	1.5648
52 (2,2',5,5)	0.7695	3.5886	1.596	14.8066	14.1824	14.0434	5.8719	4.0176
66 (2,3'4,4')	0.8744	0.8174	0.7305	8.0217	7.8959	10.0605	4.9044	2.8072
8 (2,4)	0.3748	0.2909	0.4426	9.0683	8.3474	5.1937	1.1606	1.3914
87 (2,2',3,4,5')	0.685	1.3848	0.9109	7.0973	7.0557	12.1035	8.2773	4.4821
Total PCBs (Sum Congenersx2)	67.3891	50.5111	42.4538	416.8711	546.7658	547.6839	346.4126	220.6216

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 8
PHASE 2 - OFF SHORE INVESTIGATION
POLYCHLORINATED BIPHENYL RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	SDA-S2B-BOT	SDA-S2B-BT2	SDA-S2B-MID	SDA-S2B:0-8
101 (2,2',4,4',6')	1.865	0.832	9.64	11.5
104 (2,2',4,6,6')	0.1338	0.05 U	1.1731	0.3159
105 (2,3,3'4,4')	0.9303	0.1894	6.7114	3.6742
118 (2,3'4,4',5)	1.3749	0.4594	11.2094	8.3262
126 (3,3'4,4',6)	0.02	0.02 U	0.02 U	0.02
128 (2,2',3,3'4,4')	0.4649	0.2344	3.9697	2.53
138 (2,2',3,4,4',5)	1.8067	0.731	14.5452	11.3195
153 (2,2',4,4',5,5')	1.3913	0.4672	11.0971	7.9077
170 (2,2',3,3'4,4',5)	0.2201	0.2565	5.0945	2.4776
18 (2,2',5)	0.3754	0.1821	5.4845	2.3275
180 (2,2'3,4,4',5,5')	0.7408	0.5871	10.519	5.0607
187 (2,2',3,4',5,5',6)	0.7033	0.3942	6.3455	3.7461
188 (2,2',3,4',5,6,6')	0.3349	0.3845	2.4577	1.6976
195 (2,2',3,3',4,4',5,6)	0.0796	0.0571	1.5108	0.6556
200 (2,2',3,3',4,5',6,6')	0.1714	0.0695	1.3712	0.8236
206 (2,2'3,3'4,4'5,5'6)	1.153	0.4913	11.8401	5.7814
209 (2,2',3,3',4,4',5,5',6,6')	0.9048	0.3248	4.923	2.741
28 (2,4,4')	1.0472	0.2813	6.011	6.9076
29 (2,4,5)	0.05	0.05 U	0.1317	0.0987
44 (2,2'3,5')	0.4992	0.142	4.4446	3.9503
50 (2,2,4,6)	0.4752	0.1729	3.3401	3.7887
52 (2,2',5,5)	0.8179	0.3455	5.0601	5.903
66 (2,3'4,4')	1.655	0.7319	5.6273	9.6295
8 (2,4)	0.5122	0.1773	2.7603	2.5208
87 (2,2',3,4,5')	0.5174	0.2192	5.3497	4.1246
Total PCBs (Sum Congenersx2)	49.6246	16.5662	312.1738	236.918

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 9
PHASE 2 - OFF SHORE INVESTIGATION
PESTICIDE RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
ug/kg

COMPOUND	JCC-D1-BOT	JCC-D1-MID	MCL-10	MCL-10-BOT	MCL-10-MID	MCL-11	MCL-11-BOT	MCL-11-MID
Aldrin	NC	NC	NC	NC	NC	NC	NC	NC
Hexachlorobenzene	0.08 U	0.08 U	0.2	0.08 U	0.268	0.1	0.08 U	0.08 U
Mirex	0.1 U	0.1 U	0.8	0.1 U	0.1 U	0.1	0.1 U	0.165
o,p'-DDE	NC	0.95	2.4	NC	2.5545	1.6	NC	0.6875
p,p'-DDE	0.025 U	0.3	1.6	0.1	1.51	1.3	0.025 U	0.8369

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 9
PHASE 2 - OFF SHORE INVESTIGATION
PESTICIDE RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	MCL-12	MCL-12-BOT	MCL-12-MID	MCL-13	MCL-13-BOT	MCL-13-MID	MCL-14	MCL-14-BOT
Aldrin	NC	NC	NC	NC	NC	NC	NC	NC
Hexachlorobenzene	0.5	0.08 U	0.174	0.08 U	0.08 U	0.6394	0.08 U	0.08 U
Mirex	0.1	0.1 U	0.1 U	0.1 U	0.1 U	0.8778	0.1 U	0.1 U
o,p'-DDE	2.1	0.1	1.1289	1.5759	0.1	0.8462	0.2774	NC
p,p'-DDE	1.5	0.1	0.9464	0.9775	0.1	0.9623	0.6322	0.1

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 9
PHASE 2 - OFF SHORE INVESTIGATION
PESTICIDE RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	MCL-14-MID	MCL-15	MCL-15-BOT	MCL-15-MID	MCL-16	MCL-8	MCL-9	MCL-9-BOT
Aldrin	NC	NC	NC	NC	NC	NC	NC	NC
Hexachlorobenzene	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
Mirex	0.927	0.1266	0.1 U	0.599	0.2	0.2	0.2	0.1 U
o,p'-DDE	0.7691	0.5891	NC	0.476	0.7	1.4	1	0.1
p,p'-DDE	0.8462	0.5257	0.025 U	0.4737	0.77	1	1.1	0.8

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 9
PHASE 2 - OFF SHORE INVESTIGATION
PESTICIDE RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	MCL-9-MID	NSB-1	NSB-2	NSB-3	NSB-4	NSB-5	NSB-6	NSB-7
Aldrin	NC	NC	NC	NC	NC	NC	NC	0.1883
Hexachlorobenzene	0.6264	0.787	0.2967	1.793	2.997	2.3566	0.295	0.6314
Mirex	0.1 U	0.829	0.1 U	0.1 U	0.8189	0.2999	0.5889	0.3625
o,p'-DDE	1.5	1.4216	0.4449	5.8566	5.9212	8.9334	4.762	3.53
p,p'-DDE	1.3	0.4466	0.4612	8.5498	3.8549	4.851	2.986	3.1391

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 9
PHASE 2 - OFF SHORE INVESTIGATION
PESTICIDE RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
Page 5 of 5

COMPOUND	SDA-S2B-BOT	SDA-S2B-BT2	SDA-S2B-MID	SDA-S2B:0-8
Aldrin	NC	NC	NC	NC
Hexachlorobenzene	0.2	0.08 U	0.6686	1.3
Mirex	0.1	0.1 U	1.611	0.7
o,p'-DDE	NC	0.2	4.735	NC
p,p'-DDE	0.7	0.4	4.3158	5.829

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 10
PHASE 2 - OFF SHORE INVESTIGATION
BUTYLTIN RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
ug/kg

COMPOUND	JCC-D1-BOT	JCC-D1-MID	MCL-10	MCL-10-BOT	MCL-10-MID	MCL-11	MCL-11-BOT	MCL-11-MID
Dibutyltin		0.45	0.88		1.5197	0.67		0.3369
Monobutyltin		0.42	1		0.0582	0.33		0.1449
Tetraibutyltin		0.02	0.13		1.0536	0.09		0.0307
Tributyltin		6.82	2.47		3.2236	3.13		1.552

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 10
PHASE 2 - OFF SHORE INVESTIGATION
BUTYLTIN RESULTS - ng tin/g dry weight
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
Page 2 of 5

COMPOUND	MCL-12	MCL-12-BOT	MCL-12-MID	MCL-13	MCL-13-BOT	MCL-13-MID	MCL-14	MCL-14-BOT
Dibutyltin	1.11		0.85	1.2013		1.06	0.7522	
Monobutyltin	4.55		3.69	0.528		0.86	0.6045	
Tetraibutyltin	0.13		0.28	0.0439		0.11	0.0848	
Tributyltin	3.63		1.39	2.3892		7.93	2.1375	

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 10
PHASE 2 - OFF SHORE INVESTIGATION
BUTYLTIN RESULTS - ng tin/g/dry weight
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
Page 3 of 5

COMPOUND	MCL-14-MID	MCL-15	MCL-15-BOT	MCL-15-MID	MCL-16	MCL-8	MCL-9	MCL-9-BOT
Dibutyltin	1.11	0.122			0.6	1.36	1.63	
Monobutyltin	0.38	0.2404			1.57	0.56	1.19	
Tetraibutyltin	0.16	0.0555			0.12	0.04	0.1	
Tributyltin	1.86	2.5424			1.6	3.94	5.67	

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 10
PHASE 2 - OFF SHORE INVESTIGATION
BUTYLTIN RESULTS - ng tin/g dry weight
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	MCL-9-MID	NSB-1	NSB-2	NSB-3	NSB-4	NSB-5	NSB-6	NSB-7
Dibutyltin	1.0283	0.2692	1.6485	0.423	2.0533	1.195	2.8812	0.3306
Monobutyltin	0.0495	8.9351	1.0623	0.7368	1.9711	0.9726	3.1609	0.9143
Tetraibutyltin	0.0535	0.0613	3.1834	0.2327	0.6286	0.1168	0.101	0.0276
Tributyltin	1.3441	3.1064	3.7106	4.2545	1.4149	1.3585	5.3338	1.544

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 10
PHASE 2 - OFF SHORE INVESTIGATION
BUTYLTIN RESULTS - ng tin/g dry weight
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	SDA-S2B-BOT	SDA-S2B-BT2	SDA-S2B-MID	SDA-S2B:0-8
Dibutyltin			3.6481	2.61
Monobutyltin			0.9704	2.06
Tetraibutyltin			0.061	1.87
Tributyltin			8.5622	7.76

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

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PHASE 3 SEDIMENT DATA

TABLE 11
PHASE 3 - POST EROSIONAL NEAR SHORE INVESTIGATION
METALS RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
mg/kg

COMPOUND	MCL-10-R	MCL-11-R	MCL-12-R	MCL-13-R	MCL-14-R	MCL-8-R	MCL-9-R	NSB-1-R
Aluminum	50869	33231	49396	23849	26490	47150	49103	29185
Arsenic	7	3.6	5	2.8	4.47	6.05	5.2	8.78
Cadmium	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J	0.65 J
Chromium	54.8	38.5	49.3	35.9	36.1	43.2	39.9	41
Copper	250	12.86	49.4	13.2	4.5	26.2	24.5	29.5
Iron	36838	32554	38760	24032	30819	33558	26159	51344
Lead	61	28	58.6	25.1	28.3	44.3	44.1	17.8
Manganese	577.9	354.3	444	308.7	354.5	483.2	460.2	563.1
Mercury	0.2914	0.1 J	0.3665	0.1 J	0.1 J	0.2804	0.2322	0.1 J
Nickel	18.9	18.2	20.8	5 J	17.8	23.3	16.5	26.6
Silver	0.47	0.21	0.47	0.14	0.17	0.32	0.3	0.13
Zinc	649.68	9 J	287.22	9 J	861.96	83.67	65.11	159.77

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 11
PHASE 3 - POST EROSIONAL NEAR SHORE INVESTIGATION
METALS RESULTS - mg/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	NSB-2-R	NSB-2FD-R	NSB-3-R	NSB-4-R	NSB-5-R	NSB-6-R	NSB-7-R	SDA-M1-R
Aluminum	31408	43515	40325	37904	40391	36170	28022	29115
Arsenic	12.9	18.82	15.2	15.7	14.32	8.63	11.6	3.2
Cadmium	1.68	0.65 J	4.35	6.5	2.54	0.65 J	0.65 J	0.65 J
Chromium	155.79	128.12	127.42	164.18	109.45	69.71	53.83	33.3
Copper	7629	820.9	1006	8466	590.8	164.6635	177.0335	14.5
Iron	174430	91305	163366	178862	115054	47585	69491	25075
Lead	5405	1269	718.4	1478	526.1	134.6	215.3	25.7
Manganese	1030	700.5	1032.3	1087.1	653.1	439.5	541.9	316.7
Mercury	0.2667	0.1 J	1.1711	2.9259	1.1244	0.2779	0.3768	0.2129
Nickel	87.4	16.7	75.9	223.8806	120.4	56.9	39.9	5 J
Silver	22.1	6.7	4	5.3	4.7	0.55	1.65	0.13
Zinc	2135.07	1194.98	2878.16	6912.89	2132.17	251.53	1576.44	9 J

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 11
PHASE 3 - POST EROSIONAL NEAR SHORE INVESTIGATION
METALS RESULTS - mg/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
Page 3 of 3

COMPOUND	SDA-S2B-R	SDA-S2C-R
Aluminum	26515	41536
Arsenic	4.5	6.33
Cadmium	0.65 J	0.65 J
Chromium	34	73.5
Copper	25.1	51.5
Iron	28901	32411
Lead	33.1	70.2
Manganese	234.4	369.4
Mercury	0.1 J	1.0077
Nickel	11.4	22.6
Silver	0.18	0.89
Zinc	9 J	103.08

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 12
PHASE 3 - POST EROSIONAL NEAR SHORE INVESTIGATION
SEMIVOLATILE ORGANIC COMPOUND RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
ug/kg

COMPOUND	MCL-10-R	MCL-11-R	MCL-12-R	MCL-13-R	MCL-14-R	MCL-8-R	MCL-9-R	NSB-1-R
1,6,7-Trimethylnaphthalene	1.6851	0.5915	11.6804	0.9461	0.6764	1.6471	1.4183	0.5883
1-Methylnaphthalene	6.5358	2.8808	43.5348	3.6558	4.0854	6.0381	8.1235	1.3928
1-Methylphenanthrene	18.497	7.7847	95.7195	8.1334	10.5049	18.1945	14.9503	1.5819
2,6-Dimethylnaphthalene	28.6116	15.2215	49.938	6.6029	7.0562	18.7761	21.7961	1.4507
2-Methylnaphthalene	10.232	5.0086	51.9882	5.0959	5.4547	9.1891	10.0046	2.0763
Acenaphthene	22.6019	6.4873	253.7255	10.9434	10.6807	22.5639	31.904	0.7483 UJ
Acenaphthylene	9.8814	5.2964	15.5938	5.6925	6.4743	12.688	9.9719	0.2881
Anthracene	64.9271	26.5236	536.2994	35.8896	37.0539	70.9053	86.3247	1.3207 UJ
Benzo(a)anthracene	222.2655	82.8671	1120	105.5108	103.5216	181.5943	200.6577	7.5031
Benzo(a)pyrene	168.8029	66.5019	646.1773	84.6892	89.7601	138.7011	145.2173	6.8568
Benzo(b+k)fluoranthene	352.4769	146.4195	1200	172.5246	188.0183	294.4743	298.2888	16.0401
Benzo(e)pyrene	132.9464	58.9045	419.2464	69.3548	73.0306	110.4024	108.7769	9.6228
Benzo(g,h,i)perylene	93.6016	41.2475	268.4865	45.5267	52.1153	75.1954	72.3269	6.7105
Biphenyl	5.3781	2.652	24.4162	2.9058	3.2497	4.9911	4.3815	0.743
Chrysene	196.6543	77.1281	856.352	89.4055	101.5093	159.3867	157.96	9.5897
Dibenz(a,h)anthracene	31.5809	12.3715	112.129	14.2767	15.3013	21.7516	22.611	2.0277
Fluoranthene	413.3364	160.4583	2070	202.804	212.0114	349.8379	402.1771	13.1908
Fluorene	23.3588	7.9192	305.3592	11.8109	12.6676	27.5023	35.3474	0.8388
High Molecular Weight PAHs	1040	547.6154	6530	689.8958	721.64	1180	1280	56.1118
Indeno(1,2,3-cd)pyrene	88.8273	38.2328	292.3974	46.0724	50.2048	71.321	72.6464	4.4716
Low Molecular Weight PAHs	372.938	134.2031	2910	203.0497	208.5224	394.0344	482.8783	12.3476
Naphthalene	12.4613	5.4921	93.505	8.3071	9.5768	10.8442	14.8498	1.4132
Perylene	45.0008	19.3878	161.2764	23.9598	26.0312	37.8703	38.1336	2.1212
Phenanthrene	229.4756	77.476	1660	125.3102	126.6144	240.3416	294.4759	5.6621
Pyrene	4.5678	148.2885	1730	193.2096	199.5364	325.7482	348.7467	16.9437
Total PAHs	2180	1020	12000	1270	1350	2209.964	2400	113.1823

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 12
PHASE 3 - POST EROSIIONAL NEAR SHORE INVESTIGATION
SEMIVOLATILE ORGANIC COMPOUND RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
Page 2 of 3

COMPOUND	NSB-2-R	NSB-2FD-R	NSB-3-R	NSB-4-R	NSB-5-R	NSB-6-R	NSB-7-R	SDA-M1-R
1,6,7-Trimethylnaphthalene	1.3895	1.8	4.7285	77.9261	4.7271	10.5933	3.1094	1.4771
1-Methylnaphthalene	6.0091	2.56	11.9147	298.1453	17.98	91.3099	8.7794	6.6496
1-Methylphenanthrene	4.1966	7.07	8.8921	73.9505	29.3742	107.2669	18.9568	18.1474
2,6-Dimethylnaphthalene	6.0533	8.6 U	15.4606	337.114	16.44	42.9392	11.2076	11.1917
2-Methylnaphthalene	7.9642	2.51	17.4415	256.9771	40.88	126.5066	14.6351	9.6414
Acenaphthene	3.1029	5.77	14.0135	56.6675	10.4781	293.0098	11.65	21.8561
Acenaphthylene	0.6133	1.42	1.5133	18.4275	23.1245	23.2554	12.1487	5.3733
Anthracene	6.4538	16.47	15.5688	80.6508	69.96	732.9087	38.7792	71.3414
Benzo(a)anthracene	15.6649	50.93	19.9838	122.8305	259.6567	1460	168.148	166.6689
Benzo(a)pyrene	13.2949	29.15	11.4991	125.5534	124.4473	908.6147	119.7994	119.2763
Benzo(b + k)fluoranthene	28.6981	57.59	28.015	230.0885	277.4264	1730	249.8616	261.8823
Benzo(e)pyrene	16.6726	25.06	14.0727	92.0375	129.326	580.4586	102.4459	97.1338
Benzo(g,h,i)perylene	11.7203	16.55	9.7925	57.5216	108.45	456.9292	77.7789	55.7776
Biphenyl	5.2034	6.4 U	11.2236	128.4319	12.66	38.509	10.9566	4.8413
Chrysene	14.7419	45.89	24.5157	110.7829	193.7085	1180	156.3764	154.8399
Dibenz(a,h)anthracene	3.5839	6.54	3.4807	19.4975	31.3217	155.7732	23.3712	19.7946
Fluoranthene	33.5709	113.89	71.5435	311.2468	402.8167	3779.991	312.5131	382.2215
Fluorene	3.1949	4.71	18.7175	120.3095	16.4364	388.9544	14.1722	29.4112
High Molecular Weight PAHs	114.2146	351.04	190.9537	972.0469	1390	9920	1070	1170
Indeno(1,2,3-cd)pyrene	8.2447	14.19	6.8418	48.5752	80.16	481.6496	66.7309	57.8935
Low Molecular Weight PAHs	56.3471	102.67	174.2396	1150	400.999	4360	263.8887	410.4865
Naphthalene	9.3222	4.91	20.3791	249.3732	40.36	283.4907	20.1059	12.6284
Perylene	5.1128	8.89	4.0219	21.8029	34.5078	232.9043	28.7078	31.3217
Phenanthrene	25.6958	66.88	86.606	368.826	199.76	2510.495	152.3976	260.2347
Pyrene	33.3582	104.64	59.9309	282.1359	379.8	2440	288.4413	326.0164
Total PAHs	263.8621	587.42	480.1567	3490	2500	18100	1910	2130

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 12
PHASE 3 - POST EROSIIONAL NEAR SHORE INVESTIGATION
SEMIVOLATILE ORGANIC COMPOUND RESULTS - ug/kg
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
Page 3 of 3

COMPOUND	SDA-S2B-R	SDA-S2C-R
1,6,7-Trimethylnaphthalene	1.2929	11.0525
1-Methylnaphthalene	4.131	96.9309
1-Methylphenanthrene	11.7462	127.2306
2,6-Dimethylnaphthalene	6.5933	70.9677
2-Methylnaphthalene	4.91	130.1349
Acenaphthene	11.2197	455.0084
Acenaphthylene	3.6364	16.7317
Anthracene	35.715	1030
Benzo(a)anthracene	101.5432	1560.106
Benzo(a)pyrene	86.0423	932.3427
Benzo(b+k)fluoranthene	157.4694	1800
Benzo(e)pyrene	59.5675	568.5418
Benzo(g,h,i)perylene	38.7608	311.8436
Biphenyl	2.6653	45.0448
Chrysene	91.3624	1200
Dibenz(a,h)anthracene	13.2342	137.3133
Fluoranthene	213.2548	3600
Fluorene	15.4839	560.7672
High Molecular Weight PAHs	711.1232	10300
Indeno(1,2,3-cd)pyrene	39.842	354.638
Low Molecular Weight PAHs	206.5944	5980
Naphthalene	4.7921	300.6946
Perylene	20.5849	213.8455
Phenanthrene	130.8373	3490
Pyrene	205.6862	2850
Total PAHs	1260.371	19900

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 13
PHASE 3 - POST EROSIONAL NEAR SHORE INVESTIGATION
POLYCHLORINATED BIPHENYLS RESULTS
NEWPORT, RHODE ISLAND
ug/kg

COMPOUND	MCL-10-R	MCL-11-R	MCL-12-R	MCL-13-R	MCL-14-R	MCL-8-R	MCL-9-R	NSB-1-R
101 (2,2',4,4',6')	3.423	1.499	6.698	0.96	1.225	2.7	2.352	1.545
104 (2,2',4,6,6')	0.4562 UJ	0.2736 UJ	1.0262 U	0.2595 UJ	0.3443 UJ	0.3826 UJ	0.3389 UJ	0.6 U
105 (2,3,3'4,4')	1.4968	0.7172	3.9905	0.2455	0.342	0.8626	1.0693	0.4524
118 (2,3'4,4',5)	3.3373	1.6253	6.7666	0.9731	1.0993	2.3501	2.5332	1.0461
126 (3,3'4,4',6)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.3098
128 (2,2',3,3'4,4')	1.2795	0.6448	2.0382	0.317	0.4313	0.9149	1.2232	0.3038
138 (2,2',3,4,4',5)	6.9586	3.7039	11.3197	2.3511	3.3721	6.4124	5.7602	1.7542
153 (2,2',4,4',5,5')	5.9702	3.1047	8.0924	2.1756	3.1557	6.0851	5.097	41.0209
154 (2,2,4,4',5,6')	0	0	0	0	0	0	0	0
170 (2,2',3,3'4,4',5)	2.3238	1.0988	2.8624	0.6149	1.1753	2.2554	2.2558	0.7933
18 (2,2',5)	0.5909	0.3235	1.7975	0.1958	0.1756	0.3324	0.3323	0.2313
180 (2,2'3,4,4',5,5')	4.4587	2.2318	5.4477	1.3947	2.553	4.5409	3.8244	2.1312
187 (2,2',3,4',5,5',6)	2.8274	1.3903	3.3376	0.981	1.5858	2.9913	2.3652	0.9356
188 (2,2',3,4',5,6,6')	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
195 (2,2',3,3',4,4',5,6)	0.5325	0.2736	0.5092	0.1226	0.2853	0.5757	0.6017	0.2909
200 (2,2',3,3',4,5',6,6')	0.642	0.2423	0.6193	0.1372	0.1989	0.4393	0.5973	0.1482
206 (2,2'3,3'4,4'5,5'6)	4.4191	2.0626	5.8847	0.6224	0.9933	1.8367	4.2455	0.2462 UJ
209 (2,2',3,3',4,4',5,5',6,6')	2.3038	1.1292	1.2957	0.698	0.7642	1.3475	1.8234	0.0634 UJ
28 (2,4,4')	1.4825	0.7763	4.1614	0.6033	0.4997	0.9265	0.8601	0.3315 UJ
29 (2,4,5)	0.0518	0.7 U	0.1483	0.0819	0.0513	0.0591	0.7 U	0.0625
44 (2,2'3,5')	1.1317	0.448	2.81	0.2391	0.2746	0.6096	0.7117	0.479
50 (2,2,4,6)	1.0271	0.4954	2.9829	0.3182	0.2825	0.6481	0.6053	0.2556
52 (2,2',5,5)	1.7006	0.6422	4.1941	0.5156	0.4787	1.1314	1.0024	1.2357
66 (2,3'4,4')	1.2109	0.6804	2.6751	0.4483	0.599	1.0355	1.032	0.3046
77 (3,3',4,4')	5.2091	2.5102	11.4606	1.2317 UJ	1.6206	3.5338	3.5527	2.3964
8 (2,4)	0.7938	0.3258 UJ	1.5264	0.5581	0.4617 UJ	0.5322 UJ	0.4331 UJ	0.2833 UJ
87 (2,2',3,4,5')	1.3076	0.6508	3.323	0.2727	0.3523	0.8234	0.7988	0.7651
Sum PCB Congeners x 2	112.0703	57.2999	192.1356	34.8343	46.8429	88.8534	90.4312	117.1716

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 13
PHASE 3 - POST EROSIONAL NEAR SHORE INVESTIGATION
POLYCHLORINATED BIPHENYLS RESULTS - ug.kg
NEWPORT, RHODE ISLAND

COMPOUND	NSB-2-R	NSB-2FD-R	NSB-3-R	NSB-4-R	NSB-5-R	NSB-6-R	NSB-7-R	SDA-M1-R
101 (2,2',4,4',6')	7.496	6.903	8.933	240.26	19.02	10.779	12.821	1.24
104 (2,2',4,6,6')	0.6 U	0.6145 U	0.6113 U	4.9398	1.841 U	1.1782 U	0.6522 U	0.3412 UJ
105 (2,3,3'4,4')	2.7023	3.0569	3.4432	167.2899	8.6952	5.6517	7.0861	0.4182
118 (2,3'4,4',5)	5.7484	5.7242	6.709	234.5218	16.203	10.14	11.1397	1.2308
126 (3,3'4,4',6)	0.6179	0.5 U	0.8112	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
128 (2,2',3,3'4,4')	1.3504	1.4708	1.5804	88.8392	4.7289	3.0895	4.0457	0.3886
138 (2,2',3,4,4',5)	5.5826	6.1091	6.7301	267.1989	19.3997	13.4897	15.3002	2.5017
153 (2,2',4,4',5,5')	3.8685	3.9138	4.7402	154.2251	13.5148	8.4616	9.6849	2.0521
154 (2,2,4,4',5,6')	0	0	0	0	0	0	0	0
170 (2,2',3,3'4,4',5)	0.7457	1.7131	1.0817	37.1318	3.2186	2.0522	2.4806	0.6201
18 (2,2',5)	1.3236	1.3901	13.0864	94.7311	5.1095	2.6254	7.6873	0.3158
180 (2,2'3,4,4',5,5')	1.4892	1.3479	1.9481	55.2316	22.2839	4.7694	4.5793	1.2939
187 (2,2',3,4',5,5',6)	0.8385	0.6041	1.0847	32.3026	32.577	3.3554	3.4128	0.9456
188 (2,2',3,4',5,6,6')	0.6 U	0.6 U	0.6 U	0.6 U	2.523	0.6 U	0.6 U	0.6 U
195 (2,2',3,3',4,4',5,6)	0.1436	0.1875	0.1744	0.6 U	0.6 U	0.2962	0.4541	0.1054
200 (2,2',3,3',4,5',6,6')	0.2442	0.2624	0.2601	18.1033	13.3699	0.8569	0.9952	0.1512
206 (2,2'3,3'4,4'5,5'6)	0.2279 UJ	1.4381	0.4868	82.4636	274.6873	3.9023	4.4937	0.5916
209 (2,2',3,3',4,4',5,5',6,6')	0.1267 UJ	0.589	0.1788 UJ	21.7922	73.9291	1.2856	3.6668	0.8581
28 (2,4,4')	1.6075	1.4805	11.2127	108.7676	7.2994	4.1198	11.9008	0.7816
29 (2,4,5)	0.0633	0.0937	0.193	2.2611	0.1692	0.0986	0.1697	0.0744
44 (2,2'3,5')	2.8795	2.3529	7.3155	115.7761	9.1212	5.0583	7.9435	0.4999
50 (2,2,4,6)	1.3304	1.2087	9.6556	96.0474	6.0031	3.4622	9.4952	0.4956
52 (2,2',5,5)	6.5523	5.1489	11.0049	164.0877	12.9164	7.589	9.8774	0.7566
66 (2,3'4,4')	2.6706	1.795	3.6542	66.0187	6.445	3.688	4.643	0.5456
77 (3,3',4,4')	12.5219	11.1347	14.3867	410.4677	32.5455	19.5704	23.8069	2.0014
8 (2,4)	1.0212	0.8989	9.7941	149.4359	3.9604	2.007	4.1391	0.6763
87 (2,2',3,4,5')	4.4161	3.8808	5.1703	185.8703	11.32	5.6709	8.1485	0.4508
Sum PCB Congeners x 2	133.5366	128.8372	249.6926	5598.927	1203.962	248.5946	339.4472	40.8732

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 13
PHASE 3 - POST EROSIONAL NEAR SHORE INVESTIGATION
POLYCHLORINATED BIPHENYLS RESULTS - ug/kg
NEWPORT, RHODE ISLAND

COMPOUND	SDA-S2B-R	SDA-S2C-R
101 (2,2',4,4',6')	2.278	6.358
104 (2,2',4,6,6')	0.6121 U	2.4456
105 (2,3,3'4,4')	1.1621	3.3032
118 (2,3'4,4',5)	2.4037	6.4052
126 (3,3'4,4',6)	0.5 U	0.5
128 (2,2',3,3'4,4')	0.7742	2.0471
138 (2,2',3,4,4',5)	3.591	10.7549
153 (2,2',4,4',5,5')	3.4836	7.3764
154 (2,2,4,4',5,6')	0	0
170 (2,2',3,3'4,4',5)	0.5335	2.5806
18 (2,2',5)	0.5806	1.67
180 (2,2'3,4,4',5,5')	1.0396	5.0447
187 (2,2',3,4',5,5',6)	0.6977	3.3749
188 (2,2',3,4',5,6,6')	0.6 U	0.6
195 (2,2',3,3',4,4',5,6)	0.0895	0.5224
200 (2,2',3,3',4,5',6,6')	0.1633	0.8434
206 (2,2'3,3'4,4'5,5'6)	1.5739	3.7554
209 (2,2',3,3',4,4',5,5',6,6')	0.5058	1.8459
28 (2,4,4')	0.9774	4.6186
29 (2,4,5)	0.7 U	0.177
44 (2,2'3,5')	0.6379	2.967
50 (2,2,4,6)	0.643	2.8504
52 (2,2',5,5)	1.1616	4.0978
66 (2,3'4,4')	0.7781	2.5036
77 (3,3',4,4')	3.5804	10.8323
8 (2,4)	1.2406	1.7318
87 (2,2',3,4,5')	1.0646	2.9806
Sum PCB Congeners x 2	62.7445	184.3731

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

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PHASE 2 TISSUE DATA

TABLE 14
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - METALS RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	JCC-D1-LOB-HPP	JCC-D1-LOB-MUS	JCC-M1-HC	JCC-S1-HC	MCL-10-HC
Aluminum	UG/G	2.61	2.61			23.5537
Arsenic	UG/G	19.7735	19.82			11.06
Cadmium	UG/G	8.2686	0.0015 J			0.68
Chromium	UG/G	0.1125 J	0.1125 J			0.9642
Copper	UG/G	10.77	45.71			10.59
Iron	UG/G	53.37	15.32			111.9835
Lead	UG/G	0.0882	0.139			16.1
Manganese	UG/G	6.92	8.97			32.2314
Mercury	UG/G	0.1141	0.5577			0.0559
Nickel	UG/G	0.2655 J	0.2655 J			4.6832
Silver	UG/G	1.246	0.84			1.81
Zinc	UG/G	65.15	102.11			103.9945

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 14
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - METALS RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	MCL-10-HC-DEP		MCL-11-HC	MCL-11-HC-DEP	MCL-12-HC	MCL-12-HC-DEP
Aluminum	UG/G	19.1304		18.5379	25.0929	67.0213	19.1489
Arsenic	UG/G	11.71		9.77	22.23	10.08	14.8
Cadmium	UG/G	1.14		0.46	1.39	0.92	1.35
Chromium	UG/G	1.1594		0.6527	1.3011	1.2275	1.8237
Copper	UG/G	10.06		8.62	12.55	9.28	10.83
Iron	UG/G	83.913		73.7598	102.6022	139.5254	85.4103
Lead	UG/G	0.261		0.56	0.4	0.01 J	0.169
Manganese	UG/G	57.6812		36.0313	63.3829	9.6563	68.0851
Mercury	UG/G	0.0722		0.0388	0.0406	0.0566	0.0773
Nickel	UG/G	6.9565		4.1775	4.6468	4.8282	9.2705
Silver	UG/G	2.32		2.11	2.75	2.66	3.11
Zinc	UG/G	125.6522		84.8564	137.1747	61.293	132.6748

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 14
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - METALS RESULTS
MCALLISTER POINT LANDFILL - CTO 218
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COMPOUND	UNITS	MCL-13-HC-ND	MCL-14-HC-ND	MCL-16-HC-ND		MCL-9-HC	MCL-NSB1-MF	MCL-NSB3-MF
Aluminum	UG/G	25.0577	59.7643	51.8462		125.6184		
Arsenic	UG/G	11.46	14	10.87		13.25		
Cadmium	UG/G	0.85	1.08	0.57		3.83		
Chromium	UG/G	1.0393	1.5152	0.6154		1.0601		
Copper	UG/G	10.86	13.53	10.58		51.9		
Iron	UG/G	76.4434	161.7845	136.1538		666.4311		
Lead	UG/G	0.097	0.087	0.227		19.54		
Manganese	UG/G	24.9423	73.569	24.3077		125.4417		
Mercury	UG/G	0.0718	0.068	0.0499		0.0917		
Nickel	UG/G	7.9677	10.7744	6.9231		6.3604		
Silver	UG/G	3.77	3.36	1.94		3.31		
Zinc	UG/G	88.6836	142.4242	112.7692		221.2014		

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 14
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - METALS RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	MCL-NSB4-MF	MCL-NSB6-MF	MCL10-LOB-HPP	MCL10-LOB-MUS		MCL13-LOB-HPP
Aluminum	UG/G			0.2655 J	1.22		0.2655 J
Arsenic	UG/G			19.6259	15.48		30.1613
Cadmium	UG/G			4.6939	0.0015	J	11.1694
Chromium	UG/G			0.1125 J	0.1125	J	0.63
Copper	UG/G			459.6939	61.13		978.629
Iron	UG/G			56.97	9.19		51.33
Lead	UG/G			0.131	0.042		0.1512
Manganese	UG/G			4.59	4.79		6.83
Mercury	UG/G			0.1033	0.3569		0.0515
Nickel	UG/G			0.531	0.2655	J	0.75
Silver	UG/G			3.2653	1.09		5.3226
Zinc	UG/G			49.23	97.38		122.44

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 14
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - METALS RESULTS
MCALLISTER POINT LANDFILL - CTO 218
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COMPOUND	UNITS	MCL13-LOB-MUS	MCL14-LOB-HPP	MCL14-LOB-MUS	MCL9-LOB-HPP	MCL9-LOB-MUS	NSB1-BM
Aluminum	UG/G	5.36	214.3123	20	0.2655 J	10.39	253.7594
Arsenic	UG/G	27.03	26.171	23.71	21.75	15.64	9.3
Cadmium	UG/G	0.0015 J	8.5874	0.0015 J	4.9583	0.0015 J	1.82
Chromium	UG/G	0.1125 J	0.5576	0.1125 J	0.1125 J	0.1125 J	1.0025
Copper	UG/G	73.4	949.6283	69.82	892.5	65.22	12.31
Iron	UG/G	11.2348	56.3197	35.8407	67.31	19.75	660.7769
Lead	UG/G	0.053	0.145	0.072	0.0667	0.039	1.165
Manganese	UG/G	6.9838	6.6914	12.6549	5.67	13.34	15.7895
Mercury	UG/G	0.5178	0.0552	0.4585	0.1228	0.3362	0.0832
Nickel	UG/G	0.2655 J	1.6729	0.2655 J	0.2655 J	90.02	2.8822
Silver	UG/G	1.69	12.9182	1.45	2.6667	0.68	0.106
Zinc	UG/G	115.1822	108.5502	101.0619	44.9	108.27	93.2331

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 14
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - METALS RESULTS
MCALLISTER POINT LANDFILL - CTO 218
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COMPOUND	UNITS	NSB1-BM-DEP	NSB2-BM	NSB3-BM	NSB3-BM-DEP	NSB4-BM	NSB5-BM	NSB6-BM
Aluminum	UG/G	208.9965	479.3056	337.1795	175.089	241.0606	308.7278	249.2188
Arsenic	UG/G	11.19	10.53	14.2	11.74	11.72	9.91	11.37
Cadmium	UG/G	2.25	2.04	2.2	2.36	1.94	1.75	1.61
Chromium	UG/G	1.5571	2.3611	2.5641	1.6014	1.2121	2.2189	1.4062
Copper	UG/G	9.32	19.5	40.3	21.13	21.47	18.06	13.61
Iron	UG/G	429.4118	1392.361	2475.385	809.9644	1305.6061	1232.2485	610.3125
Lead	UG/G	0.452	7.89	17.9	7.76	9.84	8.06	4.77
Manganese	UG/G	12.8028	23.75	23.0769	16.0142	16.0606	16.4201	16.875
Mercury	UG/G	0.0855	0.1092	0.2303	0.176	0.1239	0.1224	0.1051
Nickel	UG/G	2.0761	4.3056	3.3333	3.3808	2.8788	1.9231	1.875
Silver	UG/G	0.07	0.145	0.386	0.145	0.136	0.186	0.152
Zinc	UG/G	94.1176	121.5278	193.5897	132.9181	90.9091	83.7278	74.8438

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 14
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - METALS RESULTS
MCALLISTER POINT LANDFILL - CTO 218
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COMPOUND	UNITS	NSB7-BM	SDA-M1-HC	SDA-S2-HC
Aluminum	UG/G	152.5281		
Arsenic	UG/G	9.82		
Cadmium	UG/G	1.74		
Chromium	UG/G	1.4045		
Copper	UG/G	13.2		
Iron	UG/G	441.0112		
Lead	UG/G	4.09		
Manganese	UG/G	14.7472		
Mercury	UG/G	0.0842		
Nickel	UG/G	1.8258		
Silver	UG/G	0.101		
Zinc	UG/G	86.236		

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 15
PHASE 2 - OFF SHORE INVESTIGATION
TISSUES SAMPLES - PAH RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	JCC-D1-LOB-HPP	JCC-D1-LOB-MUS	JCC-M1-HC	JCC-S1-HC	MCL-10-HC
1,6,7-Trimethylnaphthalene	NG/G	7.0889 J	0.5 J	2 J	0.26 J	2 J
1-Methylnaphthalene	NG/G	3.255 J	4.1 J	1 J	0.52 J	3 J
1-Methylphenanthrene	NG/G	35.6068	1.4 J	1 J	2.36 J	7 J
2,6-Dimethylnaphthalene	NG/G	3.1186 J	1.6 J	4 J	0.15 J	2 J
2-Methylnaphthalene	NG/G	5.3 J	3.4 J	3 J	0.66 J	5 J
Acenaphthene	NG/G	16.909	1 J	2 J	4 J	1 J
Acenaphthylene	NG/G	2.4997 J	0.77 J	1 J	1.56 J	5 J
Anthracene	NG/G	15.9227 J	0.6 J	2 J	2.72 J	10 J
Benzo(a)anthracene	NG/G	119.6812	0.9 J	3.36 U	0.75 J	4 J
Benzo(a)pyrene	NG/G	51.9158	4.9 J	4	1.23 J	2 J
Benzo(b+k)fluoranthene	NG/G	186.0812	11.6	1.2	2.9	5.4
Benzo(e)pyrene	NG/G	159.6147	8.5	nc	3.16 J	8
Benzo(g,h,i)perylene	NG/G	63.428	8.1	2	1.97 J	2 J
Biphenyl	NG/G	0.64 J	0.4 J	3 J	1.11 J	2 J
Chrysene	NG/G	41.4445	8.25 J	5	2.04 J	12
Dibenz(a,h)anthracene	NG/G	0.49 J	0.49 J	0.49	0.18 J	0.49 U
Fluoranthene	NG/G	415.1352	11.9 J	3 J	9.71 J	45
Fluorene	NG/G	10.2955	1.6 J	4	0.2 J	3 J
High Molecular Weight PAHs	NG/G	925.4161	36.74	32	23.99	97
Indeno(1,2,3-cd)pyrene	NG/G	41.4174	0.1 J	2	1.645 J	1 J
Low Molecular Weight PAHs	NG/G	189.7005	22.37	22	16.35	42
Naphthalene	NG/G	29.9245	7.8	2 J	1.64 J	1 J
Perylene	NG/G	42.8207	3.1 J	nc	10.14	1 J
Phenanthrene	NG/G	108.849	7.2 J	8 J	5.57 J	17 J
Pyrene	NG/G	295.8494	9.4	19	10.08	34
Total PAHs	NG/G	1658.1881	98.51	121.2	64.555	344.4

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 15
PHASE 2 - OFF SHORE INVESTIGATION
TISSUES SAMPLES - PAH RESULTS
MCALLISTER POINT LANDFILL - CTO 218
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COMPOUND	UNITS	MCL-10-HC-DEP	MCL-11-HC	MCL-11-HC-DEP	MCL-12-HC	MCL-12-HC-DEP
1,6,7-Trimethylnaphthalene	NG/G	1 J	3 J	2 J	3 J	1 J
1-Methylnaphthalene	NG/G	2 J	3 J	3 J	4 J	2 J
1-Methylphenanthrene	NG/G	2 J	2 J	1 J	3 J	2 J
2,6-Dimethylnaphthalene	NG/G	2 J	2 J	1 J	3 J	2 J
2-Methylnaphthalene	NG/G	3 J	7 J	4 J	5 J	3 J
Acenaphthene	NG/G	1 J	1 J	1 J	2 J	1 J
Acenaphthylene	NG/G	6	5 J	6	9	6
Anthracene	NG/G	9 J	8 J	9 J	9 J	10 J
Benzo(a)anthracene	NG/G	4 J	5 J	5 J	7	5 J
Benzo(a)pyrene	NG/G	2 J	3 J	1 J	2 J	3 J
Benzo(b+k)fluoranthene	NG/G	7.9	7.8	5.2	9.3	10.6
Benzo(e)pyrene	NG/G	8	8	5 J	8	8
Benzo(g,h,i)perylene	NG/G	3 J	3 J	2 J	4	4
Biphenyl	NG/G	1 J	2 J	2 J	2 J	1 J
Chrysene	NG/G	13	12	9 J	11	14
Dibenz(a,h)anthracene	NG/G	0.49 U	0.49	0.49	1	1
Fluoranthene	NG/G	42	35	35	47	43
Fluorene	NG/G	3 J	4	3 J	3 J	3 J
High Molecular Weight PAHs	NG/G	95	85	82	110	104
Indeno(1,2,3-cd)pyrene	NG/G	1 J	2 J	1.54 U	2 J	3 J
Low Molecular Weight PAHs	NG/G	38	41	42	46	38
Naphthalene	NG/G	3 J	2	5	5	2
Perylene	NG/G	2 J	1 J	1 J	2 J	3 J
Phenanthrene	NG/G	13 J	14 J	14 J	13 J	13 J
Pyrene	NG/G	34	29	31	42	38
Total PAHs	NG/G	324.9	315.8	293.2	394.3	356.6

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 15
PHASE 2 - OFF SHORE INVESTIGATION
TISSUES SAMPLES - PAH RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	MCL-13-HC-ND	MCL-14-HC-ND	MCL-16-HC-ND	MCL-9-HC	MCL-NSB1-MF	MCL-NSB3-MF
1,6,7-Trimethylnaphthalene	NG/G	1 J	1 J	1 J	1 J	4	4
1-Methylnaphthalene	NG/G	7 J	2 J	2 J	3 J	6	4 J
1-Methylphenanthrene	NG/G	5 J	5 J	4 J	2 J	3 J	1 J
2,6-Dimethylnaphthalene	NG/G	1 J	2 J	2 J	3 J	5	5
2-Methylnaphthalene	NG/G	9 J	6 J	4 J	4 J	9	3 J
Acenaphthene	NG/G	1 J	1 J	1 J	1 J	3	3 J
Acenaphthylene	NG/G	6	6	5 J	6	1 J	3
Anthracene	NG/G	10 J	10 J	12 J	9 J	1 J	1 J
Benzo(a)anthracene	NG/G	3 J	3 J	5 J	13	3	3
Benzo(a)pyrene	NG/G	3 J	3 J	6 J	5 J	3 J	4
Benzo(b+k)fluoranthene	NG/G	11.2	10.4	15.3	19.4	1.95	1.95
Benzo(e)pyrene	NG/G	10	9	13	12	4	4
Benzo(g,h,i)perylene	NG/G	5	4	6	3 J	1.555 U	2
Biphenyl	NG/G	1 J	2 J	1 J	2 J	6	1 J
Chrysene	NG/G	13	12	17	28	5	1 J
Dibenz(a,h)anthracene	NG/G	0.49	1	0.49	1	0.49	0.49
Fluoranthene	NG/G	25	27	34	49	5 J	3 J
Fluorene	NG/G	3 J	3 J	3 J	3 J	2	2
High Molecular Weight PAHs	NG/G	65	69	88	127	26	15
Indeno(1,2,3-cd)pyrene	NG/G	2 J	2 J	3 J	2 J	2	2
Low Molecular Weight PAHs	NG/G	56	42	41	45	30	24
Naphthalene	NG/G	18	6	2	4	2	4
Perylene	NG/G	12	10	11	2 J	5 J	3 J
Phenanthrene	NG/G	9 J	10 J	14 J	18 J	12 J	8 J
Pyrene	NG/G	20	23	25	31	9	3 J
Total PAHs	NG/G	350.2	319.4	371.3	442.4	132.95	101.95

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 15
PHASE 2 - OFF SHORE INVESTIGATION
TISSUES SAMPLES - PAH RESULTS
MCALLISTER POINT LANDFILL - CTO 218
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COMPOUND	UNITS	MCL-NSB4-MF	MCL-NSB6-MF	MCL10-LOB-HPP	MCL10-LOB-MUS	MCL13-LOB-HPP
1,6,7-Trimethylnaphthalene	NG/G	4	3 J	27	1 J	7 J
1-Methylnaphthalene	NG/G	4 J	6	51	19	38
1-Methylphenanthrene	NG/G	2 J	2 J	24	2 J	40
2,6-Dimethylnaphthalene	NG/G	5	2 J	2 J	5.25 U	5 J
2-Methylnaphthalene	NG/G	5 J	9	36	16 J	32
Acenaphthene	NG/G	4 J	2 J	25	2 J	46
Acenaphthylene	NG/G	3	1 J	3	2.885 U	3
Anthracene	NG/G	2 J	2 J	nc	3 J	51
Benzo(a)anthracene	NG/G	3	3	69	7	163
Benzo(a)pyrene	NG/G	3.615 U	1 J	46	3 J	116
Benzo(b + k)fluoranthene	NG/G	4.4	2.6	135	9.1	396
Benzo(e)pyrene	NG/G	1 J	2 J	99	5 J	235
Benzo(g,h,i)perylene	NG/G	2	2	26	4	45
Biphenyl	NG/G	2 J	2 J	6	4 J	6
Chrysene	NG/G	5	5	46	4 J	82
Dibenz(a,h)anthracene	NG/G	0.49	0.49	0.49	0.49 U	0.49
Fluoranthene	NG/G	2 J	3 J	314	22	956
Fluorene	NG/G	4	3 J	29	4	46
High Molecular Weight PAHs	NG/G	12	17	792	52	2107
Indeno(1,2,3-cd)pyrene	NG/G	2	2	17	2 J	31
Low Molecular Weight PAHs	NG/G	40	28	364	68	442
Naphthalene	NG/G	12	2	31	29	2
Perylene	NG/G	7	6 J	12	1 J	64
Phenanthrene	NG/G	10 J	9 J	240	14 J	262
Pyrene	NG/G	1 J	4	316	16	789
Total PAHs	NG/G	143.4	110.6	3095	335.1	6816

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 15
PHASE 2 - OFF SHORE INVESTIGATION
TISSUES SAMPLES - PAH RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	MCL13-LOB-MUS	MCL14-LOB-HPP	MCL14-LOB-MUS	MCL9-LOB-HPP	MCL9-LOB-MUS	NSB1-BM
1,6,7-Trimethylnaphthalene	NG/G	4	18	1 J	65	1 J	9
1-Methylnaphthalene	NG/G	11 J	67	15	33	13	15
1-Methylphenanthrene	NG/G	20	65	10 J	45	2 J	15 J
2,6-Dimethylnaphthalene	NG/G	22	5	2 J	6 J	1 J	13
2-Methylnaphthalene	NG/G	15 J	76	17 J	30	16 J	17 J
Acenaphthene	NG/G	3	37	4 J	21	1 J	46
Acenaphthylene	NG/G	3	3	2 J	5 J	1 J	15
Anthracene	NG/G	3 J	18	2 J	nc	1 J	48
Benzo(a)anthracene	NG/G	10	390	16	142	5 J	75
Benzo(a)pyrene	NG/G	11	61	21	64	5 J	18
Benzo(b + k)fluoranthene	NG/G	209	169	33.8	207	10.4	63.7
Benzo(e)pyrene	NG/G	8	79	13	114	6 J	33
Benzo(g,h,i)perylene	NG/G	8	32	8	44	6	12
Biphenyl	NG/G	23	32	3 J	9 J	3 J	7 J
Chrysene	NG/G	9 J	292	27	50	3 J	113
Dibenz(a,h)anthracene	NG/G	0.49	11	0.49	6	0.49 U	4
Fluoranthene	NG/G	31	1110	101	680	20	439
Fluorene	NG/G	148	33	3 J	94	4	39
High Molecular Weight PAHs	NG/G	87	2914	217	1486	49	876
Indeno(1,2,3-cd)pyrene	NG/G	52	28	9	34	3 J	10
Low Molecular Weight PAHs	NG/G	362	420	71	450	53	470
Naphthalene	NG/G	178	2	32	48	16	32
Perylene	NG/G	6 J	31	5 J	30	2 J	10
Phenanthrene	NG/G	12 J	251	11 J	252	14 J	273
Pyrene	NG/G	25	1050	51	544	16	227
Total PAHs	NG/G	1613	7710	776.8	5043	298.4	3063.7

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 15
PHASE 2 - OFF SHORE INVESTIGATION
TISSUES SAMPLES - PAH RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	UNITS	NSB1-BM-DEP	NSB2-BM	NSB3-BM	NSB3-BM-DEP	NSB4-BM	NSB5-BM	NSB6-BM
1,6,7-Trimethylnaphthalene	NG/G	9	8	17	10	7 J	10	6 J
1-Methylnaphthalene	NG/G	6 J	7 J	7 J	6 J	4 J	8 J	6 J
1-Methylphenanthrene	NG/G	13 J	13 J	15 J	17 J	10 J	12 J	11 J
2,6-Dimethylnaphthalene	NG/G	11	10 J	10 J	6 J	6 J	13	13
2-Methylnaphthalene	NG/G	14 J	10 J	9 J	9 J	7 J	13 J	9 J
Acenaphthene	NG/G	23	12	5 J	3 J	3 J	4 J	3 J
Acenaphthylene	NG/G	12	11	12	11	10	11	12
Anthracene	NG/G	33	32	29	19	19	19	18
Benzo(a)anthracene	NG/G	51	49	48	44	32	26	28
Benzo(a)pyrene	NG/G	7 J	19	16	9	10	9	7 J
Benzo(b+k)fluoranthene	NG/G	36.4	62	49.4	38.8	34.2	34.6	29.9
Benzo(e)pyrene	NG/G	20	29	38	24	17	18	16
Benzo(g,h,i)perylene	NG/G	6	11	14	6	7	8	6
Biphenyl	NG/G	5 J	5 J	7 J	3 J	3 J	4 J	5 J
Chrysene	NG/G	85	102	98	73	68	74	66
Dibenz(a,h)anthracene	NG/G	3	4	4	2	2	2	2
Fluoranthene	NG/G	343	199	227	160	136	151	126
Fluorene	NG/G	23	14	12	7	10	10	7
High Molecular Weight PAHs	NG/G	628	477	523	385	312	324	281
Indeno(1,2,3-cd)pyrene	NG/G	4	10	8	4	5	5	5
Low Molecular Weight PAHs	NG/G	278	206	172	113	112	126	100
Naphthalene	NG/G	11	11	11	6	12	11	11
Perylene	NG/G	3 J	6 J	6 J	4 J	3 J	3 J	2 J
Phenanthrene	NG/G	162	116	94	58	51	58	40
Pyrene	NG/G	139	104	130	97	64	62	52
Total PAHs	NG/G	2039.4	1687	1734.4	1232.8	1041.2	1130.6	962.9

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 15
PHASE 2 - OFF SHORE INVESTIGATION
TISSUES SAMPLES - PAH RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	NSB7-BM	SDA-M1-HC	SDA-S2-HC
1,6,7-Trimethylnaphthalene	NG/G	7 J	1.11 J	1.01 J
1-Methylnaphthalene	NG/G	7 J	1.31 J	3.79 J
1-Methylphenanthrene	NG/G	10 J	7.07 J	15.02 J
2,6-Dimethylnaphthalene	NG/G	17	1.67 J	1.87 J
2-Methylnaphthalene	NG/G	8 J	2.06 J	1.7 J
Acenaphthene	NG/G	3 J	2.26 J	2.31 J
Acenaphthylene	NG/G	12	5.65 J	5.75 J
Anthracene	NG/G	22	12.42 J	18.6
Benzo(a)anthracene	NG/G	26	2.48 J	3.78 J
Benzo(a)pyrene	NG/G	9	1.89 J	3.48 J
Benzo(b+k)fluoranthene	NG/G	32.1	5.4	8.8
Benzo(e)pyrene	NG/G	17	5.32 J	8.8
Benzo(g,h,i)perylene	NG/G	7	4	7.86
Biphenyl	NG/G	4 J	1.7 J	3.71 J
Chrysene	NG/G	80	6.83 J	11.88
Dibenz(a,h)anthracene	NG/G	2	0.28 J	0.1 J
Fluoranthene	NG/G	156	25.83	73.76
Fluorene	NG/G	11	1.42 J	1.24 J
High Molecular Weight PAHs	NG/G	324	63.54	169.84
Indeno(1,2,3-cd)pyrene	NG/G	5	0.67 J	2.2 J
Low Molecular Weight PAHs	NG/G	117	36.72	50.06
Naphthalene	NG/G	7	1.37 J	0.48 J
Perylene	NG/G	3 J	9.57	7.92
Phenanthrene	NG/G	54	11.54 J	19.98
Pyrene	NG/G	51	26.23	76.84
Total PAHs	NG/G	1100.1	138.08	280.88

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 16
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - PCB RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	JCC-D1-LOB-HPP	JCC-D1-LOB-MUS	JCC-M1-HC	JCC-S1-HC	MCL-10-HC
PCB77/154	NG/G	151.4758	3.7511 J	13.9	5.057 J	12.3
101 (2,2',4,4',6')	NG/G	164.82	3.877	6.132	2.066 J	12.75
104 (2,2',4,6,6')	NG/G	38.2924	0.3959 J	2.35	0.163 J	0.8275 J
105 (2,3,3'4,4')	NG/G	149.4312	4.7084 J	0.781 J	0.95 J	2.4371 J
118 (2,3'4,4',5)	NG/G	482.0016	11.5198	3.388 J	2.431 J	8.3242
126 (3,3'4,4',6)	NG/G	11.2028	0.02 J	2.739 J	0.02 J	1.6318 J
128 (2,2',3,3'4,4')	NG/G	171.4469	3.6317	0.656 J	0.336 J	1.6841
138 (2,2',3,4,4',5)	NG/G	756.2761	18.1627	6.687	2.603 J	10.5952
153 (2,2',4,4',5,5')	NG/G	826.5223	24.3187	8.956	3.191 J	14.8971
170 (2,2',3,3'4,4',5)	NG/G	112.8894	2.3916	2.353	1	1.2771
18 (2,2',5)	NG/G	7.0802	1.1725 J	2.522 J	4.433 J	0.6513 J
180 (2,2'3,4,4',5,5')	NG/G	287.6029	6.6217	3.932	1.654	5.7216
187 (2,2',3,4',5,5',6)	NG/G	302.0631	9.4476	3.726	0.76 J	5.9414
188 (2,2',3,4',5,6,6')	NG/G	194.9265	4.3644	3.638	0.403 J	3.564
195 (2,2',3,3',4,4',5,6)	NG/G	14.9437	0.5083 J	2.451	1.072	1.5501
200 (2,2',3,3',4,5',6,6')	NG/G	48.4477	1.1152	1.317	0.169 J	0.7137
206 (2,2'3,3'4,4'5,5'6)	NG/G	50.2116	1.7811	2.409	0.793 J	1.5045
209 (2,2',3,3',4,4',5,5',6,6')	NG/G	23.7801	1.4122 J	1.737	0.729 J	1.3741 J
28 (2,4,4')	NG/G	89.9941	1.2676 J	3.171	1.192 J	1.77 J
29 (2,4,5)	NG/G	4.5165	0.1673 J	1.255 J	1.515 J	0.8
44 (2,2'3,5')	NG/G	22.3951	0.1491 J	1.927	1.189	2.4035
50 (2,2,4,6)	NG/G	29.3734	0.6419 J	0.608 J	0.035 J	1.1648 J
52 (2,2',5,5)	NG/G	79.9948	0.5158 J	2.558 J	0.814 J	3.9335
66 (2,3'4,4')	NG/G	148.42	4.2607 J	7.076 J	4.208 J	3.1834 J
8 (2,4)	NG/G	12.0008	0.055 J	2.35	0.055 J	0.4279 J
87 (2,2',3,4,5')	NG/G	29.7309	0.095 J	2.806	0.895 J	3.0075
Total PCBs (Sum Congenersx2)	NG/G	4209.8402	106.3524	91.425	37.733	104.4353

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 16
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - PCB RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	MCL-10-HC-DEP	MCL-11-HC	MCL-11-HC-DEP	MCL-12-HC	MCL-12-HC-DEP
PCB77/154	NG/G	10.4	8.2	7.9	13.5	10.5
101 (2,2',4,4',6')	NG/G	12.468	10.425	8.189	12.686	11.223
104 (2,2',4,6,6')	NG/G	0.6545 J	0.6077 J	0.6886 J	0.7466 J	0.7776 J
105 (2,3,3'4,4')	NG/G	2.1788 J	1.501 J	1.3405 J	3.623 J	2.1921 J
118 (2,3'4,4',5)	NG/G	9.7741	6.454	4.5522 J	7.4187	6.0038
126 (3,3'4,4',6)	NG/G	1.5674 J	1.3192 J	1.1201 J	1.7153 J	1.7541 J
128 (2,2',3,3'4,4')	NG/G	1.6415	1.2738	1.0468	2.377	1.6176
138 (2,2',3,4,4',5)	NG/G	9.5584	8.7528	6.5625	9.1233	9.8314
153 (2,2',4,4',5,5')	NG/G	13.9243	12.299	9.3206	12.7857	12.6084
170 (2,2',3,3'4,4',5)	NG/G	1.2806	1.1417	0.7798	1.1169	1.335
18 (2,2',5)	NG/G	0.4218 J	1.3688 J	0.7041 J	0.7453 J	0.6507 J
180 (2,2'3,4,4',5,5')	NG/G	5.8142	4.9876	3.684	5.1885	5.5833
187 (2,2',3,4',5,5',6)	NG/G	6.1517	5.0563	4.1795	6.4745	5.995
188 (2,2',3,4',5,6,6')	NG/G	3.7976	2.8051	2.3873	4.0409	3.2914
195 (2,2',3,3',4,4',5,6)	NG/G	2.0271	1.4908	1.3147	2.1716	2.004
200 (2,2',3,3',4,5',6,6')	NG/G	0.7401	0.5091	0.6402	0.6358	0.6604
206 (2,2'3,3'4,4'5,5'6)	NG/G	2.6374	1.577	1.6656	1.746	2.6657
209 (2,2',3,3',4,4',5,5',6,6')	NG/G	1.6939	1.1733 J	1.3683 J	1.5012	1.8025
28 (2,4,4')	NG/G	1.7639 J	1.9296 J	1.6358 J	2.1453 J	2.2503 J
29 (2,4,5)	NG/G	0.8	0.8	0.8	0.1417 J	0.8
44 (2,2'3,5')	NG/G	2.0126	1.5763	1.5962	2.3822	2.3221
50 (2,2,4,6)	NG/G	0.8054 J	0.789 J	0.8192 J	1.2154 J	0.9836 J
52 (2,2',5,5)	NG/G	3.8278	3.5385 J	3.451 J	3.5814 J	4.4609
66 (2,3'4,4')	NG/G	2.2968 J	2.3441 J	1.92 J	4.3605 J	3.7934 J
8 (2,4)	NG/G	0.312 J	0.263 J	0.423 J	0.4448 J	0.3796 J
87 (2,2',3,4,5')	NG/G	3.2238	2.0914 J	1.6475 J	4.492	2.7406 J
Total PCBs (Sum Congenersx2)	NG/G	101.7737	84.2742	69.7367	106.3594	98.2265

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 16
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - PCB RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	UNITS	MCL-13-HC-ND	MCL-14-HC-ND	MCL-16-HC-ND	MCL-9-HC	MCL-NSB1-MF
PCB77/154	NG/G	10.6	14.8	8.3	15.1	17.8
101 (2,2',4,4',6')	NG/G	11.598	13.304	9.37	15.625	211.203
104 (2,2',4,6,6')	NG/G	1.7245 J	1.4213 J	0.7964 J	1.1044 J	0.7086 J
105 (2,3,3'4,4')	NG/G	1.3302 J	1.2306 J	1.6358 J	10.2953	93.2205
118 (2,3'4,4',5)	NG/G	6.8929	6.5559	5.6791	8.4659	218.3512
126 (3,3'4,4',6)	NG/G	5.9197	5.3147	2.5	4.3528 J	2.5
128 (2,2',3,3'4,4')	NG/G	3.3178	3.0817	1.462	3.8418	63.1758
138 (2,2',3,4,4',5)	NG/G	17.8592	15.4832	8.7143	23.5228	364.4699
153 (2,2',4,4',5,5')	NG/G	24.0172	20.2822	10.9961	25.2253	328.5278
170 (2,2',3,3'4,4',5)	NG/G	3.1017	3.4061	0.9154	5.7993	54.1756
18 (2,2',5)	NG/G	2.0635 J	2.3633 J	1.3201 J	0.5834 J	0.5443 J
180 (2,2'3,4,4',5,5')	NG/G	9.8788	11.5917	5.1155	11.1395	140.4579
187 (2,2',3,4',5,5',6)	NG/G	8.3122	10.761	5.6162	9.8508	108.5344
188 (2,2',3,4',5,6,6')	NG/G	6.7425	5.3181	3.1458	5.3332	62.9213
195 (2,2',3,3',4,4',5,6)	NG/G	0.5288 J	0.4353 J	0.342 J	0.7503 J	5.5833
200 (2,2',3,3',4,5',6,6')	NG/G	0.7571	2.5677	0.5204	1.1791	15.6522
206 (2,2'3,3'4,4'5,5'6)	NG/G	2.3023	2.7139	2.5599	1.481	8.6944
209 (2,2',3,3',4,4',5,5',6,6')	NG/G	2.1468	3.1042	3.0233	1.2688 J	3.6214
28 (2,4,4')	NG/G	1.2256 J	3.1014	1.6787 J	1.5698 J	8.3284
29 (2,4,5)	NG/G	0.4943 J	0.8	0.4094 J	0.1374 J	0.8
44 (2,2'3,5')	NG/G	2.0674	2.6116	1.6795	2.5856	4.0597
50 (2,2,4,6)	NG/G	9.5732	1.3031 J	1.5135 J	1.4094 J	4.7999
52 (2,2',5,5)	NG/G	5.4846	3.793	3.3657 J	3.6464 J	74.4608
66 (2,3'4,4')	NG/G	2.9026 J	3.85	7.7249	13.3243	83.2604
8 (2,4)	NG/G	2.35	2.35	1.1401 J	0.4093 J	0.8346 J
87 (2,2',3,4,5')	NG/G	2.5436 J	2.8098	2.0454 J	4.5089	59.27
Total PCBs (Sum Congenersx2)	NG/G	145.7346	144.3539	91.5698	172.5098	1935.9553

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 16
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - PCB RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	MCL-NSB3-MF	MCL-NSB4-MF	MCL-NSB6-MF	MCL10-LOB-HPP	MCL10-LOB-MUS
PCB77/154	NG/G	11	203	13.2	81.1	9.3
101 (2,2',4,4',6')	NG/G	321.183	407.21	440.782	68.976	5.986
104 (2,2',4,6,6')	NG/G	2.35	2.5336 J	0.3825 J	0.6934 J	1.2978 J
105 (2,3,3'4,4')	NG/G	132.7818	170.6488	164.8235	130.244	3.7441 J
118 (2,3'4,4',5)	NG/G	305.1673	360.5827	438.4052	270.9601	17.095
126 (3,3'4,4',6)	NG/G	2.5	11.7409	2.5	57.6826	4.3818 J
128 (2,2',3,3'4,4')	NG/G	87.1601	100.9711	97.0979	101.2655	3.8047
138 (2,2',3,4,4',5)	NG/G	485.3539	536.4141	556.3761	359.8994	14.6214
153 (2,2',4,4',5,5')	NG/G	428.2251	405.5168	510.6872	446.6897	20.1029
170 (2,2',3,3'4,4',5)	NG/G	65.2085	100.3517	76.4793	73.7599	2.3141
18 (2,2',5)	NG/G	0.4018 J	2.2155 J	0.8034 J	5.0347 J	3.0122 J
180 (2,2'3,4,4',5,5')	NG/G	177.1321	189.7369	165.7643	178.7958	5.0961
187 (2,2',3,4',5,5',6)	NG/G	139.3577	121.4103	129.2851	150.7707	12.4971
188 (2,2',3,4',5,6,6')	NG/G	81.609	80.889	92.9478	100.6205	4.1069
195 (2,2',3,3',4,4',5,6)	NG/G	7.0526	11.3534	6.4792	9.8787	0.5327 J
200 (2,2',3,3',4,5',6,6')	NG/G	19.9822	21.5945	20.6781	23.3329	4.5614
206 (2,2'3,3'4,4'5,5'6)	NG/G	10.8305	11.2402	15.7496	28.5678	2.1058
209 (2,2',3,3',4,4',5,5',6,6')	NG/G	3.9208	9.0107	8.3561	11.1408	2.0071
28 (2,4,4')	NG/G	16.853	14.5584	8.4418	64.5429	1.4329 J
29 (2,4,5)	NG/G	0.0658 J	0.8	0.8	0.8	0.4042 J
44 (2,2'3,5')	NG/G	6.6708	53.9131	5.646	1.6576	0.4856 J
50 (2,2,4,6)	NG/G	7.6852	11.6384	7.235	12.894	1.4
52 (2,2',5,5)	NG/G	136.8409	249.344	219.3246	37.947	1.2527 J
66 (2,3'4,4')	NG/G	137.0505	220.9128	176.3408	97.7614	6.5443 J
8 (2,4)	NG/G	0.296 J	9.2891	2.35	3.2964 J	2.35
87 (2,2',3,4,5')	NG/G	94.8932	167.3106	120.5022	6.959	1.1161 J
Total PCBs (Sum Congenersx2)	NG/G	2681.5716	3474.1862	3281.4377	2325.2709	131.5526

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 16
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - PCB RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	UNITS	MCL13-LOB-HPP	MCL13-LOB-MUS	MCL14-LOB-HPP	MCL14-LOB-MUS	MCL9-LOB-HPP
PCB77/154	NG/G	44	8.6	84.8	6.2	52.7
101 (2,2',4,4',6')	NG/G	40.667	6.647	67.35	4.741	47.403
104 (2,2',4,6,6')	NG/G	3.1949 J	3.1854 J	6.4257	3.0818 J	2.5697 J
105 (2,3,3'4,4')	NG/G	76.3919	4.1	116.8334	4.1	118.4233
118 (2,3'4,4',5)	NG/G	203.1528	18.9705	290.4822	16.1061	299.9469
126 (3,3'4,4',6)	NG/G	48.532	9.6131	64.5076	1.9599 J	66.3247
128 (2,2',3,3'4,4')	NG/G	78.3493	10.0587	106.0185	8.6999	109.798
138 (2,2',3,4,4',5)	NG/G	278.3587	22.5443	384.0201	20.2627	387.847
153 (2,2',4,4',5,5')	NG/G	351.4335	31.2428	493.412	26.3728	498.8153
170 (2,2',3,3'4,4',5)	NG/G	58.7535	8.6745	78.2925	4.0669	77.4222
18 (2,2',5)	NG/G	3.911 J	2.8265 J	7.254	3.2322 J	3.7044 J
180 (2,2'3,4,4',5,5')	NG/G	136.8991	9.8161	204.4417	9.5581	202.9825
187 (2,2',3,4',5,5',6)	NG/G	122.1219	16.1507	168.6138	12.804	170.5767
188 (2,2',3,4',5,6,6')	NG/G	76.2428	5.9544	107.8371	3.7882	108.994
195 (2,2',3,3',4,4',5,6)	NG/G	7.2645	2.0632	7.6674	0.6713 J	9.5392
200 (2,2',3,3',4,5',6,6')	NG/G	15.1849	0.6081	23.8626	0.1	26.7388
206 (2,2'3,3'4,4'5,5'6)	NG/G	17.4196	1.2117	29.3185	1.2207	29.6491
209 (2,2',3,3',4,4',5,5',6,6')	NG/G	6.7574	0.6303 J	13.404	0.499 J	13.5816
28 (2,4,4')	NG/G	62.1708	1.55	44.4961	1.55	42.898
29 (2,4,5)	NG/G	0.8	0.9657 J	0.8	0.544 J	0.8
44 (2,2'3,5')	NG/G	7.8764	8.1391	4.7978	3.4257	2.7088
50 (2,2,4,6)	NG/G	18.8994	6.8048	11.9121	7.2342	7.8269
52 (2,2',5,5)	NG/G	38.4242	8.076	21.8842	2.1867 J	18.5664
66 (2,3'4,4')	NG/G	74.2915	7.6834 J	95.2327	5.6793 J	104.5788
8 (2,4)	NG/G	0.193 J	2.35	0.5479 J	2.35	3.2468 J
87 (2,2',3,4,5')	NG/G	3.9099	1.4	10.7342	1.4	7.1361
Total PCBs (Sum Congenersx2)	NG/G	1775.1999	199.8664	2444.946	151.8345	2414.7782

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 16
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - PCB RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	MCL9-LOB-MUS	NSB1-BM	NSB1-BM-DEP	NSB2-BM	NSB3-BM	NSB3-BM-DEP
PCB77/154	NG/G	9.6	50.5	34.8	42.8	107	95
101 (2,2',4,4',6')	NG/G	4.623	46.554	37.255	38.647	90.163	84.244
104 (2,2',4,6,6')	NG/G	1.3573 J	1.5833 J	1.6337 J	2.0031 J	1.4291 J	2.2416 J
105 (2,3,3'4,4')	NG/G	1.5155 J	12.6778	8.0816 J	13.7522	29.7359	28.5829
118 (2,3'4,4',5)	NG/G	17.2131	35.873	24.2414	32.6309	127.4684	59.5533
126 (3,3'4,4',6)	NG/G	2.8663 J	1.3485 J	4.8586 J	5.8891	7.9267	9.0521
128 (2,2',3,3'4,4')	NG/G	4.3143	10.6733	7.5608	9.806	21.1125	21.1659
138 (2,2',3,4,4',5)	NG/G	14.3552	61.226	45.9162	51.1364	94.1236	100.6009
153 (2,2',4,4',5,5')	NG/G	19.9493	61.5481	48.3863	51.8332	82.5828	91.0131
170 (2,2',3,3'4,4',5)	NG/G	2.1757	5.2552	4.4771	11.3555	3.5445	4.2363
18 (2,2',5)	NG/G	3.4016 J	5.4414 J	5.5528 J	8.7152	28.6738	21.1728
180 (2,2'3,4,4',5,5')	NG/G	7.5545	16.5591	13.6237	15.8467	12.8532	18.3819
187 (2,2',3,4',5,5',6)	NG/G	10.3105	20.2198	16.6277	18.3382	22.5257	27.657
188 (2,2',3,4',5,6,6')	NG/G	3.758	11.3672	8.5459	10.0507	16.1015	16.9686
195 (2,2',3,3',4,4',5,6)	NG/G	0.3989 J	0.3412 J	0.4707 J	0.4817 J	0.1846 J	0.1349 J
200 (2,2',3,3',4,5',6,6')	NG/G	3.8145	2.2336	1.7688	2.4161	3.576	3.9935
206 (2,2'3,3'4,4'5,5'6)	NG/G	2.5909	0.3956 J	0.3822 J	0.4447 J	1.1235	0.3686 J
209 (2,2',3,3',4,4',5,5',6,6')	NG/G	1.7499	0.1439 J	0.3024 J	0.1694 J	0.1457 J	0.1985 J
28 (2,4,4')	NG/G	1.5424 J	15.0804	11.7152	26.687	60.3449	39.4151
29 (2,4,5)	NG/G	0.114 J	0.095 J	0.1475 J	0.3951 J	0.7375 J	0.3396 J
44 (2,2'3,5')	NG/G	1.8162	14.2998	11.2056	14.7027	39.9076	36.0738
50 (2,2,4,6)	NG/G	1.4	10.5941	7.426	16.4012	36.0033	27.0994
52 (2,2',5,5)	NG/G	0.692 J	18.902	16.8656	24.0888	51.5661	40.2386
66 (2,3'4,4')	NG/G	1.9076 J	15.765	10.4375	11.81	28.2415	32.1593
8 (2,4)	NG/G	2.35	1.7664 J	1.4838 J	1.9536 J	7.0437	5.2704
87 (2,2',3,4,5')	NG/G	1.3098 J	19.4181	12.8898	17.0214	45.5238	40.3218
Total PCBs (Sum Congenersx2)	NG/G	122.6806	439.8618	336.6559	429.3757	919.6391	805.4842

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 16
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - PCB RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	UNITS	NSB4-BM	NSB5-BM	NSB6-BM	NSB7-BM	SDA-M1-HC	SDA-S2-HC
PCB77/154	NG/G	72.8	92.6	105	68.6	8.272	15.507
101 (2,2',4,4',6')	NG/G	68.758	76.521	86.566	62.148	5.575	9.763
104 (2,2',4,6,6')	NG/G	1.2369 J	1.2585 J	3.1104 J	1.5946 J	0.05 J	0.05 J
105 (2,3,3'4,4')	NG/G	18.1249	26.0922	38.6911	23.3526	1.261 J	2.222 J
118 (2,3'4,4',5)	NG/G	48.2787	50.6444	73.5344	61.887	3.689 J	7.329
126 (3,3'4,4',6)	NG/G	6.7123	9.3812	10.072	8.5322	0.02 J	1.64 J
128 (2,2',3,3'4,4')	NG/G	15.0557	16.5784	25.7255	16.6748	0.535 J	1.071
138 (2,2',3,4,4',5)	NG/G	77.1898	85.9672	108.494	83.9915	7.194	13.528
153 (2,2',4,4',5,5')	NG/G	76.0116	83.7262	92.0326	80.7586	11.489	19.963
170 (2,2',3,3'4,4',5)	NG/G	2.8981	4.4269	5.0456	5.6795	1.235	2.367
18 (2,2',5)	NG/G	10.9912	17.7923	6.6757	4.6192 J	1.007 J	0.626 J
180 (2,2'3,4,4',5,5')	NG/G	10.4186	13.7949	15.6873	18.0569	4.254	10.443
187 (2,2',3,4',5,5',6)	NG/G	24.6182	25.6875	27.65	26.056	2.957	6.45
188 (2,2',3,4',5,6,6')	NG/G	14.4643	21.5822	20.0227	15.9944	1.908	4.329
195 (2,2',3,3',4,4',5,6)	NG/G	0.3497 J	0.3972 J	0.3499 J	0.6719 J	1.541	3.369
200 (2,2',3,3',4,5',6,6')	NG/G	3.8096	3.5902	4.2222	3.2548	0.175 J	0.408
206 (2,2'3,3'4,4'5,5'6)	NG/G	0.763 J	0.5237 J	0.579 J	0.462 J	1.625	3.935
209 (2,2',3,3',4,4',5,5',6,6')	NG/G	0.2946 J	0.1138 J	0.388 J	0.204 J	1.275 J	3.913
28 (2,4,4')	NG/G	18.1693	23.2	11.5204	8.6294	0.005 J	3.994
29 (2,4,5)	NG/G	0.174 J	0.3 J	0.3601 J	0.1145 J	0.05 J	0.05 J
44 (2,2'3,5')	NG/G	22.0899	25.9499	22.9314	13.7064	0.337 J	1.844
50 (2,2,4,6)	NG/G	11.7869	16.6767	9.4449	6.9141	0.035 J	0.035 J
52 (2,2',5,5)	NG/G	26.4236	31.9497	29.7906	17.5177	2.998 J	5.36
66 (2,3'4,4')	NG/G	23.6402	23.856	20.7766	15.2916	6.088 J	10.843
8 (2,4)	NG/G	3.3849 J	6.3576	2.2458 J	1.7116 J	0.055 J	0.537 J
87 (2,2',3,4,5')	NG/G	28.797	35.1973	44.2409	26.6455	1.31 J	2.581 J
Total PCBs (Sum Congenersx2)	NG/G	587.2411	694.1651	765.1569	573.0688	64.94	132.157

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 17
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - PESTICIDE RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	JCC-D1-LOB-HPP	JCC-D1-LOB-MUS	JCC-M1-HC	JCC-S1-HC	MCL-10-HC
Aldrin	NG/G	nc	nc	nc	nc	nc
Hexachlorobenzene	NG/G	12.1	0.27 J	1.47	1.33	0.4
Mirex	NG/G	40.7	0.6	0.16 U	0.16 U	0.3 J
o,p'-DDE	NG/G	nc	nc	nc	nc	nc
p,p'-DDE	NG/G	67.3	6.8	5.17	2.08	6.3

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 17
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - PESTICIDE RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	UNITS	MCL-10-HC-DEP	MCL-11-HC	MCL-11-HC-DEP	MCL-12-HC	MCL-12-HC-DEP
Aldrin	NG/G	nc	nc	nc	nc	nc
Hexachlorobenzene	NG/G	0.4	0.4	0.4	0.4	0.5
Mirex	NG/G	0.4	0.3 J	0.2 J	0.4	0.3 J
o,p'-DDE	NG/G	nc	nc	nc	nc	nc
p,p'-DDE	NG/G	5.8	3.3	3.1	6.6	5.5

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 17
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - PESTICIDE RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	MCL-13-HC-ND	MCL-14-HC-ND	MCL-16-HC-ND	MCL-9-HC	MCL-NSB1-MF
Aldrin	NG/G	nc	nc	nc	nc	nc
Hexachlorobenzene	NG/G	0.33	0.41	0.8	0.4	0.9
Mirex	NG/G	0.85	0.44	0.5	nc	27.8
o,p'-DDE	NG/G	nc	nc	nc	nc	nc
p,p'-DDE	NG/G	4.79	4.53	4	6.5	88.3

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 17
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - PESTICIDE RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	MCL-NSB3-MF	MCL-NSB4-MF	MCL-NSB6-MF	MCL10-LOB-HPP	MCL10-LOB-MUS
Aldrin	NG/G	nc	nc	nc	nc	nc
Hexachlorobenzene	NG/G	1.2	0.9	1.05	7.56	0.22 J
Mirex	NG/G	33.4	29.8	18.4	0.16 U	0.16 U
o,p'-DDE	NG/G	nc	nc	nc	nc	nc
p,p'-DDE	NG/G	111	70.1	87.3	343	4.73

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 17
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - PESTICIDE RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	MCL13-LOB-HPP	MCL13-LOB-MUS	MCL14-LOB-HPP	MCL14-LOB-MUS	MCL9-LOB-HPP
Aldrin	NG/G	nc	nc	nc	nc	nc
Hexachlorobenzene	NG/G	8.94	0.44	9.69	0.72	10.1
Mirex	NG/G	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
o,p'-DDE	NG/G	nc	nc	nc	nc	nc
p,p'-DDE	NG/G	301	11.3	402	8.4	423

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 17
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - PESTICIDE RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	UNITS	MCL9-LOB-MUS	NSB1-BM	NSB1-BM-DEP	NSB2-BM	NSB3-BM	NSB3-BM-DEP
Aldrin	NG/G	nc	nc	nc	nc	nc	nc
Hexachlorobenzene	NG/G	0.32	0.3 J	0.3 J	0.3 J	0.3 J	0.2 J
Mirex	NG/G	0.16 U	2.2	1.5	3.5	1.8	2.3
o,p'-DDE	NG/G	nc	nc	nc	nc	nc	nc
p,p'-DDE	NG/G	5.3	19	14.9	13.7	25.2	23.1

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 17
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - PESTICIDE RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	NSB4-BM	NSB5-BM	NSB6-BM	NSB7-BM	SDA-M1-HC	SDA-S2-HC
Aldrin	NG/G	nc	nc	nc	nc	nc	nc
Hexachlorobenzene	NG/G	0.4	0.4	0.5	0.4	0.7	0.74
Mirex	NG/G	1.3	1.9	2.5	2.2	0.08 J	0.16 J
o,p'-DDE	NG/G	nc	nc	nc	nc	nc	nc
p,p'-DDE	NG/G	19.3	24.9	37.9	36.3	2.72	8.57

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 18
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - BUTYLTIN RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	JCC-D1-LOB-HPP	JCC-D1-LOB-MUS	JCC-M1-HC	JCC-S1-HC	MCL-10-HC
Dibutyltin	NG/G	0.28 J	2.39 J			1.28 J
Monobutyltin	NG/G	0.26 J	0.09 J			1.05 J
Tetraibutyltin	NG/G	12.13 J	0.28 J			1.94 J
Tributyltin	NG/G	0.73 J	21.88 J			36.77

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 18
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - BUTYLTIN RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	MCL-10-HC-DEP	MCL-11-HC	MCL-11-HC-DEP	MCL-12-HC	MCL-12-HC-DEP
Dibutyltin	NG/G	1.58 J	8.38 J	2.81 J	0.88 J	0.48 J
Monobutyltin	NG/G	0.19 J	1.98 J	1.28 J	0.21 J	0.54 J
Tetraibutyltin	NG/G	0.45 J	1.07 J	0.7 J	0.26 J	0.04 J
Tributyltin	NG/G	39.31	37.95	44.2	28.05	39.41

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 18
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - BUTYLTIN RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	UNITS	MCL-13-HC-ND	MCL-14-HC-ND	MCL-16-HC-ND	MCL-9-HC	MCL-NSB1-MF
Dibutyltin	NG/G	0.95 J	1.51 J	0.29 J	0.68 J	0.23 J
Monobutyltin	NG/G	0.18 J	0.99 J	0.13 J	2.66 J	0.45 J
Tetraibutyltin	NG/G	0.5 J	5.6 J	0.5 J	1.51 J	0.43 J
Tributyltin	NG/G	23.79	64.76	16.76	67.46	7.51 J

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 18
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - BUTYLTIN RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	UNITS	MCL-NSB3-MF	MCL-NSB4-MF	MCL-NSB6-MF	MCL10-LOB-HPP	MCL10-LOB-MUS
Dibutyltin	NG/G			0.42 J	0.76 J	0.66 J
Monobutyltin	NG/G			0.69 J	0.5 J	0.64 J
Tetraibutyltin	NG/G			0.47 J	2.33 J	0.26 J
Tributyltin	NG/G			3.97 J	0.66 J	0.22 J

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 18
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - BUTYLTIN RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	UNITS	MCL13-LOB-HPP	MCL13-LOB-MUS	MCL14-LOB-HPP	MCL14-LOB-MUS	MCL9-LOB-HPP
Dibutyltin	NG/G			8.85 J	0.1 J	0.03 J
Monobutyltin	NG/G			2.72 J	0.62 J	0.11 J
Tetraibutyltin	NG/G			16.31 J	0.26 J	1.44 J
Tributyltin	NG/G			1.44 J	0.35 J	0.28 J

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 18
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - BUTYLTIN RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	MCL9-LOB-MUS	NSB1-BM	NSB1-BM-DEP	NSB2-BM	NSB3-BM	NSB3-BM-DEP
Dibutyltin	NG/G	0.35 J	0.85 J	0.99 J	2.23 J	9.25 J	2.4 J
Monobutyltin	NG/G	0.6 J	2.7 J	1.89 J	0.88 J	15.31 J	1.93 J
Tetraibutyltin	NG/G	0.07 J	3.9 J	5.28 J	0.35 J	5.57 J	0.09 J
Tributyltin	NG/G	0.65 J	20.74	34.07	16.2	39.49	21.86

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 18
PHASE 2 - OFF SHORE INVESTIGATION
TISSUE SAMPLES - BUTYLTIN RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	UNITS	NSB4-BM	NSB5-BM	NSB6-BM	NSB7-BM	SDA-M1-HC	SDA-S2-HC
Dibutyltin	NG/G	0.92 J	2.83 J	0.71 J	1.43 J		
Monobutyltin	NG/G	1.24 J	0.13 J	0.57 J	0.05 J		
Tetraibutyltin	NG/G	0.21 J	0.35 J	2.83 J	0.34 J		
Tributyltin	NG/G	15.63	16.95	18	13.96		

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

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PHASE I TISSUE DATA

TABLE 19
TISSUE SAMPLES COLLECTED BY TRC
METALS RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	C1-1/2/3	C1-4	OS-22	OS-23	OS-24	OS-25	OS-26	OS-27	OS-28
Aluminum	UG/G	101	82.7		157	246	262	194	73.3	94.9
Arsenic	UG/G	11.3	19.3	16	13.7	15.3	14.9	13.2	15.4	16.2
Cadmium	UG/G	0.582	0.645		1.77	1.52	1.61	1.7	0.652	0.641
Chromium	UG/G	7.57	8.73		37.1	52.9	41.2	24.8	10.1	26.2
Copper	UG/G	10.6	8.5	13.8	7.9	12	11.2	7	8.12	7.71
Iron	UG/G	316	203	1160	764	918	882	834	263	347
Lead	UG/G	0.853	0.986		16.7	11.6	14.6	16.7	2.16	1.75
Manganese	UG/G	29.7	20.2	104	80.5	77.7	114	139	53.9	52.1
Mercury	UG/G	0.082	0.129	0.082	0.097	0.091	0.087	0.101	0.06	0.068
Nickel	UG/G	13.1	13.5	48.1	27.3	31.8	28.3	19.4	11	20.9
Silver	UG/G		0.929		0.683	0.771	0.812	0.845	1.11	0.881
Zinc	UG/G	112	97.5	167	128	119	150	162	94.2	108

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 20
TISSUE SAMPLES COLLECTED BY TRC
PAH RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	C1-1/2/3	C1-4	OS-22	OS-23	OS-24	OS-25	OS-26
Benzo(k)fluoranthene	NG/G	2.3 J	2.36 J	12.18	10.09	9.23	29.78	13.94
Acenaphthene	NG/G	1.71 J	1.43 J	1.93 J	2.81 J	2.41 J	5.47	2.27 J
Acenaphthylene	NG/G	1.37 J	1.66 J	3.45 J	2.4 J	2.91 J	4.36 J	3.23 J
Anthracene	NG/G	0.77 J	1.12 J	3.59 J	4.15 J	3.52 J	9.93	4.13 J
Benzo(a)anthracene	NG/G	3.57 J	3.18 J	17.8	17.01	16.72	50.97	24.17
Benzo(a)pyrene	NG/G	1.6 J	2.62 J	12.38	11.82	11.37	37.29	15.39
Benzo(b+k)fluoranthene	NG/G	2.3	2.36	12.18	10.09	9.23	29.78	13.94
Benzo(e)pyrene	NG/G	5.57	6.49	25.3	22.35	21.5	51.24	28.61
Benzo(g,h,i)perylene	NG/G	5.63	6.31	13.23	11.6	12.03	37.71	15.32
Biphenyl	NG/G	17.67	16.84	19.61	10.86	20.77	23.48	17.27
Chrysene	NG/G	4.7 J	3.53 J	16.96	14.16	17.57	37.99	21.29
Dibenz(a,h)anthracene	NG/G	0.79 J	1.12 J	1.88 J	2.05 J	1.91 J	6.29 J	2.71 J
Fluoranthene	NG/G	13.24	11.36	39.7	45.22	40.49	86.22	52.99
Fluorene	NG/G	1.25 J	0.99 J	3.02 J	2.7 J	2.81 J	6.71	2.49 J
High Molecular Weight PAHs	NG/G	35.95	32.91	127.53	93.53	126.27	201.72	137.45
Indeno(1,2,3-cd)pyrene	NG/G	4.07 J	4.96 J	10.54	9.56	9.38	32.94	13.02
Low Molecular Weight PAHs	NG/G	119.82	112.59	132.57	93.53	146.15	201.72	137.45
Naphthalene	NG/G	98.55	93.28	99.16	61.58	112.36	123.39	102.83
Perylene	NG/G	1.1 J	1.59 J	4.66 J	4.78 J	4.52 J	17.22	7.29
Phenanthrene	NG/G	16.17	14.11	21.42	19.89	22.14	51.86	22.5
Pyrene	NG/G	12.05	11.1	38.81	41.19	38.21	76.12	47.95
Total PAHs	NG/G	192.11	184.05	345.62	294.22	349.85	688.97	397.4

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 20
TISSUE SAMPLES COLLECTED BY TRC
PAH RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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ANAL FULL	UNITS	OS-27	OS-28
Benzo(k)fluoranthene	NG/G	5.2	9.18
Acenaphthene	NG/G	2 J	4.36
Acenaphthylene	NG/G	2.45 J	2.24 J
Anthracene	NG/G	3.72	6.1
Benzo(a)anthracene	NG/G	11.38	18.92
Benzo(a)pyrene	NG/G	7.41	11.76
Benzo(b+k)fluoranthene	NG/G	5.2	9.18
Benzo(e)pyrene	NG/G	13.4	19.45
Benzo(g,h,i)perylene	NG/G	9.63	16.36
Biphenyl	NG/G	13.94	21.86
Chrysene	NG/G	10.77	17.3
Dibenz(a,h)anthracene	NG/G	1.54 J	2.68 J
Fluoranthene	NG/G	37.51	54.88
Fluorene	NG/G	2.52 J	4.93
High Molecular Weight PAHs	NG/G	104.41	153.54
Indeno(1,2,3-cd)pyrene	NG/G	7.16	11.09
Low Molecular Weight PAHs	NG/G	110.29	157.11
Naphthalene	NG/G	80.04	98.33
Perylene	NG/G	3.81	4.89
Phenanthrene	NG/G	19.56	41.15
Pyrene	NG/G	35.8	48
Total PAHs	NG/G	267.84	393.48

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 20
TISSUE SAMPLES COLLECTED BY TRC
PAH RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	C1-1/2/3	C1-4	OS-22	OS-23	OS-24	OS-25	OS-26
Benzo(k)fluoranthene	NG/G	2.3 J	2.36 J	12.18	10.09	9.23	29.78	13.94
Acenaphthene	NG/G	1.71 J	1.43 J	1.93 J	2.81 J	2.41 J	5.47	2.27 J
Acenaphthylene	NG/G	1.37 J	1.66 J	3.45 J	2.4 J	2.91 J	4.36 J	3.23 J
Anthracene	NG/G	0.77 J	1.12 J	3.59 J	4.15 J	3.52 J	9.93	4.13 J
Benzo(a)anthracene	NG/G	3.57 J	3.18 J	17.8	17.01	16.72	50.97	24.17
Benzo(a)pyrene	NG/G	1.6 J	2.62 J	12.38	11.82	11.37	37.29	15.39
Benzo(b+k)fluoranthene	NG/G	2.3	2.36	12.18	10.09	9.23	29.78	13.94
Benzo(e)pyrene	NG/G	5.57	6.49	25.3	22.35	21.5	51.24	28.61
Benzo(g,h,i)perylene	NG/G	5.63	6.31	13.23	11.6	12.03	37.71	15.32
Biphenyl	NG/G	17.67	16.84	19.61	10.86	20.77	23.48	17.27
Chrysene	NG/G	4.7 J	3.53 J	16.96	14.16	17.57	37.99	21.29
Dibenz(a,h)anthracene	NG/G	0.79 J	1.12 J	1.88 J	2.05 J	1.91 J	6.29 J	2.71 J
Fluoranthene	NG/G	13.24	11.36	39.7	45.22	40.49	86.22	52.99
Fluorene	NG/G	1.25 J	0.99 J	3.02 J	2.7 J	2.81 J	6.71	2.49 J
High Molecular Weight PAHs	NG/G	35.95	32.91	127.53	93.53	126.27	201.72	137.45
Indeno(1,2,3-cd)pyrene	NG/G	4.07 J	4.96 J	10.54	9.56	9.38	32.94	13.02
Low Molecular Weight PAHs	NG/G	119.82	112.59	132.57	93.53	146.15	201.72	137.45
Naphthalene	NG/G	98.55	93.28	99.16	61.58	112.36	123.39	102.83
Perylene	NG/G	1.1 J	1.59 J	4.66 J	4.78 J	4.52 J	17.22	7.29
Phenanthrene	NG/G	16.17	14.11	21.42	19.89	22.14	51.86	22.5
Pyrene	NG/G	12.05	11.1	38.81	41.19	38.21	76.12	47.95
Total PAHs	NG/G	192.11	184.05	345.62	294.22	349.85	688.97	397.4

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 20
TISSUE SAMPLES COLLECTED BY TRC
PAH RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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COMPOUND	UNITS	OS-27	OS-28
Benzo(k)fluoranthene	NG/G	5.2	9.18
Acenaphthene	NG/G	2 J	4.36
Acenaphthylene	NG/G	2.45 J	2.24 J
Anthracene	NG/G	3.72	6.1
Benzo(a)anthracene	NG/G	11.38	18.92
Benzo(a)pyrene	NG/G	7.41	11.76
Benzo(b+k)fluoranthene	NG/G	5.2	9.18
Benzo(e)pyrene	NG/G	13.4	19.45
Benzo(g,h,i)perylene	NG/G	9.63	16.36
Biphenyl	NG/G	13.94	21.86
Chrysene	NG/G	10.77	17.3
Dibenz(a,h)anthracene	NG/G	1.54 J	2.68 J
Fluoranthene	NG/G	37.51	54.88
Fluorene	NG/G	2.52 J	4.93
High Molecular Weight PAHs	NG/G	104.41	153.54
Indeno(1,2,3-cd)pyrene	NG/G	7.16	11.09
Low Molecular Weight PAHs	NG/G	110.29	157.11
Naphthalene	NG/G	80.04	98.33
Perylene	NG/G	3.81	4.89
Phenanthrene	NG/G	19.56	41.15
Pyrene	NG/G	35.8	48
Total PAHs	NG/G	267.84	393.48

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 21
TISSUE SAMPLES COLECTED BY TRC
POLYCHLORINATED BIPHENYL RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND

COMPOUND	UNITS	C1-1/2/3	C1-4	OS-22	OS-23	OS-24	OS-25	OS-26	OS-27	OS-28
PCB77/154	NG/G	0 ND		0 ND			0 ND			0 ND
101 (2,2',4,4',6')	NG/G	2.75		9.55			8.68			
105 (2,3,3'4,4')	NG/G	1.35		1.38			2.53			1.76
118 (2,3'4,4',5)	NG/G	2.09		4.84			5.06			3.97
126 (3,3'4,4',6)	NG/G	0 ND		0 ND	0 ND		0 ND			0 ND
128 (2,2',3,3'4,4')	NG/G	0.36 J		1.99	1.59		1.84			0.65 J
138 (2,2',3,4,4',5)	NG/G	3.68		15.28	12.5		12.72			6.7
153 (2,2',4,4',5,5')	NG/G	4.92		22.74			19.31			11.74
18 (2,2',5)	NG/G	0 ND		0 ND						
180 (2,2'3,4,4',5,5')	NG/G	2.41		8.45	7.66		7.14	7.95		5.95
187 (2,2',3,4',5,5',6)	NG/G	2.2		6.41	5.4		5.46			4.26
195 (2,2',3,3',4,4',5,6)	NG/G	0.95		1.65	1.58		1.55	1.56		2.15
206 (2,2'3,3'4,4'5,5'6)	NG/G	0.96		3.74	3.45		3.65	5.98		2.9
209 (2,2',3,3',4,4',5,5',6,6')	NG/G	1.71		2.14	2.22		2.24	1.95		3.17
28 (2,4,4')	NG/G	0.68		0 ND						
44 (2,2'3,5')	NG/G	0.46 J		26.7			14.16			
52 (2,2',5,5)	NG/G	0.77 J		2			2.04			
66 (2,3'4,4')	NG/G	1.48		4.96			4.15			
8 (2,4)	NG/G	0 ND		0 ND						
Total PCBs (Sum Congenersx2)	NG/G	53.54		671	313.6		543.2	276.8		288.7

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

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SEDIMENT SEM/AVS DATA

TABLE 22
PHASE 1 - NEAR SHORE INVESTIGATION
SEDIMENT SAMPLES - SEM/AVS RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
umoles/g dry weight

	SDA-D1	SDA-D2	SDA-D3	SDA-M1	SDA-M2	SDA-M3	OS-30A	OS-30B	SDA-S1	SDA-S2B	SDA-S3
SEM CONC	1.4305	3.74	2.3525	2.288	1.287	6.947	1.8425	2.892	1.614	2.8015	1.11
AVS CONC	0.965	0.845	0.55	3.88	1.175	5.705	0.6	1.2	2.5	11.43	1.85
SEM AVS RATIO	0.4655	2.895	1.8025	-1.592	0.112	1.242	1.2425	1.692	-0.886	-8.6285	-0.74

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 22
PHASE 1 - NEAR SHORE INVESTIGATION
SEDIMENT SAMPLES -SEM/AVS RESULTS - umoles/g dry weight
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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	SDA-S4	JCC-D1	JCC-M1	JCC-S1
SEM CONC	1.311	2.1505	1.849	3.0425
AVS CONC	3.23	0.26	0.56	8.635
SEM AVS RATIO	-1.919	1.8905	1.289	-5.5925

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 23
PHASE 2 - OFF SHORE INVESTIGATION
SEDIMENT SAMPLES - SEM/AVS RESULTS
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
u moles/g dry weight

	MCL-10-BOT	MCL-10-MID	MCL-10	MCL-11-BOT	MCL-11-MID	MCL-11	MCL-12-BOT
SEM CONC	0.4571	1.5911	2.1853	0.9956	0.7131	1.2911	0.4688
AVS CONC	0.05 ND	17.3	14.285	0.05 ND	3.285	4.955	0.285
SEM AVS RATIO	0.4071	-15.7089	-12.0997	0.9456	-2.5719	-3.6639	0.1838

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 23
PHASE 2 - OFF SHORE INVESTIGATION
SEDIMENT SAMPLES - SEM/AVS RESULTS u moles/g dry weight
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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	MCL-12-MID	MCL-12	MCL-13-BOT	MCL-13-MID	MCL-13	MCL-14-BOT	MCL-14-MID
SEM CONC	1.4689	1.0894	0.4424	0.5552	1.1553		0.7133
AVS CONC	8.565	6.64	0.08 ND	0.705	0.84	0.1 ND	1.3
SEM AVS RATIO	-7.0961	-5.5506	0.3624	-0.1498	0.3153		-0.5867

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 23
PHASE 2 - OFF SHORE INVESTIGATION
SEDIMENT SAMPLES - SEM/AVS RESULTS - u moles/g dry weight
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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	MCL-14	MCL-15-BOT	MCL-15-MID	MCL-15	MCL-16	MCL-8	MCL-9-BOT	MCL-9-MID
SEM CONC	1.281	1.2788	0.3395	2.7011	1.3643	3.2431	1.1697	1.0909
AVS CONC	1.515	0.05 ND	0.05 ND	0.05 ND	0.3	5.235	0.05 ND	3.755
SEM AVS RATIO	-0.234	1.2288	0.2895	2.6511	1.0643	-1.9919	1.1197	-2.6641

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 23
PHASE 2 - OFF SHORE INVESTIGATION
SEDIMENT SAMPLES - SEM/AVS RESULTS- u moles/g dry weight
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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	MCL-9	NSB-1	NSB-2	NSB-3	NSB-4	NSB-5	NSB-6	NSB-7
SEM CONC	2.2596	14.887	5.2504	11.9047	16.7687	16.5036	1.9552	5.88
AVS CONC	5.13	0.085 ND	0.05 ND	9.33	2.045	0.05 ND	6.305	0.05 ND
SEM AVS RATIO	-2.8704	14.802	5.2004	2.5747	14.7237	16.4536	-4.3498	5.83

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

TABLE 23
PHASE 2 - OFF SHORE INVESTIGATION
SEDIMENT SAMPLES - SEM/AVS RESULTS - u moles/g dry weight
MCALLISTER POINT LANDFILL - CTO 218
NEWPORT, RHODE ISLAND
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	SDA-S2B-BOT	SDA-S2B-BT2	SDA-S2B-MID	SDA-S2B:0-8	JCC-D1-BOT	JCC-D1-MID	JCC-D1
SEM CONC	0.564	0.4814	1.5065	2.3643	0.4118	0.5359	1.4304
AVS CONC	0.68	0.05 ND	20.045	10.825	0.05 ND	0.13	0.995
SEM AVS RATIO	-0.116	0.4314	-18.5385	-8.4607	0.3618	0.4059	0.4354

Notes: U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate

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APPENDIX D
SEDIMENT PRG DEVELOPMENT

Final

Preliminary Remediation Goals (PRGs) for NETC McAllister Point Landfill

February 1999

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List of Acronyms and Units

ACL/MCL	Alternate Concentration Levels/Maximum Contaminant Concentration Levels
ADI	Average Daily Intake
AE	Average Exposure
AET	Apparent Effects Threshold
ARAR	Applicable or Relevant and Appropriate Requirement
AT	Averaging Time
AVS	Acid Volatile Sulfide
AWQC	Ambient Water Quality Criteria
BAF	Bioaccumulation Factor
BPJ	Best Professional Judgment
BSAF	Biota-Sediment Accumulation Factor
BW	Body Weight
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CF	Conversion Factor
CFR	Code of Federal Regulations
CoC	Contaminants of Concern
CV	Coefficient of Variation
CWA	Clean Water Act
DEP	Depurated Sample
DQ	Data Qualifier
DoD	Department of Defense
DW	Dry-Wet Ratio
ED	Exposure Duration
EF	Exposure Frequency
ELU	Elutriate
EMAP	Environmental Monitoring and Assessment Program
EPA (USEPA)	Environmental Protection Agency
EqP	Equilibrium Partitioning
ER-L	Effects Range Low
ER-M	Effects Range Medium
ERA	Ecological Risk Assessment
Foc	Fraction of Organic Carbon
FA	Freshwater Acute
FC	Freshwater Chronic
FCR	Food Consumption Rate
FFA	Federal Facility Agreement
FI	Factor Ingested
FS	Feasibility Study

List of Acronyms and Units (continued)

HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
HMW	High Molecular Weight
IF	Intake Factor
IR	Installation Restoration
Koc	Organic Carbon Partitioning Coefficient
Kow	Octanol/Water Partition Coefficient
LBC	Lower Bound Concentration
L-CoC	Limiting Chemical of Concern
LADI	Lifetime Average Daily Intake
LOAEL	Lowest Observed Adverse Effect Levels
LMW	Low Molecular Weight
NA	Not Available
NCP	National Contingency Plan
ND	Non-Depurated Sample
NETC	Naval Education and Training Center
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observed Adverse Effect Level
NOEC	No Observable Effect Concentration
NOEQ	No Observable Effect Quotient
OSWER	Office of Solid Waste Enforcement Regulations
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PRG	Preliminary Remediation Goal
PW	Porewater
RAF	Relative Absorption Factor
RAO	Remedial Action Objectives
RBC	Risk Based Concentration
RBV	Risk-Based Value
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RIDEM	Rhode Island Department of Environmental Management
RIDOH	Rhode Island Department of Health
RME	Reasonable Maximum Exposure
RPD	Relative Percent Difference
RPRG	Recommended Preliminary Remediation Goal
RSV	Reference Screening Value
SA	Saltwater Acute
SAIC	Science Applications International Corporation
SC	Saltwater Chronic

List of Acronyms and Units (continued)

SD	Standard Deviation
SDWA	Safe Drinking Water Act
SEM	Simultaneously Extractable Metals
SF	Slope Factor
SQC	Sediment Quality Criteria
SQRT	Square Root
STDEV	Standard Deviation
TBC	To Be Considered
TCLP	Toxic Concentration Leachate Procedure
TEV	Threshold Effects Value
TEV-HQ	Threshold Effects Value Hazard Quotient
TOC	Total Organic Carbon
TRV	Toxic Reference Value
TSCA	Toxic Substance Control Act
UBC	Upper Bound Cocentration
UCL	Upper Confidence Limit
URI	University of Rhode Island
WQC	Water Quality Criteria
WQSV	Water Quality Screening Value

μg/L	micro grams per liter
μmol/g dw	micro mole per gram dry weight
μg/g dw sediment	micro grams per gram of dry weight sediment
ng/g dw sediment	nano grams per gram of dry weight sediment
mg/L	milligrams per liter
kg/L	kilogram grams per liter
ppm	parts per million

1. BACKGROUND AND OBJECTIVES

The purpose of this document is to present Preliminary Remediation Goals (PRGs) for the offshore operable unit of the NETC McAllister Point Landfill Superfund Site. The general framework for this activity was based on the "Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation Manual" (Part B, Development of Risk-based Preliminary Remediation Goals, USEPA, 1991a).

The McAllister Point Landfill is located on the western shore of the U.S. Naval Education and Training Center (NETC) in Newport, Rhode Island. In November 1989, NETC (including McAllister Point Landfill) was added to the National Priorities List (NPL) of abandoned or uncontrolled hazardous waste sites. A Federal Facilities Agreement (FFA) was signed by the Navy, U.S. EPA, and the State of Rhode Island in March 1992. On September 27, 1993, a Record of Decision (ROD) was signed, which mandated capping of the McAllister Point Landfill as a source control remedy. A Feasibility Study (FS) is underway which will propose the recommended action for remediation of risks associated with the offshore portion of the site.

The appropriateness of the existing multimedia cap remedy option was evaluated with regard to its effectiveness for meeting objectives for mitigation of existing and potential threats to public health and the environment. These objectives, called Remedial Action Objectives (RAOs), are based on knowledge of the types of contaminants of concern and the environmental media (*e.g.*, soil, water, sediment) in which they are found or could be found in the future.

It is the goal of the remedial design for the marine sediment at McAllister Point to provide a mechanism to meet the RAOs, including determination of the spatial extent of the remedy such that residual contamination does not remain at levels above federal and state ARARs (Applicable or Relevant and Appropriate Requirements) or To-Be-Considered (TBC) concentrations. The applicable chemical-specific ARARs/TBCs which will be included in the Record of Decision for this site are likely to focus on sediment as the media of concern. Results from the groundwater investigations suggest that deep groundwater discharge to the McAllister Point intertidal is unlikely to pose risks to human health and aquatic biota or contribute to elevated Contaminants of Concern (CoC) in sediment.

The threshold chemical concentrations that comply with the ARAR or TBC criteria are called the PRGs for the site. The CoCs and associated concentrations to be used as PRGs are supposed to be risk-based, i.e., reflective of the results of the risk assessment with respect to the selection of those CoCs that "limit" remediation (USEPA, 1991a). Here, "limiting" CoCs are those analytes which are responsible for much of the baseline risk (because of high concentrations and/or strong correlations with high toxicity), such that

by cleaning up these CoCs to their PRG concentrations, other co-located CoCs will be cleaned up to levels much lower than their corresponding goals.

Based on the above information, the objectives of the PRG development approach are as follows:

- Derive PRGs;
- Implement PRGs to determine potential spatial extent of remedial action;
- Assess PRG-based results against ARAR compliance.

Derivation and implementation of PRGs are discussed in Sections 2 and 3, respectively. In Section 4, the effectiveness of selected PRGs are discussed relative to risk reduction achieved vs. type and concentration of CoCs constituting the PRGs.

2. PRG DERIVATION

The objective of the overall PRG development process is to select the limiting CoCs for the site and identify their respective concentrations that, when implemented as cleanup goals, will focus remedial action in those areas where risk is higher than acceptable levels. Risk at the site is determined by marine, avian aquatic and human health concerns, hence the derivation of PRGs to protect each of these principal exposure pathways is required. The general approach for PRG derivation is presented in the following section (Section 2.1); pathway-specific procedures and results are presented in Section 2.2, Section 2.3 and Section to 2.4 for marine, avian predator and human health, respectively.

In the PRG development process, it is assumed that the final PRGs developed for various CoCs can be used as a basis for intercomparison of relative risks contributed by the CoCs, both within and between exposure pathways. Implementing aquatic PRGs for a few CoCs exhibiting the maximum observed exceedences of PRG concentrations would be assumed to be protective of all co-located CoCs contributing risk in the aquatic exposure pathway. The ability to draw such conclusions is critical to the derivation of "limiting" PRGs as described throughout Section 2.

As indicated earlier, a second critical assumption in PRG development involves the degree to which the remediation of the chemical causing the highest risk will lead to reduction of risks caused by other CoCs. For the McAllister Point study area, all the various CoCs tend to be found in each environmental sample, such that it can be reasonably expected that a similar condition of co-located CoCs will exist for unsampled areas. In addition, any CoC found to be "limiting" at a given location and exposure pathway is included in the final list of CoCs selected for the pathway. Thus, when remedial technologies such as removal or capping are applied, the implementation of the most

conservative (*i.e.*, limiting) PRG can be expected to lead to risk reduction for all CoCs at all locations.

It is important to note that the limiting PRG approach will be effective only when various chemical contaminants and exposure pathways remain co-located at the sampling location. "Dis-location" of CoCs from one another might arise from application of treatment technologies that preferentially remove one CoC class over another. Dis-location of pathways may occur if different remedial solutions for a given location are selected (*e.g.*, monitoring to protect human health vs. capping to protect the marine ecosystem) to protect various classes of receptors (marine organisms, birds, humans). If either of these practices are instituted, then the available data must be reevaluated for each CoC class and exposure pathway to ensure all receptors are adequately protected.

2.1. PRG Derivation Approach

The general approach for derivation of risk-based PRGs involves an analysis of site-specificity and practicality of implementation. To this end, the following procedures outlined in Table 1 and discussed in detail in later sections will be followed to develop CoC- and exposure pathway-specific PRGs for the site:

1. *Express pathway-specific risks to target receptors as Hazard Quotients (HQs) to normalize for the inherent toxicity of the CoC and facilitate intercomparison of CoCs and exposure pathways for PRG selection.* For this investigation, various types of HQs are derived for each exposure pathway, defined as the concentration in the exposure media divided by the media-specific threshold for adverse effects. For this investigation, the media of concern for aquatic, avian aquatic predator and human health exposure pathways are sediment porewater, prey species tissue and shellfish tissue concentrations, respectively.

2. *Evaluate CoC bioavailability under site-specific conditions present at McAllister Point.* For each CoC and exposure pathway, site-specific factors exist that modify the degree of chemical exposure/bioavailability to target receptors. For example, site-specific factors related to the bound form of the CoC in the environment (*e.g.*, some metal present as metal fragments, some organics bound as incineration waste) suggest that the true CoC bioavailability to aquatic receptors (*i.e.*, infaunal and epibenthic community) at the site may be less than predicted directly by bulk sediment or water-based benchmarks. For aquatic PRG development (discussed in Section 2.2.1., below), a procedure using a modeling approach called Equilibrium Partitioning (EqP) is described wherein the chemical concentrations of organic contaminants in porewater to which the marine organisms may be exposed are predicted. These predicted values for organic contaminants are combined with direct measurements of metal concentrations in porewater to constitute the porewater data set. Porewater concentrations are then divided by the water quality

screening values (WQSVs) derived from available water and sediment benchmarks representing thresholds for adverse effects to obtain porewater Hazard Quotients (PW-HQs). Finally, the PW-HQ data are paired with co-located (*e.g.*, taken from a split sample) toxicity results and the entire database segregated into nontoxic and toxic data sets. Here, the purpose is to estimate the highest CoC concentration for which adverse effects are unlikely. This value is estimated as the greater of the upper 95% confidence limit (95% UCL) of the nontoxic PW-HQ or HQ=1 (*e.g.*, expected risk threshold at maximum CoC bioavailability) for each CoC. The resulting value is called the No Observable Effect Quotient (NOEQ), and when multiplied by the WQSV, the value becomes the No Observable Effect Concentration (NOEC). The NOEQ and associated NOEC values incorporate site-specific conditions controlling chemical bioavailability since the non-toxicity of samples indicate that chemicals were not present at toxic concentrations. The NOEC derivation is required as an intermediate step in the development of Aquatic PRGs, which is discussed in detail in Section 2.2.

Avian aquatic predators are at potential risk because of CoCs contained in the tissue of prey that they consume. Site-specific factors controlling CoC bioavailability include the species, age, and weight of local birds selected for the ecological risk assessment (great blue heron and herring gull), and factors related to their feeding habits and migratory range in the New England region. This site-specific evaluation of CoC exposure was completed in the marine ERA, wherein a toxicity-based endpoint (called the Toxicity Reference Value, TRV) is assumed to represent the highest CoC concentration at which adverse effects are not expected. This value is used as a benchmark and applied against (*i.e.*, divided into) measured CoC concentrations in shellfish tissue at the site to derive the TRV-HQ. As with the aquatic NOEQ and NOEC values, the avian TRV-HQ and TRV values are required as an intermediate step in the development of Avian Predator PRGs, discussed in detail in Section 2.3.

Finally, for human health exposures, threshold chemical intake rates (mg CoC/kg human/day) assumed to be protective of potential adverse effects from carcinogenic CoCs (< 1×10^{-4} aggregate risk) and non-carcinogenic CoCs (HQ<1) CoCs were used as recommended by USEPA and as discussed in the Human Health ERA (BRE, 1997). In the present investigation, site-specific chemical exposure rates were calculated assuming default USEPA values (e.g., fisherman body weight, exposure duration) as well as region-specific (e.g., ingestion rate, exposure frequency) factors pertinent to recreational shellfish consumption practices observed for New Englanders (see Section 2.4). Shellfish CoC concentrations that exceed risk thresholds under the Reasonable Maximum Exposure (RME) scenario were calculated for further use in the derivation of human health PRGs for the site, discussed in detail in Section 2.4.

3. *Retain CoCs likely to substantially contribute to risk at the site.* An objective of PRG development is to identify and retain CoCs for which PRG implementation will lead to effective risk reduction at the site while eliminating other CoCs that would not.

   For the aquatic exposure pathway, the maximum observed PW-HQ for each CoC at the site is compared with the toxicity test-specific NOEQ value, and the CoC was retained for further PRG development if $PW\text{-}HQ_{MAX} > NOEQ$. For avian aquatic predator exposures, all CoCs for which the TRV-HQ > 1 were retained. For human health exposures, the RME benchmarks for carcinogenic and non-carcinogenic CoCs were applied against measured concentrations of CoCs in shellfish tissue at the site. Any CoC exceeding carcinogenic and non-carcinogenic benchmarks were retained for further development.

4. *Evaluate the feasibility of the CoC-specific PRG as a long term remediation goal.* Because of the general movement of water and sediment in lower Narragansett Bay near the McAllister Point Landfill, it was assumed that it would not be technically feasible, in the long term, to remediate to CoC concentrations that are lower than those found in Narragansett Bay. Hence, the need to adjust pathway-specific adverse effect thresholds (aquatic = NOEC, avian = TRV, human health = RME) was assessed through the application of a Reference Screening Value (RSV) for the appropriate CoC media (e.g. porewater for aquatic exposure, shellfish tissue for avian and human health exposures). The RSV was calculated as the 95% upper confidence limit (95% UCL) of porewater (for aquatic RSVs) and shellfish tissue (for avian and human health RSVs) concentrations obtained for Narragansett Bay reference locations. The greater of the risk-based and reference-based concentration was adopted as the Threshold Effects Value (TEV) for each exposure pathway.

5. *Assess CoC exceedences of TEVs to identify "limiting," pathway-specific CoCs for PRG selection.* TEV Hazard Quotients (TEV-HQs) were derived from normalization of CoC concentrations in site media (porewater for aquatic pathway and shellfish tissue for avian and human health pathways) to respective TEVs. TEV-HQs were then intercompared for by pathway to determine the CoC causing maximum risk within and among pathways on a station-by-station basis. The resulting list of analytes identifies "limiting" CoCs for final PRG selection.

6. *Evaluate the practicality of the TEVs for effective risk reduction.* In this spatial analysis, a candidate PRG that, upon implementation, would result in risk reduction in the most affected areas should be favored over other candidate PRGs that do not. Note that this step, unlike the previous steps, is a qualitative, risk-based interpretation based on best professional judgment. In this analysis, the location of TEV exceedences (*e.g.*, TEV-HQ > 1) for each of the limiting CoCs is reviewed

with respect to the spatial distribution of observed risks at the site as concluded from the overall weight of evidence presented in the ecological and human health risk assessments. The relationship between the apparent risk reduction and remediated area is discussed to provide input into risk management decisions regarding the setting of Remedial Goals. As such, the discussion is intended to be primarily supportive of the FS analysis in which monetary and engineering implications of selected PRGs are evaluated.

7. *Calculate PRGs from TEVs.* Based on the selection of "limiting" CoCs and the media-specific concentrations that will achieve optimal risk reduction (TEVs), the TEV values are recalculated as necessary into appropriate (mainly sediment-based) concentration units to be implemented during site remediation. The calculated values are also discussed relative to traditional benchmarks so as to gauge the relative degree of protection afforded to exposure pathways by the approach recommended in this document.

Steps 1 to 4 above involve PRG derivation on a pathway-specific basis and are discussed for aquatic, avian predator and human health exposure pathways in Sections 2.2, Section 2.3 and Section 2.4, respectively. Steps 5 to 7, discussed in Section 3, involve PRG implementation and assessment on a pathway-specific basis as well as all exposure pathways combined.

2.2. Aquatic PRG Derivation

As identified in Section 1, steps required for aquatic PRG derivation include 1) benchmark selection and expression of CoC concentration data as HQs; 2) evaluation of CoC bioavailability under site specific conditions; 3) retention of CoCs substantially contributing to aquatic risk at the site, 4) reference data comparison; and 5) limiting CoC selection. Each of these steps is addressed in the following sections.

Benchmark selection/HQ derivation. Sediment Quality Criteria (SQC) for sediments and Water Quality Criteria (WQC) for surface waters are logical choices as ARARs for McAllister Point Landfill that supports the use of EqP-based approaches for PRG derivation. Although the direct applicability of SQC has been limited by the number of available criteria (presently five non-ionic organic compounds including three PAHs (acenaphthene (USEPA, 1993a), fluoranthene (USEPA, 1993b), phenanthrene (USEPA, 1993c) included as CoCs in the Marine ERA)), the SQC derivation process has demonstrated the applicability of WQC to porewater concentrations for prediction of sediment toxicity when partitioning characteristics of the CoC between water and the organic carbon fraction of the sediment (K_{OC}) are taken into account using the equilibrium EqP model of Di Toro *et al.* (1991):

$$1) \qquad C_p = C_s/(f_{oc} * K_{oc});$$

in which organic chemical porewater concentrations (C_p, µg/L) are calculated from the corresponding sediment concentration (C_s; µg/kg), based on f_{oc} (the fraction of organic carbon in the site sediment; %TOC/100) and K_{oc} (the organic carbon/water partitioning coefficient for the CoC). Values for K_{oc} (Table A-1) were determined from the relationship developed by the USEPA (Karickhoff,1981):

$$2) \quad \log_{10}K_{oc} = 1.0*\log_{10}K_{ow} - 0.21;$$

where K_{ow} = the octanol/water partition coefficient.

For the development of aquatic PRGs for the present investigation, the chemical concentration in porewater rather than sediment is used as the primary measure of potential adverse effects (*i.e.*, risk) to aquatic biota. The application of the EqP model for organic contaminants allows incorporation of station-specific conditions (principally TOC content of sediment) that control sediment-porewater partitioning and hence chemical bioavailability. The bioavailability of CoCs attached to organic particles vs. CoC dissolved in organic-rich water is controlled by the organic carbon partitioning coefficient. The digestive processes of typical sediment associated biota are not strong enough to remove more contaminants than that which is attached to the organic matter on the coatings of surface particles. This is in stark contrast to mammalian systems that have complex and highly efficient (*e.g.*, low pH, highly enzymatic) systems. In these mammalian systems, sediment ingestion vs. water vs. food is a very important component of the exposure analysis. Porewater concentrations were estimated from the EqP model using sediment TOC concentration measured at the location
(Table A-2.2). Direct measurements of metals in porewater obviates the need for partitioning calculations for this CoC class. Porewater concentrations for metals were used as measured directly in sediment porewater (Marine ERA Table A-2-3; SAIC and URI, 1997a).

As discussed in Section 1, determination of organic and metal CoCs responsible for the majority of the risk is assessed through normalizing concentrations to benchmarks so as to adjust for differences in the inherent toxicity of the chemical. For this investigation, WQSVs adopted primarily from USEPA Water Quality Criteria - Saltwater Chronic values (WQC-SC) (or estimated equivalents, discussed below) were used as the benchmarks.

Water-based CoC criteria are proposed for calculation following the decision tree presented in Figure 1. This approach allows for calculation of "WQC-SC equivalent" benchmarks, and assigns a data qualifier to identify the benchmark source for derivation of the HQ. In Table 2, the data qualifier (DQ) "A" is applied to benchmarks derived directly from existing WQC-SC values. For CoCs possessing WQC-saltwater acute values (WQC-SA), an 8:1 acute:chronic ratio is applied to derive the equivalent WQC-SC value (DQ = "B"). The conversion factor was derived from the mean overall acute:chronic ratio for paired chemical data contained in the USEPA AQUIRE database (Shepard, 1995).

Freshwater chronic data (WQC-FC) are used directly as screening values, with assigned data qualifier "C". As with WQC-SA values, freshwater acute (FA) values were converted to chronic values using a 8:1 acute:chronic ratio, and assigned DQ = "D".

Some sediment-based correlative benchmarks are required to complete the assessment of site-related CoCs in which water quality benchmarks are lacking (Table 2). In these cases, NOAA ER-L concentrations were selected and translated into porewater equivalent concentrations using the EqP model. In this process, it is assumed that the resultant value provides a level of protection equivalent to other water quality-based benchmarks, which is not unreasonable because WQC values are designed to be protective of 95% of all species, whereas National Oceanic and Atmospheric Administration Effects Range-Low (NOAA ER-L) values represent concentrations below which 90% of all sediment samples had no measurable adverse effect. Thus, sediment benchmark values (NOAA ER-L) were transformed into water-equivalent benchmarks using the EqP model and assuming 1% sediment TOC were given a DQ of "E" (Figure 1).

Research by the USEPA into the development of SQC for divalent metals (Cu, Cd, Pb, Ni and Zn) in sediment has shown that sediment toxicity can be predicted when the quantity of Simultaneously Extractable Metal (SEM) present in excess of the Acid Volatile Sulfide (AVS) concentration in sediment is measured (Berry *et al.*, 1996). The expression of SEM relative to AVS has been historically expressed as the SEM/AVS ratio, although the difference of SEM and AVS (SEM-AVS) is now preferred, as the metric is less sensitive to conditions in which AVS is near detection limits (*i.e.*, resulting in very high SEM/AVS ratios). The use of SEM-AVS is based on the fact that AVS will bind divalent metals in direct proportion to their respective molar concentrations (Hansen *et al.*, 1996). In the USEPA National Sediment Quality Inventory (USEPA, 1996) the SEM-AVS value of 5 µMol/g dry wt is recommended as a screening value for identification of sediments of concern with regard to potential divalent metal effects on aquatic biota. The SEM-AVS method is not directly amenable to PRG development because it does not directly identify CoC-specific PRGs. However, the data are useful for the validation of the derived values as appropriate site-specific PRGs discussed in Section 2.2. For SEM-AVS data, a benchmark of 5 µMol/g dry wt was used as discussed above; a data qualifier "F" is assigned to this benchmark in Table 2.

PW-HQs reported in Tables A-3.1 through A-4.2. were calculated as the concentration in porewater divided by the corresponding WQSV presented in Table 2. For SEM-AVS data, the SEM-AVS value was normalized to the benchmark of 5 µmol/g dry weight as discussed above. These appendices reflect segregation of the data set according to toxicity tests as explained below.

No Observable Effects Quotient derivation. A common element of correlative benchmark approaches is the attempt to establish statistical confidence around thresholds of sediment concentration that are associated with measured biological effects. The

NOAA Effects Range-Low benchmark (Long and Morgan, 1990; Long *et al.*, 1995) was developed by matching of chemical concentrations with incidence of benthic effects (*e.g.*, toxicity, reduced benthic composition, biomarker response) measured in field samples, and statistically estimating the sediment concentration below which no adverse effect was observed 90% of the time.

It is expected that site-specific factors affecting the bioavailability of CoCs in the marine sediments adjacent to McAllister Point may exist that modify the degree of chemical exposure/bioavailability to target receptors. The primary indicator of site-specific CoC bioavailability was derived from toxicity data included the amphipod (*Ampelisca abdita*) 10-day bulk sediment test, the sea urchin (*Arbacia punctulata*) fertilization porewater test, and the sea urchin (*Arbacia punctulata*) development sediment elutriate test. Toxicity results are presented in the Marine ERA (Tables 5.2-1 to 5.2-5). The entire data set includes 45 sampling locations for the amphipod (*Ampelisca abdita*) endpoint and 35 sampling locations for the sea urchin (*Arbacia punctulata*) results.

Adapting the general approach presented for ER-L derivation, discussed earlier, PW-HQ data were paired with co-located (*e.g.*, taken from a split sample) toxicity results. The paired data set was segregated in nontoxic and toxic samples as defined in the Marine ERA (*e.g.*, amphipod survival $\geq$ 80% or sea urchin fertilization/ development success $\geq$ 70% = nontoxic). For each test endpoint, the PW-HQ database was segregated into nontoxic (Tables A-3.1, A-4.1 and A-4.3 for amphipods urchin fertilization and urchin development, respectively) and toxic (Tables A-3.2, A-4.2 and A-4.4 for amphipods, urchin fertilization and urchin development, respectively) data sets. The databases include statistical summaries (mean, maximum and upper 95%) required for the NOEQ derivation, discussed below. The number of matched chemistry/toxicity data points in the non-toxic database available for derivation of organic NOEQs exceed that for metals since metals were not always measured in the samples.

The highest CoC concentration for which adverse effects are unlikely, called the NOEQ, was estimated as the greater of the upper 95% UCL of the nontoxic PW-HQ data set or HQ=1 (*e.g.*, expected risk threshold at maximum CoC bioavailability) for each CoC. The 95% UCL NOEQ was selected as a level comparable to the EPA WQC level of protection for chronic effects as calculated from single species/single toxicant bioassay results. For NOEQ values < 1, an NOEQ of one was adopted since it is unlikely that site-specific factors could increase CoC bioavailability to levels above that which is found in water-only tests.

NOEQ results for each species/test endpoint and the overall Aquatic NOEQ are provided in Table 3. The listed CoCs include metals, PAHs, Total PCBs and pesticides as measured (metals) or calculated (organic compounds) in porewater of site-associated sediments (*e.g.*, in the vicinity of McAllister Point Landfill). For PAHs, the sum of the analyte-specific HQs was calculated and similarly evaluated to address the potential

additive effects of PAH mixtures. Similarly, the sediment-based SEM-AVS measure was included to evaluate the potential additive effects of divalent metal bioavailability.

For most CoCs, the 95% UCL PW-HQ was less than 1, indicating good agreement between measured toxicity and the literature-based WQC data, that is, toxicity was not observed where criteria values predict that toxicity should not occur. Thus, where the *CoC-specific* 95% UCL PW-HQ was less than 1, a test-specific NOEQ (T-NOEQ) value of 1 was retained. For some CoCs (*e.g.*, fluorene, copper, mercury, nickel), the T-NOEQ did exceed unity somewhat. This observation is attributed to site-specific conditions that have reduced CoC bioavailability somewhat relative to conditions that under which the WQC are derived (*i.e.*, single-species, water-only laboratory bioassays). The T-NOEQ was selected as the greater of the 95% UCL PW-HQ and the default HQ of one.

Retaining CoCs substantially contributing to risk. Also listed in Table 3 are the maximum PW-HQ values (*i.e.*, maximum PW-HQ) for sediments toxic to amphipods, sea urchin gametes, and larvae. Those CoCs for which the maximum PW-HQ exceeded the NOEQ (*i.e.*, maximum HQ > NOEQ) for a given test endpoint were retained for further PRG derivation as those chemicals most likely to have contributed significantly to risks. CoCs which did not meet this requirement included five metals (silver, arsenic, cadmium, chromium, and lead), two pesticides (HCB, mirex), and 3 PAHs (acenapthene, fluoranthene, and naphthalene).

The minimum of the test-specific NOEQs was taken as the Aquatic NOEQ (A-NOEQ) and used as the interim benchmark for further PRG development. It is notable that generally good agreement was observed among the T-NOEQ data and the majority of A-NOEQs for CoCs were less than two. This suggests that the test species employed are sensitive to site CoCs and that the bioavailability of most CoCs at the site are comparable to that provided by single toxicant, water-only bioassay experiments upon which the Water Quality Criteria (WQC) were derived. For two CoCs (copper and fluorene), NOEQs > two were observed, indicating that either bioavailability under site-specific conditions is less than that observed in laboratory tests, or the test species were somewhat less sensitive than the most sensitive species used in WQC derivation. In general, however, the data suggest that amphipods and sea urchins are adequately protective surrogates for CoC-related toxicity from site sediments.

Reference Comparison/Aquatic TEV derivation. A database of aquatic RSV for the candidate CoCs discussed above was prepared and summarized in Table 4. The RSV database was assembled from measured (metals) or EqP-based predictions (organics) of porewater concentrations at reference locations used for the Allen Harbor (SAIC, 1996), McAllister Point (SAIC and URI, 1997a) and Derecktor Shipyard (SAIC and URI, 1997b) Marine Ecological Risk Assessments, performed under Trustee supervision. A limited assessment of the comparability of reference locations in lower Narragansett Bay to reference stations selected for the McAllister Point study was performed. Data

presented in Table A-2.4 show that the range of sand (75-92%), silt (6.5-10%), clay (1.2-14.7%) and TOC (0.8 - 2.1%) content for MCL reference locations bracketed the mean observed for all stations: sand (89%), silt (8.6%), clay (1.6%) and TOC (1.0%) as a whole. Sampling depths ranged from intertidal to shallow subtidal (< 5m) for all stations. Thus, similar geotechnical characteristics imply comparability of habitats such that they serve as suitable sites for background data. The reference data were screened for statistical outliers; values greater than the mean + 2 S.D. were excluded. The mean and 95% UCL of CoC concentrations after outlier removal were calculated as the RSV for further use in PRG determination, which will be discussed in the next paragraph.

Data for determination of aquatic TEVs are presented in Table 5. The Aquatic NOEQ values from Table 3 were multiplied by the respective Water Quality Screening Values (from Table 2) to obtain the equivalent water concentration units (*i.e.*, NOEC) to permit comparison with RSVs (from Table 4). The PRG development process selects the greater of the NOEC and RSV as the TEV so as to ensure that background concentrations (represented as the aquatic RSV) would not contribute to recontamination of the site. In the present study, however, the NOEC concentration exceeded the background concentration in most cases, attesting to the generally low level of environmental contamination at reference locations selected for the present study. The results suggest the Aquatic TEV values will be brought forward to Section 3, where a spatial implementation analysis will be used as a screen to determine the "limiting CoCs" needed for protection of the aquatic exposure pathway.

2.3. Avian Predator PRG Derivation

Retaining CoCs substantially contributing to risk. All CoCs with TRV-HQs > 1 were retained for further PRG derivation. The list includes eight metals (arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc) as well as Total PCBs. PAHs and pesticides were either lacking TRV values for evaluation or had TRV-HQs < 1, and thus were eliminated from further development as PRGs.

Reference Comparison/Avian predator TEV derivation. As done for the aquatic PRG development, a reference database consisting of prey species tissue concentrations was developed for selected CoCs (Table 6), including the mean and mean + upper 95% confidence band statistics after removal of outlier data. The resulting avian predator RSVs are carried forward to Table 7 for comparison against TRVs derived from the literature (primarily laboratory studies).

Table 7 reports the maximum observed TRV-HQ for the McAllister Point ERA; it is readily apparent that only metals (except nickel) and Total PCBS are CoCs of concern for avian predators consuming prey in the McAllister Point intertidal area. Also listed in Table 7 is the avian predator TRV calculated as the minimum of receptor-specific TRVs used in

the McAllister Point ERA (ERA Table 6.3-2). The avian TRV was compared against the prey species RSV concentrations (from Table 6). Only TRV values for cadmium, copper, lead, and mercury were higher than avian predator RSV concentrations. The greater of the TRV and avian RSV concentration were retained as the avian TEV. As with the Aquatic TEV, the avian predator TEV concentrations will be brought forward to Section 3, where a spatial implementation analysis will be used as screen to determine the "limiting CoCs" needed for protection of the avian predator exposure pathway.

2.4. Human Health PRG Derivation

Chemical-specific PRGs are concentration goals for individual CoCs for specific medium and land use combinations at CERCLA sites. There are two general sources of chemical-specific PRGs for human health: (1) concentrations based on ARARs and (2) concentrations based on risk assessment. ARARs include concentration limits set by other environmental regulations (*e.g.*, non-zero maximum contaminant level goals (MCLGs) set under the Safe Drinking Water Act (SDWA)). The second source for PRGs, and the focus of this section, is risk assessment or risk-based calculations that set concentration limits using carcinogenic and/or noncarcinogenic toxicity values under specific exposure conditions.

2.4.1. Benchmark Selection/HQ Derivation

The human health PRG derivation focuses only on establishment of PRGs for CoCs in shellfish tissue which will be protective of human receptors who may consume shellfish caught in the vicinity of the McAllister Point Landfill. The CoCs in shellfish tissue were identified in the baseline human health risk assessment (HHRA) for the McAllister Point Landfill (BRE, 1997). Two indigenous species were characterized for PRG evaluation, including hard-shell clams (*Mercenaria mercenaria*; quahogs) and blue mussels (*Mytilus edulis*).

The HHRA assumed local residents would come to Narragansett Bay for shellfish in areas that have been directly impacted by contaminants in the landfill, although it is currently prohibited. The receptor population for consumption of locally-caught shellfish included local adult subsistence fishermen.

Values for exposure parameters associated with exposure frequency and duration were obtained from EPA Standard Default Exposure Factors (USEPA, 1993b). The value for shellfish ingestion rate (15,600 mg/day) is based on an estimate of 150,000 mg/meal serving size and Rhode Island survey data on the number of hard-shell clam meals eaten per year (36.5 meals/year) provided by RIDEM. In the absence of relevant site-specific data, for the purposes of the human health assessment, it was assumed that all of the clam or mussel consumption by local residents will occur in the vicinity of the site. Additional

information on selected values for exposure parameters for consumers of locally-caught shellfish is located in Table 8.

2.4.2. Identification of CoCs for Shellfish Consumers

Noncarcinogenic Risks. Estimated Hazard Indices (HIs) for health effects other than cancer among consumers of locally-caught shellfish at McAllister Point are summarized by zone and CoC for reasonable maximum exposures (RME) and average exposures (AE) in Table 9. RME HIs were based on maximum shellfish concentrations in each specific zone. AE HIs were based on average shellfish concentrations in each zone.

The estimated HIs for consumption of locally-caught shellfish by subsistent fishermen were 4, 15, 5, and 40 for RME concentrations in Zones 1, 2, 3 and 3A, respectively. Adverse effects would be primarily associated with exposure to arsenic (HQ = 4, 9, 5 and 40 in Zones 1, 2, 3 and 3A, respectively). Adverse effects would also be associated with cadmium (HQ = 1) and copper (HQ = 4) in Zone 2. Because the HQs for these CoCs are each greater than 1.0, it is possible that adverse health effects in several target organs will be observed in Zone 2 exposed populations. The CoC/target organ pairs are as follows: arsenic/skin, copper/GI tract, and cadmium/kidney (BRE, 1997). Because HQs for the remaining analytes listed in
Table 9 were all significantly less than one, which is the point of departure level for remediation of noncarcinogenic risk, these analytes were not identified as CoCs in shellfish tissue based on RME concentrations.

The estimated HIs for consumption of locally-caught shellfish by subsistent fishermen were 4, 10, 5, and 30 for AE concentrations in Zones 1, 2, 3 and 3A, respectively. Adverse effects would be primarily associated with exposure to arsenic (HQ = 4, 7, 5 and 30 in Zones 1, 2, 3 and 3A, respectively). Adverse effects would also be associated with copper (HQ = 2) in Zone 2. Because the HQs for these CoCs are each greater than one, it is possible that adverse health effects in multiple target organs will be observed in Zone 2 exposed populations. The CoC/target organ pairs are as follows: arsenic/skin and copper/GI tract (BRE, 1997). Because HQs for the remaining analytes listed in Table 9 were all significantly less than one, which is the point of departure level for remediation of noncarcinogenic risk, these analytes were not identified as CoCs in shellfish tissue based on AE concentrations.

Carcinogenic Risks. Estimated cancer risks for consumers of locally-caught shellfish at McAllister Point are summarized by zone and CoC for reasonable maximum exposures and average exposures in Table 10. RME cancer risks were based on maximum shellfish concentrations in each specific zone. AE cancer risks were based on average shellfish concentrations in each zone.

The estimated cancer risks for consumers of locally-caught shellfish were estimated to be 9×10^{-4}, 5×10^{-3}, 1×10^{-3}, and 8×10^{-3} for RME concentrations in Zones 1, 2, 3 and 3A, respectively. Arsenic (8×10^{-4}), PCBs (1×10^{-4}), benzo(a)anthracene (2×10^{-6}), chrysene (2×10^{-6}), benzo(b+k)anthracene (4×10^{-6}), benzo(a)pyrene (2×10^{-6}), and indeno(1,2,3-cd)pyrene (1×10^{-6}) contributed most significantly to overall risk in Zone 1 and were identified as CoCs in shellfish tissue (BRE, 1997).

Arsenic (2×10^{-3}), PCBs (3×10^{-3}), benzo(a)anthracene (2×10^{-5}), chrysene (2×10^{-5}), benzo(b+k)anthracene (2×10^{-5}), benzo(a)pyrene (1×10^{-5}), indeno(1,2,3-cd)pyrene (6×10^{-6}), and dibenzo(a,h)anthracene (2×10^{-6}) contributed most significantly to overall risk in Zone 2 and were identified as CoCs in shellfish tissue (BRE, 1997).

Arsenic (1×10^{-3}), PCBs (8×10^{-5}), benzo(a)anthracene (8×10^{-5}), chrysene (6×10^{-5}), benzo(b+k)anthracene (1×10^{-4}), benzo(a)pyrene (5×10^{-5}), indeno(1,2,3-cd)pyrene (3×10^{-5}), and dibenzo(a,h)anthracene (9×10^{-6}) contributed most significantly to overall risk in Zone 3 and were identified as CoCs in shellfish tissue (BRE, 1997).

Arsenic (8×10^{-3}), PCBs (5×10^{-5}), benzo(a)anthracene (8×10^{-5}), chrysene (6×10^{-5}), benzo(b+k)anthracene (9×10^{-5}), benzo(a)pyrene (5×10^{-5}), indeno(1,2,3-cd)pyrene (2×10^{-5}), and dibenzo(a,h)anthracene (7×10^{-6}) contributed most significantly to overall risk in Zone 3A and were identified as CoCs in shellfish tissue (BRE, 1997).

The risks associated with other CoCs were all less than one in a million (1×10^{-6}), which is the point of departure level for remediation of carcinogenic risk. Consumers were all at risk under average exposure conditions, due primarily to arsenic and PCBs.

2.4.3. Human Health RME Derivation Approach

Non-carcinogenic CoCs. For non-carcinogenic effects, a concentration (*i.e.*, the preliminary shellfish remediation goal) is calculated which corresponds to an HI of 1, that is, the level of exposure to a CoC from all significant exposure pathways in a given medium below which it is unlikely for even sensitive populations to experience adverse health effects (USEPA, 1991a).

The likelihood that health effects other than cancer are associated with exposures to CoCs is estimated by comparing average daily intakes (ADIs) with established RfDs. The generic equation to calculate risk due to health effects other than cancer is given below (USEPA, 1989a):

$$HI = \frac{ADI}{RfD} = \frac{C \times IF \times CF \times FI \times EF \times ED \times RAF}{RfD \times BW \times AT}$$

Where:

HI	=	Total Hazard Index; ratio of average daily intake level to acceptable daily intake level (unitless)
ADI	=	Average Daily Intake (mg/kg-day)
RfD	=	Reference dose (acceptable daily intake level; mg CoC/kg-day; see Table 8)
C	=	Concentration in shellfish tissue (mg/kg)
CF	=	Conversion factor (1 kg/10^3 g)
IF	=	Intake factor[1] (i.e., shellfish consumption rate, g/day)
FI	=	Fraction ingested (i.e., fraction of shellfish ingested)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
RAF	=	Relative absorption factor (unitless; analyte-specific; see Table 8)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

If the average daily intake exceeds the RfD, the HI will exceed one and there may be concern that potential adverse systemic health effects will be observed in the exposed populations. In general, the greater the value of the HQ above one, the greater the level of concern. However, the HI does not represent a statistical probability that an adverse health effect will occur. HIs are scaling factors rather than direct estimates of risk (USEPA, 1989a).

Adding appropriate parameters, and then rearranging the equation given above to solve for the risk-based shellfish Reasonable Maximum Exposure (RME) results in the following equation:

$$RME\,(mg/kg) = \frac{HI \times RfD \times BW \times AT}{IF \times CF \times FI \times EF \times ED \times RAF}$$

The equation shown below is the reduced form of the equation given above using the exposure parameters listed in Table 8, and the toxicity values (*i.e.*, RfDs) given in Table 11. This equation is used to calculate the risk-based RME for each non-carcinogenic CoC in shellfish tissue at a prescribed HI of 1.

$$RME - noncarcinogen\,(mg/kg;\ risk\text{-}based) = \frac{4679.5 \times RfD}{RAF} \text{ - - - - - - - - - } Equation 1$$

[1] The intake factor is the product of all intake variables that, when multiplied by the concentration of the CoC in a specific medium, results in an estimate of the CoC intake in mg/kg-day for that population and exposure pathway. Intake factors may include ingestion rate, inhalation rate, body surface area exposed to soil or water, dermal permeability constants, and soil adherence factors.

Carcinogenic CoCs. For carcinogenic effects, a concentration range (i.e., the preliminary shellfish remediation goal range) is calculated which corresponds to a range between 10^{-4} and 10^{-6} incremental risk of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen from all significant exposure pathways for a given medium (USEPA, 1991a). This was based on USEPA's interpretation of the significance of the cancer risk estimate as stated in the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300):

> *.....For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6}.*

Carcinogenic risk was estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen. The numerical estimate of excess lifetime cancer risk was calculated by multiplying the lifetime average daily dose by the risk per unit dose (the slope factor), as shown in the following equation (USEPA, 1989a):

$$Risk = LADI \times SF = \frac{SF \times C \times IF \times CF \times FI \times EF \times ED \times RAF}{BW \times AT}$$

Where:

Risk	=	The unitless probability of an exposed individual developing cancer
LADI	=	Lifetime average daily intake (mg/kg-day)
SF	=	Cancer slope factor $(mg/kg\text{-}day)^{-1}$

Because the SF is the statistical 95th percent upper-bound confidence limit on the dose-response slope, this method provides a conservatively high upper-bound estimate of risk. The actual risk may be lower, and could even be zero (USEPA, 1986).

By setting the total risk for carcinogenic effects for individual CoCs at a target risk level of 10^{-6} (the NCP's point of departure for analysis of remedial alternatives), it is possible to solve for the acceptable Lower Bound Concentration (LBC) term (*i.e.*, the risk-based RME).

$$RME\ \ carcinogen\ (mg/kg;\ risk\text{-}based) = \frac{Risk \times BW \times AT}{SF \times IF \times CF \times FI \times EF \times ED \times RAF}$$

Equation 2 shown below is the reduced form of the equation given above using the exposure parameters listed in Table 8, and the toxicity values (*i.e.*, SFs) given in Table

11. This equation is used to calculate the risk-based RME for each carcinogenic CoC in shellfish tissue at a target cancer risk level of 10^{-6}.

$$RME\text{-}carcinogen\,(mg/kg;\,risk\text{-}based) = \frac{10918 \times Target\ Cancer\ Risk}{SF \times RAF} \text{---} Equation2$$

Collectively, the lower bound RME values for carcinogenic chemicals represent baseline, chemical-specific concentrations for shellfish residues that are acceptable for human consumption (*e.g.*, < 10^{-6} risk).

EPA guidance also allows total exposure of carcinogenic CoCs, that when summed, do not exceed 10^{-4} risk. In order to calculate this permissible upper bound risk level for each CoC in concentration units (*e.g.* ng CoC/g shellfish tissue) , it is necessary to apportion the permissible risk based on the lower -bound RME concentration and the ratio between 10^{-6} and 10^{-4} risk thresholds, as follows:

$$RME_{UB} = RME_{LB} \times (HI_{10^{-4}} / HI_{10^{-6}}) \text{---} Equation3$$

As previously stated, the acceptable exposure at the 10^{-6} risk threshold for a given CoC represents an HQ=1 when expressed as the CoC concentration relative to the lower bound RME benchmark. Given the eight carcinogenic CoCs identified in the present study, the permissible HI (i.e., all eight CoCs each at maximum permissible concentrations) for a given shellfish sample is the sum of individual HQs (HI = 8). Accordingly, the exposure at 10^{-4} risk represents an HI =100 when expressed as the CoC concentration relative to the same lower bound RME benchmark. By substituting acceptable HI values at lower and upper bound risk thresholds, as follows:

$$RME_{UBC} = 12.5 \times RME_{LBC} \text{---} Equation4$$

the CoC-specific upper bound RME values at 10^{-4} risk are obtained.

2.4.4. Human Health RME Derivation Results

Table 12 presents risk-based concentrations for CoCs in shellfish tissue which would be protective of subsistent fishermen consuming locally-caught shellfish. The RMEs for non-carcinogenic CoCs in shellfish tissue are estimated by insertion of appropriate exposure parameters listed in Table 8, and toxicity values (*i.e.*, RfDs) listed in Table 11, into Equation (1). Similarly, the RMEs for carcinogenic CoCs in shellfish tissue are estimated by insertion of appropriate exposure parameters listed in Table 8, and toxicity values (i.e., SFs) listed in Table 11, into Equation (2) to derive analyte-specific, LBCs protective of human health at 10^{-6} concentration risk. Finally, UBCs protective of

aggregate risks of all carcinogenic CoCs are estimated by insertion of the lower bound RME into Equation (4). For analytes for which a carcinogenic and non-carcinogenic risk-based RME are calculated (*i.e.*, arsenic) the lowest and most stringent value is considered to be the appropriate risk-based RME value (USEPA, 1991a). Per EPA guidance (discussed in Section 2.4.3), the upper bound (10^{-4} risk) carcinogenic and non-carcinogenic (HQ = 1) RME values are carried forward to Table 14 for final Human Health TEV derivation.

The efficacy of these human health-based RMEs are further evaluated by comparison against Human Health Reference Screening Values (HH-RSVs) derived from measured CoC concentrations in mussels and clams collected from Narragansett Bay reference locations (Table 13). Collection sites and data treatment follow procedures as discussed for porewater and avian prey reference values. Because shellfish tissue RMEs are reported as wet (*e.g.*, live) weight concentrations, dry to wet ratio statistics developed for McAllister Point (Table A-2.3) samples were used to permit conversion of the HH-RSV data to wet weight concentrations. Results show good agreement in water content for various species, allowing use of the average of 14% dry weight (*i.e.*, 86% moisture content) for conversion of dry weight chemistry values into wet weight concentrations.

Final human health TEVs are presented in Table 14. The RME data from Table 12 were compared to HH-RSVs reported in Table 13. With the exception of arsenic and Total PCBs, the risk-based TEV was higher than the reference concentration, and hence was adopted as the final TEV. For arsenic, the reference value was about 25-fold higher than the risk-based value; whereas for Total PCBs, the selected TEV is about two-fold higher than the TEV. The fact that the final HH-TEV for arsenic and Total PCBs are determined by reference concentrations do not necessarily suggest high risks to Narragansett Bay reference area shellfish consumers from these CoCs, but rather indicates the margin of safety afforded by the exposure assumptions used in the Reasonable Maximum Exposure scenario for these CoCs.

In Section 3 (below) the efficacy of calculated TEVs for aquatic, avian and human health are evaluated against site risks and practicality for implementation.

3. PRG IMPLEMENTATION

Implementation of aquatic, avian and human health-based PRGs begins with the straightforward application of TEV values to derive media-specific HQs. These HQ values are inter-compared for each station and CoC to identify the "limiting" CoC, *e.g.*, that CoC-exposure pathway pair which represents the maximum TEV-HQ observed for the station.

Subsequently, a qualitative assessment of the TEV is performed in order to determine whether the spatial implementation of the TEV preferentially target areas of

highest risk as identified in the Marine Ecological (aquatic and avian) and Human Health Risk Assessments. In this spatial analysis, the relationship between the apparent risk reduction and remediated area is evaluated in order to provide input into risk management decisions regarding the setting of Remediation Goals. After determination of the pathway-specific CoCs, corresponding TEV values are converted into PRGs, being the TEV-equivalent concentration expressed in units suitable for implementation during remediation.

3.1. Implementation Methods

Implementation of PRGs to determine areas of potential remedial action requires that the CoC data obtained from point samples be assigned to non-sampled locations so as to produce a map of complete spatial coverage. Numerous methods for spatial extrapolation of point data to larger areas (such as contouring) have been developed for environments and sampling strategies where the assumptions of continuity (*e.g.*, constant CoC dilution with distance) and gradation (*e.g.*, regular spacing of sampling locations) are met. In the case of McAllister Point, these assumptions are not met due to heterogeneous CoC distributions and station clustering in focused areas. Hence, for this investigation, a method using Thiessen polygons was employed as it does not require the presumption of continuity in the data (ESRI, 1989). The Thiessen polygon technique creates polygons around sampled locations with a geometry such that any location in the polygon is closer to the sampled point than to any other sampled point. The concentration of the entire polygon is then allowed to take on the value at the sampled location, and thus avoids assumptions of continuity across widely separated locations. An approach of this type was undertaken during the EPA EMAP Demonstration Study for the Virginian Province (Weisberg *et al.*, 1993).

The Thiessen polygon model constructed for McAllister Point is shown in Figure 2. Geographic Information Systems software (ESRI, 1989) was used for polygon construction and subsequent generation of PRG implementation maps. The Marine ERA evaluated chemical and biological results at 40 sampling locations throughout the McAllister Point Landfill study area. The inshore boundary of the site polygons was established as the shoreline at high tide, offshore polygons are unbounded. Shading of polygons obtained from PRG implementation will be used to demonstrate the locations where CoC concentration data exceed the PRG (lightly-shaded), hence the area of potential remedial action. It is noted, however, that the polygonal area does not necessarily represent the final remediation area since the final area will depend on final PRG selection (*i.e.*, Remediation Goals) and additional sampling to improve spatial resolution.

3.2. Implementation Results

A summary of maximum TEV-HQs and Limiting CoCs (L-CoCs) for aquatic, avian predator and human health exposure scenarios by station is reported in Table 15; supporting TEV-HQ and L-CoC data by CoC and station within each exposure pathway are provided in Tables A-5, A-6 and A-7, respectively. Table 15 also provides a summary of the maximum TEV-HQ and associated CoC among the three exposure pathways and for the "combined" pathway (discussed below).

Since the implementation of TEVs (as PRGs) are intended to reduce risk, the spatial distribution of risk should be considered when evaluating the results of TEV implementation. Results of the Marine ERA have been used to classify the study area polygons based on the probability of adverse ecological risk caused by site-related CoCs (Figure 3) (see ERA Table 1.6-3 and ERA Figure 1.6-1). As indicated by the map, the highest probability of adverse ecological risk occurs at Stations NSB-2 through NSB-5 (Zone 2). The lowest probability of risk was observed for offshore Stations OS-22 through OS-27 (Zone 5), while the remaining area was intermediate between high and low risk. Human health risks were found for intertidal areas (Station NSB-1 to NSB-7) and for the offshore station group consisting of Stations MCL-12, SDA-S2B, SDA-S2C and OS-28.

Results of the TEV implementation process are discussed separately by exposure pathway and for the combined exposure pathway in the sections below. The calculation of remediation-based concentrations from the TEVs is discussed in Section 3.3.

Aquatic Exposure Pathway. Results of aquatic TEV-HQ calculations for CoCs in porewater from the McAllister Point study area are reported in Appendix Table A-5; the analyte with the maximum TEV-HQ for each station is reported in Table 15. The analysis identifies two metals (copper and nickel), four PAHs (anthracene, chrysene, fluorene, and pyrene) and Total PCBs as limiting CoCs.

It is noted that the application of a toxicity screen for the identification of L-CoCs did not appear to have greatly affected those CoCs which would have been selected based on direct WQSV comparisons alone. For porewater, SEM-AVS values suggest that divalent metals are not biologically available (SEM-AVS < 0, Table A-3.3A), hence analyte-specific porewater concentrations, although not measured, would be expected to be less than ambient water quality criteria. Some high molecular weight PAHs were predicted to exceed WQSVs (*e.g.*, anthracene, benzo(a)anthracene, flourene, chrysene), but were not identified by the toxicity evaluation. In this case, however, these PAHs were addressed by adopting a HMW PAH aggregate PRG. Thus, while not specifically selecting these CoCs, the potential cumulative risks responsible from these PAHs were accounted for. Finally, pesticides were not identified in the toxicity screen, nor were any of these CoCs above WQSV values. Hence, it can be concluded that the toxicity screen did not exclude any key

CoCs which might have been selected by the application of WQSV alone. The spatial distribution of TEV exceedences (*i.e.*, TEV-HQ > 1) by analyte is shown in Figure 4a. Anthracene (6 polygons) and fluorene (6 polygons) were the analytes which most commonly exceeded the TEVs and at distances furthest from the landfill, while exceedences for Total PCBs (3 polygons), nickel (3 polygons), chrysene (1 polygon), pyrene (1 polygon) and copper (1 polygon) occurred in areas immediately adjacent to the landfill.

The application of SEM:AVS data can be modified to be relevant to sediments deposited as a result of resuspension. By assuming that all AVS is oxidized during resuspension (AVS = 0) the SEM concentration data can be evaluated directly against the SEM benchmark (5 μmol/g). It is noted that this evaluation was performed in the ERA (Table 6.1-2). Six stations marginally exceeded the benchmark (NSB-1, NSB-2, NSB-3, NSB-4, NSB-5, and NSB-7) but by less than a factor of three. Noting that AVS was generally low in these sediments (< 6 μMol/g) it is possible that the combined effect of divalent metals could contribute to adverse effects in recently deposited sediments at these nearshore locations.

The risk-based (TEV-HQ) point of departure between areas of high aquatic risk probability (*i.e.*, a condition where a clear association between elevated chemical exposure and adverse ecological effects is evident as defined in the Marine ERA) and areas of reduced risk probability (higher uncertainty) was evaluated in order to provide a basis for which recommended PRG (RPRG) concentrations presumably provides the most risk reduction with the least habitat disruption (e.g., ecologically "efficient" remediation).

Results of this qualitative analysis show that implementing PRGs at concentrations approximately equal to three times the baseline (*i.e.*, TEV-HQ=1) concentration (Table 5) would appear to affect risk reduction in the highest risk probability areas (Figure 4b). A similar threshold for segregating intermediate from low risk areas could not be readily discerned from the data. For example, it can be seen that reducing RPRGs to TEV-HQ = 2 concentrations would cause inclusion of intermediate risk polygons NSB-1 (Zone 1) and 0S-30 (Zone 6) into the remediation area.

Given the increasing uncertainty in the ERA weight evidence supporting the conclusion of risk as risk probability declines, it is not readily apparent that selecting the baseline risk probability (TEV-HQ = 1) threshold would be beneficial overall considering the magnitude of environmental impacts which would be caused by the remedial effort over the expansive areas represented by TEV-HQs >1. In contrast, remedial actions required at the recommended TEV concentrations three times the TEV-HQ=1 appear to represent a better balance between habitat disruption and aquatic risk reduction which would occur during remediation. Additional considerations of technical feasibility and cost are also important factors for final selection of Remedial Goals. These factors are discussed in the Feasibility Study of which this document is an Appendix.

Avian Predator Exposure Pathway. Results of avian TEV-HQ calculations for CoCs in prey tissue from the McAllister point study area are reported in Appendix Table A-6; the analyte with the maximum TEV-HQ for each station is reported in Table 15. For the avian predator exposure pathway, maximum bivalve tissue residues exceeded TEVs for lead at four stations and for Total PCBs at three stations in the McAllister Point Landfill intertidal area (Figure 5). For three of the seven stations (NSB-3 (Pb), NSB-4 (Total PCBs) and NSB-6 (Total PCBs) TEV-HQs greater than three but less than six were observed. The Marine ERA concluded that only slight risks to avian predators were present given the relatively small affected area, the low degree of exposure and conservative nature of exposure assumptions (*e.g.*, predators are assumed to spend the entire life span at any given station). Hence, the data do not appear to warrant implementation of any of the avian CoCs as PRGs (other than for purposes of monitoring). In addition, any possible concerns associated with the avian predator exposure pathway in the intertidal area would likely be addressed if any remedial actions are undertaken in this area based on concerns for aquatic and/or human health pathways.

Human Health Exposure Pathway. Results of human health TEV-HQ calculations for CoCs in shellfish tissue from the McAllister point study area are reported in Appendix Table A-7; the analyte with the maximum TEV-HQ for each station is reported in Table 15. For the human health exposure pathway, maximum shellfish tissue exceeded TEVs for Total PCBs at all seven stations (NSB-1 to NSB-7) and for arsenic at one station (SDA-S2B; Figure 6a). Three PAHs (benzo(a)anthracene, benzo(b+k)anthracene and chrysene) were observed to have TEV-HQs > 0.5 but less than one. ,As these concentrations also occurred at the same stations where Total PCB TEV exceedences were observed, these PAHs are not identified as Limiting CoCs for protection of human health.

For Total PCBs, all intertidal stations had TEV-HQs less than 4, whereas the offshore station SDA-S2B had a TEV-HQ less than two. Although the human health risks were not summarized as to magnitude (*e.g.*, high vs. low), a remediation goal of achieving risk reduction in the intertidal area where shallow water would tend to favor more intensive shellfish harvesting does provide a risk-based point of departure upon which PRG recommendations can be scaled. Considering, however, that the conservative nature of the HH-TEV calculation method resulted in selection of the reference tissue concentration as the HH-TEV, the selection of a TEV equal to three times the baseline (TEV-HQ = 1) concentration is recommended for implementation. Intertidal stations with shellfish concentrations more than 3 times the reference (TEV-HQ>3) include stations NSB-3, NSB-5, and NSB-6 (Figure 6b).

Combined Exposure Pathway. A final spatial analysis of TEV-HQs was conducted based on the assumption that a single remedial option would be adopted to address all exposure pathways simultaneously. Results shown in Figures 7a and 7b and Table 15 indicate that a focus on six CoCs (copper, nickel, anthracene, fluorene, pyrene, and Total PCBs) is required to address risks to all identified receptors. Most of the study area

contained CoC concentrations above baseline risk (Figure 7a). At a threshold equivalent to three times the threshold concentration for baseline risk (Figure 7b), the majority of intertidal stations had exceedences due to aquatic risks while human health risk for Total PCBs at NSB-3 also exceeded the TEV-HQ = 3 threshold. (It is noted that the L- CoC for this location was Pb assuming baseline risk to avian predators; as this CoC was not recommended for implementation, Total PCBs for human health becomes the replacement L-CoC).

Collectively, these polygons represent areas of most significant risks based on the results of the Marine and Human Health ERAs. Hence, a remediation goal of meeting concentrations equivalent to three times the baseline risk threshold would achieve overall risk reduction in the high risk areas for the combined exposure pathway scenario. As discussed previously, it is not apparent that remediating to lower concentrations in other areas in addition to the high risk areas would be beneficial to the extent of outweighing environmental impacts of remediation over such large areas; additional considerations of technical feasibility and cost are discussed in the Feasibility Study.

3.3. PRG Determination

Table 16 presents a summary of baseline (i.e., TEV-HQ=1) and recommended PRGs for CoCs in each of the three exposure pathways as well as the combined exposure pathway, discussed above, expressed in concentration units to be implemented during remediation. In the sections below, the pathway specific PRGs (calculated from TEVs) will be evaluated with respect to available literature-based benchmarks to provide further confirmation of the level of protection afforded to receptors of concern from site-related CoCs.

Aquatic Exposure Pathway. For the aquatic exposure pathway, copper and nickel are identified as limiting CoCs and are expressed as water concentrations since back-calculation to sediment based units is problematic given substantial uncertainty in partitioning relationships. The baseline copper value (17.6 µg/L) is approximately 6-fold higher than the saltwater acute criteria (2.9 µg/L) although it is between the freshwater chronic and acute criteria values (12 and 18 µg/L, respectively). The fact that the PRG is higher than the saltwater acute criteria is attributed to reduced bioavailability of copper, particularly the concentration of the free Cu^{2+} ion to which copper toxicity is attributed. Other factors include complexation by dissolved organic carbon (DOC), hence reduction in bioavailability. The recommended PRG (52.9 µg/L) is concluded to be protective since the value is equivalent to the highest copper concentration associated with no toxicity in either amphipod or sea urchin tests (Station NSB-2;
53 µg/L). The nickel baseline PRG value (11.2 µg/L) is only slightly above the WQC-SC value (8.3 µg/L), while the recommended PRG (33.7 µg/L) is intermediate between the chronic value and the corresponding WQC saltwater acute concentration (86 µg/L).

Considering these facts, the implementation of recommended copper and nickel PRG values are likely to be adequately protective of adverse effects to aquatic biota.

Sediment-based concentrations for the five organic contaminants listed as PRGs were back-calculated from porewater TEV values using EqP (Table 16). The NOAA ER-L/ER-M concentrations for anthracene (85-1100 ng/g), chrysene (384-2800 ng/g), fluorene (19-540 ng/g), and pyrene (665-2600 ng/g) bracket the baseline and recommended PRG concentrations and thus provide independent confirmation that implementation of recommended PRGs should provide effective risk reduction for high risk areas.

Although the baseline aquatic PRG for total PCBs (1211 ng/g) is about seven-fold higher than the NOAA ER-M (180 ng/g), the corresponding TEV value was set as the WQC-SC value (0.03 µg/L) without site-specific modification. This apparent discrepancy between the level of protection afforded by water- vs. sediment-based benchmarks is attributed to the fact that the latter benchmark is field-based and correlative in nature, the ER-L/ER-M benchmark is reflective of effects caused by complex mixtures of CoCs, not PCBs acting alone. Hence, the PCB benchmark is artificially lowered because the presence of other CoCs in the mixture will likely make the sample more toxic than would otherwise occur in the PCB-only case. In contrast, the WQC is based solely on PCB toxicity. Thus, the baseline PRG value, being set equivalent to the WQC-SC concentration, is expected to be completely protective of risks to aquatic biota from PCB exposure in sediment. Similarly, the recommended PRG for Total PCBs (3634 ng/g), being based on a TEV value only three times higher than the WQC-SC concentration (*i.e.*, 3 x 0.03 µg/L = 0.09 µg/L) and 100X less than the WQC-SA criteria (10 µg/L) should also protect for possible CoC impacts to aquatic biota in high ecological risk areas. As the WQC value was selected for protection of avian predators, not aquatic biota, the value is not directly predictive of effects on aquatic biota. For example Ho (1997) found the LC50 for PCBs to be 40 µg/L; applying an 1:8 acute:chronic ratio, a predicted chronic effect concentration of 5 µg/L is obtained. The fact that this chronic value is 160-fold higher than the "default" criteria attests to the overly conservative nature of the chronic benchmark for protection of aquatic biota. It is also noted that application of the 8:1 ratio to the published acute criteria (10 µg/L) results in a chronic value of 1.25 µg/L. The comparability of these latter acute and chronic ratios with studies by Ho (1997) confirms that amphipods are among the most sensitive species to PCB effects.

As for sediment benchmark comparisons, the RPRG concentration is well above the NOAA ER-M (180 ng/g dry weight), the value is comparable tot he State of Washington Apparent Effects Threshold (AET)-high (3100 ng/g dry) benchmark. In addition, MacDonald (1996) calculated a value of 1080 to 3240 ng/g at 1-3% TOC, which approximates the range of TOCs for the McAllister Point study area. Thus, the RPRG is comparable tot he range of independent estimates of threshold effects levels for PCBs on aquatic biota. Also, the recommended PRG for Total PCBs is only about 1.3X higher than the Sediment Effect Concentration of 2700 ng/g calculated by MacDonald (1997) based

on PCB-spiked sediment bioassay. Hence, considering factors such as characteristics of the sediment and composition of PCBs, this good agreement suggests the recommended PRG will be protective of aquatic receptors.

Avian Predator Exposure Pathway. Two analytes identified as limiting CoCs for the avian predator pathway are lead and Total PCBs (Table 16). The lead and PCB values were back-calculated from the tissue value using the Bioaccumulation Factor and Biota-Sediment Accumulation Factor derived for these CoCs as part of the Marine ERA. Due to a lack of benchmark availability, neither the lead (518 µg/g dry wt sediment) or Total PCB (134 ng/g dry wt sediment) PRG can be assessed directly with regard to the level of protection afforded to avian predators by these sediment-based values. The only relevant assessment that can be made is to assume that such values are indirectly protective of avian predators by reducing stress on avian prey leading to reduction in their food supply or quality. However, lead was not found to be a limiting PRG for the aquatic pathway so adoption of this PRG to prevent indirect effects on food supply appears unwarranted. As for PCBs, the PRG value is close to the NOAA ER-M value (180 ng/g dry weight), but is nine-fold lower than the corresponding PRG adopted for the aquatic pathway. Since the aquatic PRG is based directly on the WQC-SC value, the avian PCB PRG would appear to be overly protective of indirect effects of PCB exposures on avian food sources in the McAllister Point study area. As for the direct bioaccumulative effects, the marine ERA concluded that risks to avian predators from any site-related CoCs were unlikely primarily because of the conservative nature of the exposure assumptions. Thus, the adoption of lead and Total PCBs as avian PRGs are not recommended since little risk reduction may be expected from their implementation.

Human Health Exposure Pathway. Finally, two analytes (Total PCBs and arsenic) were identified as limiting CoCs for the human health exposure pathway. As for avian predators, it is not possible to assess the sediment-based value due to a lack of comparable benchmarks for human health. Given, however, that the baseline PRGs for Total PCBs and arsenic were set equal to reference-based concentrations, they are likely to be very protective (perhaps overprotective) of risks to humans. Adding to the conservatism of the PRGs are likely limited use of the area for shellfishing, the limited affected area, and low biomass of available shellfish to support subsistence level shellfishing, were it to occur. Accordingly, the baseline PRGs for total PCBs (40 ng/g dry weight) and arsenic (0.13 ng/g) should be retained should shellfishing practices in the study area change in the future. However, because there is presently minimal likelihood that PCBs or arsenic in shellfish are substantive sources of risk, PRGs are not recommended for implementation. It is noted also that remediation for aquatic risks due to PCBs is recommended, such that human health risks will be addressed to some extent by the aquatic PRG implementation.

Combined Exposure Pathway. PRG concentrations selected for the combined exposure pathway represent the most protective value (*i.e.*, lowest) among the three

exposure pathways. It is noted that although baseline and/or recommended PRGs for avian and human health were retained, incorporation of these PRGs for the combined exposure pathway has not been performed because of the minimal likelihood of exposure to these receptors. Thus, the implementation of recommended PRGs for the six CoCs is expected to address site-related risks for all exposure pathways combined. Baseline PRGs are expected to address the majority of site-related risks, but may be too difficult to implement based on technical feasibility and cost considerations. The recommended PRGs, in contrast, are expected to address CoC contamination in areas of highest concern, (*i.e.*, human harvesting and avian feeding zones in the landfill intertidal as well as high aquatic risk areas identified in the Marine ERA), and this would appear to provide a better balance between the degree of risk reduction and habitat disruption that would occur during remediation. A detailed analysis of technical feasibility and cost related to the selection of baseline vs. Recommended PRGs is presented in the Feasibility Study.

4. CONCLUSIONS/RECOMMENDATIONS

The PRG development strategy developed for McAllister Point Landfill was developed in a manner consistent with site ARARs and has identified PRGs which are protective of site-related risks as described in the human health and ecological risk assessments. The PRG development process was intended to derive two sets (baseline and recommended) of pathway-specific PRGs for individual CoCs and PRG recommendations for the combined exposure pathway that would reduce risks to all the identified receptors. The baseline PRGs are the baseline values that would address all potential risks identified in the marine ERA and HHRA. In contrast, the recommended PRGs are developed to target risk-reduction in the areas of highest concern, i.e., the highest ecological risk areas and the most accessible areas for human shellfish consumption. This recommendation, being based on best professional judgement, is intended to affect a remedial solution which strikes a practical balance between the degree of risk reduction which is practical in consideration of the areal extent of habitat disruption required during remediation.

The analysis of data to derive PRGs for protection of ecological and human receptors revealed that the risk-based point of departure between areas of high ecological risk/more probable human health risk occurred at concentrations equal to three times the TEV-HQ = 1. Whereas implementing the baseline PRG would address all site-related risk, the recommended PRGs based on this higher concentration threshold would result in targeting risk reduction in the areas of greatest concern for human receptors (landfill intertidal zone) and ecological receptors (landfill intertidal and nearby subtidal regions). The magnitude of the aquatic PRGs are generally comparable to available benchmarks and hence reduce uncertainty with respect to risk associated with CoC concentrations once the PRGs are implemented.

As discussed previously, the final selection of the final PRGs requires a separate analysis of exposure pathway-specific PRGs for each CoC to confirm that implementation will target remedial action in areas which will affect the greatest risk reduction among aquatic, avian predator, and human health exposure pathways in manner which is appropriately conservative and practical. Depending on the nature of the remedial action, a PRG list based on a combined pathway analysis may be suitable. Based solely on risk considerations, a factor of three may be applied to PRG values to affect risk reduction in high risk probability areas in preference to other locations assigned intermediate or lower risk probability (aquatic risks) or of more limited access to receptors (e.g., subtidal areas for human health exposures). This point of departure for risk-based decision making may represent a better balance between degree of risk reduction and spatial extent of habitat disruption.

It is acknowledged that the spatial resolution of the analysis depends on the density of stations within the study area. Some areas which might require remedial action may be presently too large, and thus will require confirmation sampling during the pre-design investigation in order to reduce uncertainty and better define the extent of the areas target for remedial action.

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Figure 1. Water Quality Screening Criteria Value Selection Process and Associated Data Qualifiers.

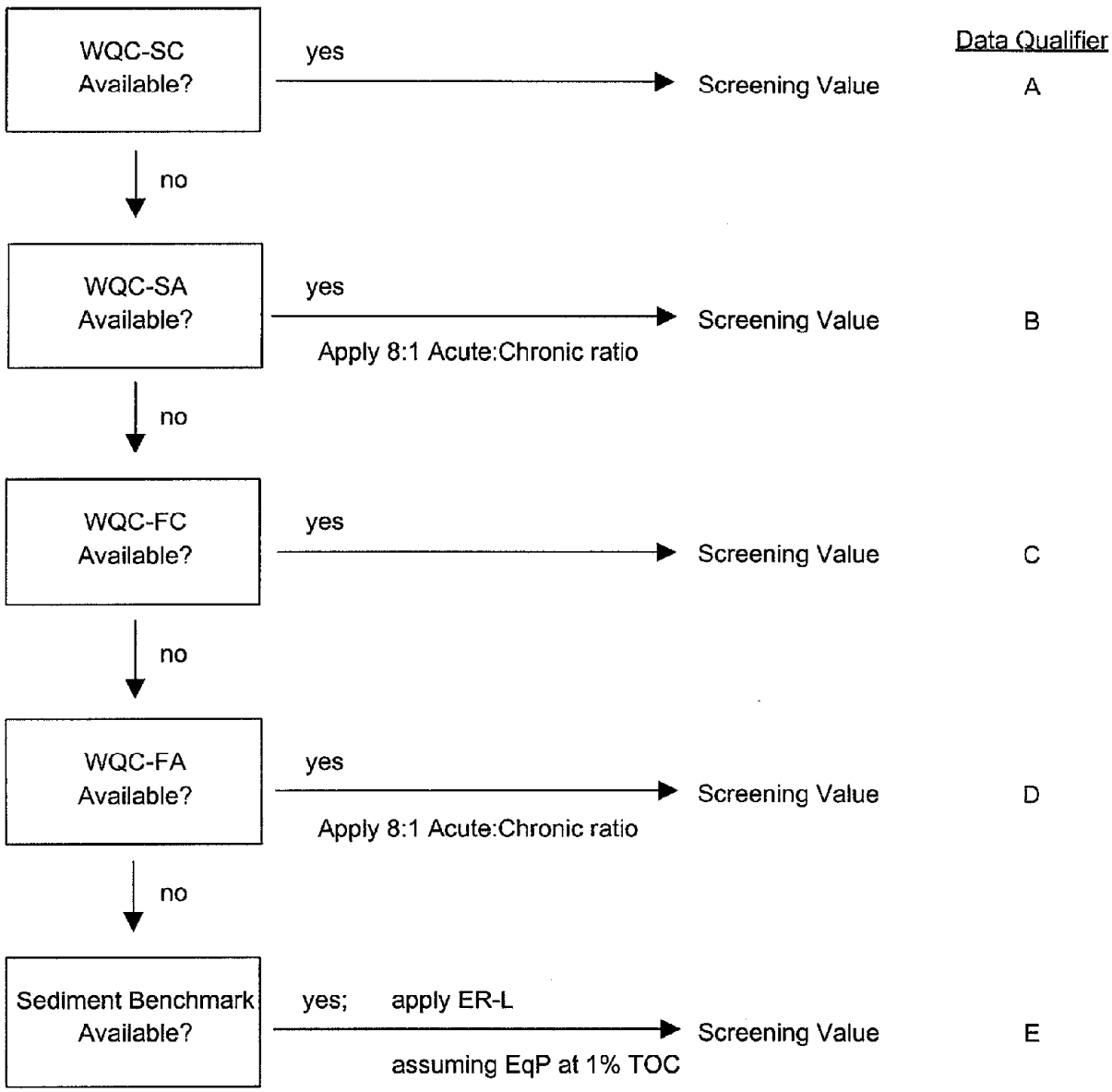
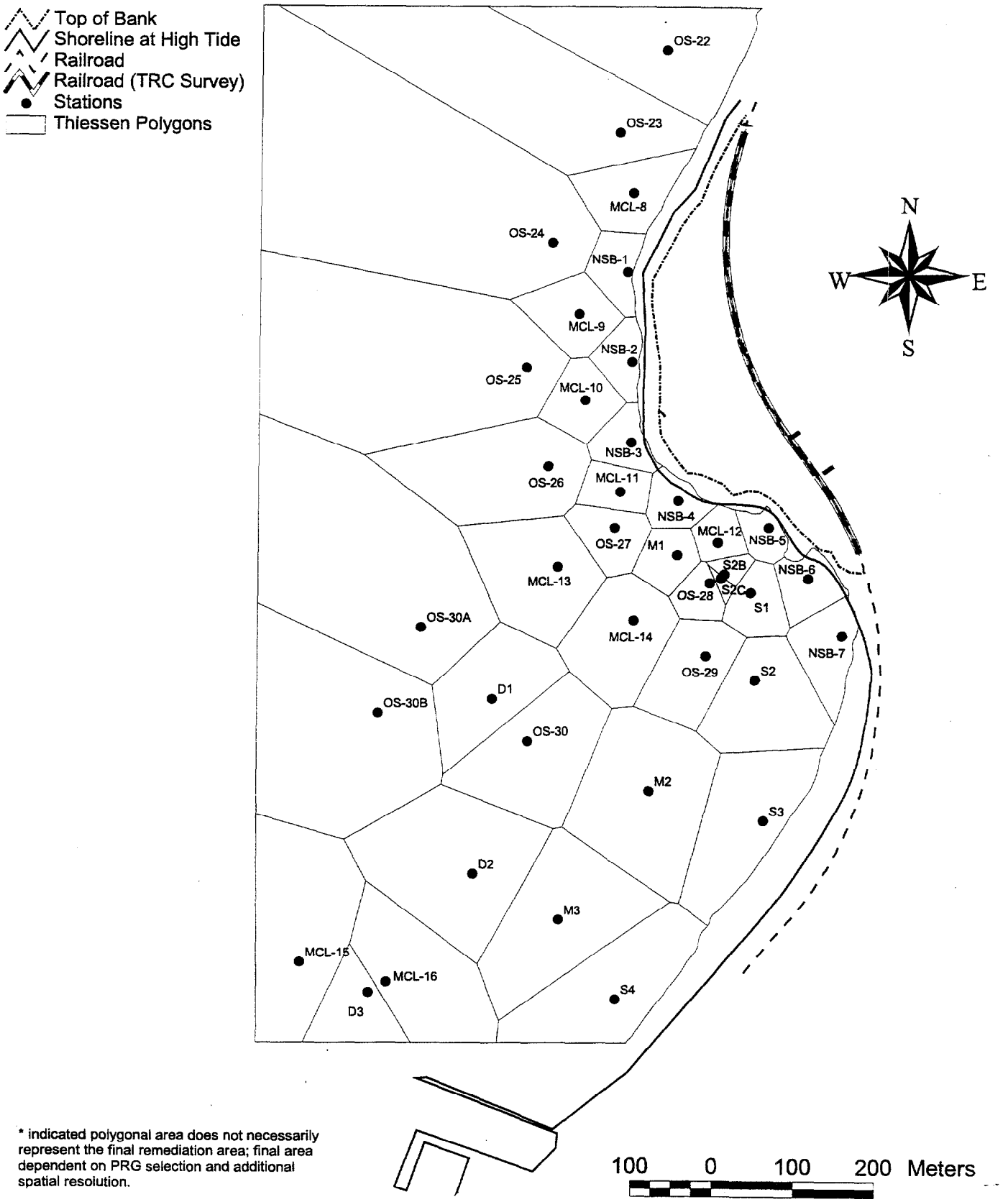
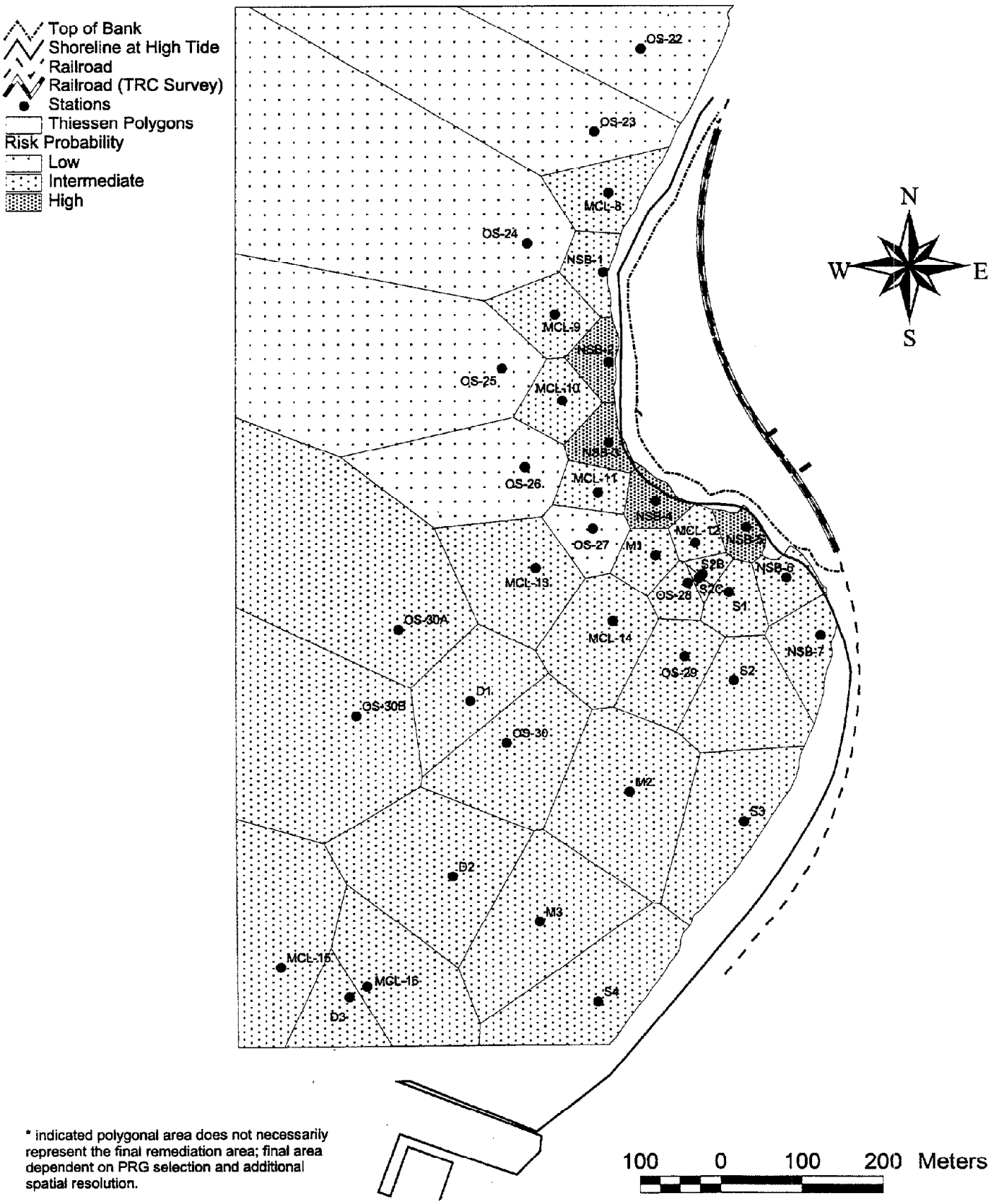


Figure 2. Thiessen Polygons for PRG Implementation for the NETC McAllister Point Landfill study area.



* indicated polygonal area does not necessarily represent the final remediation area; final area dependent on PRG selection and additional spatial resolution.

Figure 3. Aquatic risk probability for the NETC McAllister Point Landfill study area.*



* indicated polygonal area does not necessarily represent the final remediation area; final area dependent on PRG selection and additional spatial resolution.

Figure 4a. Summary of CoCs exceeding TEVs by location for the NETC McAllister Point Landfill study area:*

Aquatic Exposure Pathway: Locations with Limiting CoCs exceeding the Baseline TEV concentration**

Top of Bank
Shoreline at High Tide
Railroad
Railroad (TRC Survey)
Stations
Thiessen Polygons

Copper TEV-HQ

NSB-2: 3.02

Nickel TEV-HQs

NSB-1: 2.10
NSB-7: 1.80

Anthracene TEV-HQs

D1: 1.12
M2: 1.18
MCL-16: 1.09
MCL-8: 1.36
S2B: 4.68
S4: 1.05

Chrysene TEV-HQ

NSB-3: 3.26

Fluorene TEV-HQs

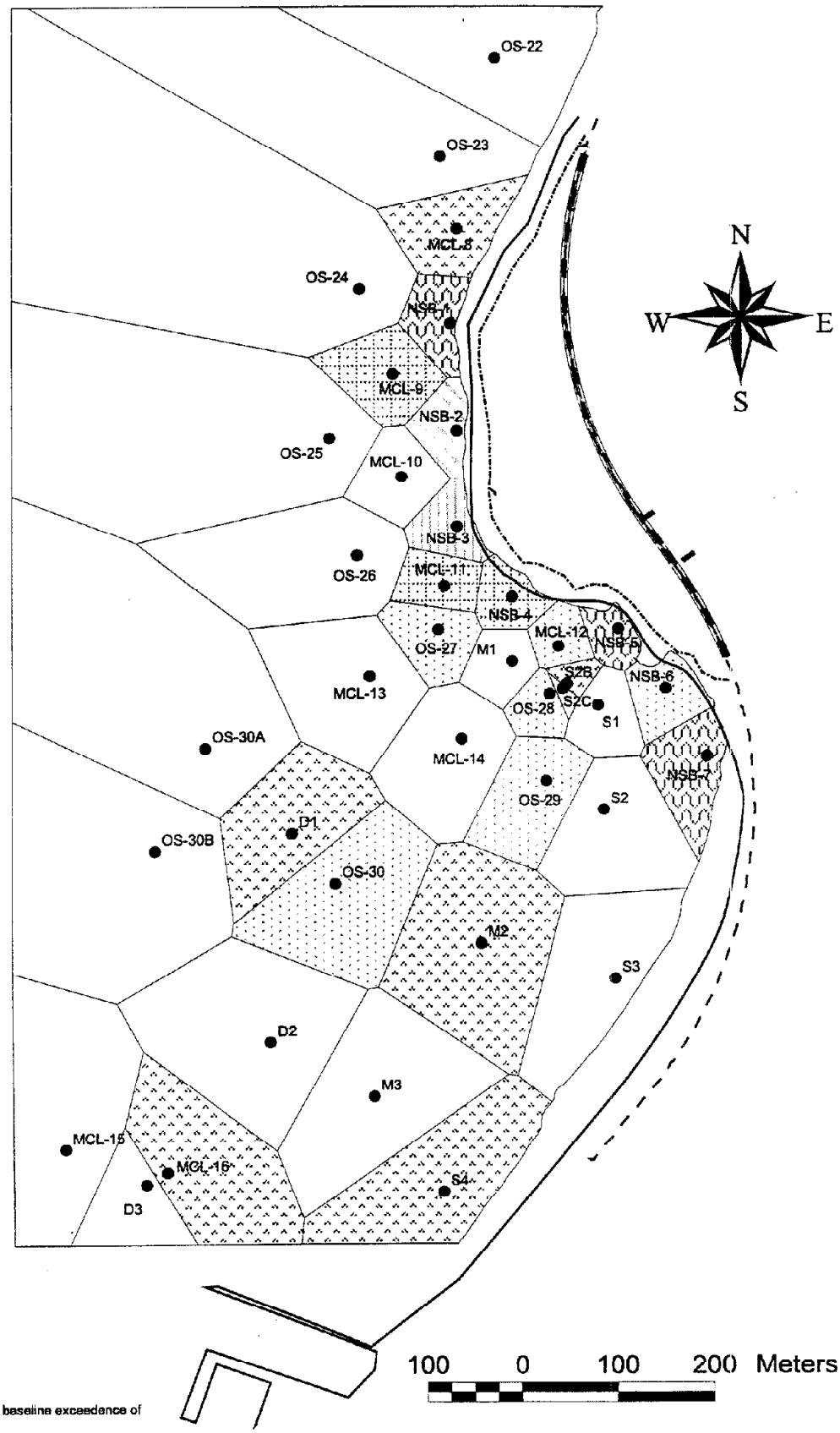
MCL-12: 3.22
NSB-6: 5.74
OS-27: 1.32
OS-28: 3.81
OS-29: 1.21
OS-30: 2.17

Pyrene TEV-HQ

S2C: 6.12

Total PCBs TEV-HQs

MCL-9: 1.04
MCL-11: 1.52
NSB-4: 16.80



* indicated polygonal area does not necessarily represent the final remediation area; final area dependent on PRG selection and additional spatial resolution.

** See Table 15 for list of Limiting CoCs and associated baseline exceedence of TEVs (TEV-HQs > 1).

Figure 4b. Summary of CoCs exceeding TEVs by location for the NETC McAllister Point Landfill study area:*

Aquatic Exposure Pathway: Locations with Limiting CoCs exceeding the RecommendedTEV concentration**

Top of Bank
Shoreline at High Tide
Railroad
Railroad (TRC Survey)
Stations
Thiessen Polygons

Copper TEV-HQ

NSB-2: 3.02

Nickel TEV-HQ

NSB-5: 4.34

Anthracene TEV-HQ

S2B: 4.68

Chrysene TEV-HQ

NSB-3: 3.26

Fluorene TEV-HQs

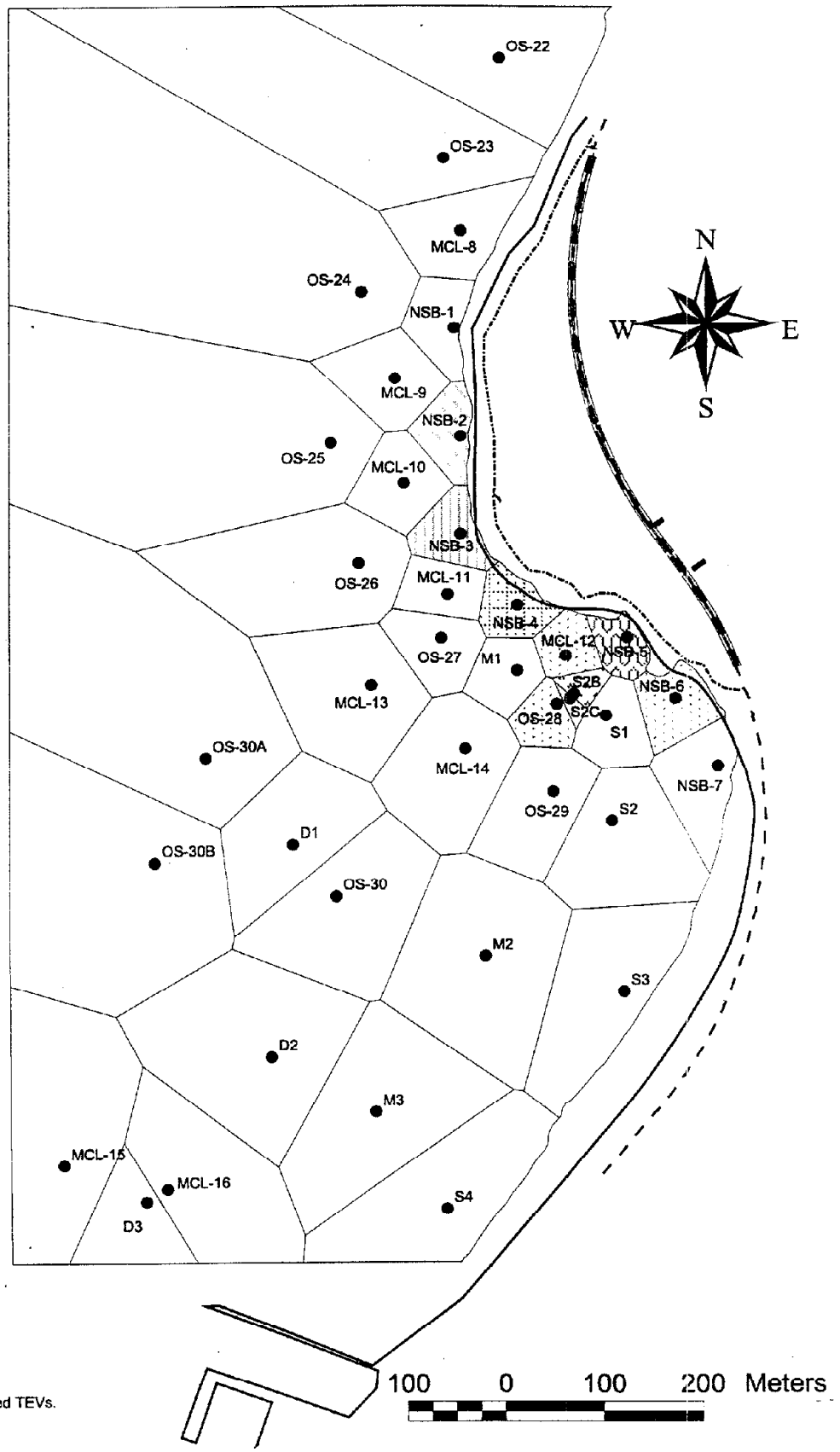
MCL-12: 3.22
OS-28: 3.81
NSB-6: 5.74

Pyrene TEV-HQ

S2C: 6.12

Total PCBs TEV-HQ

NSB-4: 16.8

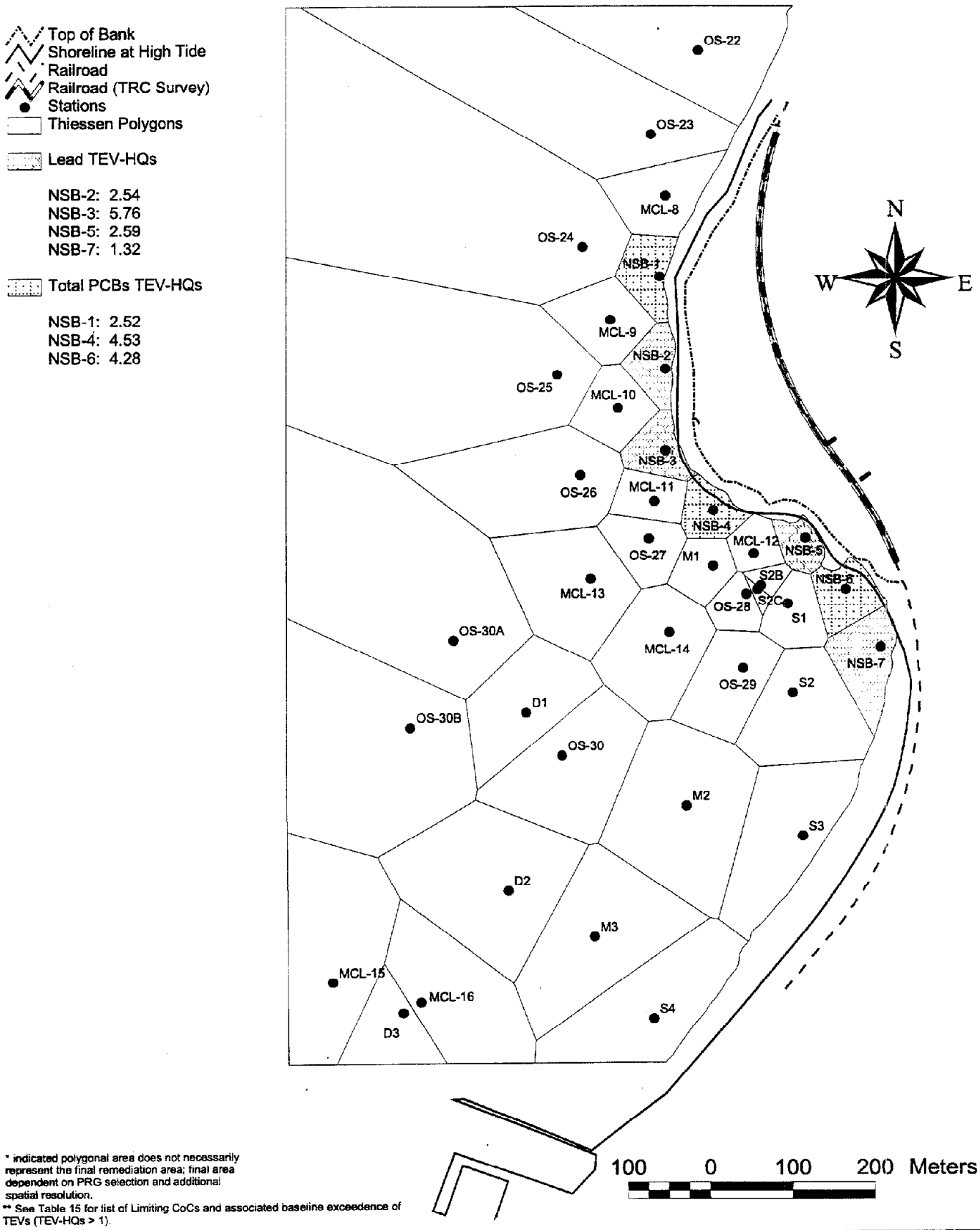


* indicated polygonal area does not necessarily represent the final remediation area; final area dependent on PRG selection and additional spatial resolution.

** See Text Section 3.2 for discussion of recommended TEVs.

Figure 5. Summary of CoCs exceeding TEVs by location for the NETC McAllister Point Landfill study area:*

Avian Predator Exposure Pathway: Locations with Limiting CoCs exceeding the Baseline TEV concentration**



* indicated polygonal area does not necessarily represent the final remediation area; final area dependent on PRG selection and additional spatial resolution.

** See Table 15 for list of Limiting CoCs and associated baseline exceedence of TEVs (TEV-HQs > 1).

Figure 6a. Summary of CoCs exceeding TEVs by location for the NETC McAllister Point Landfill study area:*

Human Health Exposure Pathway: Locations with Limiting CoCs exceeding the Baseline TEV concentration**

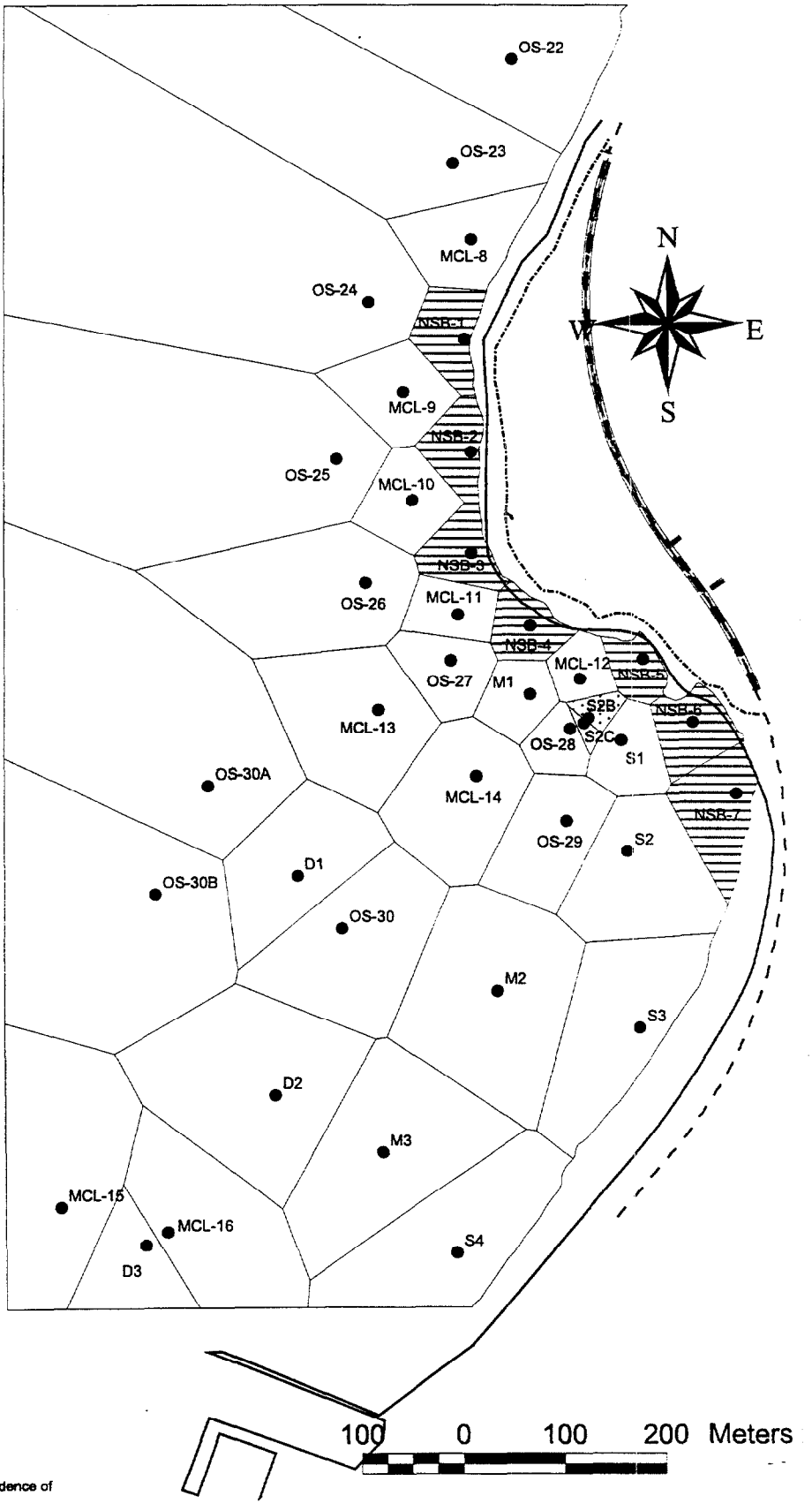
Top of Bank
Shoreline at High Tide
Railroad
Railroad (TRC Survey)
Stations
Thiessen Polygons

Total PCBs TEV-HQs

NSB-1: 1.91
NSB-2: 1.87
NSB-3: 4.00
NSB-4: 2.55
NSB-5: 3.02
NSB-6: 3.33
NSB-7: 2.49

Arsenic TEV-HQs

S2B: 1.37



* indicated polygonal area does not necessarily represent the final remediation area; final area dependent on PRG selection and additional spatial resolution.

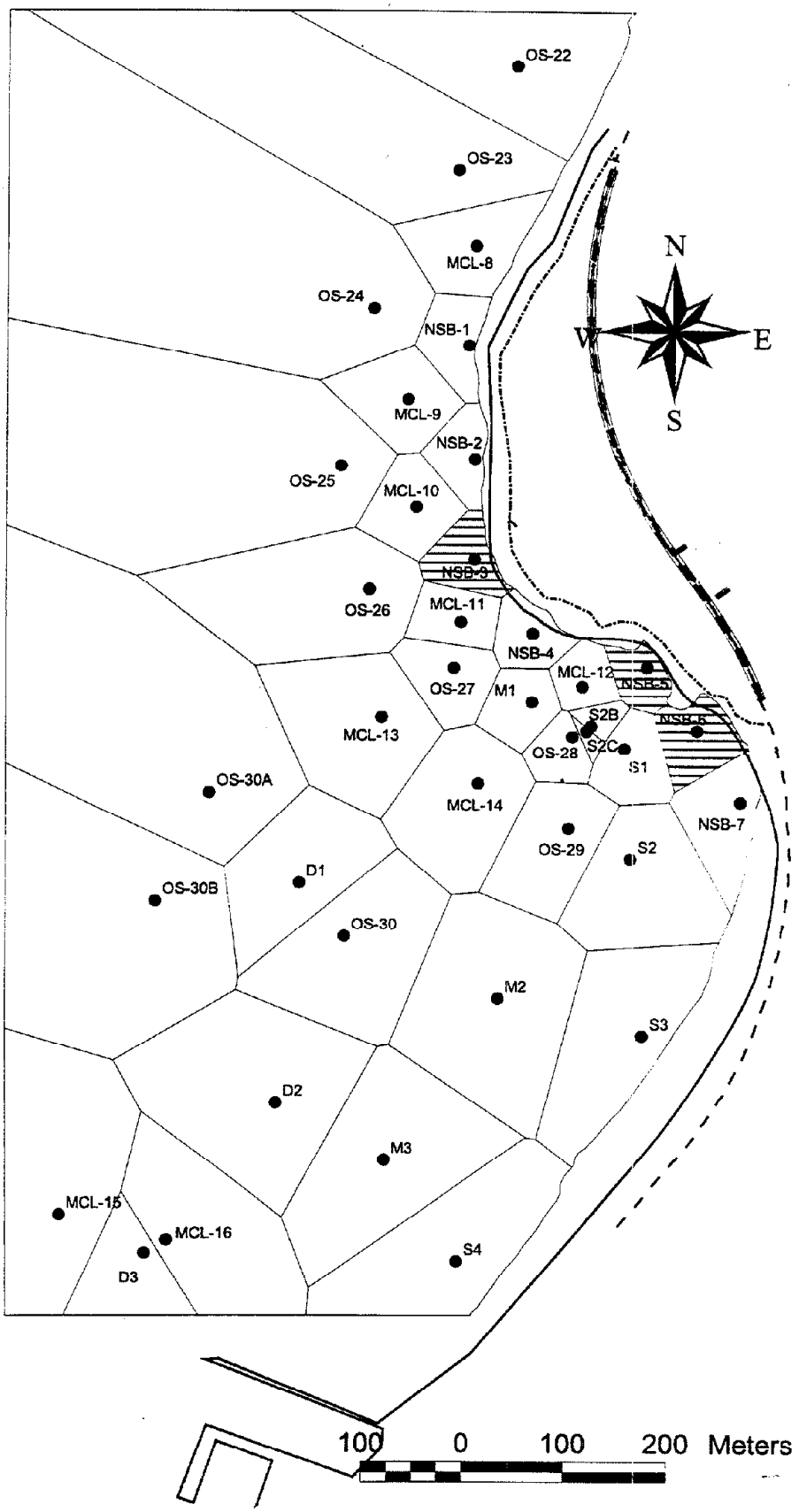
** See Table 15 for list of Limiting CoCs and associated baseline exceedence of TEVs(TEV-HQs > 1).

Figure 6b. Summary of CoCs exceeding TEVs by location for the NETC McAllister Point Landfill study area:*
Human Health Exposure Pathway: Locations with Limiting CoCs exceeding the Recommended TEV concentration**

Top of Bank
Shoreline at High Tide
Railroad
Railroad (TRC Survey)
Stations
Thiessen Polygons

Total PCBs TEV-HQs

NSB-3: 4.00
NSB-5: 3.02
NSB-6: 3.33

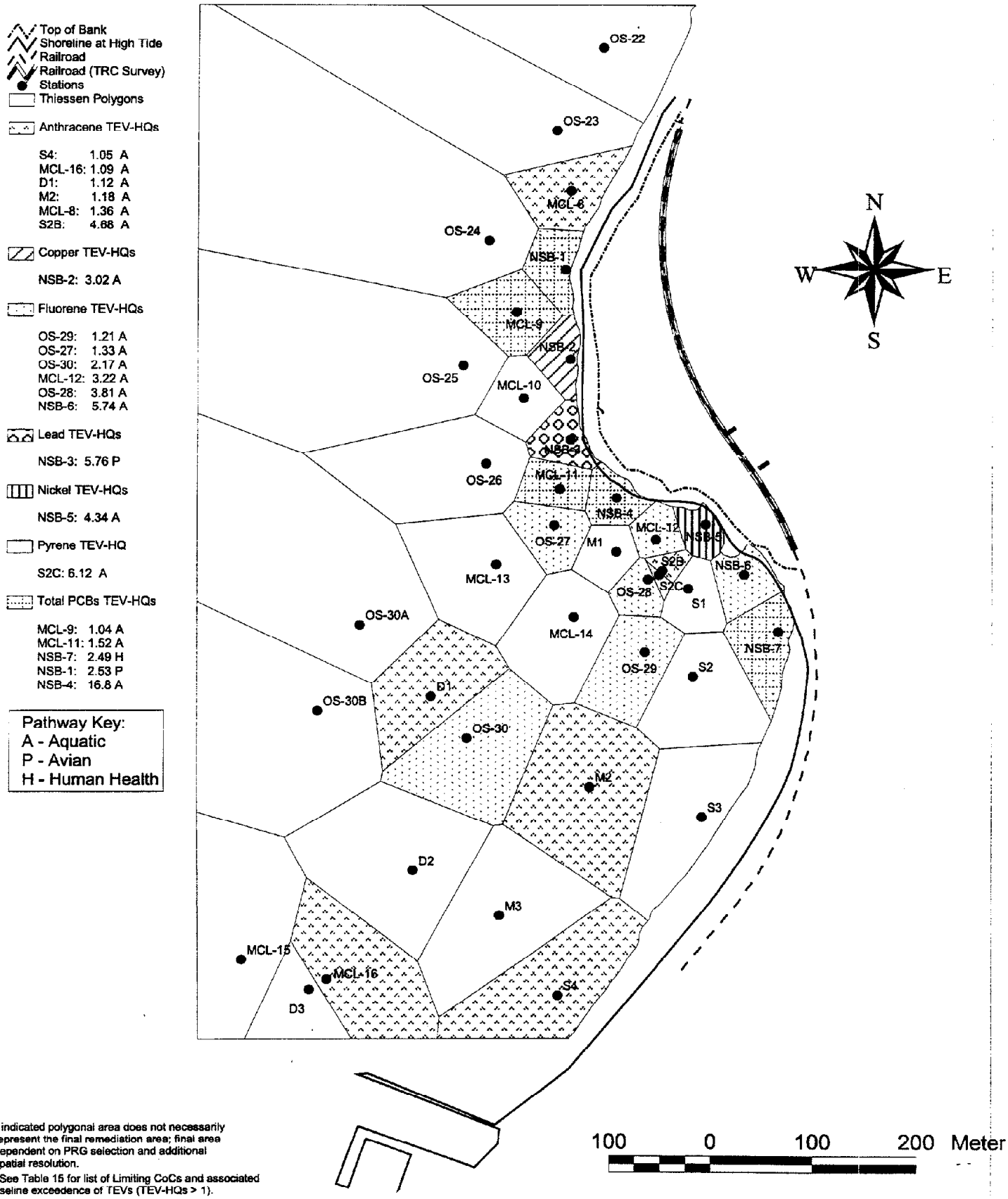


* indicated polygonal area does not necessarily represent the final remediation area; final area dependent on PRG selection and additional spatial resolution.

** See Text Section 3.2 for discussion of Recommended TEVs.

Figure 7a. Summary of CoCs exceeding TEVs by location for the NETC McAllister Point Landfill study area:*

Combined Exposure Pathway: Locations with Limiting CoCs exceeding the BaselineTEV concentration**

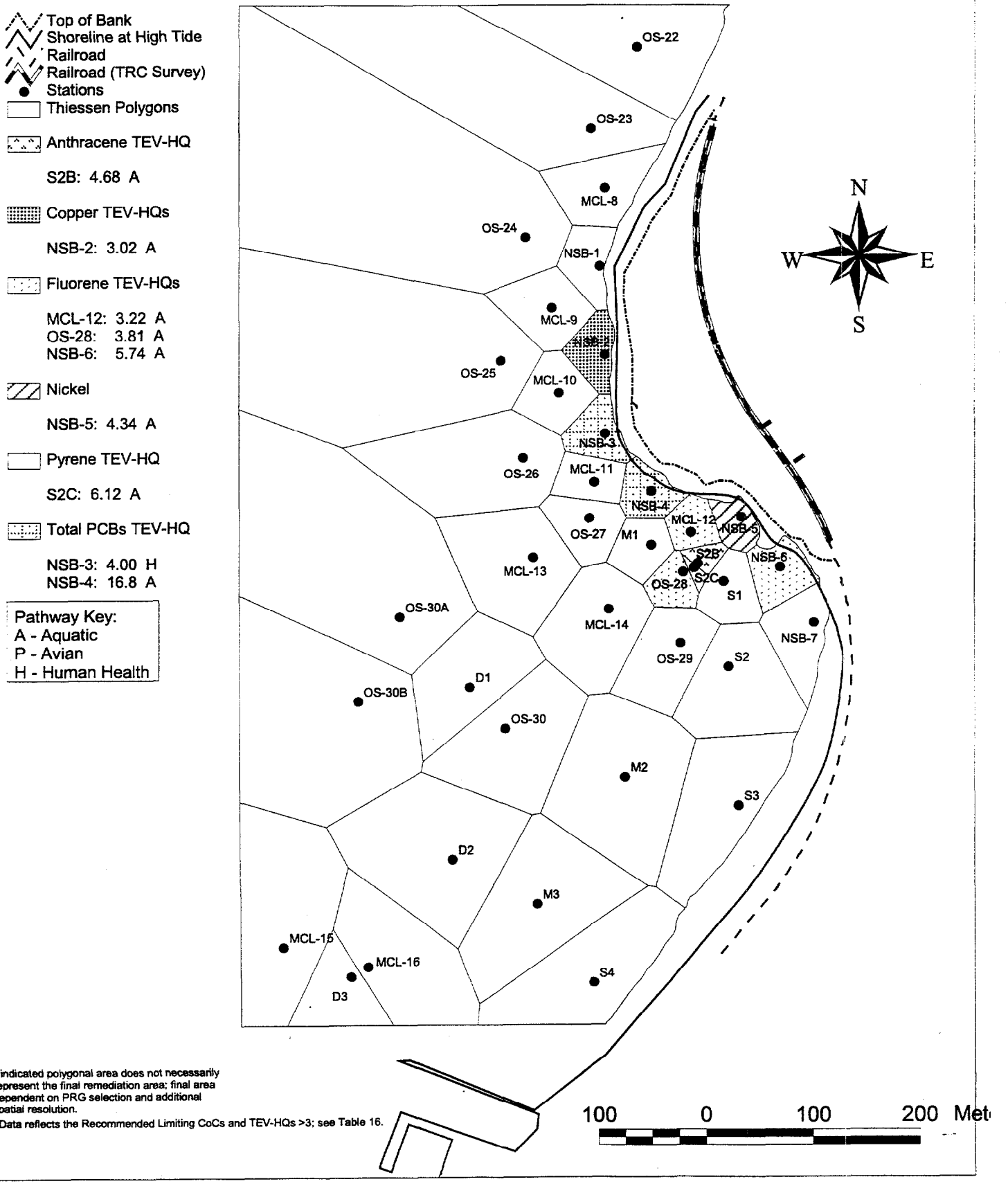


* indicated polygonal area does not necessarily represent the final remediation area; final area dependent on PRG selection and additional spatial resolution.

** See Table 15 for list of Limiting CoCs and associated baseline exceedence of TEVs (TEV-HQs > 1).

Figure 7b. Summary of CoCs exceeding TEVs by location for the NETC McAllister Point Landfill study area:*

Combined Exposure Pathway: Locations with Limiting CoCs exceeding the Recommended TEV concentration**



* indicated polygonal area does not necessarily represent the final remediation area; final area dependent on PRG selection and additional spatial resolution.

**Data reflects the Recommended Limiting CoCs and TEV-HQs >3; see Table 16.

Table 1. Procedure for Preliminary Remediation Goals (PRGs) development for aquatic, avian predator, and human health exposure pathways in the McAllister Point Landfill study area.

PROCEDURE	EXPOSURE PATHWAY		
	Aquatic	**Avian Predator**	**Human Health**
1 - Select benchmarks; Express CoC- and pathway-specific risk as Hazard Quotients (HQs).	Benchmark = Water Quality Screening Values (WQSV);PW-HQ = Porewater (PW) concentration/WQSV.	Benchmark = Toxicity Reference Value (TRV); TRV-HQ = Tissue concentration of prey species/TRV.	Benchmark = minimum Reasonable Maximum Exposure (RME) value; RME-HQ = Shellfish tissue concentration/RME.
2 - Evaluate CoC bioavailability under site-specific conditions.	Estimate 95% Upper Confidence Limit (95% UCL) of PW-HQs associated with nontoxic samples; set NOEQ = 1 where 95% UCL<1.	TRV based on avian predator exposure model for species living in the New England region.	RME based on human health exposure model for recreational shellfishing characteristics in the New England region.
3 - Retain CoCs substantially contributing to risk at the site.	Retain CoCs for which the Maximum PW-HQ associated with toxic samples > NOEQ.	Retain CoCs with TRV-HQ>1.	Retain carcinogenic CoCs with risk > $1x10^{-6}$; Retain non-carcinogenic CoCs with HQ>1.
4 - Evaluate feasibility of pathway/CoC specific PRG as a long-term remedial goal.	Compare Aquatic NOEC[1] and Reference Screening Value (RSV) for CoCs in porewater; select greater of two values as aquatic Threshold Effects Value (TEV).	Compare Avian Predator TRV and Reference Screening Value (RSV) for CoCs in prey species tissues; select greater of two values as avian predator Threshold Effects Value (TEV).	Compare human health RME and Reference Screening Value (RSV) for CoCs in shellfish species tissues; select greater of two values as human health Threshold Effects Value (TEV).
5 - Rank pathway-specific TEV-HQs and select CoCs with maximum HQs by station and pathway as "limiting" CoCs.	Calculate Aquatic TEV-HQs as station-specific PW conc./TEV; identify maximum TEV-HQ by station; compile resulting list as "limiting" Aquatic CoCs for PRG development.	Calcluate Avian Predator TEV-HQs as station-specific prey tissue conc./TEV; identify maximum TEV-HQ by station; compile resulting list as "limiting" Avian Predator CoCs for PRG development.	Calcluate Human Health TEV-HQs as station-specific shellfish tissue conc./TEV; identify maximum TEV-HQ by station; compile resulting list as "limiting" Human Health CoCs for PRG development.
6 - Determine PRGs for "limiting" CoCs, I.e., convert TEV values in concentration-based units to be used during remediation.	For metal CoCs, use aquatic TEVs as PRGs (units = µg/L); derive organic PRGs (units = ng/g dry wt sediment) from TEV using EqP model.	Calculate PRGs (units = ng/g dry wt sediment) from avian TEVs using BAF (metals) and BSAF (organics) models.	Calculate PRGs (units = ng/g dry wt sediment) from human health TEVs using BAF (metals) and BSAF (organics) models.
7 - Evaluate practicality of pathway-specific PRGs for effective risk reduction.	Compare PRG exceedence to aquatic risk distribution.	Compare PRG exceedance to avian predator risk distribution.	Compare PRG exceedence to human health risk distribution.

1 - NOEC = NOEQ x WQSV.

Table 2. Water Quality Criteria for target analytes selected for the McAllister Point Landfill PRG development and derived Water Quality Screening Values.

		EPA Water Quality Criteria				NOAA	WQSV	
Group	Target Analyte[1]	WQC-FA	WQC-FC	WQC-SA	WQC-SC	ER-L	Conc.	DQ
Metals	Arsenic	360	190	69	36	36	36	A
	Cadmium	3.9	1.1	43	9.3	9.3	9.3	A
	Chromium	1700	210	1100	50	50	50	A
	Copper	18	12	2.9	2.9	3.1	2.9	A
	Lead	83	3.2	220	8.5	8.1	8.1	A
	Mercury	2.4	0.012	2.1	0.025	0.025	0.025	A
	Nickel	1400	160	75	8.3	8.2	8.2	A
	Silver	0.92	0.12	7.2	0.92	0.92	0.92	A
	Zinc	120	110	95	86	81	81	A
	SEM-AVS						5	F
PAHs	1,6,7-Trimethylnaphthalene							NA
	1-Methylnaphthalene							NA
	1-Methylphenanthrene							NA
	2,6-Dimethylnaphthalene							NA
	2-Methylnaphthalene					70.00	1.22	E
	Acenaphthene	1700	520	970	710		710	A
	Acenaphthylene					44.00	0.64	E
	Anthracene					85.30	0.40	E
	Benzo(a)anthracene					261	0.052	E
	Benzo(a)pyrene					430	0.0265	E
	Benzo(b)fluoranthene							NA
	Benzo(e)pyrene							NA
	Benzo(g,h,i)perylene							NA
	Benzo(k)fluoranthene							NA
	Biphenyl							NA
	Chrysene					384	0.13	E
	Dibenz(a,h)anthracene					63.40	0.0127	E
	Fluoranthene	3980		40	16		16	A
	Fluorene					19.00	0.20	E
	High Molecular Weight PAHs							NA
	Indeno(1,2,3-cd)pyrene							NA
	Low Molecular Weight PAHs							NA
	Naphthalene	2300	620	2350			294	B
	Perylene							NA
	Phenanthrene	30	6.3	7.7	4.6		4.6	A
	Pyrene					665	4.73	E
	Total PAHs							NA
PCBs	Total PCBs (Sum Congenersx2)	2	0.014	10	0.03	0.03	0.03	A
Pesticides	Aldrin	3		1.3			0.163	B
	Hexachlorobenzene	6	3.68				3.68	C
	Mirex		0.001		0.001		0.001	A
	o,p'-DDE					2.20	0.000728	E
	p,p'-DDE					2.20	0.000728	E
TBT	Dibutyltin							NA
	Monobutyltin							NA
	Tributyltin							NA

DQ - Data Qualifier (see Figure 1).
WQC-FA = Water Quality Criteria - Freshwater Acute Value
WQC-FC = Water Quality Criteria - Freshwater Chronic Value
WQC-SA = Water Quality Criteria - Saltwater Acute Value
WQC-SC = Water Quality Criteria - Saltwater Chronic Value
WQSV = Water Quality Screening Value; see text and Figure 1 for WQSV derivation.
WQSV CODES:
NA= Benchmark not available to derive Screening Value
A- WQC-SC VALUE
B- 8:1 ACUTE/CHRONIC RATIO APPLIED TO WQC-SA VALUE (Shepard, 1998).
C- WQC-FC VALUE
D- 8:1 ACUTE/CHRONIC RATIO APPLIED TO WQC-FA VALUE (Shepard, 1998).
E- EqP PARTITIONING OF ER-L SEDIMENT BENCHMARK INTO WATER AT 1% TOC
F- SEM-AVS benchmark of 5 µmol/g dry wt (USEPA, 1996).
1 - EPA, 1989; Units µg/L

Table 3. Distribution of toxic and nontoxic porewater Hazard Quotients and derivation of No Observable Effect Quotients (NOEQs) for the McAllister Point Landfill aquatic exposure pathway.

		Amphipod Survival							Sea Urchin Fertilization							Sea Urchin Development							
		Nontoxic Samples			Toxic Samples				Nontoxic Samples			Toxic Samples				Nontoxic Samples			Toxic Samples				Aquatic
Class	Analyte	N	95% UCL PW-HQ[3]	NOEQ[1]	N	Max. PW-HQ[3]	Max. PW-HQ > NOEQ?	T-NOEQ[4]	N	95% UCL PW-HQ[3]	NOEQ[1]	N	Max. PW-HQ[3]	Max. PW-HQ > NOEQ?	T-NOEQ[4]	N	95% UCL PW-HQ[3]	NOEQ[1]	N	Max. PW-HQ[3]	Max. PW-HQ > NOEQ?	T-NOEQ[4]	NOEQ[5]
MET	Silver	10	0.03	1.00	6	0.03	NO		13	0.03	1.00	3	0.03	NO									
MET	Arsenic	10	0.47	1.00	6	0.07	NO		13	0.39	1.00	3	0.07	NO									
MET	Cadmium	10	1.1E-3	1.00	6	0.28	NO		13	1.1E-3	1.00	3	0.28	NO									
MET	Chromium	10	8.0E-3	1.00	6	0.04	NO		13	0.02	1.00	3	8.0E-3	NO									
MET	Copper	10	6.25	6.25	6	9.79	YES	6.25	13	6.08	6.08	3	9.38	YES	6.08								6.08
MET	Mercury	10	1.41	1.41	6	1.84	YES	1.41	13	1.39	1.39	3	1.76	YES	1.39								1.39
MET	Nickel	10	1.37	1.37	6	5.88	YES	1.37	13	1.65	1.65	3	5.88	YES	1.65								1.37
MET	Lead	10	0.06	1.00	6	0.09	NO		13	0.05	1.00	3	0.09	NO									
MET	Zinc	10	0.43	1.00	6	2.23	YES	1.00	13	0.45	1.00	3	2.23	YES	1.00								1.00
MET	SEM-AVS[2]	21	1.01	5.00	7	16.5	YES	5.00	21	2.53	5.00	7	16.5	YES	5.00								5.00
PAH	Acenaphthene	33	2.1E-3	1.00	12	3.9E-3	NO		22	1.1E-3	1.00	13	3.9E-3	NO		3	8.6E-3	1.00	4	3.1E-3	NO		
PAH	Acenaphthylene	32	0.25	1.00	12	1.00	YES	1.00	22	0.32	1.00	13	1.00	YES	1.00	3	0.58	1.00	4	0.31	NO		1.00
PAH	Anthracene	32	1.33	1.33	12	6.25	YES	1.33	22	1.65	1.65	13	6.25	YES	1.65	3	9.90	9.90	4	2.99	NO		1.33
PAH	Benzo(a)anthracene	32	0.85	1.00	12	2.35	YES	1.00	22	0.98	1.00	13	2.35	YES	1.00	3	6.44	6.44	4	2.05	NO		1.00
PAH	Benzo(a)pyrene	32	0.35	1.00	12	1.35	YES	1.00	22	0.45	1.00	13	1.35	YES	1.00	3	2.42	2.42	4	0.72	NO		1.00
PAH	Chrysene	32	0.47	1.00	11	3.26	YES	1.00	21	0.55	1.00	13	3.26	YES	1.00	3	3.44	3.44	4	1.04	NO		1.00
PAH	Dibenz(a,h)anthracene	32	0.39	1.00	11	1.29	YES	1.00	21	0.46	1.00	13	1.29	YES	1.00	3	2.79	2.79	4	0.84	NO		1.00
PAH	Fluoranthene	32	0.06	1.00	11	0.19	NO		21	0.08	1.00	13	0.19	NO		3	0.50	1.00	4	0.11	NO		
PAH	Fluorene	32	2.42	2.42	11	8.12	YES	2.42	21	2.88	2.88	13	8.12	YES	2.88	3	24.0	24.0	4	7.79	NO		2.42
PAH	2-Methylnaphthalene	25	0.49	1.00	11	2.03	YES	1.00	13	0.40	1.00	13	2.03	YES	1.00	3	2.02	2.02	4	2.03	YES	2.02	1.00
PAH	Naphthalene	33	5.3E-3	1.00	11	0.01	NO		21	3.7E-3	1.00	13	0.01	NO		3	3.0E-2	1.00	4	0.01	NO		
PAH	Phenanthrene	33	0.78	1.00	11	1.64	YES	1.00	21	0.47	1.00	13	1.64	YES	1.00	3	3.29	3.29	4	0.90	NO		1.00
PAH	Pyrene	33	1.03	1.03	11	2.03	YES	1.03	21	0.78	1.00	13	2.03	YES	1.00	3	4.29	4.29	4	1.24	NO		1.00
PAH	Sum of PAHs	33	7.56	7.56	12	25.0	YES	7.56	22	8.49	8.49	13	25.0	YES	8.49	3	59.6	59.6	4	18.2	NO		7.56
PCB	Total PCBs	33	0.36	1.00	12	16.80	YES	1.00	22	0.46	1.00	13	16.8	YES	1.00	3	3.65	3.65	4	16.8	YES	3.65	1.00
PST	HCB	21	5.2E-5	1.00	7	2.8E-4	NO		21	6.3E-5	1.00	7	2.8E-4	NO									
PST	Mirex	21	9.4E-3	1.00	7	0.02	NO		21	9.3E-3	1.00	7	0.02	NO									
PST	o,p'-DDE	10	0.52	1.00	6	3.24	YES	1.00	13	0.77	1.00	3	3.24	YES	1.00								1.00
PST	p,p'-DDE	21	0.35	1.00	7	2.53	YES	1.00	21	0.47	1.00	7	2.53	YES	1.00								1.00

PW-HQ = Porewater Hazard Quotient.

1 - NOEQ = No Observable Effect Quotient = greater of 95% Upper Confidence Limit (UCL) PW-HQ or 1.

2 - SEM-AVS expressed as µmol/g dry wt. sediment (benchmark from USEPA, 1996).

3- Porewater Hazard Quotients: for amphipod survival, see Tables A-3.1 (no toxicity) and A-3.2 (toxicity); for sea urchin fertilization, see Tables A-4.1 (no toxicity) and A-4.2 (toxicity); for sea urchin larval development, see Tables A-4.3 (no toxicity) and A-4.4 (toxicity).

4 - T-NOEQ = Test-specific NOEQ.

5 - Aquatic NOEQ = minimum of test-specific NOEQs.

Table 4. Derivation of Aquatic Reference Screening Values (RSVs) based on measured/calculated concentrations for selected contaminants in porewater from the Narragansett Bay reference locations.

Analyte[1]	JCC-D1	JCC-D1-BOT	JCC-D1-MID	JCC-M1	JCC-S1	JPC-1	JPC-2	JSC-D1	JSC-DC1	JSC-V1	JSC-W1	PCC-D1	PCC-DC1	PCC-V1	PCC-W1	Mean	Aquatic RSV[2]
Copper			2.50					1.25	1.25	1.25	1.25	1.25	1.25	2.50	1.25	1.25	1.25
Mercury			0.03					0.06	0.08	0.07	0.06	0.06	0.06	0.05	0.01	0.05	0.07
Nickel			8.00					4.00	4.00	4.00	4.00	12.0	4.00	4.00	8.00	5.00	6.55
Zinc			9.00					0.01	0.01	0.04	0.02	0.02	0.01	0.01	0.02	0.02	0.02
SEM-AVS	0.44	0.36	0.41	1.29	-5.59	-1.19	0.14	0.11	0.35	0.82	2.30	0.42	0.66	0.86	-4.10	-0.18	0.95
Acenaphthylene	0.05	0.01	3.34	0.08	0.03	0.15		0.01		0.04	0.08	0.01		1.7E-3	0.17	0.06	0.09
Anthracene	0.03	1.1E-3	8.66	0.04	0.04	0.09		0.01		0.02	0.06	2.3E-3		9.6E-4	0.06	0.03	0.05
Benzo(a)anthracene	2.3E-3	5.6E-5	0.53	2.6E-3	4.3E-3	8.5E-3		4.1E-4		5.4E-3	1.2E-2	2.3E-4		1.4E-4	1.1E-2	4.2E-3	7.2E-3
Benzo(a)pyrene	7.0E-4	4.1E-5	0.14	7.8E-4	1.0E-3	3.7E-3		1.9E-4		2.2E-3	4.5E-3	1.3E-4		5.9E-5	3.8E-3	1.6E-3	2.7E-3
Chrysene	3.8E-3	1.1E-4	0.69	4.2E-3	5.8E-3	1.6E-2		1.1E-3		1.2E-2	2.5E-2	7.6E-4		3.9E-4	2.8E-2	8.7E-3	1.5E-2
Dibenz(a,h)anthracene	1.7E-4	1.1E-5	0.04	1.9E-4	9.3E-4	1.9E-3		1.3E-4		1.2E-3	2.5E-3	1.0E-4		4.1E-5	2.4E-3	8.7E-4	1.5E-3
Fluorene	2.1E-3	8.1E-3	5.00	2.4E-3	0.02	0.05		6.0E-3		0.01	0.04	5.5E-3		2.5E-3	0.09	0.02	0.04
2-Methylnaphthalene	0.03	0.05	0.41	0.04	0.05	0.06		0.02		0.03	0.04	0.01		4.8E-3	0.09	0.04	0.06
Phenanthrene	0.08	4.1E-3	17.6	0.09	0.09	0.22		0.01		0.07	0.29	0.01		0.01	0.47	0.12	0.22
Pyrene	0.08	3.4E-3	10.2	0.09	0.11	0.17		0.01		0.10	0.23	0.01		3.3E-3	0.24	0.10	0.15
Sum of PAHs	1.16	0.28	159	1.40	1.73	2.84		0.69		1.49	3.01	0.64		0.19	4.27	1.61	2.47
Total PCBs	1.1E-3	2.0E-4	1.8E-3	4.9E-4	9.4E-4	1.8E-3		6.8E-4		6.8E-4	4.4E-4	3.4E-3		1.9E-4	9.1E-4	8.3E-4	1.2E-3
o,p'-DDE	9.0E-5		2.5E-4	2.9E-4	5.7E-5	1.7E-4		4.2E-6		2.3E-5	3.7E-5	4.1E-5		3.1E-6	1.0E-5	6.8E-5	1.3E-4
p,p'-DDE	1.8E-4	4.7E-6	7.8E-5	1.6E-4	1.2E-4	8.9E-5		1.2E-5		4.8E-5	7.5E-5	3.2E-5		6.9E-6	1.1E-4	7.6E-5	1.1E-4
% TOC	0.84			0.85	2.07	1.06	1.71	0.45		0.67	0.65	0.39		1.60	1.36	1.06	1.43

Shaded cells indicate statistical outliers, excluded from mean and Reference Screening Value calculations.
PW concentration (µg/L) = sediment concentration/(foc X Koc). See Table A-1 for Koc values.
foc = %TOC/100. See Table A-2.4 for TOC concentrations.
Data Sources: SAIC, 1996 (JSC/PCC - Allen Harbor ERA reference locations), Appendix A-1-1 (sediment concentrations) and A-1-3 (porewater concentration
SAIC and URI, 1997a (JCC - McAllister Point ERA reference location), Appendix A-1-1-1 (sediment organic chemistry), A-1-2-1 (sediment metals chemistry), and A-1-2-3 (porewater metals chemistry);
SAIC and URI, 1997b (JPC/CHC - Derecktor Shipyard ERA reference locations), Appendix A-1-1 (sediment chemistry) and A-1-2 (elutriate chemistry).
1 - List includes analytes for which NOEQs were developed; see Table 3.
2 - Aquatic Reference Screening Value (RSV) calculated as 95% Upper Confidence Limit based on sample size as follows:
Mean + ($t_{0.975}(df)$*(STDEV/(SQRT(n))); where STDEV=standard deviation; n=sample size;
$t_{0.975}(df)$ = sample size-dependent percentage points of the t distribution, (Ott, 1993).

Table 5. Derivation of Threshold Effects Values (TEVs) for the aquatic exposure pathway in the McAllister Point Landfill study area.

Class	Analyte[1]	Aquatic NOEQ[2]	WQSV[3] (µg/L)	NOEC[4,6] (µg/L)	Aquatic RSV[5] (µg/L)	Aquatic TEV[6] (µg/L)
MET	Copper	6.08	2.90	17.64	1.25	17.64
MET	Mercury	1.39	0.03	0.03	0.07	0.07
MET	Nickel	1.37	8.20	11.24	6.55	11.24
MET	Zinc	1.00	81.00	81.00	0.02	81.00
MET	SEM-AVS[6]	5.00	--	5.00		5.00
PAH	Acenaphthylene	1.00	0.64	0.64	0.09	0.64
PAH	Anthracene	1.33	0.40	0.53	0.05	0.53
PAH	Benzo(a)anthracene	1.00	0.05	0.05	7.16e-03	0.05
PAH	Benzo(a)pyrene	1.00	0.03	0.03	2.70e-03	0.03
PAH	Chrysene	1.00	0.13	0.13	0.02	0.13
PAH	Dibenz(a,h) anthracene	1.00	0.01	0.01	1.54e-03	0.01
PAH	Fluorene	2.42	0.20	0.48	0.04	0.48
PAH	2-Methylnaphthalene	1.00	1.22	1.22	0.06	1.22
PAH	Phenanthrene	1.00	4.60	4.60	0.22	4.60
PAH	Pyrene	1.00	1.21	1.21	0.15	1.21
PAH	Sum of PAHs	7.56	37.50	284	2.47	284
PCB	Total PCBs	1.00	0.03	0.03	1.20e-03	0.03
PST	o,p'-DDE	1.00	7.28e-04	7.28e-04	1.26e-04	7.28e-04
PST	p,p'-DDE	1.00	7.28e-04	7.28e-04	1.13e-04	7.28e-04

1 - List includes analytes for which NOEQs were developed; see Table 3.

2 - Aquatic NOEQ = minimum of test-specific NOEQs; see Table 3.

3 - Water Quality Screening Value; see Table 2.

4 - Site-specific No Observable Effects Concentration (NOEC) = Aquatic NOEQ x WQSV.

5 - Aquatic Reference Screening Value (RSV) = 95% Upper Confidence Limit of Narragansett Bay reference stations compiled by SAIC; see Table 4.

6- SEM-AVS concentration in units of µmole/g dry wt.

7 - Aquatic TEV is the greater of the NOEC and RSV.

Table 6. Derivation of Avian Predator Reference Screening Values (RSVs) for selected CoCs in tissues of prey from the Narragansett Bay reference locations.

Analyte	C1-1/2/3-HC	C1-4-HC	CHC-1-CN	CHC-1-IBM	CHC-1-LOB	JCC-D1-LOB-HPP	JCC-D1-LOB-MUS	JCC-M1-HC	JCC-S1-HC	JPC-1-IBM	JPC-1-LOB	JPC-1-MF	JSCD1HCND	JSCW1MFMIX	PCCD1HCND	PCCW1HCND	PCCW1MFCOM	PCCW1MFMIX	PCCW1MFSTP	Mean	Avian Predator RSV[2]
Arsenic	11.3	19.3	3.48	4.68	21.7	19.8	19.8			6.77	19.4	5.92	5.91	2.88	10.4	17.7	1.25	6.83		11.1	15.0
Cadmium	0.58	0.65	0.94	0.58	0.23	8.27	1.5E-3			0.59	0.18	1.18	0.20	0.11	0.30	0.37	0.19	0.10		0.41	0.60
Chromium	7.57	8.73	1.22	1.84	1.43	0.11	0.11			2.44	1.68	1.08	2.65	0.69	2.82	4.06	1.36	1.76		2.05	3.08
Copper	10.6	8.50	18.4	11.9	102	10.8	45.7			8.62	143	22.7	5.33	1.94	33.8	3.75	2.69	3.67		11.0	16.5
Lead	0.85	0.99	0.84	0.78	0.18	0.09	0.14			3.28	0.39	0.43	0.79	0.14	0.91	0.59	0.70	0.26		0.54	0.72
Mercury	0.08	0.13	0.17	0.18	0.23	0.11	0.56			0.17	0.30	0.11	0.01	0.07	0.10	0.01	0.10	0.01		0.12	0.16
Silver		0.93	1.58	1.5E-4	3.84	1.25	0.84			1.5E-4	2.19	1.5E-4	1.79	0.81	4.15	1.69	0.69	0.92		0.98	1.41
Zinc	112	97.5	22.0	91.7	119	65.2	102			92.8	106	34.1	74.1	167	89.6	86.1	160	186		100	124
Total PCBs	53.5		1010	389	461	4210	106	91.4	37.7	565	397	1900	51.0	616	120	68.1			1191	470	766

Metals units=µg/g dry tissue wt.; organics units=ng/g dry tissue wt.

CN=cunner, HC=hard clams, IBM=indigenous blue mussels, LOB=lobster, LOB-HPP= lobster hepatopancreas, LOB-MUS=lobster muscle, MF=marine fish, ND=non-depurated, DEP=depurated.

Shaded cells indicate statistical outliers, excluded from mean and Reference Screening Value calculations.

Data Sources: SAIC, 1996 (JSC/PCC - Allen Harbor ERA reference locations), Appendix A-1-2 (tissue concentrations);
SAIC and URI, 1997a (JCC - McAllister Point ERA reference location), Appendix A-1-1-2 (tissue organic chemistry) and A-1-2-2 (tissue metals chemistry),
SAIC and URI, 1997b (JPC/CHC - Derecktor Shipyard ERA reference locations), Appendix A-1-3 (tissue chemistry);
TRC, 1994 (C1 - NETC reference location).

1 - List includes analytes for which LOAELs were developed; see Table 7.

2 - Avian Predator Reference Screening Value (RSV) calculated as 95% Upper Confidence Limit based on sample size as follows:
Mean + ($t_{0.975}(df)$*(STDEV/(SQRT(n))); where STDEV=standard deviation; n=sample size;
$t_{0.975}(df)$ = sample size-dependent percentage points of the t distribution, (Ott, 1993).

Table 7. Derivation of Threshold Effects Values (TEVs) for the avian predator exposure pathway in the McAllister Point Landfill study area.

Class	Analyte	Maximum TRV-HQ[1,2]	Avian Predator TRV[3] (mg/kg dry tiss. wt.)	Avian Predator RSV[4] (mg/kg dry tiss. wt.)	Avian Predator TEV[5] (mg/kg dry tiss. wt.)
Metals	Arsenic	3.69	8.18	15.0	15.0
	Cadmium	7.82	1.83	0.60	1.83
	Chromium	30.8	1.72	3.08	3.08
	Copper	34.9	60.7	16.5	60.7
	Lead	39.9	3.11	0.72	3.11
	Mercury	2.77	0.38	0.16	0.38
	Nickel	0.79	--	--	--
	Silver	33.5	1.11	1.41	1.41
	Zinc	34.3	28.8	124	124
PAHs	2-Methylnaphthalene	8.0E-4	--	--	--
	Acenaphthene	0.06	--	--	--
	Acenaphthylene	0.02	--	--	--
	Anthracene	0.10	--	--	--
	Fluorene	0.18	--	--	--
	Naphthalene	1.9E-3	--	--	--
	Phenanthrene	3.2E-3	--	--	--
PCBs	Total PCBs	111	0.29	0.77	0.77
Pesticides	p,p'-DDE	0.20	--	--	--
Butyltins	Tributyltin	0.01	--	--	--

TRV=Toxicity Reference Value.

"--" - value not calculated; Maximum TRV-HQ < 1.

1 - Maximum TRV-HQ=maximum Hazard Quotient observed for any prey-receptor combination in the McAllister Point. study area; see Appendix A-2-4 in Final McAllister Point ERA (SAIC and URI, 1997a).

2 - Analytes for which maximum TRV-HQs < 1 were excluded from further PRG development.

3 - TRV = minimum of receptor-specific TRV; see Table 6.3-2 in Final McAllister Point ERA (SAIC and URI, 1997a).

4 - Avian Predator Reference Screening Value (RSV) = 95% Upper Confidence Limit of Narragansett Bay stations compiled by SAIC; see Table 6.

5 - Threshold Effects Value (TEV) selected as greater of TRV and RSV.

Table 8. Summary of Exposure Parameter Values used in estimating exposures via shellfish consumption by subsistence fishermen in the McAllister Point Landfill study area.

Parameter	RME Value	Rationale	Reference
Global variables			
Body Weight (kg)			
- Shellfishing	70	Average of adults between 18-65 years of age.	USEPA 1994
Exposure Duration (yr)			
- Shellfishing and Residential (yr)	30	Median and upper-bound time at one residence, adults.	USEPA 1994
Averaging Time (days)			
- Cancer risks	25,550	Based on 70 year life expectancy.	USEPA 1989b
- Noncancer risks			
Shellfishing and Residential	10,950	Based on exposure duration.	USEPA 1989b
Relative Absorption Factors			
- Ingestion of shellfish			USEPA 1989b
VOCs	1		
PAHs	1		
PCBs	0.3		
Pesticides	0.3 or 1	For chemicals with high and low sorption to soil, respectively.	
Inorganics	1		
Lead	0.3		
Consumption of Locally-Caught Shellfish Scenario			
Exposure Frequency (day/yr)	350	Assumes two weeks vacation.	USEPA 1994
Ingestion Rate (g/day)	15.6	Based on 150 g shellfish per serving and 36.5 servings of shellfish per year.	USEPA 1994; Rupp *et al*. (1980)
Fraction of Ingested Shellfish Caught Locally	1	Conservative assumption in absence of site-specific data.	BPJ

NOTES:
RME: Reasonable Maximum Exposure.
BPJ: Best professional judgment.

Table 9. Summary of RME-Hazard Quotients for human health effects other than cancer for consumers of locally-caught shellfish in the: Maximum and Average Exposure scenarios.

Zone 1 -- Mussels

Chemical of Concern[1]	**Non-cancer Hazard Quotient**[2]	
	Maximum Exposure[3]	Average Exposure[4]
Metals		
Arsenic	**4**	**4**
Total	**4**	**4**

Zone 2 -- Mussels

Chemical of Concern[1]	**Non-cancer Hazard Quotient**[2]	
	Maximum Exposure[3]	Average Exposure[4]
Metals		
Arsenic	**9**	**7**
Cadmium	**1**	0.6
Chromium	0.1	0.1
Copper	**4**	**2**
Mercury	0.4	0.2
Silver	0.1	0.04
Zinc	0.7	0.3
Total	**15**	**10**

RME=Reasonable Maximum Exposure.

1 - Potential Chemicals of Concern which did not present Hazard Quotients of 0.1 or greater are not included in this table.

2 - Bold values indicate HQ > 1.

3 - Assumes consumption of shellfish with highest contamination for zone.

4 - Assumes consumption of shellfish with average contamination for zone.

Table 10. Summary of RME-based risks for human health effects due to cancer for consumers of locally-caught shellfish in the: Maximum and Average Exposure scenarios.

Zone 1 -- Mussels

Chemical of Concern[1]	Cancer Risk	
	Maximum Exposure[2]	Average Exposure[3]
PAHs		
Benzo(a)anthracene	2E-06	2E-06
Chrysene	2E-06	2E-06
Benzo(b),(k)fluoranthene	4E-06	4E-06
Benzo(a)pyrene	2E-06	2E-06
Indeno(1,2,3-cd)pyrene	1E-06	1E-06
PCBs		
Total PCBs	1E-04	1E-04
Metals		
Arsenic	8E-04	8E-04
Total	9E-04	9E-04

Zone 2 -- Mussels

Chemical of Concern[1]	Cancer Risk	
	Maximum Exposure[2]	Average Exposure[3]
PAHs		
Benzo(a)anthracene	2E-05	8E-06
Chrysene	2E-05	7E-06
Benzo(b),(k)fluoranthene	2E-05	1E-05
Benzo(a)pyrene	1E-05	5E-06
Indeno(1,2,3-cd)pyrene	6E-06	3E-06
Dibenzo(a,h)anthracene	2E-06	1E-06
PCBs		
Total PCBs	3E-03	8E-04
Metals		
Arsenic	2E-03	1E-03
Total	5E-03	2E-03

RME=Reasonable Maximum Exposure.

1 - Potential Chemicals of Concern which did not present Hazard Quotients of 0.1 or greater are not included in this table.

2 - Assumes consumption of shellfish with highest contamination for zone.

3 - Assumes consumption of shellfish with average contamination for zone.

Table 11. Toxicity values for Chemicals of Concern in shellfish tissue.

Chemical of Concern	Cancer Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$	Non-cancer Chronic Reference Dose (RfD)
	Ingestion	Ingestion
PAHs		
Benzo(a)anthracene	7.3E+00	NA
Chrysene	7.3E+00	NA
Benzo(b),(k)fluoranthene	7.3E+00	NA
Benzo(a)pyrene	7.3E+00	NA
Indeno(1,2,3-cd)pyrene	7.3E+00	NA
Dibenzo(a,h)anthracene	7.3E+00	NA
PCBs		
Total PCBs	7.7E+00	NA
Metals		
Arsenic	1.5E+00	3.0E-04
Cadmium	NA	1.0E-03
Chromium	NA	5.0E-03
Copper	NA	3.7E-02
Mercury	NA	3.0E-04
Silver	NA	5.0E-03
Zinc	NA	3.0E-01

NOTES:
NA: Toxicity value not available.
Cancer Slope Factors for all carcinogenic PAHs were set equal to the most toxic PAH, Benzo(a)pyrene.
The source for all toxicity values was EPA's IRIS database, USEPA, 1997.

Table 12. Summary of risk-based Reasonable Maximum Exposure (RME) values for CoCs in shellfish tissue for the McAllister Point Landfill study area.

Chemical of Concern	Risk-based RME Value (mg/kg wet tissue wt.)		
	1×10^{-6} Cancer Risk[1]	1×10^{-4} Cancer Risk[2]	HI = 1 Non-cancer Risk[3]
PAHs			
Benzo(a)anthracene	1.5E-03	1.9E-02	-- --
Chrysene	1.5E-03	1.9E-02	-- --
Benzo(b),(k)fluoranthene	1.5E-03	1.9E-02	-- --
Benzo(a)pyrene	1.5E-03	1.9E-02	-- --
Indeno(1,2,3-cd)pyrene	1.5E-03	1.9E-02	-- --
Dibenzo(a,h)anthracene	1.5E-03	1.9E-02	-- --
PCBs			
Total PCBs	1.4E-03	1.8E-02	-- --
Metals			
Arsenic	7.3E-03	9.1E-02	1.40
Cadmium	--	--	4.68
Chromium	--	--	23.4
Copper	--	--	173
Mercury	--	--	1.40
Silver	--	--	23.4
Zinc	--	--	1404

NOTES:

1 - Derived using Equation 2 in text Section 2.4.3; Target risk level = 10^{-6} for each individual CoC.
2 - Derived using Equation 3 in text Section 2.4.3; Target risk level = 10^{-4} for the sum of all CoCs.
3 - Derived using Equation 1 in text Section 2.4.3.

-- This CoC is not a carcinogenic CoC.

- This CoC is not a non-carcinogenic CoC.

Table 13. Derivation of Human Health Reference Screening Values (RSVs) based on concentrations of selected contaminants in tissues of shellfish harvested from the lower Narragansett Bay for consumption by subsistence fishermen.

Analyte	C1-1/2/3-HC	C1-4-HC	CHC-1-IBM	JCC-M1-HC	JCC-S1-HC	JPC-1-IBM	JSCD1HCND	PCCD1HCND	PCCW1HCND	Mean	95% UCL[2]	HH-RSV[3]
Arsenic	11.3	19.3	4.68			6.77	5.91	10.4	17.7	10.9	16.2	2.26
Cadmium	0.58	0.65	0.58			0.59	0.20	0.30	0.37	0.47	0.63	0.09
Chromium	7.57	8.73	1.84			2.44	2.65	2.82	4.06	4.30	6.83	0.96
Copper	10.6	8.50	11.93			8.62	5.33	33.8	3.75	8.12	11.4	1.59
Mercury	0.08	0.13	0.18			0.17	0.01	0.10	0.01	0.10	0.16	0.02
Silver		0.93	1.5E-4			1.5E-4	1.79	4.15	1.69	1.43	3.05	0.43
Zinc	112	97.5	91.7			92.8	74.1	89.6	86.1	92.0	103	14.36
Benzo(a)anthracene	3.57	3.18	47.3	3.36	0.75	15.8	1.83	1.91	1.13	3.94	8.04	1.13E-03
Benzo(a)pyrene	1.60	2.62	31.0	4.00	1.23	7.81	1.33	1.54	1.26	2.67	4.58	6.42E-04
Benzo(b+k)fluoranthene	2.30	2.36		1.20	2.90					2.19	3.32	4.65E-04
Chrysene	4.70	3.53	49.5	5.00	2.04	16.9	7.53	11.0	8.16	7.36	11.4	1.59E-03
Dibenz(a,h)anthracene	0.79	1.12	0.49	0.49	0.18	0.49	1.30	1.05	1.40	0.81	1.14	1.59E-04
Indeno(1,2,3-cd)pyrene	4.07	4.96	15.5	2.00	1.65	1.54	0.53	2.10	0.99	2.23	3.50	4.90E-04
Total PCBs	53.5		389	91.4	37.7	565	51.0	120	68.1	116	230	0.03

Metals units=µg/g dry tissue wt.; organics units=ng/g dry tissue wt.
HC=hard clams, IBM=indigenous blue mussels, ND=non-depurated.
Shaded cells indicate statistical outliers, excluded from mean and Reference Screening Value calculations.
Data Sources: SAIC, 1996 (JSC/PCC - Allen Harbor ERA reference locations), Appendix A-1-2 (tissue concentrations);
SAIC and URI, 1997a (JCC - McAllister Point ERA reference location), Appendix A-1-1-2 (tissue organic chemistry) and A-1-2-2 (tissue metals chemistry),
SAIC and URI, 1997b (JPC/CHC - Derecktor Shipyard ERA reference locations), Appendix A-1-3 (tissue chemistry);
TRC, 1994 (C1 - NETC reference location).
1 - List includes analytes for which NOEQs were developed; see Table 14.
2 - 95% Upper Confidence Limit based on sample size as follows:
Mean + ($t_{0.975}(df)$*(STDEV/(SQRT(n))); where STDEV=standard deviation; n=sample size;
$t_{0.975}(df)$ = sample size-dependent percentage points of the t distribution, (Ott, 1993).
3 - Human Health Reference Screening Value (RSV) (Table A-2.3).

Table 14. Derivation of Threshold Effects Values (TEVs) for the human health exposure pathway in the McAllister Point study area.

Chemical Class	Chemical of Concern	RME[1] (mg/kg wet wt)	Human Health RSV[2] (mg/kg wet tiss. wt)	Human Health TEV[3] (mg/kg wet tiss. wt)
Metals	Arsenic	9.1E-02	2.26	2.26
	Cadmium	4.70	0.09	4.70
	Chromium	23.0	0.96	23.0
	Copper	170	1.59	170
	Mercury	1.40	0.02	1.40
	Silver	23.0	0.43	23.0
	Zinc	1400	14.4	1400
PAHs	Benzo(a)anthracene	1.9E-02	1.1E-03	1.9E-02
	Benzo(a)pyrene	1.9E-02	6.4E-04	1.9E-02
	Benzo(b+k)fluoranthene	1.9E-02	4.7E-04	1.9E-02
	Chrysene	1.9E-02	1.6E-03	1.9E-02
	Dibenz(a,h)anthracene	1.9E-02	1.6E-04	1.9E-02
	Indeno(1,2,3-cd)pyrene	1.9E-02	4.9E-04	1.9E-02
PCBs	Total PCBs	1.8E-02	3.2E-02	3.2E-02

TEV=Threshold Effects Value; RME=Reasonable Maximum Exposure.

1 - Minimum of risk-based RME values for carcinogenic and non-carcinogenic CoCs, see Table 12.

2 - Human Health Reference Screening Value (RSV) (Table A-2.3); see Table 13.

3 - Human Health TEV = greater of risk-based RME value and RSV.

Table 15. Summary of maximum TEV-HQs and identification of limiting CoCs by sampling location for aquatic, avian predator, and human health exposure pathways in the McAllister Point Landfill study area.

Exposure Pathway	*Parameter*	NSB-1	NSB-2	NSB-3	NSB-4	NSB-5	NSB-6	NSB-7	MCL-8	MCL-9	MCL-10
Aquatic (A)	*TEV-HQ*[1,2]	2.08	3.02	3.26	16.80	4.34	5.74	1.80	1.36	1.04	
	L-CoC	Nickel	Copper	Chrysene	Total PCBs	Nickel	Fluorene	Nickel	Anthracene	Total PCBs	
Avian Predator (P)	*TEV-HQ*[1,3]	2.53	2.54	5.76	4.53	2.59	4.28	1.32			
	L-CoC	Total PCBs	Lead	Lead	Total PCBs	Lead	Total PCBs	Lead			
Human Health (HH)	*TEV-HQ*[1,4]	1.91	1.87	4.00	2.55	3.02	3.33	2.49			
	L-CoC	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs	Total PCBs			
Combined	*TEV-HQ*[1,5]	2.53	3.02	5.76	16.8	4.34	5.74	2.49	1.36	1.04	
Exposure	*L-CoC*	Total PCBs	Copper	Lead	Total PCBs	Nickel	Fluorene	Total PCBs	Anthracene	Total PCBs	
Pathway	*Pathway*	P	A	P	A	A	A	HH	A	A	

TEV-HQ=Threshold Effects Value Hazard Quotient. L-CoC=Limiting Chemical of Concern. See text, Section 1.0.
TEV-HQs<1 not reported.
1 - TEV-HQ = media-specific concentration/analyte-pathway-specific TEV value.
2 - Values presented are maximum of Aquatic TEV-HQs by station.
Aquatic TEV values presented in Table 5; TEV-HQ values presented in Table A-5.
See Table A-2.2 for EqP-derived concentrations of organics in porewaters; see McAllister Point ERA, Appendix A for concentrations of metals in porewaters (SAIC/URI, 1997a).
Because multiple measurements were available, maximum of Phase I, II, and III TEV-HQs taken as station-specific TEV-HQ.
3 - Values presented are maximum of Avian Predator TEV-HQs by station.
Avian Predator TEV values presented in Table 7; TEV-HQ values presented in Table A-6.
See McAllister Point Marine ERA (SAIC/URI, 1997a), Appendix A for tissue contaminant concentrations.
4 - Values presented are maximum of Human Health TEV-HQs by station.
Human Health TEV values presented in Table 14; TEV-HQ values presented in Table A-7.
See McAllister Point Marine ERA (SAIC/URI, 1997a), Appendix A for tissue contaminant concentrations.
5 - Combined Exposure Pathway TEV-HQ is maximum of pathway-specific TEV-HQs by station.

Table 15. Summary of maximum TEV-HQs and identification of limiting CoCs by sampling location for aquatic, avian predator, and human health exposure pathways in the McAllister Point Landfill study area.

Exposure Pathway	*Parameter*	MCL-11	MCL-12	MCL-13	MCL-14	MCL-15	MCL-16	OS-22	OS-23	OS-24	OS-25
Aquatic (A)	*TEV-HQ*[1,2]	1.52	3.22				1.09				
	L-CoC	Total PCBs	Fluorene				Anthracene				
Avian Predator (P)	*TEV-HQ*[1,3]										
	L-CoC										
Human Health (HH)	*TEV-HQ*[1,4]										
	L-CoC										
Combined	*TEV-HQ*[1,5]	1.52	3.22				1.09				
Exposure	*L-CoC*	Total PCBs	Fluorene				Anthracene				
Pathway	*Pathway*	A	A				A				

TEV-HQ=Threshold Effects Value Hazard Quotient. L-CoC=Limiting Chemical of Concern. See text, Section 1.0.
TEV-HQs<1 not reported.
1 - TEV-HQ = media-specific concentration/analyte-pathway-specific TEV value.
2 - Values presented are maximum of Aquatic TEV-HQs by station.
Aquatic TEV values presented in Table 5; TEV-HQ values presented in Table A-5.
See Table A-2.2 for EqP-derived concentrations of organics in porewaters; see McAllister Point ERA, Appendix A for concentrations of metals in porewaters (SAIC/URI, 1997a).
Because multiple measurements were available, maximum of Phase I, II, and III TEV-HQs taken as station-specific TEV-HQ.
3 - Values presented are maximum of Avian Predator TEV-HQs by station.
Avian Predator TEV values presented in Table 7; TEV-HQ values presented in Table A-6.
See McAllister Point Marine ERA (SAIC/URI, 1997a), Appendix A for tissue contaminant concentrations.
4 - Values presented are maximum of Human Health TEV-HQs by station.
Human Health TEV values presented in Table 14; TEV-HQ values presented in Table A-7.
See McAllister Point Marine ERA (SAIC/URI, 1997a), Appendix A for tissue contaminant concentrations.
5 - Combined Exposure Pathway TEV-HQ is maximum of pathway-specific TEV-HQs by station.

Table 15. Summary of maximum TEV-HQs and identification of limiting CoCs by sampling location for aquatic, avian predator, and human health exposure pathways in the McAllister Point Landfill study area.

Exposure Pathway	*Parameter*	OS-26	OS-27	OS-28	OS-29	OS-30	OS-30A	OS-30B	SDA-D1	SDA-D2	SDA-D3
Aquatic (A)	*TEV-HQ*[1,2]		1.32	3.81	1.21	2.17			1.12		
	L-CoC		Fluorene	Fluorene	Fluorene	Fluorene			Anthracene		
Avian Predator (P)	*TEV-HQ*[1,3]										
	L-CoC										
Human Health (HH)	*TEV-HQ*[1,4]										
	L-CoC										
Combined	*TEV-HQ*[1,5]		1.32	3.81	1.21	2.17			1.12		
Exposure	*L-CoC*		Fluorene	Fluorene	Fluorene	Fluorene			Anthracene		
Pathway	*Pathway*		A	A	A	A			A		

TEV-HQ=Threshold Effects Value Hazard Quotient. L-CoC=Limiting Chemical of Concern. See text, Section 1.0.
TEV-HQs<1 not reported.
1 - TEV-HQ = media-specific concentration/analyte-pathway-specific TEV value.
2 - Values presented are maximum of Aquatic TEV-HQs by station.
Aquatic TEV values presented in Table 5; TEV-HQ values presented in Table A-5.
See Table A-2.2 for EqP-derived concentrations of organics in porewaters; see McAllister Point ERA, Appendix A for concentrations of metals in porewaters (SAIC/URI, 1997a).
Because multiple measurements were available, maximum of Phase I, II, and III TEV-HQs taken as station-specific TEV-HQ.
3 - Values presented are maximum of Avian Predator TEV-HQs by station.
Avian Predator TEV values presented in Table 7; TEV-HQ values presented in Table A-6.
See McAllister Point Marine ERA (SAIC/URI, 1997a), Appendix A for tissue contaminant concentrations.
4 - Values presented are maximum of Human Health TEV-HQs by station.
Human Health TEV values presented in Table 14; TEV-HQ values presented in Table A-7.
See McAllister Point Marine ERA (SAIC/URI, 1997a), Appendix A for tissue contaminant concentrations.
5 - Combined Exposure Pathway TEV-HQ is maximum of pathway-specific TEV-HQs by station.

Table 15. Summary of maximum TEV-HQs and identification of limiting CoCs by sampling location for aquatic, avian predator, and human health exposure pathways in the McAllister Point Landfill study area.

Exposure Pathway	*Parameter*	SDA-M1	SDA-M2	SDA-M3	SDA-S1	SDA-S2B	SDA-S2C-R	SDA-S3	SDA-S4
Aquatic (A)	*TEV-HQ*[1,2]		1.18			4.68	6.12		1.05
	L-CoC		Anthracene			Anthracene	Pyrene		Anthracene
Avian Predator (P)	*TEV-HQ*[1,3]								
	L-CoC								
Human Health (HH)	*TEV-HQ*[1,4]					1.37			
	L-CoC					Arsenic			
Combined	*TEV-HQ*[1,5]		1.18			4.68	6.12		1.05
Exposure	*L-CoC*		Anthracene			Anthracene	Pyrene		Anthracene
Pathway	*Pathway*		A			A	A		A

TEV-HQ=Threshold Effects Value Hazard Quotient. L-CoC=Limiting Chemical of Concern. See text, Section 1.0.
TEV-HQs<1 not reported.
1 - TEV-HQ = media-specific concentration/analyte-pathway-specific TEV value.
2 - Values presented are maximum of Aquatic TEV-HQs by station.
Aquatic TEV values presented in Table 5; TEV-HQ values presented in Table A-5.
See Table A-2.2 for EqP-derived concentrations of organics in porewaters; see McAllister Point ERA, Appendix A for concentrations of metals in porewaters (SAIC/URI, 1997a).
Because multiple measurements were available, maximum of Phase I, II, and III TEV-HQs taken as station-specific TEV-HQ.
3 - Values presented are maximum of Avian Predator TEV-HQs by station.
Avian Predator TEV values presented in Table 7; TEV-HQ values presented in Table A-6.
See McAllister Point Marine ERA (SAIC/URI, 1997a), Appendix A for tissue contaminant concentrations.
4 - Values presented are maximum of Human Health TEV-HQs by station.
Human Health TEV values presented in Table 14; TEV-HQ values presented in Table A-7.
See McAllister Point Marine ERA (SAIC/URI, 1997a), Appendix A for tissue contaminant concentrations.
5 - Combined Exposure Pathway TEV-HQ is maximum of pathway-specific TEV-HQs by station.

Table 16. Summary of Preliminary Remediation Goals (PRGs) for aquatic, avian predator, and human health exposure for the McAllister Point study area.

Class	Limiting Chemical of Concern[2]	PRG[1]							
		Aquatic[3]		Avian Predator[4]		Human Health[5]		Combined Exposure Pathway[5,6]	
		Baseline	RPRG	Baseline	RPRG	Baseline	RPRG	Baseline	RPRG
Metals	Arsenic					0.13	0.39		
Metals	Copper[a]	17.6	52.9					17.6	52.9
Metals	Nickel[a]	11.2	33.7					11.2	33.7
Metals	Lead[c]			518	NR				
PAHs	Anthracene[b]	171	513					171	513
PAHs	Chrysene[b]	589	1767						
PAHs	Fluorene[b]	67.7	203					67.7	203
PAHs	Pyrene[b]	997	2992					997	2992
PCBs	Total PCBs[b]	1211	3634	134	NR	40.24	121	1211	3634

Baseline PRG equivalent to TEV-HQ=1 concentration
RPRG - Recommended Preliminary Remediation Goals
NR - Not Recommended (see Sec. 3.2)

1 - List includes only limiting CoCs, i.e., CoCs with maximum TEV-HQs by station and pathway. See Table 15.

2 - Pathway-specific PRG expressed in concentration units to be used during remediation. RPRG selected based on evaluation from observed risks and implementability (see Sec. 3.2).
a - concentration units = µg/L in porewater.
b - concentration units = ng/g dry weight sediment.
c - concentration units = µg/g dry weight sediment.

3 - For PAHs and PCBs, PRG conc. = Aquatic TEV (µg/L) x K_{oc} x f_{OC}; f_{OC} = $\%TOC_{avg.}/100$
For Metals, PRG conc. = Aquatic TEV (µg/L).

4 - For PAHs and PCBs, PRG conc. = ($\%TOC_{avg}$ x (Avian TEV/$\%lipid_{avg}$))/BSAF;
For Metals, PRG conc. = (Avian TEV/BAF).

5 - For PAHs and PCBs, PRG conc. = ($\%TOC_{avg}$ x ((HH-TEV/DW_{avg})*1000/$\%lipid_{avg}$))/BSAF;
For Metals, PRG conc. = (HH TEV/BAF).

6- PRGs for the combined exposure pathway exclude avian and human health PRGs due to the minimal likelihood of exposure (see text Section 3.3).

Data Sources:
- see Table 5 for Aquatic TEV concentrations (µg/L);
- see Table 7 for Avian Predator TEV concentrations (mg/kg dry tissue weight);
- see Table 14 for Human Health TEV concentrations (mg/kg wet tissue weight);
- see Table 15 for maximum of pathway-specific TEV-HQ values.
- see Table A-1 for Koc partitioning constants;
- site average DW (dry-wet ratio) = 0.14, see Table A-2.3 for derivation;
- site average %lipid = 2.25, see Table A-2.3 for derivation;
- site average %TOC = 1.5, see Table A-2.2 for derivation;
- site average BAF for lead = .006; see McAllister Point ERA Figure 6.3-5;
- site average BAF for arsenic = 17.2; see McAllister Point ERA Figure 6.3-5;
- site average BSAF for PAHs = 0.11; see McAllister Point ERA Figure 6.3-4;
- site average BSAF for PCBs = 3.81; see McAllister Point ERA Figure 6.3-4.

Table A-1. Summary of Kow and Koc values used in calculations of organic contaminant concentrations in porewaters by equilibrium partitioning.

COMPG	ANALYTE	CAS_NO.	ANAL_FULL	LogKow	LogKoc[1]	Koc
PAH	ACENAPH	83329	Acenaphthene	3.95	3.74	5.5E+3
PAH	ACENAPL	208968	Acenaphthylene	4.05	3.84	6.9E+3
PAH	ANTHRAC	120127	Anthracene	4.54	4.33	2.1E+4
PAH	BENAAN	56553	Benzo(a)anthracene	5.91	5.70	5.0E+5
PAH	BENAPYR	50328	Benzo(a)pyrene	6.42	6.21	1.6E+6
PAH	CHRYSEN	218019	Chrysene	5.69	5.48	3.0E+5
PAH	DBAHANT	53703	Dibenz(a,h)anthracene	5.91	5.70	5.0E+5
PAH	FLUORAN	206440	Fluoranthene	4.95	4.74	5.5E+4
PAH	FLUOREN	86737	Fluorene	4.18	3.97	9.3E+3
PAH	M2NAPH	91576	2-Methylnaphthalene	3.97	3.76	5.8E+3
PAH	NAPH	91203	Naphthalene	3.45	3.24	1.7E+3
PAH	PHENAN	85018	Phenanthrene	4.49	4.28	1.9E+4
PAH	PYRENE	129000	Pyrene	4.95	4.74	5.5E+4
PCB	PCB101	3.8E+07	101 (2 2'3 5 5')	6.38	6.17	1.5E+6
PCB	PCB105	3.3E+07	105 (2 3 3'4 4')	6.65	6.44	2.8E+6
PCB	PCB118	3.2E+07	118 (2 3'4 4'5)	6.74	6.53	3.4E+6
PCB	PCB128	3.9E+07	128 (2 2'3 3'4 4')	6.74	6.53	3.4E+6
PCB	PCB138	3.5E+07	138 (2 2'3 4 4'5)	6.83	6.62	4.2E+6
PCB	PCB153	3.5E+07	153 (2 2'4 4'5 5')	6.92	6.71	5.1E+6
PCB	PCB170	3.5E+07	170 (2 2'3 3'4 4'5)	7.27	7.06	1.1E+7
PCB	PCB18	3.8E+07	18 (2 2'5)	5.24	5.03	1.1E+5
PCB	PCB180	3.5E+07	180 (2 2'3 4 4'5 5')	7.36	7.15	1.4E+7
PCB	PCB187	5.3E+07	187 (2 2'3 4'5 5'6)	7.17	6.96	9.1E+6
PCB	PCB195	5.3E+07	195 (2 2'3 3'4 4'5 6)	7.56	7.35	2.2E+7
PCB	PCB206	4E+07	206 (2 2'3 3'4 4'5 5'6)	8.09	7.88	7.6E+7
PCB	PCB209	2051243	209 (2 2'3 3'4 4'5 5'6 6'	8.18	7.97	9.3E+7
PCB	PCB28	7012375	28 (2 4 4')	5.67	5.46	2.9E+5
PCB	PCB44	4.1E+07	44 (2 2'3 5')	5.75	5.54	3.5E+5
PCB	PCB52	3.6E+07	52 (2 2'5 5)	5.84	5.63	4.3E+5
PCB	PCB66	3.3E+07	66 (2 3'4 4')	6.20	5.99	9.8E+5
PCB	PCB8	3.5E+07	8 (2 4)	5.07	4.86	7.2E+4
PST	ALDRIN	309002	Aldrin	5.40	5.19	1.5E+5
PST	DDE_OP	3424826	o,p'-DDE	5.69	5.48	3.0E+5
PST	DDE_PP	72559	p,p'-DDE	5.69	5.48	3.0E+5
PST	HCB	118741	Hexachlorobenzene	5.47	5.26	1.8E+5
PST	MIREX	2385855	Mirex	6.90	6.69	4.9E+6

1 - $\log_{10}Koc = 1.0 * \log_{10}Kow - 0.21$; Karickhoff, 1981.

Table A-2.1. Concentrations of metals contaminants in porewaters collected for the McAllister Point Landfill Marine ERA investigation.

Analyte	NSB-1	NSB-2	NSB-3	NSB-4	NSB-5	NSB-6	NSB-7	MCL-8	MCL-9	MCL-10	MCL-11	MCL-12	MCL-13	MCL-14	MCL-15	MCL-16
Copper	10.2	53.2	5.80	4.80	27.2	5.40	28.4	2.50	2.50		2.50	2.50	2.50	2.50	2.50	2.50
Mercury		4.1E-2	2.4E-2	3.3E-2	4.4E-2	2.1E-2	4.6E-2	2.7E-2	3.7E-2	3.0E-2		2.0E-2	3.7E-2	2.6E-2	2.8E-2	3.2E-2
Nickel	23.4	26.6	26.6	34.2	48.8	8.00	20.2	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Zinc	32.0	61.0	40.0	108	192	11.0	63.0	31.0	20.0	9.00	24.0	11.0	28.0	28.0	29.0	28.0

Units: PW concentration (µg/L). Porewater data not available for Phase III stations.

Table A-2-2.2. Equilibrium-partitioning calculated concentrations of organic contaminants in porewaters collected for the McAllister Point Landfill Marine ERA investigation.

Class	Analyte	NSB-1	NSB-1-R	NSB-2	NSB-2-R	NSB-3	NSB-3-R	NSB-4	NSB-4-R	NSB-5	NSB-5-R	NSB-6	NSB-6-R	NSB-7	NSB-7-R	MCL-8	MCL-8-R
PAH	Acenaphthylene	6.2E-2	4.2E-3	9.5E-3	4.0E-3	0.47	2.0E-2	0.25	0.15	0.64	0.20	0.13	0.22	0.22	9.8E-2	0.25	0.15
PAH	Anthracene	0.18	6.2E-3	2.9E-2	1.4E-2	1.19	6.6E-2	0.40	0.21	0.53	0.19	0.34	2.29	0.71	0.10	0.73	0.28
PAH	Benzo(a)anthracene	1.0E-2	1.5E-3	5.3E-3	1.4E-3	4.0E-2	3.6E-3	2.2E-2	1.4E-2	3.9E-2	3.0E-2	2.2E-2	0.19	4.0E-2	1.9E-2	3.0E-2	3.0E-2
PAH	Benzo(a)pyrene	3.3E-3	4.2E-4	1.4E-3	3.7E-4	3.6E-2	6.4E-4	8.1E-3	4.3E-3	1.5E-2	4.5E-3	8.4E-3	3.7E-2	2.7E-2	4.1E-3	9.9E-3	7.1E-3
PAH	Chrysene	2.3E-2	3.2E-3	3.2E-2	2.2E-3	0.42	7.4E-3	6.9E-2	2.0E-2	1.3E-1	3.8E-2	4.4E-2	0.26		2.9E-2	5.7E-2	4.4E-2
PAH	Dibenz(a,h)anthracene	1.1E-3	4.0E-4	3.3E-4	3.3E-4	9.8E-3	6.3E-4	4.9E-3	2.2E-3	7.0E-3	3.7E-3	5.0E-3	2.1E-2		2.6E-3	4.4E-3	3.6E-3
PAH	Fluorene	0.15	9.0E-3	5.6E-3	1.6E-2	0.97	0.18	0.31	0.72	0.36	0.10	0.19	2.78		8.4E-2	0.29	0.25
PAH	2-Methylnaphthalene	0.15	3.6E-2	6.4E-2	6.3E-2	1.03	0.28	0.39	2.48	0.74	0.42	4.3E-3	1.5E+0		0.14	0.11	0.13
PAH	Phenanthrene	0.51	3.0E-2	0.10	6.1E-2	3.76	0.41	1.30	1.08	1.33	0.62	0.83	8.78		0.44	1.01	1.05
PAH	Pyrene	0.24	3.1E-2	8.5E-2	2.8E-2	1.25	9.9E-2	0.44	0.29	0.75	0.41	0.50	2.96		0.29	0.50	0.49
PAH	Sum of PAHs	5.05	0.59	1.41	1.18	38.0	5.83	16.1	37.5	22.8	8.76	10.8	80.7	4.22	5.17	10.4	8.37
PCB	Total PCBs	6.2E-3	4.4E-3	4.5E-3	6.3E-3	5.0E-2	6.5E-2	3.4E-2	0.50	4.9E-2	2.7E-2	1.3E-2	1.6E-2	7.8E-3	2.7E-2	1.5E-3	4.3E-3
PST	o,p'-DDE	5.4E-4		1.4E-4		1.3E-3		9.3E-4		2.4E-3		9.6E-4		8.9E-4		2.0E-4	
PST	p,p'-DDE	1.7E-4		1.4E-4		1.8E-3		6.0E-4		1.3E-3		6.0E-4		7.9E-4		1.4E-4	
TOC	% TOC	0.87	1.00	1.07	2.20	1.54	1.10	2.12	1.80	1.26	1.70	1.64	1.50	1.31	1.80	2.36	1.20

PW concentration (µg/L) = sediment concentration/(foc X Koc). See Table A-1 for Koc values.
foc = %TOC/100. See Table A-2.4 for TOC concentrations at reference locations.

Table A-2-2.2 (continued). Equilibrium-partitioning calculated concentrations of organic contaminants in porewaters collected for the McAllister Point Landfill Marine ERA investigation.

Class	Analyte	MCL-9	MCL-9-R	MCL-10	MCL-10-R	MCL-11	MCL-11-R	MCL-12	MCL-12-R	MCL-13	MCL-13-R	MCL-14	MCL-14-R	MCL-15	MCL-16	OS-30A	OS-30B
PAH	Acenaphthylene	0.21	8.5E-2	0.15	6.8E-2	0.12	5.9E-2	0.34	0.11	0.16	9.1E-2	0.11	7.2E-2	6.0E-2	0.20	0.14	0.25
PAH	Anthracene	0.26	0.24	0.37	0.14	0.18	9.5E-2	0.51	1.19	0.39	0.19	0.21	0.13	8.2E-2	0.58	0.17	0.32
PAH	Benzo(a)anthracene	1.0E-2	2.4E-2	2.0E-2	2.1E-2	1.2E-2	1.3E-2	5.1E-2	0.11	2.2E-2	2.3E-2	1.2E-2	1.6E-2	4.1E-3	3.9E-2	1.2E-2	3.3E-2
PAH	Benzo(a)pyrene	5.6E-3	5.3E-3	6.2E-3	5.0E-3	4.0E-3	3.2E-3	1.2E-2	1.9E-2	7.8E-3	5.8E-3	4.3E-3	4.3E-3	1.5E-3	1.2E-2	2.5E-3	5.0E-3
PAH	Chrysene	2.9E-2	3.1E-2	4.4E-2	3.1E-2	2.3E-2	2.0E-2	9.8E-2	0.14	4.5E-2	3.3E-2	2.5E-2	2.6E-2	9.5E-3	6.5E-2	1.3E-2	3.1E-2
PAH	Dibenz(a,h)anthracene	2.2E-3	2.7E-3	2.7E-3	3.0E-3	5.0E-4	1.9E-3	3.6E-3	1.1E-2	7.8E-4	3.2E-3	8.9E-4	2.3E-3	3.0E-4	3.3E-3	1.8E-3	5.7E-3
PAH	Fluorene	0.19	0.22	0.26	0.12	0.13	6.5E-2	0.20	1.56	9.7E-2	0.14	5.2E-2	0.10	8.5E-3	0.53	0.11	0.16
PAH	2-Methylnaphthalene		0.10		8.5E-2		6.7E-2		0.43		9.8E-2		7.3E-2			0.11	0.26
PAH	Phenanthrene	0.59	0.91	1.06	0.57	0.45	0.31	1.15	4.15	1.06	0.73	0.46	0.51	0.13	1.92	0.40	0.99
PAH	Pyrene	0.23	0.37	0.37	4.0E-3	0.27	0.21	0.84	1.50	0.51	0.39	0.28	0.28	0.12	0.70	0.28	0.76
PAH	Sum of PAHs	6.12	7.08	7.17	4.39	4.87	3.17	12.6	33.5	8.18	6.26	4.58	4.59	1.70	12.37	5.02	11.4
PCB	Total PCBs	3.1E-2	2.8E-3	9.8E-3	3.6E-3	4.6E-2	2.7E-3	1.8E-2	8.3E-3	3.5E-3	3.6E-3	1.5E-3	2.4E-3	7.4E-4	2.0E-3	5.8E-3	7.2E-3
PST	o,p'-DDE	1.8E-4		2.8E-4		3.3E-4		6.0E-4		5.1E-4		6.8E-5		1.2E-4	1.5E-4		
PST	p,p'-DDE	2.0E-4		1.8E-4		2.7E-4		4.3E-4		3.1E-4		1.6E-4		1.0E-4	1.6E-4	1.9E-4	4.1E-4
TOC	% TOC	1.84	1.70	2.88	2.10	1.60	1.30	1.16	2.10	1.03	0.90	1.35	1.30	1.70	1.57	1.06	1.21

PW concentration (µg/L) = sediment concentration/(foc X Koc). See Table A-1 for Koc values.
foc = %TOC/100. See Table A-2.4 for TOC concentrations at reference locations.

Table A-2-2.2 (continued). Equilibrium-partitioning calculated concentrations of organic contaminants in porewaters collected for the McAllister Point Landfill Marine ERA investigation.

Class	Analyte	SDA-D1	SDA-D2	SDA-D3	SDA-M1	SDA-M1-R	SDA-M2	SDA-M3	SDA-S1	SDA-S2B	SDA-S2B-R	SDA-S2C-R	SDA-S3	SDA-S4
PAH	Acenaphthylene	0.12	0.12	7.5E-2	3.0E-2	7.1E-2	0.42	8.4E-2	6.2E-2	0.20	5.8E-2		4.7E-2	9.4E-2
PAH	Anthracene	0.60	0.43	0.30	0.20	0.30	0.63	0.38	0.16	2.50	0.19		3.4E-2	0.56
PAH	Benzo(a)anthracene	4.5E-2	3.2E-2	2.1E-2	2.4E-2	3.0E-2	5.4E-2	2.5E-2	1.7E-2	0.12	2.3E-2		3.3E-3	4.7E-2
PAH	Benzo(a)pyrene	7.9E-3	6.1E-3	3.7E-3	3.5E-3	6.7E-3	8.2E-3	4.2E-3	3.0E-3	2.0E-2	5.9E-3		6.2E-4	7.1E-3
PAH	Chrysene	4.6E-2	3.4E-2	2.5E-2	2.5E-2	4.7E-2	3.8E-2	3.0E-2	1.9E-2	0.14	3.4E-2		3.4E-3	4.3E-2
PAH	Dibenz(a,h)anthracene	6.7E-3	5.1E-3	3.0E-3	2.5E-3	3.6E-3	5.6E-3	2.6E-3	2.6E-3	1.6E-2	2.9E-3		7.9E-4	4.9E-3
PAH	Fluorene	0.25	0.19	0.14	7.6E-2	0.29	0.29	0.19	8.9E-2	1.62	0.18		2.0E-2	0.38
PAH	2-Methylnaphthalene	0.26	0.23	0.15	8.9E-2	0.15	0.14	0.11	9.9E-2	1.22	9.5E-2	3.23	2.5E-2	0.41
PAH	Phenanthrene	1.80	1.28	0.92	0.51	1.24	2.01	1.19	0.34	7.53	0.76	26.2	7.0E-2	2.06
PAH	Pyrene	1.08	0.80	0.52	0.41	0.54	1.29	0.73	0.37	2.45	0.42	7.41	7.2E-2	0.87
PAH	Sum of PAHs	16.0	11.5	8.55	4.90	9.36	16.8	10.5	4.30	62.5	5.99	147	1.24	14.2
PCB	Total PCBs	2.8E-3	6.5E-3	9.0E-4	1.3E-3	3.9E-3	1.9E-3	2.0E-3	5.4E-3	7.1E-3	8.0E-3	2.6E-2	1.4E-3	2.7E-3
PST	o,p'-DDE													
PST	p,p'-DDE	2.3E-4	2.4E-4	1.5E-4	1.3E-4		2.7E-4	1.9E-4	3.0E-4	2.9E-4			2.0E-4	1.4E-4
TOC	% TOC	0.81	1.13	1.74	4.66	1.10	0.87	0.94	0.83	2.19	0.90	0.70	0.55	0.74

PW concentration (µg/L) = sediment concentration/(foc X Koc). See Table A-1 for Koc values.
foc = %TOC/100. See Table A-2.4 for TOC concentrations at reference locations.

Table A-2.3. Lipid and solid content data for clams and mussels collected for the McAllister Point Landfill Marine ERA investigation.

	Solids content (g dry/g live wt)				Lipid content (%)			
FIELDID	BM-DEP	BM-ND	HC-DEP	HC-ND	BM-DEP	BM-ND	HC-DEP	HC-ND
JCC-M1-HC				0.17				
JCC-S1-HC				0.17				
SDA-M1-HC				0.17				
SDA-S2-HC				0.18				1.29
MCL-9-HC				0.09				1.36
MCL-10-HC				0.14				0.65
MCL-11-HC				0.16				1.30
MCL-12-HC				0.16				1.47
MCL-13-HC				0.12				1.10
MCL-14-HC				0.15				1.58
MCL-16-HC				0.13				1.26
OS-22-HC								5.90
OS-23-HC								6.20
OS-24-HC								5.40
OS-25-HC								5.00
OS-26-HC								6.60
OS-27-HC								4.10
OS-28-HC								3.00
MCL-10-HC-DEP			0.20				0.62	
MCL-11-HC-DEP			0.16				1.52	
MCL-12-HC-DEP			0.18				1.48	
NSB1-BM		0.14				3.27		
NSB2-BM		0.12				3.02		
NSB3-BM		0.13				2.83		
NSB4-BM		0.12				2.27		
NSB5-BM		0.13				1.89		
NSB6-BM		0.12				1.18		
NSB7-BM		0.15				0.64		
NSB1-BM-DEP	0.13				2.44			
NSB3-BM-DEP	0.10				2.75			
Mean	0.12	0.13	0.18	0.15	2.60	2.16	1.20	3.08
N	2	7	3	11	2	7	3	15
Species Mean	0.12		0.16		2.38		2.14	
Mean % solid/ lipid content	0.14				2.26			

HC = Hard Clam, BM = Blue Mussel
DEP = Depurated sample.

Table A-2.4. Geotechnical characteristics of reference sediments in Narragansett Bay, Rhode Island.

Site	Station	Depth	%Sand	%Silt	%Clay	%TOC
MCL	JCC-D1	SUR	92.1	6.67	1.19	0.84
MCL	JCC-M1	SUR	90.5	7.63	1.88	0.85
MCL	JCC-S1	SUR	75.0	10.3	14.7	2.07
DSY	JPC-1	SUR	88.1	11.9	0.00	1.06
DSY	JPC-2	SUR	66.6	33.2	0.18	1.71
AH	JSC-D1	SUR	99.9	0.12	0.00	0.45
AH	JSC-V1	SUR	97.5	2.50	0.02	0.67
AH	JSC-W1	SUR	94.1	5.88	0.00	0.65
AH	PCC-D1	SUR	100	0.01	0.00	0.39
AH	PCC-V1	SUR	86.5	13.4	0.05	1.60
AH	PCC-W1	SUR	97.0	2.94	0.04	1.36
		Mean:	89.8	8.60	1.64	1.06
		S.D.	10.5	9.32	4.37	0.55

MCL = McAllister Point Landfill ERA (SAIC and URI, 1996)
AH = Allen Harbor Landfill ERA (SAIC, 1996)
DSY= Derecktor Shipyard ERA (SAIC and URI, 1997)

Table A-3.1. Porewater Hazard Quotients (PW-HQs) based on data from the McAllister Point Landfill Marine ERA for stations exhibiting **NO TOXICITY** to amphipods (*Ampelisca abdita*).

Class	Analyte	NSB-1-R	NSB-2	NSB-6-R	MCL-8	MCL-8-R	MCL-9	MCL-9-R	MCL-10	MCL-10-R	MCL-11	MCL-11-R	MCL-12	MCL-12-R	MCL-13	MCL-13-R	MCL-14	MCL-14-R	MCL-15	MCL-16	OS-30A	OS-30B	SDA-D1	SDA-D2	SDA-D3
MET[1]	Ag		0.03		0.03		0.03		0.03		0.03		0.03		0.03		0.03		0.03	0.03					
	As		0.44		0.28		0.67		0.39		0.07		0.36		0.33		0.44		0.07	0.34					
	Cd		1.1E-3		1.1E-3		1.1E-3		1.1E-3		1.1E-3		1.1E-3		1.1E-3		1.1E-3		1.1E-3	1.1E-3					
	Cr		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01	0.01					
	Cu		18.3		0.43		0.43		0.04		0.43		0.43		0.43		0.43		0.43	0.43					
	Hg		1.64		1.08		1.48		1.20		0.40		0.80		1.48		1.04		1.12	1.28					
	Ni		3.20		0.48		0.48		0.48		0.48		0.48		0.48		0.48		0.48	0.48					
	Pb		0.01		0.09		0.01		0.01		0.01		0.01		0.09		0.09		0.01	0.01					
	Zn		0.71		0.36		0.23		0.05		0.28		0.13		0.33		0.33		0.34	0.33					
PAH[2]	ACENAPH	1.9E-5	6.6E-5	5.0E-3	2.3E-4	4.8E-4	3.4E-4	4.8E-4	4.4E-4	2.8E-4	1.9E-4	1.3E-4	5.5E-4	3.1E-3	4.8E-4	3.1E-4	2.3E-4	2.1E-4	7.1E-5	1.0E-3	2.0E-4	3.0E-4	7.8E-4	4.5E-4	3.4E-4
	ACENAPL	0.01	0.01	0.35	0.39	0.24	0.33	0.13	0.23	0.11	0.18	0.09	0.53	0.17	0.25	0.14	0.18	0.11	0.09	0.32	0.23	0.39	0.19	0.19	0.12
	ANTHRAC	0.02	0.07	5.71	1.82	0.69	0.65	0.59	0.92	0.36	0.44	0.24	1.28	2.99	0.97	0.47	0.51	0.33	0.20	1.46	0.41	0.81	1.50	1.08	0.75
	BENAAN	0.03	0.10	3.73	0.58	0.58	0.20	0.45	0.39	0.41	0.23	0.24	0.99	2.05	0.42	0.45	0.22	0.31	0.08	0.76	0.23	0.63	0.86	0.62	0.40
	BENAPYR	0.02	0.05	1.41	0.37	0.27	0.21	0.20	0.23	0.19	0.15	0.12	0.45	0.72	0.29	0.22	0.16	0.16	0.06	0.44	0.09	0.19	0.30	0.23	0.14
	CHRYSEN	0.02	0.25	2.00	0.44	0.34	0.23	0.24	0.34	0.24	0.17	0.15	0.76	1.04	0.34	0.25	0.19	0.20	0.07	0.50	0.10	0.24	0.35	0.26	0.19
	DBAHANT	0.03	0.03	1.63	0.35	0.28	0.17	0.21	0.21	0.24	0.04	0.15	0.28	0.84	0.06	0.25	0.07	0.18	0.02	0.26	0.14	0.45	0.53	0.40	0.24
	FLUORAN	1.5E-3	4.7E-3	0.29	0.03	0.03	0.02	0.03	0.03	0.02	0.02	0.01	0.06	0.11	0.04	0.03	0.02	0.02	0.01	0.05	0.02	0.05	0.08	0.06	0.04
	FLUOREN	0.04	0.03	13.89	1.44	1.23	0.95	1.11	1.32	0.60	0.67	0.33	1.02	7.79	0.48	0.70	0.26	0.52	0.04	2.63	0.54	0.81	1.27	0.97	0.71
	M2NAPH	0.03	0.05	1.20	0.09	0.11		0.08		0.07		0.05		0.35		0.08		0.06			0.09	0.21	0.22	0.19	0.12
	NAPH	1.3E-4	2.5E-4	1.8E-2	1.8E-3	8.4E-4	1.3E-3	8.1E-4	6.1E-4	5.5E-4	1.1E-3	3.9E-4	2.1E-3	4.1E-3	1.1E-3	8.6E-4	8.8E-4	6.8E-4	3.4E-4	4.4E-4	1.0E-3	2.1E-3	2.2E-3	1.5E-3	1.6E-3
	PHENAN	0.01	0.02	1.91	0.22	0.23	0.13	0.20	0.23	0.12	0.10	0.07	0.25	0.90	0.23	0.16	0.10	0.11	0.03	0.42	0.09	0.22	0.39	0.28	0.20
	PYRENE	0.03	0.07	2.45	0.41	0.41	0.19	0.31	0.31	3.3E-3	0.22	0.17	0.69	1.24	0.42	0.32	0.23	0.23	0.10	0.58	0.23	0.63	0.89	0.66	0.43
	SUMPAH	0.23	0.69	34.60	6.14	4.41	3.08	3.56	4.21	2.35	2.24	1.63	6.32	18.20	3.51	3.07	1.95	2.24	0.71	7.40	2.16	4.63	6.58	4.95	3.34
PCB[2]	TOTPCB	0.15	0.15	0.54	0.05	0.14	1.04	0.09	0.33	0.12	1.52	0.09	0.61	0.28	0.12	0.12	0.05	0.08	0.02	0.07	0.19	0.24	0.09	0.22	0.03
PST[2]	DDE_OP		0.19		0.27		0.25		0.38		0.45		0.82		0.70		0.09		0.16	0.20					
	DDE_PP		0.20		0.19		0.27		0.25		0.37		0.59		0.43		0.21		0.14	0.22	0.26	0.56	0.32	0.33	0.21
	HCB		4.1E-5		5.1E-6		6.5E-6		1.0E-5		9.3E-6		6.4E-5		1.2E-5		8.9E-6		7.0E-6	7.6E-6	6.2E-5	4.4E-5	5.7E-5	5.1E-5	2.8E-5
	MIREX		1.9E-3		1.7E-3		2.2E-3		5.7E-3		1.3E-3		1.8E-3		2.0E-3		1.5E-3		1.5E-3	2.6E-3	1.1E-2	5.4E-3	1.3E-2	5.8E-3	2.5E-3

1 - Hazard Quotients for metals calculated as porewater concentration (Table A-2.1)/WQSV (Table 2).

2 - Hazard Quotients for organics calculated as porewater concentration (Table A-2.2)/WQSV (Table 2).

3 - 95% Upper Confidence Limit calculated based on sample size as follows:

Mean + ($t_{0.975}(df)$*(STDEV/(SQRT(n))); where STDEV=standard deviation; n=sample size;

$t_{0.975}$(df) = sample size-dependent percentage points of the t distribution, (Ott, 1993).

Table A-3.1. Porewater Hazard Quotients (PW-HQs) based on data from the McAllister Point Landfill Marine ERA for stations exhibiting **NO TOXICITY** to amphipods (*Ampelisca abdita*).

Class	Analyte	SDA-M1	SDA-M1-R	SDA-M2	SDA-M3	SDA-S1	SDA-S2B-R	SDA-S2C-R	SDA-S3	SDA-S4	**Mean**	**Upper 95% Confidence Limit[3]**
MET[1]	Ag										0.03	0.03
	As										0.34	0.47
	Cd										1.1E-3	1.1E-3
	Cr										8.0E-3	8.0E-3
	Cu										2.18	6.25
	Hg										1.15	1.41
	Ni										0.75	1.37
	Pb										3.3E-2	6.0E-2
	Zn										0.31	0.43
PAH[2]	ACENAPH	1.8E-4	5.1E-4	6.7E-4	4.6E-4	9.4E-5	3.2E-4	1.7E-2	3.5E-5	8.8E-4	1.1E-3	2.1E-3
	ACENAPL	0.05	0.11	0.65	0.13	0.10	0.09		0.07	0.15	0.20	0.25
	ANTHRAC	0.51	0.76	1.57	0.95	0.39	0.46		0.09	1.40	0.95	1.33
	BENAAN	0.47	0.58	1.04	0.48	0.32	0.43		0.06	0.90	0.60	0.85
	BENAPYR	0.13	0.25	0.31	0.16	0.11	0.22		0.02	0.27	0.25	0.35
	CHRYSEN	0.19	0.36	0.29	0.23	0.14	0.26		0.03	0.33	0.34	0.47
	DBAHANT	0.19	0.28	0.44	0.20	0.20	0.23		0.06	0.39	0.28	0.39
	FLUORAN	0.03	0.04	0.10	0.05	0.03	0.03		0.01	0.07	0.04	0.06
	FLUOREN	0.38	1.43	1.47	0.93	0.44	0.92		0.10	1.91	1.47	2.42
	M2NAPH	0.07	0.12	0.11	0.09	0.08	0.08	2.65	0.02	0.33	0.26	0.49
	NAPH	4.5E-4	1.1E-3	1.4E-3	1.6E-3	4.5E-4	4.9E-4	4.0E-2	2.4E-4	2.4E-4	2.7E-3	5.3E-3
	PHENAN	0.11	0.27	0.44	0.26	0.07	0.17	5.69	0.02	0.45	0.43	0.78
	PYRENE	0.34	0.45	1.07	0.60	0.31	0.34	6.12	0.06	0.72	0.64	1.03
	SUMPAH	2.48	4.66	7.49	4.09	2.21	3.24	14.52	0.53	6.92	5.28	7.56
PCB[2]	TOTPCB	0.04	0.13	0.06	0.07	0.18	0.27	0.85	0.05	0.09	0.25	0.36
PST[2]	DDE_OP										0.35	0.52
	DDE_PP	0.18		0.37	0.27	0.41			0.27	0.20	0.30	0.35
	HCB	1.5E-5		1.3E-4	9.8E-5	7.1E-5			2.2E-5	1.6E-5	3.6E-5	5.2E-5
	MIREX	1.4E-3		2.2E-2	1.5E-2	6.8E-3			2.4E-2	2.7E-3	6.3E-3	9.4E-3

1 - Hazard Quotients for metals calculated as porewater concentration (Table A-2.1)/WQSV (Table 2).

2 - Hazard Quotients for organics calculated as porewater concentration (Table A-2.2)/WQSV (Table 2).

3 - 95% Upper Confidence Limit calculated based on sample size as follows:

Mean + ($t_{0.975}(df)$*(STDEV/(SQRT(n))); where STDEV=standard deviation; n=sample size;

$t_{0.975}$(df) = sample size-dependent percentage points of the t distribution, (Ott, 1993).

$t_{0.975}$(df) = sample size-dependent percentage points of the t distribution, (Ott, 1993).

Table A-3.2. Porewater Hazard Quotients (PW-HQs) based on data from the McAllister Point Landfill Marine ERA for stations exhibiting **TOXICITY** to amphipods (*Ampelisca abdita*).

Class	Analyte	NSB-1	NSB-2-R	NSB-3	NSB-3-R	NSB-4	NSB-4-R	NSB-5	NSB-5-R	NSB-6	NSB-7	NSB-7-R	SDA-S2B	**Mean**	**Maximum HQ**
MET[1]	Ag	0.03		0.03		0.03		0.03		0.03	0.03			0.03	0.03
	As	0.07		0.07		0.07		0.07		0.07	0.07			0.07	0.07
	Cd	1.1E-3		1.1E-3		1.1E-3		0.28		1.1E-3	1.1E-3			0.05	0.28
	Cr	4.0E-2		8.0E-3		8.0E-4		8.0E-3		8.0E-3	8.0E-3			1.2E-2	4.0E-2
	Cu	3.52		2.00		1.66		9.38		1.86	9.79			4.70	9.79
	Hg	0.40		0.96		1.32		1.76		0.84	1.84			1.19	1.84
	Ni	2.82		3.20		4.12		5.88		0.48	2.43			3.16	5.88
	Pb	0.01		0.01		0.09		0.01		0.01	0.01			0.02	0.09
	Zn	0.37		0.47		1.26		2.23		0.13	0.73			0.86	2.23
PAH[2]	ACENAPH	3.1E-4	3.6E-5	1.6E-3	3.3E-4	4.8E-4	8.1E-4	3.7E-4	1.6E-4	3.3E-4	1.3E-3	1.7E-4	3.9E-3	8.2E-4	3.9E-3
	ACENAPL	0.10	0.01	0.74	0.03	0.39	0.23	1.00	0.31	0.21	0.34	0.15	0.32	0.32	1.00
	ANTHRAC	0.45	0.03	2.98	0.17	0.99	0.52	1.33	0.48	0.84	1.79	0.25	6.25	1.34	6.25
	BENAAN	0.20	0.03	0.77	0.07	0.42	0.26	0.74	0.59	0.43	0.77	0.36	2.35	0.58	2.35
	BENAPYR	0.12	0.01	1.35	0.02	0.31	0.16	0.57	0.17	0.32	1.00	0.15	0.76	0.41	1.35
	CHRYSEN	0.17	0.02	3.26	0.06	0.53	0.16	0.98	0.29	0.34		0.22	1.08	0.65	3.26
	DBAHANT	0.09	0.03	0.77	0.05	0.38	0.17	0.55	0.29	0.39		0.20	1.29	0.38	1.29
	FLUORAN	0.02	1.7E-3	0.10	0.01	0.03	0.02	0.05	0.03	0.03		0.02	0.19	0.05	0.19
	FLUOREN	0.76	0.08	4.85	0.91	1.55	3.58	1.82	0.52	0.97		0.42	8.12	2.14	8.12
	M2NAPH	0.12	0.05	0.84	0.23	0.32	2.03	0.61	0.34	3.5E-3		0.12	1.00	0.51	2.03
	NAPH	8.4E-4	3.9E-4	8.6E-3	1.7E-3	5.0E-3	1.3E-2	7.1E-3	2.2E-3	3.3E-3		1.0E-3	1.2E-2	5.0E-3	1.3E-2
	PHENAN	0.11	0.01	0.82	0.09	0.28	0.23	0.29	0.13	0.18		0.10	1.64	0.35	1.64
	PYRENE	0.20	0.02	1.04	0.08	0.36	0.24	0.62	0.34	0.41		0.24	2.03	0.51	2.03
	SUMPAH	2.35	0.29	17.52	1.72	5.58	7.62	8.58	3.48	4.13	3.90	2.24	25.02	6.87	25.0
PCB[2]	TOTPCB	0.21	0.21	1.68	2.18	1.15	16.8	1.63	0.90	0.42	0.26	0.90	0.24	2.21	16.8
PST[2]	ALDRIN										5.7E-4			5.7E-4	0.00
	DDE_OP	0.75		1.73		1.27		3.24		1.32	1.22			1.59	3.24
	DDE_PP	0.23		2.53		0.83		1.76		0.83	1.09		0.39	1.09	2.53
	HCB	1.4E-4		1.7E-4		2.1E-4		2.8E-4		2.7E-5	7.2E-5		3.0E-5	1.3E-4	2.8E-4
	MIREX	2.0E-2		1.3E-3		7.9E-3		4.9E-3		7.3E-3	5.6E-3		5.8E-3	7.5E-3	2.0E-2

1 - Hazard Quotients for metals calculated from EqP-predicted porewater concentrations (Table A-2.1)/WQSV (Table 2).

2 - Hazard Quotients for organics calculated from EqP-predicted porewater concentrations (Table A-2.2)/WQSV (Table 2).

Table A-4.1. Porewater Hazard Quotients (PW-HQs) based on data from the McAllister Point Landfill Marine ERA for stations exhibiting **NO TOXICITY** to sea urchin (*Arbacia punctulata*) fertilization.

Class	Analyte	NSB-1	NSB-2	NSB-6	NSB-6-R	NSB-7	MCL-8	MCL-9	MCL-10	MCL-11	MCL-12	MCL-13	MCL-14	MCL-15	MCL-16	OS-30A	OS-30B	SDA-D1	SDA-D2	SDA-M2	SDA-M3	SDA-S1	SDA-S4	Mean	Upper 95% Confidence Limit[3]
MET[1]	Ag	0.03	0.03	0.03		0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03									0.03	0.03
	As	0.07	0.44	0.07		0.07	0.28	0.67	0.39	0.07	0.36	0.33	0.44	0.07	0.34									0.28	0.39
	Cd	1.1E-3	1.1E-3	1.1E-3		1.1E-3	1.1E-3	1.1E-3	1.1E-3	1.1E-3	1.1E-3	1.1E-3	1.1E-3	1.1E-3	1.1E-3									0.00	0.00
	Cr	4.0E-2	8.0E-3	8.0E-3		8.0E-3	8.0E-3	8.0E-3	8.0E-3	8.0E-3	8.0E-3	8.0E-3	8.0E-3	8.0E-3	8.0E-3									1.0E-2	1.6E-2
	Cu	3.52	18.34	1.86		9.79	0.43	0.43	0.04	0.43	0.43	0.43	0.43	0.43	0.43									2.85	6.08
	Hg	0.40	1.64	0.84		1.84	1.08	1.48	1.20	0.40	0.80	1.48	1.04	1.12	1.28									1.12	1.39
	Ni	2.82	3.20	0.48		2.43	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48									1.02	1.65
	Pb	0.01	0.01	0.01		0.01	0.09	0.01	0.01	0.01	0.01	0.09	0.09	0.01	0.01									0.03	0.05
	Zn	0.37	0.71	0.13		0.73	0.36	0.23	0.05	0.28	0.13	0.33	0.33	0.34	0.33									0.33	0.45
PAH[2]	ACENAPH	3.1E-4	6.6E-5	3.3E-4	5.0E-3	1.3E-3	2.3E-4	3.4E-4	4.4E-4	1.9E-4	5.5E-4	4.8E-4	2.3E-4	7.1E-5	1.0E-3	2.0E-4	3.0E-4	7.8E-4	4.5E-4	6.7E-4	4.6E-4	9.4E-5	8.8E-4	1.1E-3	2.1E-3
	ACENAPL	0.10	0.01	0.21	0.35	0.34	0.39	0.33	0.23	0.18	0.53	0.25	0.18	0.09	0.32	0.23	0.39	0.19	0.19	0.65	0.13	0.10	0.15	0.22	0.28
	ANTHRAC	0.45	0.07	0.84	5.71	1.79	1.82	0.65	0.92	0.44	1.28	0.97	0.51	0.20	1.46	0.41	0.81	1.50	1.08	1.57	0.95	0.39	1.40	1.04	1.39
	BENAAN	0.20	0.10	0.43	3.73	0.77	0.58	0.20	0.39	0.23	0.99	0.42	0.22	0.08	0.76	0.23	0.63	0.86	0.62	1.04	0.48	0.32	0.90	0.61	0.84
	BENAPYR	0.12	0.05	0.32	1.41	1.00	0.37	0.21	0.23	0.15	0.45	0.29	0.16	0.06	0.44	0.09	0.19	0.30	0.23	0.31	0.16	0.11	0.27	0.27	0.37
	CHRYSEN	0.17	0.25	0.34	2.00		0.44	0.23	0.34	0.17	0.76	0.34	0.19	0.07	0.50	0.10	0.24	0.35	0.26	0.29	0.23	0.14	0.33	0.32	0.45
	DBAHANT	0.09	0.03	0.39	1.63		0.35	0.17	0.21	0.04	0.28	0.06	0.07	0.02	0.26	0.14	0.45	0.53	0.40	0.44	0.20	0.20	0.39	0.29	0.40
	FLUORAN	0.02	4.7E-3	0.03	0.29		0.03	0.02	0.03	0.02	0.06	0.04	0.02	0.01	0.05	0.02	0.05	0.08	0.06	0.10	0.05	0.03	0.07	0.05	0.07
	FLUOREN	0.76	0.03	0.97	13.9		1.44	0.95	1.32	0.67	1.02	0.48	0.26	0.04	2.63	0.54	0.81	1.27	0.97	1.47	0.93	0.44	1.91	1.36	2.24
	M2NAPH	0.12	0.05	3.5E-3	1.20		0.09									0.09	0.21	0.22	0.19	0.11	0.09	0.08	0.33	0.28	0.51
	NAPH	8.4E-4	2.5E-4	3.3E-3	1.8E-2		1.8E-3	1.3E-3	6.1E-4	1.1E-3	2.1E-3	1.1E-3	8.8E-4	3.4E-4	4.4E-4	1.0E-3	2.1E-3	2.2E-3	1.5E-3	1.4E-3	1.6E-3	4.5E-4	2.4E-4	2.8E-3	5.5E-3
	PHENAN	0.11	0.02	0.18	1.91		0.22	0.13	0.23	0.10	0.25	0.23	0.10	0.03	0.42	0.09	0.22	0.39	0.28	0.44	0.26	0.07	0.45	0.44	0.80
	PYRENE	0.20	0.07	0.41	2.45		0.41	0.19	0.31	0.22	0.69	0.42	0.23	0.10	0.58	0.23	0.63	0.89	0.66	1.07	0.60	0.31	0.72	0.70	1.09
	SUMPAH	2.35	0.69	4.13	34.60	3.90	6.14	3.08	4.21	2.24	6.32	3.51	1.95	0.71	7.40	2.16	4.63	6.58	4.95	7.49	4.09	2.21	6.92	5.29	7.39
PCB[2]	TOTPCB	0.21	0.15	0.42	0.54	0.26	0.05	1.04	0.33	1.52	0.61	0.12	0.05	0.02	0.07	0.19	0.24	0.09	0.22	0.06	0.07	0.18	0.09	0.26	0.37
PST[2]	ALDRIN					5.7E-4																		5.7E-4	
	DDE_OP	0.75	0.19	1.32		1.22	0.27	0.25	0.38	0.45	0.82	0.70	0.09	0.16	0.20									4.3E-1	5.9E-1
	DDE_PP	0.23	0.20	0.83		1.09	0.19	0.27	0.25	0.37	0.59	0.43	0.21	0.14	0.22	0.26	0.56	0.32	0.33	0.37	0.27	0.41	0.20	2.7E-1	3.7E-1
	HCB	1.4E-4	4.1E-5	2.7E-5		7.2E-5	5.1E-6	6.5E-6	1.0E-5	9.3E-6	6.4E-5	1.2E-5	8.9E-6	7.0E-6	7.6E-6	6.2E-5	4.4E-5	5.7E-5	5.1E-5	1.3E-4	9.8E-5	7.1E-5	1.6E-5	0.00	0.01
	MIREX	2.0E-2	1.9E-3	7.3E-3		5.6E-3	1.7E-3	2.2E-3	5.7E-3	1.3E-3	1.8E-3	2.0E-3	1.5E-3	1.5E-3	2.6E-3	1.1E-2	5.4E-3	1.3E-2	5.8E-3	2.2E-2	1.5E-2	6.8E-3	2.7E-3	0.01	0.01

1 - Hazard Quotients for metals calculated as porewater concentration (Table A-2.1)/WQSV (Table 2).

2 - Hazard Quotients for organics calculated as porewater concentration (Table A-2.2)/WQSV (Table 2).

3 - 95% Upper Confidence Limit calculated based on sample size as follows:

Mean + ($t_{0.975}(df)$*(STDEV/(SQRT(n))); where STDEV=standard deviation; n=sample size;

$t_{0.975}$(df) = sample size-dependent percentage points of the t distribution, (Ott, 1993).

Table A-4.2. Porewater Hazard Quotients (PW-HQs) based on data from the McAllister Point Landfill Marine ERA for stations exhibiting TOXICITY to sea urchin (*Arbacia punctulata*) fertilization.

Class	Analyte	NSB-2-R	NSB-3	NSB-3-R	NSB-4	NSB-4-R	NSB-5	NSB-5-R	MCL-10-R	MCL-12-R	SDA-D3	SDA-M1	SDA-S2B	SDA-S3	**Mean**	**Maximum HQ**
MET[1]	Ag		0.03		0.03		0.03								0.03	0.03
	As		0.07		0.07		0.07								0.07	0.07
	Cd		1.1E-3		1.1E-3		0.28								0.09	0.28
	Cr		8.0E-3		8.0E-4		8.0E-3								5.6E-3	8.0E-3
	Cu		2.00		1.66		9.38								4.34	9.38
	Hg		0.96		1.32		1.76								1.35	1.76
	Ni		3.20		4.12		5.88								4.40	5.88
	Pb		8.8E-3		8.8E-2		8.8E-3								0.04	0.09
	Zn		0.47		1.26		2.23								1.32	2.23
PAH[2]	ACENAPH	3.6E-5	1.6E-3	3.3E-4	4.8E-4	8.1E-4	3.7E-4	1.6E-4	2.8E-4	3.1E-3	3.4E-4	1.8E-4	3.9E-3	3.5E-5	8.9E-4	3.9E-3
	ACENAPL	0.01	0.74	0.03	0.39	0.23	1.00	0.31	0.11	0.17	0.12	0.05	0.32	0.07	0.27	1.00
	ANTHRAC	0.03	2.98	0.17	0.99	0.52	1.33	0.48	0.36	2.99	0.75	0.51	6.25	0.09	1.34	6.25
	BENAAN	0.03	0.77	0.07	0.42	0.26	0.74	0.59	0.41	2.05	0.40	0.47	2.35	0.06	0.66	2.35
	BENAPYR	0.01	1.35	0.02	0.31	0.16	0.57	0.17	0.19	0.72	0.14	0.13	0.76	0.02	0.35	1.35
	CHRYSE	0.02	3.26	0.06	0.53	0.16	0.98	0.29	0.24	1.04	0.19	0.19	1.08	0.03	0.62	3.26
	DBAHANT	0.03	0.77	0.05	0.38	0.17	0.55	0.29	0.24	0.84	0.24	0.19	1.29	0.06	0.39	1.29
	FLUORAN	1.7E-3	9.9E-2	7.4E-3	3.3E-2	2.0E-2	5.0E-2	2.7E-2	2.2E-2	1.1E-1	3.7E-2	2.9E-2	1.9E-1	5.3E-3	4.9E-2	0.19
	FLUOREN	0.08	4.85	0.91	1.55	3.58	1.82	0.52	0.60	7.79	0.71	0.38	8.12	0.10	2.39	8.12
	M2NAPH	0.05	0.84	0.23	0.32	2.03	0.61	0.34	0.07	0.35	0.12	0.07	1.00	0.02	0.47	2.03
	NAPH	3.9E-4	8.6E-3	1.7E-3	5.0E-3	1.3E-2	7.1E-3	2.2E-3	5.5E-4	4.1E-3	1.6E-3	4.5E-4	1.2E-2	2.4E-4	4.4E-3	1.3E-2
	PHENAN	0.01	0.82	0.09	0.28	0.23	0.29	0.13	0.12	0.90	0.20	0.11	1.64	0.02	0.37	1.64
	PYRENE	0.02	1.04	0.08	0.36	0.24	0.62	0.34	3.3E-3	1.24	0.43	0.34	2.03	0.06	0.52	2.03
	SUMPAH	0.29	17.52	1.72	5.58	7.62	8.58	3.48	2.35	18.20	3.34	2.48	25.02	0.53	7.44	25.0
PCB[2]	TOTPCB	0.21	1.68	2.18	1.15	16.80	1.63	0.90	0.12	0.28	0.03	0.04	0.24	0.05	1.95	16.8
PST[2]	DDE_OP		1.73		1.27		3.24								2.08	3.24
	DDE_PP		2.53		0.83		1.76				0.21	0.18	0.39	0.27	0.88	2.53
	HCB		1.7E-4		2.1E-4		2.8E-4				2.8E-5	1.5E-5	3.0E-5	2.2E-5	1.1E-4	2.8E-4
	MIREX		1.3E-3		7.9E-3		4.9E-3				2.5E-3	1.4E-3	5.8E-3	2.4E-2	6.8E-3	2.4E-2

1 - Hazard Quotients for metals calculated as porewater concentration (Table A-2.1)/WQSV (Table 2).

2 - Hazard Quotients for organics calculated as porewater concentration (Table A-2.2)/WQSV (Table 2).

Table A-4.3. Porewater Hazard Quotients (PW-HQs) based on data from the McAllister Point Landfill Marine ERA for stations exhibiting **NO TOXICITY** to sea urchin (*Arbacia punctulata*) larval development.

Class	Analyte	NSB-3-R	NSB-6-R	MCL-10-R	**Mean**	**Upper 95% Confidence Limit[2]**
PAH[1]	ACENAPH	3.3E-4	5.0E-3	2.8E-4	1.9E-3	8.6E-3
	ACENAPL	3.1E-2	0.35	0.11	0.16	0.58
	ANTHRAC	0.17	5.71	0.36	2.08	9.90
	BENAAN	7.0E-2	3.73	0.41	1.40	6.44
	BENAPYR	2.4E-2	1.41	0.19	0.54	2.42
	CHRYSEN	5.7E-2	2.00	0.24	0.77	3.44
	DBAHANT	5.0E-2	1.63	0.24	0.64	2.79
	FLUORAN	7.4E-3	0.29	2.2E-2	0.11	0.50
	FLUOREN	0.91	13.9	0.60	5.13	24.0
	M2NAPH	0.23	1.20	6.9E-2	0.50	2.02
	NAPH	1.7E-3	1.8E-2	5.5E-4	6.6E-3	3.0E-2
	PHENAN	9.0E-2	1.91	0.12	0.71	3.29
	PYRENE	8.2E-2	2.45	3.3E-3	0.84	4.29
	SUMPAH	1.72	34.6	2.35	12.9	59.6
PCB[1]	TOTPCB	2.18	0.54	0.12	0.95	3.65

1 - Hazard Quotients for organics calculated as porewater concentration (Table A-2.2)/WQSV (Table 2).

2 - 95% Upper Confidence Limit calculated based on sample size as follows: Mean + ($t_{0.975}(df)$*(STDEV/(SQRT(n))); where STDEV=standard deviation; n=sample size; $t_{0.975}$(df) = sample size-dependent percentage points of the t distribution, (Ott, 1993).

Table A-4.4. Porewater Hazard Quotients (PW-HQs) based on data from the McAllister Point Landfill Marine ERA for stations exhibiting **TOXICITY** to sea urchin (*Arbacia punctulata*) larval development.

Class	Analyte	NSB-2-R	NSB-4-R	NSB-5-R	MCL-12-R	**Mean**	**Maximum HQ**
PAH[1]	ACENAPH	3.6E-5	8.1E-4	1.6E-4	3.1E-3	1.0E-3	3.1E-3
	ACENAPL	6.3E-3	0.23	0.31	0.17	0.18	0.31
	ANTHRAC	3.4E-2	0.52	0.48	2.99	1.01	2.99
	BENAAN	2.7E-2	0.26	0.59	2.05	0.73	2.05
	BENAPYR	1.4E-2	0.16	0.17	0.72	0.27	0.72
	CHRYSEN	1.7E-2	0.16	0.29	1.04	0.38	1.04
	DBAHANT	2.6E-2	0.17	0.29	0.84	0.33	0.84
	FLUORAN	1.7E-3	2.0E-2	2.7E-2	0.11	4.0E-2	0.11
	FLUOREN	0.08	3.58	0.52	7.79	2.99	7.79
	M2NAPH	5.2E-2	2.03	0.34	0.35	0.70	2.03
	NAPH	3.9E-4	1.3E-2	2.2E-3	4.1E-3	4.9E-3	1.3E-2
	PHENAN	1.3E-2	0.23	0.13	0.90	0.32	0.90
	PYRENE	2.3E-2	0.24	0.34	1.24	0.46	1.24
	SUMPAH	0.29	7.62	3.48	18.2	7.40	18.2
PCB[1]	TOTPCB	0.21	16.80	0.90	0.28	4.55	16.8

1 - Hazard Quotients for organics calculated as porewater concentration (Table A-2.2)/WQSV (Table 2).

Table A-5. Aquatic Threshold Effects Value Hazard Quotients[1] for CoCs in porewater from the McAllister Point study area.

Analyte	*Aquatic TEV*[2]	NSB-1	NSB-1-R	NSB-2	NSB-2-R	NSB-2FD-R	NSB-3	NSB-3-R	NSB-4	NSB-4-R	NSB-5	NSB-5-R	NSB-6	NSB-6-R	NSB-7	NSB-7-R	MCL-8	MCL-8-R	MCL-9	MCL-9-BOT	MCL-9-MID	MCL-9-R	MCL-10	MCL-10-BOT
Copper	*17.6*	0.58		3.02			0.33		0.27		1.54		0.31		1.61		0.07		0.07				0.01	
Mercury	*6.7E-2*	0.15		0.61			0.36		0.49		0.66		0.31		0.69		0.40		0.55				0.45	
Nickel	*11.2*	2.08		2.37			2.37		3.04		4.34		0.36		1.80		0.36		0.36				0.36	
Zinc	*81.0*	0.40		0.75			0.49		1.33		2.37		0.14		0.78		0.38		0.25				0.06	
SEM-AVS[3]	*5.00*	3.00		1.00			0.60		3.00		3.20		-0.80		1.20		-0.40		-0.60	0.20	-0.60		-2.40	0.00
SEM	*5.00*	2.98		1.05			2.38		3.36		3.30		0.39		1.18		0.65		0.45				0.44	
Acenaphthylene	*0.64*	0.10	0.01	0.01	0.01	0.03	0.74	0.03	0.39	0.23	1.00	0.31	0.21	0.35	0.34	0.15	0.39	0.24	0.33	0.01	0.72	0.13	0.23	0.03
Anthracene	*0.53*	0.34	0.01	0.05	0.03	0.13	2.23	0.12	0.75	0.39	1.00	0.36	0.63	4.28	1.34	0.19	1.36	0.52	0.48		0.98	0.45	0.69	0.06
Benzo(a)anthracene	*5.2E-2*	0.20	0.03	0.10	0.03	0.18	0.77	0.07	0.42	0.26	0.74	0.59	0.43	3.73	0.77	0.36	0.58	0.58	0.20	0.01	0.71	0.45	0.39	0.02
Benzo(a)pyrene	*2.7E-2*	0.12	0.02	0.05	0.01	0.06	1.35	0.02	0.31	0.16	0.57	0.17	0.32	1.41	1.00	0.15	0.37	0.27	0.21	3.0E-3	0.45	0.20	0.23	0.02
Chrysene	*0.13*	0.17	0.02	0.25	0.02	0.11	3.26	0.06	0.53	0.16	0.98	0.29	0.34	2.00		0.22	0.44	0.34	0.23	4.5E-3	0.48	0.24	0.34	0.01
Dibenz(a,h)anthracene	*1.3E-2*	0.09	0.03	0.03	0.03	0.09	0.77	0.05	0.38	0.17	0.55	0.29	0.39	1.63		0.20	0.35	0.28	0.17	0.01	0.58	0.21	0.21	0.02
Fluorene	*0.48*	0.32	0.02	0.01	0.03	0.09	2.00	0.38	0.64	1.48	0.75	0.21	0.40	5.74		0.17	0.59	0.51	0.39	0.02	0.69	0.46	0.55	0.01
2-Methylnaphthalene	*1.22*	0.12	0.03	0.05	0.05	0.03	0.84	0.23	0.32	2.03	0.61	0.34	3.5E-3	1.20		0.12	0.09	0.11		0.04	0.32	0.08		0.04
Phenanthrene	*4.60*	0.11	0.01	0.02	0.01	0.07	0.82	0.09	0.28	0.23	0.29	0.13	0.18	1.91		0.10	0.22	0.23	0.13	2.8E-3	0.24	0.20	0.23	0.01
Pyrene	*1.21*	0.20	0.03	0.07	0.02	0.14	1.04	0.08	0.36	0.24	0.62	0.34	0.41	2.45		0.24	0.41	0.41	0.19	0.01	0.53	0.31	0.31	0.02
Sum of PAHs	*284*	1.8E-2	2.1E-3	5.0E-3	4.2E-3	0.01	0.13	0.02	0.06	0.13	0.08	0.03	0.04	0.28	0.01	0.02	0.04	0.03	0.02	1.0E-3	0.05	0.02	0.03	0.01
Total PCBs	*3.0E-2*	0.21	0.15	0.15	0.21	0.37	1.68	2.18	1.15	16.8	1.63	0.90	0.42	0.54	0.26	0.90	0.05	0.14	1.04	0.01	0.08	0.09	0.33	0.03
o,p'-DDE	*7.3E-4*	0.75		0.19			1.73		1.27		3.24		1.32		1.22		0.27		0.25	0.02	0.40		0.38	
p,p'-DDE	*7.3E-4*	0.23		0.20			2.53		0.83		1.76		0.83		1.09		0.19		0.27	0.19	0.35		0.25	0.04

Shaded cells indicate TEV-HQ>1.

1 - Threshold Effects Value Hazard Quotient (TEV-HQ) = porewater concentration (Table A-2.2)/Threshold Effect Value (TEV).

2 - TEV units: µg/L; see Table 5 for TEV derivation.

3 - Value reported for confirmation purposes, but not used in PRG derivation; see text.

Table A-5 (continued). Aquatic Threshold Effects Value Hazard Quotients[1] for CoCs in porewater from the McAllister Point study area.

Analyte	*Aquatic TEV*[2]	MCL-10-MID	MCL-10-R	MCL-11	MCL-11-BOT	MCL-11-MID	MCL-11-R	MCL-12	MCL-12-BOT	MCL-12-MID	MCL-12-R	MCL-13	MCL-13-BOT	MCL-13-MID	MCL-13-R	MCL-14	MCL-14-BOT	MCL-14-MID	MCL-14-R	MCL-15	MCL-15-BOT	MCL-15-MID	MCL-16	OS-22
Copper	*17.6*			0.07				0.07				0.07				0.07				0.07			0.07	
Mercury	*6.7E-2*			0.15				0.30				0.55				0.39				0.42			0.48	
Nickel	*11.2*			0.36				0.36				0.36				0.36				0.36			0.36	
Zinc	*81.0*			0.30				0.14				0.35				0.35				0.36			0.35	
SEM-AVS[3]	*5.00*	-3.20		-0.80	0.20	-0.60		-1.20	0.00	-1.40		0.00	0.00	0.00		0.00		-0.20		0.60	0.20	0.00	0.20	
SEM	*5.00*			0.26				0.22				0.23				0.26							0.27	0.08
Acenaphthylene	*0.64*	0.24	0.11	0.18	0.01	0.25	0.09	0.53	0.04	0.20	0.17	0.25	0.05	0.23	0.14	0.18	0.02	0.43	0.11	0.09	0.01	0.08	0.32	0.63
Anthracene	*0.53*	0.61	0.27	0.33	0.01	0.97	0.18	0.96	0.03	0.49	2.24	0.73	0.05	0.35	0.35	0.38	0.02	0.41	0.25	0.15	0.01	0.11	1.09	0.89
Benzo(a)anthracene	*5.2E-2*	0.43	0.41	0.23	4.5E-3	0.58	0.24	0.99	0.02	0.33	2.05	0.42	0.03	0.22	0.45	0.22	0.01	0.32	0.31	0.08	2.3E-3	0.06	0.76	0.74
Benzo(a)pyrene	*2.7E-2*	0.24	0.19	0.15	3.3E-3	0.32	0.12	0.45	0.02	0.20	0.72	0.29	0.02	0.16	0.22	0.16	0.01	0.20	0.16	0.06	1.3E-3	0.05	0.44	0.52
Chrysene	*0.13*	0.24	0.24	0.17	2.3E-3	0.34	0.15	0.76	0.02	0.24	1.04	0.34	0.02	0.15	0.25	0.19	0.01	0.23	0.20	0.07	1.6E-3	0.05	0.50	
Dibenz(a,h)anthracene	*1.3E-2*	0.27	0.24	0.04	1.5E-3	0.35	0.15	0.28	0.02	0.23	0.84	0.06	0.02	0.19	0.25	0.07	0.01	0.24	0.18	0.02	1.1E-2	0.09	0.26	
Fluorene	*0.48*	0.62	0.25	0.28	1.7E-3	1.10	0.13	0.42	0.04	0.56	3.22	0.20	0.02	0.27	0.29	0.11	0.01	0.30	0.22	0.02	4.5E-3	0.05	1.09	
2-Methylnaphthalene	*1.22*	0.24	0.07		4.5E-3	0.12	0.05		0.05	0.20	0.35		0.01	0.11	0.08		0.01	0.13	0.06		0.01	0.04		
Phenanthrene	*4.60*	0.17	0.12	0.10	1.9E-3	0.33	0.07	0.25	0.01	0.17	0.90	0.23	0.01	0.08	0.16	0.10	4.2E-3	0.11	0.11	0.03	1.8E-3	0.02	0.42	
Pyrene	*1.21*	0.32	3.3E-3	0.22	3.4E-3	0.43	0.17	0.69	0.02	0.29	1.24	0.42	0.03	0.18	0.32	0.23	0.01	0.25	0.23	0.10	2.7E-3	0.05	0.58	
Sum of PAHs	*284*	0.03	0.02	0.02	6.4E-4	0.04	0.01	0.04	4.1E-3	0.03	0.12	0.03	2.3E-3	0.02	0.02	0.02	1.8E-3	0.02	0.02	0.01	5.7E-4	0.01	0.04	0.01
Total PCBs	*3.0E-2*	0.64	0.12	1.52	0.01	0.11	0.09	0.61	0.01	0.16	0.28	0.12	0.02	0.08	0.12	0.05	0.03	0.07	0.08	0.02	0.01	0.02	0.07	
o,p'-DDE	*7.3E-4*	0.78		0.45		0.25		0.82	0.02	0.63		0.70	0.04	0.33		0.09		0.34		0.16		0.11	0.20	
p,p'-DDE	*7.3E-4*	0.46		0.37	0.01	0.30		0.59	0.02	0.52		0.43	0.04	0.37		0.21	0.05	0.37		0.14	0.01	0.11	0.22	

Shaded cells indicate TEV-HQ>1.

1 - Threshold Effects Value Hazard Quotient (TEV-HQ) = porewater concentration (Table A-2.2)/Threshold Effect Value (TEV).

2 - TEV units: µg/L; see Table 5 for TEV derivation.

3 - Value reported for confirmation purposes, but not used in PRG derivation; see text.

Table A-5 (continued). Aquatic Threshold Effects Value Hazard Quotients[1] for CoCs in porewater from the McAllister Point study area.

Analyte	Aquatic TEV[2]	OS-23	OS-24	OS-25	OS-26	OS-27	OS-28	OS-29	OS-30	OS-30A	OS-30B	SDA-D1	SDA-D2	SDA-D3	SDA-M1	SDA-M1-R	SDA-M2	SDA-M3	SDA-S1	SDA-S2B	SDA-S2B-BOT	SDA-S2B-BT2	SDA-S2B-MID	SDA-S2B-R	SDA-S2B:0-8	SDA-S2C-R	SDA-S3	SDA-S4
Copper	17.6																											
Mercury	6.7E-2																											
Nickel	11.2																											
Zinc	81.0																											
SEM-AVS[3]	5.00									0.20	0.40	0.00	0.60	0.40	-0.40		0.00	0.20	-0.20	-1.80	0.00	0.00	-3.80		-1.60		-0.20	-0.40
SEM	5.00	0.32	0.25	0.34	0.24	0.40	0.42	0.26	0.28	0.37	0.58	0.29	0.75	0.47	0.46		0.26	1.39	0.32	0.56							0.22	0.26
Acenaphthylene	0.64		0.40	0.38	0.33	0.25	0.21	0.54	0.39	0.23	0.39	0.19	0.19	0.12	0.05	0.11	0.65	0.13	0.10	0.32	0.18	0.03	0.50	0.09	0.26		0.07	0.15
Anthracene	0.53		0.44	0.46	0.39	0.96	2.60	1.10	1.57	0.31	0.60	1.12	0.81	0.56	0.38	0.57	1.18	0.71	0.29	4.68	0.90	0.13	2.59	0.35	2.97		0.06	1.05
Benzo(a)anthracene	5.2E-2		0.41	0.44	0.43	0.69	2.17	0.95	0.97	0.23	0.63	0.86	0.62	0.40	0.47	0.58	1.04	0.48	0.32	2.35	0.57	0.06	2.47	0.43	1.75		0.06	0.90
Benzo(a)pyrene	2.7E-2		0.30	0.31	0.29	0.38	1.12	0.57	0.57	0.09	0.19	0.30	0.23	0.14	0.13	0.25	0.31	0.16	0.11	0.76	0.35	0.06	1.21	0.22	1.02		0.02	0.27
Chrysene	0.13		0.24	0.25	0.22	0.37	1.47	0.50	0.71	0.10	0.24	0.35	0.26	0.19	0.19	0.36	0.29	0.23	0.14	1.08	0.35	0.04	1.18	0.26	1.03		0.03	0.33
Dibenz(a,h)anthracene	1.3E-2	0.31	0.36	0.34	0.32	0.41	1.11	0.60	0.56	0.14	0.45	0.53	0.40	0.24	0.19	0.28	0.44	0.20	0.20	1.29	0.36	0.05	1.44	0.23	1.11		0.06	0.39
Fluorene	0.48	0.30	0.49	0.49	0.43	1.32	3.81	1.21	2.17	0.22	0.33	0.52	0.40	0.29	0.16	0.59	0.61	0.39	0.18	3.36	1.18	0.10	2.30	0.38	4.61		0.04	0.79
2-Methylnaphthalene	1.22									0.09	0.21	0.22	0.19	0.12	0.07	0.12	0.11	0.09	0.08	1.00	0.25	0.02	0.64	0.08	0.84	2.65	0.02	0.33
Phenanthrene	4.60	0.11	0.18	0.18	0.16	0.39	1.13	0.46	0.64	0.09	0.22	0.39	0.28	0.20	0.11	0.27	0.44	0.26	0.07	1.64	0.32	0.04	0.72	0.17	1.17	5.69	0.02	0.45
Pyrene	1.21	0.29	0.36	0.35	0.35	0.57	1.36	0.81	0.83	0.23	0.63	0.89	0.66	0.43	0.34	0.45	1.07	0.60	0.31	2.03	0.42	0.06	1.37	0.34	1.22	6.12	0.06	0.72
Sum of PAHs	284	0.02	0.03	0.03	0.03	0.05	0.12	0.06	0.07	0.02	0.04	0.06	0.04	0.03	0.02	0.03	0.06	0.04	0.02	0.22	0.05	0.01	0.12	0.02	0.16	0.52	4.4E-3	0.05
Total PCBs	3.0E-2									0.19	0.24	0.09	0.22	0.03	0.04	0.13	0.06	0.07	0.18	0.24	0.10	0.03	0.42	0.27	0.24	0.85	0.05	0.09
o,p'-DDE	7.3E-4																					0.05	0.85					
p,p'-DDE	7.3E-4									0.26	0.56	0.32	0.33	0.21	0.18		0.37	0.27	0.41	0.39	0.21	0.11	0.77		0.71		0.27	0.20

Shaded cells indicate TEV-HQ>1.

1 - Threshold Effects Value Hazard Quotient (TEV-HQ) = porewater concentration (Table A-2.2)/Threshold Effect Value (TEV).

2 - TEV units: µg/L; see Table 5 for TEV derivation.

3 - Value reported for confirmation purposes, but not used in PRG derivation; see text.

Table A-6. Avian predator Threshold Effects Value Hazard Quotients[1] for CoCs in tissue of prey species consumed by avian aquatic predators in the McAllister Point study area.

Analyte	*Avian TEV*[2]	NSB1-BM	NSB1-BM-DEP	NSB1-MF	NSB2-BM	NSB3-BM	NSB3-BM-DEP	NSB3-MF	NSB4-BM	NSB4-MF	NSB5-BM	NSB6-BM	NSB6-MF	NSB7-BM
Arsenic	*15.0*	0.62	0.75		0.70	0.95	0.78		0.78		0.66	0.76		0.66
Cadmium	*1.83*	0.99	1.23		1.11	1.20	1.29		1.06		0.96	0.88		0.95
Chromium	*3.08*	0.33	0.51		0.77	0.83	0.52		0.39		0.72	0.46		0.46
Copper	*60.7*	0.20	0.15		0.32	0.66	0.35		0.35		0.30	0.22		0.22
Lead	*3.11*	0.37	0.15		2.54	5.76	2.50		3.16		2.59	1.53		1.32
Mercury	*0.38*	0.22	0.22		0.29	0.60	0.46		0.33		0.32	0.28		0.22
Silver	*1.41*	0.08	0.05		0.10	0.27	0.10		0.10		0.13	0.11		0.07
Zinc	*124*	0.75	0.76		0.98	1.57	1.08		0.74		0.68	0.61		0.70
Total PCBs	*0.77*	0.57	0.44	2.53	0.56	1.20	1.05	3.50	0.77	4.53	0.91	1.00	4.28	0.75

Shaded cells indicate HQ>1.

1 - Hazard Quotient=tissue concentration (dry wt.)/TEV (dry wt.)

2 - Units: metals=µg/g dry tissue wt.; TOTPCB=ng/g dry tissue wt.. See Table 7 for avian TEVs.

Table A-7. Human Health Threshold Effects Value Hazard Quotients[1] for consumption by fishermen of CoCs in shellfish collected from the McAllister Point study area.

Analyte	*HH-TEV[2] (wet wt.)*	*HH-TEV[3] (dry wt.)*	NSB1-BM	NSB1-BM-DEP	NSB2-BM	NSB3-BM	NSB3-BM-DEP	NSB4-BM	NSB5-BM	NSB6-BM	NSB7-BM	MCL-12-HC	MCL-12-HC-DEP	OS-28	SDA-M1-HC	SDA-S2-HC
Arsenic	*2.26*	*16.2*	0.58	0.69	0.65	0.88	0.73	0.72	0.61	0.70	0.61	0.82	0.68	0.72	0.60	1.37
Cadmium	*4.70*	*33.6*	0.05	0.07	0.06	0.07	0.07	0.06	0.05	0.05	0.05	0.11	0.02	0.03	0.01	0.04
Chromium	*23.0*	*164*	6.1E-3	9.5E-3	0.01	0.02	9.7E-3	7.4E-3	0.01	8.6E-3	8.5E-3	6.5E-3	5.9E-3	0.01	0.00	0.01
Copper	*170*	*1214*	0.01	7.7E-3	0.02	0.03	0.02	0.02	0.01	0.01	0.01	4.3E-2	8.7E-3	8.3E-3	0.01	0.01
Mercury	*1.40*	*10.0*	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
Silver	*23.0*	*164*	6.5E-4	4.3E-4	8.8E-4	2.3E-3	8.8E-4	8.3E-4	1.1E-3	9.3E-4	6.1E-4	0.02	0.01	1.4E-2	1.3E-2	1.7E-2
Zinc	*1400*	*10000*	9.3E-3	9.4E-3	0.01	0.02	0.01	9.1E-3	8.4E-3	7.5E-3	8.6E-3	2.2E-2	0.01	0.01	8.5E-3	1.4E-2
Benzo(a)anthracene	*1.87E-2*	*133.5*	0.56	0.38	0.37	0.36	0.33	0.24	0.19	0.21	0.19	0.10	0.03	0.03	0.04	0.04
Benzo(a)pyrene	*1.87E-2*	*133.5*	0.13	0.05	0.14	0.12	0.07	0.07	0.07	0.05	0.07	0.04	0.01	0.01	0.02	0.01
Benzo(b+k)fluoranthene	*1.87E-2*	*133.5*	0.48	0.27	0.46	0.37	0.29	0.26	0.26	0.22	0.24	0.15	0.04	0.06	0.06	0.04
Chrysene	*1.87E-2*	*133.5*	0.85	0.64	0.76	0.73	0.55	0.51	0.55	0.49	0.60	0.21	0.09	0.10	0.09	0.07
Dibenz(a,h)anthracene	*1.87E-2*	*133.5*	0.03	0.02	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Indeno(1,2,3-cd)pyrene	*1.87E-2*	*133.5*	0.07	0.03	0.07	0.06	0.03	0.04	0.04	0.04	0.04	0.01	0.01	0.01	0.01	0.01
Total PCBs	*3.22E-2*	*230.0*	1.91	1.46	1.87	4.00	3.50	2.55	3.02	3.33	2.49	0.75	0.45	0.44	0.37	0.30

Shaded cells indicate TEV-HQ>1.

1 - Threshold Effects Value Hazard Quotients (TEV-HQ)=tissue concentration (dry wt.)/dry wt. TEV.

2 - See Table 15 for wet weight TEVs. Units: Wet wt. - mg/kg wet wt.

3 - TEV wet weight values converted to TEV dry weight values using dry/wet ratio from Table 14.
Dry wt. TEV Units - µg/g for metals, ng/g for organics.

5 - Hazard Index = Sum of TEV-HQs.

APPENDIX E
VOLUME AND AREA ESTIMATES

CONTENTS

E-1 Estimated Areal Extent And Volume Of Contaminated Sediment

E-2 Shoreline Change Analysis For Alt. NS/ER-3: Capping

E-3 Estimated Land-Based And Barge-Based Work Areas

E-4 McAllister Point Landfill Capacity Analysis

APPENDIX E-1
ESTIMATED AREAL EXTENT AND VOLUME OF CONTAMINATED SEDIMENT

CLIENT: US NAVY		JOB NUMBER: CTO 210 5728-0320	
SUBJECT: McALLISTER POINT LANDFILL - FEASIBILITY STUDY NEAR SHORE SEDIMENT VOLUMES			
BASED ON: BORING LOGS		DRAWING NUMBER: 210-1	
BY: R.SANDA/GHB	CHECKED BY: BC/DM	APPROVED BY: DKM	DATE: Nov 97, May 98, Sept. 98

OBJECTIVE: Determine volume of nearshore sediments containing concentrations of contaminants above baseline PRGs.

ASSUMPTIONS:

1. The near shore is assumed to include the coastal area adjacent to the landfill revetment out to the -3 ft MLW line and any additional areas outside the -3 ft MLW line that contain contaminated sediment intermixed with landfill materials below the surface.

2. Assume that the thickness of landfill materials decreases linearly with distance from the landfill. Therefore known thicknesses of landfill materials at two points offshore of the landfill can be used to project the limit of the landfill material (where landfill material thickness equals zero).

3. If boring log does not indicate landfill material, then limit shall be the -3 ft MLW line (elev -3.0). In the case of the southerly depostional area, when no landfill debris is present, the limit shall be the average mean low tide elevation (0.0) because contaminated sediment and landfill debris are not believed to be as extensive in this area.

APPROACH:

1. Determine limit of landfill material at each NSB/boring location by using existing boring logs. Project limit of landfill material (point where thickness = 0) by assuming straight line decrease in thickness from two points where thickness was measured.

2. Draw best-fit line between determined limits.

3. Divide shoreline into sections to estimate sediment thickness.

4. Determine the average thickness of sediments using existing boring logs. In absence of chemical data at depth assume presence of landfill materials in boring indicates presence of contaminated sediment exceeding PRGs. In absence of confirmation of landfill material, make assumptions of contaminated sediment thickness based on total sediment thickness and nature of area. (These assumptions are necessary in most areas because chemical data is not available for depths below 6 inches.)

5. Use "Planix 6" digital planimeter and Figure E-1 to determine area.

ANALYSIS: **1. Determine Limits of Nearshore Area**

NSB-1 / B-1
Boring does not indicate presence of landfill material. Limit shall be the 3-foot MLW line.

NSB-2 / B-2
Boring does not indicate presence of landfill material. Limit shall be the 3-foot MLW line.

NSB-3 / B-3A, B-3B - Landfill material detected in both borings. Determine limit of landfill by projecting a straight line of decreasing landfill material thickness out from borings B-3A and B-3B to the point where thickness = 0.

	Thickness of Landfill Mat.	Dist. from Revet.
B-3A:	5 ft.	30 ft.
B-3B:	3 ft.	50 ft.

Slope = 2ft/20ft=0.10
Projected Limit =3ft/0.10 + 50ft = **80 ft. (distance from revetment)**

NSB-4 / B-4A, B-4B - Landfill material detected in both borings. Determine limit of landfill by projecting a straight line of decreasing landfill material thickness out from borings B-4A and B-4B.

	Thickness of Landfill Mat.	Dist. from Revet.
B-4A:	9 ft.	40 ft.
B-4B:	7.5 ft.	50 ft.

Slope = 1.5ft/10ft=0.15
Projected Limit =7.5ft/0.15 + 50ft = **100 ft. (distance from revetment)**

B-4D, B-4E - Landfill material detected in both borings. Determine limit of landfill by projecting a straight line of decreasing landfill material thickness out from borings B-4D and B-4E.

	Thickness of Landfill Mat.	Dist. from Revet.
B-4D:	7 ft.	30 ft.
B-4E:	4.5 ft.	70 ft.

Slope = 2.5ft/40ft=0.0625
Projected Limit =4.5ft/0.0625 + 70ft = **142 ft. (distance from revetment)**

NSB-5 / B-5, B-5B

	Thickness of Landfill Mat.	Dist. from Revet.
B-5:	4 ft.	5 ft.
B-5B:	0 ft.	60 ft.

Assume projected limit to be location of B-5B.

NSB-6 / B-6
Boring does not indicate presence of landfill material. This area is the southerly depositional area of the landfill. Assume limit to be location of average low tide elevation (0.0)

NSB-7
No boring present. This area is the southerly depositional area of the landfill. Assume limit to be location of average low tide elevation (0.0).

2. Best-Fit Limit Line

See drawing E-1.

3. Divide Into Sections to estimate area and average depth of sediments

See drawing E-1.

4. Determine Area and Average Thickness of Sediments

Section 1
- Total sediment thickness B-1(2 ft.) and B-2(3 ft.)
- Average thickness estimated to be 2 ft. based on minimum removal depth.
- Planimetered area = 39,543 sf
- Sediment volume = 2,929 cy

Section 2
- Total sediment thickness B-3A(9 ft.) and B-3B(9 ft.)
- Average thickness of landfill materials/contaminated sediments estimated to be 4 ft. based on thickness of landfill material in B-3A(5 ft.) and B-3B(3 ft.)
- Planimetered area = 26,453 sf
- Sediment volume = 3,919 cy

Section 3
- Total sediment thickness B-4A(19 ft.), B-4B(9 ft.), and B-4F(8 ft)
- Average thickness landfill materials/contaminated sediments estimated to be 8 ft. based on thickness of landfill material in B-4A(9 ft.), B-4B(7.5 ft.), and B-4F(4 ft.)
- Planimetered area = 33,583 sf
- Sediment volume = 9,951 cy

Section 4
- Total sediment thickness B-4C(9 ft.), B-4D(7 ft.), B-4E(7 ft.), and B-5(6 ft.)
- Average thickness estimated to be 6.25 ft. based on thickness of landfill material in B-4C(8 ft.), B-4D(7 ft.), B-4E(5 ft.), and B-5(5 ft.)
- Planimetered area = 32,808 sf
- Sediment volume = 7,594 cy

Section 5

- Total sediment thickness B-6 (7 ft.), but no landfill materials observed
- Average thickness estimated to be 2 ft. – conservative estimate based on location of section in south depositional area.
- Planimetered area = 52,080 sf
- Sediment volume = 3,858 cy

Section 6 -

See separate calculation sheet for approach/assumptions for estimating sediment area and volume in Elevated-Risk Offshore Area
- Planimetered area = 82,822 sf
- Sediment volume = 6,135 cy

SUMMARY OF ESTIMATED AREA AND VOLUME OF NEARSHORE/ELEV-RISK OFFSHORE SEDIMENTS EXCEEDING BASELINE PRGs

SECTION	AREA (square feet)	AREA (acres)	AVG. THICKNESS OF CONTAM. SED. (feet)	VOLUME (cubic yards)
1	39,543	0.9	2	2929
2	26,453	0.6	4	3919
3	33,583	0.8	8	9951
4	32,808	0.8	6.25	7594
5	52,080	1.2	2	3858
6*	82,822	1.9	2	6135
TOTAL	267,289	6.1	--	34,386

* Section 6 = Elevated-Risk Offshore Area. See separate sheet for assumptions/approach.

REFERENCES:

1. Boring locations and logs from Technical Memorandum for Phase III Investigations, B&RE, April 1997.

2. Preliminary Remedial Goals (PRGs) for NETC McAllister Point Landfill, SAIC, October 1997.

CLIENT: US NAVY		JOB NUMBER: CTO 210 5728-0320	
SUBJECT: McALLISTER POINT LANDFILL - FEASIBILITY STUDY ELEVATED-RISK OFFSHORE SEDIMENT AREAS AND VOLUMES			
BASED ON: BORING LOGS		DRAWING NUMBER: 210-1	
BY: SANDA/GHB/DKM	CHECKED BY: BC/DM	APPROVED BY: DKM	DATE: Nov 97, May 98, Sept. 98

OBJECTIVE: Determine volume of nearshore sediments containing concentrations of contaminants above baseline PRGs.

APPROACH: Determine the average thickness of sediments using existing boring logs. In absence of chemical data at depth and/or confirmation of presence of landfill materials, make assumptions of contaminated sediment thickness based on total sediment thickness and nature of area. Use "Planix 6" digital planimeter and Figure E-1 to determine area.

ASSUMPTIONS:

1. The elevated-risk offshore area includes the entire area within polygons S2B, S2C, and NSB-5 as well as the area in polygons OS-28 and MCL-12 that lie outside the delineated nearshore area. The area is indicated as Section 6 on Figure E-1.

2. No chemical data are available at depth for this area. No landfill materials were observed in soil borings. Sediment samples collected from the surface exceeded baseline PRGs. Assume that average depth of contaminated sediment is 2 feet.

ANALYSIS

-Average depth of contaminated sediments is assumed to be 2 feet.
- Planimetered area = 82,822 sf = 1.9 acres
- Sediment volume = 6,135 cy

REFERENCES:

1. Boring locations and logs from Technical Memorandum for Phase III Investigations, B&RE, April 1997.

2. Preliminary Remedial Goals (PRGs) for NETC McAllister Point Landfill, SAIC, September, 1998.

CLIENT: US NAVY		JOB NUMBER: CTO 218; 5728-0320	
SUBJECT: McALLISTER POINT LANDFILL - FEASIBILITY STUDY OFF SHORE SEDIMENT VOLUMES			
BASED ON: CALCULATIONS BY SAIC		DRAWING NUMBER: 210-1	
BY: B. CONLEY	CHECKED BY: PS	APPROVED BY: DKM	DATE: Nov. 97

OBJECTIVE: Determine volume of off-shore sediments containing concentrations of contaminants above PRGs.

APPROACH: - The volume of off-shore sediments was determined by assuming that one foot of sediment would be removed from each of the polygon areas. One foot was used as a depth interval based on limited sediment core samples collected during the ERA investigation.

STATION	PERCENTAGE INCLUDED IN OFF-SHORE AREAS	AREA (m^2)	AREA (ft^2)	VOLUME (cy)
MCL-8	100	9452	102305	3789
NSB-1	88	5108	48379	1792
MCL-9	100	8654	93669	3469
NSB-2	75	4348	35296	1307
NSB-3	33	4598	16591	614
MCL-11	100	4695	50818	1882
NSB-4	25	4304	11646	431
OS-27	100	6397	69244	2565
OS-29	100	11396	123352	4569
D1	100	16713	180898	6700
OS-30	100	22068	238869	8847
M2	100	30132	326150	12080
MCL-16	100	21421	231861	8587
S4	100	23172	250813	9289
TOTAL:		172456	1779890 40.9 acres	65922

Polygon areas from Figure 4 - Human Health Exposure Pathways, of reference 1.

REFERENCES:

1. Preliminary Remedial Goals (PRGs) for NETC McAllister Point Landfill, SAIC, October 1997.

LEGEND

MW-103R — BEDROCK MONITORING WELL LOCATION

NSB-2 — NEARSHORE SEDIMENT SAMPLE

S2C-FD — OFFSHORE SEDIMENT SAMPLE (APPROX. LOCATION)

OS-28 — OFFSHORE SEDIMENT SAMPLE STATION (APPROX. LOCATION)

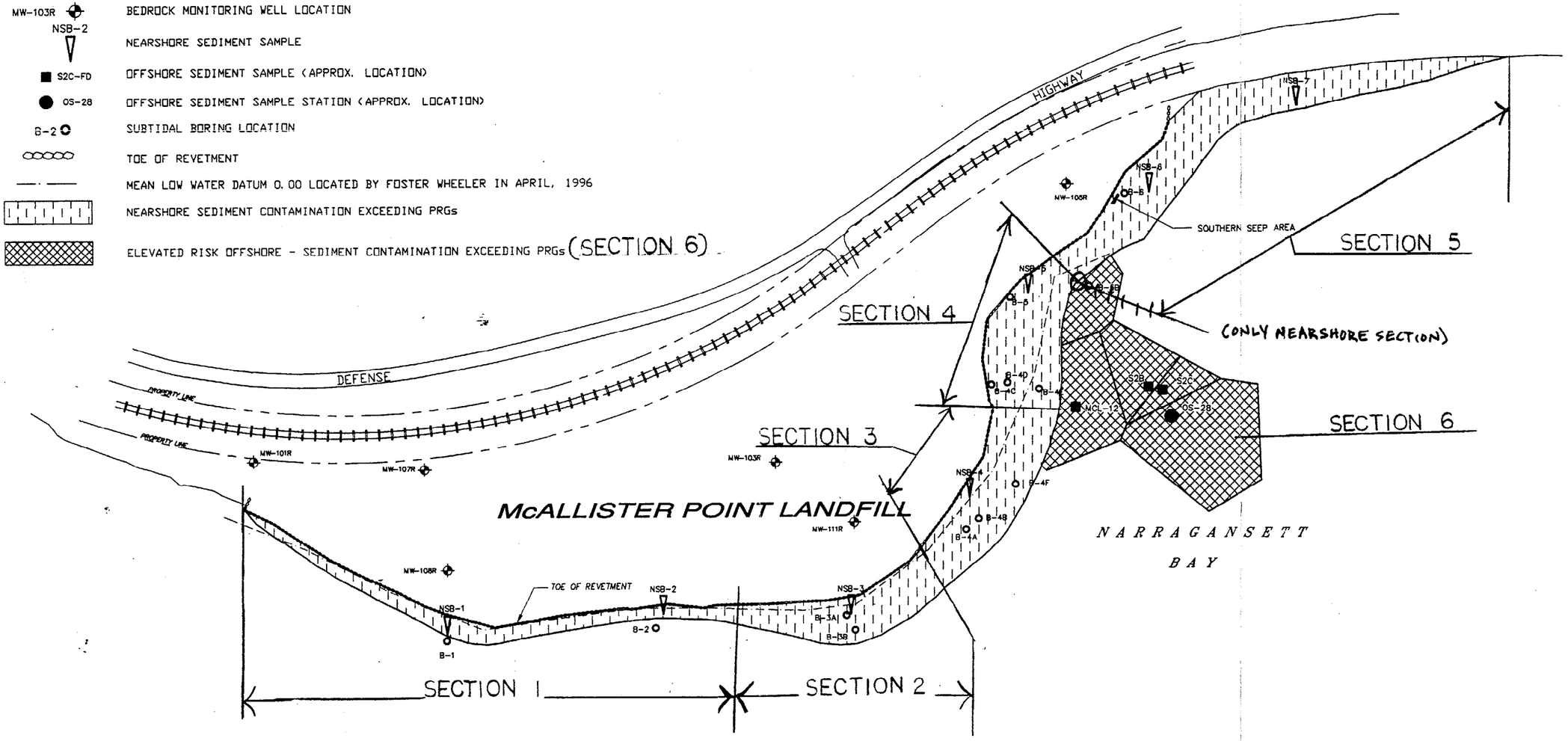
B-2 — SUBTIDAL BORING LOCATION

TOE OF REVETMENT

MEAN LOW WATER DATUM 0.00 LOCATED BY FOSTER WHEELER IN APRIL, 1996

NEARSHORE SEDIMENT CONTAMINATION EXCEEDING PRGs

ELEVATED RISK OFFSHORE - SEDIMENT CONTAMINATION EXCEEDING PRGs (SECTION 6)



NOTES:

1. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. SITE FEATURES ADAPTED AND COMPILED FROM A PLAN BY TRC, 1993.

GRAPHIC SCALE

0' 200' 400'

1 INCH = 200 FEET

SECTIONS FOR VOLUME CALCs		FIGURE E-1
McALLISTER POINT LANDFILL		
NEWPORT, RHODE ISLAND		
DRAWN BY: R.G. DEWSNAP	REV.: 2	
CHECKED BY: P. SVETAKA / G. BULLARD	DATE: 18 MAY 98	
SCALE: 1" = 200'	FILE NO.: \DWG\NAVY\MC_PT\FS\D-1.DWG	

Brown & Root Environmental
55 Jonspin Road Wilmington, MA 01887
(978)658-7899

00112L112

APPENDIX E-2
SHORELINE CHANGE ANALYSIS FOR ALT. NS/ER-3: CAPPING

CLIENT: US NAVY		JOB NUMBER: CTO 210 5728-0334	
SUBJECT: McALLISTER POINT LANDFILL - FEASIBILITY STUDY; NS/ER-3: CHANGES TO INTERTIDAL AREA			
BASED ON: AS-BUILT DRAWINGS OF EXISTING CAP		DRAWING NUMBER: E-2	
BY: GHB	CHECKED BY: DM	APPROVED BY:	DATE: May 98/Sept. 98

OBJECTIVE: Determine the subtidal and intertidal areas impacted by installing a natural and multi-media cap in the near shore areas.

ASSUMPTIONS:

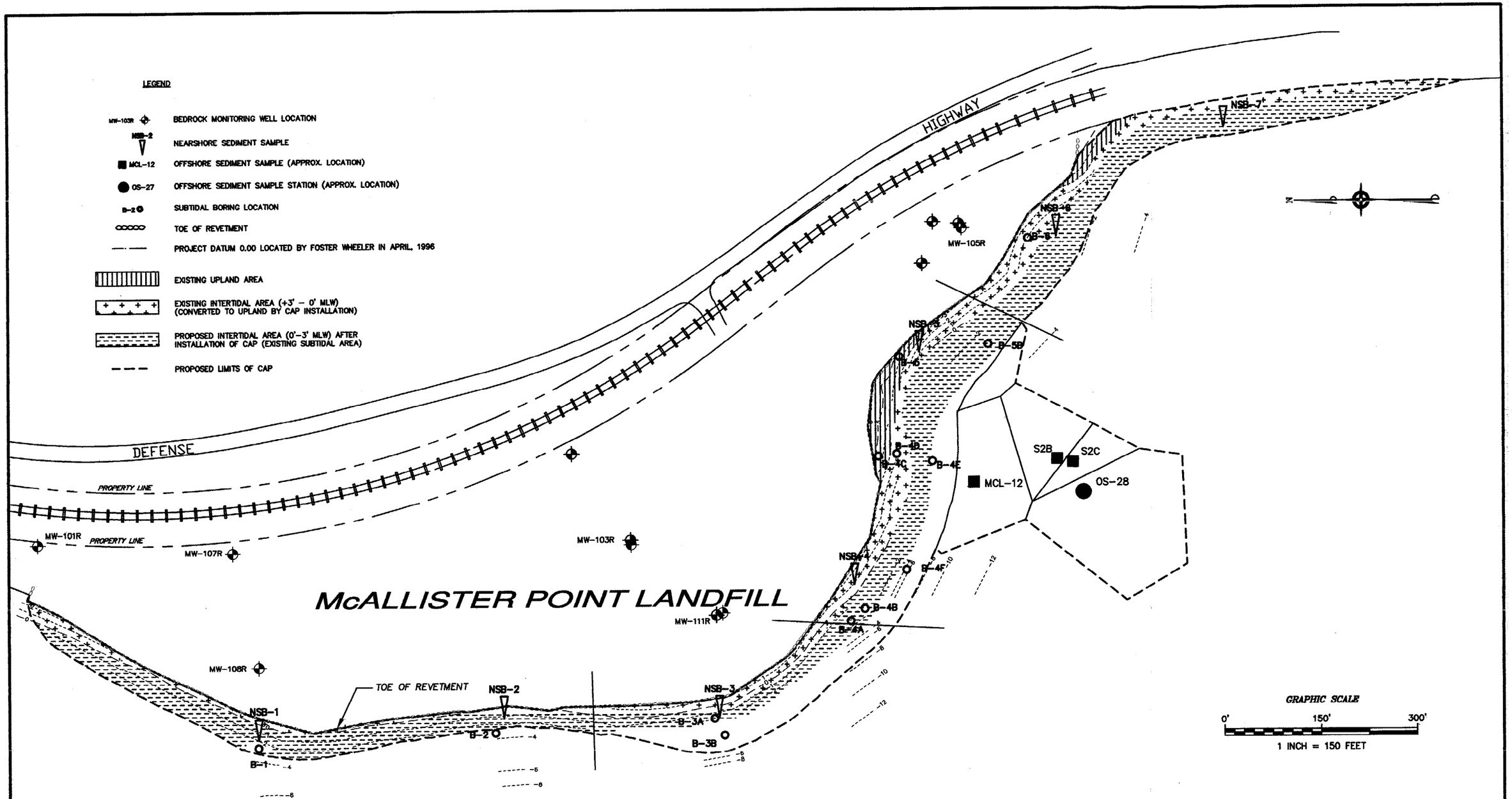
1. The average tidal flux is 3 feet.
2. Assume a maximum cap thickness of 3 feet to represent worst case impact of cap construction.

APPROACH:

1. Determine the area of the existing upland areas from the landfill revetment to $^{+}3$ Mean Low Water (MLW) as shown on Drawing E-2 (Use "Planix 6" digital planimeter to determine area).
2. Determine the area of the existing intertidal areas from $^{+}3'$-0' MLW as shown on Drawing E-2. (These areas will be converted to upland by capping).
3. Determine the area of the proposed intertidal area 0'-$^{-}3'$ MLW as shown on Drawing E-2. (These areas are currently subtidal and will be converted to intertidal by capping).

ANALYSIS:

1. Existing upland area = 3,100 sqft (0.07 acres)
2. Existing intertidal area (changed to upland) = 48,872 sqft (1.12 acres)
3. Proposed intertidal area (changed from subtidal) = 98,835 sqft (2.27 acres)
4. Net gain of upland area = 48,872 sqft (1.12 acres)
5. Net gain of intertidal area = 49,963 sqft (1.15 acres)
6. Net loss of subtidal area = 98,835 sqft (2.27 acres)



NOTES:

NS/ER-3: CHANGES TO INTERTIDAL AREA			FIGURE E-2
McALLISTER POINT LANDFILL			TETRA TECH NUS, INC.
NEWPORT, RHODE ISLAND			
DRAWN BY:	D.W. MACDOUGALL	REV.: 0	55 Jonspin Road Wilmington, MA 01887 (978)658-7899
CHECKED BY:	D. McKENNA	DATE: OCTOBER 6, 1998	
SCALE:	1" = 150'	FILE NO.: DWG\NAVY\MC_PT\FS\I-T_AREA.DWG	

00112L122

APPENDIX E-3
ESTIMATED LAND-BASED AND BARGE-BASED WORK AREAS

B&RE CALCULATION WORKSHEET

CLIENT: US NAVY		JOB NUMBER: CTO 210 5728-0320	
SUBJECT: ASSUMPTIONS TO ESTIMATE LAND-BASED AND BARGE-BASED WORK AREAS FOR DREDGING AND CAPPING ACTIONS IN NS/ER AREAS			
BASED ON: Shoreline topography, Landfill Drawings		DRAWING NUMBER:	
BY: GHB	CHECKED BY: DKM	APPROVED BY:	DATE: Sept. 98

BACKGROUND:

Access from the shoreline is limited by the presence, nature, and slope of the landfill revetment and access from the water is limited by the shallow water present close to the landfill. As a result, it was concluded that remedial actions proposed under Alternatives NS/ER-3, NS/ER-4, and NS/ER-5 would have to be conducted by a combination of land-based and barge-based equipment.

Figure E-3 shows the estimated land-based and barge-based work areas. The following assumptions were used in the FS for developing and evaluating these alternatives and estimating costs.

ASSUMPTIONS FOR LAND-BASED WORK

- A portable cofferdam would be constructed along approximately 1,200 lf of the southern depositional area shoreline extending out to approximately the -3-foot MLW water line. Shore-based work would be conducted within the cofferdam area only (see figure E-3).

- Dewatering pumps would be operated continuously (24 hour/day) to allow work to proceed in "dry" conditions. It is anticipated that the work would be performed in small sections in order to effectively manage the dewatering activities.

- Access to the work area would be from along the southeastern limits of the existing landfill, adjacent to the railroad tracks. Construction of a temporary haul road is not anticipated. Excavation, handling, and placement of materials would be accomplished using tracked excavators, wheeled front-end loaders, and off-road dump trucks.

ASSUMPTIONS FOR BARGE-BASED WORK

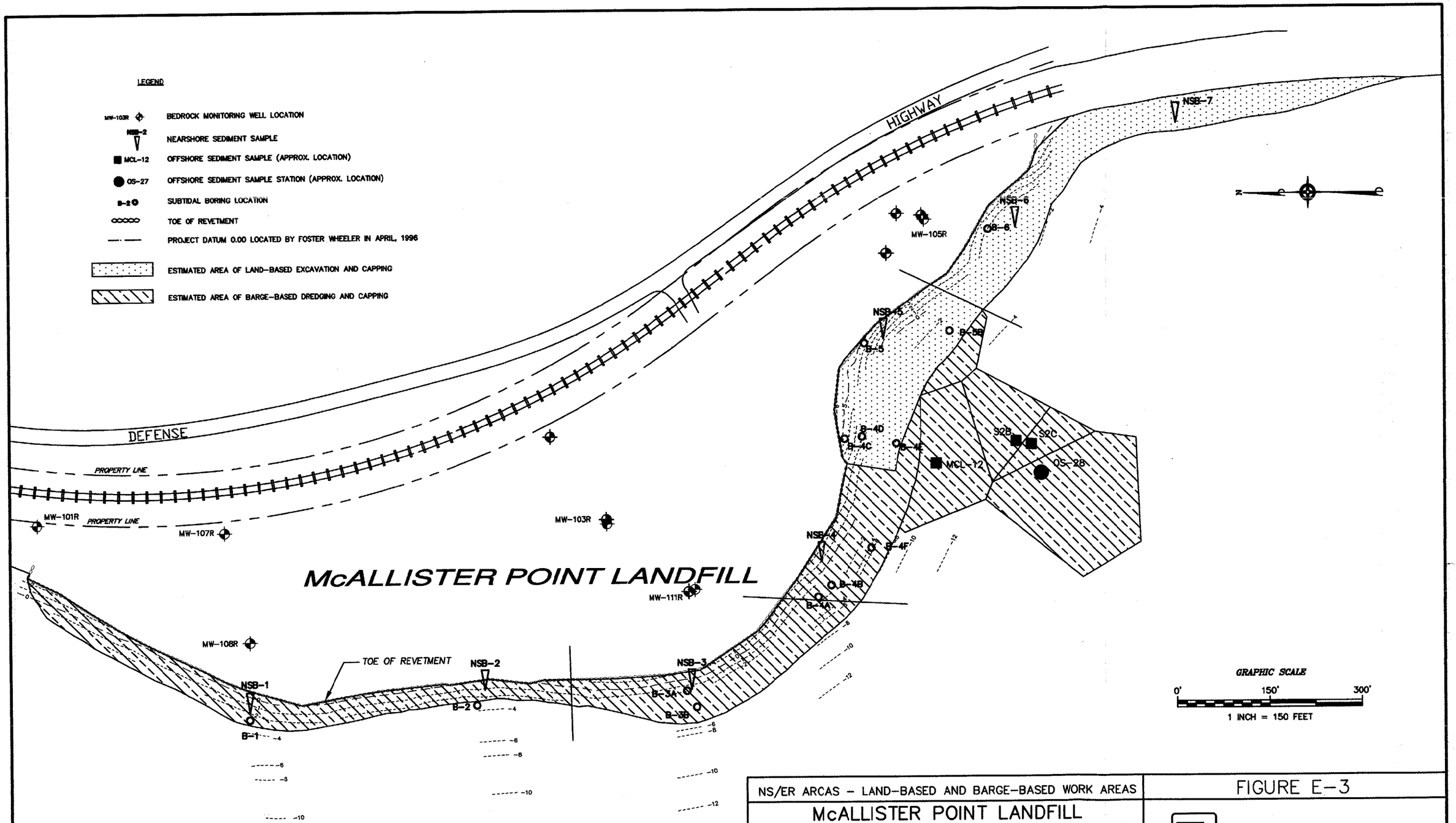
- It is assumed that the remaining work would be conducted from barges using heavy equipment such as excavators, mechanical dredges, and cranes.

- Barge-based work would be limited by the draft of the barge and the reach of the equipment. A typical barge that could support the large, heavy equipment required for dredging and placing cap materials would have a draft of 6 to 8 feet. Equipment with a reach of up to 100 feet may be needed to access the shallower areas along the central and northern shore of the landfill that can not be accessed from land.

- Pier 1 or another pier at Coddington Cove would be used as a materials and office staging area.

LEGEND

- MW-103R — BEDROCK MONITORING WELL LOCATION
- NSB-2 — NEARSHORE SEDIMENT SAMPLE
- MCL-12 — OFFSHORE SEDIMENT SAMPLE (APPROX. LOCATION)
- OS-27 — OFFSHORE SEDIMENT SAMPLE STATION (APPROX. LOCATION)
- B-2 — SUBTIDAL BORING LOCATION
- TOE OF REVETMENT
- PROJECT DATUM 0.00 LOCATED BY FOSTER WHEELER IN APRIL, 1996
- ESTIMATED AREA OF LAND-BASED EXCAVATION AND CAPPING
- ESTIMATED AREA OF BARGE-BASED DREDGING AND CAPPING



NOTES:

NS/ER ARCAS - LAND-BASED AND BARGE-BASED WORK AREAS			FIGURE E-3
McALLISTER POINT LANDFILL			TETRA TECH NUS, INC.
NEWPORT, RHODE ISLAND			55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY: D.W. MACDOUGALL	REV.: 0		
CHECKED BY: D. McKENNA	DATE: OCTOBER 7, 1998		
SCALE: 1" = 150'	FILE NO.: DWG\NAVY\MC_PT\FS\FIG_E-3.DWG		

00112L132

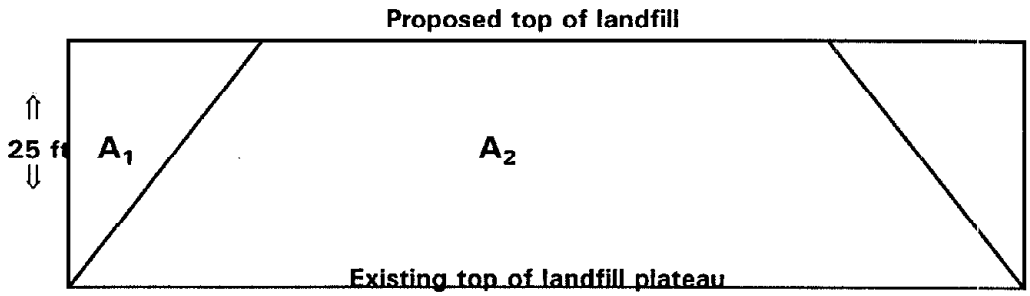
APPENDIX E-4
MCALLISTER POINT LANDFILL CAPACITY ANALYSIS

CLIENT: US NAVY		JOB NUMBER: CTO 210 5728-0332	
SUBJECT: McALLISTER POINT LANDFILL - FEASIBILITY STUDY AVAILABLE CAPACITY IN EXISTING LANDFILL			
BASED ON: AS-BUILT DRAWINGS OF EXISTING CAP		DRAWING NUMBER: E-1	
BY: GHB	CHECKED BY: DM	APPROVED BY:	DATE: May 98

OBJECTIVE: Determine volume of available capacity in the existing landfill.

APPROACH:
1. Determine the area of the existing plateau (Use "Planix 6" digital planimeter to determine area)
2. Extend the current slope contours to an acceptable elevation without creating a ridge line.
3. Calculate the volume of the available space.

ANALYSIS:
1. Existing slopes are 3H:1V
2. Existing plateau area is 97,968 sqft
3. Perimeter of existing plateau area is 2,000 lf
4. Landfill would be elevated approximately 25 feet.



Total volume A_{TOTAL} = A_1(air space) + A_2 (available landfill capacity)

Total volume A_{TOTAL} - A_1(air space) = A_2 (available landfill capacity)

1) Total volume A_{TOTAL} = (97,968 sf X 25 ft) ÷ 27 cuft/cuyd
= **90,711 cuyd**

2) A_1(air space) = (25 ft X 75 ft (assuming a 3H:1V slope) X 2000 ft (perimeter) ÷ 2) ÷ 27 cuft/cuyd
= **69,444 cuyd**

3) A_2 (available landfill capacity) = 90,711 - 69,444
= **21,267 cuyd**

REFERENCES: Final As-Built Site Plans; McAllister Point Landfill; prepared by Foster Wheeler Environmental Corporation; October 4, 1996.

Client:	US Navy			
Subject:	MPLF - Marine Sediment FS AVAILABLE CAPACITY FOR EXPANSION OF MPLF - check of GHB calcs.			
Based On:	As-Built Drawings of Existing Cap			
By:	DKM		Date:	Oct. 98

ALTERNATE APPROACH:

1 Determine volume of each 5' contour using planimeter to estimate area, then multiplying by contour thickness.
2 Add contour volumes together to get approximate expanded volume
3 Determine volume occupied by 5' thick cap.
4 Subtract cap volume from total volume.

ASSUMPTIONS:

1 Landfill slope equals existing: 1V:3H
2 See Figure for simplified topographic plan of proposed landfill expansion.

Note: Current plateau is at approx. 45 '. Proposed plateau is at 70'

AVAILABLE EXPANSION VOLUME:

Contour* (ft)	Planimeter Area (in^2)	Area (ft^2)	Countour Thickness (ft)	Volume (ft^3)	Volume (cy)	Comments
70	13.3	21,280	5	106,400	3,941	meas. area
65	24	38,400	5	192,000	7,111	estim. area
60	34.8	55,680	5	278,400	10,311	meas. area
55	50	80,000	5	400,000	14,815	estim. area
50	65.1	104,160	5	520,800	19,289	meas. area
			Total Expansion Volume=		55,467	cy (including cap)

CAP VOLUME:

ASSUMPTIONS:

- Area of cap surface = horizontal area of existing plateau (70' contour) + area of existing slopes from 70' contour down to 45' contour.
- Assume cap is 5' thick (same as existing).

APPROACH:

1. Determine horizontal area of plateau (70' cont.)
2. Determine horizontal (plan view) area of slopes from base (45' cont.) to plateau (70' cont.)
3. Convert horizontal slope area to diagonal slope area (assuming 1V:3H slope)
4. Add diagonal slope area to plateau area (70' contour) & multiply by cap thickness

	Contour* (ft)	Planimeter Area (in^2)	Area (ft^2)
1.	45	96	153,600
	70	13	21,280

Client:	US Navy			
Subject:	MPLF - Marine Sediment FS AVAILABLE CAPACITY FOR EXPANSION OF MPLF - check of GHB calcs.			
Based On:	As-Built Drawings of Existing Cap			
By:	DKM		Date:	Oct. 98

2. 45' cont - 70' cont = 153,600 ft^2
   21,280 ft^2
   Horiz. slope area 132,320 ft^2

3. Divide by horizontal length to detemine normalized length of perimeter
   Landfill slope = 1V:3H and 25V:75H
   Perimeter length = 132,320 ft^2/75 ft =1764 ft

   Diagonal length of slope = hypotenuse of 25V:75H = 79 ft

   Diagonal slope area = 79' x 1764' = 139,356 ft^2

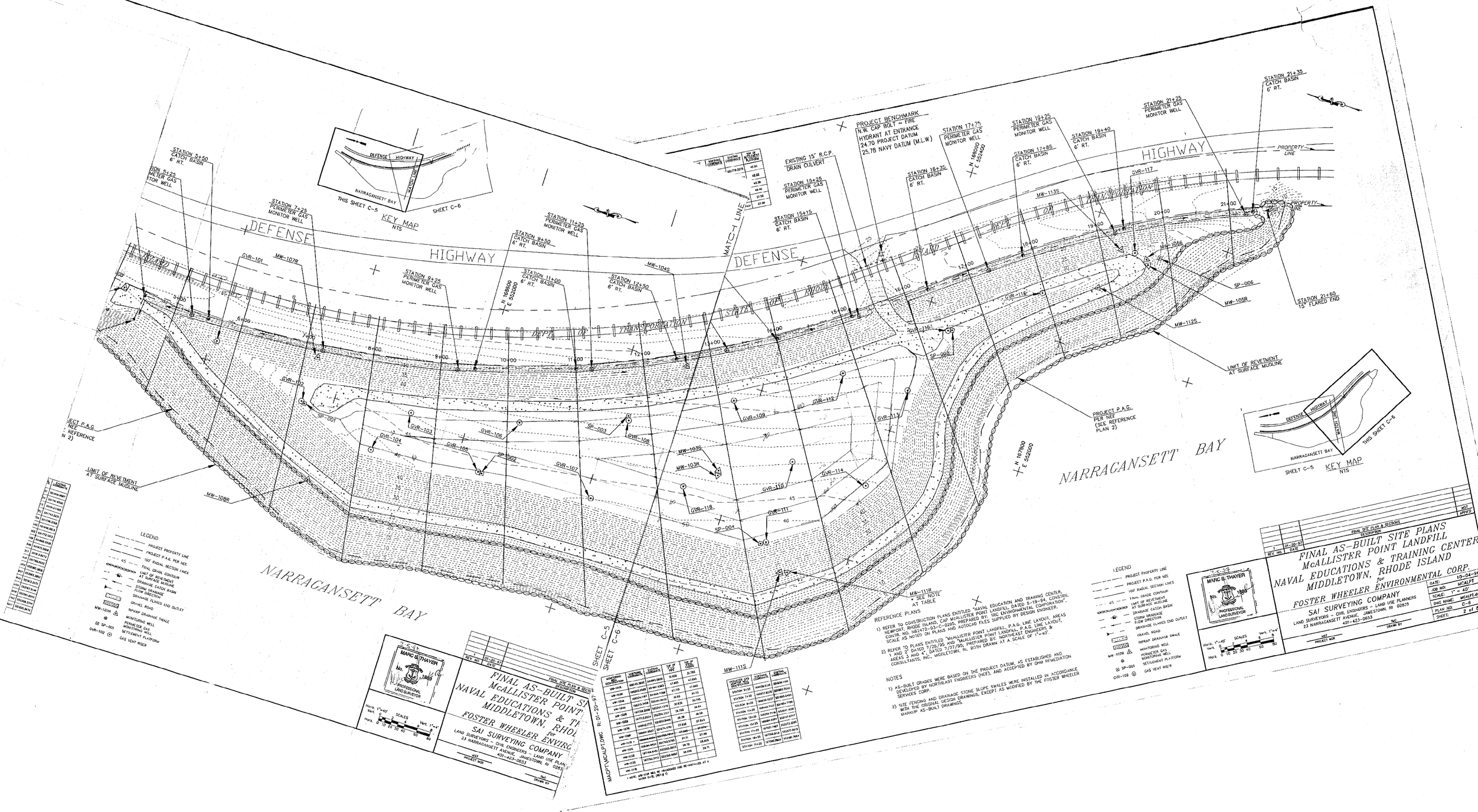
4. slope area 139,356
   plateau area + 21280
   Cap Area 160,636

	Area (ft^2)	Cap Thickness (ft)	Volume (ft^3)	Volume (cy)
Cap	160,636	5	803,180	29,747

Total Est. Expansion Volume	55,467 cy
- Est. Cap Volume	29,747 cy
Estimated Landfill Capacity	25,720 cy

Conclusion: GHB's original estimate of landfill capacity is reasonable, but may be a bit low. The actual volume available in 25' rise is probably a bit more than needed for NS/ER-4, but may not be quite enough for NS/ER-5.

For NS/ER-4 may need only 20' additional height
For NS/ER-5 may need 25' or more.


DEFENSE HIGHWAY
NARRAGANSETT BAY
NARRAGANSETT BAY
MATCH LINE
SHEET C-5
SHEET C-6
THIS SHEET C-5
SHEET C-6
KEY MAP
NTS
PROJECT BENCHMARK
N.W. CAP BOLT – FIRE HYDRANT AT ENTRANCE
24.70 PROJECT DATUM
25.78 NAVY DATUM (M.L.W.)
EXISTING 15" R.C.P. DRAIN CULVERT
STATION 5+50 CATCH BASIN 6' RT.
STATION 5+25 PERIMETER GAS MONITOR WELL
STATION 7+25 PERIMETER GAS MONITOR WELL
STATION 9+25 PERIMETER GAS MONITOR WELL
STATION 9+50 CATCH BASIN 6' RT.
STATION 11+00 CATCH BASIN 6' RT.
STATION 11+25 PERIMETER GAS MONITOR WELL
STATION 12+50 CATCH BASIN 6' RT.
STATION 15+15 CATCH BASIN 6' RT.
STATION 15+25 PERIMETER GAS MONITOR WELL
STATION 16+35 CATCH BASIN 6' RT.
STATION 17+25 PERIMETER GAS MONITOR WELL
STATION 17+85 CATCH BASIN 6' RT.
STATION 19+25 PERIMETER GAS MONITOR WELL
STATION 19+40 CATCH BASIN 6' RT.
STATION 21+25 PERIMETER GAS MONITOR WELL
STATION 21+35 CATCH BASIN 6' RT.
STATION 21+60 15" FLARED END
PROPERTY LINE
LIMIT OF REVETMENT AT SURFACE MUDLINE
PROJECT P.A.G. PER NEF (SEE REFERENCE PLAN 2)
MW-108R
MW-107R
MW-106S
MW-105R
MW-104S
MW-103S
MW-103R
MW-111S
MW-111R
MW-112S
MW-113S
SP-001
SP-002
SP-003
SP-004
SP-005
SP-006
GVR-101
GVR-102
GVR-103
GVR-104
GVR-105
GVR-106
GVR-107
GVR-108
GVR-109
GVR-110
GVR-111
GVR-112
GVR-113
GVR-114
GVR-116
GVR-117
GVR-118
N 1678000 E 525000
N 1678500 E 525400
N 1678500 E 525000
LEGEND
PROJECT PROPERTY LINE
PROJECT P.A.G. PER NEF
100' RADIAL SECTION LINES
45 FINAL GRADE CONTOUR
LIMIT OF REVETMENT AT SURFACE MUDLINE
STORM DRAINAGE CATCH BASIN
STORM DRAINAGE FLOW DIRECTION
GRAVEL FLARED END OUTLET
GRAVEL ROAD
RIPRAP DRAINAGE SWALE
MW-107R MONITORING WELL
PERIMETER GAS MONITORING WELL
SP-001 SETTLEMENT PLATFORM
GVR-102 GAS VENT RISER
REFERENCE PLANS
1) REFER TO CONSTRUCTION PLANS ENTITLED "NAVAL EDUCATION AND TRAINING CENTER, NEWPORT, RHODE ISLAND, McALLISTER POINT LANDFILL, DATED 5-19-94, CONSTRN. CONTR. NO. N62472-93-C-0295, PREPARED BY: TRC ENVIRONMENTAL CORPORATION", SCALE AS NOTED ON PLANS AND AUTOCAD FILES SUPPLIED BY DESIGN ENGINEER.
2) REFER TO PLANS ENTITLED "McALLISTER POINT LANDFILL, P.A.G. LINE LAYOUT, AREAS 1 AND 2" DATED 7/26/95 AND "McALLISTER POINT LANDFILL, P.A.G. LINE LAYOUT, AREAS 3 AND 4", DATED 7/27/95; PREPARED BY: NORTHEAST ENGINEERS & CONSULTANTS, INC., MIDDLETOWN, RI, BOTH DRAWN AT A SCALE OF 1"=40'.
NOTES
1) AS-BUILT GRADES WERE BASED ON THE PROJECT DATUM, AS ESTABLISHED AND DEVELOPED BY NORTHEAST ENGINEERS (NEE), AND ACCEPTED BY OHM REMEDIATION SERVICES CORP.
2) SITE FENDING AND DRAINAGE STONE SLOPE SWALES WERE INSTALLED IN ACCORDANCE WITH THE ORIGINAL DESIGN DRAWINGS, EXCEPT AS MODIFIED BY THE FOSTER WHEELER MARKUP AS-BUILT DRAWINGS.
MARC S. THAYER
No. 1869
PROFESSIONAL LAND SURVEYOR
SCALES
Horiz. 1"=40' Vert. 1"=4'
Horiz. 0 10 20 30 40 50 60
REV NO. DATE DESCRIPTION
1 01-20-97 FINAL SITE PLAN & SECTIONS
FINAL AS-BUILT SITE PLANS
McALLISTER POINT LANDFILL
NAVAL EDUCATIONS & TRAINING CENTER
MIDDLETOWN, RHODE ISLAND
for
FOSTER WHEELER ENVIRONMENTAL CORP.
SAI SURVEYING COMPANY
LAND SURVEYORS – CIVIL ENGINEERS – LAND USE PLANNERS
23 NARRAGANSETT AVENUE, JAMESTOWN, RI 02835
401-423-0653
DATE: 10-04-96
JOB NO: MCALPT
SCALE: 1" = 40'
DWG NAME: MCALPT.dwg
PLAN NO: C-6
SHEET: 2 of 5
DRAWN BY
PROJECT MGR
APPVD
MAC/PT/MCALPT.DWG R: 01-20-97

APPENDIX F
COST ESTIMATES

APPENDIX F-1

NEARSHORE/ELEVATED-RISK OFFSHORE ALTERNATIVES

COST ESTIMATES

Brown & Root Environmental			*Calculation Sheet*
Client: Navy CLEAN	File No.	**By:** BC	**Page** 1 of 1
Subject: Assumptions and Cost Basis, McAllister Point FS, NS-1, CTO 218		**Checked by:** RS	**Date:** 24 Oct 97

Near Shore & Elevated Risk Off-Shore Areas - Alternative 1: No Action

ASSUMPTIONS:

1. 5-year reviews at 200 LOE @ $100/hr. Approx. $1500 ODCs. Total = $ 21500 per event. Reviews to occur in years 5, 10, 15, 20, 25, and 30.

McAllister Point Landfill FS
Near Shore & Elevated Risk Areas Alternative 1 - No Action
Newport, Rhode Island
Present Worth Analysis
24 OCT 97

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$0			$0
1	0.935		$0		$0
2	0.873		$0		$0
3	0.816		$0		$0
4	0.763		$0		$0
5	0.713		$0	$21,500	$15,329
6	0.666		$0		$0
7	0.623		$0		$0
8	0.582		$0		$0
9	0.544		$0		$0
10	0.508		$0	$21,500	$10,930
11	0.475		$0		$0
12	0.444		$0		$0
13	0.415		$0		$0
14	0.388		$0		$0
15	0.362		$0	$21,500	$7,793
16	0.339		$0		$0
17	0.317		$0		$0
18	0.296		$0		$0
19	0.277		$0		$0
20	0.258		$0	$21,500	$5,556
21	0.242		$0		$0
22	0.226		$0		$0
23	0.211		$0		$0
24	0.197		$0		$0
25	0.184		$0	$21,500	$3,961
26	0.172		$0		$0
27	0.161		$0		$0
28	0.150		$0		$0
29	0.141		$0		$0
30	0.131		$0	$21,500	$2,824
		TOTAL PRESENT WORTH =			$46,393

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

Near Shore and Elevated Risk Off-Shore Alternative 2: Limited Action

ASSUMPTIONS:

1. Long-term Monitoring:

- Sediment chemistry (PCBs, PAHs, metals, Simoultaneously Extracted Metals/Acid Volatile Sulfides (SEM/AVS)); 10 samples plus 3 QC samples
- Biota chemistry 10 samples (PCBs, PAHs, metals);
- Porewater chemistry (metals); 10 samples plus 3 QC samples
- Toxicity Amphipod; 10 samples
- Toxicity Arabacia; 10 samples

Labor: 1 event/year.

- Sediment/Porewater sampling: Sample collection with equipment and crew = approximately $485/sample. Collection of 10 samples = $4,850 (QC samples collected at no additional cost)
- Biota sampling : Sample collection with equipment and crew = approximately $1043/sample. Collection of 10 samples = $10,430
- Proj. mgmt/coord. ≈ 30 hours/year @ $80/hr (w/O&P) = $2,400
- Annual: add $300 M&IE; ODCs & supplies @ $200; & shipping @ $200.
- Data Validation $5,808.
- Report prep. $9,500.

Total Labor ≅ $33,690 annually for years 1-5 and at 5 -year review cycles

Estimated analytical costs:

- Sediment chemistry (PCBs, PAHs, metals, SEM/AVS) $1537/sample @ 13 samples/yr = $19,981
- Biota chemistry (PCBs, PAHs, metals) @ $1367/sample @ 10 samples/yr = $13,670
- Porewater chemistry @ $250/ sample @ 13 samples/yr = $3,250
- Toxicity Amphipod @ $863/ sample @ 10 samples/yr = $8,630
- Toxicity Arabacia @ $662/ sample @ 10 samples/yr = $6,620

Total Analytical ≅ $52,150 annually for years 1-5 and at 5 -year review cycles

2. A row of fencing will be installed at each end of the landfill, conected to the existing fence corners, and extend to the mean low water line. Buoys will be installed at 100 foot increments along the landfill shoreline, ten feet off-shore of the mean-low tide line. Warning signs will be posted on the fence and buoys and at strategic locations on shore to warn people of the hazards associated with the use of the area.

- 300 lf fence @ $19.09 = $5,727
- 30 line posts @ $60.00 = $1,800
- 6 end posts @ $81.50 = $489
- Assume 100% surcharge/increase for installation through the cap/revetment and water = $8,016
- Install 15 buoys @ $400 ea. = $6,000
- 4 days of Boat rental = $2,000
- Install 15 - 12"X18" warning signs @ $42.44ea. = $636

Total Fence, Sign, and Buoy Cost = $24,668.

3. Inspection and Maintenance: Quarterly inspections (fence/bouys and biota) including field work and reporting, Engineer @ 16 LOE @ 80/hr = $1280/quarter; approximately $300/quarter ODCs = $1,580/quarter or $6,320/year; assume 10% of total replacement cost per year for fence/sign/bouy maintenance $2,466. Total = $8,786 annually

4. 5-year reviews at 200 LOE @ $100/hr. Approx. $1500 ODCs. Total = $ 21,500 per event
Reviews to occur in years 5, 10, 15, 20, 25, and 30.

McAllister Point Landfill FS
Near Shore & Elevated Risk Off-Shore Areas Alternative 2 - Limited Action
Newport, Rhode Island
Present Worth Analysis

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$24,668			$24,668
1	0.935		$94,626		$88,436
2	0.873		$94,626		$82,650
3	0.816		$94,626		$77,243
4	0.763		$94,626		$72,190
5	0.713		$94,626	$21,500	$82,796
6	0.666		$8,786		$5,854
7	0.623		$8,786		$5,471
8	0.582		$8,786		$5,114
9	0.544		$8,786		$4,779
10	0.508		$94,626	$21,500	$59,033
11	0.475		$8,786		$4,174
12	0.444		$8,786		$3,901
13	0.415		$8,786		$3,646
14	0.388		$8,786		$3,407
15	0.362		$94,626	$21,500	$42,089
16	0.339		$8,786		$2,976
17	0.317		$8,786		$2,781
18	0.296		$8,786		$2,599
19	0.277		$8,786		$2,429
20	0.258		$94,626	$21,500	$30,009
21	0.242		$8,786		$2,122
22	0.226		$8,786		$1,983
23	0.211		$8,786		$1,853
24	0.197		$8,786		$1,732
25	0.184		$94,626	$21,500	$21,396
26	0.172		$8,786		$1,513
27	0.161		$8,786		$1,414
28	0.150		$8,786		$1,321
29	0.141		$8,786		$1,235
30	0.131		$94,626	$21,500	$15,255
			TOTAL PRESENT WORTH =		$656,072

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

Near Shore & Elevated Risk Off-Shore Areas Alternative 3: Capping

ASSUMPTIONS:

CAPITAL COST ITEMS:

1. Pre-Design Investigation

   - Underwater video inspection of the existing surface to survey the area and to further determine the quantity of debris that requires removal prior to installation of the cap. Assume $7500 for the survey.

   - Soil borings/cores to further determine the grain size and nature of the sediments and to delineate lateral extent of contaminants exceeding the PRGs. Assume 35 soil borings at an average 5-foot depth with associate analytical costs for PCBs, PAHs, Metals and geotechnical testing. Mob./demob. @ $13,500. Sample collection @ $600 each or $21,000. Analytical @ $1,350/sample for 41 samples including QA/QC samples or $55,350. Data validation $8,200. Reporting @ $4,500. Oversight and management @ $9500. Total costs = $112,050.

2. Mobilization/Demobilization includes providing office trailers, temporary utilities and sanitary facilities, delivery and removal of major construction equipment, and providing all other facilities and materials needed by the management staff.

3. Subgrade preparation is assumed to include removal of large boulders, metal, concrete, and other debris that penetrates the surface of the ocean floor and could damage to the cap during installation or during the long-term. The extent of the debris will be determined during the pre-design underwater video inspection. It is assumed that 15 days will be required to prepare the subgrade (shore based work will be performed concurrently with barge based work). It is assumed that a total of 200 tons of debris will be removed and disposed of at a RCRA Subtitle D landfill.

4. Erosion controls will be provided to reduce migration of sediments during the subgrade preparation and cap installation by means of a silt boom. The silt boom will be anchored around the perimeter of the cap area.

5. The cap system will be installed over approximately 267,737 sf (6.2 acres) of area. The cap will include a multi-media cap constructed in high energy areas totaling 99,820 sf and a natural cap constructed in low energy areas totaling 167,917 sf. All work performed in the southern depositional (shallow) areas (approximately 85,336 sf) will be performed from the land using a portable cofferdam, dewatering pumps, and hydraulic excavation equipment. All other work in the remaining areas (including all multi-media cap work) will be performed from barge based crane and dredge equipment.

   - It is assumed that the cap construction activities will not be subject to CRMC restrictions which only allow dredging to occur between October-December. As a result, all construction work will occur within one mobilization period.

   - An 8-hour work day is assumed for all construction activities. However, due to accessibility issues and construction difficulties, it is assumed that one hour per day will be required to maintain and mobilize equipment at each work site and one hour per day will be required to secure the work areas and remove equipment from each work site (net production = 6 hours per

day). An analysis of overtime labor versus daily equipment rates should be performed at the design phase to determine if cost-benefits exist by working overtime.

BARGE BASED WORK:
- It is assumed that Pier 1 at Coddington Cove will be used as a materials and office staging area at no cost.

- The multi-media cap will consist of a geotextile layer pre-attached to both sides of the articulating concrete blocks prior to installation. The geotextile will be a heavy non-woven material with an apparent opening size (AOS) chosen to prevent sediment migration through the material. The AOS will be determined from the grain size data collected in the pre-design investigation.

- The armor layer of the multi-media cap will be a system of 15"w x 15"l x 9"h concrete blocks connected by a cable to form an articulating "mattress" (8'w x 20'l x 9"h) to prevent uplift of the underlying soils. The concrete "mattresses" will be anchored into the toe of the landfill slope and into the ocean floor at the limits of the cap with large revetment boulders. The "mattresses" will be installed by a crane from a barge. Approximately 800 sf will be installed per day.

- Following installation of the armor/geotextile layer, placement of the 24-inch sand/gravel/stone layer will be performed by a crane on a barge. Approximately 7,394 cuyd of sand/gravel/stone will be used. Barge rental with equipment and crew is assumed to be $8,600 per day (source of lump sum cost from vendor), shore equipment to load/off-load materials to barge @ $6,500/day; totaling $15,100/day and an assumed production rate of 600 cuyd placed per day. Additional costs of a survey crew to verify grades during placement is assumed at $1,000/day.

- The natural cap materials will be placed over the remaining area totaling 82,822 sf using the barge/crane equipment. This is the area identified as the "elevated risk off-shore" area. The natural cap will consist of 2 feet of sand/gravel/stone (6,135 cuyd).

- Miscellaneous large boulders will be installed over the sand/gravel/stone to help break waves and assist in habitat restoration. It is assumed that 6 boulders will be placed every 2,500 sf and it is estimated that boulders can be installed over a 15,000 sf area per day by barge.

- Water quality testing will be performed daily during debris removal and cap installation activities. It assumed that three samples will be collected daily from outside of the silt curtain work area. samples will be analyzed for PCBs, PAHs, metals, and total suspended solids (TSS).

SHORE BASED WORK:
- A portable cofferdam will be constructed along approximately 1,200 lf of the southern depositional area shoreline extending out to approximately the 3-foot MLW water line. Dewatering pumps will be operated continuously (24 hour/day) to allow excavation of debris/boulders and installation of cap materials in "dry" conditions. It is anticipated that the work will be performed in small sections in order to effectively manage the dewatering activities.

- Access to the work area will be from along the southeastern limits of the existing landfill, adjacent to the railroad tracks. Construction of a temporary haul road is not anticipated. Excavation, handling, and placement of materials will be accomplished using tracked excavators, wheeled front-end loader, and off-road dump trucks at a rate of 600 cuyd per day. Costs include a survey crew to verify grades during placement.

- The natural cap materials will be placed over an area approximately 85,336 sf. The natural cap will consist of 2 feet of sand/gravel/stone (approximately 7,585 cuyd with an assumed bulking factor of 20%).

- Miscellaneous large boulders will be installed over the sand/gravel/stone to help break waves and assist in habitat restoration. It is assumed that 6 boulders will be placed every 2,500 sf and it is estimated that boulders can be installed over a 30,000 sf area per day using the shore based equipment.

- Since this work will be performed concurrently with the barge-based work, no additional water quality testing is required.

O&M COSTS

1. Long-term Monitoring:

- Sediment chemistry (PCBs, PAHs, metals, Simultaneously Extracted Metals/Acid Volatile Sulfides (SEM/AVS)); 10 samples plus 3 QC samples
- Biota chemistry 10 samples (PCBs, PAHs, metals);
- Porewater chemistry (metals); 10 samples plus 3 QC samples
- Toxicity Amphipod; 10 samples
- Toxicity Arabacia; 10 samples

Labor: 1 event/year.

- Sediment/Porewater sampling: Sample collection with equipment and crew = approximately $485/sample. Collection of 10 samples = $4,850 (QC samples collected at no additional cost)
- Biota sampling : Sample collection with equipment and crew = approximately $1043/sample. Collection of 10 samples = $10,430
- Proj. mgmt/coord. ≈ 30 hours/year @ $80/hr (w/O&P) = $2,400
- Annual: add $300 M&IE; ODCs & supplies @ $200; & shipping @ $200.
- Data Validation $5,808.
- Report prep. $9,500.

Total Labor ≅ $33,690 annually for years 1-5 and at 5 -year review cudycles

Estimated analytical costs:

- Sediment chemistry (PCBs, PAHs, metals, SEM/AVS) $1537/sample @ 13 samples/yr = $19,981
- Biota chemistry (PCBs, PAHs, metals) @ $1367/sample @ 10 samples/yr = $13,670
- Porewater chemistry @ $250/ sample @ 13 samples/yr = $3,250
- Toxicity Amphipod @ $863/ sample @ 10 samples/yr = $8,630
- Toxicity Arabacia @ $662/ sample @ 10 samples/yr = $6,620

Total Analytical ≅ $52,150 annually for years 1-5 and at 5 -year review cudycles

2. Inspection and Maintenance of Cap:

   - Quarterly inspections to be performed by an Engineer: assume 1 day (8 hr) inspection and travel and 1 day (8 hr) to report findings. 16 hours total @ $80/hr = $1,280 plus $300 ODCs, travel costs per quarter. Total Inspection costs $6,332 per year (30 years)

   - Assume a survey crew is needed to inspect cap and verify grades annually. A barge crew is needed for 2 days per year to repair the cap using 325 cuyd of sand/gravel/stone.

   - Survey crew 3 days at $1,000/day = $3,000
   - Barge/Crew/Equipment for 2 days = $17,200
   - Overhead & profit = $2,000
   - Gravel: 325 cuyd @ $20/cuyd = $6,500

   Total Maintenance Cost = $28,700

3. 5-year reviews at 200 LOE @ $100/hr. Approx. $1500 ODCs. Total = <u>$ 21,500 per event</u>
   Reviews to occur in years 5, 10, 15, 20, 25, and 30.

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
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			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
PRE-DESIGN INVESTIGATION												
1) Underwater video inspection/survey	1	LS	7,500.00	0.00	0.00	0.00	7,500	0	0	0	7,500	Vendor Info.
2) Additional soils boring and analyses	1	LS	112,050.00	0.00	0.00	0.00	112,050	0	0	0	112,050	See assumptions
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	10	MO	400.00	0.00	0.00	0.00	4,180	0	0	0	4,180	Historical data
2) Storage Trailer (1 ea)	10	MO	100.00	0.00	0.00	0.00	1,045	0	0	0	1,045	Historical data
3) Portable Communication Equipment	8	EA	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	Historical data
4) Equipment Mobilization/Demobilization (support equip)	1	LS	45,000.00	0.00	0.00	0.00	45,000	0	0	0	45,000	Historical data
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities (elec, phone, water, sanitary, trash)	10	MO	4,000.00	0.00	0.00	0.00	41,800	0	0	0	41,800	Historical data
7) 3 Pick-up Truck (lease, fuel, oil)	10	MO	2,850.00	450.00	0.00	0.00	29,783	4,703	0	0	34,485	Historical data
8) Certification/Close-out Reports	1	LS	3,500.00	12,000.00	15,000.00	0.00	3,500	12,000	15,000	0	30,500	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	10	MO	500.00	0.00	200.00	0.00	5,225	0	2,090	0	7,315	Vendor catalog
2) PPE rolloff cont.	10	MO	350.00	0.00	0.00	0.00	3,658	0	0	0	3,658	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	2,090	HR	0.00	0.00	35.86	0.00	0	0	74,947	0	74,947	Historical data
2) Site supervisor/foreman	2,090	HR	0.00	0.00	30.00	0.00	0	0	62,700	0	62,700	Historical data
3) Site safety officer	2,090	HR	0.00	0.00	25.00	0.00	0	0	52,250	0	52,250	Historical data
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	418	HR	0.00	0.00	45.00	0.00	0	0	18,810	0	18,810	Historical data
2) Project administrator	314	HR	0.00	0.00	30.00	0.00	0	0	9,405	0	9,405	Historical data
3) Health and Safety director	105	HR	0.00	0.00	35.00	0.00	0	0	3,658	0	3,658	Historical data
4) Procurement/subcontracting	1,045	HR	0.00	0.00	30.00	0.00	0	0	31,350	0	31,350	Historical data
5) Clerical support	1,045	HR	0.00	0.00	12.36	0.00	0	0	12,916	0	12,916	Historical data
SITE PREPARATION												
1) Erosion control, silt boom	3,000	LF	0.00	10.00	4.00	4.00	0	30,000	12,000	12,000	54,000	Vendor Info.
2) Mob/Demob (barge and pier based equip.)	1	LS	57,600.00	0.00	0.00	0.00	57,600	0	0	0	57,600	Vendor Info.
3) Mob/Demob (shore based equip.)	1	LS	4,000.00	0.00	0.00	0.00	4,000	0	0	0	4,000	Vendor Info.
4) Porta Dam (install, rental, takedown)	1,200	LF	150.00	0.00	0.00	0.00	180,000	0	0	0	180,000	Historical info.
5) Porta Dam dewatering	18	DAY	0.00	0.00	665.00	150.00	0	0	11,732	2,646	14,378	021-440-0410
6) Debris/boulder removal, subgrade prep. (barge)	20	DAY	15,100.00	0.00	0.00	0.00	302,000	0	0	0	302,000	Vendor Info.
7) Debris/boulder removal, subgrade prep. (shore)	5	DAY	0.00	0.00	1,960.00	6,640.00	0	0	9,800	33,200	43,000	Historical data
8) Water quality monitoring (3 samples/day)	20	DAY	3,600.00	50.00	200.00	150.00	72,000	1,000	4,000	3,000	80,000	Historical/Vendor
9) Trans/Disposal of metal/concrete debris (RCRA D)	500	TN	110.00	0.00	0.00	0.00	55,000	0	0	0	55,000	Vendor Info.
MULTI MEDIA COVER SYSTEM												
1) Attach geotextile layer to both sides	199,640	SF	0.00	0.29	0.17	0.08	0	57,896	33,939	15,971	107,806	Vendor Info.
2) Installation of articulating blocks/geotextile	99,820	SF	18.88	9.00	0.00	0.00	1,884,602	898,380	0	0	2,782,982	Vendor Info.
3) Anchor stones for articulating blocks (60tons/acre)	137	TN	252.00	20.00	0.00	0.00	34,648	2,750	0	0	37,398	Vendor Info.
4) Installation of 24" sand/gravel/stone layer (barge)	7,394	CY	25.17	15.00	1.66	0.00	186,109	110,911	12,274	0	309,294	Vendor Info.
5) Water quality monitoring (3 samples/day)	125	DAY	3,600.00	50.00	200.00	150.00	449,190	6,239	24,955	18,716	499,100	Historical/Vendor
6) Strategically Placed Boulders	7	DAY	15,100.00	1,440.00	0.00	0.00	100,485	9,583	0	0	110,068	Vendor Info.
NATURAL CAP PLACEMENT												
1) Installation of 2 foot sand/gravel cap (shore based)	7,585	CY	0.00	15.00	4.93	11.23	0	113,778	37,395	85,182	236,355	Vendor Info.
2) Strategically Placed Boulders (shore based)	3	DAY	0.00	2,880.00	2,960.00	6,740.00	0	9,830	10,103	23,006	42,940	See assumptions
3) Installation of 2 foot sand/gravel cap (barge based)	6,135	CY	25.17	15.00	1.66	0.00	154,418	92,025	10,184	0	256,627	Vendor Info.
4) Strategically Placed Boulders (barge based)	6	DAY	15,100.00	1,440.00	0.00	0.00	83,375	7,951	0	0	91,326	See assumptions
5) Water quality monitoring (3 samples/day)	10	DAY	3,600.00	50.00	200.00	150.00	36,810	511	2,045	1,534	40,900	Historical/Vendor

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
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	Total Cost ($) Sub.	Mat.	Labor	Equip.	Total Direct Cost ($)	Comments
TOTAL	3,860,177	1,357,556	451,554	195,255	5,864,542	
Direct Cost Adjustment Factors						
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)	0	0	22,578	9,763	32,340	
Safety Level C Multiplier (25% of labor and equipment, as listed)	0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)	0	0	18,062	7,810	25,872	
Subtotal Direct Costs	3,860,177	1,357,556	474,131	205,018	5,922,755	
Indirect Cost Adjustment Factors						
Labor Overhead @ 250% (for field mgmt. & home office, only)	0	0	702,590	0	702,590	
Field Construction Labor Overhead @ 75%	0	0	139,138	0	139,138	
Subcontract Overhead @ 10%	386,018	0	0	0	386,018	
Tax on Materials @ 5%	0	67,878	0	0	67,878	
G & A @ 10% (on labor, equip., & matl's.)	0	135,756	47,413	20,502	203,671	
Subtotal Direct and Indirect Costs	4,246,194	1,561,190	1,363,273	225,520	7,422,049	
Cost Adjustment Factors						
City/Location Cost Adjustment Factor @ 7% (ref. 1)					519,543	
Adjusted Direct and Indirect Costs	4,246,194	1,561,190	1,363,273	225,520	7,941,592	
Engineering @ 6 % of total direct and indirect					476,496	
Prime Contractor Fee @ 10% of Total Adjusted Cost					794,159	
Total Costs					9,212,247	
Contingency @ 30% of Total Cost					2,763,674	
TOTAL ESTIMATED COST					11,975,921	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors at this or other sites or actual similar construction costs.

McAllister Point Landfill FS
Near Shore & Elevated Risk Off Shore Areas
Alternative 3 - Containment/Capping
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$11,975,921			$11,975,921
1	0.935		$120,872		$112,964
2	0.873		$120,872		$105,574
3	0.816		$120,872		$98,668
4	0.763		$120,872		$92,213
5	0.713		$120,872	$21,500	$101,509
6	0.666		$35,032		$23,343
7	0.623		$35,032		$21,816
8	0.582		$35,032		$20,389
9	0.544		$35,032		$19,055
10	0.508		$120,872	$21,500	$72,375
11	0.475		$35,032		$16,643
12	0.444		$35,032		$15,555
13	0.415		$35,032		$14,537
14	0.388		$35,032		$13,586
15	0.362		$120,872	$21,500	$51,602
16	0.339		$35,032		$11,867
17	0.317		$35,032		$11,090
18	0.296		$35,032		$10,365
19	0.277		$35,032		$9,687
20	0.258		$120,872	$21,500	$36,792
21	0.242		$35,032		$8,461
22	0.226		$35,032		$7,907
23	0.211		$35,032		$7,390
24	0.197		$35,032		$6,906
25	0.184		$120,872	$21,500	$26,232
26	0.172		$35,032		$6,032
27	0.161		$35,032		$5,638
28	0.150		$35,032		$5,269
29	0.141		$35,032		$4,924
30	0.131		$120,872	$21,500	$18,703
		TOTAL PRESENT WORTH =			$12,933,013

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

Near Shore & Elevated Risk Alternative 4: Partial Removal, Capping and On-Base Disposal

ASSUMPTIONS:

CAPITAL COST ITEMS:

1. Pre-Design Investigation

   - Soil borings/cores to further determine the grain size and nature of the sediments and to delineate lateral extent of contaminants exceeding the PRGs. Assume 35 soil borings at an average 5-foot depth with associate analytical costs for PCBs, PAHs, Metals and geotechnical testing. Mob./demob. @ $13,500. Sample collection @ $600 each or $21,000. Analytical @ $1,350/sample for 41 samples including QA/QC samples or $55,350. Data validation $8,200. Reporting @ $4,500. Oversight and management @ $9,500. Total costs = $112,050.

2. Mobilization/Demobilization includes providing office trailers, temporary utilities and sanitary facilities, delivery and removal of major construction equipment, and providing all other facilities and materials needed by the management staff.

3. It is assumed that no subgrade preparation will be required prior to dredging the contaminated sediments. Large metal debris, concrete debris, and large boulders will be removed from the sediments after they have been dredged, but prior to dewatering.

4. Erosion controls will be provided to reduce migration of sediments during the dredging operations by means of a silt boom. The silt boom will be anchored around the perimeter of the dredge area.

5. The cap system will be installed over approximately 267,737 sf (6.2 acres) of area. The cap will include a multi-media cap constructed in high energy areas totaling 60,036 sf and a natural cap constructed in low energy areas totaling 207,701 sf. The estimate also assumes that dredging will only be performed to a depth so that the installed cap will match the existing grades. In the most northern and southern near shore areas, the contamination is estimated to be no greater than 2 feet in depth. Consequently, these areas, which represent, approximately 92,071 sf of the 207,701 sf receiving natural cap materials, will not require a cap but, will be backfilled with the same materials used to construct the natural cap.

   - It is assumed that the dredging and cap construction activities will not be subject to CRMC restrictions which only allow dredging to occur between October-December. As a result, all dredging/construction work will occur within one mobilization period.

   - All work performed in the southern depositional (shallow) areas (approximately 85,336 sf) will be performed from the land using a portable cofferdam, dewatering pumps, and hydraulic excavation equipment. All other work in the remaining areas (including all multi-media cap work) will be performed by barge-based crane and dredge equipment.

CAP TYPE	AREA INSTALLED FROM BARGE (SF)	AREA INSTALLED FROM SHORE (SF)
Natural	122,365	85,336
Multi-Media	60,036	0
Total	182,401	85,336

- Six-inch and smaller material will be screened from the dredge spoil at each work site and hauled to the onsite landfill. Boulders and cobbles greater than 6 inches will be rinsed of fine-grained sediment and reused as capping materials. It is assumed that 20% of the volume of dredged materials will be larger than 6 inches and reused and that chemical testing of the screened materials prior to placement will not be required. Concrete and metal debris will be placed in the landfill.

- All of the dredge/excavation spoils generated, 6 inches and less (approximately 17,644 cuyds), will be disposed at the existing onsite landfill. The existing landfill cap earthen materials will be stripped, stockpiled and reinstalled after placement of the dredge spoils. The existing geosynthetics will be perforated and left in-place.

- An 8-hour work day is assumed for all construction activities. However, due to accessibility issues and construction difficulties, it is assumed that one hour per day will be required to maintain and mobilize equipment at each work site and one hour per day will be required to secure the work areas and remove equipment from each work site (net production = 6 hours per day). An analysis of overtime labor versus daily equipment rates should be performed at the design phase to determine if cost-benefits exist by working overtime.

BARGE BASED WORK

- Approximately 60,036 sf of area will be dredged to a depth of 3 feet (approximately 6,670 cuyd) to accommodate the thickness of the multi-media cap. Approximately 122,365 sf (9,065 cuyd), will be dredged to a depth of 2 feet to accommodate placement of a natural cap.

- It is assumed that Pier 1 at Coddington Cove will be used as a materials, dewatering, and office staging area at no cost. Dewatered dredge spoils will be staged at Pier 1 pending transport to the onsite landfill.

- Preparation, maintenance, and removal of the staging area was estimated at a lump sum of $11,000, which includes 2 laborers and a backhoe for 10 days and misc. materials. Dewatering/screening activities will be performed on the barge and on shore (as required) to prepare the sediments for on-base disposal. It is assumed that the barge, crew, and dredging equipment cost is $8,600 per day and shore-based equipment to load/off-load materials to barge is $6,500/day. Dewatering/screening equipment and crew is assumed to cost $4,500 per day and is assumed that extensive dewatering will not be required each day. On-site bulking of the sediments is included in the dewatering cost (if necessary). It is assumed that the production rate for the dredging operation will be 200 cuyd per day and the operation will take 79 work days.

- The multi-media cap will consist of a geotextile layer pre-attached to both sides of the articulating concrete blocks prior to installation. The geotextile will be a heavy non-woven material with an apparent opening size (AOS) chosen to prevent sediment migration through the material. The AOS will be determined from the grain size data collected in the pre-design investigation.

- The armor layer of the multi-media cap will be a system of 15"w x 15"l x 9"h concrete blocks connected by a cable to form an articulating "mattress" (8'w x 20'l x 9"h) to prevent uplift of the underlying soils. The concrete "mattresses" will be anchored into the toe of the landfill slope and into the ocean floor at the limits of the cap with large revetment boulders. The "mattresses" will be installed by a crane from a barge. Approximately 800 sf will be installed per day and take approximately 75 days to complete the installation.

- Following installation of the armor/geotextile layer, placement of the 24-inch sand/gravel/stone layer will be performed by a crane on a barge. Approximately 4,447 cuyd of sand/gravel/stone will be used. Barge rental with equipment and crew is assumed to be $8,600 per day, shore

equipment to load/off-load materials to barge at $6,500/day; totaling $15,100/day. A production rate of 600 cuyd placed per day is assumed. Additional costs of a survey crew to verify grades during placement is assumed at $1,000/day.

- The natural cap materials will be placed over the remaining area totaling 122,365 sf, which includes the area identified as the "elevated risk off-shore" area, using the barge/crane equipment. The natural cap will consist of 2 feet of sand/gravel/stone (9,064 cuyd). No bulking factor is assumed since the materials will be placed through the water column.

- Miscellaneous large boulders will be installed over the sand/gravel/stone to help break waves and assist in habitat restoration. It is assumed that 6 boulders will be placed every 2,500 sf and it is estimated that boulders can be installed over a 15,000 sf area per day by barge.

- Water quality testing will be performed daily during dredging removal and cap installation activities. It assumed that three samples will be collected daily from outside of the silt curtain work area. samples will be analyzed for PCBs, PAHs, metals, and total suspended solids (TSS).

SHORE BASED WORK

- A portable cofferdam system will be erected along the southern shoreline extending out to the 3-foot MLW line. The area will be continuously dewatered (24-hour per day) with pumps so that the excavation of sediments can occur in "dry" conditions. Excavated sediments will be screened and hauled directly to the landfill from the excavation site. Backfill materials will be placed immediately following removal of the contaminated sediments. An estimated 6,321 cuyd will be dredged/excavated in this manner. A total of 21 work days is estimated to complete the excavation work.

- Access to the work area will be from along the southeastern limits of the existing landfill, adjacent to the railroad tracks. Construction of a temporary haul road is not anticipated. Excavation, handling, and placement of materials will be accomplished using tracked excavators, a wheeled front-end loader, screener, and off-road dump trucks at a rate of 600 cuyd per day. Costs include a survey crew to verify grades during placement.

- The natural cap materials will be placed over an area approximately 85,336 sf. The natural cap will consist of 2 feet of sand/gravel/stone (approximately 7,585 cuyd with an assumed bulking factor of 20%). Since 20% of the dredged material (1,517 cuyd) will be screened and re-used, only 6,068 cuyd of material will be required from off-site sources.

- Miscellaneous large boulders will be installed over the sand/gravel/stone to help break waves and assist in habitat restoration. It is assumed that 6 boulders will be placed every 2,500 sf and it is estimated that boulders can be installed over a 30,000 sf area per day using the shore based equipment.

- Since this work will be performed concurrently with the barge-based work, no additional water quality testing is required.

O&M COSTS

1. <u>Long-term Monitoring</u>:

- Sediment chemistry (PCBs, PAHs, metals, Simultaneously Extracted Metals/Acid Volatile Sulfides (SEM/AVS)); 10 samples plus 3 QC samples
- Biota chemistry 10 samples (PCBs, PAHs, metals);
- Porewater chemistry (metals); 10 samples plus 3 QC samples
- Toxicity Amphipod; 10 samples
- Toxicity Arabacia; 10 samples

Labor: 1 event/year.

- Sediment/Porewater sampling: Sample collection with equipment and crew = approximately $485/sample. Collection of 10 samples = $4,850 (QC samples collected at no additional cost)
- Biota sampling : Sample collection with equipment and crew = approximately $1,043/sample. Collection of 10 samples = $10,430
- Proj. mgmt/coord. ≈ 30 hours/year @ $80/hr (w/O&P) = $2,400
- Annual: add $300 M&IE; ODCs & supplies @ $200; & shipping @ $200.
- Data Validation $5,808.
- Report prep. $9,500.

Total Labor ≅ $33,690 annually for years 1-5 and at 5 -year review cycles

Estimated analytical costs:

- Sediment chemistry (PCBs, PAHs, metals, SEM/AVS) $1537/sample @ 13 samples/yr = $19,981
- Biota chemistry (PCBs, PAHs, metals) @ $1367/sample @ 10 samples/yr = $13,670
- Porewater chemistry @ $250/ sample @ 13 samples/yr = $3,250
- Toxicity Amphipod @ $863/ sample @ 10 samples/yr = $8,630
- Toxicity Arabacia @ $662/ sample @ 10 samples/yr = $6,620

Total Analytical ≅ $52,150 annually for years 1-5 and at 5 -year review cycles

2. Inspection and Maintenance of Cap:

- Quarterly inspections to be performed by an Engineer: Assume 1 day (8 hr) for inspection and travel and 1day (8 hr) to prepare an inspection report. 16 hours total @ $80/hr = $1,280 plus $300 ODCs & travel costs. Total quarterly cost is $1,580. Total annual Inspection costs are $6,332.

- Assume a survey crew is needed to inspect cap and verify grades annually. A barge crew is needed for 2 days per year to repair the cap using 325 cuyd of sand/gravel/stone.

- Survey crew 3 days at $1,000/day = $3,000
- Barge/Crew/Equipment for 2 days = $17,200
- Overhead & profit = $2,000
- Gravel: 325 cuyd @ $20/cuyd = $6,500

Total Maintenance Cost = $28,700

Total annual Inspection and Maintenance costs $ 35,032.

3. 5-year reviews at 200 LOE @ $100/hr. Approx. $1500 ODCs. Total = $ 21,500 per event
Reviews to occur in years 5, 10, 15, 20, 25, and 30.

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER4 - PARTIAL REMOVAL, CAPPING AND ON-BASE DISPOSAL
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			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
PRE-DESIGN INVESTIGATION												
1) Additional soils boring and analyses	1	LS	112,050.00	0.00	0.00	0.00	112,050	0	0	0	112,050	See Assumptions
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	20	MO	400.00	0.00	0.00	0.00	7,805	0	0	0	7,805	Historical data
2) Storage Trailer (1 ea)	20	MO	150.00	0.00	0.00	0.00	2,927	0	0	0	2,927	Historical data
3) Portable Communication Equipment	8	EA	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	Historical data
4) Equipment Mobilization/Demobilization (support equi	1	LS	45,000.00	0.00	0.00	0.00	45,000	0	0	0	45,000	Historical data
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities	20	MO	4,000.00	0.00	0.00	0.00	78,048	0	0	0	78,048	Historical data
7) 3 Pick-up Truck (rental)	20	MO	2,850.00	450.00	0.00	0.00	55,609	8,780	0	0	64,389	Historical data
8) Cerification/Close-out Reports	1	EA	7,000.00	2,000.00	15,000.00	3,000.00	7,000	2,000	15,000	3,000	27,000	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	20	MO	1,500.00	0.00	200.00	0.00	29,268	0	3,902	0	33,170	Vendor catalog
2) PPE rolloff cont.	20	MO	500.00	0.00	0.00	0.00	9,756	0	0	0	9,756	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	3,902	HR	0.00	0.00	35.86	0.00	0	0	139,940	0	139,940	Historical data
2) Site engineer	3,902	HR	0.00	0.00	32.00	0.00	0	0	124,877	0	124,877	Historical data
3) Site supervisor/foreman	3,902	HR	0.00	0.00	30.00	0.00	0	0	117,072	0	117,072	Historical data
4) Site safety officer	3,902	HR	0.00	0.00	25.00	0.00	0	0	97,560	0	97,560	Historical data
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	780	HR	0.00	0.00	45.00	0.00	0	0	35,122	0	35,122	Historical data
2) Project administrator	585	HR	0.00	0.00	30.00	0.00	0	0	17,561	0	17,561	Historical data
3) Health and Safety director	195	HR	0.00	0.00	35.00	0.00	0	0	6,829	0	6,829	Historical data
4) Procurement/subcontracting	1,951	HR	0.00	0.00	30.00	0.00	0	0	58,536	0	58,536	Historical data
5) Clerical support	1,951	HR	0.00	0.00	12.36	0.00	0	0	24,117	0	24,117	Historical data
LANDFILL CAP PREP. AND RESTORATION												
1) Survey control (2-man crew)	3,600	HR	0.00	0.00	60.00	15.00	0	0	216,000	54,000	270,000	Historical data
2) Silt Fence	5,000	LF	0.00	0.50	0.35	0.00	0	2,500	1,750	0	4,250	022-700-1100
3) Strip existing cap soils and stockpile	7,259	CY	0.00	0.00	0.62	2.09	0	0	4,501	15,171	19,672	17-01-0502
3a) Remove and stage shrubs	1	LS	2,500.00	0.00	0.00	0.00	2,500	0	0	0	2,500	Historical data
4) Dredge spoil placement (12" lifts, 3 mile R/T)	17,645	CY	0.00	0.26	1.83	6.17	0	4,588	32,290	108,870	145,748	17-03-0422
5) 6" cap layer	1,815	CY	0.00	0.26	1.52	4.76	0	472	2,759	8,639	11,870	17-03-0422
6) Gas vent layer 12"	3,630	CY	0.00	9.11	0.82	2.11	0	33,069	2,977	7,659	43,705	17-03-046
6a) extend/finish existing gas vents	18	EA	500.00	0.00	0.00	0.00	9,000	0	0	0	9,000	Historical data
7) GCL furnish and install	98,000	SF	0.00	0.25	0.07	0.07	0	24,500	6,860	6,860	38,220	33-08-0543
8) 40 mil VLDPE furnish and install	98,000	SF	0.00	0.41	1.07	0.11	0	40,180	104,860	10,780	155,820	33-08-0544
9) 12" drainage layer	3,630	CY	0.00	12.00	0.23	0.34	0	43,560	835	1,234	45,629	33-08-0500
10) Geotextile furnish and install	10,889	SY	0.00	0.56	0.33	0.03	0	6,098	3,593	327	10,018	33-08-0532
11) 18" Cover soil layer (reuse)	7,259	CY	0.00	0.00	0.23	0.34	0	0	1,670	2,468	4,138	17-03-046
12) 6" Topsoil (reuse 70% from existing cap)	1,290	CY	0.00	0.00	1.43	5.14	0	0	1,845	6,631	8,475	18-05-0302
13) 6" Topsoil (30% from off-site)	540	CY	0.00	16.62	3.29	3.62	0	8,975	1,777	1,955	12,706	18-05-0301

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER4 - PARTIAL REMOVAL, CAPPING AND ON-BASE DISPOSAL
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
14) Root reinforcing mat (slopes only)	8,756	SY	0.00	0.78	0.21	0.07	0	6,830	1,839	613	9,281	022-704-0010
15) Jute mat (slopes only)	8,756	SY	0.00	1.75	0.20	0.07	0	15,323	1,751	613	17,687	022-704-0200
16) Extend & finish monitoring wells	2	EA	1,000.00	0.00	0.00	0.00	2,000	0	0	0	2,000	Historical data
17) Revegetation (hydroseed & reuse shrubs)	2.30	AC	589.62	0.00	1,000.00	200.00	1,356	0	2,300	460	4,116	Historical data
18) Restore operations areas	2	AC	5,000.00	0.00	0.00	0.00	10,000	0	0	0	10,000	Historical data
19) Geotechnical testing	150	DY	0.00	5.00	800.00	50.00	0	750	120,000	7,500	128,250	Historical data
DREDGING/WATER TREATMENT												
1) Erosion control, silt boom	3,000	LF	0.00	10.00	4.00	4.00	0	30,000	12,000	12,000	54,000	Historical data
2) Mob/Demob (barge and pier based equip.)	1	LS	167,600.00	0.00	0.00	0.00	167,600	0	0	0	167,600	Vendor Info.
3) Mob/Demob (shore based equip.)	1	LS	5,000.00	0.00	0.00	0.00	5,000	0	0	0	5,000	Vendor Info.
4) Prep., maint., and removal of staging area	1	LS	0.00	1,000.00	7,000.00	3,000.00	0	1,000	7,000	3,000	11,000	Vendor Info.
5) Porta Dam (install, rental, takedown)	1,200	LF	150.00	0.00	0.00	0.00	180,000	0	0	0	180,000	Historical data
6) Porta Dam dewatering	21	DAY	0.00	0.00	665.00	150.00	0	0	14,012	3,161	17,172	021-440-0410
7)Heavy equipment mob/demob	1	LS	10,000.00	0.00	0.00	0.00	10,000	0	0	0	10,000	Historical data
8) Excavate/screen/haul sediments (shore based)	6,321	CY	0.00	0.00	4.93	12.23	0	0	31,163	77,306	108,468	022-238-300
9) Dredge sediments (barge)	15,735	CY	43.00	0.00	0.00	0.00	676,605	0	0	0	676,605	Vendor Info.
10) Treatment of dredge water	79	DAY	4,500.00	0.00	0.00	0.00	354,038	0	0	0	354,038	Vendor Info.
11) Removal of sediments from barge	15,735	CY	32.50	0.00	0.00	0.00	511,388	0	0	0	511,388	Vendor Info.
12) Trans./Disposal of metal/concrete debris (RCRA D)	500	TN	110.00	0.00	0.00	0.00	55,000	0	0	0	55,000	Vendor Info.
13) Water Quality Testing	79	DAY	3,600.00	50.00	200.00	150.00	283,230	3,934	15,735	11,801	314,700	Historical data
MULTI-MEDIA COVER SYSTEM												
1) Attach geotextile layer to both sides	120,072	SF	0.00	0.29	0.17	0.08	0	34,821	20,412	9,606	64,839	Vendor Info.
2) Installation of articulating blocks/geotextile	60,036	SF	18.88	9.00	0.00	0.00	1,133,480	540,324	0	0	1,673,804	Vendor Info.
3) Anchor stones for articulating blocks (60tons/acre)	83	TN	252.00	20.00	0.00	0.00	20,839	1,654	0	0	22,493	Vendor Info.
4) Installation of 24" sand/gravel/stone layer (barge)	4,447	CY	25.17	15.00	1.66	0.00	111,934	66,707	7,382	0	186,023	Vendor Info.
5) Water quality monitoring (3 samples/day)	82	DAY	3,600.00	50.00	200.00	150.00	296,845	4,123	16,491	12,369	329,827	Historical/Vendor
6) Strategically Placed Boulders	4	DAY	15,100.00	1,440.00	0.00	0.00	60,436	5,763	0	0	66,200	Vendor Info.
NATURAL CAP PLACEMENT												
1) Installation of 2 feet imported sand/gravel/stone (shor	6,068	CY	0.00	15.00	4.93	11.23	0	91,022	29,916	68,145	189,084	Vendor Info.
2) Installation of 2 feet screened sand/gravel/stone (sho	1,517	CY	0.00	0.00	4.93	11.23	0	0	7,479	17,036	24,515	Vendor Info.
3) Strategically Placed Boulders (shore based)	3	DAY	0.00	2,880.00	2,960.00	6,740.00	0	8,640	8,880	20,220	37,740	See assumptions
4) Installation of 2 foot imported sand/gravel cap (barge	7,251	CY	25.17	15.00	1.66	0.00	182,519	108,772	12,037	0	303,329	Vendor Info.
5) Installation of 2 foot screened sand/gravel cap (barge	1,813	CY	25.17	0.00	1.66	0.00	45,630	0	3,009	0	48,639	Vendor Info.
6) Strategically Placed Boulders (barge based)	8	DAY	15,100.00	1,440.00	0.00	0.00	123,184	11,747	0	0	134,932	See assumptions
7) Water quality monitoring (3 samples/day)	15	DAY	3,600.00	50.00	200.00	150.00	54,386	755	3,021	2,266	60,429	Historical/Vendor
			TOTAL				4,650,631	1,106,887	1,336,658	473,690	7,567,866	

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER4 - PARTIAL REMOVAL, CAPPING AND ON-BASE DISPOSAL
NAVY CLEAN CTO 0218

Item	Qty	Unit	Unit Cost ($) Sub.	Mat.	Labor	Equip.	Total Cost ($) Sub.	Mat.	Labor	Equip.	Total Direct Cost ($)	Comments
Direct Cost Adjustment Factors												
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)							0	0	66,833	23,684	90,517	
Safety Level C Multiplier (25% of labor and equipment, as listed)							0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)							0	0	53,466	18,948	72,414	
			Subtotal Direct Costs				4,650,631	1,106,887	1,403,491	497,374	7,730,797	
Indirect Cost Adjustment Factors												
Labor Overhead @ 250% (for field mgmt. & home office, only)							0	0	1,554,030	0	1,554,030	
Field Construction Labor Overhead @ 75%							0	0	536,284	0	536,284	
Subcontract Overhead @ 10%							465,063	0	0	0	465,063	
Tax on Materials @ 5%							0	55,344	0	0	55,344	
G & A @ 10% (on labor, equip., & matl's.)							0	110,689	140,349	49,737	300,775	
			Subtotal Direct and Indirect Costs				5,115,695	1,272,920	3,634,154	547,111	10,642,294	
Cost Adjustment Factors												
City/Location Cost Adjustment Factor @ 7% (ref. 1)											744,961	
			Adjusted Direct and Indirect Costs				5,115,695	1,272,920	3,634,154	547,111	11,387,255	
Engineering @ 6 % of total direct and indirect											683,235	
Prime Contractor Fee @ 10% of Total Adjusted Cost											1,138,725	
			Total Costs								13,209,215	
Contingency @ 30% of Total Cost											3,962,765	
			TOTAL ESTIMATED COST								17,171,980	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors at this or other sites.

McAllister Point Landfill FS
Near Shore & Elevated Risk Off Shore Areas
Alternative 4 - Partial Removal, Capping and On-Base Disposal
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$17,171,980			$17,171,980
1	0.935		$120,872		$112,964
2	0.873		$120,872		$105,574
3	0.816		$120,872		$98,668
4	0.763		$120,872		$92,213
5	0.713		$120,872	$21,500	$101,509
6	0.666		$35,032		$23,343
7	0.623		$35,032		$21,816
8	0.582		$35,032		$20,389
9	0.544		$35,032		$19,055
10	0.508		$120,872	$21,500	$72,375
11	0.475		$35,032		$16,643
12	0.444		$35,032		$15,555
13	0.415		$35,032		$14,537
14	0.388		$35,032		$13,586
15	0.362		$120,872	$21,500	$51,602
16	0.339		$35,032		$11,867
17	0.317		$35,032		$11,090
18	0.296		$35,032		$10,365
19	0.277		$35,032		$9,687
20	0.258		$120,872	$21,500	$36,792
21	0.242		$35,032		$8,461
22	0.226		$35,032		$7,907
23	0.211		$35,032		$7,390
24	0.197		$35,032		$6,906
25	0.184		$120,872	$21,500	$26,232
26	0.172		$35,032		$6,032
27	0.161		$35,032		$5,638
28	0.150		$35,032		$5,269
29	0.141		$35,032		$4,924
30	0.131		$120,872	$21,500	$18,703
		TOTAL PRESENT WORTH =			$18,129,072

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

Near Shore & Elevated Risk Alternative 5: Removal with Disposal On and Off-Base

ASSUMPTIONS:

CAPITAL COST ITEMS:

1. Pre-Design Investigation

   - Soil borings/cores to further determine the grain size and nature of the sediments and to delineate lateral extent of contaminants exceeding the PRGs. Assume 35 soil borings at average 5-foot depth with associate analytical costs for PCBs, PAHs, Metals and geotechnical testing. Mob./demob. @ $13,500. Sample collection @ $600 each or $21,000. Analytical @ $1,350/sample for 41 samples including QA/QC samples or $55,350. Data validation $8,200. Reporting @ $4,500. Oversight and management @ $9,500. Total costs = $112,050.

   - This alternative requires the removal of all contaminated sediments. Consequently, sediments along approximately 600 feet of shoreline will be removed to depths exceeding the lower limits of the existing landfill toe revetment and the water table. This is likely to cause undermining of the revetment, which when combined with the existing hydrostatic pressures, is expected to cause slope failure. As a result, an investigation will be performed to evaluate slope stability concerns and to design a slope retention system (i.e. sheeting, shoring, etc.) that will allow removal of the contaminated sediments without jeopardizing the integrity of the existing landfill cap. the investigation will also determine if there is an environmental or engineering benefit to leaving the retention system in-place (only below the water line) such as long-term wash-out protection of the landfill toe or minimizing migration of contaminated sediments or groundwater. The estimated cost for the investigation is: 14 borings extending 20 feet into bedrock @ $4,000/boring including geologist oversight or $42,000. 14 samples will be collected and analyzed for geotechnical parameters @ $100/sample. The data will be evaluated and a slope stability design will be generated cost is estimated at $45,000. The total cost for this investigation is estimated at $88,400.

2. Mobilization/Demobilization includes providing office trailers, temporary utilities and sanitary facilities, delivery and removal of major construction equipment, and providing all other facilities and materials needed by the management staff.

3. It is assumed that no subgrade preparation will be required prior to dredging the contaminated sediments. Large metal and concrete debris will be removed from the sediments after they have been dredged, but prior to dewatering.

4. Erosion controls will be provided to reduce migration of sediments during the dredging operations by means of a silt boom. The silt boom will be anchored around the perimeter of the dredge area.

5. Removal of contaminated sediments (34,115 cuyd) will be accomplished through a combination of a shore-based excavation operation and a barge-based dredging operation. All work performed in the southern depositional (shallow) areas (approximately 11,182 cuyd) will be performed from the land using a portable cofferdam, dewatering pumps, and hydraulic excavation equipment. All other work in the remaining areas (approximately 22,933 cuyd) will be performed by barge-based crane and dredge equipment.

   -It is assumed that the dredging and cap construction activities will not be subject to CRMC restrictions which only allow dredging to occur between October-December. As a result, all dredging/construction work will occur within one mobilization period.

- Six-inch and smaller material will be screened from the dredge spoil at each work site and hauled to the onsite landfill. Boulders and cobbles greater than 6 inches will be rinsed of fine-grained sediment and reused as capping materials. It is assumed that 20% of the volume of dredged materials will be larger than 6 inches and reused and that chemical testing of the screened materials prior to placement will not be required. Concrete and metal debris will be placed in the landfill.

- A total of 27,292 cuyd of the dredge/excavation spoils generated, 6 inches and less, will require disposal. The existing landfill has an assumed available capacity of 21,267 cuyd. The remaining volume (6,025 cuyd) will be transported to off-site disposal facilities. It is assumed that 9% of the total volume disposed off site (542 cuyd) will require stabilization prior to landfill disposal and 1% of the total volume disposed off site (60 cuyd) will be disposed in a RCRA Subtitle C landfill. A summary of the assumed disposal methods is presented in the following table:

	Disposal Facility				
	McAllister Landfill	Subtitle D Landfill	Subtitle D with Stabilization	RCRA C Landfill	Total Volume
Volume (cuyd)	21,267	5,423	542	60	27,292

- The existing landfill cap earthen materials will be stripped, stockpiled and reinstalled after placement of the dredge spoils. The existing geosynthetics will be perforated and left in-place.

- An 8-hour work day is assumed for all construction activities. However, due to accessibility issues and construction difficulties, it is assumed that one hour per day will be required to maintain and mobilize equipment at each work site and one hour per day will be required to secure the work areas and remove equipment from each work site (net production = 6 hours per day). An analysis of overtime labor versus daily equipment rates should be performed at the design phase to determine if cost-benefits exist by working overtime.

BARGE BASED WORK

- It is assumed that Pier 1 at Coddington Cove will be used as a materials, dewatering, and office staging area at no cost. Dewatered dredge spoils will be staged at Pier 1 pending transport to the onsite landfill.

- Due to the presence of landfill debris such as the submarine netting, concrete rubble, boulders, large steel pieces, and shallow bedrock, it is assumed that it will not be feasible to drive sheet pile to stabilize the slope. For the purposes of this estimate only, it is assumed that the landfill slope will be stabilized by a retention system consisting of H-pile/soldier beams drilled 10-20' into the existing bedrock, placed on 5-foot centers, and cross braced with steel walers. The H-piles will serve as the main support for steel sheeting. The sheeting will be driven prior to dredging or, in the event refusal is encountered prior to the desired depth, the sheeting will be installed as the excavation/dredging of the contaminated sediment progresses. Sheeting materials will be removed after the completion of all dredging and backfill activities along the landfill toe. H-piles will be cut flush to grade. Implementation of this option assumes that equipment exists that can access the landfill toe, from either the landfill access road (approximately 100 feet laterally and 25 feet above the work area) or by barge (4-6 feet depth) to drill the H-pile sockets, install the H-piles, install the walers, and install the steel sheeting. The cost presented assumes that all of the work can be accomplished from the landfill access road.

- Preparation, maintenance, and removal of the Pier 1 staging area was estimated at a lump sum of $11,000, which includes 2 laborers and a backhoe for 10 days and misc. materials. Dewatering/screening activities will be performed on the barge and on shore (as required) to prepare the sediments for on-base disposal. It is assumed that the barge, crew, and dredging equipment cost is $8,600 per day and shore-based equipment to load/off-load materials to barge is $6,500/day. Dewatering/screening equipment and crew is assumed to cost $4,500 per day and is assumed that extensive dewatering will not be required each day. On-site bulking of the sediments is included in the dewatering cost (if necessary). It is assumed that the production rate for the dredging operation will be 200 cuyd per day and the operation will take 115 work days.

- It is assumed that 50 confirmation samples will be collected during the dredging operation to verify the all contaminated sediments exceeding the PRGs is removed. Samples will be analyzed for PCBs, metal, pesticides, and PAHs. Analytical costs are assumed to be $1,400/sample including shipping costs.

- Placement of approximately 22,933 cuyd of a sand/gravel/stone backfill will be performed by a crane on a barge. No bulking factor is assumed since the materials will be placed through the water column. Since 20% of the dredged material (4,587 cuyd) will be screened and re-used, only 18,346 cuyd of material will be required from off-site sources Barge rental with equipment and crew is assumed to be $8,600 per day, shore equipment to load/off-load materials to barge at $6,500/day; totaling $15,100/day. A production rate of 600 cuyd placed per day is assumed. Additional costs of a survey crew to verify grades during placement is assumed at $1,000/day.

- Miscellaneous large boulders will be installed over the sand/gravel/stone to help break waves and assist in habitat restoration. It is assumed that 6 boulders will be placed every 2,500 sf and it is estimated that boulders can be installed over a 15,000 sf area per day by barge.

- Water quality testing will be performed daily during dredging and cap installation activities. It assumed that three samples will be collected daily from outside of the silt curtain work area. Samples will be analyzed for PCBs, PAHs, metals, and total suspended solids (TSS).

SHORE BASED WORK

- A portable cofferdam system will be erected along the southern shoreline extending out to the 3-foot MLW line. The area will be continuously dewatered (24-hour per day) with pumps so that the excavation of sediments can occur in "dry" conditions. Excavated sediments will be screened and hauled directly to the landfill from the excavation site. Backfill materials will be placed immediately following removal of the contaminated sediments. An estimated 11,182 cuyd will be dredged/excavated in this manner. A total of 38 work days is estimated to complete the excavation work.

- Access to the work area will be from along the southeastern limits of the existing landfill, adjacent to the railroad tracks. Construction of a temporary haul road is not anticipated. Excavation, handling, and placement of materials will be accomplished using tracked excavators, a wheeled front-end loader, screener, and off-road dump trucks. Costs include a survey crew to verify grades during placement.

- The backfill materials consisting of sand/gravel/stone will be placed over an area approximately 85,336 sf. Assuming a bulking factor of 20%, approximately 13,418 cuyd of backfill will be placed. Also, since 20% of the dredged material (2,236 cuyd) will be screened and re-used, only 11,182 cuyd of material will be required from off-site sources.

- Miscellaneous large boulders will be installed over the sand/gravel/stone to help break waves and assist in habitat restoration. It is assumed that 6 boulders will be placed every 2,500 sf and it is estimated that boulders can be installed over a 30,000 sf area per day using the shore based equipment.

- Since this work will be performed concurrently with the barge-based work, no additional water quality testing is required.

O&M COST

Since all contamination will be removed, there are no operation and maintenance costs assumed for this alternative. However, there will be an inspection of the cap to verify habitat recovery in years 1, 2, and 5. Also, since contamination remains under the existing landfill cap, monitoring for chemical migration into the clean backfill sediments will also occur in years 1, 2, and 5.

1. Monitoring:

- Sediment chemistry (PCBs, PAHs, metals, Simultaneously Extracted Metals/Acid Volatile Sulfides (SEM/AVS)); 10 samples plus 3 QC samples
- Biota chemistry 10 samples (PCBs, PAHs, metals);
- Porewater chemistry (metals); 10 samples plus 3 QC samples
- Toxicity Amphipod; 10 samples
- Toxicity Arabacia; 10 samples

Labor: 1 event/year.

- Sediment/Porewater sampling: Sample collection with equipment and crew = approximately $485/sample. Collection of 10 samples = $4,850 (QC samples collected at no additional cost)
- Biota sampling : Sample collection with equipment and crew = approximately $1,043/sample. Collection of 10 samples = $10,430
- Proj. mgmt/coord. ≈ 30 hours/year @ $80/hr (w/O&P) = $2,400
- Annual: add $300 M&IE; ODCs & supplies @ $200; & shipping @ $200.
- Data Validation $5,808.
- Report prep. $9,500.

Total Labor ≅ $33,690 annually for years 1, 2 and 5

Estimated analytical costs:

- Sediment chemistry(PCBs, PAHs, metals,SEM/AVS) $1537/sample @ 13 samples/yr =$19,981
- Biota chemistry (PCBs, PAHs, metals) @ $1367/sample @ 10 samples/yr = $13,670
- Porewater chemistry @ $250/ sample @ 13 samples/yr = $3,250
- Toxicity Amphipod @ $863/ sample @ 10 samples/yr = $8,630
- Toxicity Arabacia @ $662/ sample @ 10 samples/yr = $6,620

Total Analytical ≅ $52,150 annually for years 1, 2, and 5

2. Inspection for Habitat Recovery:

   - Inspections to be performed by an Marine Biologist: Assume 2 days (8 hr/day) for inspection and travel and 2 days (16 hr) to prepare an inspection report. 32 hours total @ $80/hr = $2,560 plus $300 ODCs & travel costs, and $2,000 equipment costs (boat and underwater video). Total quarterly Inspection costs are $4,860. Total annual costs are $19,440.

3. 5-year reviews at 200 LOE @ $100/hr. Approx. $1500 ODCs. Total = <u>$ 21,500 per event</u>
   Assumed only 1 review to occur in year 5 because virtually all sediment > PRGs will be removed.

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER5 - REMOVAL WITH DISPOSAL ON AND OFF-BASE
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
PRE-DESIGN INVESTIGATION												
1) Sediment/soil borings and analyses	1	LS	112,050.00	0.00	0.00	0.00	112,050	0	0	0	112,050	See Assumptions
2) Slope stability analysis and design	1	LS	88,400.00	0.00	0.00	0.00	88,400	0	0	0	88,400	See Assumptions
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	23	MO	400.00	0.00	0.00	0.00	9,203	0	0	0	9,203	Historical data
3) Portable Communication Equipment	8	SETS	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	Historical data
4) Equipment Mobilization/Demobilization (support equip)	1	LS	40,000.00	0.00	0.00	0.00	40,000	0	0	0	40,000	Historical data
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities	23	MO	4,000.00	0.00	0.00	0.00	92,032	0	0	0	92,032	Historical data
7) 3 Pick-up Truck (rental)	23	MO	2,850.00	450.00	0.00	0.00	65,573	10,354	0	0	75,926	Historical data
8) Cerification/Close-out Reports	1	EA	7,000.00	2,000.00	15,000.00	3,000.00	7,000	2,000	15,000	3,000	27,000	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	23	MO	1,500.00	0.00	200.00	0.00	34,512	0	4,602	0	39,114	Vendor catalog
2) PPE rolloff cont.	23	MO	500.00	0.00	0.00	0.00	11,504	0	0	0	11,504	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	4,602	HR	0.00	0.00	35.86	0.00	0	0	165,013	0	165,013	Historical data
2) Site engineer	4,602	HR	0.00	0.00	32.00	0.00	0	0	147,251	0	147,251	Historical data
3) Site supervisor/foreman	4,602	HR	0.00	0.00	30.00	0.00	0	0	138,048	0	138,048	Historical data
4) Site safety officer	4,602	HR	0.00	0.00	25.00	0.00	0	0	115,040	0	115,040	Historical data
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	920	HR	0.00	0.00	45.00	0.00	0	0	41,414	0	41,414	Historical data
2) Project administrator	690	HR	0.00	0.00	30.00	0.00	0	0	20,707	0	20,707	Historical data
3) Health and Safety director	230	HR	0.00	0.00	35.00	0.00	0	0	8,053	0	8,053	Historical data
4) Procurement/subcontracting	2,301	HR	0.00	0.00	30.00	0.00	0	0	69,024	0	69,024	Historical data
5) Clerical support	2,301	HR	0.00	0.00	12.36	0.00	0	0	28,438	0	28,438	Historical data
LANDFILL CAP PREP. AND RESTORATION												
1) Survey control (2-man crew)	3,600	HR	0.00	0.00	60.00	15.00	0	0	216,000	54,000	270,000	Historical data
2) Silt Fence	5,000	LF	0.00	0.50	0.35		0	2,500	1,750	0	4,250	022-700-1100
3) Strip existing cap soils and stockpile	7,259	CY	0.00	0.00	0.62	2.09	0	0	4,501	15,171	19,672	17-01-0502
3a) Remove and stage shrubs	1	LS	2,500.00	0.00			2,500	0	0	0	2,500	Historical data
4) Dredge spoil placement (12" lifts, 3 mile R/T)	21,266	CY	0.00	0.26	1.83	6.17	0	5,529	38,917	131,211	175,657	17-03-0422
5) 6" cap layer	1,815	CY	0.00	0.26	1.52	4.76	0	472	2,759	8,639	11,870	17-03-0422
6) Gas vent layer 12"	3,630	CY	0.00	9.11	0.82	2.11	0	33,069	2,977	7,659	43,705	17-03-046
6a) extend/finish existing gas vents	18	EA	500.00	0.00	0.00	0.00	9,000	0	0	0	9,000	Historical data
7) GCL furnish and install	98,000	SF	0.00	0.25	0.07	0.07	0	24,500	6,860	6,860	38,220	33-08-0543
8) 40 mil VLDPE furnish and install	98,000	SF	0.00	0.41	1.07	0.11	0	40,180	104,860	10,780	155,820	33-08-0544
9) 12" drainage layer	3,630	CY	0.00	12.00	0.23	0.34	0	43,560	835	1,234	45,629	Historical data
10) Geotextile furnish and install	10,889	SY	0.00	0.56	0.33	0.03	0	6,098	3,593	327	10,018	33-08-0532
11) 18" Cover soil layer (reuse)	7,259	CY	0.00	0.00	0.23	0.34	0	0	1,670	2,468	4,138	Historical data
12) 6" Topsoil (reuse 70% from existing cap)	1,290	CY	0.00	0.00	1.43	5.14	0	0	1,845	6,631	8,475	18-05-0302
13) 6" Topsoil (30% from off-site)	540	CY	0.00	16.62	3.29	3.62	0	8,975	1,777	1,955	12,706	18-05-0301

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER5 - REMOVAL WITH DISPOSAL ON AND OFF-BASE
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
14) Root reinforcing mat (slopes only)	8,756	SY	0.00	0.78	0.21	0.07	0	6,830	1,839	613	9,281	022-704-0010
15) Jute mat (slopes only)	8,756	SY	0.00	1.75	0.20	0.07	0	15,323	1,751	613	17,687	022-704-0200
16) Extend & finish monitoring wells	2	EA	1,000.00	0.00	0.00	0.00	2,000	0	0	0	2,000	Historical data
17) Revegetation (hydroseed & reuse shrubs)	2.30	AC	589.62	0.00	1,000.00	200.00	1,356	0	2,300	460	4,116	Historical data
18) Restore operations areas	2	AC	5,000.00	0.00	0.00	0.00	10,000	0	0	0	10,000	Historical data
19) Geotechnical testing	150	DY	0.00	5.00	800.00	50.00	0	750	120,000	7,500	128,250	Historical data
20) Revise as-built records and cert. report.	1	EA	0.00	1,000.00	11,000.00	1,500.00	0	1,000	11,000	1,500	13,500	Historical data
DREDGING/WATER TREATMENT												
1) Erosion control, silt boom	3,000	LF	0.00	10.00	4.00	4.00	0	30,000	12,000	12,000	54,000	Historical data
2) Mob/Demob (barge and pier based equip.)	1	LS	167,600.00	0.00	0.00	0.00	167,600	0	0	0	167,600	Vendor Info.
3) Mob/Demob (shore based equip.)	1	LS	5,000.00	0.00	0.00	0.00	5,000	0	0	0	5,000	Vendor Info.
4) Prep., maint., and removal of staging area	1	LS	0.00	1,000.00	7,000.00	3,000.00	0	1,000	7,000	3,000	11,000	Vendor Info.
5) Mobilization/demobilization of drilling equipment	1	LS	100,000.00	0.00	0.00	0.00	100,000	0	0	0	100,000	Historical data
6) Drill sockets for H-piles	3,600	LF	150.00	0.00	0.00	0.00	540,000	0	0	0	540,000	Historical data
7) Mobilization/demob pile/sheet driving equipment	1	LS	75,000.00	0.00	0.00	0.00	75,000	0	0	0	75,000	Historical data
8) Install/grout H-piles and walers @57#/lf)	154	TN	0.00	1,162.50	122.25	228.75	0	178,909	18,814	35,205	232,928	R021-610
9) Install/remove sheeting	18,000	SF	0.00	4.09	5.16	11.60	0	73,620	92,880	208,800	375,300	Historical data
10) Remove H-piles (cut flush to grade)	120	EA	0.00	100.00	250.00	1,200.00	0	12,000	30,000	144,000	186,000	Historical data
11) Porta Dam (install, rental, takedown)	1,200	LF	150.00	0.00	0.00	0.00	180,000	0	0	0	180,000	Historical data
12) Porta Dam dewatering	37	DAY	0.00	0.00	665.00	150.00	0	0	24,787	5,591	30,378	021-440-0410
13) Heavy equipment mob/demob (shore based)	1	LS	10,000.00	0.00	0.00	0.00	10,000	0	0	0	10,000	Historical data
14) Excavate/screen/haul sediments (shore based)	11,182	CY	0.00	0.00	4.93	12.23	0	0	55,127	136,756	191,883	022-238-300
15) Dredge sediments (barge)	22,933	CY	43.00	0.00	0.00	0.00	986,119	0	0	0	986,119	Vendor Info.
16) Treatment of dredge water	115	DAY	4,500.00	0.00	0.00	0.00	515,993	0	0	0	515,993	Vendor Info.
17) Removal of sediments from barge	22,933	CY	32.50	0.00	0.00	0.00	745,323	0	0	0	745,323	Vendor Info.
18) Sediment confirmation testing	50	EA	1,400.00	0.00	0.00	0.00	70,000	0	0	0	70,000	Historical data
19) Water Quality Testing	115	DAY	3,600.00	50.00	200.00	150.00	412,794	5,733	22,933	17,200	458,660	Historical data
20) Disposal/Transport to RCRA D Landfill	8,134	TN	110.00	0.00	0.00	0.00	894,713	0	0	0	894,713	Vendor Info.
21) D/T to RCRA D Landfill w/ stabilization	813	TN	350.00	0.00	0.00	0.00	284,681	0	0	0	284,681	Vendor Info.
22) Disposal/Transport to RCRA C Landfill	90	TN	500.00	0.00	0.00	0.00	45,188	0	0	0	45,188	Vendor Info.
BACKFILL PLACEMENT												
1) Installation of 2 feet imported sand/gravel/stone (shore b	11,182	CY	0.00	15.00	4.93	11.23	0	167,730	55,127	125,574	348,431	Vendor Info.
2) Installation of 2 feet screened sand/gravel/stone (shore b	2,236	CY	0.00	0.00	4.93	11.23	0	0	11,025	25,115	36,140	Vendor Info.
3) Strategically Placed Boulders (shore based)	3	DAY	0.00	2,880.00	2,960.00	6,740.00	0	8,640	8,880	20,220	37,740	See assumptions
4) Installation of 2 foot imported sand/gravel cap (barge bas	18,346	CY	25.17	15.00	1.66	0.00	461,779	275,196	30,455	0	767,430	Vendor Info.
5) Installation of 2 foot screened sand/gravel cap (barge bas	4,587	CY	25.17	0.00	1.66	0.00	115,445	0	7,614	0	123,058	Vendor Info.
6) Strategically Placed Boulders (barge based)	8	DAY	15,100.00	1,440.00	0.00	0.00	120,800	11,520	0	0	132,320	See assumptions
7) Water quality monitoring (3 samples/day)	38	DAY	3,600.00	50.00	200.00	150.00	137,598	1,911	7,644	5,733	152,887	Historical/Vendor
			TOTAL				6,359,361	967,398	1,662,109	999,815	9,988,683	

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER5 - REMOVAL WITH DISPOSAL ON AND OFF-BASE
NAVY CLEAN CTO 0218

Item	Qty	Unit	Unit Cost ($) Sub.	Mat.	Labor	Equip.	Total Cost ($) Sub.	Mat.	Labor	Equip.	Total Direct Cost ($)	Comments
Direct Cost Adjustment Factors												
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)							0	0	83,105	49,991	133,096	
Safety Level C Multiplier (25% of labor and equipment, as listed)							0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)							0	0	66,484	39,993	106,477	
			Subtotal Direct Costs				6,359,361	967,398	1,745,215	1,049,805	10,228,256	
Indirect Cost Adjustment Factors												
Labor Overhead @ 250% (for field mgmt. & home office, only)							0	0	1,869,972	0	1,869,972	
Field Construction Labor Overhead @ 75%							0	0	685,590	0	685,590	
Subcontract Overhead @ 10%							635,936	0	0	0	635,936	
Tax on Materials @ 5%							0	48,370	0	0	48,370	
G & A @ 10% (on labor, equip., & matl's.)							0	96,740	174,521	104,981	376,242	
			Subtotal Direct and Indirect Costs				6,995,297	1,112,508	4,475,299	1,154,786	13,844,367	
Cost Adjustment Factors												
City/Location Cost Adjustment Factor @ 7% (ref. 1)											969,106	
			Adjusted Direct and Indirect Costs				6,995,297	1,112,508	4,475,299	1,154,786	14,813,473	
Engineering @ 6 % of total direct and indirect											888,808	
Prime Contractor Fee @ 10% of Total Adjusted Cost											1,481,347	
			Total Costs								17,183,628	
Contingency @ 30% of Total Cost											5,155,088	
			TOTAL ESTIMATED COST								22,338,717	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors or actual costs at this or other sites.

McAllister Point Landfill FS
Near Shore Alternative 5 - Removal with Disposal On and Off-Base
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$22,338,717			$22,338,717
1	0.935		$105,280		$98,393
2	0.873		$105,280		$91,956
3	0.816				$0
4	0.763				$0
5	0.713		$105,280	$21,500	$90,392
6	0.666				$0
7	0.623				$0
8	0.582				$0
9	0.544				$0
10	0.508				$0
11	0.475				$0
12	0.444				$0
13	0.415				$0
14	0.388				$0
15	0.362				$0
16	0.339				$0
17	0.317				$0
18	0.296				$0
19	0.277				$0
20	0.258				$0
21	0.242				$0
22	0.226				$0
23	0.211				$0
24	0.197				$0
25	0.184				$0
26	0.172				$0
27	0.161				$0
28	0.150				$0
29	0.141				$0
30	0.131				$0
		TOTAL PRESENT WORTH =			$22,619,457

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

APPENDIX F-2

OFFSHORE ALTERNATIVES COST ESTIMATES

Brown & Root Environmental			*Calculation Sheet*
Client: Navy CLEAN	File No. 5278	**By:** BC/	**Page** 1 of 1
Subject: Assumptions and Cost Basis, McAllister Point FS, OS-1, CTO 218		**Checked by:** RS	**Date:** 24 Oct 97

Off Shore Alternative 1: No Action

ASSUMPTIONS:

1. 5-year reviews at 200 LOE @ $100/hr. Approx. $1500 ODCs. Total = $ 21500 per event. Reviews to occur in years 5, 10, 15, 20, 25, and 30.

McAllister Point Landfill FS
Off Shore Alternative 1 - No Action
Newport, Rhode Island
Present Worth Analysis

T WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$0			$0
1	0.935		$0		$0
2	0.873		$0		$0
3	0.816		$0		$0
4	0.763		$0		$0
5	0.713		$0	$21,500	$15,329
6	0.666		$0		$0
7	0.623		$0		$0
8	0.582		$0		$0
9	0.544		$0		$0
10	0.508		$0	$21,500	$10,930
11	0.475		$0		$0
12	0.444		$0		$0
13	0.415		$0		$0
14	0.388		$0		$0
15	0.362		$0	$21,500	$7,793
16	0.339		$0		$0
17	0.317		$0		$0
18	0.296		$0		$0
19	0.277		$0		$0
20	0.258		$0	$21,500	$5,556
21	0.242		$0		$0
22	0.226		$0		$0
23	0.211		$0		$0
24	0.197		$0		$0
25	0.184		$0	$21,500	$3,961
26	0.172		$0		$0
27	0.161		$0		$0
28	0.150		$0		$0
29	0.141		$0		$0
30	0.131		$0	$21,500	$2,824
		TOTAL PRESENT WORTH =			$46,393

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

Brown & Root Environmental			Calculation Sheet
Client: Navy CLEAN	File No. 5278	**By:** GB	**Page** 1 of 1
Subject: Assumptions and Cost Basis, McAllister Point FS, OS-2, CTO 218		**Checked by:** DM	**Date:** 10 APR 98

Off Shore Alternative 2: Limited Action

ASSUMPTIONS:

1. Long-term Monitoring:

- Sediment chemistry (PCBs, PAHs, metals, Simoultaneously Extracted Metals/Acid Volatile Sulfides (SEM/AVS)); 16 samples plus 4 QC samples
- Biota chemistry 16 samples (PCBs, PAHs, metals);
- Toxicity Amphipod; 16 samples
- Toxicity Arabacia; 16 samples

Labor: 1 event/year.

- Sediment sampling: Sample collection with equipment and crew = approximately $485/sample. Collection of 16 samples = $7,760 (QC samples collected at no additional cost)
- Biota sampling : Sample collection with equipment and crew = approximately $1043/sample. Collection of 16 samples = $16,688
- Proj. mgmt/coord. ≈ 30 hours/year @ $80/hr (w/O&P) = $2,400
- Annual: add $500 M&IE; ODCs & supplies @ $300; & shipping @ $300.
- Data Validation $9,240.
- Report prep. $12,200.

Total Labor ≅ $40,148 annually for years 1-5 and at 5 -year review cycles

Estimated analytical costs:

- Sediment chemistry (PCBs, PAHs, metals, SEM/AVS) $1537/sample @ 20 samples/yr = $30,740
- Biota chemistry (PCBs, PAHs, metals) @ $1367/sample @ 16 samples/yr = $21,872
- Toxicity Amphipod @ $863/ sample @ 16 samples/yr = $13,808
- Toxicity Arabacia @ $662/ sample @ 16 samples/yr = $10,592

Total Analytical ≅ $70,012 annually for years 1-5 and at 5 -year review cycles

2. 5-year reviews at 200 LOE @ $100/hr. Approx. $1500 ODCs. Total = $21500 per event
Reviews to occur in years 5, 10, 15, 20, 25, and 30.

McAllister Point Landfill FS
Off Shore Alternative 2 - Limited Action
Newport, Rhode Island
Present Worth Analysis

T WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$0			$0
1	0.935		$110,160		$102,953
2	0.873		$110,160		$96,218
3	0.816		$110,160		$89,923
4	0.763		$110,160		$84,041
5	0.713		$110,160	$21,500	$93,872
6	0.666		$0		$0
7	0.623		$0		$0
8	0.582		$0		$0
9	0.544		$0		$0
10	0.508		$110,160	$21,500	$66,929
11	0.475		$0		$0
12	0.444		$0		$0
13	0.415		$0		$0
14	0.388		$0		$0
15	0.362		$110,160	$21,500	$47,720
16	0.339		$0		$0
17	0.317		$0		$0
18	0.296		$0		$0
19	0.277		$0		$0
20	0.258		$110,160	$21,500	$34,023
21	0.242		$0		$0
22	0.226		$0		$0
23	0.211		$0		$0
24	0.197		$0		$0
25	0.184		$110,160	$21,500	$24,258
26	0.172		$0		$0
27	0.161		$0		$0
28	0.150		$0		$0
29	0.141		$0		$0
30	0.131		$110,160	$21,500	$17,296
		TOTAL PRESENT WORTH =			$657,233

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

Off Shore Alternative 3: Containment/Capping

ASSUMPTIONS:

CAPITAL COST ITEMS:

1. Pre-Design Investigation

   - Underwater video inspection of the existing surface to survey the area and to determine if any debris requires removal prior to installation of the cap. Assume $7,500 for the survey.

   - Soil borings/cores to further determine the grain size and nature of the sediments and to delineate lateral extent of contaminants exceeding the PRGs. Assume 42 soil borings (3 soil borings per polygon) at an average 5-foot depth with associate analytical costs for PCBs, PAHs, Metals and geotechnical testing. Mob./demob. @ $13,500. Sample collection @ $600 each or $24,600. Analytical @ $1,350/sample for 50 samples including QA/QC samples or $67,500. Data validation $11,400. Reporting @ $6,000. Oversight and management @ $12,500. Total costs = $135,500.

2. Mobilization/Demobilization includes providing office trailers, temporary utilities and sanitary facilities, delivery and removal of major construction equipment, and providing all other facilities and materials needed by the management staff.

3. It is assumed that no subgrade preparation will be required prior to installation of the off shore cap. An underwater video would be taken in the pre-design investigation as verification of this assumption.

4. Erosion controls will be provided to reduce migration of sediments during the cap installation by means of a silt boom. The silt boom will be anchored around the perimeter of the cap area(s).

5. The cap system will be installed over approximately 40.9 acres of contaminated sediments. Total area = 1,781,604 sf. The cap will include:

   - Large concrete monuments (3'w X 3'H X 3'L) will be placed in the cap area prior to cap placement. These monuments will serve as a marker for the offshore cap location, a depth-of-fill marker during cap placement, and as a mechanism to monitor potential cap erosion. It is estimated that 3 markers will be placed per polygon.

   - Placement of the 2-foot sand and gravel layer (131,970 cuyd) will be performed by a crane on a barge. The cap will extend 10 feet beyond the limit of contaminated sediments and be anchored into the ocean floor. Barge rental with equipment and crew is assumed to be $8,600 per day, shore equipment to load/off-load materials to barge at $6,500/day; totaling $15,100/day. A production rate of 600 cuyd placed per day is assumed. Additional costs of a survey crew to verify grades during placement is assumed at $1,000/day. Assume that 600 cuyd of cap material can be placed per day. Assume 219 days of installation for the cap system using one barge/crane unit.

   - It is assumed that Pier 1 at Coddington Cove will be used as a materials and office staging area at no cost.

-It is assumed that the cap construction activities will not be subject to CRMC restrictions which only allow dredging to occur between October-December. As a result, all construction work will occur within one mobilization period.

- Miscellaneous large boulders will be installed over the sand/gravel/stone to help break waves and assist in habitat restoration. It is assumed that 6 boulders will be placed every 2,500 sf and it is estimated that boulders can be installed over a 15,000 sf area per day by barge.

- Water quality testing will be performed daily during cap installation activities. It assumed that 3 samples will be collected daily from around the perimeter of the work area. Samples will be analyzed for PCBs, PAHs, metals, and total suspended solids (TSS).

O&M COSTS

1. Long-term Monitoring:

- Sediment chemistry (PCBs, PAHs, metals, Simultaneously Extracted Metals/Acid Volatile Sulfides (SEM/AVS)); 16 samples plus 4 QC samples;
- Biota chemistry 16 samples (PCBs, PAHs, metals);
- Toxicity Amphipod; 16 samples
- Toxicity Arabacia; 16 samples

Labor: 1 event/year.

- Sediment sampling: Sample collection with equipment and crew = approximately $485/sample. Collection of 16 samples = $7,760 (QC samples collected at no additional cost)
- Biota sampling : Sample collection with equipment and crew = approximately $1043/sample. Collection of 16 samples = $16,688
- Proj. mgmt/coord. ≈ 30 hours/year @ $80/hr (w/O&P) = $2,400
- Annual: add $500 M&IE; ODCs & supplies @ $300; & shipping @ $300.
- Data Validation $9,240.
- Report prep. $12,200.

Total Labor ≅ $40,148 annually for years 1-5 and at 5 -year review cycles

Estimated analytical costs:

- Sediment chemistry (PCBs, PAHs, metals, SEM/AVS) $1537/sample @ 20 samples/yr = $30,740
- Biota chemistry (PCBs, PAHs, metals) @ $1367/sample @ 16 samples/yr = $21,872
- Toxicity Amphipod @ $863/ sample @ 16 samples/yr = $13,808
- Toxicity Arabacia @ $662/ sample @ 16 samples/yr = $10,592

Total Analytical ≅ $70,012 annually for years 1-5 and at 5 -year review cycles

2. 5-year reviews at 200 LOE @ $100/hr. Approx. $1500 ODCs. Total = $21500 per event
Reviews to occur in years 5, 10, 15, 20, 25, and 30.

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
OS-3 - CAPPING, INST. CONTROLS, NAT. ATTEN. LONG-TERM MONIT.
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
PRE-DESIGN INVESTIGATION												
1) Topographic survey	1	LS	7,500.00	0.00	0.00	0.00	7,500	0	0	0	7,500	Vendor Info.
2) Additional soils boring and analyses	1	LS	135,500.00	0.00	0.00	0.00	135,500	0	0	0	135,500	See Assumptions
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	21	MO	400.00	0.00	0.00	0.00	8,454	0	0	0	8,454	Historical data
2) Storage Trailer (1 ea)	21	MO	100.00	0.00	0.00	0.00	2,114	0	0	0	2,114	Historical data
3) Portable Communication Equipment	8	SETS	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	
4) Equipment Mobilization/Demobilization	1	LS	15,000.00	0.00	0.00	0.00	15,000	0	0	0	15,000	
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities	21	MO	4,000.00	0.00	0.00	0.00	84,545	0	0	0	84,545	
7) 3 Pick-up Truck (lease, fuel, oil)	21	MO	2,850.00	450.00	0.00	0.00	60,238	9,511	0	0	69,750	Historical data
8) Certification/Close-out Reports	1	LS	3,500.00	12,000.00	15,000.00	0.00	3,500	12,000	15,000	0	30,500	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	21	MO	500.00	0.00	200.00	0.00	10,568	0	4,227	0	14,795	Vendor catalog
2) PPE rolloff cont.	21	MO	500.00	0.00	0.00	0.00	10,568	0	0	0	10,568	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	4,227	HR	0.00	0.00	35.86	0.00	0	0	151,589	0	151,589	
2) Site supervisor/foreman	4,227	HR	0.00	0.00	30.00	0.00	0	0	126,817	0	126,817	
3) Site safety officer	4,227	HR	0.00	0.00	25.00	0.00	0	0	105,681	0	105,681	
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	845	HR	0.00	0.00	45.00	0.00	0	0	38,045	0	38,045	
2) Project administrator	634	HR	0.00	0.00	30.00	0.00	0	0	19,023	0	19,023	
3) Health and Safety director	211	HR	0.00	0.00	35.00	0.00	0	0	7,398	0	7,398	
4) Procurement/subcontracting	2,114	HR	0.00	0.00	30.00	0.00	0	0	63,409	0	63,409	
5) Clerical support	2,114	HR	0.00	0.00	12.36	0.00	0	0	26,124	0	26,124	
COVER SYSTEM PLACEMENT	1,781,604	SF										
1) Erosion control, silt boom	3,000	LF	0.00	10.00	4.00	4.00	0	30,000	12,000	12,000	54,000	Vendor Info.
2) Mob/Demob (barge and pier based equip.)	1	LS	57,600.00	0.00	0.00	0.00	57,600	0	0	0	57,600	Vendor Info.
3) Install concrete monuments (1 polygon/day)	42	EA	5,366.67	300.00	1,000.00	1,500.00	225,400	12,600	42,000	63,000	343,000	Vendor Info.
3) Installation of 2 foot sand/gravel cap	131,971	CY	25.17	15.00	1.66	0.00	3,321,702	1,979,560	219,071	0	5,520,333	Vendor Info.
4) Strategically Placed Boulders	119	DAY	15,100.00	1,440.00	0.00	0.00	1,793,481	171,034	0	0	1,964,515	See assumptions
5) Water quality monitoring (3 samples/day)	234	DAY	3,600.00	50.00	200.00	150.00	842,224	11,698	46,790	35,093	935,804	Historical/Vendor

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
OS-3 - CAPPING, INST. CONTROLS, NAT. ATTEN. LONG-TERM MONIT.
NAVY CLEAN CTO 0218

	Total Cost ($) Sub.	Mat.	Labor	Equip.	Total Direct Cost ($)	Comments
TOTAL	6,584,595	2,226,403	877,175	110,093	9,798,265	
Direct Cost Adjustment Factors						
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)	0	0	43,859	5,505	49,363	
Safety Level C Multiplier (25% of labor and equipment, as listed)	0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)	0	0	35,087	4,404	39,491	
Subtotal Direct Costs	6,584,595	2,226,403	921,034	115,597	9,887,119	
Indirect Cost Adjustment Factors						
Labor Overhead @ 250% (for field mgmt. & home office, only)	0	0	1,345,216	0	1,345,216	
Field Construction Labor Overhead @ 75%	0	0	219,224	0	219,224	
Subcontract Overhead @ 10%	658,459	0	0	0	658,459	
Tax on Materials @ 5%	0	111,320	0	0	111,320	
G & A @ 10% (on labor, equip., & matl's.)	0	222,640	92,103	11,560	326,303	
Subtotal Direct and Indirect Costs	7,243,054	2,560,363	2,577,577	127,157	12,547,642	
Cost Adjustment Factors						
City/Location Cost Adjustment Factor @ 7% (ref. 1)					878,335	
Adjusted Direct and Indirect Costs	7,243,054	2,560,363	2,577,577	127,157	13,425,977	
Engineering @ 6 % of total direct and indirect					805,559	
Prime Contractor Fee @ 10% of Total Adjusted Cost					1,342,598	
Total Costs					15,574,133	
Contingency @ 30% of Total Cost					4,672,240	
TOTAL ESTIMATED COST					20,246,373	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors at this or other sites.

McAllister Point Landfill FS
Off Shore Alternative 3 - Capping
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$20,246,373			$20,246,373
1	0.935		$110,160		$102,953
2	0.873		$110,160		$96,218
3	0.816		$110,160		$89,923
4	0.763		$110,160		$84,041
5	0.713		$110,160	$21,500	$93,872
6	0.666				$0
7	0.623				$0
8	0.582				$0
9	0.544				$0
10	0.508		$110,160	$21,500	$66,929
11	0.475				$0
12	0.444				$0
13	0.415				$0
14	0.388				$0
15	0.362		$110,160	$21,500	$47,720
16	0.339				$0
17	0.317				$0
18	0.296				$0
19	0.277				$0
20	0.258		$110,160	$21,500	$34,023
21	0.242				$0
22	0.226				$0
23	0.211				$0
24	0.197				$0
25	0.184		$110,160	$21,500	$24,258
26	0.172				$0
27	0.161				$0
28	0.150				$0
29	0.141				$0
30	0.131		$110,160	$21,500	$17,296
		TOTAL PRESENT WORTH =			$20,903,606

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

Off Shore Alternative 4: Removal and Off-Base Disposal

ASSUMPTIONS:

CAPITAL COST ITEMS:

1. Pre-Design Investigation

   - Soil borings/cores to further determine the grain size and nature of the sediments and to delineate lateral extent of contaminants exceeding the PRGs. Assume 42 soil borings (3 soil borings per polygon) at an average 5-foot depth with associate analytical costs for PCBs, PAHs, Metals and geotechnical testing. Mob./demob. @ $13,500. Sample collection @ $600 each or $24,600. Analytical @ $1,350/sample for 50 samples including QA/QC samples or $67,500. Data validation $11,400. Reporting @ $6,000. Oversight and management @ $12,500. Total costs = $135,500.

2. Mobilization/Demobilization includes providing office trailers, temporary utilities and sanitary facilities, delivery and removal of major construction equipment, and providing all other facilities and materials needed by the management staff.

3. It is assumed that no subgrade preparation will be required prior to dredging the contaminated sediments. Large metal and concrete debris will be removed from the sediments after they have been dredged, but prior to dewatering.

4. Erosion controls will be provided to reduce the migration of sediments during the dredging operations by means of a silt boom. The silt boom will be anchored around the perimeter of the dredge area.

5. This alternative requires the dredging of all sediments exceeding the PRGs. It is assumed that the average depth of contaminated sediments is 1 foot over a 1,781,604 sf area. However, an average dredge depth of 1.5 feet is estimated due to over excavation resulting from the accuracy limitations of typical dredge equipment. The total dredged volume is therefore assumed to be 98,978 cuyd.

   - Preparation, maintenance, and removal of the Pier 1 staging area was estimated at a lump sum of $11,000, which includes 2 laborers and a backhoe for 10 days and misc. materials. Dewatering/screening activities will be performed on the barge and on shore (as required) to prepare the sediments for on-base disposal. It is assumed that the barge, crew, and dredging equipment cost is $8,600 per day and shore-based equipment to load/off-load materials to barge is $6,500/day. Dewatering/screening equipment and crew is assumed to cost $4,500 per day and is assumed that extensive dewatering will not be required each day. On-site bulking of the sediments is included in the dewatering cost (if necessary). It is assumed that the production rate for the dredging operation will be 200 cuyd per day and the operation will take 495 work days for one dredge crew. It is assumed that multiple dredge crews will be used such that the duration of the dredging will not exceed 165 days.

   -It is assumed that the dredging activities will not be subject to CRMC restrictions which only allow dredging to occur between October-December. As a result, all dredging/construction work will occur within one mobilization period.

   - Six-inch and smaller material and concrete and metal debris will be screened from the dredge spoil at each work site and hauled to a RCRA D landfill. Boulders and cobbles greater than 6 inches will be rinsed of fine-grained sediment and reused as backfill materials. It is assumed

that 20% of the volume of dredged materials will be larger than 6 inches and reused and that chemical testing of the screened materials prior to placement will not be required.

- Backfill materials will be limited only to the placement of screened dredge spoil (19,796 cuyd). No additional backfill will be required. Placement of the backfill will be performed by a crane on a barge. Barge rental with equipment and crew is assumed to be $8,600 per day, shore equipment to load/off-load materials to barge at $6,500/day; totaling $15,100/day. A production rate of 600 cuyd placed per day is assumed. Additional costs of a survey crew to verify grades during placement is assumed at $1,000/day.

- An 8-hour work day is assumed for all construction activities. However, due to accessibility issues and construction difficulties, it is assumed that one hour per day will be required to maintain and mobilize equipment at each work site and one hour per day will be required to secure the work areas and remove equipment from each work site (net production = 6 hours per day). An analysis of overtime labor versus daily equipment rates should be performed at the design phase to determine if cost-benefits exist by working overtime.

- It is assumed that Pier 1 at Coddington Cove will be used as a materials, dewatering, and office staging area at no cost. Dewatered dredge spoils will be staged at Pier 1 pending transport to the onsite landfill.

- It is assumed that 50 confirmation samples will be collected during the dredging operation to verify the all contaminated sediments exceeding the PRGs is removed. Samples will be analyzed for PCBs, metal, pesticides, and PAHs. Analytical costs are assumed to be $1,400/sample including shipping costs.

- Miscellaneous large boulders will be installed over the sand/gravel/stone to help break waves and assist in habitat restoration. It is assumed that 6 boulders will be placed every 2,500 sf and it is estimated that boulders can be installed over a 15,000 sf area per day by barge.

- Water quality testing will be performed daily during dredging and cap installation activities. It assumed that three samples will be collected daily from outside of the silt curtain work area. Samples will be analyzed for PCBs, PAHs, metals, and total suspended solids (TSS).

6. Inspection for Habitat Recovery:

- Inspections to be performed by an Marine Biologist: Assume 2 days (8 hr/day) for inspection and travel and 2 days (16 hr) to prepare an inspection report. 32 hours total @ $80/hr = $2,560 plus $300 ODCs & travel costs, and $2,000 equipment costs (boat and underwater video). Total quarterly Inspection costs are $4,860. Total annual costs are $19,440. Assume habitat inspections are conducted in years 1, 2, and 5.

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
OS - 4 - REMOVAL AND OFF-BASE DISPOSAL
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
PRE-DESIGN INVESTIGATION												
1) Additional soils boring and analyses	1	LS	135,500.00			0.00	135,500	0	0	0	135,500	ee assumption
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	14	MO	400.00	0.00	0.00	0.00	5,439	0	0	0	5,439	Historical data
2) Storage Trailer (1 ea)	14	MO	100.00	0.00	0.00	0.00	1,360	0	0	0	1,360	Historical data
3) Portable Communication Equipment	8	SETS	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	Historical data
4) Equipment Mobilization/Demobilization	1	LS	25,000.00	0.00	0.00	0.00	25,000	0	0	0	25,000	Historical data
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities	14	MO	4,000.00	0.00	0.00	0.00	54,391	0	0	0	54,391	Historical data
7) 3 Pick-up Truck (rental)	14	MO	2,850.00	450.00	0.00	0.00	38,754	6,119	0	0	44,873	Historical data
8) Cerification/Close-out Reports	1	EA	7,000.00	2,000.00	15,000.00	3,000.00	7,000	2,000	15,000	3,000	27,000	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	14	MO	500.00	0.00	200.00	0.00	6,799	0	2,720	0	9,518	Vendor catalog
2) PPE rolloff cont.	14	MO	500.00	0.00	0.00	0.00	6,799	0	0	0	6,799	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	2,720	HR	0.00	0.00	35.86	0.00	0	0	97,523	0	97,523	Historical data
2) Site supervisor/foreman	2,720	HR	0.00	0.00	30.00	0.00	0	0	81,587	0	81,587	Historical data
3) Site safety officer	2,720	HR	0.00	0.00	25.00	0.00	0	0	67,989	0	67,989	Historical data
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	544	HR	0.00	0.00	45.00	0.00	0	0	24,476	0	24,476	Historical data
2) Project administrator	408	HR	0.00	0.00	30.00	0.00	0	0	12,238	0	12,238	Historical data
3) Health and Safety director	136	HR	0.00	0.00	35.00	0.00	0	0	4,759	0	4,759	Historical data
4) Procurement/subcontracting	1,360	HR	0.00	0.00	30.00	0.00	0	0	40,793	0	40,793	Historical data
5) Clerical support	1,360	HR	0.00	0.00	12.36	0.00	0	0	16,807	0	16,807	Historical data
DREDGING/WATER TREATMENT												
1) Erosion control, silt boom	5,000	LF	0.00	10.00	4.00	4.00	0	50,000	20,000	20,000	90,000	Historical data
2) Mob/Demob (barge and pier based equip.)	1	LS	167,600.00	0.00	0.00	0.00	167,600	0	0	0	167,600	Vendor Info.
3) Prep., maint., and removal of staging area	1	LS	0.00	1,000.00	7,000.00	3,000.00	0	1,000	7,000	3,000	11,000	Vendor Info.
4) Dredge sediments	98,978	CY	43.00	0.00	1.66	0.00	4,256,054	0	164,303	0	4,420,357	Vendor Info.
5) Treatment of dredge water	165	DAY	4,500.00	0.00	0.00	0.00	742,335	0	0	0	742,335	Vendor Info.
6) Removal of sediments from barge	98,978	CY	32.50	0.00	0.00	0.00	3,216,785	0	0	0	3,216,785	Vendor Info.
7) Sediment confirmation testing	50	EA	1,400.00	0.00	0.00	0.00	70,000	0	0	0	70,000	Historical data
8) Water Quality Testing	198	DAY	3,600.00	50.00	200.00	150.00	712,642	9,898	39,591	29,693	791,824	Historical data
9) Disposal/Transport to RCRA D Landfill	118,774	TN	110.00	0.00	0.00	0.00	13,065,096	0	0	0	13,065,096	Vendor Info.
10) Placement of screened dredge spoil	19,796	CY	25.17	0.00	1.66	0.00	498,255	0	32,861	0	531,116	Vendor Info.

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
OS - 4 - REMOVAL AND OFF-BASE DISPOSAL
NAVY CLEAN CTO 0218

	Total Cost ($) Sub.	Mat.	Labor	Equip.	Total Direct Cost ($)	Comments
TOTAL	23,016,008	69,017	627,648	55,693	23,768,366	
Direct Cost Adjustment Factors						
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)	0	0	31,382	2,785	34,167	
Safety Level C Multiplier (25% of labor and equipment, as listed)	0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)	0	0	25,106	2,228	27,334	
Subtotal Direct Costs	23,016,008	69,017	659,030	58,478	23,829,867	
Indirect Cost Adjustment Factors						
Labor Overhead @ 250% (for field mgmt. & home office, only)	0	0	865,432	0	865,432	
Field Construction Labor Overhead @ 75%	0	0	186,461	0	186,461	
Subcontract Overhead @ 10%	2,301,601	0	0	0	2,301,601	
Tax on Materials @ 5%	0	3,451	0	0	3,451	
G & A @ 10% (on labor, equip., & matl's.)	0	6,902	65,903	5,848	78,652	
Subtotal Direct and Indirect Costs	25,317,609	79,369	1,776,826	64,326	27,265,464	
Cost Adjustment Factors						
City/Location Cost Adjustment Factor @ 7% (ref. 1)					1,908,582	
Adjusted Direct and Indirect Costs	25,317,609	79,369	1,776,826	64,326	29,174,046	
Engineering @ 6 % of total direct and indirect					1,750,443	
Prime Contractor Fee @ 10% of Total Adjusted Cost					2,917,405	
Total Costs					33,841,894	
Contingency @ 30% of Total Cost					10,152,568	
TOTAL ESTIMATED COST					43,994,462	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors at this or other sites.

McAllister Point Landfill FS
Off Shore Alternative 4 - Removal and Off-Base Disposal
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$43,994,462			$43,994,462
1	0.935		$19,440		$18,168
2	0.873		$19,440		$16,980
3	0.816				$0
4	0.763				$0
5	0.713		$19,440		$13,860
6	0.666				$0
7	0.623				$0
8	0.582				$0
9	0.544				$0
10	0.508				$0
11	0.475				$0
12	0.444				$0
13	0.415				$0
14	0.388				$0
15	0.362				$0
16	0.339				$0
17	0.317				$0
18	0.296				$0
19	0.277				$0
20	0.258				$0
21	0.242				$0
22	0.226				$0
23	0.211				$0
24	0.197				$0
25	0.184				$0
26	0.172				$0
27	0.161				$0
28	0.150				$0
29	0.141				$0
30	0.131				$0
		TOTAL PRESENT WORTH =			$44,043,470

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

APPENDIX G

COST SENSITIVITY ANALYSIS

APPENDIX G-1

NEARSHORE/ELEVATED-RISK OFFSHORE ALTERNATIVES

COST SENSITIVITY ANALYSIS

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER-3 - CAPPING, INSTITUTIONAL CONTROLS, LONG-TERM MONITORING: (+20%) VOLUME COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
PRE-DESIGN INVESTIGATION												
1) Underwater video inspection/survey	1	LS	7,500.00	0.00	0.00	0.00	7,500	0	0	0	7,500	Vendor Info.
2) Additional soils boring and analyses	1	LS	112,050.00	0.00	0.00	0.00	112,050	0	0	0	112,050	See assumptions
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	12	MO	400.00	0.00	0.00	0.00	4,720	0	0	0	4,720	Historical data
2) Storage Trailer (1 ea)	12	MO	100.00	0.00	0.00	0.00	1,180	0	0	0	1,180	Historical data
3) Portable Communication Equipment	8	EA	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	Historical data
4) Equipment Mobilization/Demobilization (support equip)	1	LS	45,000.00	0.00	0.00	0.00	45,000	0	0	0	45,000	Historical data
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities (elec, phone, water, sanitary, trash)	12	MO	4,000.00	0.00	0.00	0.00	47,200	0	0	0	47,200	Historical data
7) 3 Pick-up Truck (lease, fuel, oil)	12	MO	2,850.00	450.00	0.00	0.00	33,630	5,310	0	0	38,940	Historical data
8) Certification/Close-out Reports	1	LS	3,500.00	12,000.00	15,000.00	0.00	3,500	12,000	15,000	0	30,500	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	12	MO	500.00	0.00	200.00	0.00	5,900	0	2,360	0	8,260	Vendor catalog
2) PPE rolloff cont.	12	MO	350.00	0.00	0.00	0.00	4,130	0	0	0	4,130	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	2,360	HR	0.00	0.00	35.86	0.00	0	0	84,630	0	84,630	Historical data
2) Site supervisor/foreman	2,360	HR	0.00	0.00	30.00	0.00	0	0	70,800	0	70,800	Historical data
3) Site safety officer	2,360	HR	0.00	0.00	25.00	0.00	0	0	59,000	0	59,000	Historical data
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	472	HR	0.00	0.00	45.00	0.00	0	0	21,240	0	21,240	Historical data
2) Project administrator	354	HR	0.00	0.00	30.00	0.00	0	0	10,620	0	10,620	Historical data
3) Health and Safety director	118	HR	0.00	0.00	35.00	0.00	0	0	4,130	0	4,130	Historical data
4) Procurement/subcontracting	1,180	HR	0.00	0.00	30.00	0.00	0	0	35,400	0	35,400	Historical data
5) Clerical support	1,180	HR	0.00	0.00	12.36	0.00	0	0	14,585	0	14,585	Historical data
SITE PREPARATION												
1) Erosion control, silt boom	3,000	LF	0.00	10.00	4.00	4.00	0	30,000	12,000	12,000	54,000	Vendor Info.
2) Mob/Demob (barge and pier based equip.)	1	LS	57,600.00	0.00	0.00	0.00	57,600	0	0	0	57,600	Vendor Info.
3) Mob/Demob (shore based equip.)	1	LS	4,000.00	0.00	0.00	0.00	4,000	0	0	0	4,000	Vendor Info.
4) Porta Dam (install, rental, takedown)	1,200	LF	150.00	0.00	0.00	0.00	180,000	0	0	0	180,000	Historical info.
5) Porta Dam dewatering	20	DAY	0.00	0.00	665.00	150.00	0	0	13,413	3,026	16,439	021-440-0410
6) Debris/boulder removal, subgrade prep. (barge)	20	DAY	15,100.00	0.00	0.00	0.00	302,000	0	0	0	302,000	Vendor Info.
7) Debris/boulder removal, subgrade prep. (shore)	5	DAY	0.00	0.00	1,960.00	6,640.00	0	0	9,800	33,200	43,000	Historical data
8) Water quality monitoring (3 samples/day)	20	DAY	3,600.00	50.00	200.00	150.00	72,000	1,000	4,000	3,000	80,000	Historical/Vendor
9) Trans/Disposal of metal/concrete debris (RCRA D)	500	TN	110.00	0.00	0.00	0.00	55,000	0	0	0	55,000	Vendor Info.
MULTI MEDIA COVER SYSTEM												
1) Attach geotextile layer to both sides	239,568	SF	0.00	0.29	0.17	0.08	0	69,475	40,727	19,165	129,367	Vendor Info.
2) Installation of articulating blocks/geotextile	119,784	SF	18.88	9.00	0.00	0.00	2,261,522	1,078,056	0	0	3,339,578	Vendor Info.
3) Anchor stones for articulating blocks (60tons/acre)	165	TN	252.00	20.00	0.00	0.00	41,578	3,300	0	0	44,878	Vendor Info.
4) Installation of 24" sand/gravel/stone layer (barge)	8,873	CY	25.17	15.00	1.66	0.00	223,331	133,093	14,729	0	371,153	Vendor Info.
5) Water quality monitoring (3 samples/day)	150	DAY	3,600.00	50.00	200.00	150.00	539,028	7,487	29,946	22,460	598,920	Historical/Vendor
6) Strategically Placed Boulders	8	DAY	15,100.00	1,440.00	0.00	0.00	120,583	11,499	0	0	132,082	Vendor Info.
NATURAL CAP PLACEMENT												
1) Installation of 2 foot sand/gravel cap (shore based)	9,102	CY	0.00	15.00	4.93	11.23	0	136,534	44,874	102,218	283,626	Vendor Info.
2) Strategically Placed Boulders (shore based)	4	DAY	0.00	2,880.00	2,960.00	6,740.00	0	11,797	12,124	27,607	51,528	See assumptions
3) Installation of 2 foot sand/gravel cap (barge based)	7,362	CY	25.17	15.00	1.66	0.00	185,302	110,430	12,221	0	307,952	Vendor Info.
4) Strategically Placed Boulders (barge based)	7	DAY	15,100.00	1,440.00	0.00	0.00	100,050	9,541	0	0	109,591	See assumptions
5) Water quality monitoring (3 samples/day)	12	DAY	3,600.00	50.00	200.00	150.00	44,172	614	2,454	1,841	49,080	Historical/Vendor

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER-3 - CAPPING, INSTITUTIONAL CONTROLS, LONG-TERM MONITORING: (+20%) VOLUME COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 218

	Total Cost ($) Sub.	Mat.	Labor	Equip.	Total Direct Cost ($)	Comments
TOTAL	4,457,174	1,620,134	514,052	224,516	6,815,877	
Direct Cost Adjustment Factors						
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)	0	0	25,703	11,226	36,928	
Safety Level C Multiplier (25% of labor and equipment, as listed)	0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)	0	0	20,562	8,981	29,543	
Subtotal Direct Costs	4,457,174	1,620,134	539,755	235,742	6,882,348	
Indirect Cost Adjustment Factors						
Labor Overhead @ 250% (for field mgmt. & home office, only)	0	0	788,511	0	788,511	
Field Construction Labor Overhead @ 75%	0	0	160,236	0	160,236	
Subcontract Overhead @ 10%	445,717	0	0	0	445,717	
Tax on Materials @ 5%	0	81,007	0	0	81,007	
G & A @ 10% (on labor, equip., & matl's.)	0	162,013	53,976	23,574	239,563	
Subtotal Direct and Indirect Costs	4,902,892	1,863,155	1,542,478	259,316	8,597,383	
Cost Adjustment Factors						
City/Location Cost Adjustment Factor @ 7% (ref. 1)					601,817	
Adjusted Direct and Indirect Costs	4,902,892	1,863,155	1,542,478	259,316	9,199,199	
Engineering @ 6 % of total direct and indirect					551,952	
Prime Contractor Fee @ 10% of Total Adjusted Cost					919,920	
Total Costs					10,671,071	
Contingency @ 30% of Total Cost					3,201,321	
TOTAL ESTIMATED COST					13,872,393	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors at this or other sites or actual similar construction costs.

McAllister Point Landfill FS
Near Shore & Elevated Risk Off Shore Areas
Alternative 3 - Containment/Capping: (+20%) VOLUME SENSITIVITY ANALYSIS
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$13,872,393			$13,872,393
1	0.935		$120,872		$112,964
2	0.873		$120,872		$105,574
3	0.816		$120,872		$98,668
4	0.763		$120,872		$92,213
5	0.713		$120,872	$21,500	$101,509
6	0.666		$35,032		$23,343
7	0.623		$35,032		$21,816
8	0.582		$35,032		$20,389
9	0.544		$35,032		$19,055
10	0.508		$120,872	$21,500	$72,375
11	0.475		$35,032		$16,643
12	0.444		$35,032		$15,555
13	0.415		$35,032		$14,537
14	0.388		$35,032		$13,586
15	0.362		$120,872	$21,500	$51,602
16	0.339		$35,032		$11,867
17	0.317		$35,032		$11,090
18	0.296		$35,032		$10,365
19	0.277		$35,032		$9,687
20	0.258		$120,872	$21,500	$36,792
21	0.242		$35,032		$8,461
22	0.226		$35,032		$7,907
23	0.211		$35,032		$7,390
24	0.197		$35,032		$6,906
25	0.184		$120,872	$21,500	$26,232
26	0.172		$35,032		$6,032
27	0.161		$35,032		$5,638
28	0.150		$35,032		$5,269
29	0.141		$35,032		$4,924
30	0.131		$120,872	$21,500	$18,703
		TOTAL PRESENT WORTH =			$14,829,485

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER-3 - CAPPING, INSTITUTIONAL CONTROLS, LONG-TERM MONITORING: (-30%) VOLUME COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
PRE-DESIGN INVESTIGATION												
1) Underwater video inspection/survey	1	LS	7,500.00	0.00	0.00	0.00	7,500	0	0	0	7,500	Vendor Info.
2) Additional soils boring and analyses	1	LS	112,050.00	0.00	0.00	0.00	112,050	0	0	0	112,050	See assumptions
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	8	MO	400.00	0.00	0.00	0.00	3,370	0	0	0	3,370	Historical data
2) Storage Trailer (1 ea)	8	MO	100.00	0.00	0.00	0.00	843	0	0	0	843	Historical data
3) Portable Communication Equipment	8	EA	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	Historical data
4) Equipment Mobilization/Demobilization (support equip)	1	LS	45,000.00	0.00	0.00	0.00	45,000	0	0	0	45,000	Historical data
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities (elec, phone, water, sanitary, trash)	8	MO	4,000.00	0.00	0.00	0.00	33,700	0	0	0	33,700	Historical data
7) 3 Pick-up Truck (lease, fuel, oil)	8	MO	2,850.00	450.00	0.00	0.00	24,011	3,791	0	0	27,803	Historical data
8) Certification/Close-out Reports	1	LS	3,500.00	12,000.00	15,000.00	0.00	3,500	12,000	15,000	0	30,500	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	8	MO	500.00	0.00	200.00	0.00	4,213	0	1,685	0	5,898	Vendor catalog
2) PPE rolloff cont.	8	MO	350.00	0.00	0.00	0.00	2,949	0	0	0	2,949	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	1,685	HR	0.00	0.00	35.86	0.00	0	0	60,424	0	60,424	Historical data
2) Site supervisor/foreman	1,685	HR	0.00	0.00	30.00	0.00	0	0	50,550	0	50,550	Historical data
3) Site safety officer	1,685	HR	0.00	0.00	25.00	0.00	0	0	42,125	0	42,125	Historical data
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	337	HR	0.00	0.00	45.00	0.00	0	0	15,165	0	15,165	Historical data
2) Project administrator	253	HR	0.00	0.00	30.00	0.00	0	0	7,583	0	7,583	Historical data
3) Health and Safety director	84	HR	0.00	0.00	35.00	0.00	0	0	2,949	0	2,949	Historical data
4) Procurement/subcontracting	843	HR	0.00	0.00	30.00	0.00	0	0	25,275	0	25,275	Historical data
5) Clerical support	843	HR	0.00	0.00	12.36	0.00	0	0	10,413	0	10,413	Historical data
SITE PREPARATION												
1) Erosion control, silt boom	3,000	LF	0.00	10.00	4.00	4.00	0	30,000	12,000	12,000	54,000	Vendor Info.
2) Mob/Demob (barge and pier based equip.)	1	LS	57,600.00	0.00	0.00	0.00	57,600	0	0	0	57,600	Vendor Info.
3) Mob/Demob (shore based equip.)	1	LS	4,000.00	0.00	0.00	0.00	4,000	0	0	0	4,000	Vendor Info.
4) Porta Dam (install, rental, takedown)	1,200	LF	150.00	0.00	0.00	0.00	180,000	0	0	0	180,000	Historical info.
5) Porta Dam dewatering	14	DAY	0.00	0.00	665.00	150.00	0	0	9,210	2,077	11,287	021-440-0410
6) Debris/boulder removal, subgrade prep. (barge)	20	DAY	15,100.00	0.00	0.00	0.00	302,000	0	0	0	302,000	Vendor Info.
7) Debris/boulder removal, subgrade prep. (shore)	5	DAY	0.00	0.00	1,960.00	6,640.00	0	0	9,800	33,200	43,000	Historical data
8) Water quality monitoring (3 samples/day)	20	DAY	3,600.00	50.00	200.00	150.00	72,000	1,000	4,000	3,000	80,000	Historical/Vendor
9) Trans/Disposal of metal/concrete debris (RCRA D)	500	TN	110.00	0.00	0.00	0.00	55,000	0	0	0	55,000	Vendor Info.
MULTI MEDIA COVER SYSTEM												
1) Attach geotextile layer to both sides	139,748	SF	0.00	0.29	0.17	0.08	0	40,527	23,757	11,180	75,464	Vendor Info.
2) Installation of articulating blocks/geotextile	69,874	SF	18.88	9.00	0.00	0.00	1,319,221	628,866	0	0	1,948,087	Vendor Info.
3) Anchor stones for articulating blocks (60tons/acre)	96	TN	252.00	20.00	0.00	0.00	24,254	1,925	0	0	26,179	Vendor Info.
4) Installation of 24" sand/gravel/stone layer (barge)	5,176	CY	25.17	15.00	1.66	0.00	130,276	77,638	8,592	0	216,506	Vendor Info.
5) Water quality monitoring (3 samples/day)	87	DAY	3,600.00	50.00	200.00	150.00	314,433	4,367	17,469	13,101	349,370	Historical/Vendor
6) Strategically Placed Boulders	5	DAY	15,100.00	1,440.00	0.00	0.00	70,340	6,708	0	0	77,048	Vendor Info.
NATURAL CAP PLACEMENT												
1) Installation of 2 foot sand/gravel cap (shore based)	5,310	CY	0.00	15.00	4.93	11.23	0	79,645	26,177	59,627	165,448	Vendor Info.
2) Strategically Placed Boulders (shore based)	2	DAY	0.00	2,880.00	2,960.00	6,740.00	0	6,881	7,072	16,104	30,058	See assumptions
3) Installation of 2 foot sand/gravel cap (barge based)	4,295	CY	25.17	15.00	1.66	0.00	108,093	64,418	7,129	0	179,639	Vendor Info.
4) Strategically Placed Boulders (barge based)	4	DAY	15,100.00	1,440.00	0.00	0.00	58,362	5,566	0	0	63,928	See assumptions
5) Water quality monitoring (3 samples/day)	7	DAY	3,600.00	50.00	200.00	150.00	25,767	358	1,432	1,074	28,630	Historical/Vendor

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER-3 - CAPPING, INSTITUTIONAL CONTROLS, LONG-TERM MONITORING: (-30%) VOLUME COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 218

	Total Cost ($) Sub.	Mat.	Labor	Equip.	Total Direct Cost ($)	Comments
TOTAL	2,964,681	963,689	357,805	151,364	4,437,539	
Direct Cost Adjustment Factors						
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)	0	0	17,890	7,568	25,458	
Safety Level C Multiplier (25% of labor and equipment, as listed)	0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)	0	0	14,312	6,055	20,367	
Subtotal Direct Costs	2,964,681	963,689	375,696	158,932	4,483,364	
Indirect Cost Adjustment Factors						
Labor Overhead @ 250% (for field mgmt. & home office, only)	0	0	573,709	0	573,709	
Field Construction Labor Overhead @ 75%	0	0	107,491	0	107,491	
Subcontract Overhead @ 10%	296,468	0	0	0	296,468	
Tax on Materials @ 5%	0	48,184	0	0	48,184	
G & A @ 10% (on labor, equip., & matl's.)	0	96,369	37,570	15,893	149,832	
Subtotal Direct and Indirect Costs	3,261,149	1,108,242	1,094,466	174,825	5,659,048	
Cost Adjustment Factors						
City/Location Cost Adjustment Factor @ 7% (ref. 1)					396,133	
Adjusted Direct and Indirect Costs	3,261,149	1,108,242	1,094,466	174,825	6,055,182	
Engineering @ 6 % of total direct and indirect					363,311	
Prime Contractor Fee @ 10% of Total Adjusted Cost					605,518	
Total Costs					7,024,011	
Contingency @ 30% of Total Cost					2,107,203	
TOTAL ESTIMATED COST					9,131,214	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors at this or other sites or actual similar construction costs.

McAllister Point Landfill FS
Near Shore & Elevated Risk Off Shore Areas
Alternative 3 - Containment/Capping: (-30%) VOLUME SENSITIVITY ANALYSIS
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$9,131,214			$9,131,214
1	0.935		$120,872		$112,964
2	0.873		$120,872		$105,574
3	0.816		$120,872		$98,668
4	0.763		$120,872		$92,213
5	0.713		$120,872	$21,500	$101,509
6	0.666		$35,032		$23,343
7	0.623		$35,032		$21,816
8	0.582		$35,032		$20,389
9	0.544		$35,032		$19,055
10	0.508		$120,872	$21,500	$72,375
11	0.475		$35,032		$16,643
12	0.444		$35,032		$15,555
13	0.415		$35,032		$14,537
14	0.388		$35,032		$13,586
15	0.362		$120,872	$21,500	$51,602
16	0.339		$35,032		$11,867
17	0.317		$35,032		$11,090
18	0.296		$35,032		$10,365
19	0.277		$35,032		$9,687
20	0.258		$120,872	$21,500	$36,792
21	0.242		$35,032		$8,461
22	0.226		$35,032		$7,907
23	0.211		$35,032		$7,390
24	0.197		$35,032		$6,906
25	0.184		$120,872	$21,500	$26,232
26	0.172		$35,032		$6,032
27	0.161		$35,032		$5,638
28	0.150		$35,032		$5,269
29	0.141		$35,032		$4,924
30	0.131		$120,872	$21,500	$18,703
		TOTAL PRESENT WORTH =			$10,088,306

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER4 - PARTIAL REMOVAL, CAPPING AND ON-BASE DISPOSAL: (+20%) VOLUME COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
PRE-DESIGN INVESTIGATION												
1) Additional soils boring and analyses	1	LS	112,050.00	0.00	0.00	0.00	112,050	0	0	0	112,050	See Assumptions
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	21	MO	400.00	0.00	0.00	0.00	8,510	0	0	0	8,510	Historical data
2) Storage Trailer (1 ea)	21	MO	150.00	0.00	0.00	0.00	3,191	0	0	0	3,191	Historical data
3) Portable Communication Equipment	8	EA	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	Historical data
4) Equipment Mobilization/Demobilization (support equi	1	LS	45,000.00	0.00	0.00	0.00	45,000	0	0	0	45,000	Historical data
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities	21	MO	4,000.00	0.00	0.00	0.00	85,097	0	0	0	85,097	Historical data
7) 3 Pick-up Truck (rental)	21	MO	2,850.00	450.00	0.00	0.00	60,632	9,573	0	0	70,205	Historical data
8) Cerification/Close-out Reports	1	EA	7,000.00	2,000.00	15,000.00	3,000.00	7,000	2,000	15,000	3,000	27,000	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	21	MO	1,500.00	0.00	200.00	0.00	31,912	0	4,255	0	36,166	Vendor catalog
2) PPE rolloff cont.	21	MO	500.00	0.00	0.00	0.00	10,637	0	0	0	10,637	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	4,255	HR	0.00	0.00	35.86	0.00	0	0	152,580	0	152,580	Historical data
2) Site engineer	4,255	HR	0.00	0.00	32.00	0.00	0	0	136,156	0	136,156	Historical data
3) Site supervisor/foreman	4,255	HR	0.00	0.00	30.00	0.00	0	0	127,646	0	127,646	Historical data
4) Site safety officer	4,255	HR	0.00	0.00	25.00	0.00	0	0	106,372	0	106,372	Historical data
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	851	HR	0.00	0.00	45.00	0.00	0	0	38,294	0	38,294	Historical data
2) Project administrator	638	HR	0.00	0.00	30.00	0.00	0	0	19,147	0	19,147	Historical data
3) Health and Safety director	213	HR	0.00	0.00	35.00	0.00	0	0	7,446	0	7,446	Historical data
4) Procurement/subcontracting	2,127	HR	0.00	0.00	30.00	0.00	0	0	63,823	0	63,823	Historical data
5) Clerical support	2,127	HR	0.00	0.00	12.36	0.00	0	0	26,295	0	26,295	Historical data
LANDFILL CAP PREP. AND RESTORATION												
1) Survey control (2-man crew)	3,600	HR	0.00	0.00	60.00	15.00	0	0	216,000	54,000	270,000	Historical data
2) Silt Fence	5,000	LF	0.00	0.50	0.35	0.00	0	2,500	1,750	0	4,250	022-700-1100
3) Strip existing cap soils and stockpile	7,259	CY	0.00	0.00	0.62	2.09	0	0	4,501	15,171	19,672	17-01-0502
3a) Remove and stage shrubs	1	LS	2,500.00	0.00	0.00	0.00	2,500	0	0	0	2,500	Historical data
4) Dredge spoil placement (12" lifts, 3 mile R/T)	17,645	CY	0.00	0.26	1.83	6.17	0	4,588	32,290	108,870	145,748	17-03-0422
5) 6" cap layer	1,815	CY	0.00	0.26	1.52	4.76	0	472	2,759	8,639	11,870	17-03-0422
6) Gas vent layer 12"	3,630	CY	0.00	9.11	0.82	2.11	0	33,069	2,977	7,659	43,705	17-03-046
6a) extend/finish existing gas vents	18	EA	500.00	0.00	0.00	0.00	9,000	0	0	0	9,000	Historical data
7) GCL furnish and install	98,000	SF	0.00	0.25	0.07	0.07	0	24,500	6,860	6,860	38,220	33-08-0543
8) 40 mil VLDPE furnish and install	98,000	SF	0.00	0.41	1.07	0.11	0	40,180	104,860	10,780	155,820	33-08-0544
9) 12" drainage layer	3,630	CY	0.00	12.00	0.23	0.34	0	43,560	835	1,234	45,629	33-08-0500
10) Geotextile furnish and install	10,889	SY	0.00	0.56	0.33	0.03	0	6,098	3,593	327	10,018	33-08-0532
11) 18" Cover soil layer (reuse)	7,259	CY	0.00	0.00	0.23	0.34	0	0	1,670	2,468	4,138	17-03-046
12) 6" Topsoil (reuse 70% from existing cap)	1,290	CY	0.00	0.00	1.43	5.14	0	0	1,845	6,631	8,475	18-05-0302
13) 6" Topsoil (30% from off-site)	540	CY	0.00	16.62	3.29	3.62	0	8,975	1,777	1,955	12,706	18-05-0301

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER4 - PARTIAL REMOVAL, CAPPING AND ON-BASE DISPOSAL: (+20%) VOLUME COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
14) Root reinforcing mat (slopes only)	8,756	SY	0.00	0.78	0.21	0.07	0	6,830	1,839	613	9,281	022-704-0010
15) Jute mat (slopes only)	8,756	SY	0.00	1.75	0.20	0.07	0	15,323	1,751	613	17,687	022-704-0200
16) Extend & finish monitoring wells	2	EA	1,000.00	0.00	0.00	0.00	2,000	0	0	0	2,000	Historical data
17) Revegetation (hydroseed & reuse shrubs)	2.30	AC	589.62	0.00	1,000.00	200.00	1,356	0	2,300	460	4,116	Historical data
18) Restore operations areas	2	AC	5,000.00	0.00	0.00	0.00	10,000	0	0	0	10,000	Historical data
19) Geotechnical testing	150	DY	0.00	5.00	800.00	50.00	0	750	120,000	7,500	128,250	Historical data
DREDGING/WATER TREATMENT												
1) Erosion control, silt boom	3,000	LF	0.00	10.00	4.00	4.00	0	30,000	12,000	12,000	54,000	Historical data
2) Mob/Demob (barge and pier based equip.)	1	LS	167,600.00	0.00	0.00	0.00	167,600	0	0	0	167,600	Vendor Info.
3) Mob/Demob (shore based equip.)	1	LS	5,000.00	0.00	0.00	0.00	5,000	0	0	0	5,000	Vendor Info.
4) Prep., maint., and removal of staging area	1	LS	0.00	1,000.00	7,000.00	3,000.00	0	1,000	7,000	3,000	11,000	Vendor Info.
5) Porta Dam (install, rental, takedown)	1,200	LF	150.00	0.00	0.00	0.00	180,000	0	0	0	180,000	Historical data
6) Porta Dam dewatering	25	DAY	0.00	0.00	665.00	150.00	0	0	16,814	3,793	20,606	021-440-0410
7)Heavy equipment mob/demob	1	LS	10,000.00	0.00	0.00	0.00	10,000	0	0	0	10,000	Historical data
8) Excavate/screen/haul sediments (shore based)	7,585	CY	0.00	0.00	4.93	12.23	0	0	37,395	92,767	130,162	022-238-300
9) Dredge sediments (barge)	18,882	CY	43.00	0.00	0.00	0.00	811,926	0	0	0	811,926	Vendor Info.
10) Treatment of dredge water	94	DAY	4,500.00	0.00	0.00	0.00	424,845	0	0	0	424,845	Vendor Info.
11) Removal of sediments from barge	18,882	CY	32.50	0.00	0.00	0.00	613,665	0	0	0	613,665	Vendor Info.
12) Trans./Disposal of metal/concrete debris (RCRA D)	500	TN	110.00	0.00	0.00	0.00	55,000	0	0	0	55,000	Vendor Info.
13) Water Quality Testing	94	DAY	3,600.00	50.00	200.00	150.00	339,876	4,721	18,882	14,162	377,640	Historical data
MULTI-MEDIA COVER SYSTEM												
1) Attach geotextile layer to both sides	144,086	SF	0.00	0.29	0.17	0.08	0	41,785	24,495	11,527	77,807	Vendor Info.
2) Installation of articulating blocks/geotextile	72,043	SF	18.88	9.00	0.00	0.00	1,360,176	648,389	0	0	2,008,564	Vendor Info.
3) Anchor stones for articulating blocks (60tons/acre)	99	TN	252.00	20.00	0.00	0.00	25,007	1,985	0	0	26,991	Vendor Info.
4) Installation of 24" sand/gravel/stone layer (barge)	5,337	CY	25.17	15.00	1.66	0.00	134,321	80,048	8,859	0	223,227	Vendor Info.
5) Water quality monitoring (3 samples/day)	99	DAY	3,600.00	50.00	200.00	150.00	356,214	4,947	19,790	14,842	395,793	Historical/Vendor
6) Strategically Placed Boulders	5	DAY	15,100.00	1,440.00	0.00	0.00	72,523	6,916	0	0	79,440	Vendor Info.
NATURAL CAP PLACEMENT												
1) Installation of 2 feet imported sand/gravel/stone (shor	7,282	CY	0.00	15.00	4.93	11.23	0	109,227	35,899	81,775	226,901	Vendor Info.
2) Installation of 2 feet screened sand/gravel/stone (sho	1,820	CY	0.00	0.00	4.93	11.23	0	0	8,975	20,444	29,418	Vendor Info.
3) Strategically Placed Boulders (shore based)	3	DAY	0.00	2,880.00	2,960.00	6,740.00	0	8,640	8,880	20,220	37,740	See assumptions
4) Installation of 2 foot imported sand/gravel cap (barge	8,702	CY	25.17	15.00	1.66	0.00	219,023	130,526	14,445	0	363,995	Vendor Info.
5) Installation of 2 foot screened sand/gravel cap (barge	2,175	CY	25.17	0.00	1.66	0.00	54,756	0	3,611	0	58,367	Vendor Info.
6) Strategically Placed Boulders (barge based)	10	DAY	15,100.00	1,440.00	0.00	0.00	147,821	14,097	0	0	161,918	See assumptions
7) Water quality monitoring (3 samples/day)	18	DAY	3,600.00	50.00	200.00	150.00	65,263	906	3,626	2,719	72,515	Historical/Vendor
			TOTAL				5,438,100	1,281,605	1,425,288	514,028	8,659,021	

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER4 - PARTIAL REMOVAL, CAPPING AND ON-BASE DISPOSAL: (+20%) VOLUME COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

Item	Qty	Unit	Unit Cost ($) Sub.	Mat.	Labor	Equip.	Total Cost ($) Sub.	Mat.	Labor	Equip.	Total Direct Cost ($)	Comments
Direct Cost Adjustment Factors												
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)							0	0	71,264	25,701	96,966	
Safety Level C Multiplier (25% of labor and equipment, as listed)							0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)							0	0	57,012	20,561	77,573	
			Subtotal Direct Costs				5,438,100	1,281,605	1,496,553	539,729	8,833,559	
Indirect Cost Adjustment Factors												
Labor Overhead @ 250% (for field mgmt. & home office, only)							0	0	1,694,395	0	1,694,395	
Field Construction Labor Overhead @ 75%							0	0	560,648	0	560,648	
Subcontract Overhead @ 10%							543,810	0	0	0	543,810	
Tax on Materials @ 5%							0	64,080	0	0	64,080	
G & A @ 10% (on labor, equip., & matl's.)							0	128,160	149,655	53,973	331,789	
			Subtotal Direct and Indirect Costs				5,981,910	1,473,846	3,901,251	593,702	12,028,281	
Cost Adjustment Factors												
City/Location Cost Adjustment Factor @ 7% (ref. 1)											841,980	
			Adjusted Direct and Indirect Costs				5,981,910	1,473,846	3,901,251	593,702	12,870,261	
Engineering @ 6 % of total direct and indirect											772,216	
Prime Contractor Fee @ 10% of Total Adjusted Cost											1,287,026	
			Total Costs								14,929,502	
Contingency @ 30% of Total Cost											4,478,851	
			TOTAL ESTIMATED COST								19,408,353	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors at this or other sites.

McAllister Point Landfill FS
Near Shore & Elevated Risk Off Shore Areas
Alternative 4 - Partial Removal, Capping and On-Base Disposal
(+20%) Volume Cost Sensitivty Analysis
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$19,408,353			$19,408,353
1	0.935		$120,872		$112,964
2	0.873		$120,872		$105,574
3	0.816		$120,872		$98,668
4	0.763		$120,872		$92,213
5	0.713		$120,872	$21,500	$101,509
6	0.666		$35,032		$23,343
7	0.623		$35,032		$21,816
8	0.582		$35,032		$20,389
9	0.544		$35,032		$19,055
10	0.508		$120,872	$21,500	$72,375
11	0.475		$35,032		$16,643
12	0.444		$35,032		$15,555
13	0.415		$35,032		$14,537
14	0.388		$35,032		$13,586
15	0.362		$120,872	$21,500	$51,602
16	0.339		$35,032		$11,867
17	0.317		$35,032		$11,090
18	0.296		$35,032		$10,365
19	0.277		$35,032		$9,687
20	0.258		$120,872	$21,500	$36,792
21	0.242		$35,032		$8,461
22	0.226		$35,032		$7,907
23	0.211		$35,032		$7,390
24	0.197		$35,032		$6,906
25	0.184		$120,872	$21,500	$26,232
26	0.172		$35,032		$6,032
27	0.161		$35,032		$5,638
28	0.150		$35,032		$5,269
29	0.141		$35,032		$4,924
30	0.131		$120,872	$21,500	$18,703
			TOTAL PRESENT WORTH =		$20,365,445

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER4 - PARTIAL REMOVAL, CAPPING AND ON-BASE DISPOSAL: (-30%) VOLUME COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
PRE-DESIGN INVESTIGATION												
1) Additional soils boring and analyses	1	LS	112,050.00	0.00	0.00	0.00	112,050	0	0	0	112,050	See Assumptions
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	17	MO	400.00	0.00	0.00	0.00	6,747	0	0	0	6,747	Historical data
2) Storage Trailer (1 ea)	17	MO	150.00	0.00	0.00	0.00	2,530	0	0	0	2,530	Historical data
3) Portable Communication Equipment	8	EA	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	Historical data
4) Equipment Mobilization/Demobilization (support equi	1	LS	45,000.00	0.00	0.00	0.00	45,000	0	0	0	45,000	Historical data
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities	17	MO	4,000.00	0.00	0.00	0.00	67,473	0	0	0	67,473	Historical data
7) 3 Pick-up Truck (rental)	17	MO	2,850.00	450.00	0.00	0.00	48,075	7,591	0	0	55,666	Historical data
8) Cerification/Close-out Reports	1	EA	7,000.00	2,000.00	15,000.00	3,000.00	7,000	2,000	15,000	3,000	27,000	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	17	MO	1,500.00	0.00	200.00	0.00	25,303	0	3,374	0	28,676	Vendor catalog
2) PPE rolloff cont.	17	MO	500.00	0.00	0.00	0.00	8,434	0	0	0	8,434	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	3,374	HR	0.00	0.00	35.86	0.00	0	0	120,980	0	120,980	Historical data
2) Site engineer	3,374	HR	0.00	0.00	32.00	0.00	0	0	107,958	0	107,958	Historical data
3) Site supervisor/foreman	3,374	HR	0.00	0.00	30.00	0.00	0	0	101,210	0	101,210	Historical data
4) Site safety officer	3,374	HR	0.00	0.00	25.00	0.00	0	0	84,342	0	84,342	Historical data
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	675	HR	0.00	0.00	45.00	0.00	0	0	30,363	0	30,363	Historical data
2) Project administrator	506	HR	0.00	0.00	30.00	0.00	0	0	15,182	0	15,182	Historical data
3) Health and Safety director	169	HR	0.00	0.00	35.00	0.00	0	0	5,904	0	5,904	Historical data
4) Procurement/subcontracting	1,687	HR	0.00	0.00	30.00	0.00	0	0	50,605	0	50,605	Historical data
5) Clerical support	1,687	HR	0.00	0.00	12.36	0.00	0	0	20,849	0	20,849	Historical data
LANDFILL CAP PREP. AND RESTORATION												
1) Survey control (2-man crew)	3,600	HR	0.00	0.00	60.00	15.00	0	0	216,000	54,000	270,000	Historical data
2) Silt Fence	5,000	LF	0.00	0.50	0.35	0.00	0	2,500	1,750	0	4,250	022-700-1100
3) Strip existing cap soils and stockpile	7,259	CY	0.00	0.00	0.62	2.09	0	0	4,501	15,171	19,672	17-01-0502
3a) Remove and stage shrubs	1	LS	2,500.00	0.00	0.00	0.00	2,500	0	0	0	2,500	Historical data
4) Dredge spoil placement (12" lifts, 3 mile R/T)	17,645	CY	0.00	0.26	1.83	6.17	0	4,588	32,290	108,870	145,748	17-03-0422
5) 6" cap layer	1,815	CY	0.00	0.26	1.52	4.76	0	472	2,759	8,639	11,870	17-03-0422
6) Gas vent layer 12"	3,630	CY	0.00	9.11	0.82	2.11	0	33,069	2,977	7,659	43,705	17-03-046
6a) extend/finish existing gas vents	18	EA	500.00	0.00	0.00	0.00	9,000	0	0	0	9,000	Historical data
7) GCL furnish and install	98,000	SF	0.00	0.25	0.07	0.07	0	24,500	6,860	6,860	38,220	33-08-0543
8) 40 mil VLDPE furnish and install	98,000	SF	0.00	0.41	1.07	0.11	0	40,180	104,860	10,780	155,820	33-08-0544
9) 12" drainage layer	3,630	CY	0.00	12.00	0.23	0.34	0	43,560	835	1,234	45,629	33-08-0500
10) Geotextile furnish and install	10,889	SY	0.00	0.56	0.33	0.03	0	6,098	3,593	327	10,018	33-08-0532
11) 18" Cover soil layer (reuse)	7,259	CY	0.00	0.00	0.23	0.34	0	0	1,670	2,468	4,138	17-03-046
12) 6" Topsoil (reuse 70% from existing cap)	1,290	CY	0.00	0.00	1.43	5.14	0	0	1,845	6,631	8,475	18-05-0302
13) 6" Topsoil (30% from off-site)	540	CY	0.00	16.62	3.29	3.62	0	8,975	1,777	1,955	12,706	18-05-0301

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER4 - PARTIAL REMOVAL, CAPPING AND ON-BASE DISPOSAL: (-30%) VOLUME COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
14) Root reinforcing mat (slopes only)	8,756	SY	0.00	0.78	0.21	0.07	0	6,830	1,839	613	9,281	022-704-0010
15) Jute mat (slopes only)	8,756	SY	0.00	1.75	0.20	0.07	0	15,323	1,751	613	17,687	022-704-0200
16) Extend & finish monitoring wells	2	EA	1,000.00	0.00	0.00	0.00	2,000	0	0	0	2,000	Historical data
17) Revegetation (hydroseed & reuse shrubs)	2.30	AC	589.62	0.00	1,000.00	200.00	1,356	0	2,300	460	4,116	Historical data
18) Restore operations areas	2	AC	5,000.00	0.00	0.00	0.00	10,000	0	0	0	10,000	Historical data
19) Geotechnical testing	150	DY	0.00	5.00	800.00	50.00	0	750	120,000	7,500	128,250	Historical data
DREDGING/WATER TREATMENT												
1) Erosion control, silt boom	3,000	LF	0.00	10.00	4.00	4.00	0	30,000	12,000	12,000	54,000	Historical data
2) Mob/Demob (barge and pier based equip.)	1	LS	167,600.00	0.00	0.00	0.00	167,600	0	0	0	167,600	Vendor Info.
3) Mob/Demob (shore based equip.)	1	LS	5,000.00	0.00	0.00	0.00	5,000	0	0	0	5,000	Vendor Info.
4) Prep., maint., and removal of staging area	1	LS	0.00	1,000.00	7,000.00	3,000.00	0	1,000	7,000	3,000	11,000	Vendor Info.
5) Porta Dam (install, rental, takedown)	1,200	LF	150.00	0.00	0.00	0.00	180,000	0	0	0	180,000	Historical data
6) Porta Dam dewatering	15	DAY	0.00	0.00	665.00	150.00	0	0	9,808	2,212	12,020	021-440-0410
7)Heavy equipment mob/demob	1	LS	10,000.00	0.00	0.00	0.00	10,000	0	0	0	10,000	Historical data
8) Excavate/screen/haul sediments (shore based)	4,425	CY	0.00	0.00	4.93	12.23	0	0	21,814	54,114	75,928	022-238-300
9) Dredge sediments (barge)	11,015	CY	43.00	0.00	0.00	0.00	473,624	0	0	0	473,624	Vendor Info.
10) Treatment of dredge water	55	DAY	4,500.00	0.00	0.00	0.00	247,826	0	0	0	247,826	Vendor Info.
11) Removal of sediments from barge	11,015	CY	32.50	0.00	0.00	0.00	357,971	0	0	0	357,971	Vendor Info.
12) Trans./Disposal of metal/concrete debris (RCRA D)	500	TN	110.00	0.00	0.00	0.00	55,000	0	0	0	55,000	Vendor Info.
13) Water Quality Testing	55	DAY	3,600.00	50.00	200.00	150.00	198,261	2,754	11,015	8,261	220,290	Historical data
MULTI-MEDIA COVER SYSTEM												
1) Attach geotextile layer to both sides	84,050	SF	0.00	0.29	0.17	0.08	0	24,375	14,289	6,724	45,387	Vendor Info.
2) Installation of articulating blocks/geotextile	42,025	SF	18.88	9.00	0.00	0.00	793,436	378,227	0	0	1,171,663	Vendor Info.
3) Anchor stones for articulating blocks (60tons/acre)	58	TN	252.00	20.00	0.00	0.00	14,587	1,158	0	0	15,745	Vendor Info.
4) Installation of 24" sand/gravel/stone layer (barge)	3,113	CY	25.17	15.00	1.66	0.00	78,354	46,695	5,168	0	130,216	Vendor Info.
5) Water quality monitoring (3 samples/day)	58	DAY	3,600.00	50.00	200.00	150.00	207,791	2,886	11,544	8,658	230,879	Historical/Vendor
6) Strategically Placed Boulders	3	DAY	15,100.00	1,440.00	0.00	0.00	42,305	4,034	0	0	46,340	Vendor Info.
NATURAL CAP PLACEMENT												
1) Installation of 2 feet imported sand/gravel/stone (shor	4,248	CY	0.00	15.00	4.93	11.23	0	63,716	20,941	47,702	132,359	Vendor Info.
2) Installation of 2 feet screened sand/gravel/stone (sho	1,062	CY	0.00	0.00	4.93	11.23	0	0	5,235	11,925	17,161	Vendor Info.
3) Strategically Placed Boulders (shore based)	3	DAY	0.00	2,880.00	2,960.00	6,740.00	0	8,640	8,880	20,220	37,740	See assumptions
4) Installation of 2 foot imported sand/gravel cap (barge	5,076	CY	25.17	15.00	1.66	0.00	127,764	76,140	8,426	0	212,330	Vendor Info.
5) Installation of 2 foot screened sand/gravel cap (barge	1,269	CY	25.17	0.00	1.66	0.00	31,941	0	2,107	0	34,047	Vendor Info.
6) Strategically Placed Boulders (barge based)	6	DAY	15,100.00	1,440.00	0.00	0.00	86,229	8,223	0	0	94,452	See assumptions
7) Water quality monitoring (3 samples/day)	11	DAY	3,600.00	50.00	200.00	150.00	38,070	529	2,115	1,586	42,300	Historical/Vendor
			TOTAL				3,469,428	844,811	1,203,712	413,183	5,931,134	

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER4 - PARTIAL REMOVAL, CAPPING AND ON-BASE DISPOSAL: (-30%) VOLUME COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

Item	Qty	Unit	Unit Cost ($) Sub.	Mat.	Labor	Equip.	Total Cost ($) Sub.	Mat.	Labor	Equip.	Total Direct Cost ($)	Comments
Direct Cost Adjustment Factors												
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)							0	0	60,186	20,659	80,845	
Safety Level C Multiplier (25% of labor and equipment, as listed)							0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)							0	0	48,148	16,527	64,676	
			Subtotal Direct Costs				3,469,428	844,811	1,263,898	433,842	6,076,654	
Indirect Cost Adjustment Factors												
Labor Overhead @ 250% (for field mgmt. & home office, only)							0	0	1,343,481	0	1,343,481	
Field Construction Labor Overhead @ 75%							0	0	499,740	0	499,740	
Subcontract Overhead @ 10%							346,943	0	0	0	346,943	
Tax on Materials @ 5%							0	42,241	0	0	42,241	
G & A @ 10% (on labor, equip., & matl's.)							0	84,481	126,390	43,384	254,255	
			Subtotal Direct and Indirect Costs				3,816,371	971,532	3,233,509	477,226	8,563,313	
Cost Adjustment Factors												
City/Location Cost Adjustment Factor @ 7% (ref. 1)											599,432	
			Adjusted Direct and Indirect Costs				3,816,371	971,532	3,233,509	477,226	9,162,745	
Engineering @ 6 % of total direct and indirect											549,765	
Prime Contractor Fee @ 10% of Total Adjusted Cost											916,275	
			Total Costs								10,628,785	
Contingency @ 30% of Total Cost											3,188,635	
			TOTAL ESTIMATED COST								13,817,420	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors at this or other sites.

McAllister Point Landfill FS
Near Shore & Elevated Risk Off Shore Areas
Alternative 4 - Partial Removal, Capping and On-Base Disposal
(-30%) Volume Cost Sensitivty Analysis
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$13,817,420			$13,817,420
1	0.935		$120,872		$112,964
2	0.873		$120,872		$105,574
3	0.816		$120,872		$98,668
4	0.763		$120,872		$92,213
5	0.713		$120,872	$21,500	$101,509
6	0.666		$35,032		$23,343
7	0.623		$35,032		$21,816
8	0.582		$35,032		$20,389
9	0.544		$35,032		$19,055
10	0.508		$120,872	$21,500	$72,375
11	0.475		$35,032		$16,643
12	0.444		$35,032		$15,555
13	0.415		$35,032		$14,537
14	0.388		$35,032		$13,586
15	0.362		$120,872	$21,500	$51,602
16	0.339		$35,032		$11,867
17	0.317		$35,032		$11,090
18	0.296		$35,032		$10,365
19	0.277		$35,032		$9,687
20	0.258		$120,872	$21,500	$36,792
21	0.242		$35,032		$8,461
22	0.226		$35,032		$7,907
23	0.211		$35,032		$7,390
24	0.197		$35,032		$6,906
25	0.184		$120,872	$21,500	$26,232
26	0.172		$35,032		$6,032
27	0.161		$35,032		$5,638
28	0.150		$35,032		$5,269
29	0.141		$35,032		$4,924
30	0.131		$120,872	$21,500	$18,703
			TOTAL PRESENT WORTH =		$14,774,512

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER5 - REMOVAL WITH DISPOSAL ON AND OFF-BASE: (+20% VOLUME) COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
PRE-DESIGN INVESTIGATION												
1) Sediment/soil borings and analyses	1	LS	112,050.00	0.00	0.00	0.00	112,050	0	0	0	112,050	See Assumptions
2) Slope stability analysis and design	1	LS	88,400.00	0.00	0.00	0.00	88,400	0	0	0	88,400	See Assumptions
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	25	MO	400.00	0.00	0.00	0.00	9,964	0	0	0	9,964	Historical data
3) Portable Communication Equipment	8	SETS	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	Historical data
4) Equipment Mobilization/Demobilization (support e	1	LS	40,000.00	0.00	0.00	0.00	40,000	0	0	0	40,000	Historical data
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities	25	MO	4,000.00	0.00	0.00	0.00	99,638	0	0	0	99,638	Historical data
7) 3 Pick-up Truck (rental)	25	MO	2,850.00	450.00	0.00	0.00	70,992	11,209	0	0	82,202	Historical data
8) Cerification/Close-out Reports	1	EA	7,000.00	2,000.00	15,000.00	3,000.00	7,000	2,000	15,000	3,000	27,000	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	25	MO	1,500.00	0.00	200.00	0.00	37,364	0	4,982	0	42,346	Vendor catalog
2) PPE rolloff cont.	25	MO	500.00	0.00	0.00	0.00	12,455	0	0	0	12,455	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	4,982	HR	0.00	0.00	35.86	0.00	0	0	178,652	0	178,652	Historical data
2) Site engineer	4,982	HR	0.00	0.00	32.00	0.00	0	0	159,421	0	159,421	Historical data
3) Site supervisor/foreman	4,982	HR	0.00	0.00	30.00	0.00	0	0	149,458	0	149,458	Historical data
4) Site safety officer	4,982	HR	0.00	0.00	25.00	0.00	0	0	124,548	0	124,548	Historical data
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	996	HR	0.00	0.00	45.00	0.00	0	0	44,837	0	44,837	Historical data
2) Project administrator	747	HR	0.00	0.00	30.00	0.00	0	0	22,419	0	22,419	Historical data
3) Health and Safety director	249	HR	0.00	0.00	35.00	0.00	0	0	8,718	0	8,718	Historical data
4) Procurement/subcontracting	2,491	HR	0.00	0.00	30.00	0.00	0	0	74,729	0	74,729	Historical data
5) Clerical support	2,491	HR	0.00	0.00	12.36	0.00	0	0	30,788	0	30,788	Historical data
LANDFILL CAP PREP. AND RESTORATION												
1) Survey control (2-man crew)	3,600	HR	0.00	0.00	60.00	15.00	0	0	216,000	54,000	270,000	Historical data
2) Silt Fence	5,000	LF	0.00	0.50	0.35		0	2,500	1,750	0	4,250	022-700-1100
3) Strip existing cap soils and stockpile	7,259	CY	0.00	0.00	0.62	2.09	0	0	4,501	15,171	19,672	17-01-0502
3a) Remove and stage shrubs	1	LS	2,500.00	0.00			2,500	0	0	0	2,500	Historical data
4) Dredge spoil placement (12" lifts, 3 mile R/T)	21,266	CY	0.00	0.26	1.83	6.17	0	5,529	38,917	131,211	175,657	17-03-0422
5) 6" cap layer	1,815	CY	0.00	0.26	1.52	4.76	0	472	2,759	8,639	11,870	17-03-0422
6) Gas vent layer 12"	3,630	CY	0.00	9.11	0.82	2.11	0	33,069	2,977	7,659	43,705	17-03-046
6a) extend/finish existing gas vents	18	EA	500.00	0.00	0.00	0.00	9,000	0	0	0	9,000	Historical data
7) GCL furnish and install	98,000	SF	0.00	0.25	0.07	0.07	0	24,500	6,860	6,860	38,220	33-08-0543
8) 40 mil VLDPE furnish and install	98,000	SF	0.00	0.41	1.07	0.11	0	40,180	104,860	10,780	155,820	33-08-0544
9) 12" drainage layer	3,630	CY	0.00	12.00	0.23	0.34	0	43,560	835	1,234	45,629	Historical data
10) Geotextile furnish and install	10,889	SY	0.00	0.56	0.33	0.03	0	6,098	3,593	327	10,018	33-08-0532
11) 18" Cover soil layer (reuse)	7,259	CY	0.00	0.00	0.23	0.34	0	0	1,670	2,468	4,138	Historical data
12) 6" Topsoil (reuse 70% from existing cap)	1,290	CY	0.00	0.00	1.43	5.14	0	0	1,845	6,631	8,475	18-05-0302
13) 6" Topsoil (30% from off-site)	540	CY	0.00	16.62	3.29	3.62	0	8,975	1,777	1,955	12,706	18-05-0301

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER5 - REMOVAL WITH DISPOSAL ON AND OFF-BASE: (+20% VOLUME) COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
14) Root reinforcing mat (slopes only)	8,756	SY	0.00	0.78	0.21	0.07	0	6,830	1,839	613	9,281	022-704-0010
15) Jute mat (slopes only)	8,756	SY	0.00	1.75	0.20	0.07	0	15,323	1,751	613	17,687	022-704-0200
16) Extend & finish monitoring wells	2	EA	1,000.00	0.00	0.00	0.00	2,000	0	0	0	2,000	Historical data
17) Revegetation (hydroseed & reuse shrubs)	2.30	AC	589.62	0.00	1,000.00	200.00	1,356	0	2,300	460	4,116	Historical data
18) Restore operations areas	2	AC	5,000.00	0.00	0.00	0.00	10,000	0	0	0	10,000	Historical data
19) Geotechnical testing	150	DY	0.00	5.00	800.00	50.00	0	750	120,000	7,500	128,250	Historical data
20) Revise as-built records and cert. report.	1	EA	0.00	1,000.00	11,000.00	1,500.00	0	1,000	11,000	1,500	13,500	Historical data
DREDGING/WATER TREATMENT												
1) Erosion control, silt boom	3,000	LF	0.00	10.00	4.00	4.00	0	30,000	12,000	12,000	54,000	Historical data
2) Mob/Demob (barge and pier based equip.)	1	LS	167,600.00	0.00	0.00	0.00	167,600	0	0	0	167,600	Vendor Info.
3) Mob/Demob (shore based equip.)	1	LS	5,000.00	0.00	0.00	0.00	5,000	0	0	0	5,000	Vendor Info.
4) Prep., maint., and removal of staging area	1	LS	0.00	1,000.00	7,000.00	3,000.00	0	1,000	7,000	3,000	11,000	Vendor Info.
5) Mobilization/demobilization of drilling equipment	1	LS	100,000.00	0.00	0.00	0.00	100,000	0	0	0	100,000	Historical data
6) Drill sockets for H-piles	3,600	LF	150.00	0.00	0.00	0.00	540,000	0	0	0	540,000	Historical data
7) Mobilization/demob pile/sheet driving equipment	1	LS	75,000.00	0.00	0.00	0.00	75,000	0	0	0	75,000	Historical data
8) Install/grout H-piles and walers @57#/lf)	154	TN	0.00	1,162.50	122.25	228.75	0	178,909	18,814	35,205	232,928	R021-610
9) Install/remove sheeting	18,000	SF	0.00	4.09	5.16	11.60	0	73,620	92,880	208,800	375,300	Historical data
10) Remove H-piles (cut flush to grade)	120	EA	0.00	100.00	250.00	1,200.00	0	12,000	30,000	144,000	186,000	Historical data
11) Porta Dam (install, rental, takedown)	1,200	LF	150.00	0.00	0.00	0.00	180,000	0	0	0	180,000	Historical data
12) Porta Dam dewatering	45	DAY	0.00	0.00	665.00	150.00	0	0	29,744	6,709	36,453	021-440-0410
13) Heavy equipment mob/demob (shore based)	1	LS	10,000.00	0.00	0.00	0.00	10,000	0	0	0	10,000	Historical data
14) Excavate/screen/haul sediments (shore based)	13,418	CY	0.00	0.00	4.93	12.23	0	0	66,153	164,107	230,260	022-238-300
15) Dredge sediments (barge)	27,520	CY	43.00	0.00	0.00	0.00	1,183,343	0	0	0	1,183,343	Vendor Info.
16) Treatment of dredge water	138	DAY	4,500.00	0.00	0.00	0.00	619,191	0	0	0	619,191	Vendor Info.
17) Removal of sediments from barge	27,520	CY	32.50	0.00	0.00	0.00	894,387	0	0	0	894,387	Vendor Info.
18) Sediment confirmation testing	50	EA	1,400.00	0.00	0.00	0.00	70,000	0	0	0	70,000	Historical data
19) Water Quality Testing	138	DAY	3,600.00	50.00	200.00	150.00	495,353	6,880	27,520	20,640	550,392	Historical data
20) Disposal/Transport to RCRA D Landfill	17,225	TN	110.00	0.00	0.00	0.00	1,894,761	0	0	0	1,894,761	Vendor Info.
21) D/T to RCRA D Landfill w/ stabilization	4,421	TN	350.00	0.00	0.00	0.00	1,547,456	0	0	0	1,547,456	Vendor Info.
22) Disposal/Transport to RCRA C Landfill	491	TN	500.00	0.00	0.00	0.00	245,628	0	0	0	245,628	Vendor Info.
BACKFILL PLACEMENT												
1) Installation of 2 feet imported sand/gravel/stone	13,418	CY	0.00	15.00	4.93	11.23	0	201,276	66,153	150,689	418,117	Vendor Info.
2) Installation of 2 feet screened sand/gravel/stone	2,684	CY	0.00	0.00	4.93	11.23	0	0	13,231	30,138	43,368	Vendor Info.
3) Strategically Placed Boulders (shore based)	3	DAY	0.00	2,880.00	2,960.00	6,740.00	0	8,640	8,880	20,220	37,740	See assumptions
4) Installation of 2 foot imported sand/gravel cap (b	22,016	CY	25.17	15.00	1.66	0.00	554,135	330,235	36,546	0	920,916	Vendor Info.
5) Installation of 2 foot screened sand/gravel cap (b	5,504	CY	25.17	0.00	1.66	0.00	138,534	0	9,137	0	147,670	Vendor Info.
6) Strategically Placed Boulders (barge based)	8	DAY	15,100.00	1,440.00	0.00	0.00	120,800	11,520	0	0	132,320	See assumptions
7) Water quality monitoring (3 samples/day)	46	DAY	3,600.00	50.00	200.00	150.00	165,118	2,293	9,173	6,880	183,464	Historical/Vendor
			TOTAL				9,515,225	1,058,368	1,766,014	1,063,008	13,402,615	

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER5 - REMOVAL WITH DISPOSAL ON AND OFF-BASE: (+20% VOLUME) COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
Direct Cost Adjustment Factors												
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)							0	0	88,301	53,150	141,451	
Safety Level C Multiplier (25% of labor and equipment, as listed)							0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)							0	0	70,641	42,520	113,161	
			Subtotal Direct Costs				9,515,225	1,058,368	1,854,314	1,116,159	13,657,227	
Indirect Cost Adjustment Factors												
Labor Overhead @ 250% (for field mgmt. & home office, only)							0	0	2,021,425	0	2,021,425	
Field Construction Labor Overhead @ 75%							0	0	718,083	0	718,083	
Subcontract Overhead @ 10%							951,522	0	0	0	951,522	
Tax on Materials @ 5%							0	52,918	0	0	52,918	
G & A @ 10% (on labor, equip., & matl's.)							0	105,837	185,431	111,616	402,884	
			Subtotal Direct and Indirect Costs				########	1,217,123	4,779,253	1,227,774	17,804,059	
Cost Adjustment Factors												
City/Location Cost Adjustment Factor @ 7% (ref. 1)											1,246,284	
			Adjusted Direct and Indirect Costs				########	1,217,123	4,779,253	1,227,774	19,050,344	
Engineering @ 6 % of total direct and indirect											1,143,021	
Prime Contractor Fee @ 10% of Total Adjusted Cost											1,905,034	
			Total Costs								22,098,399	
Contingency @ 30% of Total Cost											6,629,520	
			TOTAL ESTIMATED COST								28,727,918	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors or actual costs at this or other sites.

McAllister Point Landfill FS
Near Shore Alternative 5 - Removal with Disposal On and Off-Base
(+20%) Volume Sensitivity Analysis
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$26,324,958			$26,324,958
1	0.935		$105,280		$98,393
2	0.873		$105,280		$91,956
3	0.816				$0
4	0.763				$0
5	0.713		$105,280	$21,500	$90,392
6	0.666				$0
7	0.623				$0
8	0.582				$0
9	0.544				$0
10	0.508				$0
11	0.475				$0
12	0.444				$0
13	0.415				$0
14	0.388				$0
15	0.362				$0
16	0.339				$0
17	0.317				$0
18	0.296				$0
19	0.277				$0
20	0.258				$0
21	0.242				$0
22	0.226				$0
23	0.211				$0
24	0.197				$0
25	0.184				$0
26	0.172				$0
27	0.161				$0
28	0.150				$0
29	0.141				$0
30	0.131				$0
		TOTAL PRESENT WORTH =			$26,605,699

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER5 - REMOVAL WITH DISPOSAL ON AND OFF-BASE: (-30% VOLUME) COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	*Qty*	*Unit*	*Sub.*	*Mat.*	*Labor*	*Equip.*	*Sub.*	*Mat.*	*Labor*	*Equip.*		
PRE-DESIGN INVESTIGATION												
1) Sediment/soil borings and analyses	1	LS	112,050.00	0.00	0.00	0.00	112,050	0	0	0	112,050	See Assumptions
2) Slope stability analysis and design	1	LS	88,400.00	0.00	0.00	0.00	88,400	0	0	0	88,400	See Assumptions
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	20	MO	400.00	0.00	0.00	0.00	8,062	0	0	0	8,062	Historical data
3) Portable Communication Equipment	8	SETS	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	Historical data
4) Equipment Mobilization/Demobilization (support e	1	LS	40,000.00	0.00	0.00	0.00	40,000	0	0	0	40,000	Historical data
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities	20	MO	4,000.00	0.00	0.00	0.00	80,622	0	0	0	80,622	Historical data
7) 3 Pick-up Truck (rental)	20	MO	2,850.00	450.00	0.00	0.00	57,443	9,070	0	0	66,513	Historical data
8) Cerification/Close-out Reports	1	EA	7,000.00	2,000.00	15,000.00	3,000.00	7,000	2,000	15,000	3,000	27,000	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	20	MO	1,500.00	0.00	200.00	0.00	30,233	0	4,031	0	34,265	Vendor catalog
2) PPE rolloff cont.	20	MO	500.00	0.00	0.00	0.00	10,078	0	0	0	10,078	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	4,031	HR	0.00	0.00	35.86	0.00	0	0	144,556	0	144,556	Historical data
2) Site engineer	4,031	HR	0.00	0.00	32.00	0.00	0	0	128,996	0	128,996	Historical data
3) Site supervisor/foreman	4,031	HR	0.00	0.00	30.00	0.00	0	0	120,934	0	120,934	Historical data
4) Site safety officer	4,031	HR	0.00	0.00	25.00	0.00	0	0	100,778	0	100,778	Historical data
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	806	HR	0.00	0.00	45.00	0.00	0	0	36,280	0	36,280	Historical data
2) Project administrator	605	HR	0.00	0.00	30.00	0.00	0	0	18,140	0	18,140	Historical data
3) Health and Safety director	202	HR	0.00	0.00	35.00	0.00	0	0	7,054	0	7,054	Historical data
4) Procurement/subcontracting	2,016	HR	0.00	0.00	30.00	0.00	0	0	60,467	0	60,467	Historical data
5) Clerical support	2,016	HR	0.00	0.00	12.36	0.00	0	0	24,912	0	24,912	Historical data
LANDFILL CAP PREP. AND RESTORATION												
1) Survey control (2-man crew)	3,600	HR	0.00	0.00	60.00	15.00	0	0	216,000	54,000	270,000	Historical data
2) Silt Fence	5,000	LF	0.00	0.50	0.35		0	2,500	1,750	0	4,250	022-700-1100
3) Strip existing cap soils and stockpile	7,259	CY	0.00	0.00	0.62	2.09	0	0	4,501	15,171	19,672	17-01-0502
3a) Remove and stage shrubs	1	LS	2,500.00	0.00			2,500	0	0	0	2,500	Historical data
4) Dredge spoil placement (12" lifts, 3 mile R/T)	21,266	CY	0.00	0.26	1.83	6.17	0	5,529	38,917	131,211	175,657	17-03-0422
5) 6" cap layer	1,815	CY	0.00	0.26	1.52	4.76	0	472	2,759	8,639	11,870	17-03-0422
6) Gas vent layer 12"	3,630	CY	0.00	9.11	0.82	2.11	0	33,069	2,977	7,659	43,705	17-03-046
6a) extend/finish existing gas vents	18	EA	500.00	0.00	0.00	0.00	9,000	0	0	0	9,000	Historical data
7) GCL furnish and install	98,000	SF	0.00	0.25	0.07	0.07	0	24,500	6,860	6,860	38,220	33-08-0543
8) 40 mil VLDPE furnish and install	98,000	SF	0.00	0.41	1.07	0.11	0	40,180	104,860	10,780	155,820	33-08-0544
9) 12" drainage layer	3,630	CY	0.00	12.00	0.23	0.34	0	43,560	835	1,234	45,629	Historical data
10) Geotextile furnish and install	10,889	SY	0.00	0.56	0.33	0.03	0	6,098	3,593	327	10,018	33-08-0532
11) 18" Cover soil layer (reuse)	7,259	CY	0.00	0.00	0.23	0.34	0	0	1,670	2,468	4,138	Historical data
12) 6" Topsoil (reuse 70% from existing cap)	1,290	CY	0.00	0.00	1.43	5.14	0	0	1,845	6,631	8,475	18-05-0302
13) 6" Topsoil (30% from off-site)	540	CY	0.00	16.62	3.29	3.62	0	8,975	1,777	1,955	12,706	18-05-0301

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER5 - REMOVAL WITH DISPOSAL ON AND OFF-BASE: (-30% VOLUME) COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
14) Root reinforcing mat (slopes only)	8,756	SY	0.00	0.78	0.21	0.07	0	6,830	1,839	613	9,281	022-704-0010
15) Jute mat (slopes only)	8,756	SY	0.00	1.75	0.20	0.07	0	15,323	1,751	613	17,687	022-704-0200
16) Extend & finish monitoring wells	2	EA	1,000.00	0.00	0.00	0.00	2,000	0	0	0	2,000	Historical data
17) Revegetation (hydroseed & reuse shrubs)	2.30	AC	589.62	0.00	1,000.00	200.00	1,356	0	2,300	460	4,116	Historical data
18) Restore operations areas	2	AC	5,000.00	0.00	0.00	0.00	10,000	0	0	0	10,000	Historical data
19) Geotechnical testing	150	DY	0.00	5.00	800.00	50.00	0	750	120,000	7,500	128,250	Historical data
20) Revise as-built records and cert. report.	1	EA	0.00	1,000.00	11,000.00	1,500.00	0	1,000	11,000	1,500	13,500	Historical data
DREDGING/WATER TREATMENT												
1) Erosion control, silt boom	3,000	LF	0.00	10.00	4.00	4.00	0	30,000	12,000	12,000	54,000	Historical data
2) Mob/Demob (barge and pier based equip.)	1	LS	167,600.00	0.00	0.00	0.00	167,600	0	0	0	167,600	Vendor Info.
3) Mob/Demob (shore based equip.)	1	LS	5,000.00	0.00	0.00	0.00	5,000	0	0	0	5,000	Vendor Info.
4) Prep., maint., and removal of staging area	1	LS	0.00	1,000.00	7,000.00	3,000.00	0	1,000	7,000	3,000	11,000	Vendor Info.
5) Mobilization/demobilization of drilling equipment	1	LS	100,000.00	0.00	0.00	0.00	100,000	0	0	0	100,000	Historical data
6) Drill sockets for H-piles	3,600	LF	150.00	0.00	0.00	0.00	540,000	0	0	0	540,000	Historical data
7) Mobilization/demob pile/sheet driving equipment	1	LS	75,000.00	0.00	0.00	0.00	75,000	0	0	0	75,000	Historical data
8) Install/grout H-piles and walers @57#/lf)	154	TN	0.00	1,162.50	122.25	228.75	0	178,909	18,814	35,205	232,928	R021-610
9) Install/remove sheeting	18,000	SF	0.00	4.09	5.16	11.60	0	73,620	92,880	208,800	375,300	Historical data
10) Remove H-piles (cut flush to grade)	120	EA	0.00	100.00	250.00	1,200.00	0	12,000	30,000	144,000	186,000	Historical data
11) Porta Dam (install, rental, takedown)	1,200	LF	150.00	0.00	0.00	0.00	180,000	0	0	0	180,000	Historical data
12) Porta Dam dewatering	26	DAY	0.00	0.00	665.00	150.00	0	0	17,351	3,914	21,264	021-440-0410
13) Heavy equipment mob/demob (shore based)	1	LS	10,000.00	0.00	0.00	0.00	10,000	0	0	0	10,000	Historical data
14) Excavate/screen/haul sediments (shore based)	7,827	CY	0.00	0.00	4.93	12.23	0	0	38,589	95,729	134,318	022-238-300
15) Dredge sediments (barge)	16,053	CY	43.00	0.00	0.00	0.00	690,283	0	0	0	690,283	Vendor Info.
16) Treatment of dredge water	80	DAY	4,500.00	0.00	0.00	0.00	361,195	0	0	0	361,195	Vendor Info.
17) Removal of sediments from barge	16,053	CY	32.50	0.00	0.00	0.00	521,726	0	0	0	521,726	Vendor Info.
18) Sediment confirmation testing	50	EA	1,400.00	0.00	0.00	0.00	70,000	0	0	0	70,000	Historical data
19) Water Quality Testing	80	DAY	3,600.00	50.00	200.00	150.00	288,956	4,013	16,053	12,040	321,062	Historical data
20) Disposal/Transport to RCRA D Landfill	0	TN	110.00	0.00	0.00	0.00	0	0	0	0	0	Vendor Info.
21) D/T to RCRA D Landfill w/ stabilization	2,579	TN	350.00	0.00	0.00	0.00	902,683	0	0	0	902,683	Vendor Info.
22) Disposal/Transport to RCRA C Landfill	287	TN	500.00	0.00	0.00	0.00	143,283	0	0	0	143,283	Vendor Info.
BACKFILL PLACEMENT												
1) Installation of 2 feet imported sand/gravel/stone	7,827	CY	0.00	15.00	4.93	11.23	0	117,411	38,589	87,902	243,902	Vendor Info.
2) Installation of 2 feet screened sand/gravel/stone	1,565	CY	0.00	0.00	4.93	11.23	0	0	7,718	17,580	25,298	Vendor Info.
3) Strategically Placed Boulders (shore based)	3	DAY	0.00	2,880.00	2,960.00	6,740.00	0	8,640	8,880	20,220	37,740	See assumptions
4) Installation of 2 foot imported sand/gravel cap (b	12,842	CY	25.17	15.00	1.66	0.00	323,245	192,637	21,319	0	537,201	Vendor Info.
5) Installation of 2 foot screened sand/gravel cap (b	3,211	CY	25.17	0.00	1.66	0.00	80,811	0	5,330	0	86,141	Vendor Info.
6) Strategically Placed Boulders (barge based)	8	DAY	15,100.00	1,440.00	0.00	0.00	120,800	11,520	0	0	132,320	See assumptions
7) Water quality monitoring (3 samples/day)	27	DAY	3,600.00	50.00	200.00	150.00	96,319	1,338	5,351	4,013	107,021	Historical/Vendor
			TOTAL				5,141,846	830,944	1,506,253	905,024	8,384,067	

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
NS&ER5 - REMOVAL WITH DISPOSAL ON AND OFF-BASE: (-30% VOLUME) COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

Item	Qty	Unit	Unit Cost ($) Sub.	Mat.	Labor	Equip.	Total Cost ($) Sub.	Mat.	Labor	Equip.	Total Direct Cost ($)	Comments
Direct Cost Adjustment Factors												
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)							0	0	75,313	45,251	120,564	
Safety Level C Multiplier (25% of labor and equipment, as listed)							0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)							0	0	60,250	36,201	96,451	
			Subtotal Direct Costs				5,141,846	830,944	1,581,566	950,275	8,601,082	
Indirect Cost Adjustment Factors												
Labor Overhead @ 250% (for field mgmt. & home office, only)							0	0	1,642,793	0	1,642,793	
Field Construction Labor Overhead @ 75%							0	0	636,852	0	636,852	
Subcontract Overhead @ 10%							514,185	0	0	0	514,185	
Tax on Materials @ 5%							0	41,547	0	0	41,547	
G & A @ 10% (on labor, equip., & matl's.)							0	83,094	158,157	95,028	336,278	
			Subtotal Direct and Indirect Costs				5,656,031	955,585	4,019,368	1,045,303	11,772,737	
Cost Adjustment Factors												
City/Location Cost Adjustment Factor @ 7% (ref. 1)											824,092	
			Adjusted Direct and Indirect Costs				5,656,031	955,585	4,019,368	1,045,303	12,596,829	
Engineering @ 6 % of total direct and indirect											755,810	
Prime Contractor Fee @ 10% of Total Adjusted Cost											1,259,683	
			Total Costs								14,612,321	
Contingency @ 30% of Total Cost											4,383,696	
			TOTAL ESTIMATED COST								18,996,018	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors or actual costs at this or other sites.

McAllister Point Landfill FS
Near Shore Alternative 5 - Removal with Disposal On and Off-Base
(-30%) Volume Sensitivity Analysis
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$17,139,516			$17,139,516
1	0.935		$105,280		$98,393
2	0.873		$105,280		$91,956
3	0.816				$0
4	0.763				$0
5	0.713		$105,280	$21,500	$90,392
6	0.666				$0
7	0.623				$0
8	0.582				$0
9	0.544				$0
10	0.508				$0
11	0.475				$0
12	0.444				$0
13	0.415				$0
14	0.388				$0
15	0.362				$0
16	0.339				$0
17	0.317				$0
18	0.296				$0
19	0.277				$0
20	0.258				$0
21	0.242				$0
22	0.226				$0
23	0.211				$0
24	0.197				$0
25	0.184				$0
26	0.172				$0
27	0.161				$0
28	0.150				$0
29	0.141				$0
30	0.131				$0
		TOTAL PRESENT WORTH =			$17,420,257

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

APPENDIX G-2

OFFSHORE ALTERNATIVES

COST SENSITIVITY ANALYSIS

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
OS-3 - CAPPING, INST. CONTROLS, NAT. ATTEN. LONG-TERM MONIT.: (+30%) VOLUME (AREA) COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
PRE-DESIGN INVESTIGATION												
1) Topographic survey	1	LS	7,500.00	0.00	0.00	0.00	7,500	0	0	0	7,500	Vendor Info.
2) Additional soils boring and analyses	1	LS	135,500.00	0.00	0.00	0.00	135,500	0	0	0	135,500	See Assumptions
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	26	MO	400.00	0.00	0.00	0.00	10,487	0	0	0	10,487	Historical data
2) Storage Trailer (1 ea)	26	MO	100.00	0.00	0.00	0.00	2,622	0	0	0	2,622	Historical data
3) Portable Communication Equipment	8	SETS	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	
4) Equipment Mobilization/Demobilization	1	LS	15,000.00	0.00	0.00	0.00	15,000	0	0	0	15,000	
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities	26	MO	4,000.00	0.00	0.00	0.00	104,868	0	0	0	104,868	
7) 3 Pick-up Truck (lease, fuel, oil)	26	MO	2,850.00	450.00	0.00	0.00	74,719	11,798	0	0	86,516	Historical data
8) Certification/Close-out Reports	1	LS	3,500.00	12,000.00	15,000.00	0.00	3,500	12,000	15,000	0	30,500	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	26	MO	500.00	0.00	200.00	0.00	13,109	0	5,243	0	18,352	Vendor catalog
2) PPE rolloff cont.	26	MO	500.00	0.00	0.00	0.00	13,109	0	0	0	13,109	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	5,243	HR	0.00	0.00	35.86	0.00	0	0	188,029	0	188,029	
2) Site supervisor/foreman	5,243	HR	0.00	0.00	30.00	0.00	0	0	157,303	0	157,303	
3) Site safety officer	5,243	HR	0.00	0.00	25.00	0.00	0	0	131,086	0	131,086	
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	1,049	HR	0.00	0.00	45.00	0.00	0	0	47,191	0	47,191	
2) Project administrator	787	HR	0.00	0.00	30.00	0.00	0	0	23,595	0	23,595	
3) Health and Safety director	262	HR	0.00	0.00	35.00	0.00	0	0	9,176	0	9,176	
4) Procurement/subcontracting	2,622	HR	0.00	0.00	30.00	0.00	0	0	78,651	0	78,651	
5) Clerical support	2,622	HR	0.00	0.00	12.36	0.00	0	0	32,404	0	32,404	
COVER SYSTEM PLACEMENT	2,316,085	SF										
1) Erosion control, silt boom	3,000	LF	0.00	10.00	4.00	4.00	0	30,000	12,000	12,000	54,000	Vendor Info.
2) Mob/Demob (barge and pier based equip.)	1	LS	57,600.00	0.00	0.00	0.00	57,600	0	0	0	57,600	Vendor Info.
3) Install concrete monuments (1 polygon/day)	42	EA	5,366.67	300.00	1,000.00	1,500.00	225,400	12,600	42,000	63,000	343,000	Vendor Info.
3) Installation of 2 foot sand/gravel cap	171,562	CY	25.17	15.00	1.66	0.00	4,318,212	2,573,428	284,793	0	7,176,433	Vendor Info.
4) Strategically Placed Boulders	154	DAY	15,100.00	1,440.00	0.00	0.00	2,331,526	222,344	0	0	2,553,870	See assumptions
5) Water quality monitoring (3 samples/day)	300	DAY	3,600.00	50.00	200.00	150.00	1,079,771	14,997	59,987	44,990	1,199,746	Historical/Vendor

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
OS-3 - CAPPING, INST. CONTROLS, NAT. ATTEN. LONG-TERM MONIT.: (+30%) VOLUME (AREA) COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

	Total Cost ($) Sub.	Mat.	Labor	Equip.	Total Direct Cost ($)	Comments
TOTAL	8,399,122	2,877,167	1,086,458	119,990	12,482,738	
Direct Cost Adjustment Factors						
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)	0	0	54,323	6,000	60,322	
Safety Level C Multiplier (25% of labor and equipment, as listed)	0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)	0	0	43,458	4,800	48,258	
Subtotal Direct Costs	8,399,122	2,877,167	1,140,781	125,990	12,591,318	
Indirect Cost Adjustment Factors						
Labor Overhead @ 250% (for field mgmt. & home office, only)	0	0	1,668,588	0	1,668,588	
Field Construction Labor Overhead @ 75%	0	0	269,277	0	269,277	
Subcontract Overhead @ 10%	839,912	0	0	0	839,912	
Tax on Materials @ 5%	0	143,858	0	0	143,858	
G & A @ 10% (on labor, equip., & matl's.)	0	287,717	114,078	12,599	414,394	
Subtotal Direct and Indirect Costs	9,239,034	3,308,742	3,192,724	138,589	15,927,347	
Cost Adjustment Factors						
City/Location Cost Adjustment Factor @ 7% (ref. 1)					1,114,914	
Adjusted Direct and Indirect Costs	9,239,034	3,308,742	3,192,724	138,589	17,042,262	
Engineering @ 6 % of total direct and indirect					1,022,536	
Prime Contractor Fee @ 10% of Total Adjusted Cost					1,704,226	
Total Costs					19,769,023	
Contingency @ 30% of Total Cost					5,930,707	
TOTAL ESTIMATED COST					25,699,730	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors at this or other sites.

McAllister Point Landfill FS
Off Shore Alternative 3 - Capping: (+30%) Cost Sensitivity Analysis
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$25,699,730			$25,699,730
1	0.935		$110,160		$102,953
2	0.873		$110,160		$96,218
3	0.816		$110,160		$89,923
4	0.763		$110,160		$84,041
5	0.713		$110,160	$21,500	$93,872
6	0.666				$0
7	0.623				$0
8	0.582				$0
9	0.544				$0
10	0.508		$110,160	$21,500	$66,929
11	0.475				$0
12	0.444				$0
13	0.415				$0
14	0.388				$0
15	0.362		$110,160	$21,500	$47,720
16	0.339				$0
17	0.317				$0
18	0.296				$0
19	0.277				$0
20	0.258		$110,160	$21,500	$34,023
21	0.242				$0
22	0.226				$0
23	0.211				$0
24	0.197				$0
25	0.184		$110,160	$21,500	$24,258
26	0.172				$0
27	0.161				$0
28	0.150				$0
29	0.141				$0
30	0.131		$110,160	$21,500	$17,296
		TOTAL PRESENT WORTH =			$26,356,963

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
OS-3 - CAPPING, INST. CONTROLS, NAT. ATTEN. LONG-TERM MONIT.: (-30%) VOLUME (AREA) COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
PRE-DESIGN INVESTIGATION												
1) Topographic survey	1	LS	7,500.00	0.00	0.00	0.00	7,500	0	0	0	7,500	Vendor Info.
2) Additional soils boring and analyses	1	LS	135,500.00	0.00	0.00	0.00	135,500	0	0	0	135,500	See Assumptions
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	16	MO	400.00	0.00	0.00	0.00	6,422	0	0	0	6,422	Historical data
2) Storage Trailer (1 ea)	16	MO	100.00	0.00	0.00	0.00	1,606	0	0	0	1,606	Historical data
3) Portable Communication Equipment	8	SETS	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	
4) Equipment Mobilization/Demobilization	1	LS	15,000.00	0.00	0.00	0.00	15,000	0	0	0	15,000	
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities	16	MO	4,000.00	0.00	0.00	0.00	64,221	0	0	0	64,221	
7) 3 Pick-up Truck (lease, fuel, oil)	16	MO	2,850.00	450.00	0.00	0.00	45,758	7,225	0	0	52,983	Historical data
8) Certification/Close-out Reports	1	LS	3,500.00	12,000.00	15,000.00	0.00	3,500	12,000	15,000	0	30,500	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	16	MO	500.00	0.00	200.00	0.00	8,028	0	3,211	0	11,239	Vendor catalog
2) PPE rolloff cont.	16	MO	500.00	0.00	0.00	0.00	8,028	0	0	0	8,028	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	3,211	HR	0.00	0.00	35.86	0.00	0	0	115,149	0	115,149	
2) Site supervisor/foreman	3,211	HR	0.00	0.00	30.00	0.00	0	0	96,332	0	96,332	
3) Site safety officer	3,211	HR	0.00	0.00	25.00	0.00	0	0	80,277	0	80,277	
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	642	HR	0.00	0.00	45.00	0.00	0	0	28,900	0	28,900	
2) Project administrator	482	HR	0.00	0.00	30.00	0.00	0	0	14,450	0	14,450	
3) Health and Safety director	161	HR	0.00	0.00	35.00	0.00	0	0	5,619	0	5,619	
4) Procurement/subcontracting	1,606	HR	0.00	0.00	30.00	0.00	0	0	48,166	0	48,166	
5) Clerical support	1,606	HR	0.00	0.00	12.36	0.00	0	0	19,844	0	19,844	
COVER SYSTEM PLACEMENT	1,247,123	SF										
1) Erosion control, silt boom	3,000	LF	0.00	10.00	4.00	4.00	0	30,000	12,000	12,000	54,000	Vendor Info.
2) Mob/Demob (barge and pier based equip.)	1	LS	57,600.00	0.00	0.00	0.00	57,600	0	0	0	57,600	Vendor Info.
3) Install concrete monuments (1 polygon/day)	42	EA	5,366.67	300.00	1,000.00	1,500.00	225,400	12,600	42,000	63,000	343,000	Vendor Info.
3) Installation of 2 foot sand/gravel cap	92,379	CY	25.17	15.00	1.66	0.00	2,325,191	1,385,692	153,350	0	3,864,233	Vendor Info.
4) Strategically Placed Boulders	83	DAY	15,100.00	1,440.00	0.00	0.00	1,255,437	119,724	0	0	1,375,161	See assumptions
5) Water quality monitoring (3 samples/day)	168	DAY	3,600.00	50.00	200.00	150.00	604,677	8,398	33,593	25,195	671,863	Historical/Vendor

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
OS-3 - CAPPING, INST. CONTROLS, NAT. ATTEN. LONG-TERM MONIT.: (-30%) VOLUME (AREA) COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

	Total Cost ($) Sub.	Mat.	Labor	Equip.	Total Direct Cost ($)	Comments
TOTAL	4,770,067	1,575,639	667,892	100,195	7,113,793	
Direct Cost Adjustment Factors						
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)	0	0	33,395	5,010	38,404	
Safety Level C Multiplier (25% of labor and equipment, as listed)	0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)	0	0	26,716	4,008	30,723	
Subtotal Direct Costs	4,770,067	1,575,639	701,286	105,205	7,182,920	
Indirect Cost Adjustment Factors						
Labor Overhead @ 250% (for field mgmt. & home office, only)	0	0	1,021,844	0	1,021,844	
Field Construction Labor Overhead @ 75%	0	0	169,171	0	169,171	
Subcontract Overhead @ 10%	477,007	0	0	0	477,007	
Tax on Materials @ 5%	0	78,782	0	0	78,782	
G & A @ 10% (on labor, equip., & matl's.)	0	157,564	70,129	10,520	238,213	
Subtotal Direct and Indirect Costs	5,247,074	1,811,985	1,962,429	115,725	9,167,937	
Cost Adjustment Factors						
City/Location Cost Adjustment Factor @ 7% (ref. 1)					641,756	
Adjusted Direct and Indirect Costs	5,247,074	1,811,985	1,962,429	115,725	9,809,692	
Engineering @ 6 % of total direct and indirect					588,582	
Prime Contractor Fee @ 10% of Total Adjusted Cost					980,969	
Total Costs					11,379,243	
Contingency @ 30% of Total Cost					3,413,773	
TOTAL ESTIMATED COST					14,793,016	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors at this or other sites.

McAllister Point Landfill FS
Off Shore Alternative 4 - Removal: (+30%) Volume Cost Sensitivity Analysis
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$56,703,153			$56,703,153
1	0.935		$19,440		$18,168
2	0.873		$19,440		$16,980
3	0.816				$0
4	0.763				$0
5	0.713		$19,440		$13,860
6	0.666				$0
7	0.623				$0
8	0.582				$0
9	0.544				$0
10	0.508				$0
11	0.475				$0
12	0.444				$0
13	0.415				$0
14	0.388				$0
15	0.362				$0
16	0.339				$0
17	0.317				$0
18	0.296				$0
19	0.277				$0
20	0.258				$0
21	0.242				$0
22	0.226				$0
23	0.211				$0
24	0.197				$0
25	0.184				$0
26	0.172				$0
27	0.161				$0
28	0.150				$0
29	0.141				$0
30	0.131				$0
		TOTAL PRESENT WORTH =			$56,752,161

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
OS - 4 - REMOVAL AND OFF-BASE DISPOSAL: (+30%) VOLUME COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
PRE-DESIGN INVESTIGATION												
1) Additional soils boring and analyses	1	LS	135,500.00			0.00	135,500	0	0	0	135,500	ee assumption
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	17	MO	400.00	0.00	0.00	0.00	6,627	0	0	0	6,627	Historical data
2) Storage Trailer (1 ea)	17	MO	100.00	0.00	0.00	0.00	1,657	0	0	0	1,657	Historical data
3) Portable Communication Equipment	8	SETS	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	Historical data
4) Equipment Mobilization/Demobilization	1	LS	25,000.00	0.00	0.00	0.00	25,000	0	0	0	25,000	Historical data
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities	17	MO	4,000.00	0.00	0.00	0.00	66,269	0	0	0	66,269	Historical data
7) 3 Pick-up Truck (rental)	17	MO	2,850.00	450.00	0.00	0.00	47,216	7,455	0	0	54,672	Historical data
8) Cerification/Close-out Reports	1	EA	7,000.00	2,000.00	15,000.00	3,000.00	7,000	2,000	15,000	3,000	27,000	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	17	MO	500.00	0.00	200.00	0.00	8,284	0	3,313	0	11,597	Vendor catalog
2) PPE rolloff cont.	17	MO	500.00	0.00	0.00	0.00	8,284	0	0	0	8,284	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	3,313	HR	0.00	0.00	35.86	0.00	0	0	118,820	0	118,820	Historical data
2) Site supervisor/foreman	3,313	HR	0.00	0.00	30.00	0.00	0	0	99,403	0	99,403	Historical data
3) Site safety officer	3,313	HR	0.00	0.00	25.00	0.00	0	0	82,836	0	82,836	Historical data
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	663	HR	0.00	0.00	45.00	0.00	0	0	29,821	0	29,821	Historical data
2) Project administrator	497	HR	0.00	0.00	30.00	0.00	0	0	14,910	0	14,910	Historical data
3) Health and Safety director	166	HR	0.00	0.00	35.00	0.00	0	0	5,798	0	5,798	Historical data
4) Procurement/subcontracting	1,657	HR	0.00	0.00	30.00	0.00	0	0	49,701	0	49,701	Historical data
5) Clerical support	1,657	HR	0.00	0.00	12.36	0.00	0	0	20,477	0	20,477	Historical data
DREDGING/WATER TREATMENT												
1) Erosion control, silt boom	5,000	LF	0.00	10.00	4.00	4.00	0	50,000	20,000	20,000	90,000	Historical data
2) Mob/Demob (barge and pier based equip.)	1	LS	167,600.00	0.00	0.00	0.00	167,600	0	0	0	167,600	Vendor Info.
3) Prep., maint., and removal of staging area	1	LS	0.00	1,000.00	7,000.00	3,000.00	0	1,000	7,000	3,000	11,000	Vendor Info.
4) Dredge sediments	128,671	CY	43.00	0.00	1.66	0.00	5,532,870	0	213,595	0	5,746,465	Vendor Info.
5) Treatment of dredge water	214	DAY	4,500.00	0.00	0.00	0.00	965,036	0	0	0	965,036	Vendor Info.
6) Removal of sediments from barge	128,671	CY	32.50	0.00	0.00	0.00	4,181,821	0	0	0	4,181,821	Vendor Info.
7) Sediment confirmation testing	50	EA	1,400.00	0.00	0.00	0.00	70,000	0	0	0	70,000	Historical data
8) Water Quality Testing	257	DAY	3,600.00	50.00	200.00	150.00	926,434	12,867	51,469	38,601	1,029,371	Historical data
9) Disposal/Transport to RCRA D Landfill	154,406	TN	110.00	0.00	0.00	0.00	16,984,625	0	0	0	16,984,625	Vendor Info.
10) Placement of screened dredge spoil	25,734	CY	25.17	0.00	1.66	0.00	647,732	0	42,719	0	690,451	Vendor Info.

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
OS - 4 - REMOVAL AND OFF-BASE DISPOSAL: (+30%) VOLUME COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

	Total Cost ($) Sub.	Mat.	Labor	Equip.	Total Direct Cost ($)	Comments
TOTAL	29,788,153	73,322	774,862	64,601	30,700,938	
Direct Cost Adjustment Factors						
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)	0	0	38,743	3,230	41,973	
Safety Level C Multiplier (25% of labor and equipment, as listed)	0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)	0	0	30,994	2,584	33,579	
Subtotal Direct Costs	29,788,153	73,322	813,605	67,831	30,776,490	
Indirect Cost Adjustment Factors						
Labor Overhead @ 250% (for field mgmt. & home office, only)	0	0	1,054,416	0	1,054,416	
Field Construction Labor Overhead @ 75%	0	0	232,782	0	232,782	
Subcontract Overhead @ 10%	2,978,815	0	0	0	2,978,815	
Tax on Materials @ 5%	0	3,666	0	0	3,666	
G & A @ 10% (on labor, equip., & matl's.)	0	7,332	81,360	6,783	95,476	
Subtotal Direct and Indirect Costs	32,766,968	84,321	2,182,163	74,615	35,141,645	
Cost Adjustment Factors						
City/Location Cost Adjustment Factor @ 7% (ref. 1)					2,459,915	
Adjusted Direct and Indirect Costs	32,766,968	84,321	2,182,163	74,615	37,601,560	
Engineering @ 6 % of total direct and indirect					2,256,094	
Prime Contractor Fee @ 10% of Total Adjusted Cost					3,760,156	
Total Costs					43,617,810	
Contingency @ 30% of Total Cost					13,085,343	
TOTAL ESTIMATED COST					56,703,153	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors at this or other sites.

McAllister Point Landfill FS
Off Shore Alternative 4 - Removal: (+30%) Volume Cost Sensitivity Analysis
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$56,703,153			$56,703,153
1	0.935		$19,440		$18,168
2	0.873		$19,440		$16,980
3	0.816				$0
4	0.763				$0
5	0.713		$19,440		$13,860
6	0.666				$0
7	0.623				$0
8	0.582				$0
9	0.544				$0
10	0.508				$0
11	0.475				$0
12	0.444				$0
13	0.415				$0
14	0.388				$0
15	0.362				$0
16	0.339				$0
17	0.317				$0
18	0.296				$0
19	0.277				$0
20	0.258				$0
21	0.242				$0
22	0.226				$0
23	0.211				$0
24	0.197				$0
25	0.184				$0
26	0.172				$0
27	0.161				$0
28	0.150				$0
29	0.141				$0
30	0.131				$0
		TOTAL PRESENT WORTH =			$56,752,161

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
OS - 4 - REMOVAL AND OFF-BASE DISPOSAL: (-30%) VOLUME COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

			Unit Cost ($)				Total Cost ($)				Total Direct Cost ($)	Comments
Item	Qty	Unit	Sub.	Mat.	Labor	Equip.	Sub.	Mat.	Labor	Equip.		
PRE-DESIGN INVESTIGATION												
1) Additional soils boring and analyses	1	LS	135,500.00			0.00	135,500	0	0	0	135,500	ee assumption
MOBILIZATION/DEMOBILIZATION												
1) Office Trailer (1 ea)	11	MO	400.00	0.00	0.00	0.00	4,251	0	0	0	4,251	Historical data
2) Storage Trailer (1 ea)	11	MO	100.00	0.00	0.00	0.00	1,063	0	0	0	1,063	Historical data
3) Portable Communication Equipment	8	SETS	400.00	0.00	0.00	0.00	3,200	0	0	0	3,200	Historical data
4) Equipment Mobilization/Demobilization	1	LS	25,000.00	0.00	0.00	0.00	25,000	0	0	0	25,000	Historical data
5) Site Utility Hook-ups (elec., phone, etc.)	1	LS	3,000.00	0.00	0.00	0.00	3,000	0	0	0	3,000	Historical data
6) Site Utilities	11	MO	4,000.00	0.00	0.00	0.00	42,514	0	0	0	42,514	Historical data
7) 3 Pick-up Truck (rental)	11	MO	2,850.00	450.00	0.00	0.00	30,291	4,783	0	0	35,074	Historical data
8) Cerification/Close-out Reports	1	EA	7,000.00	2,000.00	15,000.00	3,000.00	7,000	2,000	15,000	3,000	27,000	Historical data
PERSONNEL AND EQUIP. DECON. FACILITIES AND SERVICES												
1) Personnel Decon. Trailer	11	MO	500.00	0.00	200.00	0.00	5,314	0	2,126	0	7,440	Vendor catalog
2) PPE rolloff cont.	11	MO	500.00	0.00	0.00	0.00	5,314	0	0	0	5,314	Historical data
SITE MANAGEMENT STAFFING												
1) Site manager	2,126	HR	0.00	0.00	35.86	0.00	0	0	76,227	0	76,227	Historical data
2) Site supervisor/foreman	2,126	HR	0.00	0.00	30.00	0.00	0	0	63,771	0	63,771	Historical data
3) Site safety officer	2,126	HR	0.00	0.00	25.00	0.00	0	0	53,142	0	53,142	Historical data
HOME OFFICE PROJECT MANAGEMENT AND SUPPORT												
1) Project manager	425	HR	0.00	0.00	45.00	0.00	0	0	19,131	0	19,131	Historical data
2) Project administrator	319	HR	0.00	0.00	30.00	0.00	0	0	9,566	0	9,566	Historical data
3) Health and Safety director	106	HR	0.00	0.00	35.00	0.00	0	0	3,720	0	3,720	Historical data
4) Procurement/subcontracting	1,063	HR	0.00	0.00	30.00	0.00	0	0	31,885	0	31,885	Historical data
5) Clerical support	1,063	HR	0.00	0.00	12.36	0.00	0	0	13,137	0	13,137	Historical data
DREDGING/WATER TREATMENT												
1) Erosion control, silt boom	5,000	LF	0.00	10.00	4.00	4.00	0	50,000	20,000	20,000	90,000	Historical data
2) Mob/Demob (barge and pier based equip.)	1	LS	167,600.00	0.00	0.00	0.00	167,600	0	0	0	167,600	Vendor Info.
3) Prep., maint., and removal of staging area	1	LS	0.00	1,000.00	7,000.00	3,000.00	0	1,000	7,000	3,000	11,000	Vendor Info.
4) Dredge sediments	69,285	CY	43.00	0.00	1.66	0.00	2,979,238	0	115,012	0	3,094,250	Vendor Info.
5) Treatment of dredge water	115	DAY	4,500.00	0.00	0.00	0.00	519,635	0	0	0	519,635	Vendor Info.
6) Removal of sediments from barge	69,285	CY	32.50	0.00	0.00	0.00	2,251,750	0	0	0	2,251,750	Vendor Info.
7) Sediment confirmation testing	50	EA	1,400.00	0.00	0.00	0.00	70,000	0	0	0	70,000	Historical data
8) Water Quality Testing	139	DAY	3,600.00	50.00	200.00	150.00	498,849	6,928	27,714	20,785	554,277	Historical data
9) Disposal/Transport to RCRA D Landfill	83,142	TN	110.00	0.00	0.00	0.00	9,145,567	0	0	0	9,145,567	Vendor Info.
10) Placement of screened dredge spoil	13,857	CY	25.17	0.00	1.66	0.00	348,779	0	23,002	0	371,781	Vendor Info.

McALLISTER POINT FEASIBILITY STUDY NEWPORT, RI
OS - 4 - REMOVAL AND OFF-BASE DISPOSAL: (-30%) VOLUME COST SENSITIVITY ANALYSIS
NAVY CLEAN CTO 0218

	Total Cost ($) Sub.	Mat.	Labor	Equip.	Total Direct Cost ($)	Comments
TOTAL	16,243,864	64,711	480,434	46,785	16,835,795	
Direct Cost Adjustment Factors						
Safety Level D Multiplier (5% of labor and equipment, for non-Lev. C activities)	0	0	24,022	2,339	26,361	
Safety Level C Multiplier (25% of labor and equipment, as listed)	0	0	0	0	0	
Site & Industrial Health & Safety Monitoring (4% of labor and equipment)	0	0	19,217	1,871	21,089	
Subtotal Direct Costs	16,243,864	64,711	504,455	49,125	16,883,245	
Indirect Cost Adjustment Factors						
Labor Overhead @ 250% (for field mgmt. & home office, only)	0	0	676,448	0	676,448	
Field Construction Labor Overhead @ 75%	0	0	140,139	0	140,139	
Subcontract Overhead @ 10%	1,624,386	0	0	0	1,624,386	
Tax on Materials @ 5%	0	3,236	0	0	3,236	
G & A @ 10% (on labor, equip., & matl's.)	0	6,471	50,446	4,912	61,829	
Subtotal Direct and Indirect Costs	17,868,251	74,418	1,371,488	54,037	19,389,283	
Cost Adjustment Factors						
City/Location Cost Adjustment Factor @ 7% (ref. 1)					1,357,250	
Adjusted Direct and Indirect Costs	17,868,251	74,418	1,371,488	54,037	20,746,533	
Engineering @ 6 % of total direct and indirect					1,244,792	
Prime Contractor Fee @ 10% of Total Adjusted Cost					2,074,653	
Total Costs					24,065,978	
Contingency @ 30% of Total Cost					7,219,793	
TOTAL ESTIMATED COST					31,285,772	

References used for cost estimates:

1) Means Heavy Construction Cost Data, 1998, 12th Annual Edition, R.S. Means Co., Inc., Kingston, MA
2) Echos Environmental Remediation Unit Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
3) Echos Environmental Remediation Assemblies Cost , 1998, 4th Annual Edition, Delta Technologies Group, Inc., Englewood, CO
4) Historical data based on competitive bids submitted by subcontractors at this or other sites.

McAllister Point Landfill FS
Off Shore Alternative 4 - Removal: (-30%) Volume Cost Sensitivity Analysis
Newport, Rhode Island
Present Worth Analysis

PRESENT WORTH ANALYSIS

YEAR	PRESENT WORTH FACTOR	CAPITAL COSTS	O & M COSTS	5-YEAR COSTS	PRESENT WORTH
0	1.000	$31,285,772			$31,285,772
1	0.935		$19,440		$18,168
2	0.873		$19,440		$16,980
3	0.816				$0
4	0.763				$0
5	0.713		$19,440		$13,860
6	0.666				$0
7	0.623				$0
8	0.582				$0
9	0.544				$0
10	0.508				$0
11	0.475				$0
12	0.444				$0
13	0.415				$0
14	0.388				$0
15	0.362				$0
16	0.339				$0
17	0.317				$0
18	0.296				$0
19	0.277				$0
20	0.258				$0
21	0.242				$0
22	0.226				$0
23	0.211				$0
24	0.197				$0
25	0.184				$0
26	0.172				$0
27	0.161				$0
28	0.150				$0
29	0.141				$0
30	0.131				$0
		TOTAL PRESENT WORTH =			$31,334,780

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 25, 1993