N00129.AR.000711
NSB NEW LONDON
5090.3a

# Existing Data Summary Report
for
# Basewide Groundwater Operable Unit Remedial Investigation

# Naval Submarine Base New London
Groton, Connecticut

Volume I - Text

## Northern Division
## Naval Facilities Engineering Command
Contract Number N62472-90-D-1298
Contract Task Order 0312

May 1999

TETRA TECH NUS, INC.

Rev. 1
May 1999

# EXISTING DATA SUMMARY REPORT
# FOR
# BASEWIDE GROUNDWATER OPERABLE UNIT
# REMEDIAL INVESTIGATION

## NAVAL SUBMARINE BASE - NEW LONDON
## GROTON, CONNECTICUT

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

**Submitted to:**
**Northern Division**
**Environmental Branch Code 18**
**Naval Facilities Engineering Command**
**10 Industrial Highway, Mail Stop #82**
**Lester, Pennsylvania 19113-2090**

**Submitted by:**
**Tetra Tech NUS, Inc.**
**600 Clark Avenue, Suite 3**
**King of Prussia, Pennsylvania 19406-1433**

**CONTRACT NUMBER N62472-90-D-1298**
**CONTRACT TASK ORDER 0312**

**Volume I**

**MAY 1999**


**PREPARED BY:**

COREY A. RICH, P.E.
PROJECT MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

**APPROVED BY:**

JOHN J. TREPANOWSKI, P.E.
PROGRAM MANAGER
TETRA TECH NUS, INC.
KING OF PRUSSIA, PENNSYLVANIA

# TABLE OF CONTENTS

**VOLUME I - TEXT**

**SECTION** **PAGE**

**ACRONYMS, INITIALISMS AND ABBREVIATIONS ..... ix**

**1.0 INTRODUCTION ..... 1-1**
1.1 PURPOSE OF THE REPORT ..... 1-1
1.2 BASE BACKGROUND ..... 1-1
1.2.1 Base Description ..... 1-1
1.2.2 Base History ..... 1-2
1.2.3 Previous and Ongoing Investigations and Related Documentation ..... 1-3
1.2.4 Contaminated Areas and Sources of Contamination within the Basewide Groundwater Investigation Area ..... 1-4
1.3 PHYSICAL CHARACTERISTICS ..... 1-6
1.3.1 Topography and Surface Features ..... 1-6
1.3.2 Water Classifications and Water Quality ..... 1-7
1.3.3 Soil Characteristics ..... 1-8
1.3.4 Geology ..... 1-8
1.3.5 Hydrogeology ..... 1-10
1.3.6 Climatology ..... 1-14
1.4 DATA EVALUATION ..... 1-15
1.4.1 Analytical Database ..... 1-16
1.4.2 Screening Level Assessment ..... 1-17
1.4.3 Preparation of Tag Maps ..... 1-22
1.4.4 Decision-Making Process ..... 1-24
1.5 REPORT ORGANIZATION ..... 1-24

**2.0 NORTHERN REGION OF NSB-NLON ..... 2-1**
2.1 SITE 1 – CBU DRUM STORAGE AREA ..... 2-1
2.1.1 Site Description ..... 2-1
2.1.2 Site Investigations ..... 2-2
2.1.3 Physical Characteristics ..... 2-4
2.1.4 Nature and Extent of Contamination ..... 2-5
2.1.5 Data Evaluation ..... 2-8
2.1.6 Decision Tree ..... 2-12
2.1.7 Recommendations ..... 2-13
2.2 SITE 2A – AREA A LANDFILL ..... 2-13
2.2.1 Site Description ..... 2-13
2.2.2 Site Investigations ..... 2-15
2.2.3 Physical Characteristics ..... 2-19
2.2.4 Nature and Extent of Contamination ..... 2-22
2.2.5 Data Evaluation ..... 2-28
2.2.6 Decision Tree ..... 2-35
2.2.7 Recommendations ..... 2-36
2.3 SITE 2B - AREA A WETLAND ..... 2-36
2.3.1 Site Description ..... 2-36
2.3.2 Site Investigations ..... 2-37
2.3.3 Physical Characteristics ..... 2-40
2.3.4 Nature and Extent of Contamination ..... 2-43
2.3.5 Data Evaluation ..... 2-48

# TABLE OF CONTENTS (Continued)

## VOLUME I - TEXT


| SECTION | | PAGE |
|---|---|---|
| 2.3.6 | Decision Tree | 2-55 |
| 2.3.7 | Recommendations | 2-55 |
| 2.4 | SITE 3 – AREA A DOWNSTREAM WATERCOURSES AND OBDA | 2-56 |
| 2.4.1 | Site Description | 2-56 |
| 2.4.2 | Site Investigations | 2-57 |
| 2.4.3 | Physical Characteristics | 2-61 |
| 2.4.4 | Nature and Extent of Contamination | 2-64 |
| 2.4.5 | Data Evaluation | 2-68 |
| 2.4.6 | Decision Tree | 2-72 |
| 2.4.7 | Recommendations | 2-73 |
| 2.5 | SITE 4 – RUBBLE FILL AREA AT BUNKER A86 | 2-73 |
| 2.5.1 | Site Description | 2-73 |
| 2.5.2 | Site Investigations | 2-74 |
| 2.5.3 | Physical Characteristics | 2-76 |
| 2.5.4 | Nature and Extent of Contamination | 2-78 |
| 2.5.5 | Data Evaluation | 2-81 |
| 2.5.6 | Decision Tree | 2-84 |
| 2.5.7 | Recommendations | 2-85 |
| 2.6 | SITE 5 – HAZARDOUS WASTE STORAGE FACILITY AT BUNKER A85 | 2-85 |
| 2.6.1 | Site Description | 2-85 |
| 2.6.2 | Site Investigations | 2-85 |
| 2.6.3 | Physical Characteristics | 2-86 |
| 2.6.4 | Nature and Extent of Contamination | 2-87 |
| 2.6.5 | Data Evaluation | 2-88 |
| 2.6.6 | Decision Tree | 2-88 |
| 2.6.7 | Recommendations | 2-88 |
| 2.7 | SITE 7 – TORPEDO SHOPS | 2-88 |
| 2.7.1 | Site Description | 2-88 |
| 2.7.2 | Site Investigations | 2-90 |
| 2.7.3 | Physical Characteristics | 2-92 |
| 2.7.4 | Nature and Extent of Contamination | 2-95 |
| 2.7.5 | Data Evaluation | 2-99 |
| 2.7.6 | Decision Tree | 2-105 |
| 2.7.7 | Recommendations | 2-106 |
| 2.8 | SITE 14 – OBDANE | 2-106 |
| 2.8.1 | Site Description | 2-106 |
| 2.8.2 | Site Investigations | 2-107 |
| 2.8.3 | Physical Characteristics | 2-108 |
| 2.8.4 | Nature and Extent of Contamination | 2-110 |
| 2.8.5 | Data Evaluation | 2-113 |
| 2.8.6 | Decision Tree | 2-116 |
| 2.8.7 | Recommendations | 2-116 |
| 2.9 | SITE 20 – AREA A WEAPONS CENTER | 2-117 |
| 2.9.1 | Site Description | 2-117 |
| 2.9.2 | Site Investigations | 2-118 |
| 2.9.3 | Physical Characteristics | 2-119 |
| 2.9.4 | Nature and Extent of Contamination | 2-121 |

# TABLE OF CONTENTS (ContinueD)

**VOLUME I - TEXT**

**SECTION** **PAGE**

2.9.5 Data Evaluation ..... 2-125
2.9.6 Decision Tree ..... 2-130
2.9.7 Recommendations ..... 2-130

**3.0 CENTRAL REGION OF NSB-NLON ..... 3-1**
3.1 SITE 16 – HOSPITAL INCINERATOR ..... 3-1
3.1.1 Site Description ..... 3-1
3.1.2 Site Investigations ..... 3-1
3.1.3 Physical Characteristics ..... 3-1
3.1.4 Nature and Extent of Contamination ..... 3-2
3.1.5 Data Evaluation ..... 3-2
3.1.6 Decision Tree ..... 3-3
3.1.7 Recommendations ..... 3-3

**4.0 SOUTHERN REGION OF NSB-NLON ..... 4-1**
4.1 SITE 8 – GOSS COVE LANDFILL ..... 4-1
4.1.1 Site Description ..... 4-1
4.1.2 Site Investigations ..... 4-2
4.1.3 Physical Characteristics ..... 4-6
4.1.4 Nature and Extent of Contamination ..... 4-8
4.1.5 Data Evaluation ..... 4-13
4.1.6 Decision Tree ..... 4-20
4.1.7 Recommendations ..... 4-21
4.2 SITE 12 – NEX GAS STATION (BUILDING 428) ..... 4-22
4.2.1 Site Description ..... 4-22
4.2.2 Site Investigations ..... 4-22
4.2.3 Physical Characteristics ..... 4-25
4.2.4 Nature and Extent of Contamination ..... 4-27
4.2.5 Data Evaluation ..... 4-27
4.2.6 Decision Tree ..... 4-27
4.2.7 Recommendations ..... 4-28
4.3 SITE 15 – SPENT ACID STORAGE AND DISPOSAL AREA ..... 4-28
4.3.1 Site Description ..... 4-28
4.3.2 Site Investigations ..... 4-29
4.3.3 Physical Characteristics ..... 4-30
4.3.4 Nature and Extent of Contamination ..... 4-32
4.3.5 Data Evaluation ..... 4-34
4.3.6 Decision Tree ..... 4-37
4.3.7 Recommendations ..... 4-38
4.4 SITE 18 – SOLVENT STORAGE AREA (BUILDING 33) ..... 4-38
4.4.1 Site Description ..... 4-38
4.4.2 Site Investigations ..... 4-38
4.4.3 Physical Characteristics ..... 4-38
4.4.4 Nature and Extent of Contamination ..... 4-39
4.4.5 Data Evaluation ..... 4-39
4.4.6 Decision Tree ..... 4-40
4.4.7 Recommendations ..... 4-40

# TABLE OF CONTENTS (Continued)

## VOLUME I - TEXT

**SECTION** **PAGE**

4.5 SITE 23 – TANK FARM ..... 4-40
4.5.1 Site Description ..... 4-40
4.5.2 Site Investigations ..... 4-44
4.5.3 Physical Characteristics ..... 4-51
4.5.4 Nature and Extent of Contamination ..... 4-52
4.5.5 Data Evaluation ..... 4-55
4.5.6 Decision Tree ..... 4-60
4.5.7 Recommendations ..... 4-61

**5.0 SUMMARY AND RECOMMENDATIONS ..... 5-1**
5.1 SUMMARY AND GENERAL RECOMMENDATIONS ..... 5-1
5.2 NORTHERN REGION OF NSB-NLON ..... 5-3
5.3 CENTRAL REGION OF NSB-NLON ..... 5-5
5.4 SOUTHERN REGION OF NSB-NLON ..... 5-5

**REFERENCES ..... R-1**

# TABLE OF CONTENTS (Continued)

## VOLUME II

DRAWINGS

1 STUDY LOCATIONS, STUDY AREAS, SURROUNDING LAND USE, AND CTDEP GROUNDWATER QUALITY CLASSIFICATION GOALS
2 TOPOGRAPHIC SURFACE AND REGION BOUNDARIES LOCATION MAP
3 SHALLOW OVERBURDEN GROUNDWATER POTENTIOMETRIC SURFACE MAP – NOVEMBER 20, 1995
4 BEDROCK GROUNDWATER POTENTIOMETRIC SURFACE MAP – NOVEMBER 20, 1995
5 NORTHERN REGION - PRIMARY GROUNDWATER COPCs – OVERBURDEN WELLS
6 NORTHERN REGION - PRIMARY GROUNDWATER COPCs – BEDROCK WELLS
7A NORTHERN REGION - EASTERN SIDE - PRIMARY SOIL COPCs
7B NORTHERN REGION - EASTERN SIDE - PRIMARY SEDIMENT COPCs
8 NORTHERN REGION - WESTERN SIDE - PRIMARY SOIL COPCs
9 SOUTHERN REGION - PRIMARY GROUNDWATER COPCs – OVERBURDEN WELLS
10 SOUTHERN REGION - PRIMARY GROUNDWATER COPCs – BEDROCK WELLS
11 SOUTHERN REGION - EASTERN SIDE – PRIMARY SOIL COPCs
12 SOUTHERN REGION - WESTERN SIDE – PRIMARY SOIL COPCs

## VOLUME III

APPENDICES

A ANALYTICAL DATABASE
A.1 SOIL DATABASE
A.2 TCLP DATABASE
A.3 SEDIMENT DATABASE
A.4 GROUNDWATER DATABASE
A.5 SURFACE WATER DATABASE

B CONNECTICUT REMEDIATION STANDARDS

# TABLES


| NUMBER | | PAGE |
|---|---|---|
| 1-1 | Summary of Previous and Ongoing Investigations at Naval Subase New London and Related Documentation | 1-25 |
| 1-2 | Risk-Based and Health-Based COPC Screening Levels – Solid Media | 1-55 |
| 1-3 | Risk-Based and Health-Based COPC Screening Levels – TCLP Leachates | 1-59 |
| 1-4 | Risk-Based and Health-Based COPC Screening Levels – Aqueous Media | 1-60 |
| 2-1 | COPC Screening – Soil Samples, Site 1 – CBU Drum Storage Area | 2-131 |
| 2-2 | COPC Screening – TCLP Soil Samples, Site 1 – CBU Drum Storage Area | 2-134 |
| 2-3 | COPC Screening – Groundwater Samples-Overburden Wells, Site 1 – CBU Drum Storage Area | 2-135 |
| 2-4 | COPC Screening – Soil Samples, Site 2A – Area A Landfill | 2-137 |
| 2-5 | COPC Screening – TCLP Soil Samples, Site 2A – Area A Landfill | 2-141 |
| 2-6 | COPC Screening – Groundwater Samples-Overburden Wells, Site 2A – Area A Landfill | 2-142 |
| 2-7 | COPC Screening – Groundwater Samples-Bedrock Wells, Site 2A – Area A Landfill | 2-145 |
| 2-8 | COPC Screening – Soil/Sediment Samples, Site 2B – Area A Wetland | 2-147 |
| 2-9 | COPC Screening – TCLP Soil Samples, Site 2B – Area A Wetland | 2-151 |
| 2-10 | COPC Screening – Groundwater Samples-Overburden Wells, Site 2B – Area A Wetland | 2-152 |
| 2-11 | COPC Screening – Groundwater Samples-Bedrock Wells, Site 2B – Area A Wetland | 2-154 |
| 2-12 | COPC Screening – Surface Water Samples, Site 2B – Area A Wetland | 2-156 |
| 2-13 | COPC Screening – Groundwater Samples-Overburden Wells, Site 3 – Area A Downstream Watercourses and OBDA | 2-158 |
| 2-14 | COPC Screening – Groundwater Samples-Bedrock Wells, Site 3 – Area A Downstream Watercourses and OBDA | 2-160 |
| 2-15 | COPC Screening – Groundwater Samples-Overburden Wells, Site 4 – Rubble Fill Area At Bunker A86 | 2-162 |
| 2-16 | COPC Screening – Groundwater Samples-Bedrock Wells, Site 4 – Rubble Fill Area At Bunker A86 | 2-164 |
| 2-17 | COPC Screening – Soil Samples, Site 7 – Torpedo Shops | 2-166 |
| 2-18 | COPC Screening – TCLP Soil Samples, Site 7 – Torpedo Shops | 2-169 |
| 2-19 | COPC Screening – Groundwater Samples-Overburden Wells, Site 7 – Torpedo Shops | 2-170 |
| 2-20 | COPC Screening – Groundwater Samples-Bedrock Wells, Site 7 – Torpedo Shops | 2-173 |
| 2-21 | COPC Screening – Soil Samples, Site 14 – OBDANE | 2-175 |
| 2-22 | COPC Screening – TCLP Soil Samples, Site 14 – OBDANE | 2-178 |
| 2-23 | COPC Screening – Groundwater Samples-Overburden Wells, Site 14 – OBDANE | 2-179 |
| 2-24 | COPC Screening – Soil Samples, Site 20 – Area A Weapons Center | 2-181 |
| 2-25 | COPC Screening – TCLP Soil Samples, Site 20 – Area A Weapons Center | 2-184 |
| 2-26 | COPC Screening – Groundwater Samples-Overburden Wells, Site 20 – Area A Weapons Center | 2-185 |
| 2-27 | COPC Screening – Groundwater Samples-Bedrock Wells, Site 20 – Area A Weapons Center | 2-187 |
| 4-1 | COPC Screening – Soil Samples, Site 8 – Goss Cove Landfill | 4-63 |
| 4-2 | COPC Screening – TCLP Soil Samples, Site 8 – Goss Cove Landfill | 4-67 |
| 4-3 | COPC Screening – Groundwater Samples-Overburden Wells, Site 8 – Goss Cove Landfill | 4-68 |
| 4-4 | COPC Screening – Groundwater Samples-Bedrock Wells, Site 8 – Goss Cove Landfill | 4-71 |
| 4-5 | COPC Screening – Groundwater Samples-Overburden Wells, Site 15 – SASDA | 4-73 |
| 4-6 | COPC Screening – Soil Samples, Site 23 – Fuel Farm (Including Site 9 – OT-5 Oily Wastewater Tank) | 4-75 |
| 4-7 | COPC Screening – Groundwater Samples-Overburden Wells, Site 23 – Fuel Farm (Including Site 9 – OT-5 Oily Wastewater Tank) | 4-78 |

## FIGURES

| NUMBER | | PAGE |
|---|---|---|
| 1-1 | Location Map | 1-65 |
| 1-2 | Decision Tree for Scoping Basewide Groundwater OU RI/FS | 1-67 |
| 2-1 | Site Map, Site 1 – CBU Drum Storage Area | 2-189 |
| 2-2 | Site Map, Site 2 – Area A Landfill | 2-191 |
| 2-3 | Site Map, Site 2 – Area A Wetland | 2-193 |
| 2-4 | Site Map, Site 3 – Area A Downstream Watercourses/OBDA | 2-195 |
| 2-5 | Site Map, Site 4 – Rubble Fill Area At Bunker A86 | 2-197 |
| 2-6 | Site Map, Site 7 – Torpedo Shops | 2-198 |
| 2-7 | Site Map, Site 14 – OBDANE | 2-199 |
| 2-8 | Site Map, Site 20 – Area A Weapons Center | 2-201 |
| 3-1 | Site Map, Site 16 – Hospital Incinerators | 3-5 |
| 4-1 | Site Map, Site 8 – Goss Cove Landfill | 4-81 |
| 4-2 | Site Map, Site 12 – NEX Gas Station | 4-83 |
| 4-3 | Remediation System Layout, NEX Service Station | 4-85 |
| 4-4 | Site Map, Site 15 – Spent Acid Storage and Disposal Area | 4-87 |
| 4-5 | Site Map, Site 18 – Solvent Storage Area (Building 33) | 4-88 |
| 4-6 | Site Map, Site 9 – OT-5 Wastewater Tank and Site 23 - Tank Farm | 4-89 |

# ACRONYMS, INITIALS AND ABBREVIATIONS

| | |
|---|---|
| 4,4'-DDT | 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane |
| 4,4'-DDD | 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane |
| 4,4'-DDE | 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethene |
| AS/SVE | Air Sparging/Soil Vapor Extraction |
| AWQC | Ambient Water Quality Criterion |
| B&R | Brown & Root |
| BEHP | Bis(2-Ethylhexyl) Phthalate |
| bgs | Below Ground Surface |
| BOD | Biochemical Oxygen Demand |
| BTEX | Benzene, Toluene, Ethylbenzene, and Xylenes |
| CBU | Central Batallion Unit |
| CERCLA | Comprehensive Response, Compensation and Liability Act |
| CFR | Code of Federal Register |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| COC | Chemical of Concern |
| COD | Chemical Oxygen Demand |
| COPC | Chemical of Potential Concern |
| CPAH | Carcinogenic Polynuclear Aromatic Hydrocarbon |
| CRQL | Contract-Required Quantitation Limit |
| CTDEP | Connecticut Department of Environmental Protection |
| CTE | Central Tendency Exposure |
| CTO | Contract Task Order |
| DCA | Dichloroethane |
| DCE | Dichloroethene |
| DO | Dissolved Oxygen |
| DRMO | Defense Reutilization and Marketing Office |
| DRO | Diesel Range Organics |
| EDSR | Existing Data Summary Report |
| ESQD | Explosive Safety Quantity Distance |
| FFA | Federal Facilities Agreement |
| FFS | Focused Feasibility Study |
| FID | Flame Ionization Detector |
| FS | Feasibility Study |
| GPM | Gallons Per Minute |
| GRO | Gasoline Range Organics |

| | |
|---|---|
| HHRA | Human Health Risk Assessment |
| HNUS | Halliburton NUS Corporation |
| HQ | Hazard Quotient |
| HSWA | Hazardous and Solid Waste Amendment of 1984 |
| IAS | Initial Assessment Study |
| IRP | Installation Restoration Program |
| ISI | Initial Site Inspection |
| MCL | Maximum Contaminant Level |
| msl | Mean Sea Level |
| NAD | North American Datum |
| NACIP | Navy Assessments and Control of Installation Pollutants |
| NAVFAC | Naval Facilities Engineering Command |
| NCP | National Contingency Plan |
| NEESA | Naval Energy and Environmental Support Activity |
| NESO | Naval Environmental Support Office |
| NEX | Naval Exchange |
| NIOSH | National Institute for Occupational Safety and Health |
| NOSRT | Navy's Oil Spill Response Team |
| NPAH | Noncarcinogenic Polynuclear Aromatic Hydrocarbon |
| NPL | National Priorities List |
| NSB-NLON | Naval Submarine Base - New London |
| OBDA | Overbank Disposal Area |
| OBDANE | Overbank Disposal Area Northeast |
| OCDD | Octachlorodibenzo-p-dioxin |
| OSWER | Office of Solid Waste and Emergency Response |
| OU | Operable Unit |
| PAHs | Polynuclear Aromatic Hydrocarbons |
| PCBs | Polychlorinated Biphenyls |
| PCE | Tetrachloroethene |
| ppm | parts per million |
| ppt | parts per thousand |
| RBC | Risk-Based Concentrations |
| RCRA | Resource Conservation and Recovery Act |
| RME | Reasonable Maximum Exposure |
| RI | Remedial Investigation |
| ROD | Record of Decision |
| RSR | Remediation Standard Regulations (Connecticut) |

| | |
|---|---|
| SARA | Superfund Amendments and Reauthorization Act |
| SASDA | Spend Acid Storage and Disposal Area |
| SCAPS | Site Characterization and Analysis Penetrometer System |
| SCS | Soil Conservation Service |
| SECWA | Southeastern Connecticut Water Authority |
| SI | Site Investigation |
| SOP | Standard Operating Procedure |
| SPLP | Synthetic Precipitation Leaching Procedure |
| SSL | Soil Screening Level |
| SVE | Soil Vapor Extraction |
| SVOCs | Semivolatile Organic Compounds |
| TAL | Target Analyte List |
| TCE | Trichloroethene |
| TCL | Target Compound List |
| TCLP | Toxicity Characteristic Leaching Procedure |
| TPH | Total Petroleum Hydrocarbons |
| TOC | Total Organic Carbon |
| TSCA | Toxic Substance Control act |
| TSS | Total Suspended Solids |
| TtNUS | Tetra Tech NUS, Inc. |
| UCL | Upper Confidence Limit |
| USCS | Unified Soil Classification System |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geologic Survey |
| UST | Underground Storage Tank |
| VOCs | Volatile Organic Compounds |
| WPCA | Water Pollution Control Authority (Ledyard) |
| WP/SAP | Work Plan/Sampling and Analysis Plan |

# 1.0 INTRODUCTION

This Existing Data Summary Report (EDSR) for the planned Basewide Groundwater Operable Unit (OU) Remedial Investigation (RI) at Naval Submarine Base - New London (NSB-NLON), Groton, Connecticut, was prepared for the U.S. Department of the Navy (Navy) by Tetra Tech NUS, Inc. (TtNUS) under the Comprehensive Long-Term Environmental Action Navy (CLEAN), Contract Number N62472-90-D-1298, Contract Task Order (CTO) 0312. It should be noted that TtNUS purchased the assets of Brown and Root (B&R) Environmental on January 1, 1998.

## 1.1 PURPOSE OF THE REPORT

The EDSR was prepared to summarize relevant background information and to document the scoping process for the planned Basewide Groundwater OU RI at NSB-NLON. The purpose of the scoping process is to collect and analyze existing analytical and geologic data, to establish physical characteristics of the site, and to determine the additional data needs and the appropriate studies to collect the data. After the EDSR is prepared, the next step for the Basewide Groundwater OU RI is the preparation of a Work Plan/Sampling and Analysis Plan (WP/SAP). Information provided in this EDSR will be used to generate the Basewide Groundwater OU RI WP/SAP

## 1.2 BASE BACKGROUND

This section provides a description of base operations, a brief history of NSB-NLON, and a summary of previous investigations, contaminated areas, and potential sources of contamination in the areas of NSB-NLON relevant to the basewide groundwater investigation.

### 1.2.1 Base Description

NSB-NLON is located in southeastern Connecticut in the towns of Ledyard and Groton. Figure 1-1 illustrates the location of the Base. NSB-NLON is situated on the east bank of the Thames River, approximately 6 miles north of Long Island Sound. It is bordered on the east by Connecticut Route 12, on the south by Crystal Lake Road, and on the west by the Thames River. The northern border is a low ridge that trends approximately east-southeast from the Thames River to Baldwin Hill.

NSB-NLON currently provides base command for Naval submarine activities in the Atlantic Ocean. It also provides housing for Navy personnel and their families and supports submarine training facilities, military offices, medical facilities, and facilities for submarine maintenance, repair, and overhaul.

The basewide groundwater investigation covers essentially the entire NSB-NLON area, except for a long narrow strip of land that is adjacent to the Thames River and runs the entire length of the west side of the base. Installation Restoration Program (IR) sites located in this excluded strip include the Defense Reutilization and Marketing Office (DRMO) and the Lower Subase. The remaining portion of NSB-NLON included in this investigation is bordered on the east by Connecticut Route 12, on the south by Crystal Lake Road and Goss Cove, and on the north by a low ridge that trends approximately east-southeast from the Thames River to Baldwin Hill.

A more detailed depiction of the general configuration of the area is shown on Drawing 1. As shown in Drawing 2, the study area has been divided into three regions. These regions are further discussed in Section 1.2.4.

### 1.2.2 Base History

In 1867, the state of Connecticut donated a 112-acre parcel of land on the east bank of the Thames River to the Navy. The Navy did not use the property until 1868, when it officially designated the property a Navy Yard. The site was used to moor small craft and obsolete warships and served as a coaling station for the Atlantic fleet. The Navy designated the site a Submarine Base in 1916. During World War I, facilities at the base were extensively expanded: six piers and 81 buildings were added. In 1917, a submarine school was established, and in 1918 the Submarine Medical Center was founded.

NSB-NLON underwent another period of growth during World War II. Between 1935 and 1945, the Navy built more than 180 buildings and acquired land adjacent to NSB-NLON. The base expanded from 112 acres to 497 acres. The growth of NSB-NLON continued after World War II. In 1946, the Medical Research Laboratory was established.

In 1968, the Submarine School was changed from the status of an activity to a command and became the largest tenant on the base. The Naval Submarine Support Facility was established in 1974, and the Naval Undersea Medical Institute was established the following year. Currently, NSB-NLON consists of more than 300 buildings on 576 acres of land.

On August 28, 1991, NSB-NLON was placed on the National Priorities List (NPL) by the United States Environmental Protection Agency (USEPA) pursuant to Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) of 1986. The NPL is a list of uncontrolled or abandoned hazardous waste sites identified by USEPA as requiring priority remedial actions.

In January 1995, the Navy, USEPA, and the state of Connecticut signed the USEPA Federal Facilities Agreement (FFA) for NSB-NLON. The agreement will be used to ensure that environmental impacts associated with past and present activities at NSB-NLON are thoroughly investigated and that the appropriate remedial action is pursued to protect human health and the environment. In addition, the FFA establishes a procedural framework and timetable for developing, implementing, and monitoring appropriate responses at NSB-NLON, in accordance with CERCLA (and SARA amendment of 1986), the National Contingency Plan (NCP), Resource Conservation and Recovery Act (RCRA) and Hazardous and Solid Waste Amendment (HSWA) of 1984, Executive Order 12580, and applicable state laws.

### 1.2.3 Previous and Ongoing Investigations and Related Documentation

Brief summaries of previous and ongoing investigations and activities associated with the areas to be addressed by the RI are presented in Table 1-1. The following investigations are included:

- Initial Assessment Study (Envirodyne, 1983)
- Verification Step 1-A Study (Wehran, 1988)
- Additional Site Investigation And Evaluation Of Remedial Alternatives NEX (O'Brien & Gere, 1989)
- Hydrogeologic Investigation – USTs OT-4, OT-7, OT-8, OT-9, and 54-H (Fuss & O'Neill, 1989)
- UST Removal, Waste Oil Tank 5 (Goldberg-Zoino, 1991)
- Installation And Sampling Of Monitoring Wells At The Fuel Farm (ERM, 1991)
- Environmental Testing, Waste Oil Tank 5 (Goldberg-Zoino, 1992)
- Phase I Remedial Investigation (Atlantic, 1992)
- Focused Feasibility Study, Spent Acid Storage and Disposal Area (Atlantic, 1994a)
- Focused Feasibility Study, Area A Downstream/OBDA (Atlantic, 1994b)
- Site Characterization Report for Waste Oil Tank 5 (HNUS, 1994a)
- Design Analysis - Basis of Design and Calculations for Area A Landfill Cap (Atlantic, 1994c)
- Off-Site Residential Well Water Data Evaluation Report (Atlantic, 1994d)
- Post Removal Action Report for Waste Oil Tank 5 Removal Action (HNUS, 1994b)
- Action Memorandum for DRMO and Spent Acid Storage and Disposal Area (Atlantic, 1995a)
- Background Concentrations of Inorganics In Soil (Atlantic, 1995b)
- Site Characterization Report for OT-10, Building 325 and Building 89 (HNUS, 1995a)
- Supplement to Initial Assessment Study (NEESA, 1995)
- Focused Feasibility Study, Area A Landfill (Atlantic, 1995c)
- Letter Report – Area A Landfill/Wetland Interface Sampling Results (HNUS, 1995b)
- Proposed Plan for Area A Landfill (Atlantic, 1995d)
- Record of Decision for Area A Landfill (Atlantic, 1995e)
- Report for Soil Remediation – Spent Acid Storage and Disposal Area (OHM, 1995)

- No Further Action Decision Document for CBU Drum Storage Area (U.S. Navy, 1996)
- Groundwater/Leachate Modeling Study, Area A Landfill (B&R Environmental, 1996a)
- Revised Design Analysis Report for Area A Landfill (B&R Environmental, 1996b)
- Phase II Remedial Investigation (B&R Environmental, 1997a)
- Function and Values Assessment of Area A Downstream Wetlands and Watercourses (Niering and Brawley, 1997)
- Verification Sampling Report for Site 4 (Rubble Fill at Bunker A-86) Removal Action (B&R Environmental, 1997b)
- Proposed Plan for Spent Acid Storage and Disposal Area (U.S. Navy, 1997a)
- Post Removal Report for Site 4 - Rubble Fill Area at Bunker A-86 (Foster Wheeler, 1997a)
- Post Removal Report for Over Bank Disposal Area (Foster Wheeler, 1997b)
- Proposed Plan for Area A Downstream/OBDA (B&R Environmental, 1997c)
- Data Gap Investigation Report for Goss Cove Landfill (B&R Environmental, 1997d)
- Record of Decision for Spent Acid Storage and Disposal Area (U.S. Navy, 1997b)
- Site Investigation Report for Tank Farm Investigation (B&R Environmental, 1997e)
- Feasibility Study for Soil and Sediment, Area A Downstream/OBDA (B&R Environmental, 1997f)
- Record of Decision for Area A Downstream/OBDA (B&R Environmental, 1997g)
- Interim Remedial Action at Area A Landfill (B&R Environmental, 1998)
- Wetlands Functions and Values Assessment Report (TtNUS, 1998)
- Hydrogeologic Study At The Tank Farm (TtNUS, 1999a)
- Phase I/II Environmental Assessment Report for Fusconi Dry Cleaners (CTDEP, 1999)
- Feasibility Study for Goss Cove Landfill Soil Operable Unit (TtNUS, 1999b)
- Site Management Plan for Naval Submarine Base – New London (TtNUS, 1999c)
- Evaluation of Chemical and Toxicological Data for Goss Cove (SAIC, 1999)

Analytical data from previous investigations applicable to the study area were evaluated and included in a database developed for this EDSR to aid in the determination of nature and extent of contamination and data evaluation. The previous investigations included in the database are indicated in Table 1-1. Further discussion of the database is provided in Section 1.4.

### 1.2.4 Contaminated Areas and Sources of Contamination within the Basewide Groundwater Investigation Area

Within the NSB-NLON, several potential contaminated areas and sources of contamination have been identified in regard to the investigation area covered by this basewide groundwater study. As discussed earlier in Section 1.2.1, the area covered in this investigation includes essentially the entire NSB-NLON, with the exception of a long narrow strip of land adjacent to the Thames River. This strip of land includes

the sites that have tidally influenced groundwater (i.e., the DRMO and the Lower Subase). The remaining area of NSB-NLON that is covered in this basewide groundwater investigation was divided into three regions: the northern, central, and southern. These regions are discussed in the following subsection.

#### 1.2.4.1 Regional Boundaries

Three separate areas or regions of contamination within NSB-NLON were identified for this EDSR. The three regions were delineated to encompass specific, potential sources and to aid in the focus of the preparation of the RI. The Navy and regulators previously identified potential source areas at NSB-NLON that require investigation under the Navy's IRP and UST Program. Each of the potential source areas was given a unique site number, and specific sites were grouped within each region. The subdivision of the NSB-NLON into regions will make the RI report presentation easier to follow, focus the nature and extent of contamination discussions, and allow the human health risk assessment to be linked to specific sources.

Site-specific hydrogeology information was also used to delineate the regions. The information was used to determine potential groundwater contaminant migration pathways from the previously identified potential source areas. Regional boundaries were generally chosen so that contamination from one region would not migrate into another. The three regions are shown on Drawing 2.

The Northern Region is bordered by Perimeter Road to the north and Highway 12 to the east. This region also extends to the west to include the Golf Course west of Shark Boulevard. The southern boundary of the Northern Region is represented by an imaginary line extending from the intersection of Corsair Road and Highway 12 to Pier 32 but stopping at the western edge of the Golf Course prior to the Lower Subase. The Northern Region includes the following IRP sites:

- Site 1 – Construction Battalion Unit (CBU) Drum Storage Area
- Site 2A – Area A Landfill
- Site 2B – Area A Wetland
- Site 3 – Area A Downstream Watercourses and OBDA
- Site 4 – Rubble Fill Area at Bunker A-86
- Site 5 – Hazardous Waste Storage Facility at Bunker A-85
- Site 7 – Torpedo Shops
- Site 14 – Overbank Disposal Area Northeast (OBDANE)
- Site 20 – Area A Weapons Center

The Central Region extends from the southern boundary of the Northern Region to the northern boundary of the Southern Region, which is represented by an imaginary straight line extending from Pier 6 to the southern corner of Building 446 near Highway 12. The Central Region is also bounded by the Lower Subase to the west and Highway 12 to the east. The only IRP site associated with the Central Region is Site 16 – Hospital Incinerator.

The Southern Region extends southward from the southern boundary of the Central Region. The Southern Region is bordered by Highway 12 to the east, Crystal Lake Road and Goss Cove to the South, and the Thames River or Shark Boulevard to the west. This region includes the following IRP and UST sites:

- Site 8 – Goss Cove Landfill
- Site 12 – NEX Gas Station
- Site 15 – Spent Acid Storage and Disposal Area
- Site 18 – Solvent Storage Area (Building 33)
- Site 23 – Fuel Farm (Includes Site 9 – OT-5 Oily Wastewater Tank)

## 1.3 PHYSICAL CHARACTERISTICS

General physical characteristics of the NSB-NLON, as provided in the Phase II RI report (B&R Environmental, 1997a), are summarized below.

### 1.3.1 Topography and Surface Features

Four bedrock highs form the topographic upland areas at the NSB-NLON and in the surrounding area. East of the facility, Baldwin Hill reaches an elevation of 245 feet above mean sea level (msl). In the northern, central, and southern portions of the facility, the bedrock highs reach elevations that also exceed 200 feet above msl. These bedrock highs have a northwest-southeast trend, which is consistent with the regional strike and other bedrock features in the region (USGS, 1967). The western edge of the facility borders the Thames River.

At NSB-NLON, the bedrock highs slope downward to two small, west-trending valleys. Bedrock outcrops are prevalent along steep topographic slopes. In addition to the large bedrock highs, there are several small sub-ridges, which are visible as bedrock outcrops at the facility. Two primary sub-ridges include one east of the DRMO and one northeast of the Goss Cove Landfill.

The two valleys between the bedrock highs are characterized as wetlands and poorly drained stream valleys. The valleys slope gently to the Thames River. In the northern valley, the ground elevation

ranges from approximately 80 feet in the eastern portion to near sea level along the Thames River. The eastern (upper) portion of this valley contains the Area A Wetland, which drains through an earthen dike into the Area A Downstream Watercourses. The ground surface drops steeply across the dike to 30 to 40 feet below the elevation of the wetland. Historically, the ground surface decreased more uniformly toward the Thames River (USGS, 1960). The steep drop in the ground elevation was caused by construction of the dike and subsequent filling of the wetland area with dredge spoils from the Thames River.

In the southern valley, the ground elevation slopes mildly from approximately 50 feet in the eastern portion to near sea level along the Thames River. Historically, there was a topographic depression at the former Crystal Lake between Tang Avenue and Crystal Lake Road. The topographic depression has been filled. Filling has also occurred along the Thames River, and the historical shoreline has been extended.

Currently, NSB-NLON consists of over 300 buildings on 547 acres of land (Atlantic, August 1992). The density of buildings is high along the central bedrock high, in the southern valley, and along the Thames River. In the northern valley, there are streams, a wetland, and a golf course. The northern bedrock high is not highly developed, except along the southern face at the Area A Weapons Center and the Torpedo Shops. The top and northern faces of the northern ridge are wooded, undeveloped areas.

### 1.3.2 Water Classifications and Water Quality

The Connecticut Department of Environmental Protection (CTDEP) previously classified the groundwater beneath the central and southern regions of NSB-NLON as GB/GA. However, due to the industrial nature of the site, it was unlikely that groundwater at NSB-NLON would be used as a potable water source. Based upon the availability of potable water and the proximity of the facility to the tidally influenced Thames River, the Navy applied to CTDEP to have all groundwater beneath NSB-NLON reclassified as GB. The GB classification indicates that the area has been used for long-term intense industrial or commercial development and the groundwater is not used as a drinking water source. Remediation standards for GB classified areas are generally less stringent than for GA classified areas. A reclassification application was submitted by the Navy to CTDEP on August 12, 1996. A public hearing was conducted on the issue on December 13, 1996, and formal notification from the CTDEP regarding successful reclassification was received on March 5, 1997. The groundwater for all of NSB-NLON, except for a small portion of the site north of Perimeter Road, is now classified as GB. This small northern portion, which is not part of the basewide groundwater investigation area, will remain classified as GA.

The Groton Water Department supplies potable water to NSB-NLON. The primary source of the Groton water supply is surface water reservoirs, which are supplemented with wells. The water supplies are

located within the Poquonock River Watershed, located east of NSB-NLON, and not within the NSB-NLON watershed. Groundwater and surface water at NSB-NLON are not used for drinking water. There are several irrigation wells on site at the Golf Course, located on the western side of both the Northern Region and Central Region of NSB-NLON, that have not been used for several years. Several active, private groundwater supply wells are located north (near Sleepy Hollow and along Long Cove Road and Military Highway) and northeast (along Route 12 near the trailer park) of the Northern Region of NSB-NLON.

### 1.3.3 Soil Characteristics

The United States Department of Agriculture Soil Conservation Service (SCS) has mapped the soils of NSB-NLON (SCS, 1983). According to the SCS report, soils at NSB-NLON have a moderate to moderately high permeability. Available water capacity is moderate to low. The soils are well drained and runoff is rapid. The pH of the soils indicates that they are strongly to moderately acidic, and the erosion hazard is severe.

Native soils across the facility consist of a dark, fine, sandy loam (Hollis and Charlton soils). Stones, boulders, and bedrock outcrops are prevalent on hills and ridges (the Hollis-Charlton-Rock Complex). The Hinkley Loam has been identified in the far northwestern portion of the facility. The soil is associated with stream terraces and outwash plains and consists of a dark, gravelly/sandy loam. Native materials along the Thames River were most likely of this type.

Altered soils at NSB-NLON have been classified as either Urdothents-Urban land or Urban land. The Urdothents-Urban land is defined as excessively to moderately drained soils that have been disturbed by cutting and filling. It is mapped in the northern portion of NSB-NLON in the Area A Downstream Watercourses and along the Thames River. Urban land is defined as areas where more than 85 percent of the surface is covered by streets, parking lots, and buildings. Urban land has been mapped in the southern portion of NSB-NLON and along the Thames River.

### 1.3.4 Geology

NSB-NLON is situated in the Eastern Uplands region of Connecticut. The area has irregular hills of exposed bedrock and poorly drained, uneven valleys. The bedrock consists of metamorphosed rocks of sedimentary and igneous origin. The bedrock has been faulted and folded. A major east-west-trending fault (The Honey Hill Fault) is located approximately 6 miles north of NSB-NLON. The fault does not intersect the facility.

Detailed descriptions of the regional geology are provided in the Phase I RI Report (Atlantic, 1992) and the Initial Assessment Study Report (NEESA, March 1983). The following subsections summarize the geologic setting of NSB-NLON and provide a description of the bedrock surface and structure. Site-specific geological descriptions are provided in Sections 2.0 through 4.0 of this report.

#### 1.3.4.1 Geologic Setting

According to the bedrock map (USGS, 1967), the NSB-NLON facility is underlain by the bedrock of five different formations: Alaskite Gneiss, Granitic Gneiss, Mamacoke Formation, Plainfield Formation, and Westerly Granite. The Alaskite Gneiss and Granitic Gneiss are orange-pink to light gray, medium-grained granitic gneisses. The Mamacoke Formation is a light to dark gray, medium-grained biotite-quartz-feldspar gneiss. The Plainfield Formation is a dark green hornblende-biotite-quartz-plagioclase gneiss. The Westerly Granite consists of gray, fine- to medium-grained equigranular granite.

Most of the surficial deposits in the area are unconsolidated glacial materials that were deposited during the Pleistocene Age. There are two types of glacial deposits at the facility, stratified drift and glacial till. Stratified drift consists of sorted silt, sand, and gravel that were deposited by meltwater streams. Stratified drift is located on terraces of the Thames River and is mapped along the western portion of the facility (USGS, 1960). Glacial till consists of a dense, heterogeneous mixture of clay, silt, sand, and rock fragments as large as boulders. Glacial till is exposed on most of the bedrock highs and most likely underlies outwash materials in the valleys. The thickness varies considerably but averages less than 10 feet.

The remainder of the surficial deposits are the product of post-glacial river/floodplain processes and man-made modifications. Quaternary alluvium that consists of sand, silt, and gravel has been mapped in the area of the Area A Wetland (USGS, 1960). Artificial and natural fill are prevalent at the sites under investigation.

#### 1.3.4.2 Bedrock Surface and Structure

The eastern edge of the facility is bordered by a bedrock high known as Baldwin Hill. The bedrock along this hill slopes toward the facility. There are three bedrock highs along the northern, central, and southern portions of the facility. At higher elevations (i.e., greater than 120 feet), these hills mimic the topographic surface. The depth to bedrock at wells 4MW1S through 4MW4S along the central hill and well 2WMW1D along the eastern hill is less than 10 feet. On the top of the central hill, a depth to bedrock of 2 to 7 feet was measured in 2LMW36B and 2LMW35B, respectively. For other bedrock highs where no data were available, a depth to bedrock of 10 to 15 feet was assumed.

In the two nearly east-west-trending valleys between the bedrock highs, the elevation of the bedrock surface continues to decrease along slopes similar to the hills, and the topographic surface flattens. In the northern valley, the bedrock surface decreases to a general elevation of 30 feet. The overburden thickness is typically 20 to 30 feet; however, it is thicker in the eastern portion of the valley in the vicinity of the Area A Wetland. Three oblong-shaped bedrock highs protrude within the valley. On these hills, the depth to bedrock is less than 10 feet. The southern valley is broader, and the bedrock elevation decreases to below mean sea level and the overburden thickens to greater than 50 feet. There is one bedrock outcrop northeast of the Goss Cove Landfill along Shark Boulevard. The depth to bedrock is 12 feet at the Goss Cove Landfill, as determined from boring logs for well cluster 8MW2.

Along the Thames River, the bedrock surface decreases to elevations of 66 (6TB17) and 82 (6MW2D) feet below msl. These elevations are below the bottom of the Thames River, which has an approximate depth of 40 feet.

Of the five different types of bedrock, only the biotite-quartz-feldspar gneiss of the Mamacoke Formation and the Granitic Gneiss were identified during drilling, as documented in the boring logs for site-specific investigations. The Mamacoke Formation was identified at the CBU Drum Storage Area, Area A Landfill, Area A Downstream Watercourses, Rubble Fill Area at Bunker A86, OBDA, Torpedo Shops, OBDANE, Spent Acid Storage and Disposal Area, and Goss Cove Landfill. The Granitic Gneiss was identified at the Area A Weapons Center. Both formations were identified within the Area A Wetland and the DRMO. The bedrock surface was not encountered at the Lower Subase.

### 1.3.5 Hydrogeology

This section provides a summary of hydrogeologic conditions at NSB-NLON. Brief discussions of groundwater quality and designations, aquifer characteristics, and groundwater flow are provided.

#### 1.3.5.1 Area Hydrogeology

For the state of Connecticut, the USGS National Water Summary (USGS, 1986) reports that " ... groundwater beneath more than 90 percent of the land in the state is considered to be suitable for drinking without treatment ... ." Saltwater intrusion impacts groundwater in coastal areas. Also note that groundwater is hard to very hard in 70 percent of the wells in the state's carbonate rock aquifer, 40 percent of the wells in the state's sedimentary rock aquifer, and 15 percent of the wells in the stratified drift and crystalline bedrock aquifers. NSB-NLON can be characterized as being located in the stratified drift and crystalline bedrock aquifers of the state. The report also states that "large concentrations of iron (as large as 40,000 µg/L) and manganese (as large as 14,000 µg/L) are a common natural groundwater-quality problem in Connecticut."

There are several well water users in the vicinity of NSB-NLON. These include the Groton Water Department, the Southeastern Connecticut Water Authority (SECWA), the town of Ledyard, and a limited number of residences adjacent to the base. The Groton Water Department supplies potable water to NSB-NLON. The primary source of the Groton water supply is reservoirs that are supplemented with wells. The water supplies are located within the Poquonock River Watershed, located east of NSB-NLON, which is not within the NSB-NLON watershed.

#### 1.3.5.2 Aquifer Characteristics

During the Phase II RI, completed by B&R Environmental in 1995, slug tests were performed on seven wells. The data were analyzed and values of hydraulic conductivity were estimated using the Bouwer and Rice Method (Bouwer and Rice, 1976). Values of hydraulic conductivity ranged from 0.07 to 20.3 feet/day (2.47E-5 to 7.16E-3 cm/sec). The highest value is from a well screened in loose sand and gravel near the Thames River (6MW3D). Intermediate values between 1 and 5 feet/day are for wells screened in the shallow fill and terrace deposits consisting primarily of dense, coarse sand with some gravel and silt. The lowest values of hydraulic conductivity, which are less than 1 foot/day, are from wells screened in very dense, silty sand in the shallow overburden (e.g., 15MW3S) and dense, poorly sorted sand in the deeper overburden (e.g., 8MW2D). The results indicate that the overburden materials are generally moderately permeable.

#### 1.3.5.3 General Discussion of Groundwater Flow

The following section provides a general description of groundwater flow and vertical components of groundwater flow at NSB-NLON. Site-specific discussions of groundwater flow are provided in Sections 2.0 through 4.0.

The general direction of groundwater flow at NSB-NLON is from Baldwin Hill across the facility to the west (in the direction of the Thames River). However, the water table surface locally mimics the bedrock (and topographic) surface. High hydraulic potentials develop within the three bedrock highs in the northern, central, and southern areas of the facility. Precipitation infiltrates into the overburden and bedrock and flows radially from the areas of high bedrock (and topographic) elevation toward areas of low bedrock (and topographic) elevation. More specifically, groundwater flows toward the two valleys and ultimately toward the Thames River or directly from the western edges of the three hills toward the Thames River. Drawings 3 and 4 represent groundwater potentiometric surface maps for overburden and bedrock, respectively. These drawings are based on groundwater elevations recorded on November 20, 1995.

Groundwater elevations were generally lower in August than in March. In most cases, the groundwater elevations at well clusters are similar in the bedrock and overburden. This suggests that the bedrock and overburden are hydraulically connected and that the groundwater flow directions are similar in both, as is evident by comparing the overburden and bedrock flow maps. At a few well clusters, the difference in groundwater elevations between the bedrock and overburden is greater than several feet. In these areas, the bedrock and overburden have a weak hydraulic connection, and local groundwater flow directions may vary.

Limited water-level data obtained in November 1995 from off-site wells show that groundwater in areas east of NSB-NLON are at higher elevations than along the eastern boundary of NSB-NLON, indicating that groundwater at NSB-NLON does not migrate offsite to the east. To the north, off-site wells have relatively low water levels; however, they are located in a valley on the opposite side of a large ridge that separates the waste disposal areas at NSB-NLON from these wells. The ridge acts as a local groundwater divide, preventing migration of groundwater from the northern waste disposal areas at NSB-NLON to these off-site wells.

A major basin divide occurs along the ridges of Baldwin Hill. East of Baldwin Hill, water (both surface and subsurface) is part of the Southeast Coast Major Basin. Water from this basin is not expected to travel toward the facility. West of Baldwin Hill, water is part of the Thames Major Basin. Surface water and groundwater ultimately discharge into the Thames River.

Hydraulic gradients in the bedrock are greatest where the bedrock surface slope is steepest (along the hillside at Rubble Fill at Bunker A86) and decrease where the bedrock slope is milder (in the valley at Area A Downstream Watercourses). Typically, the hydraulic gradient decreases as the bedrock slope decreases.

The vertical component of groundwater flow is predominantly downward in upland areas of NSB-NLON. However, at the base of the hills, the bedrock surface flattens and the overburden thickens. In these areas, upward gradients may occur, resulting in shallow bedrock groundwater discharge into the overburden. Near the Thames River, upward gradients exist, as is typical for groundwater in major stream valleys. Whether an upward or downward gradient develops depends on factors such as the bedrock configuration, depth of the overburden, topographic features, permeability, distance to the river, and the tides.

#### 1.3.5.4 Tidal and Seasonal Influences on Groundwater Discharge

Based on studies conducted during the Phase I and II RIs and an investigation at Building 31 completed by HNUS (HNUS, May 1993), the groundwater potentials have been shown to vary as a result of tidal and seasonal influences.

The tides of the Thames River influence the discharge of groundwater from NSB-NLON on a daily basis. Under normal flow conditions in the river, the discharge of groundwater to the Thames River is greatest at low tide. The hydraulic gradient along the river will be steepest during low tide. During high tide conditions, the elevation of the river is higher than the groundwater elevations observed along the western perimeter of the facility, which creates localized reversed gradients and consequently reverses flows.

During previous investigations, the following conclusions were reached regarding tidal influences on groundwater discharge from NSB-NLON:

- During low tide, the hydraulic gradient of the groundwater table at NSB-NLON is in the direction of the Thames River and will result in the highest discharge rate of groundwater to the river.

- During high tide, the hydraulic gradient of the groundwater at NSB-NLON along the Thames River is reversed and flow occurs from the river to the site, temporarily halting the discharge of groundwater from NSB-NLON to the river.

- The reversal in hydraulic gradient resulting from tidal influences occurs only near the river, generally within 300 feet, and does not seem to significantly alter groundwater flow in other areas of NSB-NLON.

Seasonal variations of the groundwater table across the site were recorded during monthly groundwaterlevel measurements at monitoring wells. The variations of the monthly water-level means generally correlate with the months with lower and higher precipitation and recharge.

Based on the evaluation of the monthly water-level data, the following conclusions were reached regarding seasonal influences on groundwater discharge from NSB-NLON:

- During periods of limited recharge (i.e., summer and early fall), the hydraulic gradients along the bedrock highs (where there is limited overburden thickness) decrease and the groundwater discharge from these areas decrease. Conversely, during periods of significant recharge (late fall and spring), the hydraulic gradients in these areas and groundwater discharge increases.

- Hydraulic gradients in the portions of the site where there is significant overburden (i.e., the valleys and floodplain) remain relatively constant (with the exception of tidal-related variations) throughout the year as does the groundwater discharge.

#### 1.3.5.5 Local Background Groundwater Quality

SECWA uses groundwater to provide potable water to residents in areas north, east, and northwest of NSB-NLON. Water quality data collected in 1991 and 1994 from 16 SECWA divisions indicated that barium, sodium, chloride, fluoride, sulfate, nitrates, and nitrites were detected in the groundwater.

The town of Ledyard also uses groundwater to provide potable water to its residents. The Ledyard Water Pollution Control Authority (WPCA) monitors groundwater constituents. Analysis of iron and manganese in samples collected during July and August, 1995 indicated that iron ranged from 2,170 µg/L to 2,780 µg/L and concentrations of manganese ranged from 1,100 µg/L to 1,400 µg/L.

Homes on Route 12 adjacent to the northeastern portion of the site have private drinking water wells, as do homes north of NSB-NLON on Sleepy Hollow Road, Long Cove Road, and Military Highway. The quality of the groundwater in these areas was measured by Atlantic and is summarized in the Off-site Residential Well Water Data Evaluation Report (Atlantic, July 1994d). Manganese concentrations measured in these residential wells ranged from less than 0.7 to 2,130 µg/L, and iron concentrations ranged from less than 4.8 to 21,800 µg/L. Two trailer parks near the site have wells classified as public water supply wells. The Colonel Ledyard Mobile Home Park, located on Sleepy Hollow Road adjacent to the North Gate, has a well that supplies between 15 and 20 families. The Grandview Trailer Park, located at the intersection of Long Cove Road and Route 12, has two water supply wells. There are several irrigation wells on-site at the Golf Course that have not been used for several years.

### 1.3.6 Climatology

NSB-NLON is in an area that has a variable climate that is a result of both continental and maritime air masses and modified by the region's proximity to the Atlantic Ocean. The region lies in the path of prevailing westerly winds and cyclonic disturbances that cross the country from the west or southwest toward the east and northeast. In the summer, prevailing winds are southwesterly and in the winter they are northwesterly. The average wind speed is about 10 miles per hour. The region is exposed to occasional storms that travel up the Atlantic coast. Storms in the region are laden with moisture from the ocean; in addition, some storms are tropical and occasional storms are of hurricane intensity.

The average annual temperature for New London, Connecticut, is approximately 50°F. Average monthly temperatures vary from 58 to 72°F in July and August and from 23 to 30°F in January and February.

Precipitation averages approximately 44 inches per year, as measured at New London over an 81-year interval. Precipitation ranges from 32 to 65 inches per year. The greatest amount of precipitation occurs in the months of March and August; the least amount occurs in June and September. Evaporation averages approximately 23 inches per year (NAVFAC, 1988).

## 1.4 DATA EVALUATION

Evaluation of existing analytical data for the basewide groundwater investigation area (Northern, Central and Southern Regions of NSB-NLON) is completed within this report to determine the need for further investigation at individual IRP sites. The approach to data evaluation is similar to that used in the final Phase II RI (B&R Environmental, 1997a). Once the determination of the nature and extent of contamination is made, the data evaluation steps used for each region of NSB-NLON include

- Contaminant fate and transport evaluation
- Summary of human health risk assessment (HHRA)
- Chemical of potential concern (COPC) screening level assessment.

The results of these data evaluation steps are then summarized and logically evaluated using a decision-tree flow chart (see Figure 1-2) to determine the need for further investigation at each site.

Further discussion on the subtasks that required completion to facilitate the discussion of the nature and extent of contamination and COPC screening is provided in the following subsections. These subtasks include preparation of the analytical database, COPC screening tables, and tag maps. In addition, the decision-making process outlined in Figure 1-2 is also summarized in Section 1.4.4.

In general, the contaminant fate and transport and HHRA information provided in this document is a summary of the information provided in the final Phase II RI (B&R Environmental, 1997a). For some sites, other sources of information were used. The methodology used for completing the HHRA was presented in the final Phase II RI and is not reiterated in this document. The HHRA will be revised using analytical results from additional field efforts, and the revised risk assessments will be included in the forthcoming Basewide Groundwater OU RI report. The revised risk assessment will follow the latest USEPA and CTDEP guidance.

### 1.4.1 Analytical Database

Analytical data from multiple investigations conducted at sites within the basewide groundwater investigation area of the NSB-NLON are summarized in this report. Various contractors collected the analytical data for the Navy. In some cases, different sampling protocols were used to collect the samples. The samples were also analyzed using different laboratory methods.

Because the primary objective of this report is to evaluate existing analytical data in preparation for the forthcoming Basewide Groundwater OU RI, analytical data for a specific medium were evaluated on a site-by-site basis only if contamination of the medium in question was expected to be a potential source of contamination for groundwater at that site. For example, analytical data for soil samples that were collected from sites that have been remediated or will be remediated in the near future to acceptable levels (i.e., below USEPA and CTDEP accepted PRGs) are not included in this report since the remediated soils no longer pose a threat to groundwater. Using this approach, soil and sediment analytical data from the Area A Downstream and Rubble Fill at Bunker A-86 sites and soil analytical data from the Spent Acid Storage and Disposal site were excluded from the EDSR. Existing groundwater data for these three sites are included in the EDSR and provide an indication of whether additional remedial actions are required for the groundwater.

A database of much of the available analytical data was created and used during the preparation of the final Phase II RI Report (B&R Environmental, 1997a). The Phase II RI included an evaluation of most of the sites located within the basewide groundwater investigation area. Applicable data obtained during other investigations were entered into the database as part of this or other NSB-NLON projects. A complete list of investigations included in this Basewide Groundwater OU EDSR is provided in Section 1.2.3. These investigations are summarized in Table 1-1. The complete analytical database that was used for this report is provided as Appendix A.

A summary of all analytical results (positive results and nondetects) for each applicable medium (on a site-by-site basis), including soil [analytical and Toxicity Characteristic Leaching Procedure (TCLP)], sediment, groundwater, and surface water, is provided in the database. Information provided for each sample in the database includes sample number, sample depth (soil and sediment samples only), investigation during which the sample was collected, sample date, sample location, sample type (soil and sediment samples only), validation status, sample status (i.e., location intact or excavated for soil and sediment samples only), filtering status (groundwater and surface water samples only), aquifer in which the well is screened (groundwater samples only), and field duplicate sample identification.

Statistical analysis of the data was necessary to provide information regarding frequency of detection, minimum and maximum concentration, range of nondetects, and 95 percent upper confidence limit (95%

UCL) for the COPC screening tables and to create tag maps. Data evaluation/processing techniques similar to those used in the Phase II RI were also used for this report. A summary of the medium-specific data evaluation/processing techniques used for this report is provided in the following subsections. The screening tables and tag maps are presented in subsequent sections of this report.

### 1.4.2 Screening Level Assessment

COPC screening is a qualitative process used to determine which chemicals present at a site exceed one or more selection criteria. With the exception of sediment, COPC screening tables were created for each medium, including soil (analytical and TCLP), groundwater, and surface water. Analytical results for sediment samples were evaluated only for Site 2B – Area A Wetland, and, as discussed in more detail in Section 2.3.4, analytical data for soil and sediment samples were evaluated collectively for this site. The information provided in each screening table includes frequency of detection, minimum and maximum concentrations, range of nondetects, 95% UCL, sample number and location associated with the maximum concentration, applicable federal and state criteria, corresponding off-site residential well concentration ranges (groundwater tables only), and a column indicating whether the maximum chemical concentration exceeds any of the criteria. The purpose of using both federal and state criteria is to satisfy potential concerns of each regulatory agency since federal and state criteria established for similar purposes may not have been developed using the same methodologies and exposure assumptions.

Essentially, two types of criteria are used for COPC selection: criteria based upon direct exposure and criteria based upon potential contaminant migration tendencies. Direct exposure criteria are developed for the protection of direct human contact with a medium (e.g., risk-based Region III COPC screening levels for tap water ingestion). Other health-based criteria [e.g., Connecticut cleanup criteria for pollutant mobility under the Remediation Standard Regulations (RSR)] are used to identify COPCs based on likely contaminant migration pathways.

Based upon the objectives of this project, only criteria that indicate the potential impact of contamination in each medium of concern on groundwater were included in the screening tables. For example, criteria based upon the mobility of chemicals in soil were considered for soil samples because evaluation of site data against these criteria provide an indication of the potential impact of contamination in the soil on groundwater. However, criteria related to direct contact with soils were not included because inclusion of these criteria would not provide information regarding the impact of soil contamination on groundwater. All criteria used to identify COPCs for solid environmental matrices (soil and sediment), TCLP leachates of soil and sediment, and aqueous environmental matrices (groundwater and surface water) are presented in Tables 1-2, 1-3, and 1-4, respectively.

The state of Connecticut has not developed cleanup criteria under the RSRs for all of the chemicals that were positively detected at the NSB-NLON sites included in this EDSR. As part of the Lower Subase RI, TtNUS calculated cleanup criteria (B&R Environmental, 1997e) using the methodologies outlined in the RSR guidance (CTDEP, 1996) for chemicals detected during the Lower Subase RI that lacked adopted cleanup criteria under the RSRs. These values were submitted to the state for review and were revised based on comments received from the state. These same methodologies were used to calculate cleanup criteria for additional chemicals detected at sites within the groundwater investigation area at NSB-NLON and to update, as necessary, previously calculated cleanup criteria based upon updated toxicity values. Published and calculated remediation standards and associated toxicological criteria for solid and aqueous matrices are provided for review in Tables B-1 and B-2, respectively, of Appendix B. Footnotes included on Tables 1-2 and 1-4 also indicate cleanup criteria that were calculated using these methodologies.

Unless noted otherwise in site-specific sections discussing nature and extent of contamination, all available data, including field screening data, unvalidated data, and composite soil sample data, from historical investigations conducted at sites within the groundwater investigation area were used to identify COPCs on a site- and medium-specific basis. Analytical results qualified as rejected (R) during the data validation process were not considered because of their potential unreliability. As previously noted, soil and sediment data from sites that have been remediated or will be remediated in the near future were not used in the COPC selection process.

Maximum detected chemical concentrations at each site and in each medium were compared to the risk-based and health-based screening criteria. For groundwater and surface water samples, if the maximum concentration of a chemical exceeded any of the screening criteria, that chemical was retained as a COPC. A similar approach was used for the selection of COPCs for soil and sediment samples with one exception. If the soil sample associated with the maximum concentration of a chemical was also analyzed for the same chemical following TCLP extraction, the results of the TCLP analyses were used to determine whether pollutant mobility was anticipated to be a problem and, in turn, to determine whether that chemical was detected as a COPC. This is explained on a case-by-case basis, as applicable, in the Screening Level Assessment subsections included in Sections 2 and 4.

Analytical results for field duplicate pairs were treated as independent samples when determining minimum and maximum concentrations and ranges of nondetects. In addition, the maximum concentrations detected in field duplicate pairs were used to calculate 95% UCLs. However, field duplicate pairs were treated as a single sample for the calculation of frequency of detection. This approach, which was used in the Phase II RI for Chemical of Concern (COC) screening at the request of

USEPA Region I, accounts for the heterogeneity of the soil and sediment media, and eliminates the potential for the masking of high detections in all media.

The results of the COPC screening provide an initial indication of which chemicals pose a potential human health risk via exposure to groundwater in the basewide groundwater investigation area at NSB-NLON. Although these results are media-specific, the COPCs for all media (soil, sediment, surface water, groundwater) become COPCs for groundwater. In addition, the site-specific recommendations sections in this report tie together the results of the media-specific COPC screening level assessments to indicate what media should be further evaluated at each individual site. Finally, the Summary of Historical Risk Assessments section included for each site provides further information regarding potential risk associated with exposure to groundwater.

A discussion of the criteria used for COPC selection is provided on a medium-specific basis in the remainder of this section.

#### 1.4.2.1 Soil

As discussed in Section 1.4.2, only criteria that indicate the potential impact of contamination in each medium of concern on groundwater were included in the COPC screening tables. Therefore, the following two criteria were used to screen the analytical results for soil samples:

**USEPA Generic Soil Screening Levels (SSLs) for Migration to Groundwater.** USEPA generic SSLs for migration to groundwater associated with a dilution and attenuation factor of 20 (USEPA, October 1996) were used to identify COPCs for soils. SSLs for migration to groundwater are calculated using default, residential land use exposure factors, infinite source models, and conservative default assumptions for source delineation. Therefore, these values are conservative and are designed to be protective of potential exposure at most sites. USEPA has calculated generic SSLs for approximately 110 organic and inorganic chemicals. SSLs for carcinogenic chemicals are based on a 1E-6 target incremental lifetime cancer risk. For noncarcinogenic chemicals, the SSLs are based on a target hazard quotient (HQ) of 1.

**Connecticut Pollutant Mobility Criteria (GB Classified Area).** The state has developed pollutant mobility cleanup criteria under the RSRs for GA/GAA (drinking water source) and GB (non-drinking water source) classified areas. Since the NSB-NLON is classified by the state as a GB area, GB Connecticut cleanup criteria for pollutant mobility were used to identify COPCs. For most organic chemicals, cleanup criteria for pollutant mobility are calculated using methodologies similar to those used to develop the USEPA generic SSLs for migration to groundwater. However, the actual models and reasonable maximum exposure default assumptions employed by the state are different than those advocated by

USEPA. The standards for carcinogenic chemicals are based on a 1E-6 target incremental lifetime cancer risk. The standards for noncarcinogenic chemicals are based on a target HQ of 1. It should be noted that cleanup criteria under the RSRs for inorganics and polychlorinated biphenyls (PCBs) apply to synthetic precipatation leaching procedure (SPLP) or TCLP analytical results only. Therefore, CTDEP cleanup criteria for pollutant mobility for inorganics and PCBs were used for COPC screening for TCLP leachates of soil samples. Federal Toxicity Characteristic Regulatory Levels (58 FR 46049) were also used for COPC screening for TCLP leachates of soil samples. In addition, the "20 times" rule, which is a method accepted by CTDEP, was used to establish screening level criteria for comparison to concentrations of inorganics and PCBs detected in soil and sediment samples.

#### 1.4.2.2 Sediment

As discussed in Section 1.4.2, analytical results for sediment samples collected from Site 2B – Area A Wetland, were evaluated collectively with analytical results for Area A Wetland soil samples. Therefore, the information provided in Section 1.4.2.1 also applies to sediment samples collected from this site.

Analytical results for sediment samples were not evaluated for any of the other sites because contamination of sediments at these sites is not expected to have an impact on the associated site groundwater. Additional details, as applicable, are provided in the site-specific sections discussing nature and extent of contamination.

#### 1.4.2.3 Groundwater

Multiple rounds of analytical data are available for many of the monitoring wells located within the basewide groundwater investigation area. For screening purposes, the maximum concentration of all sampling rounds was used to represent the chemical concentration in a monitoring well. Analytical results for groundwater samples collected from overburden and bedrock wells were screened independently for each site. Analytical results for filtered and unfiltered groundwater samples were also screened independently to account for the presence of suspended solids.

**USEPA Region III COPC Screening Levels for Tap Water Ingestion.** Although groundwater at NSB-NLON is not currently used as a drinking water supply and is not expected to be used as such in the future, risk-based concentrations for tap water ingestion were used to conservatively identify COPCs. The USEPA Region III criteria are calculated using an age-adjusted exposure equation, which assumes that a receptor uses groundwater for household purposes at a frequency of 350 days per year for 30-year exposure period. The screening values for tap water ingestion, which actually incorporate exposure via inhalation of volatiles, were developed using the USEPA Region III RBC Table (USEPA, 1997). For

carcinogenic chemicals, the values used for COPC screening are based on a 1E-6 target incremental lifetime cancer risk. The criteria for noncarcinogenic chemicals are based on a target HQ of 0.1.

**Federal and State Maximum Contaminant Levels (MCLs).** Federal MCLs are standards promulgated under the Safe Drinking Water Act and are designed for the protection of human health (direct ingestion). State MCLs have been promulgated under guidance for Connecticut agencies (Title 19, Health and Safety, the Public Code of the State of Connecticut, Chapter II Environmental Health). Both federal and state MCLs are developed in a similar manner (i.e., they are based on laboratory or epidemiological studies and apply to drinking water supplies). They are designed in a manner similar to the USEPA Region III RBCs (i.e., for the prevention of human health effects associated with lifetime exposure of an average adult who consumes 2 liters of water per day). However, MCLs also reflect the technical feasibility of removing the contaminant from water. Although MCLs are typically enforceable standards for groundwater, these standards are not strictly applicable to groundwater at NSB-NLON since groundwater at the site is not currently used as a drinking water supply nor is it expected to be used as such in the future. It should also be noted that primary MCLs and secondary MCLs, based on aesthetic drinking water qualities (color, odor, taste, etc.), are used to identify COPCs.

**Connecticut Groundwater Protection Criteria (GA/GAA).** Connecticut cleanup criteria for the protection of groundwater (CTDEP, January 1996) are applicable to GA/GAA classified areas (drinking water source areas) only. Although NSB-NLON is a GB classified area (a non-drinking water source area), the groundwater cleanup criteria for GA/GAA protection were used for informational purposes and as a conservative approach for COPC selection. Cleanup criteria for the protection of groundwater (GA/GAA) are calculated using methodologies similar to those used to develop the USEPA Region III COPC screening levels for tap water ingestion. However, the exposure equation and reasonable maximum exposure default assumptions employed by the state are slightly different than those advocated by USEPA Region III (i.e., a receptor is assumed to be exposed to groundwater at a frequency of 365 days per year, instead of USEPA's 350 days per year age-adjusted exposure scenario). The standards for carcinogenic chemicals are based on a 1E-6 target incremental lifetime cancer risk. The standards for noncarcinogenic chemicals are based on a target HQ of 1.

**Connecticut Surface Water Protection Criteria.** Because groundwater at the sites included in this report discharges to nearby surface water bodies and/or ultimately to the Thames River, screening criteria protective of surface water were used to identify COPCs associated with potential contaminant migration pathways. The CTDEP cleanup criteria for protection of surface water are calculated using the lower of the human health criteria or the freshwater aquatic life criteria for a chemical and dilution factors based on the nature of the chemical (CTDEP, January 1996). However, because the Thames River is a marine ecosystem and not a freshwater ecosystem, some of the CTDEP surface water remediation standards

(i.e., those based on freshwater aquatic life criteria) that were used for COPC screening are not directly applicable for COPC screening for protection of the surface water of the Thames River.

**Off-site Residential Well Data.** As further discussed in Section 1.4.3, off-site residential well data were obtained by Atlantic and are summarized in the Off-Site Residential Well Water Data Evaluation Report (Atlantic, July 1994d). The ranges of chemical concentrations detected in these residential wells are also provided in Table 1-4 and on the site-specific COPC screening tables for chemicals detected in site groundwater samples. However, these values were not used to select COPCs. Instead, a qualitative discussion of site data in comparison to the residential well concentrations is provided in each site-specific section discussing nature and extent of contamination.

It should be noted that the State of Connecticut's volatilization criteria are applicable to many of the sites that will be investigated as part of the groundwater remedial investigation. However, the volatilization criteria are less conservative than the USEPA Region III COPC Screening Levels for Tap Water Ingestion, which are used in this report for the screening level assessment of groundwater. Therefore, since the use of the volatilization criteria would not change the results of the groundwater assessment, they were not included in the screening level assessment.

#### 1.4.2.4 Surface Water

Analytical results for surface water samples collected from only Site 2B – Area A Wetland were included in this report. Analytical results for surface water samples were not evaluated for any of the other sites because contamination of surface waters at these sites is not expected to have an impact on the associated site groundwater. Additional details, as applicable, are provided in the site-specific sections discussing nature and extent of contamination.

Analytical results for filtered and unfiltered surface water samples collected from the Area A Wetland were screened independently to account for suspended sediments. The screening criteria described for groundwater in Section 1.4.2.3 were also used for COPC selection for surface water. This approach results in a conservative list of COPCs since surface water is not used as a drinking water supply.

### 1.4.3 Preparation of Tag Maps

Tag maps of primary COPCs were created to help evaluate the nature and extent of contamination at the basewide groundwater investigation area. A total of nine tag maps of soil, sediment, and groundwater concentrations showing exceedances of screening levels were created. The approach for creation of the drawings is discussed below.

#### 1.4.3.1 Soil/Sediment

Primary soil and sediment COPCs to be included on the tag maps were determined through a process involving several steps. The first step was to separate the COPC screening tables for the sites from the Northern Region from those included in the Southern Region (no site-specific data were available for the Central Region of NSB-NLON). The sites from the Northern and Southern Regions were each separated into an eastern and western side to allow all tags to be shown in a readable format. This resulted in the creation of five categories of tag maps: Northern Region Eastern Side Soil (Sites 1, 2A, 2B, 4, and 20), Northern Region Eastern Side Sediment (Site 2B), Northern Region Western Side Soil (Sites 7 and 14), Southern Region Eastern Side Soil (Sites 12, 15, and 23), and Southern Region Western Side Soil (Site 8).

To determine which COPCs would be chosen as the primary COPCs and included on the tag maps, the following procedure was used for each map. First, a total listing of all COPCs for particular region (Northern or Southern) was assembled. To reduce the number of COPCs from this listing to the primary COPCs, the following criteria were used: a primary COPC must have been selected as a COPC in at least 25 percent of the sites; and a primary COPC must have been positively detected in at least 30 percent of all the samples in the region in which it was selected as a COPC. Both analytical and TCLP results for primary COPCs are posted on the tag maps.

#### 1.4.3.2 Groundwater

Primary COPCs in groundwater to be included on the tag maps were determined through a process involving several steps. The first step was to separate the COPC screening tables for overburden groundwater from those for bedrock groundwater. Next, the screening tables for the sites from the Northern Region were separated from those included in the Southern Region (no site specific data was available for the central region of NSB-NLON), allowing four categories of tag maps to be generated: Northern Region Overburden Groundwater (Sites 1, 2A, 2B, 3, 4, 7, 14, and 20), Northern Region Bedrock Groundwater (Sites 2A, 2B, 3, 4, 7, and 20), Southern Region Overburden Groundwater (Sites 8, 9/23, and 15), and Southern Region Bedrock Groundwater (Site 8).

To determine which COPCs would be chosen as the primary COPCs for inclusion on the tag maps, the following procedure was used for each of the four map categories: First, a total listing of all COPCs for a certain groundwater category (overburden or bedrock) in a particular region (northern or southern) was assembled. To select primary COCs from this total list of COPCs, the following criteria were used: a primary COPC must have been selected as a COPC in at least 25 percent of the sites; and a primary COPC must have been positively detected in at least 30 percent of all of the samples in the region in which it was selected as a COPC. It should be noted that, when both filtered and unfiltered data were

available for a particular metal COPC, only the results of the filtered analyses were used in this screening process.

### 1.4.4 Decision-Making Process

The results of numerous investigations, conducted at specific sites within the three regions of NSB-NLON located in the basewide groundwater investigative area, are summarized and evaluated in this report to determine the need for further action to protect groundwater. The data evaluation steps used in this report are described above in Section 1.4. The results of these data evaluation steps are then summarized, using the portion of the decision-tree flow chart labeled as EDSR in Figure 1-2, to determine the direction of further actions.

The decision framework provided in Figure 1-2 is generally consistent with the RI/FS process under CERCLA. The flow chart shows the key steps required to complete investigation and remediation of the area within the basewide groundwater investigation. The flow chart also shows the logical progression from this EDSR to the final remedial action. The three potential conclusions that can be reached in this report for each region of NSB-NLON using the decision framework include:

- An imminent threat to human health or the environment exists and a time-critical removal action is necessary.
- No imminent threat exists, but data gaps exist and further investigation is required during the Basewide Groundwater OU RI.
- No data gaps exist and therefore no further investigation is required to complete the Basewide Groundwater OU RI Report.

The decisions reached for each region within NSB-NLON are provided in the following sections of this report.

## 1.5 REPORT ORGANIZATION

Section 1.0 consists of this introduction. Sections 2.0 through 4.0 discuss the three regions within the basewide groundwater investigation (Northern, Central, and Southern, respectively). Each section includes, for each site, a site description, discussion of site investigations, site-specific physical characteristics, nature and extent of contamination, data evaluation, and recommendations. Section 5.0 of this report provides a summary of conclusions and recommendations for each region of NSB-NLON.

## TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Final Initial Assessment Study of Naval Submarine Base New London, CT NEESA 13-025 Envirodyne Engineers, Inc. March, 1983 | CBU Drum Storage Area | Site 1 – CBU Drum Storage Area | Visual investigation and research of site history | None | NA[1] | Low potential for contributing contaminants to the Environment because source of contamination has been filled with concrete and closed to all drainage | No further action | NA |
| | Area A Landfill | Site 2 – Area A Landfill | | | | Source of contamination still present and potentially releasing contaminants to the environment | Sample surface water and sediment | |
| | Overbank Disposal Area | Site 3 – Area A Downstream Watercourses and OBDA | | | | | Sample surface water and sediment | |
| | Rubble Fill at Bunker A-86 | Site 4 – Rubble Fill Area at Bunker A-86 | | | | | Post "No Dumping" signs | |
| | Overbank Disposal Area Northeast | Site 14 – Overbank Disposal Area Northeast | | | | | Post "No Dumping" signs | |
| | Spent Acid Storage and Disposal Area | Site 15 – Spent Acid Storage and Disposal Area | | | | Low potential for contributing contaminants to the environment because source of contamination has been filled with concrete and closed to all drainage | No further action | |
| Final Verification Step 1A Study Naval Submarine Base – New London, CT Wehran Engineering Corporation February 1988 | Area A Landfill and Area A Wetland | Site 2 – Area A Landfill/ Area A Wetland | Surface Water | 18 | VOC[2] | The surface waters and sediments of Area A have levels of contaminants hazardous to public health and the environment | Site Characterization Step 1B Study, hydrogeological investigation, should be performed for both locations | No |
| | Overbank Disposal Area | Site 3 – Area A Downstream Watercourses and OBDA | Sediment | 18 | BNA Pest/PCB Metals | | | |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Additional Site Investigation and Evaluation of Remedial Alternatives – NEX<br>O'Brien & Gere, 1989 | NEX Gas Station | Site 12 – NEX Gas Station | Soil<br>Groundwater<br>Surface Water | 11<br>9<br>10 | BTEX, TPH, Finger Printing<br>BTEX, TPH, Finger Printing<br>BTEX, TPH | BTEX detected in soil, groundwater, and surface water. Free-phase product detected in groundwater and catch basins. Two plumes were discovered; each related to USTs. Faulty crash valve and pipe leak were cause of one plume. Leaking UST was cause of second plume. | Fix faulty valve and pipe leek. Determine extent of plumes. Remove free-product. Minimize contaminant migration in storm sewers. | No |
| Hydrogeologic Investigation USTs OT-4, OT-7, OT-8, and 54-H Naval Submarine Base – Groton, CT<br>Fuss & O'Neill, 1989 | Fuel Farm Storage Tanks, OT-4, OT-7, OT-8 and OT-9 | Site 23 – Fuel Farm | Soil<br>Groundwater | 144<br>4<br>16 | OVA screen<br>Petroleum Scan and Volatile Aromatics<br>Petroleum Scan and Volatile Aromatics | No. 2 fuel oil was detected in soil and groundwater. No free-phase product was detected in groundwater. The most significant contamination was found at OT-8. | Further investigation to determine if USTs or piping and pump-house operations are the cause of the contamination. | No |
| UST Removal – Waste Oil Tank #5<br>Naval Submarine Base – Groton, CT<br>GZA GeoEnvironmental Inc.<br>December, 1991 | Waste Oil Tank #5 and Surrounding Soil | Site 9 – Oily Wastewater Tank | Waste Oil<br>Waste Sludge<br>Soil | 2<br>1<br>2<br>2<br>2<br>2<br>2<br>39<br>3<br>2<br>2 | VOC(2)<br>TPH<br>Pest/PCB<br>VOC(2)<br>TPH<br>Pest/PCB<br>Metals<br>VOC (screening)<br>TPH<br>Pest/PCB<br>PHC (fingerprint) | Waste oil and sludge from Tank OT-5 contain PCBs, pesticides, VOCs and metals. Leakage from OT-5 and surficial spills are likely to have occurred | The extent of contamination in the surrounding soil should be investigated | No |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Environmental Testing – Waste Oil Tank #5 Naval Submarine Base – Groton, CT GZA GeoEnvironmental Inc., 1992 | Waste Oil Tank #5 and Surrounding Soil | Site 9 – Oily Wastewater Tank | Wastewater from Tank | 3 | Metals<br>VOCs<br>PCBs<br>PHC (fingerprint)<br>TPH<br>BOD<br>TSS | VOCs, mainly BTEX were detected in all samples. TPH was detected in 2 of 3 samples.<br>Aroclor 1260 was detected in one sample. One sample had seven detectable metals; however, TSS values were elevated. | None | No |
| Phase I Remedial Investigation Naval Submarine Base New London Atlantic Environmental Services, Inc. August 1992 | CBU Drum Storage Area | Site 1 – CBU Drum Storage Area | Soil<br>Sediment<br>Groundwater<br>Surface Water | 242 (total) | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals/CN[9]<br>CLP Metals<br>TPH[3]<br>TSS[4]<br>Gross Alpha<br>Gross Beta | Low concentrations ... do not cause risk to human health or the environment | Perform a supplemental Step I Investigation | Yes |
| | Area A Landfill/Area A Wetland | Site 2 – Area A Landfill/ Area A Wetland | | | | Several exposure scenarios exceed acceptable levels | Proceed to a Feasibility Study | |
| | Area A Downstream Watercourses and Over bank Disposal Area | Site 3 – Area A Downstream Watercourses/OBDA Pond | | | | Several exposure scenarios exceed acceptable levels | Proceed to a Feasibility Study | |
| | Rubble Fill Area at Bunker A-86 | Site 4 – Rubble Fill Area at Bunker A-86 | | | | Potential health risks | Proceed to Step II of the IR program | |
| | Torpedo Shops | Site 7 – Torpedo Shops | | | | Human health risks negligible ... no significant ecological risks | Proceed to Step II of the IR program | |
| | Goss Cove Landfill | Site 8 – Goss Cove Landfill | | | | Potential risk to construction workers | Proceed to Step II of the IR program | |
| | Overbank Disposal Area Northeast | Site 14 - OBDANE | | | | Negligible risk | Perform a supplemental Step I Investigation | |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Phase I Remedial Investigation Naval Submarine Base New London Atlantic Environmental Services, Inc. August 1992 (Continued) | Spent Acid Storage and Disposal Area | Site 15 – Spent Acid Storage and Disposal Area | | | | Risk to construction worker could be unacceptable | Proceed to Step II of the IR program | |
| | Area A Weapons Center | Site 20 – Area A Weapons Center | | | | Several exposure scenarios exceed acceptable levels | Proceed to a Feasibility Study | |
| | Former Gasoline Station at Dealy Center | Not Investigated | | | | No risks identified based on available data | Do not proceed with Step II, remove UST and perform corrective actions as necessary in accordance with UST regulations | |
| Draft Focused Feasibility Study-Spent Acid Storage Facility Installation Restoration Program Naval Submarine Base – New London Groton, Connecticut Atlantic Environmental Services, Inc. March, 1994 | Spent Acid Storage and Disposal Area | Site 15 – Spent Acid Storage and Disposal Area | Soil | 6 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>TCLP VOC<br>TCLP SVOC<br>TCLP Metals<br>TCLP Pest | • No VOCs were detected<br>• SVOCs, predominantly PAHs, detected across the site<br>• PCBs detected at one location at low levels<br>• Pesticides detected at low levels<br>• Several inorganics detected above background, predominantly lead | Off-site landfill provides superior protection of the environment, is easiest to implement, and is most cost effective | Yes |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Draft Focused Feasibility Study - Area A Downstream/OBDA Installation Restoration Program<br>Naval Submarine Base – New London<br>Groton, Connecticut<br>Atlantic Environmental Services, Inc.<br>April, 1994 | Area A Downstream Watercourses and OBDA Pond | Site 3 – Area A Downstream Watercourses / OBDA Pond | Surface Soil<br><br>Sediment<br><br>Earthworm | 18<br><br>60<br><br>5<br>18<br>8 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>TCLP VOC<br>TCLP SVOC<br>TCLP Metals<br>TCLP Pest/PCB<br><br>TCL Pest<br><br>Bioaccumulation<br>In-situ Bioassay<br>Lab Bioassay | • DDTR detected in all of the soil samples<br>• VOCs and SVOCs were not detected in the sediments<br>• Pesticides were detected in all of the 15 sediment samples<br>• No PCBs were detected in sediments<br>• Levels of organics are above back-ground in several locations<br>• Lower Pond and eastern end of OBDA Pond exhibit high toxicity to invertebrate<br>• Upper Pond and western end of OBDA Pond exhibit moderate to high toxicity to invertebrate<br>• Remaining areas exhibit low to moderate toxicity and support invertebrates | Off-site landfill and on-site thermal desorption provide superior protection of environment … off-site landfill is slightly more cost effective | Yes |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION
## NSB-NLON, GROTON, CONNECTICUT
## PAGE 6 OF 30

| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Site Characterization Report for Waste Oil Tank 5<br>Naval Submarine Base – New London<br>Groton, Connecticut<br>Halliburton NUS Corporation<br>May, 1994 | Waste Oil Tank #5 and Surrounding Area | Site 9 – Oily Wastewater Tank | Wastewater<br><br><br>Concrete<br><br>Soil<br><br>Groundwater | 2<br>1<br>4<br>11<br>8<br>14<br>28<br>11<br>5<br>10 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>Hardness<br>TAL Metals<br>TCL PCB<br>TCLP Metals<br>TCLP Pest/Herb<br>TCLP VOC<br>TCLP SVOC<br>TCL VOC<br>TAL Metals<br>TCL SVOC<br>TCL Pest/PCB<br>TCL VOC<br>TCL Pest/PCB<br>Hardness<br>TCL SVOC<br>TAL Metals | Contents of the waste oil tank have not significantly impacted subsurface soil below the tank or the underlying groundwater the majority of soil contamination was found at a depth of 2-4 feet which is above the tank. Except for a single detection of PCE, no contaminants were detected in groundwater above Federal drinking water standards | No further action is required. | Yes |
| Design Analysis – Basis of Design and Calculations for Area A Landfill<br>Atlantic Environmental Services, Inc.<br>May, 1994 | Area A Landfill | Site 2 – Area A Landfill | Soil<br><br><br>Soil Gas | 6<br><br><br>36 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals/CN<br>Methane | The Area A Landfill Cap and diversion of stormwater and groundwater results in actions necessary to prevent release of contaminants into the environment and prevent human exposure to the contaminants | This provides the desired improvements to the landfill while maintaining the site for government uses | No |

## TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Off-Site Residential Well Water Data Evaluation Report, Installation Restoration Program, Naval Submarine Base - New London, Groton, Connecticut<br>Atlantic Environmental Services, Inc.<br>July, 1994 | Off-site residential water wells | None | Groundwater | 175 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>Cyanide<br>Boron<br>Chloride | • Organic compounds were only detected during the first round of sampling<br>• Several instances of elevated levels of inorganics detected | Preliminary conclusion that off-site residential water wells are not being impacted by NSB-NLON | Yes |
| Draft Post-Removal Action Report for Waste Oil Tank No. 5 Removal Action<br>Naval Submarine Base – New London<br>Groton, Connecticut<br>Halliburton NUS Corporation<br>December, 1994 | Waste Oil Tank #5 and Surrounding Area | Site 9 – Oily Wastewater Tank | Wipe Samples | 30 | PCBs | Final sample results after decontamination procedures were completed indicated that test surfaces at two frac trailers and two roll-off containers were within acceptable concentration levels for PCBs | Solid wastes from the decontamination procedure and spent decontamination fluids were disposed off site | No |
| Action Memorandum for the DRMO and the Spent Acid Storage and Disposal Area, Installation Restoration Program<br>Atlantic Environmental Services, Inc.<br>March, 1995 | Spent Acid Storage and Disposal Area | Site 15 – Spent Acid Storage and Disposal Area | Soil | 13 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>TCLP Metals | Lead was the major contaminant detected in soil at the spent acid storage and disposal area … total lead concentrations detected as high as 600 mg/kg while TCLP lead concentrations were as high as 50 mg/kg | Approximately 200 cubic yards of lead contaminated soil should be removed from the spent acid area | Yes |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Background Concentrations of Inorganics in Soil Installation Restoration Program Naval Submarine Base – New London Groton, Connecticut Atlantic Environmental Services, Inc. April, 1995 | Undisturbed Areas of NSB-NLON | None | Soil | 18 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>Cyanide<br>Boron | • All site-derived background levels are within the ranges published by the USGS for background levels for the eastern United States<br>• Based on the organic compounds detected, it is concluded that all samples locations are representative of native background conditions | Background levels of inorganics were established to screen site analytical data to identify areas where releases of pollutants may have occurred | Yes |
| Site Characterization Report for OT-10, Building 325, and Building 89 Naval Submarine Base – New London Groton, Connecticut Halliburton NUS Corporation April 1995 | Building 325 – Tanks R01, R1, and R02 | Site 7 – Torpedo Shops | Soil<br>Groundwater | 11<br>4 | BTEX<br>TPH<br>BTEX<br>TPH | There is possible petroleum related contamination in the soil surrounding these tanks. The groundwater detection was below state industrial cleanup standards. | Soil recently removed … no further action | Yes Bldg 325 Only |
| | OT-10 | None | Soil<br>Groundwater | 12<br>8 | BTEX<br>TPH<br>TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>TPH | TPH does not exceed state industrial cleanup standards. Generally low level detections of other contaminants are typical of site-wide conditions and may not be associated with the tank in question | No further action | No |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Preliminary Assessment, Draft Final PA-13-025A-ENV Supplement to Initial Assessment Study NEESA 13-025, Naval Facilities Engineering Service Center, Naval Submarine Base New London Groton, Connecticut April, 1995 | Area A Downstream Watercourses | Site 3 – Area A Downstream Watercourses and OBDA | Visual Investigation and Research of Site History | None | None | Operational | Additional investigations are recommended | NA |
| | Building 450 OTTO Fuel Wastewater Tank | Site 7 – Torpedo Shops | | | | Tank was cleaned and backfilled in 1987 | Include in the Phase II RI | |
| | Building 450 Drum Storage Area | Site 7 – Torpedo shops | | | | 90 Day hazardous waste accumulation area | No further action | |
| | Pesticide Use Public Works | None | | | | Operational | No further action | |
| | Transformer at Building 157, Vault 31 | None | | | | *Oil on concrete pad* surface ... potential for PCBs | *No further action for* the cleanup recommended under the spill containment plan | |
| | Paint Residue from Repairing Potable Water Tanks No. 99 and 326 | None | | | | Sample results indicate soil contaminated with lead | Further investigation recommended | |
| | Paint Residue from Repairing Potable Water Tanks No. 444, 452, and 480 | None | | | | Possible soil contamination around tank from paint residue | Sampling is recommended to determine possible soil contamination | |
| | Hazardous Waste Accumulation Areas | Various | | | | No evidence of releases found | No further action | |
| Focused Feasibility Study – Area A Landfill Installation Restoration Program Naval Submarine Base New London – Groton, Connecticut Atlantic Environmental Services, Inc. May 1995 | Area A Landfill | Site 2 – Area A Landfill | Refer to Phase I RI Supplemental Site Investigation for Area A Landfill and Area A Landfill/Wetland Interface sampling results. | | | | Off-site landfill and off-site incineration provide superior protection of environment ... off-site landfill is more cost effective than incineration | NA |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Final Letter Report Area A Landfill/Wetland Interface Sampling Results (Appendix C of the FFS for Area A Landfill)<br>Naval Submarine Base – New London<br>Groton, Connecticut<br>Halliburton NUS Corp.<br>May, 1995 | Area A Wetland | Site 2 – Area A Wetland | Sediment | 20 | TOC<br>TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals | • Several detections of VOCs<br>• Wide variety of SVOCs detected<br>• Wide variety of pesticides detected<br>• One PCB detected<br>• Numerous detections of low level organics | It appears that the landfill is the origin of VOC contamination, the paved parking lot is the cause of the SVOC contamination and inorganic contamination is attributable to background levels in most cases | Yes |
| Proposed Plan/ Record of Decision for a Remedial Action at Area A Landfill<br>Naval Submarine Base - New London<br>Groton, Connecticut<br>Atlantic Environmental Services, Inc<br>June, 1995 | Area A Landfill | Site 2 – Area A Landfill | Soil | None | None | Preferred remedial action components include:<br>• Access restrictions<br>• Site grading and storm water management<br>• Horizontal barrier cap installation<br>• Leachate collection and treatment<br>• Post-closure groundwater monitoring | Selected remedy will involve grading and installation of impervious caps over contaminated areas of the site … the cap will reduce human and environmental exposure to site contaminants and reduce migration of contaminants from the site | NA |
| Final Report for Soil Remediation<br>Spent Acid Storage and Disposal Area<br>Naval Submarine Base - New London<br>Groton, Connecticut<br>OHM Remediation Services Corp<br>September, 1995 | Spent Acid Storage and Disposal Area | Site 15 – Spent Acid Storage and Disposal Area | Soil | 5 | Total Lead<br>TCLP Lead | Sample results were used primarily to confirm the limits of excavation of contaminated soil | Site was excavated sampling confirmed that contamination in exceedance of remedial goals was removed | Yes |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| No Further Action Decision Document for the CBU Drum Storage Area Naval Submarine Base - New London Groton, Connecticut U.S. Navy July, 1996 | CBU Drum Storage Area | Site 1 – CBU Drum Storage Area | Soil Groundwater | None | NA | Extensive contamination not observed during the investigation … contamination in ground-water does not pose unacceptable risk to human health or the environment … risk assessments show levels of analytes in soils are not likely to pose unacceptable risk to human health or the environment | No further studies or remediation are required at this site | NA |
| Revised Design Analysis Report for Area A Landfill for Naval Submarine Base - New London Groton, Connecticut Brown & Root Environmental December, 1996 | Area A Landfill | Site 2 – Area A Landfill | None | None | None | Cap would provide sufficient stability and prevent groundwater infiltration into the landfill | None | NA |

## TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION
## NSB-NLON, GROTON, CONNECTICUT
## PAGE 12 OF 30

| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Final Groundwater/ Leachate Modeling Study Report for Area A Landfill Remedial Design<br>Naval Submarine Base - New London<br>Groton, Connecticut<br>Brown & Root Environmental<br>October, 1996 | Area A Landfill | Site 2 – Area A Landfill | Soil<br><br>Groundwater Seep | 8<br><br>1 | Geotechnical Parameters<br><br>TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals | • Water table below landfill will be reduced with cover system<br>• Cover system will be stable<br>• Contaminant migration from unsaturated to saturated zone will be reduced<br>• Mass flux of contaminants of concern from landfill to wetlands will be reduced<br>• The main mechanism for groundwater/ leachate movement from landfill to wetlands is lateral groundwater flow<br>• One detection of organic and six detections of inorganics in seep sample | Do not modify existing cover system design with toe drain system | No |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Phase II Remedial Investigation for Naval Submarine Base - New London Groton, Connecticut Brown & Root Environmental March, 1997 | CBU Drum Storage Area | Site 1 – CBU Drum Storage Area | Soil<br><br>Groundwater | 5<br><br>2 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>TPH<br><br>TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>TAL Metals (diss)<br>TPH | • Potential source of contamination has been removed<br>• Soil and groundwater samples showed very little chemical concentrations<br>• All human health risks are within an acceptable range<br>• Potential for this site to impact ecological receptors is low<br>• Site will be covered with low permeability cap as part of the interim remedial action for the Area A Landfill | No further action | Yes |

## TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Phase II Remedial Investigation for Naval Submarine Base - New London Groton, Connecticut Brown & Root Environmental March, 1997 (continued) | Area A Landfill | Site 2 – Area A Landfill | Soil<br><br>Groundwater | 2<br>10<br><br>41<br>36<br><br>5<br>8<br>3 | Dioxin<br>TCL PCB (field)<br><br>TCL VOC<br>TCL SVOC<br>TAL Metals<br>TAL Metals (diss)<br>TCL PCB<br>Radiological<br>O/G, ammonia, BOD, COD, TOC, phosphorus, TSS | • Relatively high but sporadic chemical concentrations were detected in site soils<br>• Shallow groundwater contamination exists at the site<br>• Due to PCB concentrations the landfill may pose a threat to human receptors<br>• Chemicals in the soil could adversely impact ecological receptors, however, installation of the cap will eliminate these risks | In addition to the planned landfill cap, limited action consisting of access/ use restrictions and groundwater monitoring should be implemented | Yes |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Phase II Remedial Investigation for Naval Submarine Base - New London (continued) | Area A Wetland | Site 2 – Area A Wetland | Groundwater | 20 | TCL VOC<br>TCL SVOC<br>TAL Metals<br>TAL Metals (diss) | • Little evidence of surface water or groundwater contamination at the site<br>• Significant pesticide, PAH and PCB concentrations in sediment and soil at the site<br>• Except for the construction worker, all human health risks are within the acceptable range … most risk attributable to manganese in groundwater<br>• Area A Wetland does not provide a food source for ecological species, however, obvious impacts have not been observed | Site should proceed to the feasibility study phase. | Yes |
| | | | Sediment | 29<br>22<br>32<br>26<br>1 | TCL Pest (field)<br>TCL VOC<br>TCL SVOC<br>TAL Metals<br>TCL Pest<br>TCL PCB<br>O/G, ammonia, BOD, COD, TOC, phosphorus, TSS<br>TCLP Metals | | | |
| | | | Surface Water | 9<br>6<br>1 | TCL VOC<br>TCL Pest/PCB<br>TAL Metals<br>TAL Metals (diss)<br>TCL SVOC | | | |

## TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Phase II Remedial Investigation for Naval Submarine Base - New London (continued) | Area A Downstream Watercourses and Over bank Disposal Area | Site 3 – Area A Downstream Watercourses/OBDA | Groundwater | 46 | TCL VOC<br>TCL SVOC<br>TAL Metals<br>TAL Metals (diss) | • Notable detections of pesticides exist in soil and sediment at the site<br>• An unknown source of VOCs were detected in the groundwater<br>• Non-carcinogenic risks to the older child trespasser and site worker exceed EPA risks<br>• Concentrations of DDTR in sediments and surface water at the site represent a risk to ecological receptors<br>• No further action is required in the North Lake region since there is not a direct hydraulic connection between North Lake surface water and adjacent surface water/groundwater at the site | The feasibility study for this site should be revisited to focus on pesticides in soil and sediment ... more sampling is required to delineate pesticide contamination and determine the origin of VOCs in ground water ... finally, debris associated with the OBDA should be removed | Yes |
| | | | | 6 | Radiological | | | |
| | | | Sediment | 3 | TCL VOC<br>TCL SVOC<br>TCL Pest<br>TAL Metals | | | |
| | | | | 4 | TCL Pest (field) | | | |
| | | | Surface Water | 16 | TCL VOC<br>TCL Pest/PCB<br>TAL Metals | | | |
| | | | | 8 | TCL SVOC | | | |
| | | | | 2 | TAL Metals (diss) | | | |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION
## NSB-NLON, GROTON, CONNECTICUT
## PAGE 17 OF 30

| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Phase II Remedial Investigation for Naval Submarine Base - New London (continued) | Rubble Fill Area at Bunker A-86 | Site 4 – Rubble Fill Area at Bunker A-86 | Soil | 14<br>2 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>TCLP Metals<br>O/G, ammonia, BOD, COD, TOC, phosphorus, TSS | • Sediment sampling indicates that site may be contributing to downslope presence of PAHs and metals<br>• The extent of the soil contamination is unknown<br>• Human health risk assessment showed that non-cancer risk for site construction workers was above the EPA acceptable level<br>• Chemicals at the site could adversely impact ecological receptors | Additional site characterization to be conducted to determine the nature and extent of semi-volatiles and metals in site sediment and soil | Yes |
| | | | Groundwater | 10<br>8<br>2 | TCL VOC<br>TCL SVOC<br>TCL Metals<br>TAL Metals (diss)<br>TCL Pest/PCB<br>O/G, ammonia, BOD, COD, TOC, phosphorus, TSS | | | |
| | | | Sediment | 3 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>O/G, ammonia, BOD, COD, TOC, phosphorus, TSS | | | |
| | | | Surface Water | 3<br>2 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>TAL Metals (diss) | | | |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION
## NSB-NLON, GROTON, CONNECTICUT
## PAGE 18 OF 30

| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Phase II Remedial Investigation for Naval Submarine Base - New London (continued) | Torpedo Shops | Site 7 – Torpedo Shops | Soil | 20<br>15<br>9<br>5<br>1 | TCL VOC<br>TCL SVOC<br>TAL Metals<br>TCL Pest/PCB<br>TPH<br>O/G, ammonia, BOD, COD, TOC, phosphorus, TSS<br>TCLP Metals<br>TCLP Organics | • Notable detections of contamination have been seen in soil and groundwater near the abandoned sewer line<br>• Human health risk assessment showed that non-cancer risks were below EPA levels except for the construction worker and future resident... cancer risks were below acceptable levels except for the future resident<br>• Area does not provide suitable habitat for ecological receptors and therefore represents little risk although chemicals at the site could have ecological impact | Further characterization of the Torpedo Shops should be completed prior to determining whether or not the site should proceed to the FS stage | Yes |
| | | | Groundwater | 30<br>8<br>5 | TCL VOC<br>TCL SVOC<br>TAL Metals<br>TAL Metals (diss)<br>O/G, ammonia, BOD, COD, TOC, phosphorus, TSS<br>TPH | | | |
| | | | Sediment | 2 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>O/G, ammonia, BOD, COD, TOC, phosphorus, TSS | | | |
| | | | Surface Water | 1 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals | | | |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Phase II Remedial Investigation for Naval Submarine Base - New London (continued) | Goss Cove Landfill | Site 8 - Goss Cove Landfill | Soil | 30 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals | • High concentrations of organics and inorganics in soil and groundwater.<br>• Evidence of offsite impacts exist.<br>• Elevated potential human health and ecological risk estimates. | Perform Feasibility Study of Alternatives. Evaluate groundwater separate from other media. | Yes |
| | | | | 10 | TCLP Metals | | | |
| | | | | 7 | Grain size<br>Moisture, SpGr, pH, TOC | | | |
| | | | | 3 | Dioxins | | | |
| | | | Groundwater | 26 | TCL VOC<br>TCL SVOC<br>TAL Metals<br>TAL Metals (diss) | | | |
| | | | | 5 | Radiological | | | |
| | | | Sediment | 6 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>Grain size<br>Moisture, SpGr, pH, TOC<br>Dioxins | | | |
| | | | | 1 | TCLP Metals | | | |
| | | | Surface Water | 6 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>BOD, TOC, COD, O/G, TSS, Hard ammonia phosphorus | | | |
| | | | | 2 | TAL Metals (Diss) | | | |

## TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Phase II Remedial Investigation for Naval Submarine Base - New London *(continued)* | Spent Acid Storage and Disposal Area | Site 15 – Spent Acid Storage and Disposal Area | Soil | 4 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals | • Source of contamination at the site has been removed<br>• Majority of organics detected in site groundwater were detected sporadically and not detected in site soil<br>• Except for the future resident, all human health risks are within the acceptable range … most risk attributable to manganese in groundwater<br>• Area does not provide suitable habitat for ecological receptors and therefore represents little risk although chemicals at the site could have ecological impact | Further characterization to support no further action at the site | Yes |
| | | | Groundwater | 11 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>TAL Metals (diss) | | | |
| | | | | 2 | O/G, ammonia, BOD, COD, TOC, phosphorus, TSS | | | |
| | | | Sediment | 1 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>O/G, ammonia, BOD, COD, TOC, phosphorus, TSS | | | |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Phase II Remedial Investigation for Naval Submarine Base - New London (continued) | Area A Weapons Center | Site 20 – Area A Weapons Center | Soil | 12 | TCL VOC<br>TCL SVOC<br>TAL Metals | • This area may be a contaminant source for the Area A Wetlands<br>• Minimal contamination of groundwater and surface water at the site … elevated manganese levels appear to be background levels<br>• Except for the future resident and site construction worker, all human health risks are within the acceptable range … most risk attributable to manganese in groundwater<br>• Area does not provide suitable habitat for ecological receptors and therefore represents little risk although chemicals at the site could have adverse ecological effects | Site should proceed to the feasibility study phase | Yes |
| | | | | 8 | TCL Pest/PCB | | | |
| | | | | 1 | TCLP Metals | | | |
| | | | Groundwater | 9 | TCL VOC<br>TCL SVOC<br>TAL Metals<br>TAL Metals (diss) | | | |
| | | | | 2 | Radiological | | | |
| | | | Sediment | 16 | TCL SVOC<br>TAL Metals | | | |
| | | | | 6 | TCL VOC<br>TCL Pest/PCB | | | |
| | | | | 2 | Engineering[3] | | | |
| | | | Surface Water | 2 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals | | | |
| | | | | 1 | TAL Metals (diss) | | | |

## TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Phase II Remedial Investigation for Naval Submarine Base - New London (continued) | Over Bank Disposal Area Northeast | Site 14 - OBDANE | Soil<br><br><br><br><br>Groundwater | 7<br><br><br>2<br>1<br><br>2 | TCL VOC<br>TCL SVOC<br>TAL Metals<br>TCLP Metals<br>TCL Pest/PCB<br><br>TCL VOC<br>TCL SVOC<br>TAL Metals<br>TAL Metals (diss) | • Arsenic in surface soil samples found to slightly exceed state standards<br>• Lead contamination found in surface soil samples about 80 feet south of the site<br>• All human health risks were found to be within or below EPA's target range<br>• Although chemicals at the site could affect ecological receptors, no apparent effects to these groups were observed | Further surface soil characterization with respect to arsenic and lead should be completed | Yes |
| Functions and Values Assessment of Area A Downstream Wetlands and Watercourses Naval Submarine Base - New London Groton, Connecticut William A Niering and A. Hunter Brawley May, 1997 | Area A Downstream Watercourses | Site 3 – Area A Downstream Watercourses and OBDA | Vegetation of Downstream Watercourses | None | None | • The Lower Pond is the least disturbed area of wetland and Stream 2 from the Lower Pond is the least disturbed streamcourse<br>• Upper and OBDA Wetlands have been disturbed by silting and various pollutants | Disturbance of the Lower Pond should be minimized in any remedial action … disturbance of Upper Pond and OBDA Pond may be justified with appropriate wetland mitigation measures | NA |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Verification Sampling Report for Site 4 Removal Action Naval Submarine Base - New London Groton, Connecticut Brown & Root Environmental June, 1997 | Rubble Fill at Bunker A-86 | Site 4 – Rubble Fill Area at Bunker A-86 | Surface Soil | 16 | TCL SVOC TAL Metals SPLP Metals | • Concentrations of SVOCs were higher than previously encountered<br>• Except for higher manganese concentrations, inorganic levels were the same as previous investigations | Verification of contamination for removal action | No |
| Final Post Removal Report for Site 4 – Rubble Fill Area at Bunker A-86 at Naval Submarine Base New London, CT Foster Wheeler Environmental Corp. July, 1997 | Rubble Fill at Bunker A-86 | Site 4 – Rubble Fill Area at Bunker A-86 | Surface Soil | None | None | Objective of remedial action accomplished. Construction debris and contaminated soil were removed from Site 4 and incorporated into the Area A Landfill subgrade except for wood debris which was sampled and disposed off site | Site cleanup accomplished | NA |
| Final Post Removal Report for Over Bank Disposal Area at Naval Submarine Base New London, CT Foster Wheeler Environmental Corp. July, 1997 | Over Bank Disposal Area | Site 3 – Area A Downstream Watercourses and OBDA | Surface Debris | None | None | Objective of remedial action accomplished. Cleanup of debris on the surface of OBDA was completed. Debris was removed from the surface of the slope and wetlands and hauled off site for disposal | Site cleanup accomplished | NA |

## TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION
## NSB-NLON, GROTON, CONNECTICUT
## PAGE 24 OF 30

| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Data Gap Investigation Report for Goss Cove Landfill<br>Naval Submarine Base – New London<br>Groton, Connecticut<br>Brown & Root Environmental<br>August, 1997 | Goss Cove Landfill | Site 8 – Goss Cove Landfill | Soil<br><br>Groundwater | 5<br><br>7 | TCL VOC<br><br>TCL VOC<br>Geochemistry | • Source of chlorinated compounds is not in the vicinity of wells 8MW8S/8MW8D<br>• Chlorinated compounds in groundwater are migrating onto the Goss Cove Landfill from a southeast direction | Further groundwater characterization is needed in a separate investigation … proceed with the FS separate from the groundwater investigation | Yes |
| Proposed Plan/ Record of Decision for the Spent Acid Storage and Disposal Area<br>Naval Submarine Base – New London<br>Groton, Connecticut<br>Department of the Navy<br>July, 1997 | Spent Acid Storage and Disposal Area | Site 15 – Spent Acid Storage and Disposal Area | Soil | None | None | Removal Action completed in January of 1995. Risk assessment did not indicate any significant adverse health threats to humans or ecosystem. | No further action | NA |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Site Investigation Report for Tank Farm Investigation<br>Naval Submarine Base – New London<br>Groton, Connecticut<br>Brown & Root Environmental<br>September, 1997 | Tank Farm | Site 23 – Tank Farm | Soil | 145 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>TPH | TPH, PAHs and various inorganic were identified as COCs at the site | Potential excavation of soil at OT-8 … excavation at GS-7 and GS-8 at the upper base fuel pipe-line … and replacement of the existing collapsed sewer system, hot spot removal and confirmatory sampling and analysis during sewer system installation on a site-wide basis | Yes |
| | | | Groundwater | 122 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>TPH | | | |
| | | | Sediment | 12 | TCL VOC<br>TCL SVOC<br>TCL Pest/PCB<br>TAL Metals<br>TPH | | | |
| | | | Surface Water | 3 | TAL Metals<br>TPH | | | |

## TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Feasibility Study for Soil and Sediment – Area A Downstream/ OBDA Naval Submarine Base – New London Groton, Connecticut Brown & Root Environmental December, 1997 | Area A Downstream Watercourses and OBDA | Site 3 – Area A Downstream Watercourses / OBDA | Soil Sediment | None | None | Evaluated 4 remedial alternatives<br>• No action<br>• Capping, restoration of wetlands and waterways, and institutional controls<br>• Dredging, on-site dewatering, off-site disposal of sediment /soil, restoration of wetlands and waterways and monitoring<br>• Dredging, on-site dewatering/thermal desorption of sediment /soil, on-base reuse of treated soil, off-site disposal of sediment, restoration of wetlands and waterways and monitoring | No recommendations | NA |
| Proposed Plan/ Record of Decision for the Area A Downstream/OBDA Naval Submarine Base – New London Groton, Connecticut Department of the Navy December, 1997 | Area A Downstream Watercourses and OBDA | Site 3 – Area A Downstream Watercourses / OBDA | Soil Sediment | None | None | The selected remedial alternative is:<br>• Dredging, on-site dewatering, off-site disposal of sediment /soil, restoration of wetlands and waterways and monitoring | Proceed with the selected alternative | NA |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Final Report for Interim Remedial Action at Area A Landfill Naval Submarine Base – New London Groton, Connecticut Brown & Root Environmental March, 1998 | Area A Landfill | Site 2 – Area A Landfill | Soil | None | None | This report certifies that construction procedures, inspection activities, field and lab test results, and survey conducted at the Area A Landfill site were performed according to specs | This report certifies that construction procedures, inspection activities, field and lab test results, and survey conducted at the Area A Landfill site were performed according to specs | NA |
| Wetlands Functions and Values Assessment Report Tetra Tech NUS September, 1998 | Goss Cove | Site 8 - Goss Cove | Vegetation | None | None | No discrete wetland plant communities were identified. A few wetland species were found. It was concluded that the contrast between the Thames River and the cove is dramatic due to the lack of tidal flushing. | None | NA |
| Final Hydrogeologic Study at the Tank Farm Naval Submarine Base - New London, Groton, CT Tetra Tech NUS February, 1999 | Fuel Farm | Site 23 – Fuel Farm | Groundwater | 0 | NA | Four bedrock monitoring wells were installed and water levels were measured in them. | None | NA |

## TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Phase I/II Environmental Site Assessment Report for Fusconi Dry Cleaners CTDEP March, 1999 | Fusconi Dry Cleaners | Site 8 - Goss Cove Landfill | Soil<br>Groundwater<br>Drum | 13<br>2<br>1 | VOCs<br>VOCs<br>VOCs | • PCE and other VOCs were detected in nearly all samples.<br>• Company representative admitted that it was common practice to dump spent PCE out the back door to the ground. | Fusconi Dry Cleaners has procured a consultant to help them address their environmental concerns. A voluntary drum removal and soil excavation were completed. The consultant will perform further investigations to determine the nature and extent of contamination, and produce a remedial action plan to address site issues. | No |
| Feasibility Study for Goss Cove Landfill – Soil Operable Unit Naval Submarine Base – New London Groton, Connecticut Tetra Tech NUS March, 1999 | Goss Cove Landfill | Site 8 – Goss Cove Landfill | Soil | None | None | Presumptive remedy approach used to develop a single remedial alternative | Recommend capping of the site with institutional controls and monitoring | NA |

# TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Site Management Plan for Naval Submarine Base – New London Groton, Connecticut Brown & Root Environmental March, 1999 | All current IR Sites at Naval Submarine Base – New London | Site 1 – CBU Drum Storage Area<br>Site 2 – Area A Landfill/ Wetland<br>Site 3 – Area A Down-stream Watercourses and OBDA<br>Site 4 – Rubble Fill Area at Bunker A-86<br>Site 7 – Torpedo Shops<br>Site 9 – Oily Waste-water Tank OT-5<br>Site 14 – OBDANE<br>Site 15 – Spent Acid Storage and Disposal Area<br>Site 16 – Hospital Incinerator<br>Site 18 – Solvent Storage Area (Bldg 33)<br>Site 20 – Area A Weapons Center<br>Site 23 – Fuel Farm | None | None | None | Ranks of high, medium or low are developed for each site using Navy's relative risk ranking procedure. Detailed schedules summarizing planned remedial activities were also provided | Results of relative risk site evaluation will be used in conjunction with other risk management information to assist in sequencing remedial work. Activities will proceed following the schedules included. The SMP will be updated annually. | NA |

## TABLE 1-1

## SUMMARY OF PREVIOUS AND ONGOING INVESTIGATIONS AT THE NAVAL SUBASE NEW LONDON AND RELATED DOCUMENTATION NSB-NLON, GROTON, CONNECTICUT



| Report | Area Investigated | Associated NSB-NLON Site | Media Investigated | Number of Analytical Samples | Analytical parameters | Summary of Findings | Historical Recommendations | Analytical Data Included in the Database |
|---|---|---|---|---|---|---|---|---|
| Evaluation of Chemical and Toxicological Data for Goss Cove<br>SAIC<br>March 1999 | Goss Cove | Site 8 - Goss Cove Landfill | Surface Sediment | 10 | PAHs<br>Pest/PCB<br>Metals<br>AVS/SEM<br>Engr. Parameters<br>Toxicity | Concluded that a complete pathway does not exist between site-specific contaminants and observed ecological effects. The likely source of toxicity was ammonia from natural sources. | NA | No |
| | | | Subsurface Sediment | 10 | PAHs<br>Pest/PCB<br>Metals<br>AVS/SEM<br>Engr. Parameters | | | |
| | | | Pore Water | 10 | PAHs<br>Pest/PCB<br>Metals<br>TIE<br>Toxicity | | | |

1 NA: Not Applicable
2 VOC: Volatile organic compounds
BNA: base/neutral acids
Pest/PCB: pesticides and polychlorobiphenols
3 TCLP: Toxicity Characteristic Leaching Procedure
TPH: Total Petroleum Hydrocarbons
4 TSS: Total suspended solids
5 SVOC: Semivolatile organic compounds
6 TCE: Trichloroethylene
7 1,2-DCA: 1,2-dichloroethene
8 TBC: To be considered
9 TAL: Target Analyte List
CN: Cyanide

**TABLE 1-2**

**RISK-BASED AND HEALTH-BASED COPC SCREENING LEVELS - SOLID MEDIA**
**NSB-NLON, GROTON, CONNECTICUT**
**PAGE 1 OF 4**

| Analyte | USEPA Soil Screening Level Migration to Groundwater[1] | CTDEP Remediation Standard GB Pollutant Mobility[2] |
|---|---|---|
| **VOLATILE ORGANICS (mg/kg)** | | |
| 1,1,1-Trichloroethane | 2 | 40 |
| 1,1,2,2-Tetrachloroethane | 0.003 | 0.1 |
| 1,1,2-Trichloroethane | 0.02 | 1 |
| 1,1-Dichloroethene | 0.06 | 1.4 |
| 1,2-Dichloroethene (Total) | 0.4/0.7 | 12[3] |
| 2-Butanone | NA[4] | 80 |
| 4-Methyl-2-pentanone | NA | 14 |
| Acetone | 16 | 140 |
| Benzene | 0.03 | 0.2 |
| Bromodichloromethane | 0.6 | 0.11[3] |
| Bromomethane | 0.2 | 2[3] |
| Carbon Disulfide | 32 | 140[3] |
| Chlorobenzene | 1 | 20 |
| Chloroform | 0.6 | 1.2 |
| Chloromethane | NA | 0.54[3] |
| cis-1,3-Dichloropropene | 0.004[5] | 0.1 |
| Ethylbenzene | 13 | 10.1 |
| Methylene Chloride | 0.02 | 1 |
| Styrene | 4 | 20 |
| Tetrachloroethene | 0.06 | 1 |
| Toluene | 12 | 67 |
| trans-1,3-Dichloropropene | 0.004[5] | 0.1 |
| Trichloroethene | 0.06 | 1 |
| Vinyl Acetate | 170 | 1400[3] |
| Xylenes, Total | 190[6] | 19.5 |
| **SEMIVOLATILE ORGANICS (mg/kg)** | | |
| 1,4-Dichlorobenzene | 2 | 15 |
| 2,4-Dimethylphenol | 9 | 28[3] |
| 2-Methylnaphthalene | NA | 56[3] |
| 2-Methylphenol | 15 | 70[3] |
| 3,3'-Dichlorobenzidine | 0.007 | 0.016[3] |
| 4-Chloro-3-methylphenol | NA | NA |
| 4-Methylphenol | NA | 7[3] |
| Acenaphthene | 570 | 84[3] |
| Acenaphthylene | NA | 84 |
| Anthracene | 12,000 | 400 |
| Benzo(a)anthracene | 2 | 1 |
| Benzo(a)pyrene | 8 | 1 |
| Benzo(b)fluoranthene | 5 | 1 |
| Benzo(g,h,i)perylene | NA | 40[7] |
| Benzo(k)fluoranthene | 49 | 1 |
| Benzoic Acid | 400 | 5600[3] |

**TABLE 1-2**

**RISK-BASED AND HEALTH-BASED COPC SCREENING LEVELS - SOLID MEDIA**
**NSB-NLON, GROTON, CONNECTICUT**
**PAGE 2 OF 4**

| Analyte | USEPA Soil Screening Level Migration to Groundwater[1] | CTDEP Remediation Standard GB Pollutant Mobility[2] |
|---|---|---|
| Bis(2-Ethylhexyl)phthalate | 3600 | 11 |
| Butylbenzyl Phthalate | 930[8] | 200 |
| Carbazole | 0.6 | 0.36[3] |
| Chrysene | 160 | 0.96[3] |
| Dibenzo(a,h)anthracene | 2 | 0.005[9] |
| Dibenzofuran | NA | 5.6[3] |
| Diethyl Phthalate | 470 | 1100[3] |
| Dimethyl Phthalate | NA | 14,000[3] |
| Di-n-butyl phthalate | 2300 | 140 |
| Di-n-octyl phthalate | 10,000[8] | 20 |
| Fluoranthene | 4300 | 56 |
| Fluorene | 560 | 56 |
| Indeno(1,2,3-cd)pyrene | 14 | 0.005[9] |
| Isophorone | 0.5 | 7.37[3] |
| Naphthalene | 84 | 56 |
| Pentachlorophenol | 0.003 | 1 |
| Phenanthrene | NA | 40 |
| Phenol | 100 | 800 |
| Pyrene | 4200 | 40 |
| **PESTICIDES/PCBs (mg/kg)** | | |
| 4,4'-DDD | 16 | 0.029[3] |
| 4,4'-DDE | 54 | 0.021[3] |
| 4,4'-DDT | 32 | 0.021[3] |
| Aldrin | 0.5 | 0.00041[3] |
| alpha-BHC | 0.0005 | 0.0011[3] |
| Alpha-Chlordane | 10[10] | 0.066[10] |
| Aroclor-1242 | NA | 0.1[16] |
| Aroclor-1248 | NA | 0.1[16] |
| Aroclor-1254 | NA | 0.1[16] |
| Aroclor-1260 | NA | 0.1[16] |
| beta-BHC | 0.03 | 0.0039[3] |
| delta-BHC | NA | 0.0011[11] |
| Dieldrin | 0.004 | 0.007 |
| Endosulfan I | 18[12] | 8.4[12] |
| Endosulfan II | 18[12] | 8.4[12] |
| Endosulfan Sulfate | 18[12] | 8.4[12] |
| Endrin | 1[13] | 0.42[3] |
| Endrin Aldehyde | 1[13] | 0.42[14] |
| Endrin Ketone | 1[13] | 0.42[14] |
| gamma-BHC (Lindane) | 0.009 | 0.04 |
| Gamma-Chlordane | 10[10] | 0.066[10] |

TABLE 1-2

RISK-BASED AND HEALTH-BASED COPC SCREENING LEVELS - SOLID MEDIA
NSB-NLON, GROTON, CONNECTICUT
PAGE 3 OF 4

| Analyte | USEPA Soil Screening Level Migration to Groundwater[1] | CTDEP Remediation Standard GB Pollutant Mobility[2] |
|---|---|---|
| Heptachlor | 23 | 0.013 |
| Heptachlor Epoxide | 0.7 | 0.02 |
| Methoxychlor | 160 | 8 |
| **DIOXINS/FURANS (mg/kg)** | | |
| 1,2,3,4,6,7,8-HPCDF | NA | 4.67E-06[15] |
| 1,2,3,4,7,8-HXCDF | NA | 4.67E-07[15] |
| 1,2,3,6,7,8-HXCDF | NA | 4.67E-07[15] |
| OCDD | NA | 4.67E-05[15] |
| **INORGANICS (mg/kg)** | | |
| Aluminum | NA | NA |
| Antimony | 5 | 1.2[16] |
| Arsenic | 29 | 10[16] |
| Barium | 1600 | 200[16] |
| Beryllium | 63 | 0.8[16] |
| Boron | NA | 130[16] |
| Cadmium | 8 | 1[16] |
| Calcium | NA | NA |
| Chromium | NA | 10[16] |
| Cobalt | NA | 84[16] |
| Copper | NA | 260[16] |
| Cyanide | 40 | 40[16] |
| Iron | NA | NA |
| Lead | NA | 3[16] |
| Magnesium | NA | NA |
| Manganese | NA | 10[16] |
| Mercury | 2 | 0.4[16] |
| Nickel | 130 | 20[16] |
| Potassium | NA | NA |
| Selenium | 5 | 10[16] |
| Silver | 34 | 7.2[16] |
| Sodium | NA | NA |
| Thallium | 0.7 | 1[16] |
| Vanadium | 6000 | 10[16] |
| Zinc | 12,000 | 1000[16] |
| **TOTAL PETROLEUM HYDROCARBONS (mg/kg)** | | |
| TPH | NA | 2500 |

**TABLE 1-2**

**RISK-BASED AND HEALTH-BASED COPC SCREENING LEVELS - SOLID MEDIA**
**NSB-NLON, GROTON, CONNECTICUT**
**PAGE 4 OF 4**

1 SSL (USEPA, May 1996). For migration to groundwater, values associated with a dilution and attenuation factor (DAF) of 20 are used.
2 CTDEP, 1996.
3 CTDEP remediation standard not available. Toxicity criteria from USEPA Region III Risk-Based Concentration Table (April 1, 1998) was used to calculate a value using the methodology presented in the CTDEP guidance (CTDEP 1996).
4 NA - Criteria not available for this chemical.
5 Value for 1,3-dicholoropropene is used.
6 Value for o-xylenes is used.
7 Toxicity criteria not available. Toxicity criteria for pyrene was used to calculate a value.
8 Soil saturation concentration.
9 Calculated value less than reliably achievable detection limits. Reliable and accurately achievable detection limit is used.
10 Value for chlordane is used.
11 Toxicity criteria not available. Toxicity criteria for alpha-BHC was used to calculate a value.
12 Value for endosulfan is used.
13 Value for endrin is used.
14 Calculated value for endrin is used.
15 Toxicity criteria not available. Toxicity criteria for 2,3,7,8-TCDD in conjunction with toxicity equivalent factor (TEF) (EPA/625/ 3-89/016, March 1989) was used to calculate a value.
16 CTDEP remediation standard not available. Using information presented in CTDEP guidance (CTDEP 1996) and provided during a review course presented by the CTDEP and the Environmental Professional's Organization of Connecticut on January 24, 1997 (i.e., the "20 times" rule), GA groundwater protection criterion was used to calculate a value for GB pollutant mobility.

## TABLE 1-3

## RISK-BASED AND HEALTH-BASED COPC SCREENING LEVELS - TCLP LEACHATES NSB-NLON, GROTON, CONNECTICUT

| Analyte | Federal Toxicity Characteristic Regulatory Level[1] (mg/L) | CTDEP Remediation Standard GB Pollutant Mobility[2] (mg/L) |
|---|---|---|
| Arsenic | 5 | 0.5 |
| Barium | 100 | 10 |
| Cadmium | 1 | 0.05 |
| Chromium | 5 | 0.5 |
| Lead | 5 | 0.15 |
| Mercury | 0.2 | 0.02 |
| Selenium | 1 | 0.5 |
| Silver | 5 | 0.36 |

1 58 FR 46049.
2 CTDEP, 1996.

TABLE 1-4

RISK-BASED AND HEALTH-BASED COPC SCREENING LEVELS - AQUEOUS MEDIA
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 5

| Analyte | COPC Screening Level[1] | Federal MCL[2] | State MCL[3] | State Remediation Standards[4] | | Offsite Wells Concentration Range[5] |
|---|---|---|---|---|---|---|
| | | | | Groundwater Protection | Surface Water Protection | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | |
| 1,1,1-Trichloroethane | 54 | 200 | 200 | 200 | 62,000 | ND |
| 1,1,2,2-Tetrachloroethane | 0.053 | - | - | 0.5 | 110 | ND |
| 1,1,2-Trichloroethane | 0.19 | 5 | 5 | 5 | 1260 | ND |
| 1,1-Dichloroethane | 80 | - | - | 70 | - | ND |
| 1,1-Dichloroethene | 0.044 | 7 | 7 | 7 | 96 | ND |
| 1,2-Dichloroethane | 0.12 | 5 | 5 | 1 | 2970 | ND |
| 1,2-Dichloroethene (Total) | 5.5 | 70/100[6] | 70/100[6] | 63[7] | 14,000[8,9] | ND |
| 2-Butanone | 190 | - | - | 400 | - | ND |
| 2-Hexanone | 150 | - | - | 280[7] | - | ND |
| 4-Methyl-2-pentanone | 290 | - | - | 350 | - | ND |
| Acetone | 370 | - | - | 700 | - | ND |
| Benzene | 0.36 | 5 | 5 | 1 | 710 | ND |
| Bromodichloromethane | 0.17 | 100/80[10] | 100 | 0.56[7] | 660[8] | ND |
| Bromomethane | 0.85 | - | - | 9.8[7] | 80,000[8] | ND |
| Carbon Disulfide | 100 | - | - | 700[7] | - | ND |
| Chlorobenzene | 3.5 | 100 | 100 | 100 | 420,000 | ND |
| Chloroform | 0.15 | 100/80[10] | 100 | 6 | 14,100 | ND |
| Chloromethane | 1.5 | - | - | 2.7[7] | 9400[8] | 27 |
| Ethylbenzene | 130 | 700 | 700 | 700 | 580,000 | ND |
| Methyl Tert-Butyl Ether | 630 | - | - | 100 | - | ND |
| Methylene Chloride | 4.1 | 5 | 5 | 5 | 48,000 | 4 |
| Tetrachloroethene | 1.1 | 5 | 5 | 5 | 88 | ND |
| Toluene | 75 | 1000 | 1000 | 1000 | 4,000,000 | ND |
| Trichloroethene | 1.6 | 5 | 5 | 5 | 2340 | ND |
| Vinyl Chloride | 0.019 | 2 | 2 | 2 | 15,750 | ND |
| Xylenes, Total | 1200 | 10,000 | 10,000 | 530 | - | 2 |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | |
| 1,2,4-Trichlorobenzene | 19 | 70 | 70 | 70[7] | - | ND |
| 1,2-Dichlorobenzene | 6.4 | 600 | 600 | 600 | 170,000 | ND |

TABLE 1-4

RISK-BASED AND HEALTH-BASED COPC SCREENING LEVELS - AQUEOUS MEDIA
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 5

| Analyte | COPC Screening Level[1] | Federal MCL[2] | State MCL[3] | State Remediation Standards[4] | | Offsite Wells Concentration Range[5] |
|---|---|---|---|---|---|---|
| | | | | Groundwater Protection | Surface Water Protection | |
| 1,3-Dichlorobenzene | 1.4 | 600 | - | 210[7] | 26,000 | ND |
| 1,4-Dichlorobenzene | 0.47 | 75 | 75 | 75 | 26,000 | ND |
| 2,4-Dichlorophenol | 11 | - | - | 20 | 15,800 | ND |
| 2,4-Dimethylphenol | 73 | - | - | 140[7] | - | ND |
| 2,4-Dinitrotoluene | 7.3 | - | - | 14[7] | 270[8] | ND |
| 2,6-Dinitrotoluene | 3.7 | - | - | 7[7] | - | ND |
| 2-Chlorophenol | 18 | - | - | 36 | 46,000[8] | ND |
| 2-Methylnaphthalene | 150 | - | - | 280[7] | - | ND |
| 2-Methylphenol | 180 | - | - | 350[7] | - | ND |
| 4-Methylphenol | 18 | - | - | 35[7] | - | ND |
| Acenaphthene | 220 | - | - | 420[7] | 27,000[8] | ND |
| Acenaphthylene | - | - | - | 420 | 0.3 | ND |
| Anthracene | 1100 | - | - | 2000 | 1,100,000 | ND |
| Benzo(a)anthracene | 0.092 | - | - | 0.06 | 0.3 | ND |
| Benzo(a)pyrene | 0.0092 | 0.2 | 0.2 | 0.2 | 0.3 | ND |
| Benzo(b)fluoranthene | 0.092 | - | - | 0.08 | 0.3 | ND |
| Benzo(g,h,i)perylene | - | - | - | 200[7,11] | 0.3[8,11] | ND |
| Benzo(k)fluoranthene | 0.92 | - | - | 0.5 | 0.3 | ND |
| Benzoic Acid | 15,000 | - | - | 28,000[7] | - | ND |
| Bis(2-Ethylhexyl)phthalate | 4.8 | 6 | 6 | 2 | 59 | 3 |
| Butylbenzyl Phthalate | 730 | - | - | 1000 | 52,000[8] | ND |
| Carbazole | 3.3 | - | - | 1.8[7] | 29[8] | ND |
| Chrysene | 9.2 | - | - | 4.8[7] | 0.3[8] | ND |
| Dibenzo(a,h)anthracene | 0.0092 | - | - | 0.2[12] | 0.3[8] | ND |
| Dibenzofuran | 2.4 | - | - | 28[7] | - | ND |
| Diethyl Phthalate | 2900 | - | - | 5600[7] | 2,400,000[8] | ND |
| Dimethyl Phthalate | 37,000 | - | - | 70,000[7] | 58,000,000[8] | ND |
| Di-n-butyl phthalate | 370 | - | - | 700 | 120,000 | ND |
| Di-n-octyl phthalate | 73 | - | - | 100 | - | ND |

TABLE 1-4

RISK-BASED AND HEALTH-BASED COPC SCREENING LEVELS - AQUEOUS MEDIA
NSB-NLON, GROTON, CONNECTICUT
PAGE 3 OF 5

| Analyte | COPC Screening Level[1] | Federal MCL[2] | State MCL[3] | State Remediation Standards[4] | | Offsite Wells Concentration Range[5] |
|---|---|---|---|---|---|---|
| | | | | Groundwater Protection | Surface Water Protection | |
| Fluoranthene | 150 | - | - | 280 | 3700 | ND |
| Fluorene | 150 | - | - | 280 | 140,000 | ND |
| Indeno(1,2,3-cd)pyrene | 0.092 | - | - | 0.2[12] | 0.3[8] | ND |
| Naphthalene | 150 | - | - | 280 | - | ND |
| N-Nitrosodiphenylamine | 14 | - | - | 7.1[7] | 480[8] | ND |
| Phenanthrene | - | - | - | 200 | 0.3 | ND |
| Phenol | 2200 | - | - | 4000 | 92,000,000 | ND |
| Pyrene | 110 | - | - | 200 | 110,000 | ND |
| **PESTICIDES/PCBs (ug/L)** | | | | | | |
| Aroclor-1016 | 0.096 | 0.5 | 0.5 | 0.5[13] | 0.5 | ND |
| Aroclor-1254 | 0.0033 | 0.5 | 0.5 | 0.5[13] | 0.5 | ND |
| Aroclor-1260 | 0.033 | 0.5 | 0.5 | 0.5[13] | 0.5 | ND |
| Heptachlor | 0.0023 | 0.4 | 0.4 | 0.4 | 0.05 | ND |
| **INORGANICS (ug/L)** | | | | | | |
| Aluminum | - | 50 to 200[14] | - | - | - | 15.4 - 3360 |
| Antimony | 1.5 | 6 | 6 | 6 | 86,000 | ND |
| Arsenic | 0.045 | 50 | 50 | 50 | 4 | 0.64 |
| Barium | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 |
| Beryllium | 73 | 4 | 4 | 4 | 4 | 0.33 - 0.41 |
| Boron | 330 | - | - | 630[7] | - | 9.3 - 126 |
| Cadmium | 1.8 | 5 | 5 | 5 | 6 | 1.9 - 26.3 |
| Calcium | - | - | - | - | - | 3110 - 46,000 |
| Chromium (Total) | 18[15] | 100 | 100 | 50 | 110[15] | 2.7 - 6.7 |
| Cobalt | 220 | - | - | 420[7] | - | 1.9 - 6 |
| Copper | 150 | 1300[16] | - | 1300 | 48 | 1.6 - 2160 |
| Cyanide | 73 | 200 | 200 | 200 | 52 | 1.2 - 15.5 |
| Iron | 1100 | 300[14] | - | - | - | 4.8 - 21,800 |
| Lead | - | 15[16] | - | 15 | 13 | 1 - 264 |
| Magnesium | - | - | - | - | - | 654 - 5810 |
| Manganese | 84 | 50[14] | 5000[17] | 50[7] | - | 0.89 - 2130 |

TABLE 1-4

RISK-BASED AND HEALTH-BASED COPC SCREENING LEVELS - AQUEOUS MEDIA
NSB-NLON, GROTON, CONNECTICUT
PAGE 4 OF 5

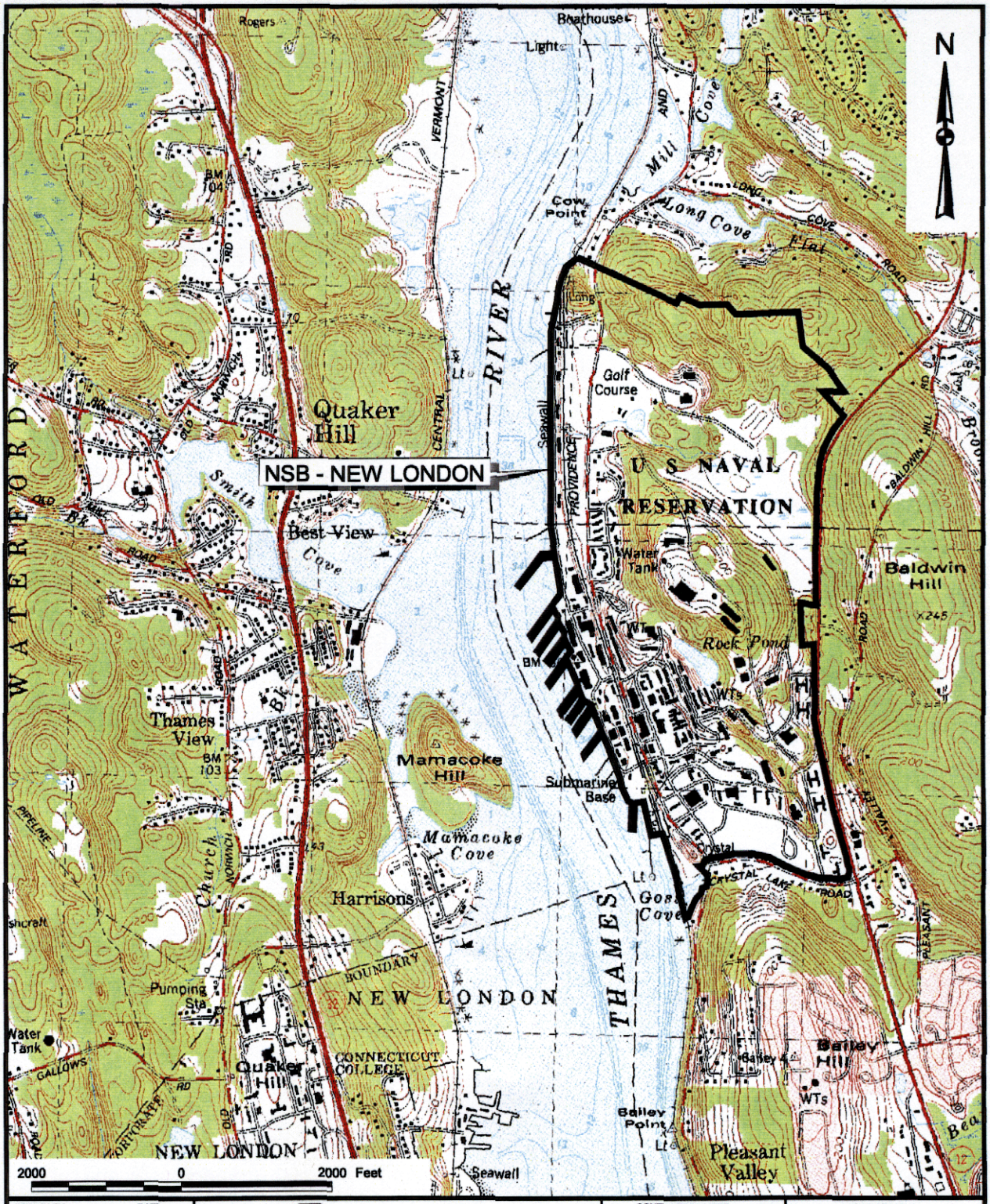
| Analyte | COPC Screening Level[1] | Federal MCL[2] | State MCL[3] | State Remediation Standards[4] | | Offsite Wells Concentration Range[5] |
|---|---|---|---|---|---|---|
| | | | | Groundwater Protection | Surface Water Protection | |
| Mercury | 1.1 | 2 | 2 | 2 | 0.4 | 0.13 - 1.3 |
| Nickel | 73 | 100[18] | 100 | 100 | 880 | 5 - 17.5 |
| Potassium | - | - | - | - | - | 290 - 17,900 |
| Selenium | 18 | 50 | 50 | 50 | 50 | 1 - 4.1 |
| Silver | 18 | 100[14] | 50 | 36 | 12 | 2 - 5.8 |
| Sodium | - | - | 28,000[19] | - | - | 3160 - 97,700 |
| Thallium | 0.26 | 2 | 2 | 5 | 63 | 1.2 - 4.3 |
| Vanadium | 26 | - | - | 50 | - | 33.1 |
| Zinc | 1100 | 5000[14] | - | 5000 | 123 | 4.5 - 445 |
| **TOTAL PETROLEUM HYDROCARBONS (ug/L)** | | | | | | |
| Diesel Range Organics | - | - | - | - | - | NA |
| Gasoline Range Organics | - | - | - | - | - | NA |
| Oil & Grease | - | - | - | - | - | NA |
| TPH | - | - | - | 500 | - | ND |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | |
| Ammonia, as Nitrogen | - | - | - | - | - | NA |
| Biochemical Oxygen Demand | - | - | - | - | - | NA |
| Chemical Oxygen Demand | - | - | - | - | - | NA |
| Hardness as CaCO3 | - | - | - | - | - | NA |
| Total Organic Carbon | - | - | - | - | - | NA |
| Total Phosphorus | - | - | - | - | - | NA |
| Total Suspended Solids | - | - | - | - | - | NA |

# TABLE 1-4

## RISK-BASED AND HEALTH-BASED COPC SCREENING LEVELS - AQUEOUS MEDIA
## NSB-NLON, GROTON, CONNECTICUT
## PAGE 5 OF 5

1 Based on USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6.
2 Maximum Contaminant Level. (USEPA, October 1996).
3 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health.
4 CTDEP, January 1996.
5 Atlantic, July 1994. These values were not used for COPC screening, but were addressed qualitatively in the discussion of nature and extent of contamination of groundwater for each site.
6 Values presented for cis-/trans- isomers.
7 CTDEP Remediation standard not available. Toxicity criteria from USEPA Region III Risk-Based Concentration Table (April 1, 1998) was used to calculate a value using the methodology presented in the CTDEP guidance (CTDEP, 1996).
8 CTDEP remediation standard not available. Value calculated using lower of human health or freshwater aquifer life criteria and dilution factors based on the methodology presented in CTDEP guidance (CTDEP, 1996).
9 Value used is for trans-1,2-dichloroethene.
10 Current MCL is 100 µg/L. 1994 Proposed Rule for Disinfectants and Disinfection By-products states that the total for all trihalomethanes combined cannot exceed 80 µg/L.
11 Calculated value used is for pyrene.
12 Calculated value is less than reliably achievable detection limit. Reliably and accurately achievable detection limit is used.
13 Value used is for polychlorinated biphenyls (PCBs).
14 Secondary MCL based on aesthetic water qualities.
15 Hexavalent chromium.
16 Action Level.
17 Current Connecticut Department of Public Health and Addiction Services Action Level.
18 Being remanded.
19 Notification Level.
\- Not available.
NA Not analyzed.
ND Not detected.

This page intentionally left blank.



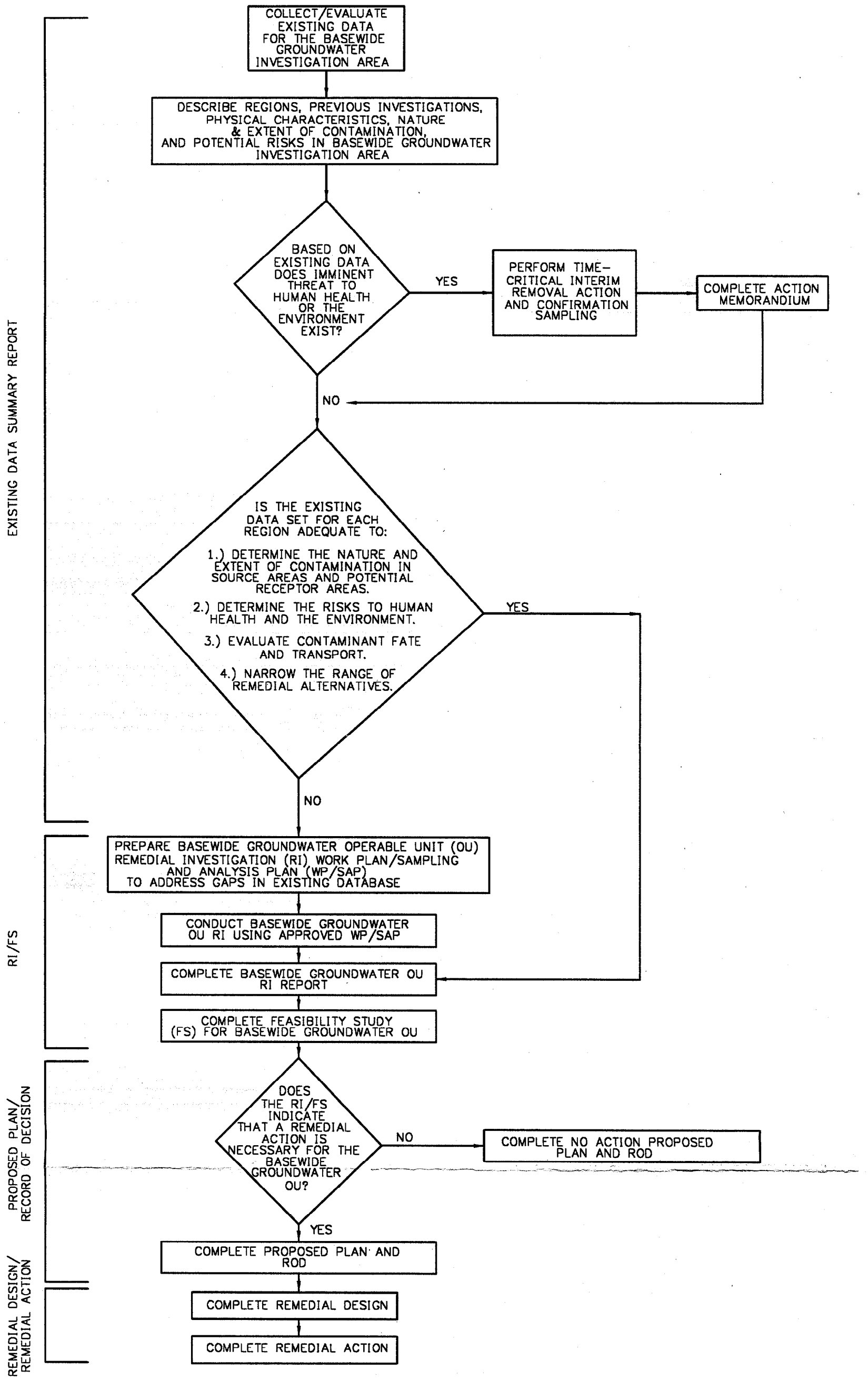

| DRAWN BY | DATE | Tetra Tech NUS, Inc. | CONTRACT NUMBER | OWNER NO. |
|---|---|---|---|---|
| D. PERRY | 2-DEC-98 | | 7856 | 312 |
| CHECKED BY | DATE | LOCATION MAP<br>NSB-NEW LONDON<br>GROTON, CONNECTICUT | APPROVED BY CAR | DATE 12/7/98 |
| COST/SCHEDULE-AREA | | | APPROVED BY | DATE |
| SCALE | | | DRAWING NO. | REV |
| AS NOTED | | | FIGURE 1-1 | 0 |

P:\GIS\NLON\NORTH&SOUTH_TAGS.APR 2-DEC-98 DNP USGS LAYOUT



01639014

ACAD: 7856cn01.dwg 11/02/98 HJP




| | | | |
|---|---|---|---|
| DRAWN BY HJP DATE 10/29/98 | Tetra Tech NUS, Inc. | CONTRACT NO. 7856 | OWNER NO. 312 |
| CHECKED BY DATE | DECISION TREE FOR SCOPING BASEWIDE GROUNDWATER OU RI/FS NSB-NLON, GROTON, CONNECTICUT | APPROVED BY Tony C. Rich | DATE 11/5/98 |
| COST/SCHED-AREA | | APPROVED BY | DATE |
| SCALE AS NOTED | | DRAWING NO. FIGURE 1-2 | REV. 0 |

FORM CADD NO. TtNUS_BV.DWG - REV 0 - 1/20/98



01639022

# 2.0 NORTHERN REGION OF NSB-NLON

The Northern Region of NSB-NLON is bordered by Perimeter Road to the north and Highway 12 to the east. This region also extends to the west to include the Golf Course west of Shark Boulevard. The southern boundary of the Northern Region, which is based on topography/groundwater flow direction, is represented by an imaginary line extending from the intersection of Corsair Road and Highway 12 to Pier 32 but stopping at the western edge of the Golf Course before the Lower Subase (see Drawing 2). The Northern Region includes the following IRP Sites:

- Site 1 – CBU Drum Storage Area
- Site 2A – Area A Landfill
- Site 2B – Area A Wetland
- Site 3 – Area A Downstream Watercourses and OBDA
- Site 4 – Rubble Fill Area at Bunker A86
- Site 5 – Hazardous Waste Storage Facility at Bunker A-85
- Site 7 – Torpedo Shops
- Site 14 – OBDANE
- Site 20 – Area A Weapons Center

The existing data summary for each of these sites is covered in detail in Sections 2.1 through 2.9, respectively.

## 2.1 SITE 1 – CBU DRUM STORAGE AREA

### 2.1.1 Site Description

The CBU Drum Storage Area was an unpaved area located in the northern section of NSB-NLON, adjacent to the deployed personnel parking lot and within the boundary of the Area A Landfill. The location of the CBU Drum Storage Area in relationship to other NSB-NLON IRP sites is shown on Drawing 1. Figure 2-1 provides the general arrangement of the site. The site was situated on a flat, open area at the base of a wooded hillside that slopes to the northeast toward the site at a 25 percent grade. The site was approximately 15 feet in width by 30 feet in length but was placed under the cover system for the Area A Landfill during the interim remedial action at that site.

Twenty-six 55-gallon drums of waste oil, lubricating oil, and paint materials were observed at the site during the 1982 Initial Assessment Study (IAS). Some of the drums were reportedly leaking at that time. The IAS report concluded that the site had not been used for several years. Atlantic personnel inspected the site on

October 20, 1988 and observed two 55-gallon drums labeled as engine oil. No surface soil staining or stressed vegetation was evident. The drums noted in the IAS report were reportedly removed and properly disposed by the Navy; the two drums observed in 1988 were subsequently removed.

This site has been capped and paved over with asphalt as a result of the cover system installed at the Area A Landfill. A No Further Action Decision Document has been signed for this site. Therefore, for the purpose of this document, the current conditions at the Area A Landfill Site describe the current conditions of the CBU Drum Storage Area.

### 2.1.2 Site Investigations

The following investigations and decision documents related to the CBU Drum Storage Area are discussed in the subsections that follow:

- Final IAS (Envirodyne, 1983)
- Phase I RI (Atlantic, 1992)
- No Further Action Decision Document for CBU Drum Storage Area (U.S. Navy, 1996)
- Phase II RI (B&R Environmental, 1997a)
- Other investigations

#### 2.1.2.1 Final Initial Assessment Study

In 1982, Envirodyne Engineers, Inc. performed an IAS at NSB-NLON as part of the Navy Assessments and Control of Installation Pollutants (NACIP) program. The purpose of this study was to identify and evaluate past waste disposal practices and to assess the potential for environmental impacts. Envirodyne reviewed installation records, interviewed long-term and former employees, toured the installation, and photographed sites as part of the IAS.

Envirodyne identified 11 sites at NSB-NLON as having contained hazardous material; one of which was the CBU Drum Storage Area (Site 1). The IAS concluded that this site had a low potential for contributing contaminants to the environment since the source of contamination has been filled with concrete and closed to all drainage. The IAS recommended no further action for this site.

#### 2.1.2.2 Phase I Remedial Investigation

An investigation of 11 sites was completed at NSB-NLON by Atlantic Environmental Services, Inc. from 1990 through 1992. The CBU Drum Storage Area – Site 1 was one of the sites investigated.

The CBU Drum Storage Area Phase I field investigation included the collection of three surface (0- to 6-inch depth) and three shallow subsurface (12- to 18-inch depth) soil samples from three locations at the site. A seventh sample was a composite of 0- to 6-inch depth samples from the three locations. The sample locations were in the central part of the CBU Drum Storage Area, as shown on Figure 2-1. These samples were collected to screen for potential releases associated with past drum storage. The three surface soil samples were analyzed for total petroleum hydrocarbons (TPH) and TCLP metals/PCBs, and the three shallow subsurface soil samples were analyzed for TPH and target compound list (TCL) volatile organic compounds (VOCs). The composite of the three surface soil samples was analyzed for TCL semivolatile organic compounds (SVOCs), TCL pesticides/PCBs, and target analyte list (TAL) metals.

The Phase I RI concluded that low contaminant concentrations present at this site do not pose a risk to human health or the environment, but it recommended that a Supplemental Step 1 Investigation be performed at the CBU Drum Storage Area.

#### 2.1.2.3 Phase II Remedial Investigation

A Phase II RI at 13 sites at NSB-NLON was conducted by B&R Environmental from 1995 through 1997. The CBU Drum Storage Area was one of the sites investigated as part of this RI.

One monitoring well (1MW2S) was installed during this phase of investigation in a location presumed (based on topography) to be downgradient of the CBU Drum Storage Area. One groundwater sample was collected from this well during each of two sampling rounds and analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals (total and dissolved), and TPH. Two additional surface and three subsurface soil samples were collected from the monitoring well boring and two test borings located at the perimeter and downslope of the storage area. The first boring (1TB1) was sampled at depths of 0 to 2 feet and 6 to 8 feet. The second boring (1TB2), at monitoring well 1MW2S location, was sampled at a depth of 12 to 14 feet. The third boring (1TB3), located downslope of the site, was sampled at depths of 0 to 2 feet and 5 to 7 feet. Each of the soil samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals (total only), and TPH. Sample locations are depicted on Figure 2-1.

The Phase II RI concluded that the potential source of contamination has been removed from Site 1, soil and groundwater samples showed very low chemical concentrations, all human health risks at the site are within an acceptable range, the potential of the site to impact ecological receptors is low, and the site will be covered with a low-permeability cap as part of the interim remedial action for the Area A Landfill (Site 2A).

#### 2.1.2.4 No Further Action Decision Document for CBU Drum Storage Area

This decision document was signed by the U.S. Navy, the USEPA, Region I, and CTDEP in September 1996, after the results of the Draft Final Phase II RI Report were available. This document substantiated that extensive contamination was not observed at this site during previous investigations, that contamination in groundwater does not pose unacceptable risk to human health or the environment, and that risk assessments show that levels of constituents in soils are not likely to pose unacceptable risk to human health or the environment. The document declares that no further studies or remediation are required at the CBU Drum Storage Area Site.

#### 2.1.2.5 Other Investigations

See Report For Interim Remedial Action At Area A Landfill (Section 2.2.2.8)

### 2.1.3 Physical Characteristics

This section presents a summary of physical characteristics for the CBU Drum Storage Area based on information generated during the Phase I and Phase II RIs. Topography and surface features, surface water, and soils no longer apply to the CBU Drum Storage Area since it has been placed under the cover system of the Area A Landfill as part of an interim remedial action at that site. See the Area A Landfill Site (Section 2.2.3) for current information on these characteristics. Historical geology and hydrogeology information is discussed in the subsections that follow, but the information may not be entirely applicable because of the site's current status beneath the landfill cover.

#### 2.1.3.1 Surrounding Topography and Surface Features

See Section 2.2.3.1 under Site 2A – Area A Landfill.

#### 2.1.3.2 Surface Water Features

See Section 2.2.3.2 under Site 2A – Area A Landfill.

#### 2.1.3.3 Soil Characteristics

See Section 2.2.3.3 under Site 2A – Area A Landfill.

### 2.1.3.4 Geology and Hydrogeology

Geology

The CBU Drum Storage Area is located within the boundary of the Area A Landfill, along the southern side. Before the site was covered as part of the interim remedial action at the Area A Landfill, one test boring (1TB1) was drilled within the site boundary during the Phase II RI field investigation. The overburden consisted of silty sand to a depth of 12 feet underlain by sand and gravel to a total drilled depth of 14.5 feet at this location. Fill material (wood fragments, bullets, and plastic) was encountered during drilling. Field personnel reported a fuel odor and oily sheen on soils in the top 7 feet of the boring.

Two additional test borings (1TB2 and 1TB3) were drilled outside the site boundary. The overburden observed in these borings also consisted of silty sand. Fill material (gravel, brick, plastic, and aluminum foil) was encountered during drilling, as shown in the boring logs. At 1TB2, a fuel odor and oily sheen were noted on soils to a depth of 14 feet. At 1TB3, a clayey silt layer lies beneath the silty sand. This material is similar to the dredge spoil that had been identified beneath the Area A Landfill and within the Area A Wetland.

Bedrock was not encountered in any of the borings. However, according to the bedrock geology map (USGS, 1967), the bedrock is mapped as the Mamacoke Formation. The bedrock surface is expected to slope toward the northeast. The depth to bedrock was estimated to be approximately 15 to 30 feet in the vicinity of the CBU Drum Storage Area (the test borings were 14 feet in depth) prior to the installation of the landfill cover. There appears to be a local bedrock depression at the 2LMW8 well cluster (adjacent to the CBU Drum Storage Area). Bedrock was encountered in the boring for this well at a depth of 42 feet.

Prior to the installation of the landfill cover, groundwater was present within the overburden materials underlying the site. Depth to groundwater ranged from 1 to 9 feet bgs in monitoring well 1MW2S during the three comprehensive water-level rounds. Based on the projected groundwater contours for this area and on ground surface topography, shallow groundwater flow across and downgradient from the CBU Drum Storage Area was determined to be to the northeast. The groundwater elevation at well 1MW2S was similar to the groundwater elevation at well 2LMW8S, both of which were located along the upgradient boundary of the Area A landfill. An upward gradient at the 2LMW8 well cluster suggested that groundwater discharged from the bedrock into the overburden in this area.

### 2.1.4 Nature and Extent of Contamination

Soil, sediment, groundwater, and surface water sampling was conducted at the CBU Drum Storage Area during the Phase I and Phase II RIs. Based upon the results of these investigations, the nature and extent

of contamination of the soil and groundwater at the CBU Drum Storage Area are discussed on a matrix-specific basis in the following subsections. Analytical results for sediment and surface water samples will not be discussed because contamination in these media are not expected to impact the groundwater at this site. The complete analytical database for soil and groundwater is contained in Appendix A.

#### 2.1.4.1 Soil

Table 2-1 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in soil samples collected from the CBU Drum Storage Area. Table 2-2 presents similar information for TCLP results. Based upon the screening level assessment for the CBU Drum Storage Area (Section 2.1.5.3) and the procedures for the preparation of soil tag maps (Section 1.4.3.1), analytical results for primary COPCs in CBU Drum Storage Area soil samples and associated TCLP leachates are presented on Drawing 7A (Volume II).

As shown on Table 2-1, seven VOCs were detected in soil samples collected from the CBU Drum Storage Area. 1,1,1-Trichloroethane, methylene chloride, tetrachloroethene (PCE), and trichloroethene (TCE) were each detected in only one or two of nine samples at concentrations ranging from 0.001 mg/kg to 0.028 mg/kg. 2-Butanone and ethylbenzene were each detected in four of nine soil samples at concentrations ranging from 0.015 mg/kg to 0.17 mg/kg (2-butanone) and from 0.006 mg/kg to 0.079 mg/kg (ethylbenzene). Total xylenes was detected in six of nine soil samples at concentrations ranging from 0.001 mg/kg to 0.38 mg/kg. The maximum concentrations of all VOCs were detected in the soil sample collected at a depth interval of 5 to 7 feet bgs from boring 1TB3.

Twenty-two SVOCs, including 17 PAHs, two phthalate esters, 1,4-dichlorobenzene, dibenzofuran, and carbazole, were detected in the soil samples. Maximum concentrations of 13 compounds were noted in the soil sample collected from a depth interval of 6 to 8 feet from boring 1TB1, located on the perimeter of the site. Maximum concentrations of three compounds were detected in the soil sample collected from the 0- to 2-foot sample collected from boring 1TB1. The maximum concentrations of the remaining six SVOCs were detected in the two soil samples collected from the off-site boring (boring 1TB3). Analytical results for the deepest sample collected (12 to 14 feet from monitoring well boring 1TB2) indicated the lowest concentrations and the least number of positive results. PAHs, which are typical constituents of oils and tars, were detected at the greatest concentrations, with a maximum concentration of phenanthrene (16 mg/kg) in the sample from boring 1TB1 (6 to 8 feet).

Eleven pesticides and two PCBs were detected in the six CBU Drum Storage Area soil samples analyzed for this fraction. However, most of the positive results for pesticides and PCBs were associated with the two

soil samples collected from boring 1TB1, which is located on the site boundary. Concentrations of most pesticides/PCBs in these two samples decreased with depth. 4,4'-DDD was detected at the greatest concentrations (3.9 mg/kg in the 0- to 2-foot sample and 2.1 mg/kg in the 6- to 8-foot sample). Other than Aroclor-1254 (0.42 mg/kg) in the 0- to 2-foot sample, all other pesticides/PCBs were detected at concentrations ranging from 0.00018 mg/kg to 0.058 mg/kg in the two soil samples collected from boring 1TB1. Other pesticide/PCB detections include 4,4'-DDD (0.055 mg/kg) in composite surface soil sample 1SS4C (0 to 2 feet bgs), 4,4'-DDD (0.024 mg/kg) and 4,4'-DDT (0.14 mg/kg) in the soil sample collected from a depth interval of 12 to 14 feet bgs from boring 1TB2, and Aroclor-1248 (0.36 mg/kg) in the soil sample collected from a depth interval of 5 to 7 feet bgs from boring 1TB3. The presence of 4,4'-DDD, 4,4'-DDT, and Aroclor-1248 in subsurface samples from borings 1TB2 and 1TB3 is most likely attributable to reworking of the soil, particularly since this site is located within the confines of the Area A Landfill. These concentrations may also be the result of past pesticide applications or dredge spoil placement (for the deep samples) and probably do not represent the direct disposal of pesticides at the site (based upon the low concentrations and sporadic detections).

As shown on Table 2-1, 22 metals were detected in the six CBU Drum Storage Area soil samples analyzed for this fraction. Selenium and boron were detected in one and two samples, respectively; mercury was detected in four samples; and antimony and arsenic were each detected in five samples. The remaining metals were detected in all six soil samples. Maximum concentrations of 13 metals were detected in the sample collected from a depth interval of 6 to 8 feet from boring 1TB1.

Eleven soil samples collected from the CBU Drum Storage Area were analyzed for TPH. TPH was detected in all 11 samples at concentrations ranging from 41 mg/kg to 9,800 mg/kg. TPH was detected in samples 1SS3D (1 to 1.5 feet), 1TB1-0608 (6 to 8 feet), and 1TB1-0002 (0 to 2 feet) at concentrations of 9,800 mg/kg, 7,510 mg/kg, and 2,570 mg/kg, respectively. Concentrations of TPH in the remaining eight samples ranged from 41 mg/kg to 730 mg/kg.

TCLP extraction followed by analysis for PCBs and metals was performed for three surface soil samples collected during the Phase I RI. As shown on Table 2-2, barium was detected in all three leachates (0.22 mg/L to 0.33 mg/L). Lead (0.6 mg/L) and selenium (0.0021 mg/L) were each detected in one of three leachates.

#### 2.1.4.2 Groundwater

Two groundwater samples were collected from the CBU Drum Storage area. These samples were collected on two different occasions from a single overburden monitoring well (1MW2S) located on the side/downgradient edge of the site. Table 2-3 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample

number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in groundwater samples collected from the CBU Drum Storage Area. Based upon the screening level assessment for the CBU Drum Storage Area (Section 2.1.5.3) and the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary COPCs in CBU Drum Storage Area overburden groundwater samples are presented on Drawing 5 (Volume II).

Chlorobenzene and total xylenes were the only VOCs detected in the groundwater samples. These chemicals were detected only during Round 1 of the Phase II RI, at concentrations of 12 µg/L and 24 µg/L, respectively. No VOCs were detected during Round 2 of the Phase II RI. It should be noted that, of the VOCs, total xylenes was detected most frequently and at the greatest concentrations in the CBU Drum Storage Area soil samples. However, total xylenes was not detected at significant concentrations in the groundwater. Total xylenes was also detected at a concentration of 2 µg/L in one of the off-site residential groundwater samples.

As shown on Table 2-3, 13 SVOCs, including eight PAHs, two phthalates, carbazole, dibenzofuran, and 4-methylphenol, were detected in the Phase II RI groundwater samples. Reported concentrations were relatively low, ranging from 0.6 µg/L (4-methylphenol and di-n-butylphthalate) to 31 µg/L (naphthalene).

No pesticides or PCBs were detected in the groundwater samples during either round of the Phase II RI. TPH was detected at a concentration of 1,200 µg/L in the Round 2 sample but was not detected in the Round 1 sample.

Twelve metals were detected in unfiltered CBU Drum Storage Area groundwater samples, and 11 metals were detected in filtered groundwater samples. Concentrations of metals detected in the filtered and unfiltered samples were relatively similar (i.e., at the same order of magnitude). This indicates that there was a minimal amount of suspended sediment in the samples (i.e., the water was not turbid). This may be attributable to the use of low-flow sampling techniques. As shown on Table 2-3, maximum concentrations of arsenic, calcium, and iron in filtered and unfiltered samples and of boron in unfiltered samples exceeded the upper end of the range of concentrations detected in off-site residential wells. Although lead was detected in the soil samples and, as discussed in Section 2.1.4.1, in one of the TCLP leachates, lead was not detected in the groundwater samples.

### 2.1.5 Data Evaluation

This section summarizes data evaluation procedures performed for site data. A discussion of contaminant fate and transport, a summary of the historical human health risk assessment(s) performed for the site, and a screening level assessment of site data are provided.

#### 2.1.5.1 Contaminant Fate and Transport

The analytical results presented in the preceding section indicate that organic chemicals (primarily PAHs) are present beyond the identified site boundaries of the CBU Drum Storage Area. This can be expected since the CBU Drum Storage Area lies within the confines of the Area A Landfill. Contamination appears to have migrated vertically, as evidenced by the presence of volatile and some of the more soluble semivolatile organic compounds at depth in the soil, as well as in the groundwater, although no notable potential source areas were noted in the analytical soil sample results. Since the time of data collection, the site has been capped, eliminating the possibility of potential human exposure to soil at the site, and minimizing the amount of precipitation that could infiltrate through the soil and potentially transport contamination to the groundwater.

#### 2.1.5.2 Summary of Human Health Risk Assessment

Because the CBU Drum Storage Area is a relatively isolated site and the only foreseeable future use is as a storage area, the baseline human health risk assessment conducted during the Phase II RI focused on central tendency exposure (CTE) and reasonable maximum exposure (RME) scenarios for an older child trespasser and a construction worker. Groundwater was not considered to be a potential medium of exposure for the older child trespasser. Dermal contact with groundwater during intrusive activities was evaluated as a potential route of exposure for the construction worker. Construction workers were included in the assessment since capping of the CBU Drum Storage Area in conjunction with the Area A Landfill cover system was planned at the time of Phase II RI. The cover system has been installed since the time of the Phase II RI (installation was completed in September 1997). As previously noted, this cover system eliminates the possibility of potential human exposure to soil at the site.

Hazard quotients for dermal contact with groundwater for the construction worker for the RME and CTE scenarios were both less than the USEPA acceptable level of 1.0, indicating that no adverse systemic effects are anticipated for these receptors under the defined exposure scenarios. Incremental cancer risks for the RME and CTE scenarios were 3.3E-8 and 2.2E-8, respectively. These risks were less than the CTDEP target cancer risk (1E-5) and the lower limit (1E-6) of USEPA's target range for carcinogenic risk. Therefore, the Phase II RI risk assessment concluded that the site poses minimal risk to human health. The capping of the site has further minimized any potential risk.

#### 2.1.5.3 Screening Level Assessment

COPCs at this site were selected using the risk-based COPC screening levels described in Section 1.4.2. All data collected during the Phase I and II RIs were used in the selection of COPCs for soil and

groundwater. Maximum and 95% UCL chemical concentrations are presented in the summary tables. Although the maximum concentration of a chemical may exceed an associated criterion, the distribution of the chemical in the medium is also important with respect to decision making. Therefore, the 95% UCL chemical concentration was included to provide some information on the potential distribution of the chemical. In addition, the summary tables for groundwater samples present the range of concentrations detected in off-site residential wells for each detected chemical to enable comparison of site groundwater data with groundwater data collected from wells unaffected by the site. A brief narrative of the findings of this qualitative analysis is provided in the remainder of this section.

The following parameters were selected as COPCs for CBU Drum Storage Area soils, based upon the COPC screening analysis presented in Table 2-1 and Table 2-2:

- Chlorinated aliphatic hydrocarbons (methylene chloride)
- PAHs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene]
- SVOCs (carbazole)
- Pesticides (4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, dieldrin, and heptachlor epoxide)
- PCBs (Aroclor-1248 and Aroclor-1254)
- Inorganics (antimony, arsenic, beryllium, cadmium, chromium, lead, mercury, manganese, nickel, and vanadium)
- TPH.

Based upon the procedures for the preparation of soil tag maps (Section 1.4.3.1), analytical results for primary soil COPCs (all aforementioned COPCs except dibenzo(a,h)anthracene, carbazole, aldrin, dieldrin, heptachlor expoxide, Aroclor-1248, and TPH) associated with CBU Drum Storage Area soil samples and TCLP leachates are presented on Drawing 7A (Volume II).

Maximum concentrations of methylene chloride, benzo(a)anthracene, carbazole, dieldrin, and antimony exceeded USEPA SSLs for migration to groundwater. Maximum concentrations of several parameters (all of the SVOCs, PAHs, pesticides, PCBs, and inorganics previously listed as COPCs plus TPH) exceeded the Connecticut remediation standards for pollutant mobility for groundwater classified as GB. Chemical concentrations in excess of the SSLs and/or Connecticut remediation standards for pollutant mobility indicate the potential for these chemicals to migrate to groundwater and potentially impact the quality of the groundwater.

As shown in Table 2-2, the concentration of lead (0.6 mg/L) detected in the TCLP leachate of one sample (1SS1) exceeded the Connecticut pollutant mobility standard for GB areas (0.15 mg/L), further indicating

the potential for lead to migrate from site soils to groundwater. However, this concentration did not exceed the federal toxicity characteristic regulatory level (5.0 mg/L). Aroclor-1248, Aroclor-1254, arsenic, cadmium, chromium, and mercury were not detected in the TCLP leachates or were detected at concentrations less than the associated Connecticut pollutant mobility standard for GB areas and the federal toxicity characteristic regulatory levels. However, the soil samples associated with the maximum concentrations of these COPCs were not included in the group of samples subjected to TCLP analysis. Therefore, although TCLP results do not indicate the potential for these chemicals to migrate from site soils to groundwater, the TCLP results cannot be used with absolute certainty to negate the potential for migration of these chemicals to groundwater that is indicated by the soil data. Thus these chemicals were retained as COPCs.

Aluminum, copper, and iron were not evaluated for COPC selection; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity data for these chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Finally, USEPA SSLs and CTDEP pollutant mobility criteria were not available for calcium, magnesium, sodium, and potassium because these chemicals are considered to be essential nutrients.

Of the aforementioned soil COPCs, only carbazole, TPH, arsenic, chromium, and manganese were also detected in site groundwater.

The following parameters were selected as COPCs for CBU Drum Storage Area overburden groundwater based upon the COPC screening analysis presented on Table 2-3:

- Monocyclic aromatic hydrocarbons (chlorobenzene)
- SVOCs (carbazole and dibenzofuran)
- PAHs (phenanthrene)
- Inorganics (arsenic and manganese)
- TPH.

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary overburden groundwater COPCs (arsenic and manganese) associated with CBU Drum Storage Area overburden groundwater samples are presented on Drawing 5 (back pocket).

Maximum concentrations of several chemicals [chlorobenzene, carbazole, dibenzofuran, arsenic (filtered and unfiltered), iron (filtered and unfiltered), and manganese (filtered and unfiltered)] exceeded the COPC screening level. Maximum concentrations of iron (filtered and unfiltered) and manganese (filtered and unfiltered) exceeded the federal MCL, and the maximum concentration of sodium (unfiltered samples only)

slightly exceeded the state MCL. However, iron was not evaluated for COPC selection; USEPA Region I does not advocate quantitative evaluation of exposure to this chemical because the only available toxicity criterion for this chemical is a provisional reference dose based on allowable intakes rather than adverse effect levels. Furthermore, sodium was not selected as a COPC because it is considered to be an essential nutrient. No screening criteria were available for calcium, magnesium, and potassium because these metals are considered to be essential nutrients.

Maximum concentrations of carbazole, manganese (filtered and unfiltered), and TPH detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. Groundwater protection criteria specific to GB-designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

Because groundwater at the CBU Drum Storage Area eventually discharges to a surface water body (the Area A Wetland or the streams of the Area A Downstream Watercourses), site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection. Phenanthrene and arsenic (filtered) were the only chemicals detected at maximum concentrations exceeding the surface water protection criteria.

It should also be noted that, of the previously discussed COPCs, the maximum concentrations of total xylenes and arsenic in the CBU Drum Storage Area overburden groundwater samples exceeded the detected concentrations of these chemicals in off-site residential wells.

### 2.1.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Site 1 using the decision tree approach is as follows:

- The CBU Drum Storage Area was investigated during the IAS and the Phase I and Phase II RIs. The information collected during these investigations was sufficient to describe the site and its physical characteristics.

- The Phase II RI concluded that the potential source of contamination had been removed from Site 1, soil and groundwater samples showed insignificant chemical concentrations, all human health risks at the site were within an acceptable range, the potential of the site to impact ecological receptors was low, and the site would be capped with a low-permeability cover system as part of the interim remedial action for the Area A Landfill (Site 2A).

- The No Further Action Decision Document signed by the U.S. Navy, USEPA Region I, and CTDEP in September 1996 substantiated that extensive contamination was not observed at this site during previous investigations, that contamination in the groundwater did not pose unacceptable risk to human health or the environment, and that risk assessments showed that levels of analytes in soils are not likely to pose unacceptable risk to human health or the environment. The document declared that no further studies or remediation are required at the CBU Drum Storage Area Site.

### 2.1.7 Recommendations

Site 1 was thoroughly investigated during three previous investigations and a No Further Action Decision Document was signed for the site in September 1996. Since a low-permeability cover system and paving have been installed over the site as part of the interim remedial action at the Area A Landfill in 1997, it is recommended that the groundwater at this site be monitored as part of the Groundwater Monitoring Plan for the Area A Landfill and no further actions take place for the soil.

## 2.2 SITE 2A – AREA A LANDFILL

### 2.2.1 Site Description

The Area A Landfill is located in the northeastern and north-central section of NSB-NLON and encompasses approximately 13 acres. The general configuration of the Area A Landfill and adjacent sites is shown on Figure 2-2. The location of the Area A Landfill in relationship to other NSB-NLON IRP sites is shown on Drawing 1. Access to the landfill is via a dirt road off Wahoo Avenue. The thickness of the landfill materials is estimated to be 10 to 20 feet based on test boring data. The Area A Landfill is a relatively flat area bordered by a steep, wooded hillside that rises to the south, a steep wooded ravine to the west, and the Area A Wetland to the north. The landfill extends east along the wetland as far as a recreational area (tennis courts). Most filling occurred within the eastern and western limits of the landfill.

According to the IAS report, the landfill opened sometime before 1957. However, a 1957 aerial photograph shows no apparent landfilling, which may indicate a somewhat later start-up date. All materials generated by base operations that were not salvageable were incinerated, and the residues were disposed in the Goss Cove and Area A Landfills. The base incinerator, which was located north of the Lower Subase along the waterfront at the present location of Building 478, ceased operation in 1963. From 1963 to 1973, all refuse and debris were disposed in the Area A Landfill. Since on-site disposal of solid radioactive waste attributed to the Naval Nuclear Propulsion Program (NNPP) has been prohibited since the inception of the Program, and based on records, established policy, and interviews, the potential for NNPP radioactive material having been disposed on site is considered to be effectively zero. Although unlikely, given what is known about the

material used for fill, small amounts of general radioactive material (G-RAM) incorporated in consumer products (e.g., radioluminescent exit signs, smoke detectors, etc.) could have been disposed with other industrial material in the DRMO, Area A Landfill, or Goss Cove Landfill areas. It is not expected that the potential for G-RAM radioactivity in these former landfills would vary substantially from that in commercial landfills operated for typical civilian use.

The area fill method was reportedly used in landfill operations. New refuse was dumped from the face of previously deposited refuse and covered with earth. The cover material used on the landfill was sand and gravel obtained from the Groton water supply reservoir. Landfilling operations ceased in 1973. After closure, a concrete pad was constructed in the southwestern portion of the landfill for above-ground storage of industrial wastes. Up to the time of the interim remedial action at the Area A Landfill, the pad was still in existence and located adjacent and to the northeast of Building 373, and south of the dirt road that extends through this area. In the early 1980s, 42 steel drums, 87 transformers (mineral oil and PCB), and 60 to 80 electrical switches were stored on the pad. Two transformers and several electrical switches were reportedly leaking. Past leakage of oil was also evident. Most drums were stacked on wooden pallets and those having PCB labels were covered and bound with plastic sheeting. All these materials have since been properly disposed off site.

The IAS report indicated that refuse, including steel drums, oxygen candles, wood and metal scrap, concrete, and tires, was exposed at the edge of the landfill adjacent to the wetland. The IAS report also stated that petroleum compounds had recently been poured from containers and had flowed into the wetland at two locations (northwestern portions of the landfill) and that, when batteries were overhauled, spent sulfuric acid solution was transferred to barrels and transported to Area A for disposal. The acid was poured into trenches dug with a bulldozer and subsequently covered with soil.

Atlantic personnel performed an inspection of the Area A Landfill on September 30, 1988. Iron floc was observed along the toe of the slope of the landfill extending from the dike to the eastern end of the deployed parking lot. The slope of the landfill had been covered with fill, and material in the landfill was not visible.

Sand bags, salt, and contractors' supplies and equipment are stored at the former landfill. Several transformers, removed underground storage tanks, crane weights, and other equipment were previously stored on the concrete pad in the southwestern portion of the landfill. The remainder of the landfill was not paved until the recent interim remedial action in 1997.

A low-permeability cover system was installed on the Area A Landfill as an interim remedial action for soils at the site. The cover system consisted of a bedding/gas management layer underlying a double liner, a drainage layer above the double liner, and an operating surface in selected areas at the top. The remedial

action also included the installation of a surface water and groundwater interception trench along the southern border (upgradient) of the site.

### 2.2.2 Site Investigations

The following investigations and decision documents related to the Area A Landfill are discussed in the subsections that follow:

- Final Initial Assessment Study (Envirodyne, 1983)
- Final Verification Step 1A Study (Wehran, 1988)
- Phase I Remedial Investigation (Atlantic, 1992)
- Focused Feasibility Study (Atlantic, 1995c)
- Revised Design Analysis Report (B&R Environmental, 1996b)
- Groundwater/Leachate Modeling Study for Remedial Design (B&R Environmental, 1996a)
- Phase II Remedial Investigation (B&R Environmental, 1997a)
- Report for Interim Remedial Action (B&R Environmental, 1998)

#### 2.2.2.1 Final Initial Assessment Study

In 1982, Envirodyne Engineers, Inc. performed an IAS at NSB-NLON as part of the NACIP program. The purpose of this study was to identify and evaluate past waste disposal practices and to assess the potential for environmental impacts. Envirodyne reviewed installation records, interviewed long-term and former employees, toured the installation, and photographed sites as part of the IAS.

Envirodyne identified 11 sites at NSB-NLON as having contained hazardous material; one site was Area A (Site 2) which included the Area A Landfill, the Area A Wetland, and the Area A Downstream Watercourses. The IAS concluded that the source of contamination for this site was still present and potentially releasing contaminants to the environment. The IAS recommended that further sampling of surface waters and sediments at this site be performed.

#### 2.2.2.2 Final Verification Step 1A Study

In 1988, Wehran Engineering Corporation performed a Final Verification Step 1A Study for the DRMO Area, the OBDA, and the Area A Landfill as part of the NACIP program. The purpose of this study was to verify the presence or absence of contamination at these historically documented landfill areas. As part of the Verification Step 1A Study, Wehran performed three rounds of surface water and sediment sampling at six locations (SW-1 through SW-6) adjacent to the Area A Landfill Site. These samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals.

The study concluded that the surface waters and sediments near the Area A Landfill have levels of metals, PAHs, and pesticides that exceed regulatory criteria; however, the immediate health threat to base personnel from these contaminants appears minimal. The Verification Step 1A Study recommended that a Site Characterization Step 1B Study be performed at the Area A Site.

#### 2.2.2.3 Phase I Remedial Investigation

An investigation of 11 sites was completed at NSB-NLON by Atlantic Environmental Services, Inc. from 1990 through 1992. Area A Site 2, which includes the present Area A Landfill, the Area A Wetland, and the Area A Downstream Watercourses and OBDA, was one of the sites investigated.

The Phase I RI of the Area A Landfill consisted of test borings, monitoring well installation, and soil and groundwater sampling. Nine subsurface soil samples (greater than 2 feet deep) and one field duplicate were collected from one test boring and seven monitoring well borings at the site. Five surface soil samples (less than 2 feet deep) and one field duplicate were also collected and analyzed. All soil samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals, and TCLP metals and pesticides. Landfill materials were encountered during drilling, generally to an average depth of 10 to 12 feet. Landfill materials that were encountered included glass, brick, wood, plastic, and ash, intermixed with sand and gravel material used as cover.

Twelve groundwater samples (plus two field duplicates) were collected from five shallow and 12 deep monitoring wells. All groundwater samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals, and radiological parameters (gross alpha and gross beta). Sample locations are shown on Figure 2-2.

The Phase I RI concluded that several risk exposure scenarios exceeded acceptable regulatory levels and that a feasibility study (FS) should be performed at the Area A Landfill Site.

#### 2.2.2.4 Focused Feasibility Study

In response to the recommendations of the Phase I RI, a Focused Feasibility Study (FFS) for the Area A Landfill site was completed by Atlantic Environmental Services in 1995. Field investigation activities were conducted in support of the FFS in order to characterize the subsurface soil in the vicinity of the bituminous concrete pad located at the southwestern end of the landfill.

Ten surface soil samples plus one field duplicate and 10 subsurface soil samples plus two field duplicates were initially collected during the FFS. All surface soil samples were analyzed for TCL VOCs, TCL SVOCs,

TCL pesticides/PCBs, and TAL metals. Other surface soil analyses included dioxin on sample 2LTB13; engineering parameters including grain size distribution, moisture content, specific gravity, organic content, cation exchange capacity, pH, and TOC on sample 2LTB17; and a complete TCLP analysis including VOCs, SVOCs, pesticides/PCBs, herbicides, and metals on sample 2LTB18.

Seven of the 10 subsurface soil samples plus the two field duplicates were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and TAL metals. In addition, sample 2LTB22 (6 to 8 feet deep) was analyzed for TCL VOCs, TCL SVOCs, and TAL metals and sample 2LTB22 (8 to 10 feet deep) was analyzed for TCL pesticides/PCBs. Sample 2LTB19 (4 to 6 feet deep) was only analyzed for engineering parameters. Other analyses included dioxin on sample 2LTB23 and its field duplicate (2LTB33) and the complete TCLP suite on sample 2LTB26.

Three additional subsurface soil samples (LFSB03, LFSB04, and LFSB05) were collected as part of a supplemental investigation sampling round for the Phase I RI, to support the FFS. These samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and TAL metals. Samples of the concrete pad were also collected during the FFS from four areas where evidence of staining was observed and these were analyzed for TCL pesticides/PCBs. Sample locations for the Area A Landfill are shown on Figure 2-2.

The FFS concluded that off-site landfilling and off-site incineration provide superior protection of the environment and that the landfilling alternative is more cost effective than the incineration alternative.

#### 2.2.2.5 Revised Design Analysis Report

The purpose of this document was to provide an interim remedial design for the Area A Landfill that included only a containment or capping action. Further evaluation of groundwater conditions at the site would then determine if additional remedial actions would be necessary. This document concluded that the final cover system at the Area A Landfill represented the action necessary to prevent the release of waste materials contained in the landfill into the environment and to prevent human exposure to these waste materials. It also concluded that the cap provides the desired improvements to the landfill while maintaining the site for current government use.

#### 2.2.2.6 Groundwater Leachate Modeling Study for Remedial Design

This study was performed by B&R Environmental in 1996 in support of the remedial design of a cover system for the Area A Landfill. The objectives of this study were to predict the impact of the landfill cover system on the saturated thickness of the fill material within the landfill and on the flow and composition of the groundwater/leachate discharging from the Area A Landfill to the Area A Wetland and to compare the

slope stability effectiveness and cost of the landfill cover system with those of a landfill cover system featuring a toe drain.

In support of this investigation, eight soil samples were collected and analyzed for geotechnical parameters, and one groundwater seep sample was collected and analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and TAL metals. The study concluded that the cover system would be stable, reduce the water table beneath the landfill, reduce contaminant migration from the unsaturated to the saturated zone, and reduce the mass flux of the contaminants of concern from the landfill to the wetlands. This study also concluded that the cover system compared favorably to one with a toe drain system and should not be replaced by such a system.

#### 2.2.2.7 Phase II Remedial Investigation

A Phase II RI at 13 sites at NSB-NLON was conducted by B&R Environmental from 1995 through 1997. The Area A Landfill Site 2 was investigated as part of the RI.

Three surface and seven subsurface soil samples were collected from two test borings located near Building 373 and were analyzed for PCBs in the field using a gas chromatograph. One surface and one subsurface sample were also analyzed for dioxins at a fixed base laboratory. Groundwater samples were collected from 27 monitoring wells during the first round of the Phase II RI. Five of these samples were collected from newly installed wells and 22 were collected from existing wells. Most of these samples were analyzed for TCL VOCs, TCL SVOCs, and TAL metals (total and dissolved). Additional analyses included four samples for TCL PCBs, four samples for radiological parameters (gross alpha, gross beta, and a complete gamma spectrum), and three samples for water quality parameters including oil and grease, ammonia, biochemical oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon (TOC), total phosphorus, and total suspended solids (TSS). Eight wells were sampled during the second round of groundwater sampling, resulting in a total of 14 samples (between shallow and deep aquifers) plus one field duplicate. All were analyzed for TCL VOCs, TCL SVOCs, and TAL metals (total and dissolved). In addition, one sample was analyzed for TCL PCBs and four samples were analyzed for radiological parameters. Sample locations are depicted on Figure 2-2.

The findings of the Phase II RI concluded that shallow groundwater contamination exists at the site, the landfill soil may pose a threat to human receptors due to PCB concentrations in the landfill, and chemicals in the soil could adversely impact ecological receptors; however, the installation of the cover system will eliminate these risks.

The Phase II RI recommended that, in addition to the planned landfill cover system, institutional controls including access/use restrictions and groundwater monitoring should be implemented at the site.

#### 2.2.2.8 Report for Interim Remedial Action at Area A Landfill

This report, submitted by B&R Environmental in 1998, certified that all construction procedures, inspection activities, field and laboratory testing results, and surveys conducted at the Area A Landfill site (including the CBU Drum Storage Area) during remedial activities involving the installation of the final cover system were performed according to specifications.

### 2.2.3 Physical Characteristics

This section presents a summary of site physical characteristics for the Area A Landfill based on information generated during the Phase I and Phase II RIs. Topography and surface features, surface water, soils, geology, and hydrogeology are discussed in the subsections that follow.

#### 2.2.3.1 Surrounding Topography and Surface Features

Drawing 2 and Figure 2-2 show the topography and surface features of the Area A Landfill and the surrounding sites including the CBU Drum Storage Area, the Area A Wetland, and the OBDA. Prior to the installation of the landfill cover system in 1997, the ground surface at the Area A Landfill sloped gently across the landfill toward the Area A Wetland. A steep hillside (central bedrock high) bordered the southern edge of the landfill. Near the northwestern edge of the landfill, the ground surface dropped along a steep ravine and dike to the OBDA. The ground surface increased in elevation to the northeast from the tennis courts to Route 12 and Baldwin Hill. The ground surface elevation across the landfill from upgradient to downgradient edge ranged from approximately 90 to 80 feet msl. Adjacent to the toe of the landfill, the Area A Wetland ground surface is at an elevation of approximately 72 feet msl.

Previously, sand and gravel were used as cover materials for the Area A Landfill. A concrete pad was located in the southwestern portion of the site adjacent to Building 373 and south of the dirt entrance road, and the remainder of the landfill was not paved. Since the interim remedial action was completed at the site in 1997, the Area A Landfill has been covered (cover system paved over with asphalt) and the concrete pad and Building 373 have been removed. In addition, the CBU Drum Storage Area, formerly Site 1, has also been placed beneath the cover system.

#### 2.2.3.2 Surface Water Features

Runoff from the Area A Landfill cover system drains as overland flow north into the Area A Wetland, which subsequently discharges to the Area A Downstream Watercourses and ultimately into the Thames River. Surface runoff from areas upgradient of the landfill are collected in a drainage ditch on the southern side of the landfill, then conveyed to the Area A Wetland via a culvert through the eastern side of the landfill.

### 2.2.3.3 Soil Characteristics

The SCS Soils Map (SCS, 1983) classifies the soil at most of the Area A Landfill as Udorthents-Urban land. This soil type is defined as excessively drained to moderately drained soils that have been disturbed by cutting and filling. Along the southwestern slope of the landfill and in upgradient areas, the soil is classified as the Hollis-Charlton-Rock complex. Stones and boulders are intermingled with a dark, fine, sandy loam. Bedrock outcrops are prevalent in the area.

### 2.2.3.4 Geology and Hydrogeology

Geology

The Area A Landfill contains 10 to 20 feet of miscellaneous fill that consists of fine- to coarse-grained sand and gravel, as well as refuse including ash, wood fragments, paper, brick fragments, and asphalt. The fill is generally underlain by 10 to 20 feet of dredge spoil. Where no dredge spoil underlies the fill material, the fill material directly overlies a thin alluvial layer or the bedrock surface. Dredge spoil is encountered mainly beneath the easternmost portion of the landfill. Along the southeastern border of the landfill, the fill material is underlain by an alluvial layer, consisting of silty sand. The alluvial layer is underlain by gravel and gneiss boulders. Boulders were also identified outside the eastern edge of the landfill at well cluster 2LMW19.

The bedrock beneath the Area A Landfill has been identified as the biotite-quartz-feldspar gneiss of the Mamacoke Formation. Quartzite was identified at a depth of 80 feet in the 2LMW20D boring log. This is consistent with the existence of quartzite layers within the Mamacoke Formation. The bedrock surface slopes to the northeast toward the Area A Wetland from the large central bedrock high in the center of the facility. The landfill is situated along the flank of the bedrock ridge such that the depth to bedrock increases to the northeast. In the western portion of the site, the landfill is situated immediately adjacent to the hillside and the depth to bedrock is typically less than 20 feet, whereas in the eastern portion the landfill is located farther out from the hillside and the depth to bedrock increases to 70 feet. There appears to be a localized bedrock depression at 2LMW8D; however, there are insufficient data to verify the extent of the depression.

Hydrogeology

Groundwater was encountered within the dredge spoil, alluvium, and bedrock underlying the Area A Landfill. In some areas, the bottom portion of the fill materials is also below the water table. Depth to groundwater averages about 10 feet across the landfill. The saturated thickness of the overburden materials ranges from less than 10 feet to at least 65 feet across the landfill.

Drawing 3 shows basewide shallow overburden groundwater contours, including the Area A Landfill, Area A Wetland, and the OBDA. Groundwater flows northeastward across most of the Area A Landfill, from the topographic/bedrock high to the Area A Wetland. Drawing 4 shows bedrock groundwater flow contours for the same area. Both maps show a similar groundwater flow pattern, indicating an overall hydraulic connection between the two units. Upward groundwater gradients from the bedrock to the overburden/fill are predominant. Although a downward gradient exists at the 2LMW18 well cluster, the bedrock elevation is lower and the overburden is thicker. Hydraulic potentials between the bedrock and overburden groundwater at the 2LMW7, 2LMW8, 2LMW17, 2LMW18, and 2LMW20 well clusters differ by 3 to 7 feet. This suggests that, although groundwater flow directions in the bedrock and overburden are similar, the degree of hydraulic connection varies spatially and there is restriction of flow between the overburden and bedrock in some areas.

East of the Area A Landfill, near the 2LMW19 and 2WMW3 well clusters, local groundwater flow is to the north and west into the Area A Wetland. Groundwater elevations in the bedrock and overburden are similar, and vertical gradients are minimal.

In the western portion of the Area A Landfill near the dike, groundwater flows to the northwest toward the Area A Downstream Watercourses. At the 2LMW9 well cluster, the groundwater elevation in the overburden is relatively high, presumably as a result of the presence of the dike acting as a damming effect on the shallow groundwater. In the bedrock, the groundwater potential is significantly lower when compared to the groundwater potential in other bedrock wells at the Area A Landfill, reflecting a hydraulic connection and flow to the Area A Downstream Watercourses.

This abnormally low bedrock groundwater potential may be hydraulically connected to a groundwater discharge seep that is present at the toe of the OBDA. The seep, which is located at an elevation that would correspond with groundwater to the bedrock, may be acting to dewater the local bedrock.

Estimated hydraulic conductivities based on the pumping test performed during the Phase II RI are 3.5 feet/day at 2LOW1S and 2.1 feet/day at well 2LOW2S. The geometric mean of these two values is 2.7 feet/day. Slug tests performed during the Phase I RI indicate that the hydraulic conductivity for the combined fill material and dredge spoil was 3.2 feet/day. The estimated hydraulic conductivity for the dredge spoil alone was 1.0 feet/day. These hydraulic conductivity test data suggest that the dredge spoils have a somewhat lower hydraulic conductivity than the fill materials.

An estimate of the seepage velocity was determined by assuming a porosity of 0.30, a flow gradient of 0.0033 (based on water-level measurements taken in 1993), and a hydraulic conductivity of the Area A Landfill of 2.7 feet/day. The seepage velocity is estimated to be 0.30 feet/day.

### 2.2.4 Nature and Extent of Contamination

Soil, groundwater, and pavement sampling was conducted at the Area A Landfill during the Phase I and Phase II RIs and the FFS. Based upon the results of these investigations, the nature and extent of contamination of the soil and groundwater at the Area A Landfill are discussed on a matrix-specific basis in the following subsections. Analytical results for pavement samples will not be discussed because the pavement was excavated and disposed off site during the installation of the Area A Landfill cover system. The complete analytical database for soil and groundwater is contained in Appendix A.

#### 2.2.4.1 Soil

Table 2-4 presents descriptive statistics (frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in soil samples collected from the Area A Landfill. Table 2-5 presents similar information for TCLP results. Based upon the screening level assessment for the Area A Landfill (Section 2.2.5.3) and the procedures for the preparation of soil tag maps (Section 1.4.3.1), analytical results for primary COPCs in Area A Landfill soil samples and associated TCLP leachates are presented on Drawing 7A (Volume II).

As shown on Table 2-4, several VOCs, including three ketones, four monocyclic aromatics, five chlorinated aliphatics, and carbon disulfide were detected in the Area A Landfill soil samples. With the exception of acetone, methylene chloride, ethylbenzene, toluene, and total xylenes, the VOCs were infrequently detected (in from one to three of 35 samples). Acetone and methylene chloride, which are both common laboratory contaminants, were detected at concentrations ranging from 0.009 mg/kg to 0.25 mg/kg and from 0.001 mg/kg to 0.025 mg/kg, respectively.

Four monocyclic aromatic compounds were detected at relatively high concentrations in the soil sample collected from a depth interval of 4 to 8 feet from boring 2LTB23 (chlorobenzene at 4.5 mg/kg, ethylbenzene at 28 mg/kg, toluene at 3.2 mg/kg, and total xylenes at 140 mg/kg). This boring is located near the eastern side of the former concrete pad. Surface soil sample 2LSS1 (0-6 inches), collected from an area about 200 feet east of former Building 373 and adjacent to the northeastern corner of the former concrete pad, contained high concentrations of three monocyclic aromatic hydrocarbons (ethylbenzene at 14 mg/kg, total xylenes at 75 mg/kg, and chlorobenzene at 4.5 mg/kg). These results indicate the possible occurrence of a recent spill because monocyclic aromatics were not prevalent in the groundwater samples collected in the area surrounding the concrete pad, as discussed in the next section. These monocyclic aromatics were also detected at substantially lower concentrations in from one to 11 other soil samples. Chlorobenzene was detected at a concentration of 0.043 mg/kg in surface soil

sample 2LSS2 (0 to 0.5 feet bgs). Ethylbenzene and total xylenes were detected in the soil sample collected at a depth interval of 6 to 8 feet bgs from boring 2LTB20, located approximately 30 feet northeast of former Building 373, at concentrations of 7.7 mg/kg and 8.8 mg/kg, respectively. Concentrations of ethylbenzene in the remaining soil samples ranged from 0.002 mg/kg to 0.068 mg/kg, concentrations of toluene ranged from 0.004 mg/kg to 0.027 mg/kg, and concentrations of total xylenes ranged from 0.004 mg/kg to 0.69 mg/kg. All other VOCs were detected at concentrations ranging from 0.002 mg/kg to 0.022 mg/kg.

Twenty-two SVOCs were detected in the Area A Landfill soil samples. As shown on Table 2-4, 16 of these SVOCs were PAHs. Maximum concentrations of 14 SVOCs were detected in the soil sample collected from a depth interval of 6 to 8 feet bgs from boring 2LTB20. Maximum concentrations of PAHs ranged from 0.22 mg/kg (acenaphthylene) to 61 mg/kg (phenanthrene). 2,4-Dimethylphenol, 4-methylphenol, bis(2-ethylhexyl)phthalate, carbazole, di-n-butyl phthalate, and dibenzofuran were also each detected in one to six samples.

Fifteen pesticides and four PCBs were detected in the Area A Landfill soil samples. Maximum concentrations were associated with various samples, although the maximum concentrations of five pesticides were detected in the field duplicate soil sample collected at a depth interval of 10 to 12 feet bgs from boring 2LTB29, and the maximum concentrations of three pesticides and one PCB were detected in the soil sample or field duplicate sample collected from a depth interval of 4 to 8 feet bgs from boring 2LTB23. These two borings were located approximately 80 feet and 40 feet, respectively, east of the former concrete pad. Aroclor-1254, 4,4'-DDT, 4,4'-DDD, and 4,4'-DDE were detected most frequently; Aroclor-1254 was detected in 22 of 45 soil samples, and 4,4'-DDT and its degradation products were each detected in 13 or 14 of 35 soil samples. The remaining pesticides and PCBs were detected in one to eight soil samples. The four detected PCBs, 4,4'-DDT, and 4,4'-DDD were also reported at the greatest concentrations. The maximum concentrations of the four detected PCBs ranged from 1.7 mg/kg (Aroclor-1242) to 100 mg/kg (Aroclor-1254), and the maximum concentrations of 4,4'-DDT and 4,4'-DDD were 2.3 mg/kg and 2.2 mg/kg, respectively.

Octachlorodibenzo-p-dioxin (OCDD) was detected at concentrations ranging from 0.0016 mg/kg to 0.0025 mg/kg in four Area A Landfill soil samples. In addition, three furans (1,2,3,4,6,7,8-HpCDF at 0.0002 mg/kg, 1,2,3,4,7,8-HxCDF at 0.0003 mg/kg, and 1,2,3,6,7,8-HxCDF at 0.0002 mg/kg) were detected in the soil sample collected from a depth interval of 4 to 8 feet bgs from boring 2LTB23. No other dioxins or furans were detected in the four soil samples analyzed for these parameters.

As shown in Table 2-4, 24 metals and cyanide were detected in the Area A Landfill soil samples. Seventeen of these metals were detected in from 32 to 35 of 35 soil samples. Maximum concentrations of

12 metals were detected in the soil sample collected from a depth interval of 6 to 8 feet from boring 2LTB22. The boring log indicates that this sample was collected in fill material. Notable concentrations associated with this sample include those reported for copper (21,600 mg/kg), lead (1,780 mg/kg), nickel (1,440 mg/kg), and zinc (9,850 mg/kg).

TPH was detected at concentration of 46.7 mg/kg and 48.2 mg/kg in the two Area A Landfill soil samples analyzed for this parameter. Analyses for percent ash, cation exchange capacity, pH, specific gravity, and TOC were performed for two soil samples. Results for these analyses are provided in Table 2-4.

TCLP extraction followed by analysis for pesticides and metals was performed for 16 Area A Landfill soil samples. Analyses for TCLP VOCs, SVOCs, and herbicides were also performed for two of the 16 leachates. No organic compounds were detected in the TCLP leachates. As shown on Table 2-5, seven metals were detected in TCLP leachate samples. Arsenic, barium, cadmium, and lead were each detected in more than half of the leachates (i.e., in nine to 16 of the 16 leachates). Maximum concentrations of arsenic, chromium, selenium, and silver were detected in the leachate of the soil sample collected from a depth interval of 2 to 8 feet bgs from well boring 2LMW9.

#### 2.2.4.2 Groundwater

Groundwater samples were collected from overburden and bedrock wells at the Area A Landfill. Well 2LMW19S was screened at an interval that spans both the overburden and bedrock aquifers. Groundwater samples collected from this well are considered to be representative of the overburden aquifer for purposes of data evaluation. Table 2-6 presents descriptive statistics (frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in groundwater samples collected from overburden wells at the Area A Landfill. Table 2-7 presents similar information for groundwater samples collected from bedrock wells at the Area A Landfill. Based upon the screening level assessment for the Area A Landfill (Section 2.2.5.3) and the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary COPCs in Area A Landfill overburden and bedrock groundwater samples are presented on Drawings 5 and 6, respectively (Volume II).

Overburden Wells

Eleven VOCs, including five monocyclic aromatics, three chlorinated aliphatics, two ketones, and carbon disulfide, were detected in the groundwater samples collected from overburden wells. The reported concentrations of most of these VOCs were relatively low, ranging from 1 µg/L to 22 µg/L. However, reported concentrations of the monocyclic aromatics (benzene, chlorobenzene, ethylbenzene, toluene, and

total xylenes) ranged from 1 µg/L (toluene) to 1,200 µg/L (chlorobenzene). The maximum concentrations of these chemicals, as well as the maximum concentration of chloroform, were associated with groundwater samples collected from well 2LMW18S, which is located in the central portion of the landfill. Methylene chloride and total xylenes were also detected in the off-site residential wells at concentrations of 4 µg/L and 2 µg/L, respectively.

As shown on Table 2-6, 24 SVOCs were detected in the groundwater samples collected from Area A Landfill overburden wells. Various classes of SVOCs, including chlorinated benzenes, substituted phenols, PAHs, and phthalates, as well as 2,4-dinitrotoluene, benzoic acid, carbazole, dibenzofuran, and n-nitrosodiphenylamine, were detected. In general, SVOCs were infrequently detected at relatively low concentrations. With the exception of naphthalene, which was detected in 11 of 23 samples, the remaining SVOCs were detected in from one to seven samples, and 15 of the SVOCs were detected only one to three of 23 samples. Concentrations of all but five SVOCs [1,2,4-trichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, bis(2-ethylhexyl)phthalate, and naphthalene] ranged from 0.5 µg/L to 22 µg/L. The concentrations of the five aforementioned SVOCs ranged from 1 µg/L to 140 µg/L. Bis(2-ethylhexyl)phthalate was also detected at a concentration of 3 µg/L in one of the off-site residential wells. Bis(2-ethylhexyl)phthalate is considered to be a common laboratory contaminant. Maximum concentrations of 18 of the 24 SVOCs were associated with groundwater samples collected from well 2LMW18S.

Three PCBs were detected in groundwater samples collected from well 2LMW18S. Aroclor-1016 was detected at a concentration of 7.5 µg/L in a groundwater sample collected from this well during Round 2 of the Phase II RI, Aroclor-1254 was detected at concentrations of 130 µg/L and 150 µg/L in the field duplicate samples collected from this well during the Phase I RI, and Aroclor-1260 was detected at concentrations of 710 µg/L and 290 µg/L in groundwater samples collected from this well during the Rounds 1 and 2, respectively, of the Phase II RI. No other pesticides or PCBs were detected in any of the groundwater samples collected from the overburden wells at the Area A Landfill.

Twenty-two metals were detected in the unfiltered groundwater samples collected from the Area A Landfill overburden wells, and 21 metals were detected in the associated filtered groundwater samples. In general, reported concentrations of metals in filtered and unfiltered samples were relatively similar (i.e., at the same order of magnitude). Exceptions to this statement include reported results for chromium, vanadium, and zinc; maximum concentrations reported for each of these metals in unfiltered groundwater samples were from eight to 32 times greater than the maximum concentrations reported for the respective metals in filtered groundwater samples. As shown on Table 2-6, maximum concentrations of all metals except aluminum in filtered samples, copper in unfiltered and filtered samples, lead in unfiltered and filtered samples, manganese in filtered samples, mercury in filtered and unfiltered samples, selenium in unfiltered samples, thallium in unfiltered samples, vanadium in filtered samples, and zinc in filtered samples exceeded

respective concentrations of these metals detected in unfiltered samples collected from off-site residential wells. A majority of the maximum concentrations were associated with samples collected from wells 2LMW18S and 2LMW13S.

Radionuclide analyses (gross alpha and gross beta) were performed for groundwater samples collected from six overburden wells during the Phase I RI. Complete gamma spectrum analyses, in addition to analyses for gross alpha and gross beta, were performed for four groundwater samples collected from overburden wells during the Phase II RI. Analytical results for radionuclide analyses are provided in the database tables in Appendix A. Based on the levels of uncertainty reported with the results (i.e., uncertainty levels are greater than results themselves), gross alpha levels in groundwater samples collected from all overburden wells except 2LMW17S (Phase I result) and 2LMW18S (Phase II Round 2 result) and the gross beta level in sample 2LMW17S (Phase I result) are considered to be not detected in these samples. Of the remaining results, gross alpha was detected at concentrations of 3.3 pCi/L and 11 pCi/L in samples from overburden wells 2LMW17S and 2LMW18S, respectively. Gross beta was detected in groundwater samples from Area A Landfill overburden wells at concentrations ranging from 3.7 pCi/L to 85 pCi/L.

The only radionuclide identified by complete gamma spectrum analysis was naturally occurring potassium-40. Once again, based on the levels of uncertainty reported with results, potassium-40 is considered to be not detected in the groundwater sample collected from well 2LMW18S during Round 2 of the Phase II RI. Therefore, potassium-40 was detected at concentrations of 250 pCi/L (Round 1) and 130 pCi/L (Round 2) in groundwater samples collected from well 2LMW7S during the Phase II RI.

Analyses for several general chemistry parameters, including ammonia, BOD, COD, hardness, oil and grease, TOC, total phosphorus, and TSS were also performed for selected groundwater samples collected from the Area A Landfill overburden wells. Analytical results for these parameters are summarized on Table 2-6.

Bedrock Wells

Nine VOCs, including two monocyclic aromatics, five chlorinated aliphatics, one ketone, and carbon disulfide, were detected in from one to four of the 24 groundwater samples collected from Area A Landfill bedrock wells. Maximum concentrations of 1,1,2,2-tetrachloroethane, 4-methyl-2-pentanone, and TCE were 140 µg/L, 49 µg/L, and 23 µg/L, respectively. Maximum concentrations of the remaining VOCs ranged from 1 µg/L to 6 µg/L. Maximum concentrations of the five chlorinated aliphatics (1,1,2,2-tetrachloroethane, total 1,2-dichloroethene, methylene chloride, PCE, and TCE) were associated with groundwater samples collected from well 2LMW13D. Unlike the groundwater samples collected from the Area A Landfill

overburden wells (specifically well 2LMW18S), monocyclic aromatics were not detected at significant concentrations in groundwater samples from the Area A Landfill bedrock wells. Chlorobenzene and total xylenes were the only detected monocyclic aromatics, and maximum concentrations reported for these chemicals in groundwater samples from the bedrock wells were only 6 µg/L and 2 µg/L, respectively. As previously noted, methylene chloride and total xylenes were also detected in the off-site residential wells at concentrations of 4 µg/L and 2 µg/L, respectively.

Only one-third of the total number of SVOCs detected in groundwater samples from Area A Landfill overburden wells were detected in groundwater samples collected from Area A Landfill bedrock wells. Five phthalates (which are common field and laboratory contaminants), 4-methylphenol, phenol, and benzoic acid were detected in from one to five of the 24 groundwater samples collected from bedrock wells. Diethylphthalate was detected in sample 2LGW17D-2 at a concentration of 120 µg/L. All other reported SVOC concentrations ranged from 0.5 µg/L to 10 µg/L. As previously noted, bis(2-ethylhexyl)phthalate was also detected at a concentration of 3 µg/L in one of the off-site residential wells. It should also be noted that bis(2-ethylhexyl)phthalate is considered to be a common laboratory contaminant. Neither pesticides nor PCBs were detected in any of the groundwater samples collected from the bedrock wells.

Twenty-three metals were detected in the unfiltered groundwater samples collected from the Area A Landfill bedrock wells, and 21 metals were detected in the associated filtered groundwater samples. As was true for groundwater samples collected from Area A Landfill overburden wells, reported concentrations of metals in filtered and unfiltered samples for most metals were relatively similar (i.e., at the same order of magnitude). Exceptions to this statement include reported results for aluminum, cadmium, chromium, copper, and lead; maximum concentrations reported for each of these metals in unfiltered groundwater samples from bedrock wells were from eight to 200 times greater than the maximum concentrations reported for the respective metals in filtered groundwater samples. As shown on Table 2-7, maximum concentrations of a majority of the detected metals exceeded respective concentrations of these metals detected in unfiltered samples collected from off-site residential wells. However, with the exception of antimony, cadmium, mercury, nickel, silver, and thallium in unfiltered samples and of beryllium, cadmium, nickel, selenium, and vanadium in filtered samples, maximum concentrations of metals detected in groundwater samples from bedrock wells were from 1.5 to 27 times less than maximum concentrations of respective metals detected in groundwater samples from overburden wells. A majority of the maximum concentrations detected in the bedrock well samples were associated with samples collected from wells 2LMW19D and 2LMW9D. As shown on Figure 2-2, these wells are located on opposite ends of the Area A Landfill.

Radionuclide analyses (gross alpha and gross beta) were performed for seven groundwater samples collected from bedrock wells during the Phase I RI. Complete gamma spectrum analyses, in addition to analyses for gross alpha and gross beta, were performed for four groundwater samples collected from

bedrock wells during the Phase II RI. Analytical results for radionuclide analyses are provided in the database tables in Appendix A. Potassium-40 was not detected in any of these groundwater samples. Based on the levels of uncertainty reported with the results (i.e., uncertainty levels are equal to or greater than results themselves), gross alpha levels in the groundwater samples collected from bedrock wells 2LMW14D, 2LMW18D, 2LMW7D, and 2LMW8D and gross beta levels in the groundwater sample collected from bedrock well 2LMW8D are considered to be not detected in these samples. Of the remaining results gross alpha was detected at concentrations ranging from 2.9 pCi/L to 24 pCi/L in groundwater samples collected from Area A Landfill bedrock wells, and gross beta was detected in corresponding samples at concentrations ranging from 3.7 pCi/L to 42 pCi/L. Maximum concentrations for gross alpha and gross beta in these samples were associated with the groundwater sample collected from bedrock well 2LMW13D during Round 2 of the Phase II RI.

Seventeen of the groundwater samples collected from Area A Landfill bedrock wells were analyzed for hardness. Reported results for this parameter ranged from 72 mg/L to 304 mg/L.

### 2.2.5 Data Evaluation

This section summarizes data evaluation procedures performed for site data. A discussion of contaminant fate and transport, a summary of the historical HHRA(s) performed for the site, and a screening level assessment of site data are provided.

#### 2.2.5.1 Contaminant Fate and Transport

The analytical data for the samples collected at this site indicate that some vertical contaminant transport may have occurred. However, since many of the contaminants observed in the soil are relatively insoluble (e.g., PAHs, Aroclors, DDT, and dioxins), it is possible that the contamination at depth does not reflect transport but rather successive emplacement of waste and soil (i.e., landfilling operations).

An overburden well located in the central portion of the Area A Landfill (well 2LMW18S) contained several monocyclic aromatics, which are very soluble relative to PAHs, etc. However, these compounds were not present at high concentrations in the soil. The suite of contaminants found in this sample may indicate a prior spill followed by vertical migration to the water table. The types of compounds that were detected are typical of those found in fuels.

Other wells located near former Building 373 also contained several VOCs (the halogenated aliphatics). These compounds are also fairly soluble and, when spilled, may migrate vertically through the soil column. Once in the groundwater, monocyclic aromatics and halogenated aliphatics will migrate downgradient at a

rate determined by the amount of organic carbon in the soil matrix (the retardation factor) and the interstitial pore velocity of the groundwater.

The two areas of contamination identified in the groundwater (centering around wells 2LMW18S and 2LMW13D) are not apparently related either spatially or in the types of chemicals observed. In both areas, the concentrations have reduced since they were first sampled in 1990, indicating potential migration from these areas.

4,4'-DDT and its metabolites occur at various depths in the soil. This may indicate that the 4,4'-DDT is degrading, as would be expected. The presence of these pesticides in deeper soil samples may indicate that spraying occurred while the Area A Landfill was active and may not be indicative of vertical transport of these highly sorptive compounds.

Since the time of data collection, the landfill has been capped, eliminating the possibility of human exposure to soil at the site and minimizing the amount of precipitation that could infiltrate through the soil and potentially transport contamination to the groundwater.

#### 2.2.5.2 Summary of Human Health Risk Assessment

Three potential receptor groups, full-time employees, older child trespassers, and construction workers, were considered for the Area A Landfill during the Phase II RI risk assessment. Because of the nature of the site, a future residential exposure scenario was not considered. Therefore, the only exposure to groundwater at the Area A Landfill was assumed to be direct contact with this medium for the construction worker during construction activities.

Noncarcinogenic risks associated with dermal contact with groundwater for the construction worker exceeded 1.0 for both RME and CTE scenarios (8,100 and 430, respectively). Elevated risks for the construction worker are a result of exposure to PCBs in groundwater because the individual HQs for PCBs for the RME and CTE scenarios were 8,100 and 430, respectively. Estimated risks associated with other chemicals detected in groundwater are relatively insignificant.

The incremental cancer risk associated with dermal contact with groundwater for the construction worker under the CTE (4.0E-5) was within USEPA's target risk range but exceeded the CTDEP target cancer risk (1E-5). The incremental cancer risk for this route of exposure under the RME (9.7E-4) exceeded the CTDEP target cancer risk and 1E-4, the upper limit of USEPA's target risk range. Potential carcinogenic risks for dermal contact with water were also attributed to PCBs.

#### 2.2.5.3 Screening Level Assessment

COPCs at this site were selected using the risk-based COPC screening levels described in Section 1.4.2. All data collected during the Phase I and II RIs were used to select COPCs for soil and groundwater. Maximum and 95% UCL chemical concentrations are presented in the summary tables. Although the maximum concentration of a chemical may exceed an associated criterion, the distribution of the chemical in the medium is also important with respect to decision making. Therefore, the 95% UCL chemical concentration was included to provide some information on the potential distribution of the chemical. In addition, the summary tables for groundwater samples present the range of concentrations detected in off-site residential wells for each detected chemical to enable comparison of site groundwater data with groundwater data collected from wells unaffected by the site. A brief narrative of the findings of this qualitative analysis is provided in the remainder of this section.

The following parameters were selected as COPCs for Area A Landfill soils based upon the COPC screening analysis presented in Table 2-4 and Table 2-5:

- Chlorinated aliphatic hydrocarbons (1,1,2,2-tetrachloroethane and methylene chloride)
- Monocyclic aromatic hydrocarbons (ethylbenzene, chlorobenzene, and total xylenes)
- PAHs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, and phenanthrene]
- SVOCs (dibenzofuran and carbazole)
- Pesticides (4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, dieldrin, alpha-chlordane, gamma-chlordane, endrin, endrin ketone, and heptachlor)
- PCBs (Aroclor-1242, Aroclor-1248, Aroclor-1254, and Aroclor-1260)
- Dioxins/furans (1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, and OCDD)
- Inorganics (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, nickel, silver, thallium, vanadium, and zinc).

Based upon the procedures for the preparation of soil tag maps (Section 1.4.3.1), analytical results for primary soil COPCs [methylene chloride, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aroclor-1254, and all aforementioned inorganics except cobalt, thallium, and zinc] associated with Area A Landfill soil samples and TCLP leachates are presented on Drawing 7A (Volume II).

Maximum concentrations of 1,1,2,2-tetrachloroethane, chlorobenzene, and methylene chloride exceeded the USEPA SSLs for migration to groundwater. Maximum concentrations of total xylenes, benzo(k)fluoranthene, chrysene, dibenzofuran, indeno(1,2,3-cd)pyrene, phenanthrene, 4,4'-DDD,

4,4'-DDE, 4,4'-DDT, aldrin, alpha-chlordane, gamma-chlordane, endrin, endrin ketone, heptachlor, all PCBs, dioxins/furans, arsenic, barium, beryllium, chromium, cobalt, copper, lead, manganese, vanadium, and zinc exceeded the Connecticut remediation standards for pollutant mobility for groundwater classified as GB. Maximum concentrations of ethylbenzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, carbazole, dieldrin, antimony, cadmium, mercury, nickel, silver, and thallium exceeded both USEPA SSLs for migration to groundwater and Connecticut remediation standards for pollutant mobility for groundwater classified as GB. However, of the selected COPCs, 1,1,2,2-tetrachloroethane, aldrin, Aroclor-1242, and thallium were detected in less than 5 percent of the samples collected. Chemical concentrations in excess of the SSLs and/or Connecticut remediation standards for pollutant mobility indicate the potential for these chemicals to migrate to groundwater and potentially impact the quality of the groundwater.

The concentrations of lead detected in several TCLP leachates and of cadmium detected in the TCLP leachates of two soil samples exceeded the Connecticut pollutant mobility standard for GB areas, further indicating the potential for lead and cadmium to migrate from site soils to groundwater. However, none of the TCLP leachate concentrations exceeded the associated federal toxicity characteristic regulatory levels of 5.0 mg/L (lead) or 1.0 mg/L (cadmium). As previously noted, mercury was detected in soil samples at a maximum concentration exceeding both the USEPA SSL for migration to groundwater and the Connecticut remediation standard for pollutant mobility. However the soil sample associated with the maximum concentration of mercury was also subjected to TCLP analysis, and mercury was not detected in any of the TCLP leachates. Therefore, the TCLP data indicate that pollutant mobility is not anticipated to be of concern for mercury in the soil matrix at this site, and mercury was not selected as a COPC.

Chlorobenzene, chlordane, endrin, heptachlor, arsenic, barium, chromium, and silver were not detected in the TCLP leachates or were detected at concentrations less than the associated Connecticut pollutant mobility standard for GB areas and the federal toxicity characteristic regulatory levels. However, the soil samples associated with the maximum concentrations of these COPCs were not included in the group of samples subjected to TCLP analysis. Therefore, although TCLP results do not indicate the potential for these chemicals to migrate from site soils to groundwater, the TCLP results cannot be used with absolute certainty to negate the potential for migration of these chemicals to groundwater that is indicated by the soil data. Thus, these chemicals were retained as COPCs.

Aluminum, copper, and iron were not evaluated for COPC selection; USEPA Region I does not advocate the quantitative evaluation of exposure to these chemicals because the only available toxicity data for these chemicals are provisional references doses based on allowable intakes rather than adverse effect levels. Additionally, USEPA SSLs and CTDEP pollutant mobility criteria were not available for calcium, magnesium, sodium, and potassium because these analytes are considered to be essential nutrients.

Of the aforementioned COPCs, 1,1,2,2-tetrachloroethane, chlorobenzene, ethylbenzene, methylene chloride, total xylenes, carbazole, dibenzofuran, phenanthrene, Aroclor-1254, Aroclor-1260, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, nickel, manganese, silver, thallium, vanadium, and zinc were also detected in groundwater at this site.

The following parameters were selected as COPCs for Area A Landfill overburden groundwater based upon the COPC screening analysis presented on Table 2-6:

- Chlorinated aliphatic hydrocarbons (chloroform and methylene chloride)
- Monocyclic aromatic hydrocarbons (benzene, chlorobenzene, 1,2,4-trichlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and total xylenes)
- PAHs (phenanthrene)
- SVOCs [carbazole, 4-methylphenol and bis(2-ethylhexyl)phthalate]
- PCBs (Aroclor-1016, Aroclor-1254, and Aroclor-1260)
- Inorganics (antimony, arsenic, barium, beryllium, boron, cadmium, chromium, lead, manganese, nickel, thallium, vanadium, and zinc).

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary overburden groundwater COPCs (arsenic, boron, lead, and manganese) associated with Area A Landfill overburden groundwater samples are presented on Drawing 5 (Volume II).

Maximum concentrations of benzene, chlorobenzene, methylene chloride, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, bis(2-ethylhexyl)phthalate, all three detected PCBs, antimony (filtered), cadmium (unfiltered), chromium (unfiltered), and thallium (filtered and unfiltered) exceeded the COPC screening level, the federal MCL, and the state MCL. Of these three criteria, maximum concentrations of chloroform, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 4-methylphenol, arsenic (filtered and unfiltered), barium (filtered and unfiltered), boron (filtered and unfiltered), nickel (unfiltered), and vanadium (unfiltered) exceeded only the COPC screening level. Beryllium (unfiltered) concentrations exceeded both the federal and state MCLs. Maximum concentrations of manganese (filtered and unfiltered) exceeded both the COPC screening level and the federal MCL. The maximum concentrations of lead (filtered and unfiltered) were in excess of the federal MCL.

Concentrations of iron (filtered and unfiltered) exceeded both the COPC screening level and the federal MCL. Aluminum (unfiltered) was detected at a maximum concentration in excess of the federal secondary MCL. However, aluminum and iron were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for both

chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium was detected in filtered and unfiltered samples at maximum concentrations in excess of the state MCL. However, sodium was not selected as a COPC because this chemical is considered to be an essential nutrient. Additionally, no screening criteria were available for calcium, magnesium, and potassium because these analytes are considered to be essential nutrients.

Maximum concentrations of benzene, chlorobenzene, chloroform, methylene chloride, total xylenes, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, bis(2-ethylhexyl)phthalate, carbazole, all three detected PCBs, antimony (filtered), beryllium (unfiltered), boron (filtered and unfiltered), cadmium (unfiltered), chromium (unfiltered), lead (filtered and unfiltered), manganese (filtered and unfiltered), thallium (filtered); and vanadium (unfiltered) detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. Groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

Because groundwater at the Area A Landfill eventually discharges to a surface water body (i.e., the Area A Wetland or the streams of the Area A Downstream Watercourses), site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection. Bis(2-ethylhexyl)phthalate, phenanthrene, all three detected PCBs, arsenic (filtered and unfiltered), beryllium (unfiltered), cadmium (unfiltered), chromium (unfiltered), copper (unfiltered), lead (filtered and unfiltered), and zinc (unfiltered) were detected at maximum concentrations exceeding the surface water protection criteria. However, copper was not selected as a COPC; USEPA Region I does not advocate quantitative evaluation of exposure to this chemical because the only available toxicity criteria for this chemical are provisional reference doses based on allowable intakes rather than adverse effect levels.

Of the previously mentioned COPCs, maximum concentrations of methylene chloride, total xylenes, bis(2-ethylhexyl)phthalate, and all inorganic chemicals except lead in Area A Landfill overburden groundwater samples exceeded detected concentrations of these chemicals in off-site residential wells.

The following parameters were selected as COPCs for Area A Landfill bedrock groundwater based upon the COPC screening analysis presented on Table 2-7:

- Chlorinated aliphatic hydrocarbons (1,1,2,2-tetrachlororethane, PCE, and TCE)
- Monocyclic aromatic hydrocarbons (chlorobenzene)
- PAHs (phenanthrene)

- SVOCs [bis(2-ethylhexyl)phthalate]
- Inorganics (antimony, arsenic, barium, cadmium, chromium, lead, manganese, nickel, and thallium).

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary bedrock groundwater COPCs (arsenic, barium, and manganese) associated with Area A Landfill bedrock groundwater samples are presented on Drawing 6 (Volume II).

Maximum concentrations of TCE, bis(2-ethylhexyl)phthalate, antimony (filtered and unfiltered), cadmium (unfiltered), and thallium (unfiltered) exceeded the COPC screening level, the federal MCL, and the state MCL. Of these three criteria, maximum concentrations of 1,1,2,2-tetrachloroethane, PCE, chlorobenzene, arsenic (filtered and unfiltered), barium (filtered and unfiltered), cadmium (filtered), chromium (unfiltered), and nickel (unfiltered) exceeded only the COPC screening levels. Maximum concentrations of manganese (filtered and unfiltered) exceeded both the COPC screening level and the federal MCL. The maximum concentration of lead (unfiltered) was in excess of the federal MCL. Of these COPCs, PCE, chlorobenzene, and antimony (unfiltered) were detected at frequencies of less than 5 percent.

Concentrations of iron (filtered and unfiltered) exceeded the COPC screening level and the federal MCL. Aluminum (unfiltered) concentrations were in excess of the federal secondary MCL. However, aluminum and iron were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for both chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium (filtered and unfiltered) was detected at maximum concentrations in excess of the state MCL. However, sodium was not selected as a COPC because it is considered to be an essential nutrient. Additionally, no screening criteria were available for calcium, magnesium, and potassium because these analytes are considered to be essential nutrients.

Maximum concentrations of 1,1,2,2,-tetrachloroethene, TCE, bis(2-ethylhexyl)phthalate, antimony (filtered and unfiltered), cadmium (unfiltered), lead (unfiltered), and manganese (filtered and unfiltered) detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. As previously noted, groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

Because groundwater at the Area A Landfill eventually discharges to a surface water body (i.e., the Area A Wetland or the streams of the Area A Downstream Watercourses), site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection. 1,1,2,2-

Tetrachloroethane, arsenic (unfiltered), cadmium (unfiltered), and lead (unfiltered) were detected at maximum concentrations exceeding the surface water protection criteria.

Of the previously mentioned COPCs, maximum concentrations of bis(2-ethylhexyl)phthalate and most of the inorganic chemicals in groundwater from bedrock wells were in excess of the maximum detected concentrations of these chemicals in off-site residential wells. Conversely, the concentrations of lead, manganese, and thallium detected in groundwater from bedrock wells at Area A Landfill were all less than concentrations detected in off-site residential wells.

### 2.2.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Site 2A using the decision tree approach is as follows:

- The Area A Landfill was investigated during the IAS, the Verification Step 1A Study, the Phase I and Phase II RIs, the FFS, and the Groundwater/Leachate Modeling Study For Remedial Design. The information collected during these investigations is sufficient to describe the site and its physical characteristics.

- The Phase I RI concluded that several risk exposure scenarios exceeded acceptable regulatory levels and that an FS should be performed at the Area A Landfill Site. Although the FS concluded that off-site landfilling and off-site incineration would provide superior protection of the environment, the Revised Design Analysis Report completed by B&R Environmental in 1996 concluded that an interim remedial design, which included only a containment or capping action, represented the action necessary to prevent the release of waste materials in the landfill from entering the environment and to prevent human exposure to these waste materials. The report also concluded that the cover system provides the desired improvements to the landfill, while maintaining the site for current government use and continuing evaluation of groundwater conditions at the site would determine if additional remedial actions would be necessary. A follow-up Groundwater Leachate Modeling Study For the Remedial Design (Cover System) concluded that the cover system would be stable, reduce the water table beneath the landfill, reduce contaminant migration from the unsaturated to the saturated zone, and reduce the mass flux of the contaminants of concern from the landfill to the wetlands.

- The Phase II RI concluded that shallow groundwater contamination exists at the site, the landfill may pose a threat to human receptors due to PCB concentrations in the landfill, and chemicals in the soil could adversely impact ecological receptors; however, the installation of the cap would eliminate these risks. This investigation also recommended that, in addition to the planned landfill cover

system, limited action consisting of access/use restrictions and groundwater monitoring should be implemented at the Area A Landfill.

- A low-permeability cover system was installed on the Area A Landfill as an interim remedial action for soils at the site. The cover system consists of a bedding/gas management layer underlying a double liner, a drainage layer above the double liner, and an operating surface (paving) in selected areas at the top. The remedial action also included the installation of a surface water and groundwater interception trench along the southern border (upgradient) of the site.

- In conjunction with the installation of the cover system at the Area A Landfill, a groundwater monitoring program will soon be implemented. A draft final version of the Groundwater Monitoring Plan for the Area A Landfill was issued by the Navy in January 1999. It is anticipated that this monitoring program will include sampling points within the Area A Wetland, the Area A Downstream Watercourses and OBDA, and the former Rubble Fill Area at Bunker A-86.

### 2.2.7 Recommendations

Site 2A was thoroughly investigated during previous investigations. Since a cover system and paving have been installed over the Area A Landfill as a result of the interim remedial action in 1997, the release of waste materials to the environment should be minimized and human exposure to these waste materials should not occur. However, it is recommended that access/use restrictions, cap maintenance activities, and a groundwater monitoring program should be initiated at this site to ensure that the interim remedial action results in continued protection of human health and the environment. Additional sampling and analysis activities conducted for the groundwater monitoring program at this site should be evaluated during the Basewide Groundwater OU RI. The analytical program for the site should be consistent with the final approved Groundwater Monitoring Plan.

## 2.3 SITE 2B - AREA A WETLAND

### 2.3.1 Site Description

The Area A Wetland is adjacent to the northeastern edge of the Area A Landfill and is approximately 23.6 acres in size. The Area A Wetland is depicted on Figure 2-3. The location of the Area A Wetland within NSB-NLON is shown on Drawing 1. This portion of NSB-NLON was undeveloped, wooded land, and possibly wetland until the late 1950s. In the late 1950s, dredge spoils from the Thames River were pumped to this area and contained within an earthen dike that extends from the Area A Landfill to the southern side of the Area A Weapons Center. Based on the boring logs, the total volume of dredged material in the wetlands is approximately 1.2 million cubic yards.

There is a small pond located at the southern portion of the wetland, and between 1 and 3 feet of standing water is present during all seasons. *Phragmites* is the predominant type of vegetation. Atlantic Environmental Services reported that pesticide "bricks" were placed on the wetland ice during winter and allowed to dissolve as a mosquito control measure. These "bricks" consisted of formulated (water-soluble) DDT and were used in the 1960s, prior to the 1972 ban on 4,4'-DDT.

### 2.3.2 Site Investigations

The following investigations and decision documents related to the Area A Wetland are discussed in the subsections that follow:

- Final Initial Assessment Study (Envirodyne, 1983)
- Final Verification Step 1A Study (Wehran, 1988)
- Phase I RI (Atlantic, 1992)
- Area A Landfill/Wetland Interface Sampling (HNUS, 1995b)
- Phase II RI (B&R Environmental, 1997a)

#### 2.3.2.1 Final Initial Assessment Study

In 1982, Envirodyne Engineers performed an IAS at NSB-NLON as part of the NACIP program. The purpose of this study was to identify and evaluate past waste disposal practices and to assess the potential for environmental impacts. Envirodyne reviewed installation records, interviewed long-term and former employees, toured the installation, and photographed sites as part of the IAS.

Envirodyne identified 11 sites at NSB-NLON as having contained hazardous material, one of which was the Area A (Site 2), which included the Area A Landfill, the Area A Wetland, and the Area A Downstream Watercourses. The IAS concluded that the source of contamination for this site was still present and potentially releasing contaminants to the environment. The IAS recommended that further sampling of surface waters and sediments at this site be performed.

#### 2.3.2.2 Final Verification Step 1A Study

In 1988, Wehran Engineering Corporation performed a Final Verification Step 1A Study for the DRMO Area, the OBDA, and the Area A Landfill as part of the NACIP program. The purpose of this study was to verify the presence or absence of contamination at these historically documented landfill areas. As part of the Verification Step 1A Study, Wehran performed three rounds of surface water and sediment

sampling at six locations (SW-1 through SW-6) adjacent to the Area A Landfill Site and including the Area A Wetlands. These samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals.

The study concluded that the surface waters and sediments near the Area A Landfill Site have levels of metals, PAHs, and pesticides that exceed regulatory criteria; however, the immediate health threat to base personnel from these contaminants appears minimal. The Verification Step 1A Study recommended that a Site Characterization Step 1B Study be performed at the Area A Site.

#### 2.3.2.3 Phase I Remedial Investigation

An investigation of 11 sites was completed at NSB-NLON by Atlantic Environmental Services from 1990 through 1992. One site was identified as Area A Site 2 and includes the present Area A Landfill, the Area A Wetland, and the Area A Downstream Watercourses and OBDA.

A total of eight samples plus two field duplicates from depths of less than 2 feet (considered to be surface soil samples) and a total of 25 samples plus one field duplicate from depths greater than 2 feet (considered to be subsurface soil samples) were collected from the Area A Wetland during the Phase I RI. For the purposes of classification, samples collected from depth intervals that began in the 0- to 2-foot range (e.g., 1 to 3 feet) were considered surface soils. In addition, eight composite sediment samples (2WSD1 through 2WSD8) plus one field duplicate were collected from various on-site areas, and a ninth grab sediment sample (2WSD9) was collected from the drainage culvert coming from the Area A Weapons Center. All surface soil, subsurface soil, and sediment samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals (total), TCLP metals, and TCLP pesticides.

The areas where composite samples 2WSD1 through 2WSD4 and 2WSD6 through 2WSD8 were collected were also each evaluated via the installation of a test boring to investigate deeper soils; five surface and 19 subsurface soil samples (plus two surface and one subsurface field duplicates) were collected from the seven test borings in these areas. Additional soil samples (two surface soils plus one field duplicate and six subsurface soils) were collected from four monitoring well borings located throughout the Area A Wetland. The goal of the sampling and analysis program was to assess the nature and extent of potential soil and sediment contamination. All soil/sediment samples collected within the limits of the wetland were at or below the groundwater table. Previous analysis of Area A Wetland sediments had indicated the presence of VOCs, SVOCs, pesticides, and metals.

Groundwater samples were collected from three shallow wells and four deep wells in the Area A Wetland during the Phase I RI. Two surface water samples (plus one field duplicate) were collected; one was located near Route 12 and the other was located near the dike outlet. All groundwater and surface water samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals (total), and

radiological parameters including gross alpha and gross beta analyses. Sample locations are shown on Figure 2-3. Several avian and amphibian ecological samples were also collected during the Phase I RI.

The risk exposure scenarios evaluated using Phase I RI data indicated exceedances of acceptable regulatory levels and that a FS should be performed at the Area A Wetland Site.

#### 2.3.2.4 Area A Landfill/Wetland Interface Sampling

As part of the landfill/wetland interface sampling performed by Halliburton NUS Corporation in 1994, 10 landfill side sediment samples and 10 wetland side sediment samples were collected and analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals, and TOC to determine extent of contamination. The data obtained from this study indicated that the Area A Landfill appeared to be the source of VOCs, the asphalt paved parking lot could be the cause of the SVOC contamination, and inorganic contamination was attributable to background levels in most cases.

#### 2.3.2.5 Phase II Remedial Investigation

A Phase II RI at 13 sites at NSB-NLON was conducted by B&R Environmental from 1995 through 1997. The Area A Wetland Site 2 was investigated as part of the RI.

Four new monitoring wells were installed during the Phase II RI, and two rounds of groundwater sampling were completed. Ten samples were collected from four shallow (overburden) and six deep (bedrock) wells during Round 1, and 10 samples (including one field duplicate) were collected from three shallow and six deep wells during Round 2. All groundwater samples collected during both rounds were analyzed for TCL VOCs, TCL SVOCs, and TAL metals (total and dissolved). Twenty-nine sediment samples were collected [all samples were field screened for pesticide using a gas chromatopgraph (GC), and six samples were analyzed at a fixed-base laboratory]. Fixed-base laboratory analyses included TCL pesticides on all six samples; one of the samples was additionally analyzed for TCLP Metals and engineering parameters including grain size distribution, moisture content, specific gravity, organic content, cation exchange capacity, pH, and TOC. A more extensive surface water sampling program was undertaken during the Phase II RI to define the nature and extent of contamination in the Area A Wetland. Of the nine surface water samples collected, seven were collected along Route 12, along the Area A Landfill boundary, and in the northeast portion of the site (east of the Area A Weapons Center). All nine surface water samples were analyzed for TCL VOCs, TCL pesticides/PCBs, and TAL metals (total). In addition, six of the nine samples were analyzed for dissolved TAL metals and a single sample was analyzed for TCL SVOCs. Sample locations are shown on Figure 2-3.

The Phase II RI concluded that little evidence of surface water or groundwater contamination exists at the site; the site may pose a risk to the construction worker due to potential exposure to manganese in the groundwater; and significant pesticide, PCB, and PAH concentrations exist in site soil and sediments. The recommendations in the Phase II indicated that a FS should be conducted for this site.

#### 2.3.2.6 Other Investigations

Four sediment samples (2WSD23, 2WSD24, 2WSD25, and 2WSD26) were collected from the southwestern portion of the Area A Wetland (along the earthen dike) as part of the Area A Downstream/OBDA FFS completed by B&R Environmental in late 1997. These four samples were analyzed for TCL pesticides/PCBs, grain size distribution, moisture content, and TOC.

### 2.3.3 Physical Characteristics

This section presents a summary of site physical characteristics for the Area A Wetland based on information generated during the Phase I and Phase II RIs. Topography and surface features, surface water, soils, geology, and hydrogeology are discussed in the subsections that follow.

#### 2.3.3.1 Topography and Surface Features

The Area A Wetland is a relatively flat-lying, swampy, vegetated area. Figure 2-3 shows the topography and surface features of the Area A Wetland and the surrounding sites, including the Area A Landfill, the Area A Weapons Center, and the OBDA. In general, the surface elevation of the wetland is between 70 and 80 feet. According to the surficial geology map (USGS, 1960), this area (between Baldwin Hill and the earthen dike) was historically a wetland.

The surface elevation increases to nearly 100 feet in the northeastern corner of the wetland. This area was historically a stream valley. After the earthen dike was constructed and the ground surface of the wetland was raised by filling with dredge spoil, groundwater levels rose to the point such that the dredge spoil placed in the northeastern corner became saturated.

Several areas within the Area A Wetland are elevated. The most prominent topographic feature is a bedrock knob, located between the Area A Weapons Center and the Area A Landfill. Test boring 2WTB4 confirmed the presence of bedrock within 1 foot of the ground surface at this location. Additionally, the local bedrock knob is confirmed by the historical surficial geology map, which pre-dates the construction of the earthen dike and filling activities.

#### 2.3.3.2 Surface Water Features

A small pond is located at the southeastern end of the wetland. Between 1 and 3 feet of standing water is present in the pond during all seasons. Water from the wetland discharges through an earthen dike at the western edge of the wetland via four 24-inch metal culverts to the Area A Downstream Watercourses. These watercourses subsequently discharge into the Thames River. Several shallow intermittent drainage channels cross the wetland.

#### 2.3.3.3 Soil Characteristics

The SCS Soils Map (SCS, 1983) classifies the soil at the Area A Wetland as Udorthents-Urban land. This soil type is defined as excessively drained to moderately drained soils that have been disturbed by cutting and filling. This is consistent with historical information regarding the placement of dredge spoils in the area. The surface of the Area A Wetland is covered with a 2-foot layer of roots and plant debris derived from *Phragmites*, the predominant vegetation.

#### 2.3.3.4 Geology and Hydrogeology

Geology

The Area A Wetland is underlain by dredge spoils that consist of silt and clay with traces of fine sand and shell fragments. The make-up of the dredge spoils reflects their original depositional environment, i.e., river bottom sediments. The dredge spoils extend across the present site southeastward to 2WMW3 (near the tennis courts) and southwestward beneath the Area A Landfill. Dredge spoils are between 25 and 35 feet thick on the southern side of the wetland adjacent to the landfill and 10 to 15 feet thick on the northeastern side of the wetland. Where dredge spoil does not lie directly on bedrock, it is underlain by a thin remnant of topsoil, which consists of dark, organic-rich silt, clay, and traces of roots. The topsoil is in turn underlain by alluvial deposits.

The alluvial deposits that underlie portions of the Area A Wetland lie between dredge spoil materials/topsoil and bedrock. These deposits consist primarily of sand, with gravel and/or silt, and are significantly more coarse grained than the overlying dredge spoils. The observed thickness of the alluvium in the Area A Wetland borings ranged from 0 to approximately 36 feet. Since most borings/wells are located along the fringes of the wetland, the presence/thickness of alluvium within the central portion of the alluvium can only be estimated. Where present, the alluvium was first encountered at elevations typically ranging from 45 to 50 feet msl in the eastern portion of the wetland and 35 to 40 feet msl in the western portion near the dike.

Bedrock beneath the southern portion of the wetland has been identified as the Mamacoke Formation. The northernmost portion of the wetland is underlain by the Granite Gneiss, a gneissic biotite granite. The bedrock surface slopes to the valley occupied by the Area A Wetland from northern, eastern, and central bedrock highs toward the center of the wetland. The lowest bedrock elevation of 8.7 feet was identified at monitoring well location 2WMW3D. There are no data to confirm the bedrock elevation within the center of the wetland. There are two localized bedrock highs. In the northwestern central portion of the wetland, the bedrock high corresponds to a topographic high and dry area within the wetland. This topographic high was identified on a historical surficial geology map (USGS, 1960). At the Weapons Center, a remnant bedrock high exists. This bedrock feature is the remnant of past blasting activity that lowered a formerly higher bedrock elevation at this location.

Hydrogeology

Groundwater is present within the overburden and bedrock underlying the Area A Wetland. As is typical for wetland environments, the water table is nearly at the ground surface throughout most of the Area A Wetland. Overburden (both the dredge spoils and alluvium) exists largely under saturated conditions. Due to the finer grained nature of the dredge spoils in comparison to the alluvium, the two units are distinct from a hydrogeologic perspective but are hydraulically connected. Drawing 3 shows shallow overburden groundwater contours for the Area A Wetland. Groundwater flow directions in the bedrock mimic the shallow overburden flow pattern. Groundwater flows from higher elevations toward the bedrock valley and ultimately travels to the Area A Downstream Watercourses through a combination of discharge to local streams within the wetland and aquifer underflow. Groundwater elevations are similar in the bedrock and overburden, but the gradient is slightly upward at the 2WMW5 well cluster and slightly downward at the 2WMW21 well cluster. The hydraulic gradient is relatively flat across the Area A Wetland.

The shallow groundwater flow gradient from monitoring well 2WMW3S to Staff Gauge SG-6 is approximately 0.0025 based on the August 1994 water-level measurements. Using a hydraulic conductivity of 1.0 feet/day based on slug testing completed in the dredge spoils and assuming an effective porosity of 0.30, the estimated groundwater seepage velocity through the dredge spoils is 0.008 ft/day. Based on a hydraulic conductivity of 6.8 feet/day for the alluvium (calculated from a slug test for the Downstream Watercourses area), the alluvium is significantly more permeable than the dredge spoils, and groundwater flow velocities are expected to be higher. Using the same gradient and porosity as was used for the dredge spoils, a flow velocity of 0.06 feet/day for the alluvium was calculated.

### 2.3.4 Nature and Extent of Contamination

This section presents an evaluation of the nature and extent of contamination in the Area A Wetland. The discussion includes chemical analytical results for soil, sediment, groundwater, and surface water collected during the Phase I RI, the Phase II RI, the Area A Downstream/OBDA FFS, and the Area A Landfill FFS. Because of the fluctuating nature of the groundwater table at the site during wet versus dry periods, it is often difficult to distinguish between soil and sediment matrices. In addition, any potential impact to groundwater and surface water from soil and sediment would be collective. Therefore, analytical results for soil and sediment samples are evaluated collectively for this site. The complete analytical database for all samples is contained in Appendix A.

#### 2.3.4.1 Soil and Sediment

Table 2-8 presents descriptive statistics (frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in soil or sediment samples collected from the Area A Wetland. Table 2-9 presents similar information for TCLP results. Based upon the screening level assessment for the Area A Wetland (Section 2.3.5.3) and the procedures for the preparation of soil/sediment tag maps (Section 1.4.3.1), analytical results for primary COPCs in Area A Wetland soil and sediment samples and associated TCLP leachates are presented on Drawings 7A and B, respectively (Volume II).

Several VOCs, including carbon disulfide, two ketones, four monocyclic aromatics, and four halogenated aliphatics, were detected in the Area A Wetland soil and sediment samples. As shown on Table 2-8, 2-butanone, acetone, and carbon disulfide were detected most frequently (in from 19 to 32 of 60 samples) and at the greatest concentrations (ranging from 0.005 mg/kg to 1.4 mg/kg, from 0.027 mg/kg to 0.85 mg/kg, and from 0.002 mg/kg to 0.042 mg/kg, respectively). Halogenated aliphatics (1,1-dichloroethene, methylene chloride, PCE, and TCE) were detected in from one to nine samples at concentrations ranging from 0.002 mg/kg to 0.016 mg/kg. Monocyclic aromatics (benzene, chlorobenzene, toluene, and total xylenes) were detected in from one to six samples at concentrations ranging from 0.002 mg/kg to 0.014 mg/kg. These results are not considered to be indicative of a major source of VOCs.

PAHs were the most frequently detected class of compounds in the sediment and soil samples; they were also detected at the greatest concentrations. Other SVOCs detected in sediment and soil samples include three phthalate esters at concentrations ranging from 0.021 mg/kg to 3.5 mg/kg, three phenols (each detected in only one sample at concentrations ranging from 0.043 mg/kg to 0.24 mg/kg), 1,4-dichlorobenzene (at a concentration of 0.042 mg/kg in sample T6-B only), benzoic acid [at a concentration of 32 mg/kg in sediment sample 112690-2WSD9(0-0.5) and at concentrations ranging from

0.13 mg/kg to 0.78 mg/kg in four other samples], and carbazole (at concentrations ranging from 0.025 mg/kg to 0.13 mg/kg in six samples).

Concentrations of PAHs generally decreased with depth. The greatest total concentrations of both carcinogenic polynuclear aromatic hydrocarbons (CPAH; 227 mg/kg) and non-carcinogenic polynuclear aromatic hydrocarbons (NPAH; 184.4 mg/kg) were associated with sediment sample 2WSD9, collected from the Area A Weapons Center drainage culvert. Other than sample 2WSD9, concentrations of CPAHs and NPAHs were generally greatest along the boundary of the Area A Landfill (particularly along the northwestern end of the boundary). Concentrations of CPAH and NPAH in all individual samples collected in the eastern part of the wetland area (i.e., away from the landfill boundary) were less than 1 mg/kg; only CPAH and NPAH concentrations detected in composite samples from the eastern portion of the wetland exceeded 1 mg/kg.

Twenty-nine sediment samples were analyzed for 4,4'-DDT and its metabolites and dieldrin using field screening methodologies. No pesticides were detected. Detection limits for these analyses ranged from approximately 0.019 mg/kg to 0.047 mg/kg.

The fixed-base laboratory detected pesticides in several sediment samples. 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT were detected most frequently (in 13 to 18 samples) and at the greatest concentrations (ranging from 0.0044 mg/kg to 4.8 mg/kg). Maximum concentrations of these three pesticides were detected in sediment sample 2WSD25(0.0-1.0), which was collected at the outfall into the Area A Downstream watercourses. Aroclor-1260 was detected in seven samples, at concentrations ranging from 0.082 mg/kg to 1.5 mg/kg. These seven samples included samples collected during the FFS from transects 1, 6, and 7 and surface soil sample 2WTB2 (0 to 2 feet), all located along the northwestern boundary of the landfill. Alpha- and gamma-chlordane were also detected in 12 and 11 FFS samples, respectively, but at much lower concentrations ($C_{max}$ = 0.029 mg/kg). The remaining pesticides were detected in from one to four samples at concentrations of ranging from 0.0021 mg/kg to 0.038 mg/kg. With the exceptions of 4,4'-DDT and its degradation products detected in sediment sample 2WSD25 and nearby sediment sample 2WSD24, pesticide concentrations were greater in samples collected from transects 2, 3, 5, and 6 along the northwestern boundary of the Area A Landfill than in samples collected elsewhere in the Area A Wetland.

As shown on Table 2-8, all 22 TAL metals plus boron and cyanide were detected in the Area A Wetland soil and sediment samples. Most of the maximum concentrations of these analytes were also detected in samples collected along the northwestern boundary of the landfill; 10 of the maximum concentrations were associated with sample T7-B. With the exception of antimony, boron, cyanide, mercury, selenium, and silver, each of the inorganic analytes was detected in from 52 to 61 of 61 samples.

Analysis for TOC was performed for 24 of the Area A Wetland sediment samples. Reported concentrations for this parameter ranged from 8,420 mg/kg to 91,000 mg/kg.

TCLP extraction followed by analysis for pesticides and metals were performed for 42 soil and sediment samples. Pesticides were not detected in any of the TCLP leachates. All eight TCLP metals were detected in the TCLP leachates of the soil and sediment samples, although mercury was detected in only two of 42 leachates. Arsenic, barium, cadmium, and chromium were each detected in more than half of the 42 leachates. Lead was detected at the greatest concentration, with a maximum concentration of 1.5 mg/L. Maximum concentrations of the remaining metals ranged from 0.0006 mg/L (mercury) to 0.67 mg/L (barium).

#### 2.3.4.2 Groundwater

Groundwater samples from both overburden and bedrock wells were collected at the Area A Wetland. Table 2-10 presents descriptive statistics (frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in groundwater samples collected from overburden wells at the Area A Wetland. Table 2-11 presents similar information for groundwater samples collected from bedrock wells at the Area A Wetland. Based upon the screening level assessment for the Area A Wetland (Section 2.3.5.3) and the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary COPCs in Area A Wetland overburden and bedrock groundwater samples are presented on Drawings 5 and 6, respectively (Volume II).

Overburden Wells

Carbon disulfide (2 µg/L) and total xylenes (1 µg/L) were each detected in a single Area A Wetland groundwater sample. No other VOCs were detected in the 10 groundwater samples that were collected from Area A Wetland overburden wells. Benzoic acid and two phthalate esters were also each detected in one groundwater sample. Concentrations of these SVOCs ranged from 0.8 µg/L to 1 µg/L. Neither pesticides nor PCBs were detected in any of the Area A Wetland groundwater samples. These results indicate minimal organic contamination of groundwater in the overburden aquifer.

As shown on Table 2-10, 22 metals and cyanide were detected in the unfiltered groundwater samples, and 19 metals were detected in the filtered groundwater samples. Maximum concentrations of all these metals except aluminum in filtered samples, cadmium in unfiltered samples, copper in filtered and unfiltered samples, lead in unfiltered samples, nickel in filtered samples, selenium in unfiltered samples, silver in unfiltered samples, vanadium in filtered and unfiltered samples, and zinc in filtered and unfiltered samples

exceeded the maximum concentrations of respective metals detected in the off-site residential wells. In general, maximum concentrations of metals detected in filtered and unfiltered samples were at the same order of magnitude. Notable results among filtered and unfiltered samples include maximum concentrations reported for arsenic (138 µg/L), barium (754 µg/L), boron (3,340 µg/L), iron (131,000 µg/L), magnesium (1,080,000 µg/L), manganese (9360 µg/L), silver (9.8 µg/L), sodium (8,180,000 µg/L), and zinc (183 µg/L). Almost half of the maximum concentrations of metals and cyanide were associated with the groundwater sample collected from well 2WMW21S, located near the eastern border of the site.

Radionuclide analyses (gross alpha and gross beta) were performed for groundwater samples collected during the Phase I RI. Analytical results for radionuclide analyses are provided in the database tables (Appendix A). Based on the levels of uncertainty reported with results (i.e., uncertainty levels are greater than results), gross alpha is considered to be not detected in samples 2WMW3S and 2WMW5S. Gross alpha was detected at a concentration of 2.8 pCi/L in the groundwater sample collected from well 2WMW6S. Gross beta was detected in the three samples analyzed for this parameter at concentrations ranging from 4.4 pCi/L to 40.2 pCi/L.

Analyses for hardness were performed for seven of the groundwater samples collected from the overburden wells. Reported concentrations for this parameter ranged from 96 mg/L to 6150 mg/L.

Bedrock Wells

VOCs were not detected in the 16 groundwater samples collected from Area A Wetland bedrock wells. 2-Methylphenol (2 µg/L), 4-methylphenol (3 µg/L), and phenol (14 µg/L) were detected in a single groundwater sample collected from bedrock well 2WMW22D during Round 2 of the Phase II RI. Benzoic acid and three phthalate esters were also detected in from one to five of the 16 samples. With the exception of bis(2-ethylhexyl)phthalate, which was detected at a concentration of 31 µg/L in one sample, concentrations of these SVOCs ranged from 0.5 µg/L (benzoic acid) to 13 µg/L [bis(2-ethylhexyl)phthalate]. Neither pesticides nor PCBs were detected in any of the Area A Wetland groundwater samples. Therefore, results for the groundwater samples collected from Area A Wetland bedrock wells also indicate minimal organic contamination.

As shown on Table 2-11, 21 metals were detected in the unfiltered groundwater samples collected from the bedrock wells, and 20 metals were detected in the filtered groundwater samples. Cyanide was not detected in these samples. Maximum concentrations of all of these metals except chromium and vanadium in unfiltered samples; cadmium, copper, lead and zinc in filtered and unfiltered samples; and silver in filtered samples, exceeded the maximum concentrations of respective metals detected in the offsite residential wells. In general, maximum concentrations of metals detected in filtered and unfiltered samples were at the

same order of magnitude. Notable results among filtered and unfiltered samples include maximum concentrations reported for aluminum (9,910 µg/L), barium (904 µg/L), iron (108,000 µg/L), manganese (7,160 µg/L), nickel (116 µg/L), sodium (1,290,000 µg/L), and zinc (274 µg/L). Approximately 41 percent and 37 percent, respectively, of the maximum concentrations of metals were associated with groundwater samples collected from wells 2WMW6D (located along the fence that surrounds the adjoining Area A Weapons Center) and 2WMW3D (located near the tennis courts at the southern end of the site). A comparison of the results presented on Tables 2-10 and 2-11 indicate that the concentrations of most metals in groundwater samples collected from overburden and bedrock wells were relatively similar. However, the maximum concentrations of arsenic, boron, copper, magnesium, potassium, sodium, and vanadium in overburden samples were greater than five times the maximum concentrations reported for respective metals in the bedrock samples, and the maximum concentration reported for lead for bedrock samples was greater than five times the maximum concentration reported for lead in the overburden samples.

As previously noted, radionuclide analyses (gross alpha and gross beta) were performed for groundwater samples collected during the Phase I RI. Analytical results for radionuclide analyses are provided in the database tables (Appendix A). Based on the levels of uncertainty reported with results (i.e., uncertainty levels are greater than results), gross alpha levels in the groundwater samples collected from well 2WMW1D and 2WMW6D and gross beta levels in the groundwater sample collected from well 2WMW1D, are considered to be not detected. Of the remaining results, gross alpha was detected at concentrations of 4.7 pCi/L and 42.2 pCi/L in two groundwater samples collected from bedrock wells, and gross beta was detected at concentrations ranging from 3.8 pCi/L to 51 pCi/L in three groundwater samples collected from bedrock wells. Maximum concentrations for both gross alpha and gross beta were associated with well 2WMW3D.

Hardness analyses were performed 12 of the unfiltered groundwater samples and three of the unfiltered groundwater samples collected from Area A Wetland bedrock wells. Reported concentrations for this parameter in unfiltered groundwater samples ranged from 18 mg/L to 840 mg/L, and reported concentrations in filtered groundwater samples ranged from 16 mg/L to 124 mg/L.

#### 2.3.4.3 Surface Water

Eleven surface water samples plus one field duplicate sample were collected at the Area A Wetland. Table 2-12 presents descriptive statistics (frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in the surface water samples.

PCE was the only VOC detected in the 11 surface water samples. It was detected at a concentration of 0.002 mg/L in sample 2WSW12, which was collected from an area adjacent to the Area A Landfill. Diethylphthalate, a common field and laboratory contaminant, was detected at a concentration of 0.002 mg/L in one of the three surface water samples analyzed for SVOCs. Pesticides and PCBs were not detected in any of the 11 samples that were analyzed for these parameters. These analytical results indicate that there is essentially no organic contamination present in the Area A Wetland surface water.

As shown on Table 2-12, 19 metals were detected in the Area A Wetland unfiltered surface water samples, and 14 metals were detected in the filtered surface water samples. Maximum concentrations of metals were associated with various samples. Notable results include maximum concentrations reported for aluminum (20,900 µg/L), cadmium (126 µg/L), manganese (1,870 µg/L), nickel (84.7 µg/L), and zinc (334 µg/L).

Radionuclide analyses (gross alpha and gross beta) were performed for surface water samples collected from two locations during the Phase I RI. Analytical results for radionuclide analyses are provided in the database tables (Appendix A). Based on the levels of uncertainty reported with results (i.e., uncertainty levels are greater than results), gross alpha levels in surface water samples collected from both locations and gross beta levels in the surface water sample collected from location 2WSW1 are considered to be not detected. Therefore, gross beta was detected only in the surface water sample and field duplicate sample collected from location 2WSW2 (near the Area A Wetland outlet), at concentrations of 6.9 pCi/L and 11 pCi/L, respectively.

Hardness analyses were performed for one filtered and nine unfiltered Area A Wetland surface water samples. Hardness was not detected in the filtered sample and one of the unfiltered samples. Reported results for hardness for the remaining unfiltered samples ranged from 16 mg/L to 160 mg/L.

### 2.3.5 Data Evaluation

This section summarizes data evaluation procedures performed for site data. A discussion of contaminant fate and transport, a summary of the historical HHRA(s) performed for the site, and a screening level assessment of site data are provided.

#### 2.3.5.1 Contaminant Fate and Transport

The chemical analytical data do not indicate that contaminants are migrating from this area. Rather, the wetland receives runoff from surrounding areas such as Route 12, the Area A Weapons Center, and the Area A Landfill, which probably accounts for the presence of PAHs, pesticides, and some metals in the sediment and soils. The area may also have been affected by the past direct application of pesticides (i.e.,

DDT "bricks") or by the placement of contaminated dredge spoils. During the Phase I RI, total xylenes was detected in a single shallow well (2WMW5S) at a concentration of 1 µg/L. This result is not indicative of significant vertical transport of soluble contaminants. A few phthalate esters and metals were detected at concentrations that exceed drinking water standards; however, since these analytes are not typically soluble, their presence may be related to the presence of suspended sediment in the samples. Therefore, little contaminant transport appears to be occurring at this site.

#### 2.3.5.2 Summary of Human Health Risk Assessment

The baseline risk assessment conducted for the Area A Wetland as part of the Phase II RI focused on an older child trespasser and a construction worker under CTE and RME scenarios. Groundwater was not considered to be a potential medium for exposure for the trespasser. Dermal contact with groundwater was evaluated as a potential route of exposure for the construction worker.

Noncarcinogenic risks associated with exposure to groundwater for the construction worker were less than the USEPA acceptable level of 1.0 for the CTE scenario but exceeded 1.0 for the RME scenario. Elevated noncarcinogenic hazards for the construction worker under the RME scenario were primarily attributed to dermal exposure to manganese in groundwater. The chemical-specific HQ for manganese via dermal contact (1.7) slightly exceeded unity. Manganese is relatively abundant in the environment.

Lifetime incremental cancer risks (ICR) associated with dermal contact with groundwater for the CTE and RME scenarios for the construction worker were less than 1E-5, the CTDEP target cancer risk, and less than 1E-6, the lower bound of the USEPA target risk range.

#### 2.3.5.3 Screening Level Assessment

COPCs at this site were selected using the risk-based COPC screening levels described in Section 1.4.2. All data collected during the Phase I and II RIs were used to select COPCs for soil and groundwater. Maximum and 95% UCL chemical concentrations are presented in the summary tables. Although the maximum concentration of a chemical may exceed an associated criterion, the distribution of the chemical in the medium is also important with respect to decision making. Therefore, the 95% UCL chemical concentration was included to provide some information on the potential distribution of the chemical. In addition, the summary tables for groundwater samples present the range of concentrations detected in off-site residential wells for each detected chemical to enable comparison of site groundwater data with groundwater data collected from wells unaffected by the site. A brief narrative of the findings of this qualitative analysis is provided in the remainder of this section.

The following parameters were selected as COPCs for Area A Wetland soils and sediments based upon the COPC screening analysis presented in Table 2-8 and Table 2-9:

- PAHs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene]
- SVOCs (pentachlorophenol)
- Pesticides (4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, dieldrin, and delta-BHC)
- PCBs (Aroclor-1260)
- Inorganics (antimony, arsenic, barium, lead, mercury, manganese, nickel, selenium, silver, and vanadium).

Based upon the procedures for the preparation of soil/sediment tag maps (Section 1.4.3.1), analytical results for primary soil and sediment COPCs [all aforementioned COPCs except dibenzo(a,h)anthracene, fluoranthene, pyrene, pentachlorophenol, dibenzofuran, aldrin, dieldrin, delta-BHC, Aroclor-1260, and selenium] associated with Area A Wetland soil and sediment samples and associated TCLP leachates are presented on Drawings 7A and B, respectively (Volume II).

Maximum concentrations of pentachlorophenol and selenium exceeded the USEPA SSLs for migration to groundwater. Maximum concentrations of benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, pyrene, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, Aroclor-1260, delta-BHC, arsenic, barium, beryllium, chromium, lead, manganese, mercury, nickel, silver, and vanadium exceeded the Connecticut remediation standards for pollutant mobility for groundwater classified as GB. Maximum concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, dieldrin, and cadmium exceeded both USEPA SSLs for migration to groundwater and Connecticut remediation standards for pollutant mobility for groundwater classified as GB. Additionally, note that pentachlorophenol, aldrin, dieldrin, and delta-BHC were detected in less than 3 percent of the collected samples. Chemical concentrations in excess of the SSLs and/or Connecticut remediation standards for pollutant mobility indicate the potential for these chemicals to migrate to groundwater and potentially impact the quality of the groundwater.

The maximum concentrations of lead and silver detected in TCLP leachates exceeded the respective Connecticut pollutant mobility standards for GB areas, further indicating the potential for lead and silver to migrate from site soils to groundwater. However, none of the TCLP leachate concentrations exceeded associated federal toxicity characteristic levels.

As previously noted, cadmium was detected in soil samples at a maximum concentration exceeding both the USEPA SSL for migration to groundwater and the Connecticut remediation standard for pollutant

mobility, and chromium was detected in soil samples at a maximum concentration exceeding the Connecticut remediation standard for pollutant mobility. However the soil samples associated with the maximum concentrations of cadmium and chromium were also subjected to TCLP analysis, and cadmium and chromium were not detected in any of the TCLP leachates. Therefore, the TCLP data indicate that pollutant mobility is not anticipated to be of concern for cadmium and chromium in the soil matrix at this site, and these chemicals were not selected as COPCs.

Arsenic, barium, mercury, and selenium were detected in the TCLP leachates at concentrations less than the associated Connecticut pollutant mobility standard for GB areas and the federal toxicity characteristic regulatory levels. However, the soil samples associated with the maximum concentrations of these COPCs were not included in the group of samples subjected to TCLP analysis. Therefore, although TCLP results do not indicate the potential for these chemicals to migrate from site soils to groundwater, the TCLP results cannot be used with absolute certainty to negate the potential for migration of these chemicals to groundwater that is indicated by the soil data. Thus, these chemicals were retained as COPCs.

Aluminum, copper, and iron were not evaluated for COPC selection; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for these chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Additionally, USEPA SSLs and CTDEP pollutant mobility criteria were not available for calcium, magnesium, sodium, and potassium because these chemicals are considered to be essential nutrients.

Of the aforementioned soil and sediment COPCs, antimony, arsenic, barium, lead, manganese, nickel, selenium, silver, and vanadium were also detected in groundwater at this site.

The following parameters were selected as COPCs for Area A Wetland overburden groundwater based upon the COPC screening analysis presented on Table 2-10:

- Inorganics (arsenic, barium, boron, cadmium, manganese, thallium, vanadium, and zinc).

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for the primary overburden groundwater COPCs (arsenic, boron, and manganese) associated with Area A Wetland overburden groundwater samples are presented on Drawing 5 (Volume II).

Maximum concentrations of arsenic (filtered and unfiltered), cadmium (filtered and unfiltered), manganese (filtered and unfiltered), and thallium (filtered and unfiltered) exceeded the COPC screening level, the federal

MCL, and the state MCL. Of these three criteria, maximum concentrations of boron (filtered and unfiltered), barium (filtered and unfiltered), and vanadium (filtered) exceeded only the COPC screening level.

Concentrations of iron (filtered and unfiltered) exceeded both COPC screening levels and the federal MCL. Aluminum (filtered and unfiltered) was detected at maximum concentrations in excess of the federal secondary MCL. However, aluminum and iron were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for both chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium (filtered and unfiltered) was detected at maximum concentrations in excess of the state MCL. However, sodium, calcium, magnesium, and potassium, were not selected as COPCs because these chemicals are considered to be essential nutrients.

Maximum concentrations of arsenic (filtered and unfiltered), boron (filtered and unfiltered), cadmium (filtered and unfiltered), manganese (filtered and unfiltered), and thallium (filtered and unfiltered) detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. Groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

Because groundwater at the Area A Wetland eventually discharges to a surface water body (i.e., the Area A Wetland itself or the streams of the Area A Downstream Watercourses), site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection. Arsenic (filtered and unfiltered), cadmium (filtered and unfiltered), and zinc (unfiltered) were detected at maximum concentrations exceeding the surface water protection criteria.

For the previously mentioned COPCs, maximum concentrations of arsenic, barium, boron, cadmium, manganese, and thallium in overburden groundwater at Area A Wetland exceeded detected concentrations of these chemicals in off-site residential wells. Conversely, the maximum concentrations of vanadium and zinc were less than the respective maximum detected concentrations in off-site residential wells.

The following parameters were selected as COPCs for Area A Wetland bedrock groundwater based upon the COPC screening analysis presented on Table 2-11:

- SVOC [bis(2-ethylhexyl)phthalate]

- Inorganics (antimony, arsenic, barium, beryllium, boron, cadmium, lead, manganese, nickel, thallium, and zinc).

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary bedrock groundwater COPCs (arsenic, barium, manganese, and zinc) associated with Area A Wetland bedrock groundwater samples are presented on Drawing 6 (Volume II).

Maximum concentrations of bis(2-ethylhexyl)phthalate, antimony (filtered), cadmium (filtered and unfiltered), manganese (filtered and unfiltered), nickel (filtered and unfiltered), and thallium (filtered and unfiltered) exceeded the COPC screening level, the federal MCL, and the state MCL. Of these three criteria, maximum concentrations of arsenic (filtered and unfiltered), barium (filtered and unfiltered), and boron (filtered and unfiltered) exceeded only the COPC screening levels. Beryllium (filtered) concentrations exceeded both the federal and state MCLs. The maximum concentration of lead (unfiltered) was in excess of the state MCL.

Concentrations of iron (filtered and unfiltered) exceeded COPC screening levels as well as the federal MCL. Aluminum (filtered and unfiltered) concentrations were in excess of the federal secondary MCL. However, aluminum and iron were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for both chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium (filtered and unfiltered) was detected at maximum concentrations in excess of the state MCL. However, sodium, calcium, magnesium, and potassium were not selected as COPCs because these chemicals are considered to be essential nutrients.

Maximum concentrations of bis(2-ethylhexyl)phthalate, antimony (filtered), beryllium (filtered), cadmium (filtered and unfiltered), lead (unfiltered), manganese (filtered and unfiltered), nickel (filtered and unfiltered) and thallium (filtered and unfiltered) detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. As previously noted, groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

Because groundwater at the Area A Wetland eventually discharges to a surface water body (i.e., the Area A Wetland itself or the streams of the Area A Downstream Watercourses), site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection. Arsenic (filtered and unfiltered), beryllium (filtered), cadmium (filtered and unfiltered), lead (filtered and unfiltered), and

zinc (filtered and unfiltered) were detected at maximum concentrations exceeding the surface water protection criteria.

Of the COPCs selected for bedrock groundwater, maximum concentrations of bis(2-ethylhexyl)phthalate, antimony, arsenic, barium, beryllium, boron, manganese, nickel, and thallium were in excess of the maximum detected concentrations of these chemicals in off-site residential wells. Conversely, the concentrations of cadmium, lead, and zinc detected in Area A Wetland bedrock groundwater were below the respective concentrations detected in off-site residential wells.

The following parameters were selected as COPCs for Area A Wetland surface water based upon the COPC screening analysis presented on Table 2-12:

- Inorganics (arsenic, boron, cadmium, manganese, nickel, and zinc).

Maximum concentrations of cadmium (unfiltered) exceeded the COPC screening level, the federal MCL, and the state MCL. Of these three criteria, maximum concentrations of arsenic (unfiltered), boron (unfiltered), and nickel (unfiltered) exceeded only the COPC screening levels. Manganese (filtered and unfiltered) concentrations exceeded both the federal and state MCLs.

Concentrations of iron (filtered and unfiltered) exceeded COPC screening levels and the federal MCL. Aluminum (filtered and unfiltered) concentrations were in excess of the federal secondary MCL. However, aluminum and iron were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for both chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium (filtered and unfiltered) was detected at maximum concentrations in excess of the state MCL. However, sodium, calcium, magnesium, and potassium were not selected as COPCs because these chemicals are considered to be essential nutrients.

Maximum concentrations of cadmium (unfiltered) and manganese (filtered and unfiltered) detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. As previously noted, groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment. Additionally, cadmium (unfiltered) and zinc (unfiltered) were detected at maximum concentrations exceeding the Connecticut remediation standards for surface water protection.

### 2.3.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Site 2B using the decision tree approach is as follows:

- The Area A Wetland was investigated during the IAS, the Verification Step 1A Study, the Phase I and Phase II RIs, and the Area A Landfill/Wetland Interface Sampling. The information collected during these investigations is sufficient to describe the site and its physical characteristics.

- The Phase II RIs concluded that little evidence of surface water or groundwater contamination exists at the site; however, significant pesticide, PCB, and PAH contamination exists in the site soil and sediments. Both the Phase I and Phase II RIs concluded that there are risks associated with this site and the Area A Wetland should proceed to a FS.

- The Area A Landfill/Wetland Interface Sampling Investigation concluded that the Area A Landfill appeared to be the source of organic contamination at the Area A Wetland. The installation of the cover system over the Area A Landfill Site will significantly reduce the migration of contaminants to this site.

- Further action is required at Site 2B, as discussed in Section 2.3.7.

### 2.3.7 Recommendations

Site 2B was thoroughly investigated during previous investigations. Since a cover system has been installed at the Area A Landfill and the landfill has been paved over as a result of an interim remedial action in 1997, the future release of contaminants to the Area A Wetland should be minimized. Although previous investigations have indicated contamination in the soil and sediments of the Area A Wetland it is believed that the only current source of these contaminants may be the Area A Weapons Center. Therefore, it is recommended that the Area A Wetland proceed to an FS to evaluate a limited action effort consisting of a groundwater monitoring program and possibly access/use restrictions. The groundwater monitoring program will verify that contamination detected in the soil and sediment of the Area A Wetland is not migrating downgradient. The exact nature of the limited action alternative will be developed in the FS along with one or more active remediation alternatives.

A limited action alternative may only be implemented at the Area A Wetland if it compares favorably in the FS to other "no action" and "active remediation" alternatives. Any groundwater monitoring points at this site must be sampled in conjunction with the groundwater monitoring program that will soon be implemented in conjunction with the cover system at the Area A Landfill since that program will include

sampling points within the Area A Wetland at the interface with the landfill. The results of the sampling activities should be evaluated within the Basewide Groundwater OU RI.

## 2.4 SITE 3 – AREA A DOWNSTREAM WATERCOURSES AND OBDA

### 2.4.1 Site Description

The Area A Downstream Watercourses receive surface water and groundwater recharge from the Area A Landfill, Area A Wetland, Torpedo Shops, OBDANE, and surrounding areas and convey them to the Thames River. The Area A Downstream Watercourses include North Lake and several small ponds (Upper Pond, Lower Pond, and OBDA Pond) and interconnected streams (Streams 1 through 6). The general configuration of the Area A Downstream Watercourses is shown on Figure 2-4. The location of these sites within NSB-NLON is shown on Drawing 1.

The primary discharge point of the Area A Wetland is from four 24-inch diameter metal culverts through the dike. The discharge from this culvert forms a small stream (Stream 4) that flows westward for approximately 200 feet into Upper Pond. Under normal flow conditions, Upper Pond discharges to Stream 3, which flows northward and then westward toward Triton Avenue (past the OBDANE site) to the entrance of the Torpedo Shops. At this location, it meets the drainage channel from the Torpedo Shops and forms Stream 5. Stream 5 flows westward along Triton Avenue through the Small Arms Range and under Shark Boulevard and eventually discharges to the Thames River at the DRMO outfall. Upper Pond also has a discharge structure on the south side. During periods of high flow and high water at the pond, water also flows out through this structure to Stream 1, which flows westward from the OBDA site. A second pond (Lower Pond), northwest of Upper Pond, is a natural depression and is recharged by groundwater inflow. The outlet of the pond forms Stream 2, which enters a storm sewer and flows to the west around North Lake.

Groundwater discharges from the Area A Landfill to a small pond (the OBDA Pond) at the base of the dike and the OBDA. Stream 1 flows from this pond westward toward North Lake, a recreational swimming area for Navy personnel. Under normal flow conditions, the stream enters a culvert that by-passes North Lake and discharges to a stream (Stream 6) below the outfall of the lake. Stream 6, which is formed by Stream 1, Stream 2, and the outflow of North Lake, flows westward under Shark Boulevard and through the golf course to the Thames River. North Lake is filled with potable water every year and drained at the end of the season. Surface water levels in North Lake do not appear to coincide with groundwater levels in adjacent monitoring wells, indicating little hydraulic connection between surface water of North Lake and the shallow groundwater.

Most of the area is within designated Explosive Safety Quantity Distance (ESQD) arcs of the Area A Weapons Center; therefore, further development is not planned for this area. Navy regulations prohibit construction of inhabited buildings or structures within these arcs and, while existing buildings operate under a waiver of these regulations, no further construction is planned. The soil and sediment at Site 3 is currently under remedial design. A Proposed Plan and Record of Decision (ROD) have been completed; the ROD was signed in late 1997. Under this design plan, contaminated soil and sediment at Site 3 will be dredged and hauled off site for disposal and wetlands and waterways in the area will be restored.

The OBDA is located on the slope of the dike below and adjacent to the Area A Landfill. It is located on the southwestern end of the dike where the angle of the slope approaches 45 degrees. A small wetland exists at the base of the dike. This area was used as a disposal site after the earthen dike was constructed in 1957. The IAS report (NEESA, 1983) indicated that the material had been there for many years. The IAS report also indicated that the materials were not covered and included 30 partially covered 200-gallon metal fuel tanks and scrap lumber. Atlantic personnel inspected the OBDA on September 30, 1988 and observed approximately 30 empty, unlabeled 200-gallon tanks, old creosote telephone poles, several empty unlabeled 55-gallon drums, and rolls of wire. Orange sediments were observed in the water discharging from the base of the dike embankment. All the debris from the OBDA area was removed and disposed off site as part of a time-critical removal action.

### 2.4.2 Site Investigations

The following investigations and decision documents related to the Area A Downstream Watercourses and OBDA are discussed in the subsections that follow:

- Final Initial Assessment Study (Envirodyne, 1983)
- Final Verification Step 1A Study (Wehran, 1988)
- Phase I Remedial Investigation (Atlantic, 1992)
- Focused Feasibility Study (Atlantic, 1994b)
- Phase II Remedial Investigation (B&R Environmental, 1997a)
- Feasibility Study for Soil and Sediment (B&R Environmental, 1997f)
- Proposed Plan (B&R Environmental, 1997c)
- Record of Decision (B&R Environmental, 1997g)

#### 2.4.2.1 Final Initial Assessment Study

In 1982, Envirodyne Engineers performed an IAS at NSB-NLON as part of the NACIP program. The purpose of this study was to identify and evaluate past waste disposal practices and to assess the

potential for environmental impacts. Envirodyne reviewed installation records, interviewed long-term and former employees, toured the installation, and photographed sites as part of the IAS.

Envirodyne identified 11 sites at NSB-NLON as having contained hazardous material; two of the sites were Area A (Site 2), which included the Area A Landfill, the Area A Wetland, and the Area A Downstream Watercourses, and OBDA (Site 3). The IAS concluded that the source of contamination for this site was still present and potentially releasing contaminants to the environment. The IAS recommended that further sampling of surface waters and sediments at this site be performed.

#### 2.4.2.2 Final Verification Step 1A Study

In 1988, Wehran Engineering Corporation performed a Final Verification Step 1A Study for the DRMO Area, the OBDA, and the Area A Landfill as part of the NACIP program. The purpose of this study was to verify the presence or absence of contamination at these historically documented landfill areas. As part of the Verification Step 1A Study, Wehran performed three rounds of surface water and sediment sampling at six locations (SW-1 through SW-6) adjacent to the Area A Landfill site, including the OBDA. These samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals.

The study concluded that the surface waters and sediments near the Area A Landfill Site have levels of metals, PAHs, and pesticides that exceed regulatory criteria; however, the immediate health threat to base personnel from these contaminants appears minimal. The Verification Step 1A Study recommended that a Site Characterization Step 1B Study be performed at the Area A Site.

#### 2.4.2.3 Phase I Remedial Investigation

An investigation of 11 sites was completed at NSB-NLON by Atlantic Environmental Services from 1990 through 1992. Two sites, Area A (Site 2) which includes the present Area A Landfill, the Area A Wetland, and the Area A Downstream Watercourses, and OBDA (Site 3) were identified.

One surface and four subsurface soil samples were collected from five monitoring well borings completed during the Phase I RI. With the exception of the surface soil sample collected from well 3MW12S, which was located adjacent to the wetland at the OBDA, the soil sampling was conducted at locations in undeveloped wooded areas where no past disposal had been reported. All five soil samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals (total), and TCLP metals. In addition, TCLP pesticides analysis was conducted on the surface soil sample collected from well 3MW12S.

Twenty-two sediment samples (plus three field duplicates) were collected for analysis from the wetland near the OBDA and the Area A Downstream Watercourses and associated ponds. The samples were collected from 18 sample locations and included five sample locations at the OBDA. Two sediment samples were collected at each OBDA sampling location (0 to 6 inches and 12 to 18 inches). Previous analysis of sediments in this area indicated the presence of pesticides and metals. All sediment samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals (total), and TCLP metals and pesticides.

Three shallow (overburden) and five deep (bedrock) monitoring wells were installed and sampled in this area, accounting for eight groundwater samples (plus one field duplicate). Additionally, 12 surface water samples (plus two field duplicates) were collected from this area. All groundwater and surface water samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and TAL metals (total). In addition, gross alpha and gross beta radiological analyses were performed for three surface water samples and all groundwater samples except for the field duplicate sample. A wildlife survey was also performed in this area during the Phase I RI. All sample locations are shown in Figure 2-4.

The Phase I RI concluded that several risk exposure scenarios exceeded acceptable regulatory levels and that a FS should be performed at the Area A Downstream Watercourses and OBDA Site.

#### 2.4.2.4 Focused Feasibility Study

A draft FFS covering surface soil and sediments at Site 3 was completed by Atlantic Environmental Services in 1994. During this investigation, eight surface soil samples (plus one field duplicate) were collected and analyzed for TCL pesticides/PCBs. Six of the eight surface soil samples were also analyzed for grain size distribution, moisture content, and TOC. Additionally, 12 sediment samples (plus one field duplicate) were collected. Sample locations are shown on Figure 2-4. Ecological sampling was also performed as part of the FFS.

The FFS concluded that VOCs, SVOCs, and PCBs were not found in the sediments at Site 3; however, pesticides were detected in all 15 sediment samples. In addition, DDTR was detected in all the soil samples at the site. The FFS concluded that off-site landfilling and on-site thermal desorption provide superior protection of the environment and that the landfilling alternative is more cost effective than the on-site thermal desorption alternative.

#### 2.4.2.5 Phase II Remedial Investigation

A Phase II RI at 13 sites at NSB-NLON was conducted by B&R Environmental from 1995 through 1997. Area A Downstream Watercourses and OBDA Site 3 was one of the sites investigated.

Thirteen new groundwater wells (seven shallow and six deep) were installed and sampled during the Phase II RI. Eight previously installed monitoring wells were also sampled. Two rounds of groundwater sampling were completed, and 23 samples (including two field duplicates) were collected during each sampling round. All groundwater samples collected during both rounds of sampling were analyzed for TCL VOCs, TCL SVOCs, and TAL metals (total and dissolved). In addition, nine selected samples and one duplicate were analyzed for gross alpha and gross beta radiological parameters. Four sediment samples and 16 surface water samples (including two field duplicate samples) were also collected at this site. Sample locations are shown on Figure 2-4.

Phase II RI Supplemental Ecological Investigation

Four additional rounds of surface water and sediment sampling were conducted as part of the Phase II RI, primarily to obtain ecological data for the site. Twenty-one surface water samples (plus from one to three field duplicates) and 21 sediment samples were collected during Rounds 1, 2, and 3. Only 17 surface water samples (plus one field duplicate) and seventeen sediment samples were collected during Round 4 because four sample stations were dry at the time of sampling. Samples collected during Rounds 1, 3, and 4 were analyzed for TSS (surface water samples) and macroinvertebrate taxonomy (sediment samples) only. Samples collected during Round 2 were analyzed for several additional ecological and chemical parameters. Sample locations are shown on Figure 2-4.

Off-site reference samples were also collected for surface water and sediment in conjunction with the ecological sampling. These samples were collected from a reference stream and two ponds, similar in nature to the Area A Downstream and OBDA ponds and streams. For example, the reference ponds and stream had similar substrate, morphology, vegetation, current velocity, water temperature, pH, and dissolved oxygen (DO) levels but were located away from known sources of contamination to provide adequate data on background concentrations of constituents. The two ponds were Niantic Pond and Pequot Woods Ponds. The reference stream was Fishtown Brook, which is formed by the discharge from Pequot Woods Pond.

A soil gas survey was also performed in December 1993, as part of the Phase II RI. Forty-five soil gas samples were successfully collected from a 150- by 150-foot grid in the vicinity of monitoring well 2DMW15. Sampling was attempted at two additional locations (D19 and D41) but could not be completed due to repeated auger refusal at location D19 and the presence of water at location D41. All samples were field-screened for PCE, TCE, and toluene.

The Phase II RI concluded that an unknown source of VOCs was detected in the groundwater at Site 3, the site poses noncarcinogenic risks to the site worker and older child trespasser, and notable detections of pesticides exist in site soil and sediments. The Phase II RI recommended that the feasibility study for this site should be revisited to focus on pesticides in soil and sediment, more sampling is required to delineate pesticide contamination and determine the origin of VOCs in groundwater, and finally, the debris associated with the OBDA should be removed.

#### 2.4.2.6 Focused Feasibility Study for Soil and Sediment

A FFS for soil and sediment at Site 3 was completed by B&R Environmental in December, 1997. No additional samples were collected during this investigation, which evaluated four remedial alternatives for the Area A Downstream Watercourses and OBDA: no action; capping, restoration of wetlands and waterways, and institutional controls; dredging, on-site dewatering, off-site disposal of sediment and soil, restoration of wetlands and waterways, and monitoring; and dredging, on-site dewatering, on-site thermal desorption of sediment and soil, on-base reuse of treated soil, off-site disposal of sediment, restoration of wetlands and waterways, and monitoring.

#### 2.4.2.7 Proposed Plan and Record of Decision Documents

The preferred remedial alternative in the Proposed Plan consisted of dredging, on-site dewatering, off-site disposal of sediment and soil, restoration of wetlands and waterways, and monitoring. The ROD, signed in December 1997, indicated that the Navy proceed with the selected remedial alternative. The site is currently under remedial design.

### 2.4.3 Physical Characteristics

This section presents a summary of site physical characteristics for the Area A Downstream Watercourses based on information generated during the Phase I and Phase II RIs. Subsequent to the completion of the RIs, the debris associated with the OBDA was removed in accordance with a time-critical removal action. Topography and surface features, surface water, soils, geology, and hydrogeology are discussed in the subsections that follow.

#### 2.4.3.1 Topography and Surface Features

Site 3 is located within a northwest-trending valley situated between the topographic/bedrock high that occupies the central area of the NSB-NLON and the topographic/bedrock high that forms the northern border of the NSB-NLON. Figure 2-4 shows the topography and surface features of Site 3. This valley between the large northern and central ridges is narrow in the eastern portion of the site near the earthen dike, then widens to the west. The ground surface drops steeply approximately 30 to 40 feet from the

Area A Wetland across the dike to Site 3. The ground surface in the downstream area near the dike is at an approximate elevation of 40 feet msl. From the base of the dikes, the ground surface elevation gently drops along the stream valley toward the Thames River. A local topographic high that rises to 70 feet msl exists east of North Lake and is believed to reflect a local bedrock high. The OBDA is located in a relatively flat area at the base of the dike. The ground elevation is approximately 40 feet msl at the OBDA.

There are relatively few buildings (Buildings 281, 468, 223, 282, 454) at Site 3. Most of these buildings are associated with the recreational area at North Lake and the golf course. A large portion of the area is a golf course. Further development is not planned for this area, because most of it is within the designated EQSD arcs of the Weapons Center.

#### 2.4.3.2 Surface Water Features

The Area A Downstream Watercourses receive surface water and groundwater recharge from the Area A Landfill, Area A Wetland, Torpedo Shops, OBDANE and surrounding areas and convey them to the Thames River. The Area A Downstream Watercourses include North Lake and several small ponds (Upper Pond, Lower Pond, and OBDA Pond) and interconnected streams (Streams 1 through 6).

#### 2.4.3.3 Soil Characteristics

According to the SCS Soils Map (SCS, 1983), the soil in the eastern portion of Site 3 (between the earthen dike and North Lake) is Charlton-Hollis complex. This complex consists of rocky, fine sandy loam. In the western portion of the site, which is primarily a golf course, the soil is classified as Udorthents-Urban land. Along the bedrock high near wells 2DMW16, 2DMW24, and 2DMW25, the soil is classified as the Hollis-Charlton-Rock complex. This soil is defined as stones and boulders intermingled with a dark, fine, sandy loam. The soil at the OBDA is also defined as the Hollis-Charlton-Rock complex.

#### 2.4.3.4 Geology and Hydrogeology

Geology

The geology of Site 3 consists of overburden deposits (primarily of silt, sand, and gravel) overlying metamorphic bedrock. The bedrock within the Area A Downstream Watercourses and OBDA has been identified as the Mamacoke Formation. The overburden consists of silty sand and gravel and is mapped as stratified drift of former meltwater streams (USGS, 1960). Although these are natural materials, they have most likely been re-worked in the area of the golf course.

In general, the overburden thickness increases from the valley margins to the center of the valley and from southeast to northwest along the valley axis. The overburden thickness is less than 5 feet at wells 2DMW23S and 2DMW10D and less than 15 feet at wells 2DMW25D and 2DMW27D. The overburden is thicker in the golf course area, and bedrock surface was not encountered in the 50-foot boring at well 2WMW26D.

The bedrock surface slopes from the northern and central bedrock highs that surround the area toward the northwest-trending valley. There appears to be a localized bedrock high at well 2DMW15D. The depth to bedrock is only 4 feet at this location, and the bedrock surface elevation is higher than was encountered in surrounding boreholes. This local bedrock high corresponds to a topographic high on the surficial geology map (USGS, 1960).

The OBDA is located along the base of the earthen dike, below and adjacent to the Area A Landfill. During the Phase I RI, two monitoring wells were installed (3MW12S, 3MW12D) in this area. The boring logs indicate that the overburden locally consists of sand and boulders. The depth to bedrock was approximately 15 feet.

Hydrogeology

Groundwater is present in both the overburden and bedrock underlying Site 3. The saturated thickness of the overburden ranges from a few feet, along the valley margins, to greater than 40 feet, in the central portion of the stream valley. Depth to groundwater ranges from a few feet in the eastern portion of the site to over 15 feet in the golf course area to the west. Drawing 3 shows groundwater flow patterns in the shallow overburden across Site 3. Drawing 4 shows groundwater flow patterns for the shallow bedrock. In both the overburden and bedrock, groundwater flows from the topographic/bedrock highs and the Area A Wetland to the site. From the downstream area, groundwater flows to the west toward and discharges into the Thames River. At the OBDA, there are upward gradients between the overburden and bedrock at the 2DMW11 and 3MW12 well clusters. There are downward gradients throughout most of Site 3 (2DMW16, 2DMW24, 2DMW25, 2DMW26, and 2DMW27 well clusters). An upward gradient is present in well cluster 2DMW28.

Along the valley margins and near the Area A Wetlands dike, local groundwater flow gradients are steep. As the bedrock slope becomes milder and the overburden thickens, the hydraulic gradients flatten. The overall hydraulic gradient in the direction of groundwater flow across Site 3 within both the overburden and bedrock is approximately 0.022. In both the overburden and bedrock, the hydraulic gradient slightly steepens toward the Thames River.

A slug test was performed in overburden well 2DMW16S within Site 3 during the Phase I RI. Using the test data, a hydraulic conductivity of 6.8 ft/day was calculated for this well. The well is screened primarily in sandy materials.

Bedrock wells (2DMW10D and 2DMW16D) were also slug tested during the Phase I RI. Bulk hydraulic conductivity values of 1.25 ft/day and 0.09 ft/day, respectively, were derived for the bedrock from the test data.

Using a flow gradient of 0.022, a hydraulic conductivity of 6.8 ft/day, and an assumed porosity of 0.3, the average groundwater flow velocity through the sandy overburden materials at Site 3 was calculated as approximately 0.5 ft/day. This velocity is based on limited data, especially in regard to hydraulic conductivities, and therefore should be regarded as a rough estimate only.

### 2.4.4 Nature and Extent of Contamination

Soil, groundwater, surface water, and sediment sampling was conducted at Site 3 during the Phase I and Phase II RIs and the FFS. Based upon the results of these investigations, the nature and extent of contamination of groundwater at the site are discussed in the following subsection. The complete analytical database for groundwater is contained in Appendix A. Analytical results for soil and sediment samples will not be discussed because all contaminated soils and sediments at this site will be removed as part of a remedial action and will therefore no longer be a potential source of contamination for groundwater. Analytical results for surface water samples will not be discussed because this medium will also no longer be a potential source of contamination for groundwater after the contaminated sediments from the Area A Downstream Watercourses are removed and the appropriate remedial actions are taken for the Installation Restoration Program sites (i.e., Area A Landfill, Area A Wetland, Area A Weapons Center, and the Torpedo Shops) located hydraulically upgradient of Site 3.

#### 2.4.4.1 Groundwater

Groundwater samples from both overburden and bedrock wells installed within the Area A Downstream Watercourses (Site 3A) and downgradient of the OBDA (Site 3B) were collected during previous investigations. Well 2DMW27S was screened at an interval that spans both the overburden and bedrock aquifers. Groundwater samples collected from this well are considered to be representative of the overburden aquifer for purposes of data evaluation. Table 2-13 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in groundwater samples collected from overburden wells at the Area A Downstream Watercourses. Table 2-14 presents similar information for

groundwater samples collected from bedrock wells at this site. Based upon the screening level assessment for the Area A Downstream Watercourses and OBDA (Section 2.4.5.3) and the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary COPCs in Area A Downstream Watercourses and OBDA overburden and bedrock groundwater samples are presented on Drawings 5 and 6, respectively (Volume II).

Overburden Wells

As shown on Table 2-13, seven VOCs, including six halogenated aliphatics and benzene, were detected in the groundwater samples collected from the overburden wells at the Area A Downstream Watercourses. Each VOC was detected in from one to three of 25 samples. Most of the positive results were associated with samples collected from well 2DMW29S, located along Triton Road in the north-central portion of the site. Maximum concentrations of total 1,2-dichloroethene (28 µg/L), bromodichloromethane (2 µg/L), chloroform (12 µg/L), methylene chloride (11 µg/L), and vinyl chloride (130 µg/L) were detected in samples from this well. As discussed in the Phase II RI (B&R Environmental, 1997a), none of these chemicals were identified in the surface water samples collected from the adjacent drainageway along Triton Road. However, well 2DMW29S is located in close proximity to a storm sewer/drainageway that ultimately receives discharge from the Torpedo Shops leach fields. It is believed that the source of this groundwater contamination is the leach fields. Similar types of contamination were found in samples collected in the vicinity of the leach fields. Chloromethane and methylene chloride were also detected in one of the samples collected from the off-site residential wells. However, only methylene chloride was detected in site groundwater at a maximum concentration in excess of that detected in the off-site residential wells.

Two phthalate esters (plasticizers that are common field and laboratory contaminants) and benzoic acid were each detected in from one to three of the groundwater samples collected from overburden wells. Concentrations of bis(2-ethylhexyl)phthalate ranged from 6 µg/L to 59 µg/L. This SVOC was also detected at a concentration of 3 µg/L in one of the groundwater samples collected from the off-site residential wells. Concentrations of the remaining two SVOCs ranged from only 0.6 µg/L to 0.7 µg/L. Neither pesticides nor PCBs were detected in groundwater samples collected from the overburden wells.

As shown on Table 2-13, 23 metals were detected in unfiltered groundwater samples collected from the overburden wells and 19 metals were detected in the associated filtered groundwater samples. Maximum concentrations of all metals except cadmium, copper, lead, and silver (in both filtered and unfiltered samples); iron and zinc (in filtered samples only); and mercury and selenium (in unfiltered samples only) exceeded concentrations of respective metals detected in unfiltered groundwater samples collected from the off-site residential wells. Greater than two-thirds of the maximum concentrations of metals were

associated with samples collected from overburden wells 2DMW30S and 2DMW12S. Notable results for metals include maximum concentrations reported for aluminum (97,400 µg/L), arsenic (23.9 µg/L), barium (835 µg/L), manganese (6,710 µg/L), vanadium (229 µg/L), and zinc (800 µg/L).

Radionuclide analyses (gross alpha and gross beta) were performed for three groundwater samples collected from overburden wells during the Phase I RI. Complete gamma spectrum analysis and analyses for gross alpha and gross beta were performed for four groundwater samples collected from overburden wells during the Phase II RI. Analytical results for radionuclide analyses are provided in the database tables in Appendix A. Based on the levels of uncertainty reported with results (i.e., uncertainty levels are greater than results themselves), the gross alpha level in the groundwater sample collected from well 2DMW16S and gross beta levels in the groundwater samples collected during the Phase I RI from wells 2DMW11S and 3MW12S were considered to be not detected in these samples. Of the remaining results, gross alpha concentrations reported for samples collected from the overburden wells ranged from 6 pCi/L to 89 pCi/L, and gross beta concentrations ranged from 5.1 pCi/L to 64 pCi/L. Maximum concentrations of gross alpha and gross beta were associated with the groundwater sample collected from well 3MW12S during Round 2 of the Phase II. Complete gamma spectrum analyses performed during Rounds 1 and 2 of Phase II yielded no positive results for radionuclides.

Analyses for hardness were performed for 19 of the groundwater samples collected from overburden wells. Reported results for this parameter ranged from 43 mg/L to 456 mg/L.

Bedrock Wells

Five halogenated aliphatics (1,1,2,2-tetrachloroethane, total 1,2-dichloroethene, chloroform, methylene chloride, and TCE) were detected in the groundwater samples collected from bedrock wells at the Area A Downstream Watercourses. Each VOC was detected in from one to four of the 25 groundwater samples. Concentrations ranged from 1 µg/L (TCE) to 17 µg/L (also TCE). Methylene chloride, which was detected in a single groundwater sample at a concentration of 7 µg/L, was also detected in one of the samples from the off-site residential wells at a concentration of 4 µg/L. Maximum concentrations of 1,1,2,2-tetrachloroethane, total 1,2-dichloroethene, and TCE were detected in the groundwater sample collected from well 2DMW16D, located approximately 125 feet southeast of North Lake, during the Phase I RI.

Eleven SVOCs were also detected in groundwater samples from the Area A Downstream Watercourses bedrock wells. Six PAHs, ranging in concentration from 1 µg/L to 4 µg/L, were detected in the groundwater sample collected during Round 1 of the Phase II RI from well 3MW12D. This well is located at the downgradient edge of the OBDA. As discussed in the Phase II RI (B&R Environmental, 1997a),

PAHs were also prevalent contaminants in the sediment samples collected from the OBDA wetland. The dredge spoils placed in this area are the most likely source of PAH contamination.

In addition, bis(2-ethylhexyl)phthalate was detected in five groundwater samples at concentrations ranging from 2 µg/L to 20 µg/L. This SVOC was also detected in one of the samples collected from the off-site residential wells at a concentration of 3 µg/L. Two additional phthalates, benzoic acid, and phenol were each detected in one or two groundwater samples at concentrations ranging from 0.5 µg/L to 5 µg/L. As previously noted, phthalates are considered to be common laboratory contaminants. Neither pesticides nor PCBs were detected in any of the groundwater samples.

As shown on Table 2-14, 22 metals were detected in unfiltered groundwater samples collected from the bedrock wells and 18 metals were detected in the associated filtered groundwater samples. Maximum concentrations of all metals except aluminum, barium, mercury, and nickel (in filtered samples only); cadmium, silver, and vanadium (in unfiltered samples only); and copper, lead, and zinc (in filtered and unfiltered samples) exceeded concentrations of respective metals detected in unfiltered groundwater samples collected from the off-site residential wells. Approximately 42 percent of the maximum concentrations of metals were associated with samples collected from bedrock well 2DMW12D. Notable results for metals include maximum concentrations reported for manganese (7,630 µg/L) and sodium (3,560,000 µg/L).

Radionuclide analyses (gross alpha and gross beta) were performed for three groundwater samples collected from overburden wells during the Phase I RI. Complete gamma spectrum analysis and to analyses for gross alpha and gross beta were performed for four groundwater samples collected from overburden wells during the Phase II RI. Analytical results for radionuclide analyses are provided in the database tables in Appendix A. Based on the levels of uncertainty reported with results (i.e., uncertainty levels are greater than or equal to the results themselves), gross alpha levels in the groundwater samples collected during the Phase I RI from bedrock wells 2DMW11D, 2DMW15D, and 2DMW16D are considered to be not detected in these samples. The remaining results for samples collected from the bedrock wells ranged from 3.1 pCi/L to 35 pCi/L, and gross beta concentrations ranged from 5.6 pCi/L to 40 pCi/L. Complete gamma spectrum analyses performed during Rounds 1 and 2 of Phase II yielded no positive results for radionuclides.

Analyses for hardness were performed for 19 of the groundwater samples collected from bedrock wells. Reported results for this parameter ranged from 28 mg/L to 572 mg/L.

### 2.4.5 Data Evaluation

This section summarizes data evaluation procedures performed for site data. A discussion of contaminant fate and transport, a summary of the historical HHRA(s) performed for the site, and a screening level assessment of site data are provided.

#### 2.4.5.1 Contaminant Fate and Transport

The Area A Downstream Watercourses and OBDA consists of a number of drainageways that receive runoff from the OBDANE, Area A Landfill, Area A Wetland Torpedo Shops, and Area A Weapons Center. Additional runoff is received from various roadways.

The groundwater data collected from this site indicated that shallow overburden groundwater well 2DMW29S near Triton Road contained notable concentrations of vinyl chloride (130 μg/L) and 1,2-dichloroethene (29 μg/L). No soil samples were collected in the same general area, so a source could not be identified. These compounds are highly soluble and may have migrated from a localized disposal area (surface or subsurface) or possibly from the Torpedo Shops. No intervening wells are available to determine if the Torpedo Shops site is the source, although halogenated aliphatics were detected at that site. 1,2-Dichloroethene (total) was also detected in bedrock wells. It was detected at a maximum concentration of 13 μg/L in well 2DMW16D.

#### 2.4.5.2 Summary of Human Health Risk Assessment

Three potential receptor groups were considered for the Phase II RI baseline risk assessment: older child trespassers, construction workers, and adult and child recreational users. However, groundwater was considered to be a potential medium of exposure for the construction worker only. An evaluation of risks associated with dermal contact with groundwater during intrusive activities was conducted for the construction worker under CTE and RME scenarios.

The noncarcinogenic risk associated with dermal exposure to groundwater for the construction worker under the CTE scenario was less than the USEPA acceptable level of one. However, the noncarcinogenic risk for this route of exposure under the RME scenario was 9.2. Antimony and manganese were the primary contributors to the noncarcinogenic hazards; the HQs associated with dermal contact with groundwater for the construction worker for these two chemicals under RME were 7.5 and 1.4, respectively.

The incremental cancer risks associated with dermal contact with groundwater for the construction worker were within USEPA's target risk range (1E-4 to 1E-6) and less than the CTDEP target cancer risk (1E-5) for both the RME and CTE scenarios. Carcinogenic risks associated with dermal exposure to groundwater for

the construction worker were largely attributed to the sporadic presence of vinyl chloride in shallow wells and 1,1,2,2-tetrachloroethane in deep wells.

#### 2.4.5.3 Screening Level Assessment

COPCs at this site were selected using the risk-based COPC screening levels described in Section 1.4.2. All data collected during the Phase I and II RIs were used to select COPCs for groundwater. Maximum and 95% UCL chemical concentrations are presented in the summary tables. Although the maximum concentration of a chemical may exceed an associated criterion, the distribution of the chemical in the medium is also important with respect to decision making. Therefore, the 95% UCL chemical concentration was included to provide some information on the potential distribution of the chemical. In addition, the summary tables for groundwater samples present the range of concentrations detected in off-site residential wells for each detected chemical to enable comparison of site groundwater data with groundwater data collected from wells unaffected by the site. A brief narrative of the findings of this qualitative analysis is provided in the remainder of this section.

The following parameters were selected as COPCs for Area A Downstream Watercourses and OBDA overburden groundwater based upon the COPC screening analysis presented on Table 2-13:

- Halogenated aliphatic hydrocarbons: [1,2-dichloroethene (total), bromodichloromethane, chloroform, chloromethane, methylene chloride, and vinyl chloride]
- Monocyclic aromatic hydrocarbons (benzene)
- SVOCs [bis(2-ethylhexyl)phthalate]
- Inorganics (arsenic, barium, beryllium, boron, cadmium, chromium, lead, manganese, mercury, thallium, vanadium, and zinc).

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary overburden groundwater COPCs (arsenic, boron, lead, and manganese) associated with Area A Downstream Watercourses and OBDA overburden groundwater samples are presented on Drawing 5 (Volume II).

Maximum concentrations of methylene chloride, vinyl chloride, bis(2-ethylhexyl)phthalate, cadmium (unfiltered), manganese (filtered and unfiltered), and thallium (filtered and unfiltered) exceeded the COPC screening level, the federal MCL, and the state MCL. Of these three criteria, maximum concentrations of 1,2-dichlororethene (total), benzene, bromodichloromethane, chloroform, chloromethane, arsenic (filtered and unfiltered), barium (filtered and unfiltered), boron (filtered and unfiltered), cadmium (filtered), chromium (unfiltered), and vanadium (unfiltered) exceeded only the COPC screening level. The maximum concentration of beryllium (unfiltered) was in excess of both the federal and state MCLs, and the maximum

concentration of lead (unfiltered) exceeded the federal action level for lead in drinking water. However, of these COPCs, benzene, bromodichloromethane, chloromethane, methylene chloride, and mercury were detected at frequencies of 5 percent or less.

Concentrations of iron (filtered and unfiltered) exceeded both COPC screening levels as well as the federal MCL. Aluminum (filtered and unfiltered) was detected at maximum concentrations in excess of the federal secondary MCL. The maximum detected concentration of copper (unfiltered) was in excess of the COPC screening level. However, these chemicals were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for these chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium (filtered and unfiltered) was detected at maximum concentrations in excess of the state MCL. However, sodium, calcium, magnesium, and potassium were not selected as COPCs because these chemicals are considered to be essential nutrients.

Maximum concentrations of bromodichloromethane, chloroform, methylene chloride, vinyl chloride, bis(2-ethylhexyl)phthalate, beryllium (unfiltered), cadmium (unfiltered), chromium (unfiltered), lead (unfiltered), manganese (filtered and unfiltered), thallium (filtered and unfiltered), and vanadium (unfiltered) detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. Groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

Site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection, yielding the following exceedances: arsenic (filtered and unfiltered), beryllium (unfiltered), copper (unfiltered), lead (unfiltered), mercury (unfiltered), and zinc (unfiltered). Copper was not selected as a COPC; USEPA Region I does not advocate quantitative evaluation of exposure to this chemical because the only available toxicity criterion for this chemical is a provisional reference dose based on allowable intakes rather than adverse effect levels.

Of the selected COPCs, maximum concentrations of methylene chloride, bis(2-ethylhexyl)phthalate arsenic, barium, beryllium, boron, chromium, manganese, thallium, vanadium, and zinc in overburden groundwater at Area A Wetland exceeded detected concentrations of these chemicals in off-site residential wells. Conversely, the maximum detected concentrations of chloromethane, cadmium, mercury, and lead were below the maximum detected concentrations of these compounds detected in off-site residential wells.

The following parameters were selected as COPCs for Site 3 bedrock groundwater based upon the COPC screening analysis presented on Table 2-14:

- Chlorinated aliphatic hydrocarbons [1,1,2,2-tetrachloroethane, 1,2-dichloroethene (total), chloroform, methylene chloride, and TCE],
- SVOCs [bis(2-ethylhexyl)phthalate]
- PAHs [benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene]
- Inorganics (antimony, arsenic, barium, boron, cadmium, chromium, manganese, and thallium)

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for the primary bedrock groundwater COPCs (arsenic, barium, manganese, and zinc) associated with Area A Downstream Watercourses and OBDA bedrock groundwater samples are presented on Drawing 6 (Volume II).

Maximum concentrations of methylene chloride, TCE, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, antimony (filtered), cadmium (unfiltered), manganese (filtered and unfiltered), and thallium (filtered and unfiltered) exceeded the COPC screening level, the federal MCL, and the state MCL. Of these three criteria, maximum concentrations of 1,1,2,2-tetrachloroethane, 1,2-dichloroethene (total), chloroform, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, arsenic (filtered and unfiltered), barium (unfiltered), boron (filtered and unfiltered), and chromium (unfiltered) exceeded only the COPC screening levels. However, 1,1,2,2-tetrachloroethane, chloroform, methylene chloride, and the aforementioned PAHs were detected in less than 5 percent of the samples collected.

Concentrations of iron (filtered and unfiltered) exceeded COPC screening levels as well as the federal MCL. Aluminum (unfiltered) concentrations were in excess of the federal secondary MCL. However, aluminum and iron were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for both chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium (filtered and unfiltered) was detected at maximum concentrations in excess of the state MCL. However, sodium, calcium, magnesium, and potassium were not selected as COPCs because these chemicals are considered to be essential nutrients.

Maximum concentrations of 1,1,2,2-tetrachloroethane, methylene chloride, TCE, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, antimony (filtered), cadmium (unfiltered), lead (unfiltered), manganese (filtered and unfiltered), and thallium (filtered and unfiltered) detected in groundwater samples exceeded the

Connecticut remediation standards for groundwater protection. As previously noted, groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

Site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection, yielding the following exceedances: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, arsenic (filtered and unfiltered), and cadmium (unfiltered).

Of the selected COPCs, maximum concentrations of methylene chloride, bis(2-ethylhexy)phthalate, antimony, arsenic, barium, boron, chromium, manganese, and thallium were in excess of the maximum detected concentrations of these chemicals in off-site residential wells. Conversely, the concentrations of cadmium detected at Area A Wetland bedrock groundwater were below the concentration detected in off-site residential wells.

### 2.4.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Site 3 using the decision tree approach is as follows:

- Site 3 was investigated during the IAS, the Verification Step 1A Study, the Phase I and Phase II RIs, and two FFSs involving soil and sediments. The information collected during these investigations is sufficient to describe the site and its physical characteristics.

- The Phase II RI concluded that an unknown source of VOCs was detected in the groundwater at Site 3, the site poses noncarcinogenic risks to the site worker and older child trespasser, and notable detections of pesticides exist in site soil and sediments. The Phase II RI recommended that the FS for this site should be revisited to focus on pesticides in soil and sediment, more sampling is required to delineate pesticide contamination and determine the origin of VOCs in groundwater, and finally, the debris associated with the OBDA should be removed. This debris was removed during the remedial installation of the cover system at the Area A Landfill.

- The FS for soil and sediments at Site 3, which evaluated several remedial alternatives, was completed. The associated Proposed Plan was submitted; the preferred alternative consisted of dredging, on-site dewatering, off-site disposal of sediment and soil, restoration of wetlands and

waterways, and monitoring. The ROD, signed in December 1997, indicated that the Navy should proceed with the selected remedial alternative at Site 3.

- Further action is required at Site 3, as discussed in Section 2.4.7.

### 2.4.7 Recommendations

Site 3 was thoroughly investigated during previous investigations. In accordance with the ROD, signed in December 1997, all contaminated soil and sediments at this site will be removed and therefore will no longer be a potential source of contamination to the groundwater.

Several VOCs, including chloroform, vinyl chloride and 1,2-dichloroethene (total), were found in samples collected from overburden wells (and to a lesser extent in bedrock wells) in the north-central and western areas of the site, especially along Triton Road. Therefore, it is recommended that additional groundwater sampling and analyses be performed in support of the Basewide Groundwater OU RI to determine the source and extent of the VOCs and the fate and transport processes affecting the VOCs in both the overburden and bedrock aquifers.

In addition to the effort required for the VOC contamination, existing monitoring wells within the Area A Downstream site should be sampled and analyzed to verify that pesticides in the overlying soil and sediment are not impacting the groundwater. The groundwater samples should also be analyzed for TCL SVOCs and TAL metals to address the concerns brought up as a result of the screening level analysis.

## 2.5 SITE 4 – RUBBLE FILL AREA AT BUNKER A86

### 2.5.1 Site Description

Bunker A86 is located at the end of a dirt road off Wahoo Avenue in the north-central section of NSB-NLON. The Rubble Fill Area was located south of the Area A Landfill, near the landfill's west end. Historical site features are shown on Figure 2-5. The location of the site in relationship to other NSB-NLON IRP sites is shown on Drawing 1.

The Rubble Fill Area, which constituted Site 4, was located north of the dirt road and west of the bunker. The size of the site was approximately 25 feet in width by 60 feet in length. The site was on a wooded hillside that slopes to the north-northeast at a grade of approximately 40 percent. The IAS report indicated that discarded construction materials including concrete, asphalt, an electric motor, tar buckets, wood, and gravel were present at the site. As concluded in the IAS report, material had not been disposed at the site for more than 10 years prior to the date of the IAS (NEESA, 1982).

Atlantic personnel inspected the site on October 20, 1988 and noted that the majority of the material present at that time was construction debris (wood and concrete). Chemical containers found at the base of the fill during this inspection included an empty 5-gallon container of monothanolanine (labeled as a corrosive), an empty 5-gallon container of thorite (labeled as non-shrinking compound for patching concrete), and a 55-gallon drum of lubricating oil that was approximately 10 percent full.

In early 1997, construction debris and contaminated soil and sediment were removed from the site as part of a time-critical removal action and incorporated into the Area A Landfill subgrade except for the wood debris, which was sampled and disposed off site. Subsequently, the Verification Sampling Report determined that the cancer risk associated with the site still exceeded USEPA's target range. Therefore, in July 1997, the remaining contaminated soil was removed from Site 4, leaving only exposed bedrock. This completed the remedial action for the Rubble Fill Area at Bunker A86.

### 2.5.2 Site Investigations

The following investigations and decision documents related to the Rubble Fill Area At Bunker A86 are discussed in the subsections that follow:

- Final Initial Assessment Study (Envirodyne, 1983)
- Phase I RI (Atlantic, 1992)
- Phase II RI (B&R Environmental, 1997a)
- Verification Sampling Report for Site 4 Removal Action (B&R Environmental, 1997b)
- Action Memorandum for Site 4 – Rubble Fill Area at Bunker A86 (U.S. Navy, 1997d)

#### 2.5.2.1 Final Initial Assessment Study

In 1982, Envirodyne Engineers performed an IAS at NSB-NLON as part of the NACIP program. The purpose of this study was to identify and evaluate past waste disposal practices and to assess the potential for environmental impacts. Envirodyne reviewed installation records, interviewed long-term and former employees, toured the installation, and photographed sites as part of the IAS.

Envirodyne identified 11 sites at NSB-NLON as having contained hazardous material; one was the Rubble Fill Area at Bunker A86 (Site 4). The IAS concluded that the source of contamination for this site was still present and potentially releasing contaminants to the environment. The IAS recommended that "No Dumping" signs be posted at the site.

#### 2.5.2.2 Phase I Remedial Investigation

An investigation of 11 sites was completed at NSB-NLON by Atlantic Environmental Services from 1990 through 1992. The Rubble Fill Area at Bunker A86 Site 4 was one of the sites investigated.

During the Phase I RI, five shallow soil samples were collected from the Rubble Fill Area to screen for potential releases from discarded construction materials and a drum partially filled with an oily liquid. Samples were collected from depths of 0 to 6 inches and 12 to 18 inches at each of two locations. Both of the shallow depth samples were analyzed for TCLP metals and TCLP PCBs, and one of the samples was also analyzed for TCL VOCs. Both of the 12- to 18-inch deep samples were analyzed for TCL VOCs. A fifth sample (4SS3C), which was a composite of the two 0- to 6-inch samples, was also obtained and analyzed for TCL SVOCs, TCL pesticides/PCBs, and TAL metals (total). Sample locations are illustrated on Figure 2-5.

The Phase I RI concluded that there are potential health risks associated with the Rubble Fill Area at Bunker A86 and that this site should proceed to Step II of the IRP.

#### 2.5.2.3 Phase II Remedial Investigation

A Phase II RI at 13 sites at NSB-NLON was conducted by B&R Environmental from 1995 through 1997. The Rubble Fill Area At Bunker A86 Site 4 was one of the sites investigated.

Four shallow wells and one deep well were installed north and east of the Rubble Fill Area during the Phase II RI. Two rounds of groundwater samples were collected; samples were collected from each of the five wells during each sampling round. All five samples from each round of sampling were analyzed for TCL VOCs, TCL SVOCs, and TAL metals (total and dissolved). In addition, all samples in the first round and three samples in the second round were analyzed for TCL pesticides/PCBs, and one sample in each round was analyzed for BOD, COD, TOC, oil and grease (hydrocarbon fraction), suspended solids, hardness, ammonia, and total phosphorus.

Six soil samples were collected from four of the monitoring well borings and two test borings. Three of the samples were taken at a depth interval of 0 to 2 feet and three were collected from deeper intervals. Seven additional surface soil samples (0- to 6-inch depth) plus one field duplicate were also collected. Most of the Phase II soil samples were collected outside the perimeter of the site (to the north and east). All soil samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and TAL metals (total). In addition, two soil samples (4TB1 and 4TB2) were also analyzed for TCLP metals, and two soil samples (4MW2S and 4MW3S) were also analyzed for grain size distribution, moisture content, specific gravity, organic content, cation exchange capacity, pH, and TOC.

Two surface water samples (plus one field duplicate) and three sediment samples were also collected. These samples were collected at upslope (4SW/SD1) and downslope (4SW/SD2) locations from a ditch that discharges to a larger swale. Surface water is present in the ditch and swale during, or immediately following, a precipitation event. Two rounds of sediment sampling were conducted at the downslope location. All sediment samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals (total), grain size distribution, moisture content, specific gravity, organic content, cation exchange capacity, pH, and TOC. Surface water samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and TAL metals (total and dissolved). Sample locations are shown on Figure 2-5.

The Phase II RI concluded that the site may be contributing to the downslope presence of PAHs and metals but the extent of soil contamination is not known. In addition, a human health risk assessment showed that non-cancer risk for the site construction worker was above EPA acceptable levels. The RI report recommended that additional site characterization be conducted to determine the nature and extent of SVOC and metals contamination in sediment and soil at the Rubble Fill Area.

#### 2.5.2.4 Verification Sampling Report and Action Memorandum for Site 4 Removal Action

A sampling program for the purpose of verifying contamination to be removed from the site was performed by B&R Environmental in early 1997. During this investigation, 16 surface soil samples were collected in the vicinity of Site 4 and analyzed for TCL SVOCs, TAL metals, and synthetic precipitation leaching procedure (SPLP) metals. The data collected from this investigation showed similar inorganic concentrations but higher concentrations of SVOCs than previous investigations. Subsequently, in July 1997, construction debris and contaminated soil were removed from Site 4 and incorporated into the Area A Landfill subgrade, except for wood debris, which was sampled and disposed off site. This completed the clean-up action at the Rubble Fill Area at Bunker A86.

### 2.5.3 Physical Characteristics

This section presents a summary of site physical characteristics for the Rubble Fill Area at Bunker A86 site based on information generated during the Phase I and Phase II RIs. Topography and surface features, surface water, and soils no longer apply to the Rubble Fill Area since it has been placed under the cover system of the Area A Landfill as part of an interim remedial action at that site. See the Area A Landfill Site (Section 2.2.3) for current information on these characteristics. Historical geology and hydrogeology are discussed in the subsections that follow but may not be entirely applicable based upon the removal of all soil at the site down to bedrock.

### 2.5.3.1 Surrounding Topography and Surface Features

See Section 2.2.3.1 under Site 2A – Area A Landfill

### 2.5.3.2 Surface Water Features

See Section 2.2.3.2 under Site 2A – Area A Landfill

### 2.5.3.3 Soil Characteristics

Not applicable. All soils have been removed from the Rubble Fill Area at Bunker A86.

### 2.5.3.4 Geology and Hydrogeology

Geology

The Rubble Fill Area was located on the northern flank of the central bedrock high that slopes downward toward the Area A Landfill and the Area A Wetland. Within the boundary of the Rubble Fill Area, the depth to bedrock was measured at 12 feet (boring 4TB1). Silty sand, gravel, and fly ash were identified during completion of the boring. Outside the Rubble Fill Area, the depth to bedrock ranges from 2.5 feet at well 4MW1S to 8.5 feet at well 4MW4D. The overburden consists of silty sand with traces of gravel (till). The bedrock surface elevation decreases toward the northeast, but the overburden thickness is locally irregular. Bedrock encountered in the 4MW4D boring consists of gneiss and granite, which has been identified as the Mamacoke Formation.

Hydrogeology

Groundwater was encountered in both the overburden and bedrock underlying the Rubble Fill Area. Due to the shallow depth to bedrock, the saturated thickness of the overburden was generally less than 5 feet, and at well 4MW1S, the water table is below the bedrock surface. Drawings 3 and 4 show groundwater contours for the Rubble Fill Area. Groundwater flows to the north-northeast following topography/bedrock surface slope toward the Area A Landfill and Area A Wetland. Well 4MW1S is screened in the bedrock. Wells 4MW2S, 4MW3S, and 4MW4S are screened partially in the overburden and mostly in the bedrock.

Although the groundwater elevations at the 4MW4 well cluster apparently indicate a downward gradient between the shallow bedrock and deeper bedrock, an upward gradient actually exists. Accurate measurements of the water level in well 4MW4D could not be obtained during the Phase II RI in either March or August 1994 because of artesian conditions. Well 4MW4D is screened in the deeper bedrock, and the depth to water recorded from the reference elevation was 0.0 feet in both the March and August

1994 Phase II RI water-level measurement rounds since the well was flowing at the time of the measurements. Additional measurements were taken during November 1995 using an extension pipe on the flowing wells, and the resulting water levels that were obtained indicated that an upward gradient exists between the overburden and bedrock at this location.

Based on the August 1994 Phase II RI round of water-level measurements, the hydraulic gradient across the site is approximately 0.21. Since no site-specific hydraulic conductivity values for the overburden or bedrock are available, groundwater flow velocity estimates were not generated for the Rubble Fill Area.

### 2.5.4 Nature and Extent of Contamination

Soil, groundwater, surface water, and sediment sampling was conducted at the Rubble Fill Area at Bunker A86 during the Phase I and Phase II RIs. Based upon the results of these investigations, the nature and extent of contamination of groundwater at the Rubble Fill Area at Bunker A86 are discussed in the following subsection. The complete analytical database for groundwater is contained in Appendix A. Analytical results for soil and sediment samples will not be discussed because all soils and sediments at this site have been removed since the time of data collection and are therefore no longer a potential source of contamination for the groundwater at this site. Analytical results for surface water samples are also no longer applicable because removal of the soil and sediments from the site eliminated the ditch from where the surface water samples were collected.

#### 2.5.4.1 Groundwater

Groundwater samples from both overburden and bedrock wells were collected at the Rubble Fill Area at Bunker A86. Wells 4MW2S, 4MW3S, and 4MW4S were each screened at an interval that spans both the overburden and bedrock aquifers. Groundwater samples collected from these wells are considered to be representative of the overburden aquifer for purposes of data evaluation. Table 2-15 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in groundwater samples collected from overburden wells at the Rubble Fill Area. Table 2-16 presents similar information for groundwater samples collected from bedrock wells at this site. Based upon the screening level assessment for the Rubble Fill Area at Bunker A86 (Section 2.5.5.3) and the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary COPCs in Rubble Fill Area overburden and bedrock groundwater samples are presented on Drawings 5 and 6, respectively (Volume II).

Overburden Wells

Six groundwater samples were collected from three Rubble Fill Area overburden wells during Rounds 1 and 2 of the Phase II RI. Chloroform was detected at a concentrations ranging from 3 µg/L to 11 µg/L in both groundwater samples collected from well 4MW3S and the groundwater sample collected during Round 1 of the Phase II RI from well 4MW4S. 1,1,1-Trichloroethane (2 µg/L) and bromodichloromethane (1 µg/L) were detected in the groundwater sample collected from well 4MW2S during Round 2 of the Phase II RI. Methylene chloride (4 µg/L) and total xylenes (2 µg/L) were detected in the groundwater sample collected from well 4MW4S during Round 2 and Round 1, respectively, of the Phase II RI. As shown on Table 2-15, methylene chloride and total xylenes were also detected at these same concentrations in the off-site residential wells. No other VOCs were detected in groundwater samples collected from the Rubble Fill Area overburden wells.

As shown on Table 2-15, benzoic acid (0.6 µg/L) and bis(2-ethylhexyl)phthalate (11 µg/L) were each detected in one of the six groundwater samples collected from Rubble Fill Area overburden wells. Bis(2-ethylhexyl)phthalate was also detected in one of the off-site residential wells at a concentration of 3 µg/L. No other SVOCs were detected in groundwater samples collected from the Rubble Fill Area overburden wells. It should also be noted that bis(2-ethylhexyl)phthalate is considered to be a common field and laboratory contaminant.

As shown on Table 2-15, only four of the six groundwater samples collected from the overburden wells were analyzed for pesticides and PCBs. Heptachlor was detected at a concentration of 0.53 µg/L in the groundwater sample collected from well 4MW2S during Round 1 of the Phase II RI. No other pesticides or PCBs were detected.

Eleven metals (barium, boron, cadmium, calcium, copper, lead, magnesium, manganese, potassium, sodium, and zinc) were detected in the unfiltered groundwater samples collected from the Rubble Fill Area overburden wells. With the exception of cadmium, these same metals plus antimony, iron, and thallium were detected in the associated filtered groundwater samples. All but three of the maximum concentrations were associated with samples collected from wells 4MW2S and 4MW4S. With the exception of lead, maximum concentrations of metals detected in filtered samples were relatively similar (i.e., at the same order of magnitude) as the maximum concentrations of respective metals detected in unfiltered samples. The maximum concentration of lead in unfiltered samples was approximately 15 times greater than maximum concentration of lead detected in the filtered samples. Maximum concentrations of antimony and thallium in filtered groundwater samples exceeded concentrations of these respective metals detected in unfiltered groundwater samples from the off-site residential wells.

Analyses for total phosphorus and TSS were performed for the two groundwater samples collected from well 4MW3S. In addition, analyses for hardness were performed for all six of the groundwater samples collected from overburden wells. Table 2-15 provides a summary of the results of these analyses.

Bedrock Wells

Four groundwater samples were collected from two Rubble Fill Area bedrock wells during Rounds 1 and 2 of the Phase II RI. As shown on Table 2-16, five VOCs (4-methyl-2-pentanone, bromodichloromethane, carbon disulfide, chloroform, and methylene chloride) were detected in these groundwater samples. All five VOCs were detected at concentrations ranging from 1 µg/L to 9 µg/L in one or the other of the two groundwater samples collected from well 4MW1S, located southeast of the site and nearest to Bunker A86. The concentration of methylene chloride detected in this sample (8 µg/L) exceeded the concentration of this chemical detected in the off-site residential wells (4 µg/L). Chloroform was detected at a concentration of 3 µg/L in the groundwater sample collected from well 4MW4D during Round 1 of the Phase II RI. VOCs were not detected in the groundwater samples collected from well 4MW4D during Round 2 of the Phase II RI.

Benzoic acid (0.7 µg/L) and bis(2-ethylhexyl)phthalate (2 µg/L) were detected in the groundwater sample collected from well 4MW1S during Round 2 of the Phase II RI. This reported concentration for bis(2-ethylhexyl)phthalate is less than the concentration detected in one of the off-site residential wells (3 µg/L). No other SVOCs were detected in groundwater samples collected from the Rubble Fill Area bedrock wells. Pesticides and PCBs were also not detected in these samples.

As shown on Table 2-16, the list of metals detected in the groundwater samples collected from Rubble Fill Area bedrock wells is similar to the list of metals detected in the Rubble Fill area overburden well samples. Aluminum, chromium, and vanadium, however, were also detected in the bedrock groundwater samples, in addition to the list of metals associated with the overburden groundwater samples. The concentrations of metals detected in groundwater samples collected from the bedrock wells were also relatively similar (i.e., at the same order of magnitude) to concentrations of respective metals detected in groundwater samples collected from the overburden wells. Maximum concentrations of chromium and thallium in unfiltered groundwater samples and of thallium in filtered groundwater samples exceeded concentrations of these respective metals detected in unfiltered groundwater samples from the off-site residential wells.

Three of the four groundwater samples collected from Rubble Fill Area bedrock wells were analyzed for hardness. Reported results for this parameter ranged from 60 mg/L to 90 mg/L.

### 2.5.5 Data Evaluation

This section summarizes data evaluation procedures performed for site data. A discussion of contaminant fate and transport, a summary of the historical HHRA(s) performed for the site, and a screening level assessment of site data are provided.

#### 2.5.5.1 Contaminant Fate and Transport

Historically, runoff from the Rubble Fill Area was affecting sediments in the local drainageways. PAHs and phthalate esters were detected in the shallow soil samples (those less than 2 feet deep) and in the sediment samples collected downstream of the site. Detections of these compounds indicated contaminant transport from the site. PAHs and phthalates under most conditions are fairly insoluble and are transported primarily via erosion of soil particles by surface water runoff, with subsequent bulk movement of the soil particles downstream.

Also, the detection of several VOCs in the soil, groundwater, and sediment at the site during previous investigations was indicative of a potential source area (the Rubble Fill Area) and transport (to groundwater and to sediment/surface water via groundwater discharge). The concentrations were typically low, and the soil and sediment samples contained similar types of chemicals and concentrations. The VOCs detected (ketones, monocyclic aromatics, and halogenated aliphatics) are typically not persistent compounds and are considered to be fairly soluble in comparison to the PAHs and phthalate esters. Therefore, transport of these compounds via runoff was considered to be a less likely scenario than movement to the water table and discharge to water bodies. However, based on the absence of any significant groundwater contamination, this was not considered an important migration pathway.

Subsequent to the Phase II RI, all related site soils and sediments were excavated to the top of bedrock, therefore eliminating the source of future contaminant migration.

#### 2.5.5.2 Summary of Human Health Risk Assessment

The baseline risk assessment conducted during the Phase II RI for the Rubble Fill Area included consideration of two primary receptor groups: construction workers and older child trespassers. Dermal contact with groundwater during intrusive activities was considered to be a potential route of exposure for the construction worker. However, groundwater was not considered to be a potential medium for exposure for the older child trespasser.

Noncarcinogenic risk estimates associated with exposure to groundwater were less than the USEPA acceptable level of one for the construction worker under the RME and CTE scenarios. This indicates

that exposure to chemicals detected in the groundwater at the Rubble Fill Area is not expected to produce adverse health effects for the construction worker under the defined exposure conditions.

Incremental lifetime cancer risks associated with exposure to groundwater for the construction worker were less than the USEPA's acceptable target risk range (1E-6 to 1E-4) and CTDEP's target cancer risk (1E-5) under both exposure scenarios. Therefore, the Phase II RI risk assessment concluded that the site poses little risk to human health.

#### 2.5.5.3 Screening Level Assessment

COPCs at this site were selected using the risk-based COPC screening levels described in Section 1.4.2. All data collected during the Phase I and II RIs were used to select COPCs for groundwater. Maximum and 95% UCL chemical concentrations are presented in the summary tables. Although the maximum concentration of a chemical may exceed an associated criterion, the distribution of the chemical in the medium is also important with respect to decision making. Therefore, the 95% UCL chemical concentration was included to provide some information on the potential distribution of the chemical. In addition, the summary tables for groundwater samples present the range of concentrations detected in off-site residential wells for each detected chemical to enable comparison of site groundwater data with groundwater data collected from wells unaffected by the site. A brief narrative of the findings of this qualitative analysis is provided in the remainder of this section.

The following parameters were selected as COPCs for the Rubble Fill Area at Bunker A86 overburden groundwater, based upon the COPC screening analysis presented on Table 2-15:

- Chlorinated aliphatic hydrocarbons (bromodichloromethane and chloroform)
- SVOCs [bis(2-ethylhexyl)phthalate]
- Pesticides (heptachlor)
- Inorganics (antimony, cadmium, lead, and thallium).

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for the primary overburden groundwater COPC (lead) associated with Rubble Fill Area overburden groundwater samples are presented on Drawing 5 (Volume II).

Maximum concentrations of bis(2-ethylhexyl)phthalate, heptachlor, antimony (filtered), cadmium (unfiltered), and thallium (filtered) exceeded the COPC screening level, the federal MCL, and the state MCL. Of these three criteria, maximum concentrations of bromodichloromethane and chloroform exceeded only the COPC screening level. The maximum concentration of lead (unfiltered) was in excess of the federal MCL.

Sodium (filtered and unfiltered) was detected at maximum concentrations in excess of the state MCL. However, sodium, calcium, magnesium, and potassium were not selected as COPCs because these chemicals are considered to be essential nutrients.

Maximum concentrations of bromodichloromethane, chloroform, bis(2-ethylhexyl)phthalate, heptachlor, antimony (filtered), cadmium (unfiltered), lead (unfiltered), and thallium (filtered) detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. Groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

Site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection, yielding the following exceedances: heptachlor, cadmium (unfiltered), and lead (unfiltered).

Of the selected COPCs, maximum concentrations of bis(2-ethylhexyl)phthalate and thallium in overburden groundwater at the Rubble Fill Area at Bunker A86 exceeded detected concentrations of these chemicals in off-site residential wells. Conversely, the maximum concentrations of cadmium and lead were below the maximum detected concentrations of these metals in unfiltered groundwater samples from the off-site residential wells.

The following parameters were selected as COPCs for the Rubble Fill Area at Bunker A86 bedrock groundwater based upon the COPC screening analysis presented on Table 2-16:

- Chlorinated aliphatic hydrocarbons (bromodichloromethane, chloroform, and methylene chloride)
- Inorganics (cadmium, manganese, and thallium).

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for the primary bedrock groundwater COPC (manganese) associated with Rubble Fill Area bedrock groundwater samples are presented on Drawing 6 (Volume II).

Maximum concentrations of methylene chloride and thallium (filtered and unfiltered) exceeded the COPC screening level, the federal MCL, and the state MCL. Of these three criteria, maximum concentrations of bromodichloromethane, chloroform, and cadmium (filtered) exceeded only the COPC screening level. The maximum concentration of manganese (unfiltered) was in excess of the federal MCL.

Concentrations of iron (unfiltered) exceeded both COPC screening level and the federal MCL. Aluminum (unfiltered) was detected at a maximum concentration in excess of the federal secondary MCL. However, iron and aluminum were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for both chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium (filtered and unfiltered) was detected at maximum concentrations in excess of the state MCL. However, sodium, calcium, magnesium, and potassium were not selected as COPCs because these analytes are considered to be essential nutrients.

Maximum concentrations of bromodichloromethane, chloroform, methylene chloride, manganese (unfiltered), and thallium (filtered and unfiltered) detected in groundwater samples from bedrock wells exceeded the Connecticut remediation standards for groundwater protection. As previously noted, groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

None of the detected analytes were present at concentrations in excess of the Connecticut remediation standards for protection of surface water.

The maximum concentrations of methylene chloride and thallium in bedrock groundwater at the Rubble Fill Area at Bunker A86 exceeded detected concentrations of these chemicals in unfiltered groundwater samples from off-site residential wells. Conversely, the maximum concentrations of cadmium and manganese in bedrock groundwater samples at Site 4 were less than the maximum detected concentrations of these respective metals in unfiltered groundwater samples from the off-site residential wells.

### 2.5.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Site 4 using the decision tree approach is as follows:

- The Rubble Fill Area at Bunker A86 was investigated during the IAS, the Phase I and Phase II RIs, and a Verification Sampling Investigation. The information collected during these investigations is sufficient to describe the site and its physical characteristics.

- Both the Phase I and Phase II RIs concluded that there are health risks associated with this site. The Phase II RI findings indicated that this site may be contributing to the downslope presence of PAHs and metals in soils but the extent of contamination was not known. The RI report recommended that additional site characterization be conducted to determine the nature and extent of SVOC and metals contamination in the sediments and soil at Site 4.

- In early 1997, construction debris and contaminated soil and sediment were removed from the site as part of a time-critical removal action and incorporated into the Area A Landfill subgrade, except for the wood debris, which was sampled and disposed off site. Subsequently, the Verification Sampling Report determined that the cancer risk associated with the site still exceeded EPA's target range; therefore, in July 1997, the remaining contaminated soil was removed from Site 4, leaving only exposed bedrock. This completed the remedial action for the Rubble Fill Area at Bunker A86.

- Further limited action is anticipated at Site 4 as discussed in Section 2.5.7.

### 2.5.7 Recommendations

Site 4 was thoroughly investigated during four previous investigations. A removal action was completed for the soil, sediment, and debris at this site in 1997. Since a groundwater monitoring program will soon be implemented in conjunction with the cover system at the Area A Landfill and that program will include sampling points within and downgradient of the former Rubble Fill Area at Bunker A86, additional sampling activities at this site in support of the Basewide Groundwater OU RI should be coordinated with that monitoring program.

## 2.6 SITE 5 – HAZARDOUS WASTE STORAGE FACILITY AT BUNKER A85

### 2.6.1 Site Description

Site 5 consists of the hazardous waste storage facility at Bunker A-85. Since the 1980s, this site has been used as a RCRA hazardous waste holding facility for permanent storage of RCRA-type hazardous materials. The site is located approximately 300 feet southeast of the Rubble Fill Area at Bunker A86 and east of Wahoo Avenue. The site is shown on Drawing 1.

### 2.6.2 Site Investigations

The following investigations related to the Hazardous Waste Storage Facility at Bunker A85 are discussed in the subsections which follow:

- Final Initial Assessment Study (Envirodyne, 1983)
- RCRA Closure Plan (Foster Wheeler, 1998)

#### 2.6.2.1 Final Initial Assessment Study

Site 5 was evaluated during the IAS for NSB-NLON that was conducted in March 1983. No sampling activities were conducted as part of the study. The study's recommendation for this site was to not pursue further investigation of the site because, at the time of the IAS study, the site was operational. The site continues to be operational under the RCRA program and therefore is not subject to the CERCLA investigative recommendations as outlined in this EDSR.

#### 2.6.2.2 Draft RCRA Closure Plan

A RCRA closure plan for Site 5 was completed by Foster Wheeler Environmental Corporation in August 1998. The purpose of the closure plan was to properly close the interim hazardous storage facility in accordance with federal and CTDEP RCRA regulations. The structure to be closed include a reinforced concrete bunker, eight wooden storage sheds, a silver recovery area, and paved outside areas in the vicinity of these structures. As part of the closure plan site characterization sampling (i.e., 36 soil samples and 2 crushed concrete samples) and analyses were performed to determine contaminants of concern. Samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals, TPH, cyanide, and sulfide.

This sampling program was followed by a second sampling phase to determine the horizontal and vertical extent of contamination. The soil sampling was performed using 20-foot-by-50-foot grid approach with additional borings advanced in a 10-foot-by-25-foot grid to further define contamination. Samples were analyzed for TPH (both field screening and fixed-base lab testing), TCL SVOCs, TCL pesticides/PCBs, and arsenic. The analytical results were screened against applicable federal and CTDEP criteria. Based upon the sampling and screening results, the Navy intends to complete clean closure of the site by removing approximately 3,000 cubic yards of contaminated soil.

### 2.6.3 Physical Characteristics

This section presents a summary of site physical characteristics for the Hazardous Waste Storage Facility at Bunker A85. Topography and surface features, surface water, soils, geology, and hydrogeology are discussed in the subsections that follow.

#### 2.6.3.1 Surrounding Topography and Surface Features

The ground surface in the vicinity of Site 5 has an approximate 40 percent slope from the central bedrock high to the north-northeast toward the Area A Wetland, according to the contours on Drawing 2. Within the site boundaries, the ground elevation ranges between 170 and 180 feet msl. Bedrock is exposed downslope of the site.

#### 2.6.3.2 Surface Water Features

Surface drainage from the Hazardous Waste Storage Facility follows topography, flowing north-northeast toward the Area A Landfill and Area A Wetland.

#### 2.6.3.3 Soil Characteristics

The SCS Soils Map (SCS, 1983) classifies the soil at the Hazardous Waste Storage Facility as the Hollis-Charlton-Rock complex. This soil is defined as stones and boulders intermingled with a dark, fine, sandy loam. Bedrock outcrops are prevalent.

#### 2.6.3.4 Geology and Hydrogeology

Geology

The Hazardous Waste Storage Facility is located on the northern flank of the central bedrock high that slopes downward toward the Area A Landfill and the Area A Wetland. The bedrock surface elevation decreases toward the northeast, but the overburden thickness is locally irregular.

Hydrogeology

Drawings 3 and 4 show groundwater contours for the Hazardous Waste Storage Facility for the overburden groundwater and bedrock groundwater, respectively. Groundwater flows to the north-northeast following topography/bedrock surface slope toward the Area A Landfill and Area A Wetland.

### 2.6.4 Nature and Extent of Contamination

Since this site is currently being closed under RCRA and all contaminated media will be removed, the nature and extent of contamination will not be discussed in this EDSR.

### 2.6.5 Data Evaluation

Since this site is currently being closed under RCRA and all contaminated media will be removed, no data evaluation tasks will be completed in this EDSR.

### 2.6.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Site 5 using the decision tree approach is as follows:

- Data was obtained for the Hazardous Waste Storage Facility at Bunker A85 under RCRA.
- The site is presently being closed under the RCRA program.
- No further action is required for Site 5 under CERCLA. Further information is discussed in Section 2.6.7.

### 2.6.7 Recommendations

A thorough RCRA closure investigation of Site 5 was recently conducted by the Navy following federal and CTDEP RCRA guidelines. The results of the investigation showed that contaminants were present at the site in excess of applicable criteria. The Navy intends to remediate approximately 3,000 cubic yards of contaminated soil as part of the closure plan for the site. Since the site will be closed in accordance with RCRA regulations, it is recommended that no further action take place at this site under CERCLA.

## 2.7 SITE 7 – TORPEDO SHOPS

### 2.7.1 Site Description

The Torpedo Shops site is located in the northern portion of NSB-NLON on the northern side of Triton Avenue. Figure 2-6 shows the general site arrangement. The site location with respect to other IRP sites at NSB-NLON is shown on Drawing 1. The site is bordered on the east and north by 60-foot-high bedrock cliffs. The remainder of the site slopes to the southwest. An earthen berm extends along the base of the eastern portion of the exposed rock face. Three buildings (325, 450, and 477) exist at the site.

Building 325 is a torpedo overhaul facility. It was built in 1955 and had an on-site septic system until 1983, when all plumbing facilities were connected to sanitary sewers. The original septic leach field for Building 325 is located southwest of the building, adjacent to Triton Road. This leach field became clogged in 1975 and was abandoned. A new leach field (south leach field) was constructed next to the original leach field and was used until sanitary sewers were installed in 1983.

Atlantic personnel performed a visual inspection of Building 325 on March 20, 1989. According to interviews with on-site personnel, a variety of fuels, solvents, and petroleum products have been used in the building. Otto Fuel II [which is comprised of propylene glycol dinitrate (76 percent), 2-nitrodiphenylamine (1.5 percent), and di-n-butyl sebacate (22.5 percent) and produces hydrogen cyanide when burned], high-octane alcohol (190 proof grain alcohol), and TH-Dimer (jet rocket fuel) were observed in maintenance areas. Solvents including mineral spirits, alcohol, and 1,1,1-trichloroethane, as well as petroleum products such as motor oil and grease, were used in this building. A sink in one area was previously used for film development, and another sink was used for the overhaul of alkaline batteries. This plumbing drained into the on-site septic system until 1983. A maintenance area has a shallow sump that is covered with a flush-mounted steel grating. The area surrounding this sump was previously a washdown/blowdown area for weapons. It is not known where this sump drains, although there is a fair probability that it drains into the south leach field. Two underground No. 2 fuel oil tanks are located on the southern side of this building. A third tank, which was located above ground adjacent to the building, was used for temporary storage of No. 2 fuel oil but, based on field reconnaissance, had been removed as of March 15, 1995.

A smaller building attached to the east side of Building 325 was also inspected by Atlantic personnel. It was previously used as an assembly shop for torpedoes and was a paint shop at the time of the inspection. A storage closet in this building included containers of 1,1,1-trichloroethane and methyl ethyl ketone (2-butanone). Drums and cylinders were stored outside on the eastern side of this building. The vessels were labeled as containing propane, isobutane, 2-butanone, xylot, methylene chloride, propellant, and zinc chromate. An addition to the northern side of Building 325 was under construction at the time of the Atlantic inspection and has since been completed. This building is used as a torpedo shop.

Building 450 is the primary MK-48 torpedo overhaul/assembly facility. It was built in 1974 and was served by its own septic system until 1983, when it was connected to sanitary sewers. Only domestic wastewater from toilets, lavatories, and showers in Building 450 had been directed to the septic field (north leach field). Torpedo overhaul/assembly operations of Building 450 generate fuels, solvents, and petroleum products as wastes. An Otto fuel and seawater mixture is drained from the torpedoes, which are then replenished with fresh fuel. The IAS report indicated that Building 450 generates approximately 3,000 gallons of Otto fuel wastewater per month. This building was constructed with a waste collection system that collected waste products from floor drains and discharged to an underground waste tank/sump with a capacity of approximately 1,500 gallons. The waste tank was pumped periodically and the contents were disposed off site. Otto fuel product was previously stored in a 4,000-gallon underground tank south of Building 450.

Building 477, approximately 65 feet east of Building 450, was formerly used to store Otto fuel in drums. On-site personnel report that solvents including 1,1,1-trichloroethane, TCE, toluene, mineral spirits, alcohol, and bulk freon have been used at this facility. Petroleum products including TL-250 motor oil and hydraulic fluid have also been used in this building for torpedo maintenance. In the past, only domestic waste water from toilets, lavatories, and showers in Building 450 was directed to the septic field (north system).

Atlantic personnel performed a site inspection of Building 450 on March 20, 1989. The former septic leach field is located southwest of this building in a flat, elevated area. The hazardous waste sump was no longer in use and, reportedly, was decommissioned in 1987. It was replaced with three 1,000-gallon above-ground tanks located south of the building. The floor drains were sealed and replaced with a new system for pumping waste products to the new tanks. A 4,000-gallon above-ground Otto fuel storage tank replaced the previous tank and is located south of the building. No construction is planned for the immediate future at Building 450.

### 2.7.2 Site Investigations

The following investigations and decision documents related to the Torpedo Shops are discussed in the subsections that follow:

- Phase I RI (Atlantic, 1992)
- Site Characterization Report for OT-10, Building 325, and Building 89 (B&R Environmental, 1996c)
- Phase II RI (B&R Environmental, 1997a)

#### 2.7.2.1 Phase I Remedial Investigation

An investigation of 11 sites was completed at NSB-NLON by Atlantic Environmental Services, from 1990 through 1992. The Torpedo Shops Site 7 was one of the sites investigated.

The Phase I RI for this site focused primarily on subsurface soils because the source being investigated at that time was the subsurface leach fields. The investigation began with a soil gas survey of the area surrounding Buildings 450 and 325. These results were used to guide the installation of monitoring wells and the collection of soil samples from the well and test borings.

Three monitoring wells were installed, including an upgradient bedrock well (7MW1) and an overburden well (7MW2 and 7MW3) in each leach field area. Well 7MW1 was installed in bedrock as a result of the shallow depth to bedrock in the area. One groundwater sample was collected from each of the monitoring wells. A field duplicate was also collected from 7MW1. The groundwater samples were

analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and TAL metals (total). The field duplicate was not analyzed for pesticides/PCBs.

One surface (from a depth of less than 2 feet) and nine subsurface soil samples including one field duplicate were collected from the three monitoring well borings and six additional test borings. All soil samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals (total), and TCLP metals.

One sediment sample and one surface water sample were also collected west (downstream) of the buildings and analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and TAL metals (total). All sampling locations are shown on Figure 2-6.

The Phase I RI concluded that there are negligible health risks associated with the Torpedo Shops and that this site should proceed to Step II of the IR Program.

#### 2.7.2.2 Site Characterization Report for OT-10, Building 325 and Building 89

In 1995, B&R Environmental performed an investigation to determine whether the two fuel oil tanks (R01R1 and R02) at Building 325 in the Torpedo Shop Area had impacted the soil surrounding the site. A secondary objective of the investigation was to install permanent leak detection systems at Building 325 so that environmental conditions at the site could be monitored over the lifetime of the tanks. Data from the investigation were used to support closure of Tank R01R1 and to establish that Tank R02 was operating properly and could remain in service.

During the investigation, 11 soil samples and four groundwater samples were collected and analyzed for BTEX and TPH. Soils around Tank R01R1 that were contaminated with TPH and exceeded the direct exposure clean-up standard of 500 mg/kg were excavated and removed at Building 325. The soils were replaced with clean sand and gravel fill. The investigation concluded that no further action was necessary at this site; however, continued monitoring of the groundwater was suggested.

#### 2.7.2.3 Phase II Remedial Investigation

A Phase II RI at 13 sites at NSB-NLON was conducted by B&R Environmental from 1995 through 1997. The Torpedo Shops Site 7 was one of the sites investigated in this second-phase RI.

Soil sampling conducted during the Phase II RI was expanded to cover the entire area surrounding the three buildings, as well as the area downgradient of the buildings and their associated leach fields. As with the Phase I RI, the Phase II RI began with a soil gas survey. Forty-five soil gas samples were

successfully collected from a gridded area surrounding Buildings 325 and 450. All samples were field screened for acetone, benzene, freon 113, m- and p-xylenes, o-xylenes, toluene, PCE, and TCE. Soil sampling locations were then selected to collect confirmatory samples for the soil gas survey and to expand on the Phase I RI. Nineteen soil samples and two duplicates were obtained during the Phase II RI; six surface soil samples (from depths of less than 2 feet) and 13 subsurface soil samples (from depths of greater than 2 feet) were collected from eight monitoring wells and nine test borings. Samples collected from depth intervals that began in the 0- to 2-foot range (e.g., 0 to 3 feet or 1 to 3 feet) were considered surface soils.

Eight shallow overburden monitoring wells and three bedrock wells were installed during the Phase II RI. Each of the new wells and three previously installed wells were sampled during two rounds of sampling. Fifteen samples (including one field duplicate sample) were collected during each sampling round. All 30 groundwater samples were analyzed for TCL VOCs, TCL SVOCs, and TAL metals (total and dissolved). In addition, seven samples were analyzed for TPH, and eight samples were analyzed for BOD, COD, TOC, oil and grease (hydrocarbon fraction), hardness, suspended solids, ammonia, and total phosphorus.

A downstream surface water sample (7SW1) and two sediment samples (7SD2 and 7SD3) were collected during the Phase II RI. 7SD2 was the most upstream sediment sample, followed by 7SD3. These samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and TAL metals (total). In addition, the two sediment samples were analyzed for grain size distribution, moisture content, specific gravity, organic content, cation exchange capacity, pH, and TOC. All sample locations are shown on Figure 2-6.

The results of the Phase II RI showed that notable detections of contamination were found in soil and groundwater near the abandoned leach field. In addition, a human health risk assessment showed that non-cancer risks were below acceptable levels except for the construction worker and future resident, and cancer risks were below acceptable levels except for the future resident. The Phase II RI recommended that further characterization of the Torpedo Shops should be completed prior to determining whether or not the site should proceed to the FS stage.

### 2.7.3 Physical Characteristics

This section presents a summary of site physical characteristics for the Torpedo Shops based on information generated during the Phase I and Phase II RIs. Topography and surface features, surface water, soils, geology, and hydrogeology are discussed in the subsections that follow.

#### 2.7.3.1 Surrounding Topography and Surface Features

Drawing 2 shows the topography and surface features of the Torpedo Shops. The Torpedo Shops site is surrounded on the north and east by an exposed bedrock cliff. The steep bedrock cliff is the result of quarry activity along the northern bedrock high. The ground surface slopes gently to the southwest. There is an earthen berm along the eastern boundary of the site.

Three buildings are located within the fenced area that encompasses the Torpedo Shops. Buildings 450 and 477 are located at an approximate ground elevation of 60 feet msl. Building 325 is located at a slightly lower ground elevation of approximately 50 feet msl. According to the Phase I RI report (Atlantic, 1992), an addition was constructed on the northern side of Building 325. There are drainage swales on the southern side of Buildings 325 and 450. On the southern side of Building 450, there are three 1,000-gallon above-ground waste storage tanks and one 4,000-gallon above-ground Otto fuel storage tank.

#### 2.7.3.2 Surface Water Features

Surface runoff from the Torpedo Shops flows southwestward to drainage swales and storm sewers located on the southern side of Buildings 325 and 450. Runoff contained by the berm, as well as the storm sewer system, drains through culverts under Triton Avenue into the Area A Downstream Watercourses and eventually into the Thames River.

#### 2.7.3.3 Soil Characteristics

The SCS Soils Map (SCS, 1983) classifies the soil at the Torpedo Shops as Udorthents-Urban land. This soil type is defined as excessively drained to moderately drained soils that have been disturbed by cutting and filling. The area within and outside the Torpedo Shops has a history of quarrying and filling activity. Native soils have been replaced by fill.

#### 2.7.3.4 Geology and Hydrogeology

Geology

The geology of the Torpedo Shops consists of a southwestward-thickening wedge of overburden materials overlying metamorphic bedrock. The surficial deposits underlying the Torpedo Shops site consist of fill material that varies in thickness from 2 to 10 feet. The fill consists primarily of sand and gravel. The fill either lies directly on bedrock (in the northeastern portion of the site) or is underlain by up to 30 feet of silty sand (along the southwestern edge of the site). The Torpedo Shops area has a history of quarrying and filling; therefore, the silty sand is natural alluvium.

The Torpedo Shops area is bordered to the north and east by a steep bedrock escarpment. In the northeastern portion of the site, the bedrock surface is relatively flat and has a mild slope toward the southwest. The bedrock surface in this area has been altered by quarry activity. Overburden thickness is typically less than 6 feet in this area (7TB8, 7TB9, 7TB10, 7TB12, 7TB13, 7MW7S, and 7MW2D). Southwest of 7MW7S and 7MW2D and southeast of 7TB10, the bedrock slopes to the west and southwest more steeply from elevations of 40 to 45 feet msl to elevations of 15 to 20 feet msl. The overburden thickness increases to 30 to 40 feet in this area (7TB15, 7MW3D).

The bedrock at the Torpedo Shops has been identified as the Mamacoke Formation. The bedrock surface between 7MW1D and 7MW7S slopes at a grade of approximately 2 percent. The bedrock surface between 7MW7S and 7MW3D slopes at a steeper grade of approximately 14 percent.

Hydrogeology

Groundwater was encountered in both the overburden and bedrock underlying the Torpedo Shops. Depths to groundwater average less than 10 feet across the site. Within the overburden, the water table was generally encountered near the fill/alluvium interface, where both units were present. Drawing 3 shows the overburden groundwater flow pattern across the Torpedo Shops. The general direction of shallow groundwater flow is to the west-southwest, toward the Area A Downstream Watercourses. Groundwater flow directions in the shallow bedrock, based on data from wells 7MW1D, 7MW2D, 7MW4S, 7MW5D, and 7MW7S, which are screened in the bedrock, are to the west and southwest (Drawing 4). In the overburden, the hydraulic gradient across the site is approximately 0.015. Within the bedrock, the flow gradient appears to be slightly higher, at 0.02.

Downward vertical gradients were consistently observed at the Torpedo Shops. Well clusters 7MW2S/2D (alluvium/bedrock), 7MW3S/3D (combined fill and alluvium/deep alluvium), and 7MW5S/5D (combined overburden and bedrock/deeper bedrock) all had downward vertical gradients, indicating that the Torpedo Shops area is a local recharge area for groundwater.

During the Phase I RI, a slug test was performed at the 7MW2S well. The estimated hydraulic conductivity based on this slug test was 10.7 feet/day. Assuming a hydraulic gradient of 0.015 and a porosity of 0.30, the estimated groundwater seepage velocity in the alluvium at the site is 0.5 feet/day. The value of hydraulic conductivity is slightly higher than most values estimated for the alluvium at other sites investigated during the Phase II RI; therefore, the seepage velocity may be somewhat overestimated.

### 2.7.4 Nature and Extent of Contamination

Soil, sediment, groundwater, and surface water sampling was conducted at the Torpedo Shops site during the Phase I and Phase II RIs and the Site Characterization. A soil gas survey was also conducted during the Phase I RI. Based upon the results of these investigations, the nature and extent of contamination of the soil and groundwater at the Torpedo Shops are discussed on a matrix-specific basis in the following subsections. Historical analytical results for sediment and surface water samples will not be discussed since the results indicate that existing levels of contamination in these media are generally not expected to impact the groundwater at this site. Analytical results from the soil gas survey will not be discussed because these data do not provide information applicable to the impact of contamination in soils on groundwater. In addition, analytical results from the analysis of the soil sample collected from boring B325-MW02 are not included because the soil in this area was excavated as part of a removal action that was completed as a result of the site characterization. The complete analytical database for soil and groundwater samples is contained in Appendix A.

#### 2.7.4.1 Soil

Table 2-17 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in soil samples collected from the Torpedo Shops site. Table 2-18 presents similar information for TCLP results. Based upon the screening level assessment for the Torpedo Shops (Section 2.7.5.3), and the procedures for the preparation of soil tag maps (Section 1.4.3.1), analytical results for primary COPCs in Torpedo Shops soil samples and associated TCLP leachates are presented on Drawing 8 in Volume II of this report.

Nine VOCs, including three chlorinated aliphatics, three monocyclic aromatics, two ketones, and carbon disulfide, were detected in the soil samples. Most were detected infrequently at relatively low concentrations. Methylene chloride, a common laboratory contaminant, was detected most frequently (in 14 of 27 samples) at concentrations ranging from 0.003 mg/kg to 0.42 mg/kg. Benzene, toluene, and total xylenes were each detected in from one to six of 37 samples at concentrations ranging from 0.0005 mg/kg to 0.011 mg/kg. 1,1-Dichloroethene, 2-butanone, acetone, carbon disulfide, and PCE were each detected in from one to five of 27 samples. With the exception of acetone, which was detected at a maximum concentration of 0.17 mg/kg, these VOCs were detected at concentrations ranging from 0.003 mg/kg to 0.032 mg/kg.

Twenty-five SVOCs, including 17 PAHs, four phthalate esters, 4-methylphenol, benzoic acid, carbazole, and dibenzofuran, were detected in soil samples collected from the Torpedo Shops site. As shown on

Table 2-17, PAHs were detected most frequently and, with one exception, at the greatest concentrations. Reported concentrations of PAHs ranged from 0.018 mg/kg (fluoranthene) to 4.3 mg/kg (phenanthrene). Diethyl phthalate was detected at a concentration of 14 mg/kg in the soil sample collected a depth interval of 1 to 3 feet bgs from boring 7MW7S, located along the drainage swale south of Building 450. Maximum concentrations of nine SVOCs (all PAHs) were associated with the soil sample collected from a depth interval of 1 to 3 feet bgs from test boring 7TB10, located south of Building 325. Maximum concentrations of an additional nine SVOCs were associated with the soil sample collected from a depth interval of 1 to 3 feet bgs from well boring 7MW4S, located near the southeastern corner of Building 325.

As shown on Table 2-17, eight pesticides and one PCB were detected in the Torpedo Shops soil samples. 4,4'-DDT and its breakdown products, 4,4'-DDD and 4,4'-DDT, were detected most frequently, with each being detected in four or five of 23 samples. Concentrations of these three pesticides ranged from 0.0044 mg/kg to 0.21 mg/kg. Aroclor-1254 was detected in a single soil sample, collected at a depth interval of 2 to 4 feet bgs from well boring 7MW2S, at a concentration of 0.66 mg/kg. Endrin ketone (0.0068 mg/kg), heptachlor (0.0047 mg/kg), and methoxychlor (0.032 mg/kg) were detected in the soil sample collected from a depth interval of 1 to 3 feet bgs from well boring 7MW4S, located near the southeastern end of Building 325. The remaining two pesticides (endosulfan sulfate and endrin aldehyde) were each detected in two samples at concentrations ranging from 0.0055 mg/kg to 0.035 mg/kg.

As shown on Table 2-17, 23 metals were detected in the Torpedo Shops soil samples, although mercury, selenium, and thallium were each detected in from only one to five of 27 samples. Maximum concentrations of 11 metals were detected in the soil sample collected from a depth interval of 5 to 7 feet bgs from well boring 7MW6S, located along the western side of Building 325.

TCLP extraction followed by analysis for metals was performed for 10 soil samples collected from the Torpedo Shops site. In addition, the TCLP leachate of one of these samples was also analyzed for TCLP organics (VOCs, SVOCs, pesticides, and herbicides). No organic compounds were detected in this leachate. Arsenic, barium, cadmium, and selenium were detected in the TCLP leachate samples. Barium was detected in all 10 leachates at concentrations ranging from 0.145 mg/L to 0.49 mg/L. Arsenic was detected in seven of the leachates at concentrations ranging from 0.13 mg/L to 0.38 mg/L. Selenium was detected in two leachates at concentrations of 0.11 mg/L and 0.14 mg/L, and cadmium was detected in a single leachate at a concentration of 0.0095 mg/L.

TPH was detected in 12 of 20 soil samples at concentrations ranging from 28 mg/kg to 898 mg/kg. The maximum TPH concentration was detected in the soil sample collected from a depth interval of 4 to 8 feet bgs from well boring 7MW8S, located along Triton Road in the western portion of the site. Analyses for

TOC were performed for five soil samples. Reported results for these five samples range from 2,740 mg/kg to 18,800 mg/kg.

#### 2.7.4.2 Groundwater

Groundwater samples from both overburden and bedrock wells were collected at the Torpedo Shops site. Table 2-19 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in groundwater samples collected from overburden wells at the Torpedo Shops site. Table 2-20 presents similar information for groundwater samples collected from bedrock wells at the Torpedo Shops site. Based upon the screening level assessment for the Torpedo Shops (Section 2.7.5.3) and the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary COPCs in Torpedo Shops overburden and bedrock groundwater samples are presented on Drawings 5 and 6, respectively (Volume II).

Overburden Wells

Nine VOCs, including six chlorinated aliphatics, 2-butanone, and carbon disulfide, were detected in groundwater samples collected from the Torpedo Shops overburden wells. As shown on Table 2-19, 1,1,1-trichloroethane and 1,1-dichloroethane were each detected in six of 20 groundwater samples at concentrations ranging from 2 µg/L to 42 µg/L. 1,1-Dichloroethene was detected in four groundwater samples at concentrations ranging from 1 µg/L to 2 µg/L. The remaining VOCs were detected in one or two samples at concentrations ranging from 1 µg/L to 10 µg/L. Maximum concentrations of all VOCs except 2-butanone, chlorobenzene, and methylene chloride were associated with samples collected from well 7MW3S, located west of Building 325 in the south leach field. Methylene chloride, which was detected in a single groundwater sample at a concentration of 4 µg/L, was also detected in one of the off-site residential wells at a concentration of 4 µg/L.

Thirteen SVOCs, including six PAHs, three phthalates, 1,4-dichlorobenzene, benzoic acid, dibenzofuran, and phenol, were detected in the 20 groundwater samples collected from overburden wells. Benzoic acid and di-n-butyl phthalate were detected in six and four samples, respectively. The remaining SVOCs were each detected in only one or two of 20 samples. With the exception of bis(2-ethylhexyl)phthalate, which was detected in a single groundwater sample at a concentration of 380 µg/L and in one of the off-site residential wells at a concentration of 3 µg/L, all SVOC concentrations ranged from 0.5 µg/L to 9 µg/L. Maximum concentrations of eight SVOCs were associated with groundwater samples collected from well 7MW8S, located along Triton Road in the western portion of the site.

The two groundwater samples collected during the Phase I RI were analyzed for pesticides and PCBs. Neither pesticides nor PCBs were detected in either of these samples.

As shown on Table 2-19, 22 metals were detected in unfiltered groundwater samples collected from the overburden wells, and 15 metals were detected in the corresponding filtered groundwater samples. In general, maximum concentrations reported for metals in unfiltered and filtered samples were relatively similar (i.e., at the same order of magnitude). Close to half of the maximum concentrations of metals were associated with groundwater samples collected from well 7MW3D, located near Triton Road and west of the south leach field. Maximum concentrations of all metals except barium (filtered samples only), cadmium, calcium, copper, iron (filtered samples only), lead, manganese, potassium, and zinc exceeded concentrations of respective metals detected in unfiltered groundwater samples collected from off-site residential wells. Notable results include the maximum concentrations reported for antimony (108 µg/L), manganese (1,780 µg/L), and silver (38.9 µg/L).

Analyses for oil and grease were performed for four of the groundwater samples, resulting in a concentration of 600 µg/L reported for one sample (from well 7MW3D). TPH analyses were performed for nine of the groundwater samples collected from overburden wells. TPH was detected in two of these samples (both collected from well 7MW8S) at concentrations of 700 µg/L and 1200 µg/L. This well is located along Triton Road, downstream of the three buildings.

Analyses for COD, hardness, total phosphorus, and TSS were also performed for selected groundwater samples collected from the overburden wells. Analytical results for these parameters are provided in Table 2-19.

Bedrock Wells

Minimal organic contamination was detected in the groundwater samples collected from the Torpedo Shops bedrock wells. 1,1,1-Trichloroethane (2 µg/L), methylene chloride (1 µg/L), benzoic acid (0.7 µg/L), and phenol (0.8 µg/L) were detected in one or the other of two samples collected from well 7MW5D. 4-Methyl-2-pentanone (21 µg/L) was detected in a groundwater sample collected from well 7MW4S, methylene chloride (1 µg/L) was detected in a groundwater sample collected from well 7MW2D, and total xylenes (1.2 µg/L) was detected in a groundwater sample collected from well B325-MW2. Methylene chloride and total xylenes were also detected in off-site residential wells at concentrations (4 µg/L and 2 µg/L, respectively) greater than the concentrations detected in the Torpedo Shops groundwater samples. No other VOCs, SVOCs, pesticides, or PCBs were detected in the groundwater samples collected from Torpedo Shops bedrock wells.

As shown on Table 2-20, 24 metals were detected in unfiltered groundwater samples collected from the bedrock wells, and 14 metals were detected in the corresponding filtered groundwater samples. Maximum concentrations reported for barium, copper, iron, lead, and zinc in unfiltered samples were more than five times greater than maximum concentrations of respective metals reported for filtered samples. This indicates that concentrations of these metals in the unfiltered samples may be caused by the presence of suspended sediments and may not actually represent contamination of the groundwater. More than half of the maximum concentrations of metals were associated with groundwater samples collected from well 7MW5D, located near the southwestern corner of Building 450. In addition, several maximum concentrations were associated with groundwater samples collected from well 7MW4S, located near the southeastern corner of Building 325. Maximum concentrations of all metals except barium (filtered samples only), boron (unfiltered samples only), cadmium, calcium, copper, iron (filtered samples only), lead, potassium (filtered samples only), silver, and zinc exceeded concentrations of respective metals detected in unfiltered groundwater samples collected from off-site residential wells. Notable results include the maximum concentrations reported for aluminum (56,200 µg/L), arsenic (112 µg/L), barium (585 µg/L), chromium (104 µg/L), copper (797 µg/L), manganese (7830 µg/L), nickel (94 µg/L), and zinc (412 µg/L).

Analyses for ammonia, COD, hardness, TOC, total phosphorus, and TSS were also performed for selected groundwater samples collected from the bedrock wells. Analytical results for these parameters are provided in Table 2-20.

### 2.7.5 Data Evaluation

This section summarizes data evaluation procedures performed for site data. A discussion of contaminant fate and transport, a summary of the historical human health risk assessment(s) performed for the site, and a screening level assessment of site data are provided.

#### 2.7.5.1 Contaminant Fate and Transport

The analytical results for soil, overburden groundwater, and bedrock groundwater samples collected at the Torpedo Shops (Site 7) are not indicative of significant off-site transport of contaminants. Although there was a direct subsurface discharge (i.e., the septic systems), the samples collected in the vicinity of these sources appear to contain little contamination (the soil contained a few ketones at concentrations ranging from 0.032 mg/kg to 0.17 mg/kg and halogenated aliphatics at concentrations ranging from 0.003 mg/kg to 0.42 mg/kg). Halogenated aliphatics (1,1,1-trichloroethane and 1,1-dichloroethane) were also detected in an overburden well installed in the south septic system. Although the soil data do not clearly indicate a source of volatile organic chemicals, these compounds were detected in the groundwater but at low concentrations.

A number of PAHs were detected in the soil samples, especially samples collected from relatively shallow depths (e.g., 1 to 4 feet bgs). A sample collected from an upgradient well boring at the same depth contained concentrations similar to a sample collected from the septic systems. These results may be indicative of past practices at the Torpedo Shops or may possibly be related to fill material emplaced during site construction. PAHs are not typically soluble and are most likely to be retained by soil particles and migrate during erosional events (wind or water).

#### 2.7.5.2 Summary of Human Health Risk Assessment

The baseline human health risk assessment conducted during the Phase II RI for the Torpedo Shops site considered the potential exposure of three receptor groups, including full-time employees, construction workers, and future potential residents. In accordance with USEPA Region I guidance, CTE and RME exposure scenarios were considered for each receptor. Groundwater was not considered to be a potential medium for exposure for the full-time employee. Dermal contact with groundwater was evaluated as a potential route of exposure for the construction worker. Exposures to groundwater through direct ingestion, dermal contact while showering/bathing, and inhalation of volatiles while showering/bathing were evaluated for future potential residents.

Noncarcinogenic risks associated with exposure to groundwater exceeded the USEPA acceptable level of one for the construction worker under the RME scenario and for the future resident under the RME and CTE scenarios. The noncarcinogenic risks for the construction worker are attributable to potential exposure to manganese in groundwater. Elevated noncarcinogenic risks for the future resident are a result of groundwater exposure to bis(2-ethylhexyl)phthalate and several metals (antimony, arsenic, manganese, and thallium).

Incremental cancer risk associated with exposure to groundwater was less than USEPA and CTDEP target cancer risks for the CTE construction worker. For the RME construction worker, incremental cancer risk associated with exposure to groundwater was less than the CTDEP target cancer risk of 1E-5 and was within USEPA's acceptable target risk range of 1E-6 to 1E-4. Incremental cancer risk associated with exposure to groundwater for the CTE future potential resident was also within the USEPA target risk range; however, this value exceeded the CTDEP target cancer risk. Carcinogenic risk associated with exposure to groundwater exceeded 1E-5 and 1E-4 for the RME future resident. Bis(2-ethylhexyl)phthalate and arsenic contributed significantly to the carcinogenic risks for this receptor; chemical-specific incremental cancer risks for these chemicals via direct ingestion of groundwater and dermal contact with groundwater exceeded 1E-4.

### 2.7.5.3 Screening Level Assessment

COPCs at this site were selected using the risk-based COPC screening levels described in Section 1.4.2. All data collected during the Phase I and II RIs were used to select COPCs for soil and groundwater. Maximum and 95% UCL chemical concentrations are presented in the summary tables. Although the maximum concentration of a chemical may exceed an associated criterion, the distribution of the chemical in the medium is also important with respect to decision making. Therefore, the 95% UCL chemical concentration was included to provide some information on the potential distribution of the chemical. In addition, the summary tables for groundwater samples present the range of concentrations detected in off-site residential wells for each detected chemical to enable comparison of site groundwater data with groundwater data collected from wells unaffected by the site. A brief narrative of the findings of this qualitative analysis is provided in the remainder of this section.

The following parameters were selected as COPCs for Torpedo Shops soils based upon the COPC screening analysis presented in Table 2-17 and Table 2-18:

- Chlorinated aliphatic hydrocarbons (methylene chloride)
- PAHs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene]
- SVOCs (carbazole)
- Pesticides (4,4'-DDE and 4,4'-DDT)
- PCBs (Aroclor-1254)
- Inorganics (antimony, barium, beryllium, chromium, lead, manganese, mercury, nickel, thallium and vanadium).

Based upon the procedures for the preparation of soil tag maps (Section 1.4.3.1), analytical results for primary soil COPCs [all aforementioned COPCs except dibenzo(a,h)anthracene, carbazole, and thallium] associated with Torpedo Shops soil samples and TCLP leachates are presented on Drawing 8 in Volume II of this report.

Maximum concentrations of benzo(a)anthracene, carbazole, and antimony exceeded both USEPA SSLs for migration to groundwater and Connecticut remediation standards for pollutant mobility for groundwater classified as GB. Maximum concentrations of methylene chloride and thallium exceeded the USEPA SSLs for migration to groundwater. Maximum concentrations of benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, 4,4'-DDE, 4,4'-DDT Aroclor-1254, barium, beryllium, cadmium, chromium, lead, manganese, mercury, nickel, and vanadium exceeded the Connecticut remediation standards for pollutant mobility for groundwater classified as GB. Chemical

concentrations in excess of the SSLs and/or Connecticut remediation standards for pollutant mobility indicate the potential for these chemicals to migrate to groundwater and potentially impact the quality of the groundwater.

As previously noted, cadmium was detected in soil samples at a maximum concentration exceeding the Connecticut remediation standard for pollutant mobility. However the soil sample associated with the maximum concentration of cadmium was also subjected to TCLP analysis, and cadmium was not detected at concentrations exceeding the associated Connecticut pollutant mobility standard for GB areas or the federal toxicity characteristic regulatory level in any of the TCLP leachates. Therefore, the TCLP data indicate that pollutant mobility is not anticipated to be of concern for cadmium in the soil matrix at this site, and cadmium was not selected as a COPC.

Barium, chromium, lead, and mercury were not detected in the TCLP leachates or were detected at concentrations less than the associated Connecticut pollutant mobility standard for GB areas and the federal toxicity characteristic regulatory levels. However, the soil samples associated with the maximum concentrations of these COPCs were not included in the group of samples subjected to TCLP analysis. Therefore, although TCLP results do not indicate the potential for these chemicals to migrate from site soils to groundwater, the TCLP results cannot be used with absolute certainty to negate the potential for migration of these chemicals to groundwater that is indicated by the soil data. Thus, barium, chromium, lead, and mercury were retained as COPCs.

Aluminum, copper, and iron were not evaluated for COPC selection; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for these chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. In addition, USEPA SSLs and CTDEP pollutant mobility criteria were not available for calcium, magnesium, sodium, and potassium because these analytes are considered to be essential nutrients.

Of the aforementioned soil COPCs, methylene chloride, antimony, barium, beryllium, chromium, lead, manganese, mercury, nickel, thallium, and vanadium were also detected in groundwater at this site.

The following parameters were selected as COPCs for the Torpedo Shops overburden groundwater based upon the COPC screening analysis presented on Table 2-19:

- Monocyclic aromatic hydrocarbons (1,4-dichlorobenzene)
- Chlorinated aliphatic hydrocarbons (1,1-dichloroethene and chloroform)
- PAHs (acenaphthylene and phenanthrene)
- SVOCs [bis(2-ethylhexyl)phthalate and dibenzofuran]

- Inorganics (antimony, arsenic, cadmium, chromium, lead, manganese, silver, thallium, and vanadium)
- TPH.

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary overburden groundwater COPCs (arsenic, lead, and manganese) associated with Torpedo Shops overburden groundwater samples are presented on Drawing 5 (Volume II).

Maximum concentrations of bis(2-ethylhexyl)phthalate, antimony (filtered and unfiltered), and thallium (filtered and unfiltered) exceeded the COPC screening level, the federal MCL, and the state MCL. Of these three criteria, maximum concentrations of 1,1-dichloroethene, chloroform, 1,4-dichlorobenzene, dibenzofuran, arsenic (filtered and unfiltered), cadmium (unfiltered), chromium (unfiltered), silver (unfiltered), and vanadium (unfiltered) exceeded only the COPC screening level. Additionally, the maximum concentration of manganese (filtered and unfiltered) exceeded both the COPC screening level and the federal MCL, and the maximum concentration of lead exceeded the federal MCL. However, chloroform, 1,4-dichlorobenzene, and bis(2-ethylhexyl)phthalate were detected at frequencies of only 5 percent.

Concentrations of iron (filtered and unfiltered) exceeded both COPC screening levels and the federal MCL. Aluminum (unfiltered) was detected at a maximum concentration in excess of the federal secondary MCL. However, aluminum and iron were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for both chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium (filtered and unfiltered) was detected at maximum concentrations in excess of the state MCL. However, sodium, calcium, magnesium, and potassium were not selected as COPCs because these analytes are considered to be essential nutrients.

Maximum concentrations of bis(2-ethylhexyl)phthalate, antimony (filtered and unfiltered), lead (unfiltered), manganese (filtered and unfiltered), silver (unfiltered), thallium (filtered and unfiltered), vanadium (unfiltered), and TPH detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. Groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

Site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection, and this comparison yielded the following exceedances: acenaphthylene, bis(2-

ethylhexyl)phthalate, phenanthrene, arsenic (filtered and unfiltered), lead (unfiltered), and silver (unfiltered).

Of the COPCs selected for groundwater samples collected from overburden wells, maximum concentrations of bis(2-ethylhexyl)phthalate, antimony, arsenic, chromium, silver, thallium, and vanadium in overburden groundwater at the Torpedo Shops exceeded detected concentrations of these chemicals in unfiltered groundwater samples from off-site residential wells. Conversely, the maximum detected concentrations of cadmium, lead, and manganese in overburden groundwater were less than respective maximum concentrations detected in off-site residential wells.

The following parameters were selected as COPCs for the Torpedo Shop bedrock groundwater based upon the COPC screening analysis presented on Table 2-20:

- Inorganics (antimony, arsenic, barium, cadmium, chromium, lead, manganese, mercury, nickel, selenium, thallium, vanadium, and zinc).

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary bedrock groundwater COPCs (arsenic, barium, manganese, and zinc) associated with Torpedo Shops bedrock groundwater samples are presented on Drawing 6 in Volume II of this report.

Maximum concentrations of antimony (filtered and unfiltered), arsenic (unfiltered), chromium (unfiltered), cadmium (filtered and unfiltered), manganese (unfiltered), mercury (unfiltered), and thallium (unfiltered) exceeded the COPC screening level, the federal MCL, and the state MCL. Of these three criteria, maximum concentrations of barium (unfiltered), cadmium (filtered and unfiltered), nickel (unfiltered), selenium (unfiltered), and vanadium (unfiltered) exceeded only the COPC screening levels. Lead (unfiltered) concentrations exceeded the federal MCL. The maximum concentration of manganese (filtered) was in excess of both the COPC screening level and the federal MCL.

Concentrations of iron (filtered and unfiltered) exceeded COPC screening level and/or the federal MCL. Aluminum (unfiltered) concentrations were in excess of the federal secondary MCL, and maximum concentration of copper (unfiltered) exceeded the COPC screening level. However, aluminum, copper, and iron were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for both chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium (filtered and unfiltered) was detected at maximum concentrations in excess of the state MCL. However, sodium, calcium, magnesium, and potassium were not selected as COPCs because these analytes are considered to be essential nutrients.

Maximum concentrations of antimony (filtered and unfiltered), arsenic (unfiltered), chromium (unfiltered), lead (unfiltered), manganese (filtered and unfiltered), mercury (unfiltered), thallium (unfiltered), and vanadium (unfiltered) detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. As previously noted, groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

Site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection. This comparison yielded the following exceedances: arsenic (unfiltered), copper (unfiltered), lead (unfiltered), mercury (unfiltered), and zinc (unfiltered). However, s previously noted, copper was not selected as a COPC; USEPA Region I does not advocate quantitative evaluation of exposure to copper because the only available toxicity criterion for this chemical is a provisional reference dose based on allowable intakes rather than adverse effect levels.

Of the selected COPCs, maximum concentrations of antimony, arsenic, barium, chromium, manganese, mercury, nickel, selenium, thallium, and vanadium were in excess of the maximum detected concentrations of these chemicals detected in unfiltered groundwater samples from off-site residential wells. Conversely, the concentrations of cadmium, lead, and zinc detected in the Torpedo Shops bedrock groundwater were below the respective concentrations detected in off-site residential wells.

### 2.7.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Site 7 using the decision tree approach is as follows:

- The Torpedo Shops were investigated during the Phase I and Phase II RIs and the Site Characterization at Building 325. The information collected during these investigations is sufficient to describe the site and its physical characteristics; however, more data are required to determine the nature and extent of organic contamination at this site.

- The Phase I RI concluded that the human health risks associated with this site are negligible; however, the Phase II RI found notable detections of contamination in soil and groundwater near the abandoned septic system. Methylene chloride and several PAHs were found in approximately 50 percent of the soil samples collected at Site 7. Several of these chemicals were also evident in the overburden groundwater analyses, especially in the south-central area of the site. In addition, health

risks to the construction worker and future resident exceeded USEPA's acceptable levels. The Phase II RI recommended that further characterization of Site 7 be completed to determine if it is necessary to proceed to an FS.

- Further action is required at Site 7, as discussed below in Section 2.7.7.

### 2.7.7 Recommendations

Site 7 was investigated during three previous investigations. The results of these investigations indicate that additional soil and groundwater sampling in support of the Basewide Groundwater OU RI should be initiated in and around the area of the abandoned septic system line to verify the nature and extent of organic contamination originating from the Torpedo Shops. Additional overburden and bedrock groundwater monitoring wells should be installed, as necessary, and sampled to verify the migration pathways and the extent (i.e., both horizontal and vertical) of volatile organic contamination from the site.

The additional soil and groundwater samples should also be analyzed for TCL SVOCs and TAL metals to address concerns brought up by the screening level analysis. Ammonium perchlorate should also be analyzed for in the groundwater samples because it is possible that this compound was released as a result of maintenance activities on the torpedoes.

## 2.8 SITE 14 – OBDANE

### 2.8.1 Site Description

The OBDANE site is located in a heavily wooded area on the edge of a ravine northwest of the Area A Landfill, west of the Area A Weapons Center and south of the Torpedo Shops. At one time, miscellaneous wastes were apparently dumped over the bedrock edge. The site is circular and approximately 80 feet in diameter. A dirt road provides limited access to the wooded site. Figure 2-7 displays the general site arrangement. The site location is shown on Drawing 1. A nearly vertical 20-foot-high bedrock face is located at the eastern edge of the site. The rest of the site slopes to the southwest.

The IAS report stated that the vegetation at the site indicated that no dumping had occurred within 10 years prior to the 1982 investigation. Atlantic personnel inspected the site on September 30, 1988 and verified the IAS report of the presence of several empty fiber drums. No visual staining or stressed vegetation were observed at this time. No development of this area is currently planned.

### 2.8.2 Site Investigations

The following investigations and decision documents related to the OBDANE site are discussed in the subsections that follow:

- Final IAS (Envirodyne, 1983)
- Phase I RI (Atlantic, 1992)
- Phase II RI (B&R Environmental, 1997a)

#### 2.8.2.1 Final Initial Assessment Study

In 1982, Envirodyne Engineers performed an IAS at NSB-NLON as part of the NACIP program. The purpose of this study was to identify and evaluate past waste disposal practices and to assess the potential for environmental impacts. Envirodyne reviewed installation records, interviewed long-term and former employees, toured the installation, and photographed sites as part of the IAS.

Envirodyne identified 11 sites at NSB-NLON as having contained hazardous material; one site was the Overbank Disposal Area Northeast, or OBDANE (Site 14). The IAS concluded that the source of contamination for this site was still present and potentially releasing contaminants to the environment. The IAS recommended that "No Dumping" signs be posted at the site.

#### 2.8.2.2 Phase I Remedial Investigation

An investigation of 11 sites was completed at NSB-NLON by Atlantic Environmental Services from 1990 through 1992. OBDANE Site 14 was one of the sites investigated,.

The Phase I RI field investigation at this site consisted of surface soil sampling. Four surface soil samples were collected from two locations within the limits of the identified disposal area during the 1990 Phase I RI. A sample was collected from the 0- to 6-inch and 12- to 18-inch interval from each location. A fifth sample (14SS3C) plus a field duplicate were composites of the two surface samples. Sample locations are depicted on Figure 2-7.

The Phase I RI concluded that there was negligible risk associated with this site and recommended that a supplemental Step I Investigation be performed for Site 14.

#### 2.8.2.3 Phase II Remedial Investigation

A Phase II RI at 13 sites at NSB-NLON was conducted by B&R Environmental from 1995 through 1997. OBDANE Site 14 was one of the sites investigated.

A single shallow monitoring well (14MW1S) was installed in the presumed downgradient direction from the site during the Phase II RI. The well was sampled during Rounds 1 and 2 of the Phase II RI and analyzed for TCL VOCs, TCL SVOCs, and TAL metals (total and dissolved) in each round.

Six additional soil samples were collected from three different borings during the Phase II RI. Samples were collected from depths of 0 to 2 feet and 8 to 10 feet from boring 14TB1 (located within the limits of the disposal area) and from depths of 0 to 2 feet and 2 to 4 feet from boring 14TB2 (located south of the disposal area). Two soil samples were also collected from the boring drilled for the installation of a monitoring well (14MW1) from depth intervals of 0 to 2 feet and 2 to 4 feet. In addition, a single surface soil sample (0 to 6 inches) was collected approximately 75 feet south of the disposal area. All soil samples were analyzed for TCL VOCs, TCL SVOCs, and TAL metals (total). In addition, the two soil samples from 14MW1 were also analyzed for TCLP metals and the soil sample 14SS3 was also analyzed for TCL pesticides/PCBs. Sample locations are shown on Figure 2-7.

The Phase II RI concluded that all human health risks were found to be within or below USEPA's target range; however, arsenic was found in surface soil samples at concentrations that slightly exceeded state standards, and lead contamination was found in surface soil samples approximately 80 feet south of the site. The RI report recommended that further characterization of the surface soil with respect to arsenic and lead should be completed.

### 2.8.3 Physical Characteristics

This section presents a summary of site physical characteristics for the OBDANE based on information generated during the Phase I and Phase II RIs. Topography and surface features, surface water, soils, geology, and hydrogeology are discussed in the subsections that follow.

#### 2.8.3.1 Surrounding Topography and Surface Features

Drawing 2 shows the topography and surface features of the OBDANE. The OBDANE is located near the base of the bedrock high that slopes southwest from the Area A Weapons Center. There are bedrock exposures upslope of the site. The ground elevation of the site ranges from approximately 80 to 50 feet msl. Downslope of the site, the ground flattens toward the Area A Downstream Watercourses, which have a general ground elevation of 40 feet msl.

#### 2.8.3.2 Surface Water Features

Surface runoff from the OBDANE site flows to the southwest into a stream (Stream 3) that is part of the Area A Downstream Watercourses. The stream then flows along Triton Road and ultimately discharges into the Thames River at the southern end of the DRMO site.

#### 2.8.3.3 Soil Characteristics

The SCS Soils Map (SCS, 1983) classifies the soil at the OBDANE as the Hollis-Charlton-Rock complex. This soil is defined as stones and boulders intermingled with a dark, fine, sandy loam. Bedrock outcrops are prevalent.

#### 2.8.3.4 Geology and Hydrogeology

Geology

The geology of the OBDANE consists of sand and silt alluvium overlying metamorphic bedrock. During the Phase II RI, one test boring (14TB1) was drilled within the boundary of the site. The overburden consists of silty sand with gneiss fragments. Outside the OBDANE boundary, the overburden at boring 14TB2A and well 14MW1S consists of sand with traces of mica. These deposits are either present-day stream deposits or stratified drift of former glacial streams. Bedrock (the Mamacoke) was encountered at depths of 14 and 12 feet at boring 14TB2A and well 14MW1S, respectively.

The bedrock at the OBDANE slopes toward the southwest according to the general trend of the northern ridge. Because the bedrock elevation at well 2DMW11D, which is downgradient of the OBDANE, is similar to those present at the site, the bedrock surface slope appears to flatten to the southwest.

Hydrogeology

Groundwater is present within both the overburden and bedrock underlying the OBDANE. Depth to groundwater at well 14MW1S was less than 5 feet. The saturated thickness of the overburden materials is approximately 6 to 10 feet at OBDANE along Stream 3. Groundwater was not encountered at the higher elevation of boring 14TB1.

Drawing 3 shows overburden groundwater contours across the OBDANE. Groundwater in the overburden flows westward from the Area A Weapons Center across the OBDANE toward the Area A Downstream watercourses and the Thames River. The groundwater flow pattern in the underlying bedrock is expected to be similar to that observed for the overburden. Upgradient of the OBDANE, there

is a steep hydraulic gradient. The water-table surface generally mimics the approximately 30-foot drop in the topographic surface from the Area A Weapons Center to the OBDANE.

The hydraulic gradient within the overburden across the OBDANE based on the August 1994 Phase II RI water level data is 0.045. Assuming a hydraulic conductivity of 6.8 feet/day for the sandy alluvium, which was reported for the alluvium in the Area A Downstream Watercourses during the Phase I RI (based on a slug test for well 2DMW16S), and a porosity of 0.30, the estimated groundwater seepage velocity in the shallow overburden is approximately 1 foot/day.

The hydraulic gradient and topographic surface flattens downgradient of the OBDANE. Based on the March 1994 Phase II RI water level data, the hydraulic gradient between wells 14MW1S and 2DMW26S is 0.022. Assuming the hydraulic conductivity for the sandy alluvium in the Area A Downstream Watercourses is 6.8 feet/day and the porosity is 0.30, the estimated groundwater seepage velocity downgradient of the site in the shallow overburden is 0.50 foot/day.

### 2.8.4 Nature and Extent of Contamination

This section presents an evaluation of the nature and extent of contamination in the OBDANE (Site 14). The discussion includes analytical results for soil and groundwater samples collected during the Phase I and Phase II RIs. The complete analytical database for all samples is contained in Appendix A.

#### 2.8.4.1 Soil

Table 2-21 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in soil samples collected from the OBDANE. Table 2-22 presents similar information for TCLP results. Based upon the screening level assessment for the OBDANE (Section 2.8.5.3) and the procedures for the preparation of soil tag maps (Section 1.4.3.1), analytical results for primary COPCs in OBDANE soil samples and associated TCLP leachates are presented on Drawing 8 in Volume II of this report.

As shown on Table 2-21, 11 VOCs were detected in the 10 OBDANE soil samples analyzed for this fraction. However, eight of these VOCs, including six chlorinated hydrocarbons, benzene, and total xylenes, were detected in a single surface soil sample at very low concentrations (i.e., with one result at a concentration of 0.008 mg/kg and the remaining results at concentrations of 0.002 mg/kg or 0.003 mg/kg). This sample, 14SS3, was collected from a depth interval of 0 to 0.5 feet bgs at a location approximately 75 feet south (and cross-gradient) of the actual disposal area. PCE was detected in two surface soil

samples at concentrations of 0.002 mg/kg and 0.003 mg/kg. Toluene (0.018 mg/kg) and methylene chloride (0.007 mg/kg) were each detected in a single soil sample. These results are not considered to be indicative of a major source of VOCs. As discussed in Section 2.8.4.2, the analytical results for groundwater samples support this statement.

Ten PAHs and benzoic acid were detected in from two to five of the eight OBDANE soil samples analyzed for SVOCs. The maximum concentrations of all PAHs were detected in the soil sample collected from a depth interval of 8 to 10 feet bgs from boring 14TB1, located in the northwestern portion of the disposal area; however, these maximum concentrations were relatively low, ranging from 0.04 mg/kg (phenanthrene) to 0.11 mg/kg [benzo(a)pyrene and chrysene]. The sum of all SVOC concentrations reported for this sample was 0.877 mg/kg. The sum of SVOC concentrations reported for the sample collected from a depth interval of 0 to 2 feet from boring 14TB1 was 0.757 mg/kg. No SVOCs were detected in the soil sample collected at a 2- to 4-foot interval from boring 14TB2A. The sums of SVOC concentrations for the remaining OBDANE soil samples ranged from 0.029 mg/kg to 0.43 mg/kg.

Surface soil samples 14SS3 and 14SS3C were also analyzed for pesticides and PCBs. 4,4'-DDT (0.4 mg/kg) and related compounds, 4,4'-DDE (0.074 mg/kg) and 4,4'-DDD (0.011 mg/kg), were detected in sample 14SS3. These results do not appear to indicate that pesticide-contaminated material was disposed at this site but rather that this site may have been affected by past base-wide applications of 4,4'-DDT.

Twenty-three metals were detected in the soil samples, although five of these metals (antimony, boron, mercury, selenium, and silver) were detected in only one or two samples. The maximum concentrations of 10 metals were detected in the samples collected from a depth interval of 0 to 2 feet bgs from well 14MW1S. Four additional maximum concentrations were detected in the sample collected from a depth interval of 2 to 4 feet bgs from this same well. Three metals (arsenic, boron, and lead) were detected in surface sample 14SS3 at concentrations (16.3 mg/kg, 27.6 mg/kg, and 403 mg/kg, respectively) notably greater than the respective concentrations of these metals detected in the other soil samples. All other metals in surface soil sample 14SS3 were reported at concentrations below the maximum detected concentrations for the other samples. Because soil samples collected from the disposal area do not contain these metals at elevated concentrations, a source could not be identified.

TCLP extraction followed by analysis for metals was performed for four of the OBDANE soil samples. As shown on Table 2-22, cadmium (0.0079 mg/L), chromium (0.0032 mg/L), and lead (0.306 mg/L) were each detected in one of the TCLP leachates. Barium was detected in two of the TCLP leachates (0.1 mg/L and 0.11 mg/L).

#### 2.8.4.2 Groundwater

A total of two groundwater samples were collected from a single overburden well (14MW1S) during Rounds 1 and 2 of the Phase II RI. This well is located approximately 25 feet southwest of OBDANE. Although this well is not located immediately downgradient of the site, groundwater samples from this well probably provide an accurate representation of groundwater conditions downgradient of the site.

Table 2-23 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in these two groundwater samples. Based upon the screening level assessment for the OBDANE (Section 2.8.5.3) and the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary COPCs in OBDANE overburden groundwater samples are presented on Drawing 5 in Volume II of this report.

Only one VOC (carbon disulfide) and one SVOC [bis(2-ethylhexyl)phthalate] were detected in the two groundwater samples collected from well 14MW1S. Both chemicals were detected at an estimated concentration of 1 µg/L. Bis(2-ethylhexyl)phthalate was also detected at a concentration of 3 µg/L in one of the off-site residential wells. Neither of these compounds was detected in any of the soil samples collected at the site. Therefore, as stated in the preceding section, the OBDANE does not appear to be a major source of organic contamination.

As shown on Table 2-23, 11 metals were detected in the unfiltered OBDANE groundwater samples, and 12 metals were detected in the associated filtered groundwater samples. With the exception of aluminum (detected at a concentration of 171 µg/L in unfiltered sample 14GW1S only), there were no significant differences between filtered and unfiltered metals results (i.e., filtered and unfiltered results for the remaining metals were at the same order of magnitude). Maximum concentrations of arsenic in filtered samples and of boron and cobalt in unfiltered samples exceeded respective concentrations of these metals detected in the unfiltered groundwater samples collected from the off-site residential wells. Notable results include boron ($C_{max}$ = 130 µg/L) and manganese ($C_{max}$ = 779 µg/L) in both filtered and unfiltered samples.

Analyses for hardness were also performed for the two OBDANE groundwater samples. Reported results for this parameter were 24 µg/L and 32 µg/L.

### 2.8.5 Data Evaluation

This section summarizes data evaluation procedures performed for site data. A discussion of contaminant fate and transport, a summary of the historical human health risk assessment(s) performed for the site, and a screening level assessment of site data are provided.

#### 2.8.5.1 Contaminant Fate and Transport

The soil samples collected at the OBDANE contained several VOCs and SVOCs. However, results for these parameters were relatively low (concentrations of VOCs sampled from 0.002 mg/kg, to 0.018 mg/kg, and concentrations of SVOCs ranged from 0.025 mg/kg to 0.11 mg/kg). These results indicate that the soil at this site is not a significant source of organic contaminants. Three pesticides (4,4'-DDT and its metabolites) were detected in one site soil sample; however, the site does not appear to represent a major source of pesticide contamination ($C_{max}$ = 0.4 mg/kg). None of the organic compounds identified in soil were detected in the site groundwater samples.

A sample collected outside the boundaries of the known disposal area contained elevated levels of some metals. However, since these metals were found at lower concentrations within the disposal area, the OBDANE does not appear to be the source. In conclusion, the data indicate no identifiable off-site transport of contaminants from this site.

#### 2.8.5.2 Summary of Human Health Risk Assessment

Based on the relatively remote nature of the OBDANE site, construction workers and older child trespassers were considered to be the only potential receptors of concern for the site during the Phase II RI risk assessment, and only construction workers were considered likely to be exposed to groundwater. Dermal exposures to groundwater during intrusive activities under CTE and RME scenarios were evaluated for the construction worker.

Noncarcinogenic risks associated with dermal exposure to groundwater for the construction worker under both CTE and RME scenarios were less than the USEPA acceptable level of one. Projected lifetime incremental cancer risks for this route of exposure under both scenarios were also less than USEPA's acceptable target risk range (1E-6 to 1E-4) and the CTDEP target cancer risk (1E-5). Therefore, it was concluded that the site poses little risk to human health.

#### 2.8.5.3 Screening Level Assessment

COPCs at this site were selected using the risk-based COPC screening levels described in Section 1.4.2. All data collected during the Phase I and II RIs were used to select COPCs for soil and groundwater.

Maximum and 95% UCL chemical concentrations are presented in the summary tables. Although the maximum concentration of a chemical may exceed an associated criterion, the distribution of the chemical in the medium is also important with respect to decision making. Therefore, the 95% UCL chemical concentration was included to provide some information on the potential distribution of the chemical. In addition, the summary tables for groundwater samples present the range of concentrations detected in off-site residential wells for each detected chemical to enable comparison of site groundwater data with groundwater data collected from wells unaffected by the site. A brief narrative of the findings of this qualitative analysis is provided in the remainder of this section.

The following parameters were selected as COPCs for OBDANE soils based upon the COPC screening analysis presented in Table 2-21 and Table 2-22:

- PAHs [indeno(1,2,3-cd)pyrene]
- Pesticides (4,4'-DDE and 4,4'-DDT)
- Inorganics (antimony, arsenic, cadmium, lead, manganese, and vanadium).

Based upon the procedures for the preparation of soil tag maps (Section 1.4.3.1), analytical results for primary soil COPCs (all aforementioned COPCs) associated with OBDANE soil samples and TCLP leachates are presented on Drawing 8 in Volume II of this report.

Maximum concentrations of all the aforementioned chemicals and chromium exceeded the Connecticut remediation standards for pollutant mobility for groundwater classified as GB. Chemical concentrations in excess of Connecticut remediation standards for pollutant mobility indicate the potential for these chemicals to migrate to groundwater and potentially impact the quality of the groundwater. However, although chromium was detected in soil samples at a maximum concentration exceeding the Connecticut remediation standard for pollutant mobility, the soil sample associated with the maximum concentration of chromium was also subjected to TCLP analysis. Chromium was not detected at concentrations exceeding the associated Connecticut pollutant mobility standard for GB areas or the federal toxicity characteristic regulatory level in any of the TCLP leachates. Therefore, the TCLP data indicate that pollutant mobility is not anticipated to be of concern for chromium in the soil matrix at this site, and chromium was not selected as a COPC.

Arsenic, cadmium, and lead were not detected in the TCLP leachates or were detected at concentrations less than the associated Connecticut pollutant mobility standard for GB areas and the federal toxicity characteristic regulatory levels. However, the soil samples associated with the maximum concentrations of these COPCs were not included in the group of samples subjected to TCLP analysis. Therefore, although TCLP results do not indicate the potential for these chemicals to migrate from site soils to

groundwater, the TCLP results cannot be used with absolute certainty to negate the potential for migration of these chemicals to groundwater that is indicated by the soil data. Thus, arsenic, cadmium, and lead were retained as COPCs.

Aluminum, copper, and iron were not evaluated for COPC selection; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for both chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. In addition, USEPA SSLs and CTDEP pollutant mobility criteria were not available for calcium, magnesium, sodium, and potassium because these analytes are considered to be essential nutrients.

Of the aforementioned soil COPCs, only arsenic, lead, manganese, and vanadium were also detected in groundwater at this site.

The following parameters were selected as COPCs for the overburden groundwater based upon the COPC screening analysis presented on Table 2-23:

- Inorganics (arsenic and manganese).

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary overburden groundwater COPCs (arsenic and manganese) associated with OBDANE overburden groundwater samples are presented on Drawing 5 in Volume II of this report.

Maximum concentrations of manganese (filtered and unfiltered) exceeded the COPC screening level and the federal MCL. The maximum concentration of arsenic (filtered) exceeded the COPC screening level.

Concentrations of iron (filtered and unfiltered) exceeded both the COPC screening level and the federal MCL. However, iron was not selected as a COPC because USEPA Region I does not advocate quantitative evaluation of exposure to this chemical because the only available toxicity criterion for this chemical is a provisional reference dose based on allowable intakes rather than adverse effect levels. Sodium (filtered and unfiltered) was detected at maximum concentrations in excess of the state MCL. However, sodium, calcium, magnesium, and potassium were not selected as COPCs because these analytes are considered to be essential nutrients.

Maximum concentrations of manganese detected in filtered and unfiltered groundwater samples exceeded the Connecticut remediation standards for groundwater protection. Groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection

criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

None of the maximum detected chemical concentrations exceeded Connecticut remediation standards for surface water.

Of the two selected COPCs, the maximum concentration of arsenic in overburden groundwater at the OBDANE exceeded detected concentrations of this analyte in unfiltered groundwater samples collected from off-site residential wells. However, the concentrations of manganese in all OBDANE groundwater samples were less than the concentrations of manganese detected in off-site residential wells.

### 2.8.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Site 14 using the decision tree approach is as follows:

- The OBDANE was investigated during the IAS and the Phase I and Phase II RIs. The information collected during these investigations is sufficient to describe the site and its physical characteristics.

- Both the Phase I and Phase II RIs concluded that the human health risks associated with this site are all below EPA's target risk range. However, the Phase II RI found arsenic present in surface soil at concentrations that slightly exceed state standards. In addition, lead contamination was found in surface soil samples located approximately 80 feet south of the site. The RI report recommended that further characterization of the surface soil with respect to arsenic and lead be completed at Site 14.

- Further action is anticipated at Site 14 as discussed in Section 2.8.7.

### 2.8.7 Recommendations

Site 14 was investigated during three previous investigations. It is recommended that a removal action be completed for the soil at this site at the same time that the remediation at the Area A Downstream Watercourses Site 3 occurs. Following the removal action, confirmation sampling should be performed to verify that all contaminated soil at Site 14 has been removed.

The single overburden well installed at Site 3 should be resampled during the Basewide Groundwater OU RI. The sample should be analyzed for TCL VOCs to verify the extent of contaminant migration from the Torpedo Shops and for TAL metals to support determination of background concentrations.

## 2.9 SITE 20 – AREA A WEAPONS CENTER

### 2.9.1 Site Description

The Area A Weapons Center site consists of Building 524 and the weapons storage bunkers. The storage bunker area is divided into two portions (north and south areas) that were constructed at different times and are of different design. The site is located at the southeastern end of Triton Avenue and is adjacent to and on the northwestern side of the Area A Wetland. The general configuration of the Area A Weapons Center site is shown in Figure 2-8. The location of the site with respect to other IRP sites within NSB-NLON is shown on Drawing 1.

The Area A Weapons Center (Building 524) is located near the top of a local topographic and bedrock high. Building 524 was constructed in 1990-1991. Portions of the site were blasted to remove bedrock to accommodate construction of the building. The weapons storage bunkers are located southeast and downhill of Building 524 and are adjacent to and at a slightly higher elevation than the Area A Wetland.

Prior to construction of the Area A Weapons Center, the site consisted of woodlands in the vicinity of Building 524 and Area A Wetland in the bunker areas. Based on review of aerial photographs, the southern area of weapons storage bunkers was first evident in 1969. The northern area of weapons storage bunkers was first evident in February 1974.

Atlantic personnel inspected the Area Weapons Center on September 11, 1992. The following information was obtained during the site inspection. Building 524 is used for administration, minor torpedo assembly, and storage of simulator torpedoes. No weapons production takes place in this building. Small quantities of chemicals and chemical waste generated by activities in this building are stored in 1- to 5-gallon containers in seven metal storage cabinets located on a paved area south of the building. Chemicals include cleaning and lubricating compounds, paints, and adhesives. Many of these materials are classified as corrosive or flammable materials. The waste storage and management practices appeared to be good.

The weapons storage bunkers are located southeast of Building 524. Liquid fuels in the weapons storage bunkers include Otto fuel, JP-10, and TH Dimer (kerosene). The group of southern area bunkers has been reconstructed in the last 10 years. A major part of the reconstruction involved removal of structurally unsuitable soil from the site.

Routine maintenance and security improvements that are planned for the Area A Weapons Center include grouting and waterproofing of bunkers, repaving of roads, installation of culverts, and regrading associated with these activities.

### 2.9.2 Site Investigations

The following investigations and decision documents related to the Area A Weapons Center are discussed in the subsections that follow:

- Phase I RI (Atlantic, 1992)
- Phase II RI (B&R Environmental, 1997a)

#### 2.9.2.1 Phase I Remedial Investigation

This site was not investigated during the Phase I RI. Although samples were obtained in the vicinity of the site, these samples were collected as part of the Area A Wetland investigation. One groundwater sample was collected from well 2WMW4D. Well 2WMW4S was not completed due to a lack of significant groundwater in the shallow overburden. One surface soil sample 2WMW4 (0 to 2 feet) was collected from the boring 2WMW4S.

The Phase I RI concluded that several exposure scenarios exceeded acceptable levels at this site and recommended that the Area A Weapons Center proceed to a FS.

#### 2.9.2.2 Phase II Remedial Investigation

A Phase II RI at 13 sites at NSB-NLON was conducted by B&R Environmental from 1995 through 1997. The Area A Weapons Center Site 20 was one of the sites investigated as part of the RI.

Ten soil samples (plus two field duplicate samples) were collected from two monitoring well borings and eight test borings. Three samples (plus one field duplicate) were collected from depths of less than 2 feet (i.e., surface soils). Seven samples (plus one field duplicate) were collected from depths between 2 and 18 feet (i.e., subsurface soils). All soil samples were analyzed for TCL VOCs, TCL SVOCs, and TAL metals (total). In addition, eight of the soil samples (including both field duplicates) were also analyzed for TCL pesticides/PCBs, and one subsurface soil sample was also analyzed for TCLP metals.

Three new shallow overburden groundwater wells were installed and sampled. Additionally, the deep (bedrock) well 2WMW4D from the Phase I RI was sampled. Two rounds of groundwater samples were collected and four samples (plus one field duplicate during Round 1 only, from well 2WCMW1S) were collected during each sampling round. All groundwater samples in both rounds were analyzed for TCL VOCs, TCL SVOCs, and TAL metals (total and dissolved). In addition, one groundwater sample in each

round was analyzed for radiological parameters including gross alpha, gross beta, and a complete gamma spectrum analysis.

During the Phase II RI, 15 sediment samples plus one field duplicate sample were collected at this site. The sediment samples were collected from three distinct drainage areas. Two surface water samples were also collected from stormwater drainageways at the Area A Weapons Center. All sample locations are shown on Figure 2-8.

The Phase II RI concluded that, although there is minimal contamination of groundwater and surface water at the site, this area may be a contaminant source for the Area A Wetlands. The Phase II RI report recommended that the Area A Weapons Center proceed to the FS stage.

### 2.9.3 Physical Characteristics

This section presents a summary of site physical characteristics for the Area A Weapons Center based on information generated during the Phase I and Phase II RIs. Topography and surface features, surface water, soils, geology, and hydrogeology are discussed in the subsections that follow.

#### 2.9.3.1 Surrounding Topography and Surface Features

Drawing 2 shows the topography and surface features of the Area A Weapons Center. The site consists of Building 524 and weapons storage bunkers. The Area A Weapons Center is located near the top of the northern topographic and bedrock high. The ground surface generally slopes from the northern bedrock high to the south toward the Area A Wetland. The 90-foot ground surface contour surrounds the site. The shape of this contour is consistent with the topography on the historical surficial geology map (USGS, 1960). The ground surface across the Area A Weapons Center is relatively flat. It was altered when the bedrock was blasted during construction of Building 524. To the west and southwest, the ground surface slopes to a ravine (Area A Downstream Watercourses) and toward the OBDANE.

#### 2.9.3.2 Surface Water Features

Two drainage culverts (one along the northwestern side and one along the southeastern side of the site) collect runoff from the surrounding hillsides and from the Area A Weapons Center and discharge it to the Area A Wetland. The drainage culvert along the northwestern side eventually discharges to a storm sewer that passes along the southern side of the site and discharges into the Area A Wetland. The drainage culvert along the southeastern side collects runoff from the hillside north of the site and continues along the southeastern side of the site, eventually discharging to another drainage area of the Area A Wetland. The

Area A Wetland discharges to the Area A Downstream Watercourses and subsequently into the Thames River. Water typically flows in these drainage culverts immediately following precipitation occurrences.

#### 2.9.3.3 Soil Characteristics

The SCS Soils Map (SCS, 1983) classifies the soil at the Area A Weapons Center as Udorthents-Urban land. This soil type is defined as excessively to moderately drained soils that have been disturbed by cutting and filling. The bedrock surface has been altered by blasting in some areas of the site. Other areas have been filled with dredge spoils. Native soils at the Area A Weapons Center were likely the same as those along the northern bedrock high. The SCS Map classifies this soil as the Hollis-Charlton-Rock complex, which is defined as stones and boulders intermingled with a dark, fine, sandy loam. Bedrock outcrops are prevalent.

#### 2.9.3.4 Geology and Hydrogeology

Geology

The overburden materials at the Area A Weapons Center consist of 4 to 16 feet of coarse sand, gravel, and rock fill that is underlain by up to 17 feet of fine-grained dredge spoils. At the 2WCTB1 and 2WCTB4 test boring locations, 8 and 4 feet, respectively, of fill material rests directly on bedrock (Mamacoke Formation). These are the only test borings where the bedrock was encountered and dredge spoils were not present. The overburden thickness generally increases to the south and east, toward the Area A Wetland.

The bedrock surface generally slopes to the southwest across the site, toward the valley occupied by the Area A Wetland. The bedrock elevations at the 2WCTB1 and 2WCTB4 test borings are higher than at the 2WCTB6 test boring, which indicates that the bedrock surface does not slope uniformly and that localized bedrock surface depression(s) are present. This identified depression is most likely the result of the blasting activities that occurred during the construction of the Area A Weapons Center. The historical surficial geology map (USGS, 1960) indicates that, formerly, the bedrock rose steeply to the 2WCTB1 and 2WCTB4 test borings and then rose gently to the 2WCTB6 test boring.

Hydrogeology

Groundwater is present in both the overburden and bedrock underlying the Area A Weapons Center. The saturated thickness of the overburden deposits is variable, ranging up to 25 feet or more. Overburden groundwater is primarily found within the dredge spoil materials, with only the lowermost few feet of the coarser-grained fill deposits saturated. Drawing 3 shows shallow overburden groundwater contours for the Area A Weapons Center and nearby areas. Drawing 4 shows bedrock groundwater contours for the same

areas. Groundwater in both the overburden and bedrock flows across the weapons center to the southwest. Although monitoring well 2WMW6S was dry during the August round of data collection, the March data indicate a downward gradient between 2WMW6S and 2WMW6D, indicating downward flow from the overburden to the bedrock in this area.

The shallow overburden hydraulic gradient across the Area A Weapons Center is 0.019. Assuming an average horizontal hydraulic conductivity of 2.7 feet/day (based on the Area A Landfill pumping test) and a porosity of 0.30, the seepage velocity for this area is estimated to be about 0.17 feet/day. The bedrock flow gradient is similar to the overburden gradient; however, there are not sufficient data available regarding bedrock permeability and porosity to calculate flow velocities within the bedrock.

### 2.9.4 Nature and Extent of Contamination

Soil, sediment, groundwater, and surface water sampling was conducted at the Area A Weapons Center during the Phase I and Phase II RIs. Based upon the results of these investigations, the nature and extent of contamination of the soil and groundwater at the Area A Weapons Center are discussed on a matrix-specific basis in the following subsections. Analytical results for sediment and surface water samples will not be discussed since potential contamination of these media is not expected to impact the groundwater at this site. The complete analytical database for soil and groundwater samples is contained in Appendix A.

#### 2.9.4.1 Soil

Table 2-24 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in soil samples collected from the Area A Weapons Center. Table 2-25 presents similar information for TCLP results. Based upon the screening level assessment for the Area A Weapons Center (Section 2.9.5.3) and the procedures for the preparation of soil tag maps (Section 1.4.3.1), analytical results for primary COPCs in Area A Weapons Center soil samples and associated TCLP leachates are presented on Drawing 7A in Volume II of this report.

Five VOCs, including acetone, 2-butanone, carbon disulfide, toluene, and TCE, were infrequently detected in the Area A Weapons Center soil samples. Acetone and 2-butanone, which are both common laboratory contaminants, were detected at concentrations of 0.69 mg/kg and 0.24 mg/kg, respectively, in the soil sample collected from a depth interval of 8 to 10 feet bgs from boring 2WCTB6. The remaining VOC concentrations ranged from 0.002 mg/kg to 0.011 mg/kg. These analytical results do not indicate significant VOC contamination at this site.

As shown on Table 2-24, SVOCs, particularly PAHs, were detected more frequently and at greater concentrations than VOCs. The soil sample collected from a depth interval of 0 to 2 feet bgs from boring 2WCTB2, located southwest of the bunkers along Triton Road, yielded the greatest concentrations of PAHs. For example, some of the PAHs and associated concentrations reported for this sample include fluoranthene (5.7 mg/kg), phenanthrene (4.2 mg/kg), pyrene (4 mg/kg), benzo(b)fluoranthene (3.2 mg/kg), chrysene (2.3 mg/kg), and benzo(a)anthracene (2.1 mg/kg). Concentrations of PAHs generally decreased with depth. The maximum concentration of any PAH reported for soil samples collected at depths greater than 2 feet bgs was 0.5 mg/kg (pyrene in the sample collected at a depth interval of 8 to 10 feet bgs from boring 2WCTB6, located in the central part of the complex).

Three phthalate esters, which are common field and laboratory contaminants, were also detected in the Area A Weapons Center soil samples. These compounds were detected infrequently (each in two or three of 11 samples) at concentrations ranging from 0.028 mg/kg to 0.36 mg/kg. Carbazole (0.4 mg/kg and 0.72 mg/kg) was also detected in the soil sample and field duplicate sample collected at a depth interval of 0 to 2 feet bgs from boring 2WCTB2. Dibenzofuran was detected at concentrations of 0.084 mg/kg and 0.031 mg/kg in soil samples (both 0 to 2 feet bgs) collected from borings 2WCTB2 and 2WCTB1, respectively. Benzoic acid, ranging in concentration from 0.047 mg/kg to 0.48 mg/kg, was detected in 5 of 11 soil samples.

Three pesticides were detected in the Area A Weapons Center soil samples. 4,4'-DDE was detected in one sample and its associated field duplicate sample at concentrations of 0.004 mg/kg and 0.0074 mg/kg. Endrin was detected in two samples at concentrations of 0.011 mg/kg and 0.014 mg/kg. Endrin aldehyde was detected in two samples at concentrations of 0.0064 mg/kg and 0.007 mg/kg. Maximum concentrations of these three pesticides were detected in the soil sample or field duplicate sample collected at a depth interval of 0 to 2 feet bgs from boring 2WCTB2, located along Triton Road. Aroclor-1260 was detected at a concentration of 0.05 mg/kg in the soil sample collected from boring 2WMW4S (0 to 2 feet bgs).

Twenty-two metals were detected in the Area A Weapons Center soil samples, although antimony, cadmium, mercury, and silver were each detected in only two or three samples. As shown on Table 2-24, maximum concentrations of 10 metals were reported for the soil sample collected from a depth interval of 4 to 6 feet bgs from boring 2WCTB3, located on the northwestern side of the northern bunkers. Maximum concentrations for six additional metals were reported for the soil sample collected from a depth interval of 16 to 18 feet bgs from boring 2WCMW3S, located south of the bunkers.

As shown in Table 2-25, TCLP extraction followed by analysis for metals was performed for three Area A Weapons Center soil samples. Barium was detected in all three TCLP leachates at concentrations

ranging from 0.0317 mg/L to 0.248 mg/L. Arsenic, chromium, and selenium were each detected in the TCLP leachate of the soil sample collected from a depth interval of 6 to 8 feet bgs from boring 2WCTB5.

#### 2.9.4.2 Groundwater

Groundwater samples from both overburden and bedrock wells were collected at the Area A Weapons Center. Table 2-26 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in groundwater samples collected from overburden wells at the Area A Weapons Center. Table 2-27 presents similar information for groundwater samples collected from bedrock wells at the Area A Weapons Center. Based upon the screening level assessment for the Area A Weapons Center (Section 2.9.5.3) and the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary COPCs in Area A Weapons Center overburden and bedrock groundwater samples are presented on Drawings 5 and 6, respectively (Volume II).

Overburden Wells

No VOCs were detected in groundwater samples collected from the Area A Weapons Center overburden wells. Five SVOCs were detected at low concentrations. Bis(2-ethylhexyl)phthalate, a common field and laboratory contaminant, was detected in three of six samples at concentrations ranging from 2 µg/L to 3 µg/L. Bis(2-ethylhexyl)phthalate was also detected in one of the off-site residential wells at a concentration of 3 µg/L. 1,3-Dichlorobenzene (0.6 µg/L), benzo(g,h,i)perylene (1 µg/L), dibenzo(a,h)anthracene (0.8 µg/L), and indeno(1,2,3-cd)pyrene (1 µg/L) were each detected in one or the other of two groundwater samples collected from well 2WCMW1S.

Nineteen metals were detected in unfiltered groundwater samples collected from the overburden wells. Sixteen metals were detected in the corresponding filtered groundwater samples. A majority of the maximum concentrations of metals were associated with groundwater samples collected from well 2WCMW3S, located south of the site along the drainageway into the Area A Wetland. Concentrations of metals in filtered and unfiltered samples were relatively similar (i.e., at the same order of magnitude). As shown in Table 2-26, maximum concentrations of most metals exceeded concentrations reported for groundwater samples collected from off-site residential wells. Notable concentrations reported for groundwater samples include the maximum concentrations of arsenic (19.9 µg/L), boron (3810 µg/L), manganese (6540 µg/L), and sodium (3,580,000 µg/L).

Analyses for hardness were performed for two filtered and six unfiltered groundwater samples. Reported results for hardness for the two filtered samples were 125 mg/L and 436 mg/L. Reported results for hardness for the six unfiltered groundwater samples ranged from 64 mg/L to 4,000 mg/L.

Bedrock Wells

Three groundwater samples were collected (during the Phase I RI and Rounds 1 and 2 of the Phase II RI) from a single Area A Weapons Center bedrock well (2WMW4D). Six VOCs were detected (each in only one of the three samples) at concentrations ranging from 1 µg/L to 12 µg/L. As shown on Table 2-27, these VOCs include three ketones and three halogenated aliphatics. Three SVOCs were detected at concentrations ranging from 2 µg/L to 7 µg/L. Benzoic acid and di-n-octyl phthalate were each detected in one of three samples, and bis(2-ethylhexyl)phthalate was detected in two of the samples. As previously noted, bis(2-ethylhexyl)phthalate was also detected in one of the off-site residential wells at a concentration of 3 µg/L.

Thirteen metals were detected in unfiltered groundwater samples collected from the bedrock wells. Seven metals were detected in the corresponding filtered groundwater samples. Maximum concentrations of nickel and selenium exceeded concentrations reported for unfiltered groundwater samples collected from the off-site residential wells. A comparison of Tables 2-26 and 2-27 indicates that maximum concentrations of a majority of metals in overburden well samples are more than an order of magnitude greater than respective maximum concentrations of metals detected in bedrock well samples.

Radionuclide analyses (gross alpha and gross beta) were performed for the three groundwater samples collected from bedrock well 2WMW4D. Analytical results for radionuclide analyses are provided in the database tables (Appendix A). Gross alpha was detected at concentrations ranging from 10.1 pCi/L to 20 pCi/L, and gross beta was detected at concentrations ranging from 4.4 pCi/L to 22 pCi/L. Maximum concentrations of both parameters were associated with the sample collected during Round 2 of the Phase II RI. Complete gamma spectrum analyses performed for samples collected from this well during Rounds 1 and 2 of the Phase II RI detected no radionuclides.

Analyses for hardness were performed for one filtered and two unfiltered groundwater samples. The reported result for hardness for the filtered sample was 94 mg/L. Reported results for hardness for the two unfiltered groundwater samples were 92 mg/L and 118 mg/L.

### 2.9.5 Data Evaluation

This section summarizes data evaluation procedures performed for site data. A discussion of contaminant fate and transport, a summary of the historical HHRA(s) performed for the site, and a screening level assessment of site data are provided.

#### 2.9.5.1 Contaminant Fate and Transport

The primary classes of contaminants identified at the Area A Weapons Center are PAHs and phthalate esters. These chemicals are typically less soluble than volatile organics and therefore are most likely to migrate via erosional processes. Relatively low concentrations of PAHs (i.e., slightly above the method detection limits) were detected in one overburden groundwater sample (2WCGW1S-2). No PAHs were detected in bedrock groundwater samples. PAHs present in site soils would not be expected to migrate to groundwater.

#### 2.9.5.2 Summary of Human Health Risk Assessment

Three potential receptor groups were considered during the Phase II RI risk assessment for the Area A Weapons Center based on current and projected future land use. These included full-time employees, construction workers, and potential future residents. Both noncarcinogenic and carcinogenic risk estimates were generated for these receptor groups for both CTE and RME scenarios. Groundwater was not considered to be a potential medium for exposure for the full-time employee. Dermal contact with groundwater was evaluated as a potential route of exposure for the construction worker. Future residents were assumed to use groundwater as potable water; therefore, exposures to groundwater through direct ingestion, dermal contact while showering/bathing, and inhalation of volatiles while showering/bathing were evaluated for future potential residents.

The noncarcinogenic risk estimate associated with dermal contact with groundwater for the CTE construction worker was less than one. Noncarcinogenic risks for the RME construction worker and potential future residents (CTE and RME) exceeded the USEPA acceptable level of 1.0. The majority of the noncarcinogenic risks were associated with exposure to manganese in groundwater. Manganese is a commonly found naturally occurring metal. Arsenic and thallium were additional noncarcinogens of concern for the future resident exposed to groundwater under the RME scenario. Dermal contact with groundwater was the primary route of concern for the construction worker, and ingestion of groundwater was the primary route of concern for the future resident.

Incremental cancer risks were less than 1E-6 for the construction worker under both exposure scenarios and for the future resident (for both dermal contact and inhalation routes of exposure) under the CTE

scenario. The incremental cancer risk associated with the ingestion of groundwater for the CTE future resident (6.4E-5) was within USEPA's target risk range of 1E-6 to 1E-4 but exceeded the CTDEP target cancer risk of 1E-5. However, for the RME future resident, the cumulative incremental cancer risk associated with exposure to groundwater (6.4E-4) exceeded 1E-4, the upper limit of USEPA's target risk range, and the CTDEP target cancer risk. Estimated carcinogenic risks for future residents are primarily a result of exposure to dibenzo(a,h)anthracene and arsenic in groundwater. The exposure route that most contributes to the elevated carcinogenic risks for the future resident is incidental ingestion of groundwater.

#### 2.9.5.3 Screening Level Assessment

COPCs at this site were selected using the risk-based COPC screening levels described in Section 1.4.2. All data collected during the Phase I and II RIs were used to select COPCs for soil and groundwater. Maximum and 95% UCL chemical concentrations are presented in the summary tables. Although the maximum concentration of a chemical may exceed an associated criterion, the distribution of the chemical in the medium is also important with respect to decision making. Therefore, the 95% UCL chemical concentration was included to provide some information on the potential distribution of the chemical. In addition, the summary tables for groundwater samples present the range of concentrations detected in off-site residential wells for each detected chemical to enable comparison of site groundwater data with groundwater data collected from wells unaffected by the site. A brief narrative of the findings of this qualitative analysis is provided in the remainder of this section.

The following parameters were selected as COPCs for Area A Weapons Center soils based upon the COPC screening analysis presented in Table 2-24 and Table 2-25:

- PAHs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, chrysene, and indeno(1,2,3-cd)pyrene].
- SVOCs (carbazole)
- Inorganics (antimony, arsenic, beryllium, chromium, lead, manganese, nickel, and vanadium).

Based upon the procedures for the preparation of soil tag maps (Section 1.4.3.1), analytical results for primary soil COPCs [all aforementioned COPCs except dibenzo(a,h)anthracene and carbazole] associated with Area A Weapons Center soil samples and TCLP leachates are presented on Drawing 7A (Volume II).

All of the aforementioned COPCs and cadmium exceeded the Connecticut remediation standards for pollutant mobility for groundwater classified as GB. Maximum concentrations of benzo(a)anthracene, carbazole, and antimony also exceeded USEPA SSLs for migration to groundwater. Chemical concentrations in excess of the SSLs and/or Connecticut remediation standards for pollutant mobility

indicate the potential for these chemicals to migrate to groundwater and potentially impact the quality of the groundwater.

As previously noted, cadmium was detected in soil samples at a maximum concentration exceeding the Connecticut remediation standard for pollutant mobility. However the soil sample associated with the maximum concentration of cadmium was also subjected to TCLP analysis, and cadmium was not detected at concentrations exceeding the associated Connecticut pollutant mobility standard for GB areas or the federal toxicity characteristic regulatory level in any of the TCLP leachates. Therefore, the TCLP data indicate that pollutant mobility is not anticipated to be of concern for cadmium in the soil matrix at this site, and cadmium was not selected as a COPC.

Arsenic, barium, chromium, and lead were not detected in the TCLP leachates or were detected at concentrations less than the associated Connecticut pollutant mobility standard for GB areas and the federal toxicity characteristic regulatory levels. However, the soil samples associated with the maximum concentrations of these COPCs were not included in the group of samples subjected to TCLP analysis. Therefore, although TCLP results do not indicate the potential for these chemicals to migrate from site soils to groundwater, the TCLP results cannot be used with absolute certainty to negate the potential for migration of these chemicals to groundwater that is indicated by the soil data. Thus, arsenic, barium, chromium, lead, and mercury were retained as COPCs for soil.

Aluminum, copper, and iron were not evaluated for COPC selection; USEPA Region I does not advocate the quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for these chemicals are provisional references doses based on allowable intakes rather than adverse effect levels. In addition, USEPA SSLs and CTDEP pollutant mobility criteria were not available for calcium, magnesium, sodium, and potassium because these analytes are considered to be essential nutrients.

Of the aforementioned soil COPCs, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and all inorganic soil COPCs were detected in groundwater at this site.

The following parameters were selected as COPCs for Area A Weapons Center overburden groundwater based upon the COPC screening analysis presented on Table 2-26:

- PAHs [benzo(g,h,i)perylene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene]
- SVOCs [bis(2-ethylhexyl)phthalate]
- Inorganics (antimony, arsenic, boron, chromium, lead, manganese, and thallium).

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary overburden groundwater COPCs (arsenic, boron, lead, and manganese) associated with Area A Weapons Center overburden groundwater samples are presented on Drawing 5 (Volume II).

Maximum concentrations of antimony (filtered), manganese (filtered and unfiltered), and thallium (unfiltered) exceeded the COPC screening level, the federal MCL, and the state MCL. Of these three criteria, maximum concentrations of dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, arsenic (filtered and unfiltered), boron (filtered and unfiltered), and chromium (unfiltered) exceeded only the COPC screening level. The maximum concentration of lead (unfiltered) was in excess of the federal MCL.

Concentrations of iron (filtered and unfiltered) exceeded both COPC screening levels and the federal MCL. Aluminum (unfiltered) was detected at a maximum concentration in excess of the federal secondary MCL. However, aluminum and iron were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for both chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium (filtered and unfiltered) was detected at maximum concentrations in excess of the state MCL. However, sodium was not selected as a COPC because this analyte is considered to be an essential nutrient. Additionally, no screening criteria were available for calcium, magnesium, and potassium, because these analytes are considered to be essential nutrients.

Maximum concentrations of bis(2-ethylhexyl)phthalate, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, antimony (filtered), boron (filtered and unfiltered), lead (unfiltered), manganese (filtered and unfiltered), and thallium (unfiltered) detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. Groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

Because groundwater at the Area A Weapons Center eventually discharges to a surface water body (i.e., the Area A Wetland or the streams of the Area A Downstream Watercourses), site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection. Benzo(g,h,i)perylene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, arsenic (filtered and unfiltered), and lead (unfiltered) were detected at maximum concentrations exceeding the surface water protection criteria.

Of the selected COPCs, maximum concentrations of arsenic, boron, chromium, manganese, and thallium in Area A Weapons Center overburden groundwater samples exceeded concentrations of these

chemicals detected in unfiltered groundwater samples from off-site residential wells. Conversely, the detected concentrations of lead were all below maximum concentrations of lead detected in unfiltered groundwater samples from off-site residential wells. Additionally, the maximum detected concentration of bis(2-ethylhexyl)phthalate (3 µg/L) in groundwater samples from Area A Weapons Center overburden wells was equivalent to the concentration of this compound detected in the off-site residential wells.

The following parameters were selected as COPCs for Area A Weapons Center bedrock groundwater based upon the COPC screening analysis presented on Table 2-27:

- Chlorinated aliphatic hydrocarbons (1,1,2-trichlororethane, 1,2-dichloroethane, and TCE)
- Inorganics (antimony and manganese).

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for the primary bedrock groundwater COPC (manganese) associated with Area A Weapons Center bedrock groundwater samples are presented on Drawing 6 in Volume II of this report.

The maximum concentration of antimony (filtered) exceeded the COPC screening level, the federal MCL, and the state MCL. Of these three criteria, maximum concentrations of 1,1,2-trichloroethane, 1,2-dichloroethane, and TCE exceeded only the COPC screening levels. Maximum concentrations of manganese (filtered and unfiltered) exceeded both the COPC screening level and the federal MCL.

Concentrations of iron (unfiltered) exceeded the COPC screening level and the federal MCL. Aluminum (unfiltered) concentrations were in excess of the federal secondary MCL. However, aluminum and iron were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for both chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Additionally, calcium, magnesium, sodium, and potassium were not considered for COPC selection because these analytes are considered to be essential nutrients.

The maximum concentrations of antimony (filtered) and manganese (filtered and unfiltered) detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. As previously noted, groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

None of the chemicals detected in groundwater samples from bedrock wells were present at concentrations in excess of the Connecticut remediation standards for surface water protection.

None of the COPCs selected for groundwater samples collected from bedrock wells were detected at concentrations in excess of the maximum detected concentrations of respective chemicals in off-site residential wells.

### 2.9.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Site 20 using the decision tree approach is as follows:

- The Area A Weapons Center was investigated during the Phase I and Phase II RIs . The information collected during these investigations is sufficient to describe the site and its physical characteristics.

- The Phase I RI concluded that the human health risks associated with this site exceeded USEPA's target risk range. The Phase II RI found that, although there is little evidence of groundwater and surface water contamination at the site, the Area A Weapons Center may be a source of contamination for the Area A Wetlands. Both the Phase I and Phase II RIs recommended that Site 20 proceed to a FS.

- Further action is anticipated at Site 20 as discussed in Section 2.9.7.

### 2.9.7 Recommendations

Site 20 was investigated during two previous investigations. Based on an evaluation of these results, it is recommended that this site proceed to a FS for the evaluation of soil and sediments at the site. Depending on the results of the FS, a removal action may be required to prevent the migration of contaminants to the Area A Wetland from occurring.

Further groundwater sampling from existing overburden and bedrock groundwater monitoring wells during the Basewide Groundwater OU RI is recommended for Site 20. The analytical program should include TCL VOCs, TCL SVOCs, TAL metals, and ammonium perchlorate. The additional sampling and analysis will address concerns brought up by the screening level analysis. Ammonium perchlorate should be analyzed for because it is possible that this compound was released as a result of maintenance activities on torpedoes or weapons. The results of the groundwater sampling and analyses will be used to determine the need for additional actions at the site.

TABLE 2-1

COPC SCREENING - SOIL SAMPLES
SITE 1 - CBU DRUM STORAGE AREA[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **VOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 1,1,1-Trichloroethane | 1/9 | 0.001 J | 0.001 J | 0.006 - 0.028 | 0.001 | 1TB3-0507 | 1TB3 | 2 | 40 | N |
| 2-Butanone | 4/9 | 0.015 | 0.17 J | 0.011 - 0.056 | 0.17 | 1TB3-0507 | 1TB3 | - | 80 | N |
| Ethylbenzene | 4/9 | 0.006 J | 0.079 J | 0.006 - 0.013 | 0.073 | 1TB3-0507 | 1TB3 | 13 | 10.1 | N |
| Methylene Chloride | 2/9 | 0.001 J | 0.028 J | 0.006 - 0.028 | 0.026 | 1TB3-0507 | 1TB3 | 0.02 | 1 | Y |
| Tetrachloroethene | 2/9 | 0.002 J | 0.004 J | 0.006 - 0.028 | 0.004 | 1TB3-0507 | 1TB3 | 0.06 | 1 | N |
| Trichloroethene | 2/9 | 0.002 J | 0.003 J | 0.006 - 0.028 | 0.003 | 1TB3-0507 | 1TB3 | 0.06 | 1 | N |
| Xylenes, Total | 6/9 | 0.001 J | 0.38 J | 0.006 | 0.38 | 1TB3-0507 | 1TB3 | 190 | 19.5 | N |
| **SEMIVOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 1,4-Dichlorobenzene | 1/6 | 0.11 J | 0.11 J | 0.37 - 3.8 | 0.11 | 1TB1-0002 | 1TB1 | 2 | 15 | N |
| 2-Methylnaphthalene | 3/6 | 0.025 J | 12 | 0.43 - 3.8 | 12 | 1TB1-0608 | 1TB1 | - | 56 | N |
| Acenaphthene | 2/6 | 0.24 J | 2.8 J | 0.37 - 2 | 2.8 | 1TB1-0608 | 1TB1 | 570 | 84 | N |
| Acenaphthylene | 1/6 | 0.035 J | 0.035 J | 0.37 - 3.8 | 0.035 | 1TB3-0002 | 1TB3 | - | 84 | N |
| Anthracene | 4/6 | 0.086 J | 2.8 J | 0.43 - 2 | 2.8 | 1TB1-0608 | 1TB1 | 12000 | 400 | N |
| Benzo(a)anthracene | 4/6 | 0.23 J | 2.3 | 0.43 - 2 | 2.3 | 1TB1-0608 | 1TB1 | 2 | 1 | Y |
| Benzo(a)pyrene | 4/6 | 0.25 J | 1.1 J | 0.43 - 2 | 1.1 | 1TB3-0507 | 1TB3 | 8 | 1 | Y |
| Benzo(b)fluoranthene | 5/6 | 0.029 J | 2.2 J | 2 | 1.640 | 1TB3-0507 | 1TB3 | 5 | 1 | Y |
| Benzo(g,h,i)perylene | 3/6 | 0.18 J | 0.28 J | 0.43 - 3.8 | 0.28 | 1TB1-0608 | 1TB1 | - | 40 | N |
| Benzo(k)fluoranthene | 1/6 | 0.61 J | 0.61 J | 0.37 - 3.8 | 0.61 | 1TB1-0002 | 1TB1 | 49 | 1 | N |
| Butylbenzyl Phthalate | 1/6 | 0.82 J | 0.82 J | 0.37 - 3.8 | 0.82 | 1TB3-0002 | 1TB3 | 930 | 200 | N |
| Carbazole | 3/5 | 0.035 J | 0.7 J | 0.37 - 0.43 | 0.7 | 1TB1-0608 | 1TB1 | 0.6 | 0.36 | Y |
| Chrysene | 4/6 | 0.29 J | 1.9 | 0.43 - 2 | 1.58 | 1TB1-0608 | 1TB1 | 160 | 0.96 | Y |
| Di-n-butyl phthalate | 2/6 | 0.46 J | 0.97 | 0.37 - 3.8 | 0.97 | 1TB1-0002 | 1TB1 | 2300 | 140 | N |
| Dibenzo(a,h)anthracene | 1/6 | 0.059 J | 0.059 J | 0.37 - 3.8 | 0.059 | 1TB3-0002 | 1TB3 | 2 | 0.005 | Y |
| Dibenzofuran | 2/6 | 0.024 J | 2.5 J | 0.37 - 3.8 | 2.5 | 1TB1-0608 | 1TB1 | - | 5.6 | N |
| Fluoranthene | 6/6 | 0.042 J | 13 | - | 13 | 1TB1-0608 | 1TB1 | 4300 | 56 | N |
| Fluorene | 4/6 | 0.043 J | 3.6 J | 0.43 - 2 | 3.6 | 1TB1-0608 | 1TB1 | 560 | 56 | N |
| Indeno(1,2,3-cd)pyrene | 4/6 | 0.2 J | 0.95 J | 0.43 - 2 | 0.95 | 1TB3-0507 | 1TB3 | 14 | 0.005 | Y |
| Naphthalene | 2/6 | 0.93 | 6.5 | 0.37 - 3.8 | 6.5 | 1TB1-0608 | 1TB1 | 84 | 56 | N |
| Phenanthrene | 5/6 | 0.053 J | 16 | 2 | 16 | 1TB1-0608 | 1TB1 | - | 40 | N |
| Pyrene | 6/6 | 0.037 J | 9 | - | 9 | 1TB1-0608 | 1TB1 | 4200 | 40 | N |

TABLE 2-1

COPC SCREENING - SOIL SAMPLES
SITE 1 - CBU DRUM STORAGE AREA[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **PESTICIDES/PCBs (mg/kg)** | | | | | | | | | | |
| 4,4'-DDD | 4/6 | 0.024 J | 3.9 | 0.037 - 0.038 | 3.9 | 1TB1-0002 | 1TB1 | 16 | 0.029 | Y |
| 4,4'-DDE | 2/6 | 0.025 J | 0.058 J | 0.02 - 0.043 | 0.054 | 1TB1-0002 | 1TB1 | 54 | 0.021 | Y |
| 4,4'-DDT | 3/6 | 0.0079 J | 0.14 J | 0.02 - 0.038 | 0.14 | 1TB2-1214 | 1TB2 | 32 | 0.021 | Y |
| Aldrin | 1/6 | 0.0026 J | 0.0026 J | 0.01 - 0.022 | 0.0026 | 1TB1-0608 | 1TB1 | 0.5 | 0.00041 | Y |
| Alpha-Chlordane | 2/6 | 0.0099 J | 0.028 | 0.019 - 0.1 | 0.028 | 1TB1-0002 | 1TB1 | 10 | 0.066 | N |
| Aroclor-1248 | 1/6 | 0.36 J | 0.36 J | 0.1 - 0.52 | 0.29 | 1TB3-0507 | 1TB3 | - | 0.1 | Y |
| Aroclor-1254 | 1/6 | 0.42 J | 0.42 J | 0.2 - 0.52 | 0.40 | 1TB1-0002 | 1TB1 | - | 0.1 | Y |
| Dieldrin | 2/6 | 0.029 J | 0.031 J | 0.02 - 0.043 | 0.028 | 1TB1-0608 | 1TB1 | 0.004 | 0.007 | Y |
| Endrin | 2/6 | 0.0035 J | 0.0041 J | 0.02 - 0.043 | 0.0041 | 1TB1-0002 | 1TB1 | 1 | 0.042 | N |
| Gamma-Chlordane | 1/6 | 0.0076 J | 0.0076 J | 0.019 - 0.1 | 0.0076 | 1TB1-0002 | 1TB1 | 10 | 0.066 | N |
| Heptachlor | 1/6 | 0.0034 J | 0.0034 J | 0.01 - 0.022 | 0.0034 | 1TB1-0608 | 1TB1 | 23 | 0.013 | N |
| Heptachlor Epoxide | 1/6 | 0.027 J | 0.027 J | 0.01 - 0.022 | 0.024 | 1TB1-0608 | 1TB1 | 0.7 | 0.02 | Y |
| gamma-BHC (Lindane) | 1/6 | 0.0018 J | 0.0018 J | 0.01 - 0.022 | 0.0018 | 1TB1-0608 | 1TB1 | 0.009 | 0.04 | N |
| **INORGANICS (mg/kg)** | | | | | | | | | | |
| Aluminum | 6/6 | 7110 | 18900 | - | 17254 | 1TB1-0608 | 1TB1 | - | - | N[5] |
| Antimony | 5/5 | 5.3 J | 17.4 J | - | 17.4 | 1TB1-0608 | 1TB1 | 5 | 1.2 | Y |
| Arsenic | 5/6 | 2.1 | 10.2 | 2.7 | 10.2 | 1TB1-0608 | 1TB1 | 29 | 10 | Y |
| Barium | 6/6 | 40.7 J | 93.9 J | - | 81.9 | 1TB1-0608 | 1TB1 | 1600 | 200 | N |
| Beryllium | 6/6 | 0.36 J | 1.6 | - | 1.6 | 1TB3-0507 | 1TB3 | 63 | 0.8 | Y |
| Boron | 2/5 | 14.6 J | 19.7 J | 11.4 - 13 | 19.7 | 1TB1-0608 | 1TB1 | - | 130 | N |
| Cadmium | 6/6 | 0.73 J | 2.6 J | - | 2.14 | 1TB1-0608 | 1TB1 | 8 | 1 | Y |
| Calcium | 6/6 | 1760 J | 9130 J | - | 8348 | 1TB3-0507 | 1TB3 | - | - | N[6] |
| Chromium | 6/6 | 14.7 | 42.9 | - | 36.6 | 1TB1-0608 | 1TB1 | - | 10 | Y |
| Cobalt | 6/6 | 4.7 J | 9.5 J | - | 9.3 | 1TB3-0507 | 1TB3 | - | 84 | N |
| Copper | 6/6 | 14.1 J | 164 J | - | 164 | 1TB3-0507 | 1TB3 | - | 260 | N[5] |
| Iron | 6/6 | 12000 | 31200 | - | 25808 | 1TB1-0608 | 1TB1 | - | - | N[5] |
| Lead | 6/6 | 4.8 | 366 | - | 366 | 1TB1-0608 | 1TB1 | - | 3 | Y |
| Magnesium | 6/6 | 2490 | 5610 | - | 4791 | 1TB1-0608 | 1TB1 | - | - | N[6] |
| Manganese | 6/6 | 165 | 290 | - | 257 | 1TB1-0608 | 1TB1 | - | 10 | Y |

TABLE 2-1

COPC SCREENING - SOIL SAMPLES
SITE 1 - CBU DRUM STORAGE AREA[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 3 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| Mercury | 4/6 | 0.15 J | 0.61 | 0.12 - 0.18 | 0.61 | 1TB3-0507 | 1TB3 | 2 | 0.4 | Y |
| Nickel | 6/6 | 9.1 J | 46.6 | - | 46.6 | 1TB3-0507 | 1TB3 | 130 | 20 | Y |
| Potassium | 6/6 | 255 J | 3550 J | - | 2553 | 1TB1-0608 | 1TB1 | - | - | N[6] |
| Selenium | 1/6 | 0.93 J | 0.93 J | 0.46 - 0.71 | 0.93 | 112890-1SS4C | 1SS4C | 5 | 10 | N |
| Sodium | 6/6 | 93.2 J | 582 J | - | 462.7 | 1TB1-0608 | 1TB1 | - | - | N[6] |
| Vanadium | 6/6 | 16.2 | 186 | - | 186 | 1TB1-0002 | 1TB1 | 6000 | 10 | Y |
| Zinc | 6/6 | 39.6 J | 709 J | - | 709 | 1TB3-0507 | 1TB3 | 12000 | 1000 | N |
| **TOTAL PETROLEUM HYDROCARBONS (mg/kg)** | | | | | | | | | | |
| TPH | 11/11 | 41 | 9800 | - | 9800 | 112890-1SS3D | 1SS3 | - | 2500 | Y |

1 Includes samples 112890-1SS1D, 112890-1SS1S, 112890-1SS2D, 112890-1SS2S, 112890-1SS3D, 112890-1SS3S, 112890-1SS4C, 1TB1-0002, 1TB1-0608, 1TB2-1214, 1TB3-0002, 1TB3-0507.
2 USEPA Soil Screening Levels (USEPA, May 1996). See Table 1-2 for futher details regarding surrogate and/or calculated values.
3 CTDEP, 1996. See Table 1-2 for futher details regarding surrogate and/or calculated values.
4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.
5 USEPA Region I does not advocate quantitative evaluation of this chemical.
6 Essential nutrient; not evaluated for COPC selection.
- Not Applicable or Not Available.

## TABLE 2-2

## COPC SCREENING - TCLP SOIL SAMPLES
## SITE 1 - CBU DRUM STORAGE AREA[1]
## NSB-NLON, GROTON, CONNECTICUT

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | Federal Pollutant Mobility (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **TCLP METALS (mg/L)** | | | | | | | | | | |
| Barium | 3/3 | 0.22 J | 0.33 J | - | 0.29 | 112890-1SS3S-T | 1SS3 | 100 | 10 | N |
| Lead | 1/3 | 0.6 | 0.6 | 0.3 | 0.6 | 112890-1SS1S-T | 1SS1 | 5 | 0.15 | Y |
| Selenium | 1/3 | 0.0021 J | 0.0021 J | 0.002 - 0.0021 | 0.0021 | 112890-1SS2S-T | 1SS2 | 1 | 0.5 | N |

1 Includes samples 112890-1SS1S-T, 112890-1SS2S-T, 112890-1SS3S-T.
2 Federal Toxicity Characteristic Regulatory Level (58 FR 46049).
3 CTDEP, 1996.
4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.
- Not Applicable.

TABLE 2-3

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 1 - CBU DRUM STORAGE AREA[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Chlorobenzene | 1/2 | 12 | 12 | 10 | 12 | 1GW2S | 1MW2S | 3.5 | 100 | 100 | 100 | 420000 | ND | Y |
| Xylenes, Total | 1/2 | 24 | 24 | 10 | 24 | 1GW2S | 1MW2S | 1200 | 10000 | 10000 | 530 | - | 2 | N |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | 2/2 | 1 J | 12 | - | 6.5 | 1GW2S-2 | 1MW2S | 150 | - | - | 280 | - | ND | N |
| 4-Methylphenol | 2/2 | 0.6 J | 1 J | - | 0.8 | 1GW2S | 1MW2S | 18 | - | - | 35 | - | ND | N |
| Acenaphthene | 2/2 | 2 J | 8 J | - | 5 | 1GW2S-2 | 1MW2S | 220 | - | - | 420 | 27000 | ND | N |
| Anthracene | 2/2 | 1 J | 3 J | - | 2 | 1GW2S-2 | 1MW2S | 1100 | - | - | 2000 | 1100000 | ND | N |
| Carbazole | 2/2 | 7 J | 19 | - | 13 | 1GW2S-2 | 1MW2S | 3.3 | - | - | 1.8 | 29 | ND | Y |
| Di-n-butyl phthalate | 1/2 | 0.6 J | 0.6 J | 10 | 0.6 | 1GW2S-2 | 1MW2S | 370 | - | - | 700 | 120000 | ND | N |
| Dibenzofuran | 2/2 | 2 J | 13 | - | 7.5 | 1GW2S-2 | 1MW2S | 2.4 | - | - | 28 | - | ND | Y |
| Diethyl Phthalate | 2/2 | 1 J | 1 J | - | 1 | 1GW2S/ 1GW2S-2 | 1MW2S/ 1MW2S | 2900 | - | - | 5600 | 2400000 | ND | N |
| Fluoranthene | 1/2 | 3 J | 3 J | 10 | 3 | 1GW2S-2 | 1MW2S | 150 | - | - | 280 | 3700 | ND | N |
| Fluorene | 2/2 | 2 J | 13 | - | 7.5 | 1GW2S-2 | 1MW2S | 150 | - | - | 280 | 140000 | ND | N |
| Naphthalene | 2/2 | 9 J | 31 | - | 20 | 1GW2S-2 | 1MW2S | 150 | - | - | 280 | - | ND | N |
| Phenanthrene | 2/2 | 4 J | 22 | - | 13 | 1GW2S-2 | 1MW2S | - | - | - | 200 | 0.3 | ND | Y |
| Pyrene | 1/2 | 1 J | 1 J | 10 | 1 | 1GW2S-2 | 1MW2S | 110 | - | - | 200 | 110000 | ND | N |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 1/2 | 94.9 | 94.9 | 132 | 94.9 | 1GW2S-2 | 1MW2S | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Arsenic | 2/2 | 2.4 J | 3.5 | - | 2.95 | 1GW2S-2 | 1MW2S | 0.045 | 50 | 50 | 50 | 4 | 0.64 | Y |
| Arsenic, Filtered | 2/2 | 4 J | 4.4 | - | 4.2 | 1GW2S2DISS | 1MW2S | 0.045 | 50 | 50 | 50 | 4 | - | Y |
| Barium | 2/2 | 35.5 J | 92.5 | - | 64 | 1GW2S-2 | 1MW2S | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | N |
| Barium, Filtered | 2/2 | 32.1 | 90.6 | - | 61.35 | 1GW2S2DISS | 1MW2S | 260 | 2000 | 2000 | 1000 | - | - | N |
| Boron | 2/2 | 54.5 J | 130 | - | 92.25 | 1GW2S-2 | 1MW2S | 330 | - | - | 630 | - | 9.3 - 126 | N |
| Boron, Filtered | 2/2 | 57.1 J | 112 | - | 84.55 | 1GW2S2DISS | 1MW2S | 330 | - | - | 630 | - | - | N |
| Calcium | 2/2 | 29900 | 68500 | - | 49200 | 1GW2S-2 | 1MW2S | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 2/2 | 29600 | 67700 | - | 48650 | 1GW2S2DISS | 1MW2S | - | - | - | - | - | - | N[9] |
| Chromium | 1/2 | 1.6 J | 1.6 J | 4.5 | 1.6 | 1GW2S-2 | 1MW2S | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | N |
| Iron | 2/2 | 13400 | 27600 | - | 20500 | 1GW2S-2 | 1MW2S | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 2/2 | 13300 | 27100 | - | 20200 | 1GW2S2DISS | 1MW2S | 1100 | 300 | - | - | - | - | N[8] |
| Magnesium | 2/2 | 4290 | 5400 | - | 4845 | 1GW2S-2 | 1MW2S | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 2/2 | 4320 | 5220 | - | 4770 | 1GW2S2DISS | 1MW2S | - | - | - | - | - | - | N[9] |
| Manganese | 2/2 | 409 | 527 | - | 468 | 1GW2S-2 | 1MW2S | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 2/2 | 406 | 520 | - | 463 | 1GW2S2DISS | 1MW2S | 84 | 50 | 5000 | 50 | - | - | Y |
| Potassium | 2/2 | 3490 | 3930 | - | 3710 | 1GW2S-2 | 1MW2S | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 2/2 | 2940 | 4060 | - | 3500 | 1GW2S2DISS | 1MW2S | - | - | - | - | - | - | N[9] |
| Silver, Filtered | 1/2 | 2.2 | 2.2 | - | 2.2 | 1GW2S2DISS | 1MW2S | 18 | 100 | 50 | 36 | 12 | - | N |
| Sodium | 2/2 | 17400 | 28300 | - | 22850 | 1GW2S-2 | 1MW2S | - | - | 28000 | - | - | 3160 - 97700 | N[9] |

TABLE 2-3

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 1 - CBU DRUM STORAGE AREA[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| Sodium, Filtered | 2/2 | 17900 | 27500 | - | 22700 | 1GW2S2DISS | 1MW2S | - | - | 28000 | - | - | - | N[9] |
| Zinc | 1/2 | 8 | 8 | 9.8 | 8 | 1GW2S-2 | 1MW2S | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | N |
| Zinc, Filtered | 2/2 | 2.8 | 12.4 | - | 7.6 | 1GW2S DISS | 1MW2S | 1100 | 5000 | - | 5000 | 123 | - | N |
| **TOTAL PETROLEUM HYDROCARBONS (ug/L)** | | | | | | | | | | | | | | |
| TPH | 1/2 | 1200 | 1200 | 500 | 1200 | 1GW2S-2 | 1MW2S | - | - | - | 500 | - | NA | Y |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Hardness as CaCO3 | 2/2 | 96 | 180 | - | 138 | 1GW2S-2 | 1MW2S | - | - | - | - | - | NA | N[10] |

1 Includes samples 1GW2S, 1GW2S DISS, 1GW2S-2, 1GW2S2DISS.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
\- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 2-4

COPC SCREENING - SOIL SAMPLES
SITE 2A - AREA A LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 4

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **VOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 1/35 | 0.022 | 0.022 | 0.005 - 4.5 | 0.022 | 080290-2LMW14S(5-7) | 2LMW14S | 0.003 | 0.1 | Y |
| 1,1,2-Trichloroethane | 1/35 | 0.011 | 0.011 | 0.005 - 4.5 | 0.011 | 080290-2LMW14S(5-7) | 2LMW14S | 0.02 | 1 | N |
| 2-Butanone | 1/35 | 0.002 J | 0.002 J | 0.01 - 5.3 | 0.002 | 112890-2LSS2 | 2LSS2 | - | 80 | N |
| 4-Methyl-2-pentanone | 1/35 | 0.012 | 0.012 | 0.01 - 5.3 | 0.012 | 080790-2LMW18S(2-6) | 2LMW18S | - | 14 | N |
| Acetone | 9/35 | 0.009 J | 0.25 J | 0.011 - 5.3 | 0.25 | 081690-2LTB2(2-8) | 2LTB2 | 16 | 140 | N |
| Carbon Disulfide | 2/35 | 0.005 J | 0.008 J | 0.005 - 4.5 | 0.008 | LF-SB03-18.5-20.5 | LF-SB03 | 32 | 140 | N |
| Chlorobenzene | 3/35 | 0.043 J | 4.5 | 0.005 - 3.3 | 4.5 | 112890-2LSS1/ 2LTB23 (4-8)-D | 2LSS1/ 2LTB23-FSS | 1 | 20 | Y |
| Ethylbenzene | 8/35 | 0.002 J | 28 | 0.005 - 0.037 | 28 | 2LTB23 (4-8)-D | 2LTB23-FSS | 13 | 10.1 | Y |
| Methylene Chloride | 12/35 | 0.001 J | 0.025 | 0.005 - 4.5 | 0.025 | 2LTB19 (2-4) | 2LTB19 | 0.02 | 1 | Y |
| Tetrachloroethene | 1/35 | 0.004 J | 0.004 J | 0.005 - 4.5 | 0.004 | 112890-2LSS2 | 2LSS2 | 0.06 | 1 | N |
| Toluene | 12/35 | 0.004 J | 3.2 J | 0.005 - 3 | 3.2 | 2LTB23 (4-8)-D | 2LTB23-FSS | 12 | 67 | N |
| Trichloroethene | 2/35 | 0.002 J | 0.002 J | 0.005 - 4.5 | 0.002 | 080290-2LMW14S(5-7)/ 112890-2LSS2 | 2LMW14S/ 2LSS2 | 0.06 | 1 | N |
| Xylenes, Total | 10/35 | 0.004 J | 140 J | 0.005 - 0.037 | 140 | 2LTB23 (4-8)-D | 2LTB23-FSS | 190 | 19.5 | Y |
| **SEMIVOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 2,4-Dimethylphenol | 1/35 | 0.19 J | 0.19 J | 0.34 - 12 | 0.19 | 2LTB23 (4-8)-D | 2LTB23-FSS | 9 | 28 | N |
| 2-Methylnaphthalene | 5/35 | 0.053 J | 1.3 J | 0.34 - 12 | 1.3 | 081690-2LTB2(2-8) | 2LTB2 | - | 56 | N |
| 4-Methylphenol | 2/35 | 0.34 J | 2 J | 0.34 - 12 | 2 | 2LTB23 (4-8) | 2LTB23-FSS | - | 7 | N |
| Acenaphthene | 4/35 | 0.05 J | 8.4 J | 0.34 - 11 | 8.4 | 2LTB20 (6-8) | 2LTB20 | 570 | 84 | N |
| Acenaphthylene | 1/35 | 0.22 J | 0.22 J | 0.34 - 12 | 0.22 | 2LTB28 (4-6) | 2LTB28 | - | 84 | N |
| Anthracene | 5/35 | 0.23 J | 19 | 0.34 - 11 | 19 | 2LTB20 (6-8) | 2LTB20 | 12000 | 400 | N |
| Benzo(a)anthracene | 16/35 | 0.097 J | 23 | 0.35 - 11 | 23 | 2LTB20 (6-8) | 2LTB20 | 2 | 1 | Y |
| Benzo(a)pyrene | 14/35 | 0.046 J | 15 | 0.34 - 11 | 15 | 2LTB20 (6-8) | 2LTB20 | 8 | 1 | Y |
| Benzo(b)fluoranthene | 16/35 | 0.07 J | 15 | 0.35 - 11 | 15 | 2LTB20 (6-8) | 2LTB20 | 5 | 1 | Y |
| Benzo(g,h,i)perylene | 5/35 | 0.044 J | 0.59 J | 0.34 - 12 | 0.59 | 2LTB26 (4-6) | 2LTB26 | - | 40 | N |
| Benzo(k)fluoranthene | 17/35 | 0.057 J | 14 J | 0.35 - 11 | 14 | 2LTB20 (6-8) | 2LTB20 | 49 | 1 | Y |
| Bis(2-Ethylhexyl)phthalate | 6/35 | 0.078 J | 1.9 | 0.35 - 12 | 1.9 | 081690-2LMW9(2-8) | 2LMW9S | 3600 | 11 | N |
| Carbazole | 3/21 | 0.41 | 9.8 J | 0.35 - 11 | 9.8 | 2LTB20 (6-8) | 2LTB20 | 0.6 | 0.36 | Y |
| Chrysene | 17/35 | 0.037 J | 19 | 0.35 - 11 | 19 | 2LTB20 (6-8) | 2LTB20 | 160 | 0.96 | Y |
| Di-n-butyl phthalate | 2/35 | 0.061 J | 0.076 J | 0.34 - 12 | 0.076 | 081590-2LMW7(7-10) | 2LMW7S | 2300 | 140 | N |
| Dibenzofuran | 4/35 | 0.083 J | 13 | 0.34 - 11 | 13 | 2LTB20 (6-8) | 2LTB20 | - | 5.6 | Y |

TABLE 2-4

COPC SCREENING - SOIL SAMPLES
SITE 2A - AREA A LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 4

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| Fluoranthene | 19/35 | 0.049 J | 47 | 0.35 - 11 | 47 | 2LTB20 (6-8) | 2LTB20 | 4300 | 56 | N |
| Fluorene | 4/35 | 0.13 J | 17 | 0.34 - 11 | 17 | 2LTB20 (6-8) | 2LTB20 | 560 | 56 | N |
| Indeno(1,2,3-cd)pyrene | 4/35 | 0.23 J | 0.64 J | 0.34 - 12 | 0.64 | 2LTB26 (4-6) | 2LTB26 | 14 | 0.005 | Y |
| Naphthalene | 6/35 | 0.12 J | 20 | 0.34 - 11 | 20 | 2LTB20 (6-8) | 2LTB20 | 84 | 56 | N |
| Phenanthrene | 17/35 | 0.066 J | 61 | 0.35 - 11 | 61 | 2LTB20 (6-8) | 2LTB20 | - | 40 | Y |
| Pyrene | 21/35 | 0.03 J | 40 | 0.35 - 11 | 40 | 2LTB20 (6-8) | 2LTB20 | 4200 | 40 | N |
| **PESTICIDES/PCBs (mg/kg)** | | | | | | | | | | |
| 4,4'-DDD | 14/35 | 0.0096 J | 2.2 J | 0.0037 - 0.37 | 2.2 | 2LTB29 (10-12)-D | 2LTB29 | 16 | 0.029 | Y |
| 4,4'-DDE | 13/35 | 0.0042 J | 0.45 | 0.0037 - 0.37 | 0.45 | 2LTB31 (8-10) | 2LTB31 | 54 | 0.021 | Y |
| 4,4'-DDT | 14/35 | 0.0068 | 2.3 J | 0.0035 - 0.37 | 2.3 | 112890-2LSS2 | 2LSS2 | 32 | 0.021 | Y |
| Aldrin | 1/35 | 0.0006 J | 0.0006 J | 0.0018 - 0.19 | 0.0006 | 2LTB16 (0-2) | 2LTB16 | 0.5 | 0.00041 | Y |
| Alpha-Chlordane | 7/35 | 0.002 J | 0.1 | 0.0018 - 0.91 | 0.1 | 2LTB29 (10-12)-D | 2LTB29 | 10 | 0.066 | Y |
| Aroclor-1242 | 1/35 | 1.7 | 1.7 | 0.035 - 3.7 | 1.7 | 2LTB31 (8-10) | 2LTB31 | - | 0.1 | Y |
| Aroclor-1248 | 8/45 | 0.051 | 3.7 | 0.0268 - 3.7 | 3.7 | 2LTB23-0406(FIELD) | 2LTB23-PH2 | - | 0.1 | Y |
| Aroclor-1254 | 22/45 | 0.015 J | 100 J | 0.0268 - 1.8 | 100 | 2LTB23 (4-8)-D | 2LTB23-FSS | - | 0.1 | Y |
| Aroclor-1260 | 4/35 | 0.23 J | 12 | 0.035 - 3.7 | 12 | 112890-2LSS2 | 2LSS2 | - | 0.1 | Y |
| Dieldrin | 5/35 | 0.0012 J | 0.035 J | 0.0035 - 0.37 | 0.035 | 2LTB29 (10-12)-D | 2LTB29 | 0.004 | 0.007 | Y |
| Endosulfan I | 3/35 | 0.002 J | 0.34 J | 0.0018 - 0.19 | 0.34 | 2LTB23 (4-8)-D | 2LTB23-FSS | 18 | 8.4 | N |
| Endosulfan II | 1/35 | 0.002 J | 0.002 J | 0.0035 - 0.37 | 0.002 | 2LTB17 (0-2) | 2LTB17 | 18 | 8.4 | N |
| Endrin | 7/35 | 0.0009 J | 0.47 J | 0.0035 - 0.18 | 0.47 | 2LTB23 (4-8) | 2LTB23-FSS | 1 | 0.42 | Y |
| Endrin Aldehyde | 4/21 | 0.019 J | 0.091 | 0.0035 - 0.37 | 0.091 | 2LTB20 (6-8) | 2LTB20 | - | 0.42 | N |
| Endrin Ketone | 2/35 | 0.0059 J | 0.57 | 0.0035 - 0.37 | 0.57 | 112890-2LSS2 | 2LSS2 | - | 0.42 | Y |
| Gamma-Chlordane | 6/35 | 0.003 J | 0.095 J | 0.0018 - 0.91 | 0.095 | 2LTB29 (10-12)-D | 2LTB29 | 10 | 0.066 | Y |
| Heptachlor | 3/35 | 0.0005 J | 0.079 J | 0.0018 - 0.19 | 0.079 | 2LTB23 (4-8) | 2LTB23-FSS | 23 | 0.013 | Y |
| Heptachlor Epoxide | 2/35 | 0.0007 J | 0.0053 J | 0.0018 - 0.19 | 0.0053 | 2LTB29 (10-12)-D | 2LTB29 | 0.7 | 0.02 | N |
| Methoxychlor | 1/35 | 0.019 J | 0.019 J | 0.018 - 1.9 | 0.019 | 2LTB17 (0-2) | 2LTB17 | 160 | 8 | N |
| **DIOXINS/FURANS (mg/kg)** | | | | | | | | | | |
| 1,2,3,4,6,7,8-HpCDF | 1/4 | 0.0002 | 0.0002 | 0.0001 - 0.0003 | 0.0002 | 2LTB23 (4-8)-D | 2LTB23-FSS | - | 0.00000467 | Y |
| 1,2,3,4,7,8-HxCDF | 1/4 | 0.0003 | 0.0003 | 0.0002 - 0.0006 | 0.0003 | 2LTB23 (4-8)-D | 2LTB23-FSS | - | 0.000000467 | Y |
| 1,2,3,6,7,8-HxCDF | 1/4 | 0.0002 | 0.0002 | 0.0001 - 0.0007 | 0.0002 | 2LTB23 (4-8)-D | 2LTB23-FSS | - | 0.000000467 | Y |
| OCDD | 4/4 | 0.0016 | 0.0025 J | 0.002 | 0.0025 | 2LTB13-0001 | 2LTB13-PH2 | - | 0.0000467 | Y |
| **INORGANICS (mg/kg)** | | | | | | | | | | |
| Aluminum | 35/35 | 4450 | 18400 | - | 9437 | LF-SB05-12.5-14.5 | LF-SB05 | - | - | N[6] |

TABLE 2-4

COPC SCREENING - SOIL SAMPLES
SITE 2A - AREA A LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 3 OF 4

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| Antimony | 6/31 | 25.6 J | 134 J | 0.87 - 26.9 | 34.9 | 2LTB22 (6-8) | 2LTB22 | 5 | 1.2 | Y |
| Arsenic | 32/35 | 0.5 | 10.6 J | 0.87 - 1.5 | 4.3 | 2LTB22 (6-8) | 2LTB22 | 29 | 10 | Y |
| Barium | 35/35 | 18.4 J | 667 J | - | 667 | 2LTB23 (4-8) | 2LTB23-FSS | 1600 | 200 | Y |
| Beryllium | 35/35 | 0.24 | 3.9 | - | 3.9 | 080790-2LMW18S(2-6) | 2LMW18S | 63 | 0.8 | Y |
| Boron | 5/18 | 22.7 | 79.8 | 0.95 - 19 | 52.7 | 2LTB22 (6-8) | 2LTB22 | - | 130 | N |
| Cadmium | 28/35 | 0.32 J | 12.1 J | 0.22 - 0.43 | 12.1 | 080290-2LMW8S(6-10)/ 2LTB23 (4-8)-D | 2LMW8S/ 2LTB23-FSS | 8 | 1 | Y |
| Calcium | 35/35 | 794 | 17200 | - | 17200 | 2LTB22 (6-8) | 2LTB22 | - | - | N[7] |
| Chromium | 35/35 | 6.5 | 289 J | - | 289 | 2LTB22 (6-8) | 2LTB22 | - | 10 | Y |
| Cobalt | 34/35 | 3.8 | 122 | 4.5 | 122 | 2LTB22 (6-8) | 2LTB22 | - | 84 | Y |
| Copper | 35/35 | 3.1 | 21600 J | - | 2473 | 2LTB22 (6-8) | 2LTB22 | - | 260 | N[6] |
| Cyanide | 9/37 | 0.08 | 6.2 J | 0.09 - 1.8 | 6.2 | LF-TP22 | LF-TP22 | 40 | 40 | N |
| Iron | 35/35 | 7660 | 157000 | - | 157000 | 2LTB22 (6-8) | 2LTB22 | - | - | N[6] |
| Lead | 35/35 | 4.9 | 1780 | - | 1780 | 2LTB22 (6-8) | 2LTB22 | - | 3 | Y |
| Magnesium | 35/35 | 1570 | 9330 | - | 9330 | 2LTB23 (4-8)-D | 2LTB23-FSS | - | - | N[7] |
| Manganese | 35/35 | 74 J | 1150 J | - | 328 | 2LTB22 (6-8) | 2LTB22 | - | 10 | Y |
| Mercury | 12/35 | 0.03 | 3.6 | 0.02 - 0.24 | 3.6 | 081590-2LMW17(4-8) | 2LMW17S | 2 | 0.4 | N[5] |
| Nickel | 35/35 | 4.9 | 1440 J | - | 1440 | 2LTB22 (6-8) | 2LTB22 | 130 | 20 | Y |
| Potassium | 35/35 | 549 J | 4500 | - | 1744 | LF-SB03-18.5-20.5 | LF-SB03 | - | - | N[7] |
| Selenium | 7/35 | 0.13 J | 2.3 | 0.13 - 0.93 | 2.3 | LF-SB03-18.5-20.5 | LF-SB03 | 5 | 10 | N |
| Silver | 7/33 | 2.8 | 38.9 | 0.15 - 2.69 | 38.9 | 2LTB19 (2-4) | 2LTB19 | 34 | 7.2 | Y |
| Sodium | 33/35 | 33.6 | 7190 | 140 - 267 | 1408 | LF-SB03-18.5-20.5 | LF-SB03 | - | - | N[7] |
| Thallium | 1/35 | 1.8 | 1.8 | 0.16 - 2.1 | 0.47 | LF-SB03-18.5-20.5 | LF-SB03 | 0.7 | 1 | Y |
| Vanadium | 35/35 | 13.8 | 138 | - | 138 | 2LTB20 (6-8) | 2LTB20 | 6000 | 10 | Y |
| Zinc | 35/35 | 24.5 | 9850 J | - | 9850 | 2LTB22 (6-8) | 2LTB22 | 12000 | 1000 | Y |
| **TOTAL PETROLEUM HYDROCARBONS (mg/kg)** | | | | | | | | | | |
| TPH | 2/2 | 46.7 J | 48.2 J | - | 48.2 | SB07,S4,6-8 | LF-SB07 | - | 2500 | N |
| **MISCELLANEOUS PARAMETERS** | | | | | | | | | | |
| Ash (%) | 2/2 | 92 | 93.5 | - | 93.5 | 2LTB19 (4-6) | 2LTB19 | - | - | N[8] |
| Cation Exchange Capacity (meq/100g) | 2/2 | 3.9 | 4.9 | - | 4.9 | 2LTB17 (0-2) | 2LTB17 | - | - | N[8] |
| pH | 2/2 | 8.08 J | 8.56 J | - | 8.56 | 2LTB19 (4-6) | 2LTB19 | - | - | N[8] |

TABLE 2-4

COPC SCREENING - SOIL SAMPLES
SITE 2A - AREA A LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 4 OF 4

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| Specific Gravity (g/cm3) | 2/2 | 2.3 | 2.4 | - | 2.4 | 2LTB17 (0-2) | 2LTB17 | - | - | N[8] |
| Total Organic Carbon (mg/kg) | 2/2 | 2900 | 4500 | - | 4500 | 2LTB17 (0-2) | 2LTB17 | - | - | N[8] |

1 Includes samples 080290-2LMW14S(5-7), 080290-2LMW8S(6-10), 080790-2LMW18S(0-2), 080790-2LMW18S(2-6), 081590-2LMW17(0-2), 081590-2LMW17(4-8), 081590-2LMW7(7-10), 081690-2LMW9(2-8), 081690-2LTB2(2-8), 081790-2LMW9(0-4), 081790-2LMW9(0-4)-D, 082290-2LMW13(2-4), 082290-2LMW13(2-4)-D, 082290-2LMW13(6-8), 112890-2LSS1, 112890-2LSS2, 2LSS20 (0-1), 2LSS20 (0-1)-D, 2LSS21 (0-1), 2LSS22 (0-1), 2LSS23 (0-1), 2LSS24 (0-1), 2LTB13 (0-2), 2LTB13-0001, 2LTB13-0001A(FIELD), 2LTB13-0102(FIELD), 2LTB13-0204(FIELD), 2LTB13-0406(FIELD), 2LTB13-0608(FIELD), 2LTB16 (0-2), 2LTB17 (0-2), 2LTB18 (0-2), 2LTB19 (2-4), 2LTB19 (4-6), 2LTB20 (6-8), 2LTB22 (6-8), 2LTB22 (8-10), 2LTB23 (4-8), 2LTB23 (4-8)-D, 2LTB23-0002(FIELD), 2LTB23-0406, 2LTB23-0406(FIELD), 2LTB23-0608(FIELD), 2LTB23-0810(FIELD), 2LTB23-1012(FIELD), 2LTB26 (4-6), 2LTB28 (4-6), 2LTB29 (10-12), 2LTB29 (10-12)-D, 2LTB31 (8-10), 2LTB9 (0-2), LF-SB03-18.5-20.5, LF-SB04-0810, LF-SB05-12.5-14.5, LF-TP22, LF-TP23, LF-TP26, LF-TP27, SB07,S12.22-24, SB07,S4.6-8.
2 USEPA Soil Screening Levels (USEPA, May 1996). See Table 1-2 for futher details regarding surrogate and/or calculated values.
3 CTDEP, 1996. See Table 1-2 for futher details regarding surrogate and/or calculated values.
4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.
5 TCLP extraction followed by analysis for metals was also performed for the soil sample associated with the maximum concentration of this chemical. The resulting TCLP data indicate that pollutant mobility is not anticipated to be of concern for this chemical in the soil matrix in this area (i.e., this chemical was not detected in assocaited TCLP leachates or was detected at concentrations less than the associated Connecticut pollutant mobility standard for GB areas and the federal toxicity characteristic regulatory level).
6 USEPA Region I does not advocate quantitative evaluation of this chemical.
7 Essential nutrient; not evaluated for COPC selection.
8 Not applicable for COPC screening.
- Not Applicable or Not Available.

## TABLE 2-5

## COPC SCREENING - TCLP SOIL SAMPLES
## SITE 2A - AREA A LANDFILL[1]
## NSB-NLON, GROTON, CONNECTICUT

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | Federal Pollutant Mobility (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **TCLP METALS (mg/L)** | | | | | | | | | | |
| Arsenic | 11/16 | 0.004 | 0.3 J | 0.0345 - 0.3 | 0.3 | 081690-2LMW9(2-8)-T | 2LMW9S | 5 | 0.5 | N |
| Barium | 16/16 | 0.14 J | 1.06 J | - | 0.43 | 2LTB18 (0-2)-T | 2LTB18 | 100 | 10 | N |
| Cadmium | 11/16 | 0.005 J | 0.065 J | 0.005 | 0.065 | 081590-2LMW17(4-8)-T | 2LMW17S | 1 | 0.05 | Y |
| Chromium | 7/16 | 0.0059 | 0.035 J | 0.01 - 0.05 | 0.035 | 081690-2LMW9(2-8)-T | 2LMW9S | 5 | 0.5 | N |
| Lead | 9/16 | 0.004 J | 2.19 J | 0.1 - 0.3 | 2.19 | 2LTB18 (0-2)-T | 2LTB18 | 5 | 0.15 | Y |
| Selenium | 7/16 | 0.003 | 0.23 J | 0.002 - 0.1 | 0.23 | 081690-2LMW9(2-8)-T | 2LMW9S | 1 | 0.5 | N |
| Silver | 4/14 | 0.01 J | 0.042 J | 0.0019 - 0.031 | 0.019 | 081690-2LMW9(2-8)-T | 2LMW9S | 5 | 0.36 | N |

1 Includes samples 080290-2LMW14S(5-7)-T, 080290-2LMW8S(6-10)-T, 080790-2LMW18S(0-2)-T, 080790-2LMW18S(2-6)-T, 081590-2LMW17(0-2)-T, 081590-2LMW17(4-8)-T, 081590-2LMW7(7-10)-T, 081690-2LMW9(2-8)-T, 081690-2LTB2(2-8)-T, 082290-2LMW13(6-8)-T, 112890-2LSS1-T, 112890-2LSS2-T, 2LMW13(2-4)-D-T, 2LMW13(2-4)-T, 2LMW9(0-4)-D-T, 2LMW9(0-4)-T, 2LTB18 (0-2)-T, 2LTB26 (4-6)-T.
2 Federal Toxicity Characteristic Regulatory Level (58 FR 46049).
3 CTDEP, 1996.
4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.
- Not Applicable.

TABLE 2-6

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 2A - AREA A LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,2-Dichloroethene (total) | 1/28 | 2 J | 2 J | 5 - 100 | 2 | 2LGW13S | 2LMW13S | 5.5 | 70/100 | 70/100 | 63 | 14000 | ND | N |
| 4-Methyl-2-pentanone | 8/28 | 3 J | 11 | 10 - 100 | 11 | 2LPW1S-4 | 2LPW1S | 290 | - | - | 350 | - | ND | N |
| Acetone | 1/28 | 10 J | 10 J | 10 - 110 | 10 | 2LGW9S | 2LMW9S | 370 | - | - | 700 | - | ND | N |
| Benzene | 3/28 | 6 J | 32 J | 5 - 10 | 32 | 2LGW18S-2 | 2LMW18S | 0.36 | 5 | 5 | 1 | 710 | ND | Y |
| Carbon Disulfide | 3/28 | 1 J | 3 J | 5 - 100 | 3 | 2LGW7S-2 | 2LMW7S | 100 | - | - | 700 | - | ND | N |
| Chlorobenzene | 3/28 | 140 | 1200 | 5 - 10 | 1200 | 2LGW18S-2 | 2LMW18S | 3.5 | 100 | 100 | 100 | 420000 | ND | Y |
| Chloroform | 1/28 | 16 J | 16 J | 5 - 25 | 16 | 2LGW18S-2 | 2LMW18S | 0.15 | 100/80 | 100 | 6 | 14100 | ND | Y |
| Ethylbenzene | 12/28 | 2 J | 120 | 5 - 10 | 120 | 121390-2LMW18S | 2LMW18S | 130 | 700 | 700 | 700 | 580000 | ND | N |
| Methylene Chloride | 5/28 | 6.5 | 22 | 5 - 100 | 22 | 2LPW1S-3/ 2LPW1S-4 | 2LPW1S/ 2LPW1S | 4.1 | 5 | 5 | 5 | 48000 | 4 | Y |
| Toluene | 9/28 | 1 J | 2 J | 5 - 100 | 2 | 2LGW18S/ 2LPW1S-1/ 2LPW1S-3/ 2LPW1S-5/ 2LPW1S-6/ 2LPW1S-8 | 2LMW18S/ 2LPW1S/ 2LPW1S/ 2LPW1S/ 2LPW1S/ 2LPW1S | 75 | 1000 | 1000 | 1000 | 4000000 | ND | N |
| Xylenes, Total | 14/28 | 2 J | 840 | 5 - 10 | 840 | 121390-2LMW18S | 2LMW18S | 1200 | 10000 | 10000 | 530 | - | 2 | Y |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,2,4-Trichlorobenzene | 3/23 | 7 J | 72 J | 10 | 72 | 121390-2LMW18S-D | 2LMW18S | 19 | 70 | 70 | 70 | - | ND | Y |
| 1,2-Dichlorobenzene | 2/23 | 8 J | 14 J | 10 | 14 | 121390-2LMW18S-D | 2LMW18S | 6.4 | 600 | 600 | 600 | 170000 | ND | Y |
| 1,3-Dichlorobenzene | 3/23 | 7 J | 33 J | 10 | 33 | 121390-2LMW18S-D | 2LMW18S | 1.4 | 600 | - | 210 | 26000 | ND | Y |
| 1,4-Dichlorobenzene | 3/23 | 14 | 140 J | 10 | 140 | 121390-2LMW18S-D | 2LMW18S | 0.47 | 75 | 75 | 75 | 26000 | ND | Y |
| 2,4-Dichlorophenol | 1/23 | 2 J | 2 J | 10 | 2 | 2LGW18S-2 | 2LMW18S | 11 | - | - | 20 | 15800 | ND | N |
| 2,4-Dimethylphenol | 3/23 | 0.8 J | 19 J | 10 | 19 | 121390-2LMW18S | 2LMW18S | 73 | - | - | 140 | - | ND | N |
| 2,4-Dinitrotoluene | 1/23 | 7 J | 7 J | 10 | 7 | 2LGW7S | 2LMW7S | 7.3 | - | - | 14 | 270 | ND | N |
| 2-Chlorophenol | 2/23 | 4 J | 12 | 10 | 12 | 2LGW18S-2 | 2LMW18S | 18 | - | - | 36 | 46000 | ND | N |
| 2-Methylnaphthalene | 6/23 | 0.8 J | 6 J | 10 | 6 | 2LGW18S | 2LMW18S | 150 | - | - | 280 | - | ND | N |
| 4-Chloro-3-methylphenol | 1/23 | 8 J | 8 J | 10 | 8 | 2LGW18S-2 | 2LMW18S | - | - | - | - | - | ND | N |
| 4-Methylphenol | 6/23 | 0.5 J | 22 J | 10 | 22 | 121390-2LMW18S-D | 2LMW18S | 18 | - | - | 35 | - | ND | Y |
| Acenaphthene | 5/23 | 0.5 J | 1 J | 10 | 1 | 2LGW18S/ 2LGW7S/ 2LGW9S | 2LMW18S/ 2LMW7S/ 2LMW9S | 220 | - | - | 420 | 27000 | ND | N |
| Anthracene | 1/23 | 0.5 J | 0.5 J | 10 | 0.5 | 2LGW18S-2 | 2LMW18S | 1100 | - | - | 2000 | 1100000 | ND | N |
| Benzoic Acid | 6/23 | 1 J | 14 J | 10 - 50 | 14 | 2LGW18S | 2LMW18S | 15000 | - | - | 28000 | - | ND | N |
| Bis(2-Ethylhexyl)phthalate | 7/23 | 1 | 62 J | 10 | 62 | 2LGW7S-2 | 2LMW7S | 4.8 | 6 | 6 | 2 | 59 | 3 | Y |
| Butylbenzyl Phthalate | 1/23 | 1 J | 1 J | 10 | 1 | 2LGW8S | 2LMW8S | 730 | - | - | 1000 | 52000 | ND | N |
| Carbazole | 4/18 | 0.5 J | 2 J | 10 | 2 | 2LGW18S | 2LMW18S | 3.3 | - | - | 1.8 | 29 | ND | Y |
| Di-n-butyl phthalate | 2/23 | 0.8 J | 1 J | 10 | 1 | 2LGW9S | 2LMW9S | 370 | - | - | 700 | 120000 | ND | N |
| Dibenzofuran | 1/23 | 0.6 J | 0.6 J | 10 | 0.6 | 2LPW1S-1 | 2LPW1S | 2.4 | - | - | 28 | - | ND | N |
| Diethyl Phthalate | 5/23 | 1 J | 17 J | 10 | 17 | 121390-2LMW18S-D | 2LMW18S | 2900 | - | - | 5600 | 2400000 | ND | N |
| Fluorene | 5/23 | 0.8 J | 1 J | 10 | 1 | 2LGW18S/ 2LGW7S | 2LMW18S/ 2LMW7S | 150 | - | - | 280 | 140000 | ND | N |
| N-Nitrosodiphenylamine | 1/23 | 1 J | 1 J | 10 | 1 | 2LGW18S-2 | 2LMW18S | 14 | - | - | 7.1 | 480 | ND | N |
| Naphthalene | 11/23 | 1 J | 42 | 10 | 42 | 2LGW18S | 2LMW18S | 150 | - | - | 280 | - | ND | N |

TABLE 2-6

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 2A - AREA A LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| Phenanthrene | 3/23 | 1 J | 1 J | 10 | 1 | 2LPW1S-1/ 2LPW1S-7/ 2LPW1S-8 | 2LPW1S/ 2LPW1S/ 2LPW1S | - | - | - | 200 | 0.3 | ND | Y |
| **PESTICIDES/PCBs (ug/L)** | | | | | | | | | | | | | | |
| Aroclor-1016 | 1/10 | 7.5 J | 7.5 J | 0.1 - 10 | 7.5 | 2LGW18S-2 | 2LMW18S | 0.096 | 0.5 | 0.5 | 0.5 | 0.5 | ND | Y |
| Aroclor-1254 | 1/10 | 130 | 150 | 0.1 - 10 | 150 | 121390-2LMW18S | 2LMW18S | 0.0033 | 0.5 | 0.5 | 0.5 | 0.5 | ND | Y |
| Aroclor-1260 | 2/10 | 290 J | 710 | 0.1 - 1 | 710 | 2LGW18S | 2LMW18S | 0.033 | 0.5 | 0.5 | 0.5 | 0.5 | ND | Y |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 8/22 | 51.1 | 89300 | 30 - 116 | 89300 | 2LGW13S | 2LMW13S | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Aluminum, Filtered | 2/17 | 12.8 | 62.5 | 10 - 116 | 47.8 | 2LGW18S2DISS | 2LMW18S | - | 50 to 200 | - | - | - | - | N[8] |
| Antimony, Filtered | 3/17 | 13.7 J | 34.1 | 12 - 19.9 | 34.1 | 2LGW13S DISS | 2LMW13S | 1.5 | 6 | 6 | 6 | 86000 | - | Y |
| Arsenic | 10/22 | 2.3 J | 37 | 2 - 20 | 37 | 2LGW7S-2 | 2LMW7S | 0.045 | 50 | 50 | 50 | 4 | 0.64 | Y |
| Arsenic, Filtered | 8/17 | 2.3 J | 7.3 J | 2 - 20 | 7.3 | 2LGW13S DISS | 2LMW13S | 0.045 | 50 | 50 | 50 | 4 | - | Y |
| Barium | 22/22 | 18.5 | 956 | - | 956 | 2LPW1S-8 | 2LPW1S | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | Y |
| Barium, Filtered | 15/17 | 29.2 | 924 | 5 - 48 | 924 | 2LPW1S-8 DISS | 2LPW1S | 260 | 2000 | 2000 | 1000 | - | - | Y |
| Beryllium | 3/22 | 1.1 J | 4.2 | 1 | 4.2 | 2LGW13S | 2LMW13S | 73 | 4 | 4 | 4 | 4 | 0.33 - 0.41 | Y |
| Beryllium, Filtered | 2/17 | 1.2 J | 1.2 J | 1 | 1.2 | 2LPW1S-1 DISS/ 2LPW1S-7 DISS | 2LPW1S/ 2LPW1S | 73 | 4 | 4 | 4 | 4 | - | N |
| Boron | 7/17 | 52.5 J | 3010 J | 38.5 - 719 | 3010 | 2LGW7S-2 | 2LMW7S | 330 | - | - | 630 | - | 9.3 - 126 | Y |
| Boron, Filtered | 10/17 | 39.3 | 2670 | 35.7 - 131 | 2670 | 2LGW7S2DISS | 2LMW7S | 330 | - | - | 630 | - | - | Y |
| Cadmium | 2/20 | 3.8 | 29.1 | 2 - 3 | 29.1 | 121390-2LMW18S | 2LMW18S | 1.8 | 5 | 5 | 5 | 6 | 1.9 - 26.3 | Y |
| Calcium | 22/22 | 10800 | 174000 | - | 86099 | 2LGW18S | 2LMW18S | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 16/17 | 19200 | 161000 | 157 | 85942 | 2LGW18S DISS | 2LMW18S | - | - | - | - | - | - | N[9] |
| Chromium | 8/22 | 3.2 J | 142 | 3 - 5.4 | 142 | 2LGW13S | 2LMW13S | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | Y |
| Chromium, Filtered | 1/17 | 6.7 | 6.7 | 3 - 6 | 6.7 | 2LGW18S2DISS | 2LMW18S | 18 | 100 | 100 | 50 | 110 | - | N |
| Cobalt | 5/22 | 3.5 J | 35.5 | 3 - 14.4 | 35.5 | 2LGW13S | 2LMW13S | 220 | - | - | 420 | - | 1.9 - 6 | N |
| Cobalt, Filtered | 3/17 | 4.5 | 14.4 | 3 - 10.4 | 14.4 | 2LGW18S2DISS | 2LMW18S | 220 | - | - | 420 | - | - | N |
| Copper | 12/22 | 2.5 | 125 | 2 - 5.8 | 125 | 2LGW13S | 2LMW13S | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Copper, Filtered | 6/18 | 2.7 | 30.1 J | 2 - 5 | 30.1 | 2LGW7S2DISS | 2LMW7S | 150 | 1300 | - | 1300 | 48 | - | N[8] |
| Iron | 22/22 | 55.1 J | 193000 | - | 193000 | 121390-2LMW18S-D/ 2LGW18S-2 | 2LMW18S/ 2LMW18S | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 16/17 | 46.4 | 193000 | 12.1 | 193000 | 2LGW18S2DISS | 2LMW18S | 1100 | 300 | - | - | - | - | N[8] |
| Lead | 8/23 | 3 | 84 | 1 - 10 | 84 | 2LGW18S-2 | 2LMW18S | - | 15 | - | 15 | 13 | 1 - 264 | Y |
| Lead, Filtered | 3/18 | 2.4 J | 20.6 | 1 - 10 | 20.6 | 2LPW1S DISS | 2LPW1S | - | 15 | - | 15 | 13 | - | Y |
| Magnesium | 22/22 | 2440 | 563000 | - | 107150 | 2LGW7S-2 | 2LMW7S | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 16/17 | 4630 | 451000 | 106 | 451000 | 2LGW7S2DISS | 2LMW7S | - | - | - | - | - | - | N[9] |
| Manganese | 22/22 | 126 | 2570 | - | 1077 | 2LGW13S | 2LMW13S | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 17/17 | 9.1 | 2010 | - | 2010 | 2LGW20S2DISS-D | 2LMW20S | 84 | 50 | 5000 | 50 | - | - | Y |
| Mercury | 2/22 | 0.32 J | 0.32 J | 0.2 | 0.32 | 2LGW13S/ 2LGW18S-2 | 2LMW13S/ 2LMW18S | 1.1 | 2 | 2 | 2 | 0.4 | 0.13 - 1.3 | N |
| Mercury, Filtered | 1/17 | 0.29 | 0.29 | 0.2 | 0.29 | 2LGW8S DISS | 2LMW8S | 1.1 | 2 | 2 | 2 | 0.4 | - | N |
| Nickel | 8/23 | 9.3 | 79.5 | 7 - 21.4 | 79.5 | 2LGW13S | 2LMW13S | 73 | 100 | 100 | 100 | 880 | 5 - 17.5 | Y |
| Nickel, Filtered | 4/18 | 9 J | 24.9 | 7 - 28 | 24.9 | 2LGW18S2DISS | 2LMW18S | 73 | 100 | 100 | 100 | 880 | - | N |
| Potassium | 22/22 | 1300 | 208000 | - | 83576 | 2LGW7S-2 | 2LMW7S | - | - | - | - | - | 290 - 17900 | N[9] |

TABLE 2-6

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 2A - AREA A LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 3 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| Potassium, Filtered | 15/17 | 2220 | 172000 | 1000 - 2500 | 157443 | 2LGW7S2DISS | 2LMW7S | - | - | - | - | - | - | N[9] |
| Selenium | 4/22 | 1 J | 2.9 J | 1 - 30 | 2.9 | 010391-2LMW7S/ 121390-2LMW18S | 2LMW7S/ 2LMW18S | 18 | 50 | 50 | 50 | 50 | 1 - 4.1 | N |
| Sodium | 22/22 | 10700 | 7280000 | - | 7280000 | 2LPW1S-8 | 2LPW1S | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 16/17 | 17200 | 6960000 | 104 | 6960000 | 2LPW1S-1 DISS | 2LPW1S | - | - | 28000 | - | - | - | N[9] |
| Thallium | 1/16 | 2 J | 3.7 J | 1 - 20 | 3.7 | 2LGW20S-2-D | 2LMW20S | 0.26 | 2 | 2 | 5 | 63 | 1.2 - 4.3 | Y |
| Thallium, Filtered | 1/15 | 4.15 J | 5.8 J | 1 - 20 | 5.8 | 2LGW20S2DISS | 2LMW20S | 0.26 | 2 | 2 | 5 | 63 | - | Y |
| Vanadium | 6/22 | 4.5 J | 182 | 3 - 20 | 182 | 2LGW13S | 2LMW13S | 26 | - | - | 50 | - | 33.1 | Y |
| Vanadium, Filtered | 3/17 | 2.3 J | 5.6 | 1 - 11.4 | 5.6 | 2LGW8S DISS | 2LMW8S | 26 | - | - | 50 | - | - | N |
| Zinc | 17/23 | 2.8 J | 612 | 2 - 26.3 | 612 | 121390-2LMW18S-D | 2LMW18S | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | Y |
| Zinc, Filtered | 10/18 | 2.3 J | 74 | 2 - 10.1 | 65 | 2LGW18S2DISS | 2LMW18S | 1100 | 5000 | - | 5000 | 123 | - | N |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Ammonia, As Nitrogen | 3/3 | 6.79 | 10.2 | .- | 10.2 | 2LPW1S-1 | 2LPW1S | - | - | - | - | - | NA | N[10] |
| Biochemical Oxygen Demand | 1/3 | 4.1 | 4.1 | 2 - 3 | 4.1 | 2LPW1S-1 | 2LPW1S | - | - | - | - | - | NA | N[10] |
| Chemical Oxygen Demand | 3/3 | 839 | 9440 | - | 9440 | 2LPW1S-8 | 2LPW1S | - | - | - | - | - | NA | N[10] |
| Hardness As CaCO3 | 15/15 | 64 | 2900 | - | 1451 | 2LGW7S-2 | 2LMW7S | - | - | - | - | - | NA | N[10] |
| Oil & Grease (ug/L) | 3/3 | 600 | 1100 | - | 1100 | 2LPW1S-7 | 2LPW1S | - | - | - | - | - | NA | N[10] |
| Total Organic Carbon | 3/3 | 7.2 | 13.4 | - | 13.4 | 2LPW1S-1 | 2LPW1S | - | - | - | - | - | NA | N[10] |
| Total Phosphorus | 2/3 | 0.11 | 0.12 | 0.1 | 0.12 | 2LPW1S-7 | 2LPW1S | - | - | - | - | - | NA | N[10] |
| Total Suspended Solids | 3/3 | 33 | 38 | - | 38 | 2LPW1S-1 | 2LPW1S | - | - | - | - | - | NA | N[10] |

1 Includes samples 010291-2LMW17S, 010291-2LMW9S, 010391-2LMW7S, 121390-2LMW18S, 121390-2LMW18S-D, 121490-2LMW8S, 2LGW13S, 2LGW13S DISS, 2LGW17S, 2LGW17S DISS, 2LGW17S-2, 2LGW17S2DISS, 2LGW18S, 2LGW18S DISS, 2LGW18S-2, 2LGW18S2DISS, 2LGW19S, 2LGW19S DISS, 2LGW19S-2, 2LGW19S2DISS, 2LGW1S-X, 2LGW20S, 2LGW20S DISS, 2LGW20S-2, 2LGW20S-2-D, 2LGW20S2DISS, 2LGW20S2DISS-D, 2LGW7S, 2LGW7S DISS, 2LGW7S-2, 2LGW7S2DISS, 2LGW8S, 2LGW8S DISS, 2LGW8S-2, 2LGW8S2DISS, 2LGW9S, 2LGW9S DISS, 2LPW1S, 2LPW1S DISS, 2LPW1S-1, 2LPW1S-1 DISS, 2LPW1S-2, 2LPW1S-3, 2LPW1S-4, 2LPW1S-5, 2LPW1S-6, 2LPW1S-7, 2LPW1S-7 DISS, 2LPW1S-8, 2LPW1S-8 DISS.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 2-7

COPC SCREENING - GROUNDWATER SAMPLES - BEDROCK WELLS
SITE 2A - AREA A LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 4/24 | 1 J | 140 | 5 - 10 | 140 | 011091-2LMW13D | 2LMW13D | 0.053 | - | - | 0.5 | 110 | ND | Y |
| 1,2-Dichloroethene (total) | 3/24 | 1 J | 2 J | 5 - 10 | 2 | 2LGW13D | 2LMW13D | 5.5 | 70/100 | 70/100 | 63 | 14000 | ND | N |
| 4-Methyl-2-pentanone | 1/24 | 49 | 49 | 10 | 49 | 2LGW17D-2 | 2LMW17D | 290 | - | - | 350 | 4400000 | ND | N |
| Carbon Disulfide | 2/24 | 1 J | 1 J | 5 - 10 | 1 | 2LGW14D/ 2LGW17D-2 | 2LMW14D/ 2LMW17D | 100 | - | - | 700 | 840000 | ND | N |
| Chlorobenzene | 1/24 | 6 J | 6 J | 5 - 10 | 6 | 2LGW18D-2 | 2LMW18D | 3.5 | 100 | 100 | 100 | 420000 | ND | Y |
| Methylene Chloride | 1/24 | 1 J | 1 J | 5 - 45 | 1 | 2LGW13D-2 | 2LMW13D | 4.1 | 5 | 5 | 5 | 48000 | 4 | N |
| Tetrachloroethene | 1/24 | 3 J | 3 J | 5 - 10 | 3 | 2LGW13D-2 | 2LMW13D | 1.1 | 5 | 5 | 5 | 88 | ND | Y |
| Trichloroethene | 3/24 | 4 J | 23 | 5 - 10 | 23 | 2LGW13D-2 | 2LMW13D | 1.6 | 5 | 5 | 5 | 2340 | ND | Y |
| Xylenes, Total | 2/24 | 2 J | 2 J | 5 - 10 | 2 | 2LGW17D-2/ 2LGW19D | 2LMW17D/ 2LMW19D | 1200 | 10000 | 10000 | 530 | 1400000 | 2 | N |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 4-Methylphenol | 1/24 | 6 J | 6 J | 10 | 6 | 2LGW17D-2 | 2LMW17D | 18 | - | - | 35 | 32000 | ND | N |
| Benzoic Acid | 5/24 | 0.5 J | 2 J | 50 | 2 | 2LGW13D-2 2LGW18D/ 2LGW20D-2 | 2LMW13D 2LMW18D/ 2LMW20D | 15000 | - | - | 28000 | 28000000 | ND | N |
| Bis(2-Ethylhexyl)phthalate | 4/24 | 3 J | 10 J | 10 - 17 | 10 | 2LGW7D-2 | 2LMW7D | 4.8 | 6 | 6 | 2 | 59 | 3 | Y |
| Butylbenzyl Phthalate | 1/24 | 0.5 J | 0.5 J | 10 - 20 | 0.5 | 2LGW8D-2 | 2LMW8D | 730 | - | - | 1000 | 52000 | ND | N |
| Di-n-butyl phthalate | 1/24 | 1 J | 1 J | 10 - 20 | 1 | 2LGW9D-2 | 2LMW9D | 370 | - | - | 700 | 120000 | ND | N |
| Di-n-octyl phthalate | 1/24 | 2 J | 2 J | 10 - 20 | 2 | 2LGW19D | 2LMW19D | 73 | - | - | 100 | 230 | ND | N |
| Diethyl Phthalate | 2/24 | 0.6 J | 120 | 10 | 120 | 2LGW17D-2 | 2LMW17D | 2900 | - | - | 5600 | 2400000 | ND | N |
| Phenol | 4/24 | 0.7 J | 6 J | 10 | 6 | 2LGW17D-2 | 2LMW17D | 2200 | - | - | 4000 | 92000000 | ND | N |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 10/24 | 24 J | 3340 J | 30 - 240 | 3340 | 2LGW19D | 2LMW19D | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[6] |
| Aluminum, Filtered | 2/17 | 15 | 16.7 | 13 - 135 | 16.7 | 2LGW8D2DISS | 2LMW8D | - | 50 to 200 | - | - | - | - | N[8] |
| Antimony | 1/24 | 20.6 J | 20.6 J | 3 - 25 | 20.6 | 2LGW18D | 2LMW18D | 1.5 | 6 | 6 | 6 | 86000 | ND | Y |
| Antimony, Filtered | 1/17 | 19.4 | 19.4 | 12 - 15.4 | 19.4 | 2LGW8D2DISS | 2LMW8D | 1.5 | 6 | 6 | 6 | 86000 | - | Y |
| Arsenic | 11/24 | 2.3 | 7 J | 2 - 5 | 2.8 | 2LGW17D-2 | 2LMW17D | 0.045 | 50 | 50 | 50 | 4 | 0.64 | Y |
| Arsenic, Filtered | 4/17 | 2.8 J | 3.6 J | 1 - 5 | 3.6 | 2LGW7D2DISS | 2LMW7D | 0.045 | 50 | 50 | 50 | 4 | - | Y |
| Barium | 23/24 | 8.7 J | 281 | 15 | 146.4 | 2LGW19D | 2LMW19D | 260 | 2000 | 2000 | 1000 | 940000 | 2.8 - 183 | Y |
| Barium, Filtered | 15/17 | 32.6 | 265 | 5 - 6 | 126.6 | 2LGW19D-2DISS | 2LMW19D | 260 | 2000 | 2000 | 1000 | 940000 | - | Y |
| Beryllium | 1/24 | 1.5 J | 1.5 J | 1 | 1.5 | 2LGW19D | 2LMW19D | 73 | 4 | 4 | 4 | 4 | 0.33 - 0.41 | N |
| Beryllium, Filtered | 1/17 | 1.4 J | 1.4 J | 1 | 1.4 | 2LGW19D DISS | 2LMW19D | 73 | 4 | 4 | 4 | 4 | - | N |
| Boron | 3/17 | 57.8 J | 177 | 16.4 - 113 | 177 | 2LGW9D | 2LMW9D | 330 | - | - | 630 | 49000 | 9.3 - 126 | N |
| Boron, Filtered | 6/17 | 11.8 J | 186 J | 13 - 80.6 | 186 | 2LGW9D DISS | 2LMW9D | 330 | - | - | 630 | 49000 | - | N |
| Cadmium | 7/24 | 1.7 J | 44.8 J | 1 - 3 | 44.8 | 011091-2LMW13D | 2LMW13D | 1.8 | 5 | 5 | 5 | 6 | 1.9 - 26.3 | Y |
| Cadmium, Filtered | 1/17 | 2.1 J | 2.1 J | 1 - 3 | 2.1 | 2LGW18D DISS | 2LMW18D | 1.8 | 5 | 5 | 5 | 6 | - | Y |
| Calcium | 24/24 | 13900 | 94100 | - | 41873 | 2LGW19D-2 | 2LMW19D | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 17/17 | 19900 | 97800 | - | 50067 | 2LGW19D-2DISS | 2LMW19D | - | - | - | - | - | - | N[9] |
| Chromium | 4/24 | 2.3 | 32.5 | 3 - 5 | 32.5 | 2LGW19D | 2LMW19D | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | Y |
| Chromium, Filtered | 1/17 | 3.9 | 3.9 | 3 - 5.3 | 3.9 | 2LGW18D2DISS | 2LMW18D | 18 | 100 | 100 | 50 | 110 | - | N |
| Cobalt | 3/24 | 3.2 | 24.8 | 3 - 18 | 24.8 | 2LGW20D-2 | 2LMW20D | 220 | - | - | 420 | 160000 | 1.9 - 6 | N |
| Copper | 12/24 | 5 | 42.7 | 2 - 10.2 | 10 | 2LGW19D | 2LMW19D | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Copper, Filtered | 1/17 | 4.8 | 4.8 | 2 - 5 | 4.8 | 2LGW8D2DISS | 2LMW8D | 150 | 1300 | - | 1300 | 48 | - | N[8] |

TABLE 2-7

COPC SCREENING - GROUNDWATER SAMPLES - BEDROCK WELLS
SITE 2A - AREA A LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| Iron | 24/24 | 28.1 J | 83900 | - | 83900 | 2LGW7D-2 | 2LMW7D | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 16/17 | 22.7 | 42700 | 20 | 42700 | 2LGW18D2DISS | 2LMW18D | 1100 | 300 | - | - | - | - | N[8] |
| Lead | 7/24 | 2.6 J | 21.6 J | 2 - 3.9 | 21.6 | 2LGW19D | 2LMW19D | - | 15 | - | 15 | 13 | 1 - 264 | Y |
| Lead, Filtered | 1/17 | 2.6 J | 2.6 J | 1 - 2 | 2.6 | 2LGW9D2DISS | 2LMW9D | - | 15 | - | 15 | 13 | - | N |
| Magnesium | 24/24 | 2120 | 37100 | - | 37100 | 2LGW9D-2 | 2LMW9D | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 17/17 | 2730 | 38400 | - | 38400 | 2LGW9D2DISS | 2LMW9D | - | - | - | - | - | - | N[9] |
| Manganese | 24/24 | 57.5 J | 1360 | - | 724.8 | 2LGW14D | 2LMW14D | 84 | 50 | 5000 | 50 | 430000 | 0.89 - 2130 | Y |
| Manganese, Filtered | 17/17 | 12.1 | 1350 | - | 1350 | 2LGW14D DISS | 2LMW14D | 84 | 50 | 5000 | 50 | 430000 | - | Y |
| Mercury | 1/24 | 0.36 J | 0.36 J | 0.2 | 0.36 | 2LGW17D-2 | 2LMW17D | 1.1 | 2 | 2 | 2 | 0.4 | 0.13 - 1.3 | N |
| Mercury, Filtered | 1/17 | 0.2 | 0.2 | 0.2 | 0.2 | 2LGW19D DISS | 2LMW19D | 1.1 | 2 | 2 | 2 | 0.4 | - | N |
| Nickel | 7/24 | 13.7 | 80.9 | 7 - 59.2 | 80.9 | 2LGW19D | 2LMW19D | 73 | 100 | 100 | 100 | 880 | 5 - 17.5 | Y |
| Nickel, Filtered | 4/17 | 3.9 | 34.9 | 7 - 14.5 | 34.9 | 2LGW19D DISS | 2LMW19D | 73 | 100 | 100 | 100 | 880 | - | N |
| Potassium | 23/24 | 865 J | 16900 | 1020 | 7513 | 2LGW9D | 2LMW9D | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 15/17 | 1450 | 17100 | 701 - 2450 | 9567 | 2LGW9D DISS | 2LMW9D | - | - | - | - | - | - | N[9] |
| Selenium | 2/24 | 1 J | 1.5 | 1 - 5 | 1.5 | 011091-2LMW9D | 2LMW9D | 18 | 50 | 50 | 50 | 50 | 1 - 4.1 | N |
| Selenium, Filtered | 1/17 | 3 | 3 | 1 - 5 | 3 | 2LGW19D DISS | 2LMW19D | 18 | 50 | 50 | 50 | 50 | - | N |
| Silver | 2/24 | 2.5 J | 3.5 J | 1 - 7 | 3.5 | 2LGW19D | 2LMW19D | 18 | 100 | 50 | 36 | 12 | 2 - 5.8 | N |
| Sodium | 24/24 | 10600 | 365000 | - | 135762 | 2LGW9D | 2LMW9D | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 17/17 | 12300 | 378000 | - | 179339 | 2LGW9D DISS | 2LMW9D | - | - | 28000 | - | - | - | N[9] |
| Thallium | 1/15 | 4 J | 4 J | 1.1 - 20 | 4 | 2LGW13D-2 | 2LMW13D | 0.26 | 2 | 2 | 5 | 63 | 1.2 - 4.3 | Y |
| Vanadium, Filtered | 1/17 | 6.3 | 6.3 | 1 - 5 | 6.3 | 2LGW14D DISS | 2LMW14D | 26 | - | - | 50 | - | - | N |
| Zinc | 15/24 | 2.8 J | 112 J | 2 - 21.2 | 31.8 | 2LGW19D | 2LMW19D | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | N |
| Zinc, Filtered | 10/17 | 2.4 J | 19.4 | 2 - 20.4 | 12.2 | 2LGW14D DISS | 2LMW14D | 1100 | 5000 | - | 5000 | 123 | - | N |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Hardness As CaCO3 | 17/17 | 72 | 304 | - | 190 | 2LGW19D-2 | 2LMW19D | - | - | - | - | - | NA | N[10] |

1 Includes samples 010891-2LMW17D, 010891-2LMW7D, 010891-2LMW7D-D, 011091-2LMW13D, 011091-2LMW9D, 121390-2LMW18D, 121790-2LMW14D, 121790-2LMW8D, 2LGW13D, 2LGW13D DISS, 2LGW13D-2, 2LGW13D2DISS, 2LGW14D, 2LGW14D DISS, 2LGW17D, 2LGW17D DISS, 2LGW17D-2, 2LGW17D2DISS, 2LGW18D, 2LGW18D DISS, 2LGW18D-2, 2LGW18D2DISS, 2LGW19D, 2LGW19D DISS, 2LGW19D-2, 2LGW19D-2DISS, 2LGW20D, 2LGW20D DISS, 2LGW20D-2, 2LGW20D2DISS, 2LGW7D, 2LGW7D DISS, 2LGW7D-2, 2LGW7D2DISS, 2LGW8D, 2LGW8D DISS, 2LGW8D-2, 2LGW8D2DISS, 2LGW9D, 2LGW9D DISS, 2LGW9D-2, 2LGW9D2DISS.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 2-8

COPC SCREENING - SOIL AND SEDIMENT SAMPLES
SITE 2B - AREA A WETLAND[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 4

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **VOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 1,1-Dichloroethene | 1/60 | 0.002 J | 0.002 J | 0.005 - 0.056 | 0.002 | 090590-2WTB1(20-22) | 2WTB1 | 0.06 | 1.4 | N |
| 2-Butanone | 19/60 | 0.005 J | 1.4 | 0.011 - 0.11 | 1.4 | T8-B | T8B | - | 80 | N |
| Acetone | 28/60 | 0.027 | 0.85 | 0.011 - 0.11 | 0.85 | 083090-2WTB8(1-3) | 2WTB8 | 16 | 140 | N |
| Benzene | 1/60 | 0.003 J | 0.003 J | 0.005 - 0.056 | 0.003 | 090490-2WMW5(13) | 2WMW5S | 0.03 | 0.2 | N |
| Carbon Disulfide | 32/60 | 0.002 J | 0.042 | 0.005 - 0.056 | 0.0158 | 090690-2WTB2(4-6) | 2WTB2 | 32 | 140 | N |
| Chlorobenzene | 3/61 | 0.002 J | 0.014 J | 0.005 - 0.056 | 0.014 | T7-B | T7B | 1 | 20 | N |
| Methylene Chloride | 9/60 | 0.002 J | 0.01 J | 0.005 - 0.074 | 0.01 | 112690-2WSD4(0-0.5)/ 112690-2WSD6(0-0.5) | 2WSD4/ 2WSD6 | 0.02 | 1 | N |
| Tetrachloroethene | 6/60 | 0.003 J | 0.016 J | 0.003 - 0.056 | 0.016 | 112690-2WSD4(0-0.5) | 2WSD4 | 0.06 | 1 | N |
| Toluene | 6/60 | 0.002 J | 0.006 J | 0.004 - 0.056 | 0.006 | T8-B | T8B | 12 | 67 | N |
| Trichloroethene | 5/60 | 0.003 J | 0.012 J | 0.005 - 0.056 | 0.012 | 090590-2WTB1(20-22) | 2WTB1 | 0.06 | 1 | N |
| Xylenes, Total | 1/60 | 0.003 J | 0.003 J | 0.005 - 0.056 | 0.003 | T6-B | T6B | 190 | 19.5 | N |
| **SEMIVOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 1,4-Dichlorobenzene | 1/60 | 0.042 J | 0.042 J | 0.35 - 6.6 | 0.042 | T6-B | T6B | 2 | 15 | N |
| 2,4-Dimethylphenol | 1/60 | 0.21 J | 0.21 J | 0.35 - 6.6 | 0.21 | T8-B | T8B | 9 | 28 | N |
| 2-Methylnaphthalene | 4/60 | 0.04 J | 0.055 J | 0.35 - 6.6 | 0.055 | T3-A | T3A | - | 56 | N |
| 4-Methylphenol | 1/60 | 0.043 J | 0.043 J | 0.35 - 6.6 | 0.043 | T9-A | T9A | - | 7 | N |
| Acenaphthene | 9/61 | 0.03 J | 0.38 J | 0.35 - 6.6 | 0.38 | T7-B | T7B | 570 | 84 | N |
| Acenaphthylene | 7/60 | 0.034 J | 0.39 | 0.35 - 6.6 | 0.39 | T3-A | T3A | - | 84 | N |
| Anthracene | 18/60 | 0.034 J | 2.4 J | 0.35 - 3.7 | 2.4 | 112690-2WSD9(0-0.5) | 2WSD9 | 12000 | 400 | N |
| Benzo(a)anthracene | 37/61 | 0.025 J | 27 | 0.36 - 3.7 | 27 | 112690-2WSD9(0-0.5) | 2WSD9 | 2 | 1 | Y |
| Benzo(a)pyrene | 27/61 | 0.03 J | 35 | 0.36 - 3.7 | 35 | 112690-2WSD9(0-0.5) | 2WSD9 | 8 | 1 | Y |
| Benzo(b)fluoranthene | 33/61 | 0.044 J | 55 | 0.36 - 3.7 | 55 | 112690-2WSD9(0-0.5) | 2WSD9 | 5 | 1 | Y |
| Benzo(g,h,i)perylene | 20/61 | 0.027 J | 23 | 0.35 - 3.7 | 23 | 112690-2WSD9(0-0.5) | 2WSD9 | - | 40 | N |
| Benzo(k)fluoranthene | 35/61 | 0.062 J | 45 | 0.36 - 3.7 | 45 | 112690-2WSD9(0-0.5) | 2WSD9 | 49 | 1 | Y |
| Benzoic Acid | 5/60 | 0.13 J | 32 J | 1.7 - 18 | 32 | 112690-2WSD9(0-0.5) | 2WSD9 | 400 | 5600 | N |
| Bis(2-Ethylhexyl)phthalate | 21/60 | 0.073 J | 3.5 J | 0.35 - 6.6 | 3.5 | T10-B | T10B | 3600 | 11 | N |
| Butylbenzyl Phthalate | 5/61 | 0.021 J | 0.39 J | 0.35 - 6.6 | 0.39 | T7-B | T7B | 930 | 200 | N |
| Carbazole | 6/19 | 0.025 J | 0.13 J | 0.38 - 0.8 | 0.13 | T5-A | T5A | 0.6 | 0.36 | N |
| Chrysene | 38/61 | 0.038 J | 42 | 0.36 - 3.7 | 42 | 112690-2WSD9(0-0.5) | 2WSD9 | 160 | 0.96 | Y |
| Di-n-butyl phthalate | 8/60 | 0.023 J | 0.063 J | 0.35 - 7.9 | 0.063 | T3-B | T3B | 2300 | 140 | N |
| Dibenzo(a,h)anthracene | 6/60 | 0.072 J | 0.31 J | 0.35 - 6.6 | 0.31 | T2-A-D | T2A | 2 | 0.005 | Y |
| Dibenzofuran | 10/61 | 0.035 J | 1 J | 0.35 - 3.7 | 1 | 112690-2WSD9(0-0.5) | 2WSD9 | - | 5.6 | N |

TABLE 2-8

COPC SCREENING - SOIL AND SEDIMENT SAMPLES
SITE 2B - AREA A WETLAND[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 4

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| Fluoranthene | 50/61 | 0.003 J | 80 | 0.36 - 3.7 | 80 | 112690-2WSD9(0-0.5) | 2WSD9 | 4300 | 56 | Y |
| Fluorene | 12/61 | 0.021 J | 1 J | 0.35 - 3.7 | 1 | 112690-2WSD9(0-0.5) | 2WSD9 | 560 | 56 | N |
| Indeno(1,2,3-cd)pyrene | 22/61 | 0.022 J | 23 | 0.35 - 3.7 | 23 | 112690-2WSD9(0-0.5) | 2WSD9 | 14 | 0.005 | Y |
| Naphthalene | 5/60 | 0.056 J | 0.077 J | 0.35 - 6.6 | 0.077 | T9-A | T9A | 84 | 56 | N |
| Pentachlorophenol | 1/60 | 0.24 J | 0.24 J | 0.93 - 32 | 0.24 | T1-B | T1B | 0.003 | 1 | Y |
| Phenanthrene | 34/61 | 0.022 J | 36 | 0.36 - 3.7 | 36 | 112690-2WSD9(0-0.5) | 2WSD9 | - | 40 | N |
| Pyrene | 54/61 | 0.008 J | 42 J | 0.36 - 3.7 | 42 | 112690-2WSD9(0-0.5) | 2WSD9 | 4200 | 40 | Y |
| **PESTICIDES/PCBs (mg/kg)** | | | | | | | | | | |
| 4,4'-DDD | 18/68 | 0.0045 J | 4.8 J | 0.0038 - 0.064 | 4.8 | 2WSD25 (0.0-1.0) | 2WSD25 | 16 | 0.029 | Y |
| 4,4'-DDE | 18/71 | 0.0062 J | 0.72 J | 0.0038 - 0.064 | 0.72 | 2WSD25 (0.0-1.0) | 2WSD25 | 54 | 0.021 | Y |
| 4,4'-DDT | 13/64 | 0.0044 J | 2.9 | 0.0038 - 0.064 | 2.9 | 2WSD25 (0.0-1.0)/ T3-B | 2WSD25/ T3B | 32 | 0.021 | Y |
| Aldrin | 1/69 | 0.0032 J | 0.0032 J | 0.002 - 0.032 | 0.0032 | T5-A | T5A | 0.5 | 0.00041 | Y |
| Alpha-Chlordane | 12/71 | 0.0029 J | 0.029 | 0.002 - 0.32 | 0.029 | T6-A/ T6-A-D | T6A/ T6A | 10 | 0.066 | N |
| Aroclor-1260 | 7/65 | 0.082 J | 1.5 | 0.038 - 0.64 | 1.5 | T6-A-D | T6A | - | 0.1 | Y |
| Dieldrin | 2/70 | 0.0084 J | 0.026 | 0.0038 - 0.064 | 0.026 | T6-A | T6A | 0.004 | 0.007 | Y |
| Endosulfan I | 4/70 | 0.0021 J | 0.011 J | 0.002 - 0.032 | 0.011 | T3-A | T3A | 18 | 8.4 | N |
| Endosulfan II | 2/68 | 0.0069 J | 0.031 J | 0.0038 - 0.064 | 0.031 | T2-A | T2A | 18 | 8.4 | N |
| Endosulfan Sulfate | 2/69 | 0.0069 J | 0.014 J | 0.0038 - 0.064 | 0.014 | T3-A | T3A | 18 | 8.4 | N |
| Endrin | 2/70 | 0.0078 J | 0.016 J | 0.0038 - 0.064 | 0.016 | T5-A | T5A | 1 | 0.42 | N |
| Endrin Aldehyde | 4/28 | 0.0056 J | 0.016 J | 0.0038 - 0.048 | 0.016 | T2-A/ T3-B | T2A/ T3B | 1 | 0.42 | N |
| Endrin Ketone | 1/69 | 0.02 J | 0.02 J | 0.0038 - 0.064 | 0.02 | T5-A | T5A | 1 | 0.42 | N |
| Gamma-Chlordane | 11/70 | 0.0037 J | 0.023 J | 0.002 - 0.32 | 0.023 | T6-A-D | T6A | 10 | 0.066 | N |
| Heptachlor | 3/70 | 0.0028 J | 0.0045 J | 0.002 - 0.032 | 0.0045 | T5-A | T5A | 23 | 0.013 | N |
| Heptachlor Epoxide | 4/70 | 0.0022 J | 0.0045 | 0.002 - 0.032 | 0.0045 | T1-B | T1B | 0.7 | 0.02 | N |
| Methoxychlor | 1/69 | 0.038 J | 0.038 J | 0.02 - 0.32 | 0.038 | T5-A | T5A | 160 | 8 | N |
| beta-BHC | 1/70 | 0.0027 J | 0.0027 J | 0.002 - 0.032 | 0.0027 | T5-A | T5A | 0.03 | 0.0039 | N |
| delta-BHC | 1/70 | 0.0042 J | 0.0042 J | 0.002 - 0.032 | 0.0042 | T5-A | T5A | - | 0.0011 | Y |
| gamma-BHC (Lindane) | 1/70 | 0.0035 J | 0.0035 J | 0.002 - 0.032 | 0.0035 | T5-A | T5A | 0.009 | 0.04 | N |
| **INORGANICS (mg/kg)** | | | | | | | | | | |
| Aluminum | 61/61 | 2690 | 27100 J | - | 27100 | T7-B | T7B | - | - | N[6] |
| Antimony | 4/50 | 0.48 J | 1.2 J | 0.47 - 3.4 | 1.2 | T7-A | T7A | 5 | 1.2 | N |

TABLE 2-8

COPC SCREENING - SOIL AND SEDIMENT SAMPLES
SITE 2B - AREA A WETLAND[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 3 OF 4

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| Arsenic | 60/61 | 1 J | 14.1 | 1.1 | 14.1 | T8-B | T8B | 29 | 10 | Y |
| Barium | 61/61 | 11.9 | 318 J | - | 318 | T7-B | T7B | 1600 | 200 | Y |
| Beryllium | 60/61 | 0.14 J | 4.1 J | 0.3 | 4.1 | T7-B | T7B | 63 | 0.8 | Y |
| Boron | 5/19 | 14.7 | 39.6 | 0.35 - 7.6 | 39.6 | T9-B | T9B | - | 130 | N |
| Cadmium | 52/61 | 0.12 J | 11.5 J | 0.12 - 0.38 | 11.5 | 083190-2WTB3(4-6)-D | 2WTB3 | 8 | 1 | Y |
| Calcium | 61/61 | 868 | 12900 | - | 12900 | 090590-2WTB1(10-12) | 2WTB1 | - | - | N[7] |
| Chromium | 61/61 | 7 | 102 | - | 102 | 083090-2WTB8(1-3) | 2WTB8 | - | 10 | N[5] |
| Cobalt | 60/61 | 3 | 13.6 J | 6.7 | 13.6 | T7-B | T7B | - | 84 | N |
| Copper | 61/61 | 10.2 | 173 J | - | 173 | T7-B | T7B | - | 260 | N[6] |
| Cyanide | 7/55 | 0.9 J | 6.1 J | 0.59 - 2.8 | 6.1 | T7-B | T7B | 40 | 40 | N |
| Iron | 61/61 | 5630 | 198000 J | - | 198000 | T7-B | T7B | - | - | N[6] |
| Lead | 61/61 | 4.8 J | 298 | - | 298 | 100390-2WMW6(2-4) | 2WMW6S | - | 3 | Y |
| Magnesium | 61/61 | 1570 | 9150 | - | 9150 | T8-B | T8B | - | - | N[7] |
| Manganese | 61/61 | 55.3 | 376 | - | 376 | 090690-2WTB2(0-2)-D | 2WTB2 | - | 10 | Y |
| Mercury | 24/54 | 0.15 J | 1.2 J | 0.1 - 0.51 | 1.2 | T6-B | T6B | 2 | 0.4 | Y |
| Nickel | 61/61 | 6.6 J | 61.5 J | - | 61.5 | T2-A | T2A | 130 | 20 | Y |
| Potassium | 61/61 | 659 | 5170 J | - | 5170 | T8-B | T8B | - | - | N[7] |
| Selenium | 30/61 | 0.7 | 6.8 J | 0.44 - 1.3 | 6.8 | T7-B/ T7-B | T7B/ T7B | 5 | 10 | Y |
| Silver | 16/60 | 0.17 J | 31.8 | 0.12 - 3.2 | 31.8 | 083190-2WTB3(10-12) | 2WTB3 | 34 | 7.2 | Y |
| Sodium | 61/61 | 114 | 9970 J | - | 9970 | 090690-2WTB2(10-12) | 2WTB2 | - | - | N[7] |
| Vanadium | 61/61 | 8.9 J | 203 J | - | 203 | T7-B | T7B | 6000 | 10 | Y |
| Zinc | 61/61 | 35 J | 702 J | - | 702 | T7-B | T7B | 12000 | 1000 | N |
| **MISCELLANEOUS PARAMETERS (mg/kg)** | | | | | | | | | | |
| Total Organic Carbon | 24/24 | 8420 | 91000 | - | 51434 | 2WSD24 (0.0-1.0) | 2WSD24 | - | - | N[8] |

1 Includes samples 082190-2WMW3(10-12), 082190-2WMW3(16-18), 082390-2WMW2-(0-2), 083090-2WTB8(1-3), 083090-2WTB8(10-12), 083090-2WTB8(6-8), 083190-2WTB3(10-12), 083190-2WTB3(15-17), 083190-2WTB3(20-22), 083190-2WTB3(4-6), 083190-2WTB3(4-6)-D, 090490-2WMW5(0-2), 090490-2WMW5(0-2)-D, 090490-2WMW5(10-12), 090490-2WMW5(13), 090490-2WMW5(4-6), 090590-2WTB1(10-12), 090590-2WTB1(15-17), 090590-2WTB1(20-22), 090590-2WTB1(8-10), 090590-2WTB7(0-2), 090590-2WTB7(0-2)-D, 090590-2WTB7(10-12), 090590-2WTB7(4-6), 090690-2WTB2(0-2), 090690-2WTB2(0-2)-D, 090690-2WTB2(10-12), 090690-2WTB2(15-17), 090690-2WTB2(20-22), 090690-2WTB2(4-6), 090690-2WTB4(0-2), 090690-2WTB6(0-2), 090690-2WTB6(15-17), 090690-2WTB6(20-22), 090690-2WTB6(4-6), 100390-2WMW6(2-4), 112690-2WSD1(0-0.5), 112690-2WSD1(0-0.5)-D, 112690-2WSD2(0-0.5), 112690-2WSD3(0-0.5), 112690-2WSD4(0-0.5), 112690-2WSD5(0-0.5), 112690-2WSD6(0-0.5), 112690-2WSD7(0-0.5), 112690-2WSD8(0-0.5),

**TABLE 2-8**

**COPC SCREENING - SOIL AND SEDIMENT SAMPLES**
**SITE 2B - AREA A WETLAND[1]**
**NSB-NLON, GROTON, CONNECTICUT**
**PAGE 4 OF 4**

112690-2WSD3(0-0.5), 112690-2WSD4(0-0.5), 112690-2WSD5(0-0.5), 112690-2WSD6(0-0.5), 112690-2WSD7(0-0.5), 112690-2WSD8(0-0.5), 112690-2WSD9(0-0.5), 2WSD10(FIELD), 2WSD11(FIELD), 2WSD12(FIELD), 2WSD13(FIELD), 2WSD14, 2SWD14(FIELD), 2WSD15(FIELD), 2WSD16(FIELD), 2WSD17(FIELD), 2WSD18(FIELD), 2WSD19(FIELD), 2WSD20(FIELD), 2WSD21(FIELD), 2WSD22(FIELD), 2WSD23 (0.0-1.0), 2WSD24 (0.0-1.0), 2WSD25 (0.0-1.0), 2WSD26 (0.0-1.0), 2WSD27(FIELD), 2WSD28(FIELD), 2WSD29(FIELD), 2WSD30(FIELD), 2WSD31(FIELD), 2WSD32(FIELD), 2WSD33(FIELD), 2WSD34, 2WSD34(FIELD), 2WSD35(FIELD), 2WSD36(FIELD), 2WSD37(FIELD), 2WSD38, 2WSD38(FIELD), 2WSD39, 2WSD39(FIELD), 2WSD40, 2WSD40(FIELD), 2WSD41, 2WSD41(FIELD), 2WSD42(FIELD), T1-A, T1-B, T10-A, T10-B, T2-A, T-2-A-D, T2-B, T3-A, T3-B, T4-A, T4-B, T5-A, T5-B, T6-A. T6-A-D. T6-B. T7-A. T7-B. T8-A. T8-B. T9-A. T9-B.

2 USEPA Soil Screening Levels (USEPA, May 1996). See Table 1-2 for futher details regarding surrogate and/or calculated values.
3 CTDEP, 1996. See Table 1-2 for futher details regarding surrogate and/or calculated values.
4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.
5 TCLP extraction followed by analysis for metals was also performed for the soil sample associated with the maximum concentration of this chemical. The resulting TCLP data indicate that pollutant mobility is not anticipated to be of concern for this chemical in the soil matrix in this area (i.e., this chemical was not detected in associated TCLP leachates or was detected at concentrations less than the associated Connecticut pollutant mobility standard for GB areas and the federal toxicity characteristic regulatory level).
6 USEPA Region I does not advocate quantitative evaluation of this chemical.
7 Essential nutrient; not evaluated for COPC selection.
8 Not applicable for COPC screening.
- Not Applicable or Not Available.

TABLE 2-9

COPC SCREENING - TCLP SOIL/SEDIMENT SAMPLES
SITE 2B - AREA A WETLAND[1]
NSB-NLON, GROTON, CONNECTICUT

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | Federal Pollutant Mobility (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **TCLP METALS (mg/L)** | | | | | | | | | | |
| Arsenic | 25/42 | 0.0024 | 0.41 J | 0.002 - 0.3 | 0.41 | 083190-2WTB3(15-17)-T | 2WTB3 | 5 | 0.5 | N |
| Barium | 36/42 | 0.025 | 0.67 J | 0.015 - 0.032 | 0.1698 | 2WTB2(0-2)-T | 2WTB2 | 100 | 10 | N |
| Cadmium | 23/42 | 0.0023 | 0.024 | 0.002 - 0.014 | 0.024 | 2WTB2(0-2)-D-T | 2WTB2 | 1 | 0.05 | N |
| Chromium | 31/42 | 0.0068 | 0.079 J | 0.05 | 0.079 | 090690-2WTB2(15-17)-T | 2WTB2 | 5 | 0.5 | N |
| Lead | 12/42 | 0.0022 J | 1.5 | 0.002 - 0.1 | 1.5 | 100390-2WMW6(2-4)-T | 2WMW6S | 5 | 0.15 | Y |
| Mercury | 2/42 | 0.0003 | 0.0006 | 0.0002 - 0.004 | 0.0006 | 2WTB3(4-6)-T | 2WTB3 | 0.2 | 0.02 | N |
| Selenium | 19/42 | 0.0029 J | 0.23 J | 0.02 - 0.1 | 0.23 | 083190-2WTB3(15-17)-T | 2WTB3 | 1 | 0.5 | N |
| Silver | 16/38 | 0.007 J | 0.38 J | 0.008 - 0.066 | 0.38 | 083190-2WTB3(10-12)-T | 2WTB3 | 5 | 0.36 | Y |

1 Includes samples 082190-2WMW3(10-12)-T, 082190-2WMW3(16-18)-T, 082390-2WMW2(0-2)-T, 083090-2WTB8(1-3)-T, 083090-2WTB8(10-12)-T, 083090-2WTB8(6-8)-T, 083190-2WTB3(10-12)-T, 083190-2WTB3(15-17)-T, 083190-2WTB3(20-22)-T, 090490-2WMW5(10-12)-T, 090490-2WMW5(13)-T, 090490-2WMW5(4-6)-T, 090590-2WTB1(10-12)-T, 090590-2WTB1(15-17)-T, 090590-2WTB1(20-22)-T, 090590-2WTB1(8-10)-T, 090590-2WTB7(10-12)-T, 090590-2WTB7(4-6)-T, 090690-2WTB2(10-12)-T, 090690-2WTB2(15-17)-T, 090690-2WTB2(20-22)-T, 090690-2WTB2(4-6)-T, 090690-2WTB4(0-2)-T, 090690-2WTB6(0-2)-T, 090690-2WTB6(15-17)T, 090690-2WTB6(20-22)-T, 090690-2WTB6(4-6)-T, 100390-2WMW6(2-4)-T, 112690-2WSD2(0-0.5)-T, 112690-2WSD3(0-0.5)-T, 112690-2WSD4(0-0.5)-T, 112690-2WSD5(0-0.5)-T, 112690-2WSD6(0-0.5)-T, 112690-2WSD7(0-0.5)-T, 112690-2WSD8(0-0.5)-T, 112690-2WSD9(0-0.5)-T, 2WMW5(0-2)-D-T, 2WMW5(0-2)-T, 2WSD1(0-0.5)-D-T, 2WSD1(0-0.5)-T, 2WSD39-T, 2WTB2(0-2)-D-T, 2WTB2(0-2)-T, 2WTB3(4-6)-D-T, 2WTB3(4-6)-T, 2WTB7(0-2)-D-T, 2WTB7(0-2)-T.

2 Federal Toxicity Characteristic Regulatory Level (58 FR 46049).

3 CTDEP, 1996.

4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.

TABLE 2-10

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 2B - AREA A WETLAND[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Carbon Disulfide | 1/10 | 2 J | 2 J | 5 - 10 | 2 | 2WGW21S | 2WMW21S | 100 | - | - | 700 | - | ND | N |
| Xylenes, Total | 1/10 | 1 J | 1 J | 5 - 10 | 1 | 121490-2WMW5S | 2WMW5S | 1200 | 10000 | 10000 | 530 | - | 2 | N |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Benzoic Acid | 1/10 | 0.8 J | 0.8 J | 25 - 50 | 0.8 | 2WGW6S | 2WMW6S | 15000 | - | - | 28000 | - | ND | N |
| Di-n-butyl phthalate | 1/10 | 1 J | 1 J | 10 | 1 | 2WGW3S | 2WMW3S | 370 | - | - | 700 | 120000 | ND | N |
| Diethyl Phthalate | 1/10 | 1 J | 1 J | 10 | 1 | 2WGW3S | 2WMW3S | 2900 | - | - | 5600 | 2400000 | ND | N |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 8/10 | 39.6 | 4160 | 30 - 53.1 | 4160 | 2WGW21S-2 | 2WMW21S | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Aluminum, Filtered | 4/7 | 28.9 | 2180 | 14 - 37.3 | 2180 | 2WGW6S DISS | 2WMW6S | - | 50 to 200 | - | - | - | - | N[8] |
| Arsenic | 6/9 | 4.9 J | 109 J | 2 - 3 | 109 | 2WGW21S | 2WMW21S | 0.045 | 50 | 50 | 50 | 4 | 0.64 | Y |
| Arsenic, Filtered | 5/7 | 3.2 J | 138 | 2 | 138 | 2WGW21S DISS | 2WMW21S | 0.045 | 50 | 50 | 50 | 4 | - | Y |
| Barium | 10/10 | 17.8 | 754 J | - | 754 | 2WGW5S | 2WMW5S | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | Y |
| Barium, Filtered | 7/7 | 15.9 | 707 | - | 707 | 2WGW3S DISS | 2WMW3S | 260 | 2000 | 2000 | 1000 | - | - | Y |
| Beryllium | 3/10 | 1 | 1.6 J | 1 | 1.6 | 2WGW6S | 2WMW6S | 73 | 4 | 4 | 4 | 4 | 0.33 - 0.41 | N |
| Beryllium, Filtered | 2/7 | 1.2 J | 2.3 | 1 | 2.3 | 2WGW6S DISS | 2WMW6S | 73 | 4 | 4 | 4 | 4 | - | N |
| Boron | 7/7 | 90.7 J | 3260 J | - | 3260 | 2WGW21S | 2WMW21S | 330 | - | - | 630 | - | 9.3 - 126 | Y |
| Boron, Filtered | 7/7 | 96.8 | 3340 J | - | 3340 | 2WGW21S DISS | 2WMW21S | 330 | - | - | 630 | - | - | Y |
| Cadmium | 5/9 | 3.9 J | 10.6 | 1 - 3 | 10.6 | 121190-2WMW3S | 2WMW3S | 1.8 | 5 | 5 | 5 | 6 | 1.9 - 26.3 | Y |
| Cadmium, Filtered | 2/5 | 5.2 | 30.6 J | 2 - 3.2 | 30.6 | 2WGW3S DISS | 2WMW3S | 1.8 | 5 | 5 | 5 | 6 | - | Y |
| Calcium | 10/10 | 18700 | 296000 | - | 254840 | 2WGW21S-2 | 2WMW21S | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 7/7 | 27600 | 291000 | - | 291000 | 2WGW21S2DISS | 2WMW21S | - | - | - | - | - | - | N[9] |
| Chromium | 3/10 | 2.9 | 13.8 J | 3 - 5 | 13.8 | 2WGW21S-2 | 2WMW21S | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | N |
| Cobalt | 6/10 | 2.1 | 20.7 | 4 - 19.9 | 12.4 | 2WGW6S | 2WMW6S | 220 | - | - | 420 | - | 1.9 - 6 | N |
| Cobalt, Filtered | 1/7 | 17.7 | 17.7 | 3 - 29.2 | 17.7 | 2WGW5S2DISS | 2WMW5S | 220 | - | - | 420 | - | - | N |
| Copper | 6/10 | 3 J | 44.6 J | 1.1 - 9.5 | 44.6 | 2WGW21S-2 | 2WMW21S | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Copper, Filtered | 1/7 | 37 J | 37 J | 2 - 12 | 37 | 2WGW21S2DISS | 2WMW21S | 150 | 1300 | - | 1300 | 48 | - | N[8] |
| Cyanide | 1/3 | 5 | 5 | 5 | 5 | 121490-2WMW5S | 2WMW5S | 73 | 200 | 200 | 200 | 52 | 1.2 - 15.5 | N |
| Iron | 10/10 | 394 | 131000 J | - | 64377 | 2WGW5S | 2WMW5S | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 6/7 | 114 J | 123000 J | 89.5 | 71045 | 2WGW3S DISS | 2WMW3S | 1100 | 300 | - | - | - | - | N[8] |
| Lead | 5/10 | 1.3 J | 3.3 | 2 - 15.1 | 3.3 | 2WGW5S-2 | 2WMW5S | - | 15 | - | 15 | 13 | 1 - 264 | N |
| Magnesium | 10/10 | 4350 | 1080000 | - | 1080000 | 2WGW21S-2 | 2WMW21S | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 7/7 | 5870 | 1050000 | - | 1050000 | 2WGW21S2DISS | 2WMW21S | - | - | - | - | - | - | N[9] |
| Manganese | 10/10 | 648 | 9270 | - | 9270 | 2WGW5S-2 | 2WMW5S | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 7/7 | 657 | 9360 | - | 7233 | 2WGW5S2DISS | 2WMW5S | 84 | 50 | 5000 | 50 | - | - | Y |
| Nickel | 2/10 | 39.7 J | 48 | 7 - 25.6 | 48 | 2WGW6S | 2WMW6S | 73 | 100 | 100 | 100 | 880 | 5 - 17.5 | N |
| Nickel, Filtered | 2/7 | 12.1 J | 12.8 J | 7 - 45.5 | 12.8 | 2WGW5S DISS | 2WMW5S | 73 | 100 | 100 | 100 | 880 | - | N |
| Potassium | 10/10 | 5510 | 815000 J | - | 815000 | 2WGW21S | 2WMW21S | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 7/7 | 6590 | 843000 J | - | 843000 | 2WGW21S DISS | 2WMW21S | - | - | - | - | - | - | N[9] |
| Selenium | 2/10 | 2.2 J | 2.3 J | 1 - 5 | 1.9 | 121190-2WMW3S | 2WMW3S | 18 | 50 | 50 | 50 | 50 | 1 - 4.1 | N |
| Silver | 1/10 | 1.5 J | 1.5 J | 2 - 7 | 1.5 | 2WGW3S-2 | 2WMW3S | 18 | 100 | 50 | 36 | 12 | 2 - 5.8 | N |

TABLE 2-10

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 2B - AREA A WETLAND[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| Silver, Filtered | 2/7 | 4.5 | 9.8 J | 2 - 2.4 | 9.8 | 2WGW3S DISS | 2WMW3S | 18 | 100 | 50 | 36 | 12 | - | N |
| Sodium | 10/10 | 21200 | 8500000 | - | 8500000 | 2WGW21S-2 | 2WMW21S | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 7/7 | 21300 | 8180000 | - | 8180000 | 2WGW21S2DISS | 2WMW21S | - | - | 28000 | - | - | - | N[9] |
| Thallium | 2/7 | 8.6 J | 15.2 J | 1 - 10 | 9.5 | 2WGW21S | 2WMW21S | 0.26 | 2 | 2 | 5 | 63 | 1.2 - 4.3 | Y |
| Thallium, Filtered | 2/6 | 1.4 J | 7 J | 1 - 20 | 7 | 2WGW5S2DISS | 2WMW5S | 0.26 | 2 | 2 | 5 | 63 | - | Y |
| Vanadium | 3/10 | 2.7 | 26 J | 3.3 - 20 | 26 | 2WGW21S | 2WMW21S | 26 | - | - | 50 | - | 33.1 | N |
| Vanadium, Filtered | 1/7 | 32 J | 32 J | 3 - 11.3 | 32 | 2WGW21S DISS | 2WMW21S | 26 | - | - | 50 | - | - | Y |
| Zinc | 5/10 | 8.3 | 182 | 2 - 7 | 182 | 2WGW6S | 2WMW6S | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | Y |
| Zinc, Filtered | 3/7 | 3 J | 183 | 2 - 6.1 | 183 | 2WGW6S DISS | 2WMW6S | 1100 | 5000 | - | 5000 | 123 | - | Y |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Hardness as CaCO3 | 7/7 | 96 | 6150 | - | 6150 | 2WGW21S-2 | 2WMW21S | - | - | - | - | - | NA | N[10] |

1 Includes samples 010291-2WMW6S, 121190-2WMW3S, 121490-2WMW5S, 2WGW21S, 2WGW21S DISS, 2WGW21S-2, 2WGW21S2DISS, 2WGW3S, 2WGW3S DISS, 2WGW3S-2, 2WGW3S2DISS, 2WGW5S, 2WGW5S DISS, 2WGW5S-2, 2WGW5S2DISS, 2WGW6S, 2WGW6S DISS.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 2-11

COPC SCREENING - GROUNDWATER SAMPLES - BEDROCK WELLS
SITE 2B - AREA A WETLAND[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration Sample Number | Maximum Concentration Location | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] Groundwater Protection | State Remediation Standards[5] Surface Water Protection | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | 1 | | | | | | |
| 2-Methylphenol | 1/16 | 2 J | 2 J | 10 | 2 | 2WGW22D-2 | 2WMW22D | 180 | - | - | 350 | - | ND | N |
| 4-Methylphenol | 1/16 | 3 J | 3 J | 10 | 3 | 2WGW22D-2 | 2WMW22D | 18 | - | - | 35 | - | ND | N |
| Benzoic Acid | 5/16 | 0.5 J | 12 J | 25 - 50 | 12 | 011191-2WMW3D | 2WMW3D | 15000 | - | - | 28000 | - | ND | N |
| Bis(2-Ethylhexyl)phthalate | 3/16 | 11 | 31 J | 10 | 31 | 2WGW6D-2-D | 2WMW6D | 4.8 | 6 | 6 | 2 | 59 | 3 | Y |
| Di-n-octyl phthalate | 2/16 | 0.6 J | 3 J | 10 | 3 | 2WGW3D | 2WMW3D | 73 | - | - | 100 | - | ND | N |
| Diethyl Phthalate | 1/16 | 1 J | 1 J | 10 | 1 | 2WGW3D | 2WMW3D | 2900 | - | - | 5600 | 2400000 | ND | N |
| Phenol | 1/16 | 14 | 14 | 10 | 14 | 2WGW22D-2 | 2WMW22D | 2200 | - | - | 4000 | 92000000 | ND | N |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 8/16 | 71.7 | 9910 | 30 - 306 | 5736.7 | 2WGW6D | 2WMW6D | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Aluminum, Filtered | 2/12 | 69.5 | 7520 | 14 - 120 | 7520 | 2WGW6D DISS | 2WMW6D | - | 50 to 200 | - | - | - | - | N[8] |
| Antimony, Filtered | 1/11 | 9.7 J | 13.4 J | 12 - 15 | 13.4 | 2WGW6D2DISS-D | 2WMW6D | 1.5 | 6 | 6 | 6 | 86000 | - | Y |
| Arsenic | 6/16 | 1.9 J | 6.5 J | 2 - 5 | 3.3 | 2WGW6D-2 | 2WMW6D | 0.045 | 50 | 50 | 50 | 4 | 0.64 | Y |
| Arsenic, Filtered | 4/12 | 2.4 | 5.5 | 2 - 6.1 | 5.5 | 2WGW5D DISS | 2WMW5D | 0.045 | 50 | 50 | 50 | 4 | - | Y |
| Barium | 16/16 | 15.5 J | 904 J | - | 348.9 | 2WGW3D | 2WMW3D | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | Y |
| Barium, Filtered | 12/12 | 13.9 | 805 | - | 376.2 | 2WGW3D DISS | 2WMW3D | 260 | 2000 | 2000 | 1000 | - | - | Y |
| Beryllium | 1/16 | 3.6 | 3.6 | 1 | 3.6 | 2WGW6D | 2WMW6D | 73 | 4 | 4 | 4 | 4 | 0.33 - 0.41 | N |
| Beryllium, Filtered | 1/12 | 4.2 | 4.2 | 1 - 1.3 | 4.2 | 2WGW6D DISS | 2WMW6D | 73 | 4 | 4 | 4 | 4 | - | Y |
| Boron | 5/11 | 89.7 J | 403 | 21.3 - 43 | 403 | 2WGW6D | 2WMW6D | 330 | - | - | 630 | - | 9.3 - 126 | Y |
| Boron, Filtered | 6/12 | 61.1 | 400 | 21.2 - 50 | 384.5 | 2WGW6D DISS | 2WMW6D | 330 | - | - | 630 | - | - | Y |
| Cadmium | 4/16 | 1.2 J | 10.9 J | 2 - 4.8 | 10.9 | 2WGW3D | 2WMW3D | 1.8 | 5 | 5 | 5 | 6 | 1.9 - 26.3 | Y |
| Cadmium, Filtered | 1/12 | 18.1 | 18.1 | 2 - 4.5 | 18.1 | 2WGW3D DISS | 2WMW3D | 1.8 | 5 | 5 | 5 | 6 | - | Y |
| Calcium | 16/16 | 5920 | 127000 | - | 78631 | 2WGW6D | 2WMW6D | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 12/12 | 5980 | 130000 | - | 82925 | 2WGW6D DISS | 2WMW6D | - | - | - | - | - | - | N[9] |
| Chromium | 2/16 | 3.5 J | 4.9 | 3 - 5 | 4.9 | 2WGW3D-2 | 2WMW3D | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | N |
| Cobalt | 6/16 | 3.1 | 37.5 | 3 - 5 | 37.5 | 2WGW6D | 2WMW6D | 220 | - | - | 420 | - | 1.9 - 6 | N |
| Cobalt, Filtered | 2/12 | 17.7 | 40.9 | 3 - 19.3 | 40.9 | 2WGW6D DISS | 2WMW6D | 220 | - | - | 420 | - | - | N |
| Copper | 7/16 | 2.8 J | 10.6 | 2 - 17.2 | 10.6 | 2WGW2D-2 | 2WMW2D | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Copper, Filtered | 1/12 | 3.7 J | 3.7 J | 2 - 5 | 3.7 | 2WGW2D2DISS | 2WMW2D | 150 | 1300 | - | 1300 | 48 | - | N[8] |
| Iron | 15/16 | 85.1 J | 108000 J | 105 | 108000 | 2WGW3D | 2WMW3D | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 8/12 | 1120 J | 73600 J | 18.6 - 58.2 | 73600 | 2WGW3D DISS | 2WMW3D | 1100 | 300 | - | - | - | - | N[8] |
| Lead | 9/16 | 2 | 32.7 | 1 - 10 | 12.5 | 2WGW2D-2 | 2WMW2D | - | 15 | - | 15 | 13 | 1 - 264 | Y |
| Lead, Filtered | 7/12 | 1.6 J | 13.3 | 2 | 13.3 | 2WGW2D2DISS | 2WMW2D | - | 15 | - | 15 | 13 | - | Y |
| Magnesium | 16/16 | 1340 J | 131000 J | - | 82014 | 2WGW3D | 2WMW3D | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 12/12 | 1340 | 130000 | - | 75871 | 2WGW3D DISS | 2WMW3D | - | - | - | - | - | - | N[9] |
| Manganese | 16/16 | 2.3 | 7160 | - | 7160 | 2WGW5D-2 | 2WMW5D | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 12/12 | 6.8 | 7090 | - | 7090 | 2WGW5D2DISS | 2WMW5D | 84 | 50 | 5000 | 50 | - | - | Y |
| Nickel | 5/16 | 9.3 J | 116 | 7 - 15.2 | 116 | 2WGW6D | 2WMW6D | 73 | 100 | 100 | 100 | 880 | 5 - 17.5 | Y |
| Nickel, Filtered | 2/12 | 6.95 J | 101 | 7 - 11 | 101 | 2WGW6D DISS | 2WMW6D | 73 | 100 | 100 | 100 | 880 | - | Y |
| Potassium | 14/16 | 557 J | 44700 J | 1650 - 2290 | 25506 | 2WGW3D | 2WMW3D | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 10/12 | 488 | 42500 J | 1230 - 2510 | 28739 | 2WGW3D DISS | 2WMW3D | - | - | - | - | - | - | N[9] |
| Selenium | 3/16 | 3 J | 5.1 J | 1 - 5 | 5.1 | 2WGW6D-2-D | 2WMW6D | 18 | 50 | 50 | 50 | 50 | 1 - 4.1 | N |

TABLE 2-11

COPC SCREENING - GROUNDWATER SAMPLES - BEDROCK WELLS
SITE 2B - AREA A WETLAND[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| Silver, Filtered | 1/12 | 3.9 J | 3.9 J | 2 | 3.9 | 2WGW3D DISS | 2WMW3D | 18 | 100 | 50 | 36 | 12 | - | N |
| Sodium | 16/16 | 7580 | 1290000 J | - | 827208 | 2WGW3D | 2WMW3D | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 12/12 | 7560 | 1280000 J | - | 1020228 | 2WGW3D DISS | 2WMW3D | - | - | 28000 | - | - | - | N[9] |
| Thallium | 3/14 | 4.25 J | 9 J | 1 - 20 | 7.5 | 2WGW5D-2 | 2WMW5D | 0.26 | 2 | 2 | 5 | 63 | 1.2 - 4.3 | Y |
| Thallium, Filtered | 2/11 | 1.3 J | 8.8 J | 1 - 20 | 5.5 | 2WGW5D2DISS | 2WMW5D | 0.26 | 2 | 2 | 5 | 63 | - | Y |
| Vanadium | 1/16 | 4.7 | 4.7 | 3 - 20 | 4.7 | 2WGW3D-2 | 2WMW3D | 26 | - | - | 50 | - | 33.1 | N |
| Zinc | 12/16 | 6.8 J | 274 | 12 - 26.7 | 59.8 | 2WGW6D | 2WMW6D | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | Y |
| Zinc, Filtered | 6/12 | 5.2 | 262 | 4.4 - 21.6 | 82.5 | 2WGW6D DISS | 2WMW6D | 1100 | 5000 | - | 5000 | 123 | - | Y |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Hardness As CaCO3 | 12/12 | 18 | 840 | - | 505 | 2WGW3D | 2WMW3D | - | - | - | - | - | NA | N[10] |
| Hardness As CaCO3, Filtered | 3/3 | 16 | 124 | - | 124 | 2WGW21D DISS | 2WMW21D | - | - | - | - | - | NA | N[10] |

1 Includs samples 011191-2WMW3D, 011491-2WMW2D, 011591-2WMW1D, 121890-2WMW6D, 2WGW21D, 2WGW21D DISS, 2WGW21D-2, 2WGW21D2DISS, 2WGW22D, 2WGW22D DISS, 2WGW22D-2, 2WGW22D2DISS, 2WGW2D, 2WGW2D DISS, 2WGW2D-2, 2WGW2DDISS, 2WGW3D, 2WGW3D DISS, 2WGW3D-2, 2WGW3D2DISS, 2WGW5D, 2WGW5D DISS, 2WGW5D-2, 2WGW5D2DISS, 2WGW6D. 2WGW6D DISS. 2WGW6D-2. 2WGW6D-2-D. 2WGW6D2DISS. 2WGW6D2DISS-D.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 2-12

COPC SCREENING - SURFACE WATER SAMPLES
SITE 2B - AREA A WETLAND[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Select as COPC? (6) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | |
| Tetrachloroethene | 1/11 | 0.002 J | 0.002 J | 0.005 - 0.01 | 0.002 | 2WSW12 | 2WSW12 | 1.1 | 5 | 5 | 5 | 88 | N |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | |
| Diethyl Phthalate | 1/3 | 0.002 J | 0.002 J | 0.01 | 0.002 | 121090-2WSW2 | 2WSW2 | 2900 | - | - | 5600 | 2400000 | N |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | |
| Aluminum | 10/11 | 66.9 J | 20900 | 117 | 20900 | 2WSW1 | 2WSW1 | - | 50 to 200 | - | - | - | N[7] |
| Aluminum, Filtered | 5/6 | 86.3 | 259 | 136 | 229.2 | 2WSW6 DISS | 2WSW6 | - | 50 to 200 | - | - | - | N[7] |
| Arsenic | 3/11 | 2.8 | 2.9 | 2 - 3 | 2.9 | 2WSW1 | 2WSW1 | 0.045 | 50 | 50 | 50 | 4 | Y |
| Barium | 4/11 | 22.3 | 115 | 8 - 76.1 | 81.0 | 2WSW2 | 2WSW2 | 260 | 2000 | 2000 | 1000 | - | N |
| Barium, Filtered | 2/6 | 83.3 | 91.2 | 8 - 30.1 | 91.2 | 2WSW2 DISS | 2WSW2 | 260 | 2000 | 2000 | 1000 | - | N |
| Boron | 5/9 | 121 | 369 | 50 | 212 | 2WSW2 | 2WSW2 | 330 | - | - | 630 | - | Y |
| Boron, Filtered | 4/6 | 75.9 J | 222 | 50 | 156.9 | 2WSW6 DISS | 2WSW6 | 330 | - | - | 630 | - | N |
| Cadmium | 2/11 | 7.1 J | 126 J | 2 - 4.4 | 126 | 121090-2WSW2 | 2WSW2 | 1.8 | 5 | 5 | 5 | 6 | Y |
| Calcium | 11/11 | 272 J | 46500 | - | 24826 | 2WSW12 | 2WSW12 | - | - | - | - | - | N[8] |
| Calcium, Filtered | 6/6 | 256 J | 45300 | - | 35109 | 2WSW12 DISS | 2WSW12 | - | - | - | - | - | N[8] |
| Chromium | 1/11 | 6.8 | 6.8 | 3 - 6.5 | 6.8 | 121090-2WSW1 | 2WSW1 | 18 | 100 | 100 | 50 | 110 | N |
| Cobalt | 2/11 | 63.9 | 66.8 | 5 | 66.8 | 2WSW6 | 2WSW6 | 220 | - | - | 420 | - | N |
| Copper | 5/11 | 6.1 J | 29.3 J | 2 - 16.8 | 29.3 | 2WSW1 | 2WSW1 | 150 | 1300 | - | 1300 | 48 | N[7] |
| Copper, Filtered | 1/6 | 4.5 J | 4.5 J | 2 - 5.3 | 4.5 | 2WSW7 DISS | 2WSW7 | 150 | 1300 | - | 1300 | 48 | N[7] |
| Iron | 8/11 | 293 J | 11300 | 5.7 - 11.9 | 11300 | 2WSW12 | 2WSW12 | 1100 | 300 | - | - | - | N[7] |
| Iron, Filtered | 6/6 | 110 | 19400 | - | 19400 | 2WSW12 DISS | 2WSW12 | 1100 | 300 | - | - | - | N[7] |
| Lead | 6/7 | 1.5 | 7.8 | 1 - 2 | 7.6 | 121090-2WSW1 | 2WSW1 | - | 15 | - | 15 | 13 | N |
| Lead, Filtered | 2/5 | 1.8 J | 6.1 J | 1 | 6.1 | 2WSW7 DISS | 2WSW7 | - | 15 | - | 15 | 13 | N |
| Magnesium | 10/11 | 443 | 18500 | 94 | 9878 | 2WSW1 | 2WSW1 | - | - | - | - | - | N[8] |
| Magnesium, Filtered | 6/6 | 103 J | 10800 | - | 9273 | 2WSW2 DISS | 2WSW2 | - | - | - | - | - | N[8] |
| Manganese | 8/11 | 43.7 J | 1870 | 6 - 6.4 | 1870 | 2WSW6 | 2WSW6 | 84 | 50 | 5000 | 50 | - | Y |
| Manganese, Filtered | 6/6 | 9.6 J | 571 | - | 571 | 2WSW12 DISS | 2WSW12 | 84 | 50 | 5000 | 50 | - | Y |
| Mercury | 1/9 | 0.21 J | 0.21 J | 0.2 | 0.21 | 2WSW9 | 2WSW9 | 1.1 | 2 | 2 | 2 | 0.4 | N |
| Mercury, Filtered | 1/6 | 0.22 J | 0.22 J | 0.2 | 0.22 | 2WSW12 DISS | 2WSW12 | 1.1 | 2 | 2 | 2 | 0.4 | N |
| Nickel | 4/11 | 5.4 | 84.7 | 7 - 11 | 84.7 | 2WSW1 | 2WSW1 | 73 | 100 | 100 | 100 | 880 | Y |
| Potassium | 11/11 | 447 J | 15300 | - | 8486 | 2WSW2 | 2WSW2 | - | - | - | - | - | N[8] |
| Potassium, Filtered | 6/6 | 542 J | 14700 | - | 14700 | 2WSW2 DISS | 2WSW2 | - | - | - | - | - | N[8] |
| Sodium | 9/11 | 19700 | 143000 | 1150 - 1640 | 70929 | 2WSW2 | 2WSW2 | - | - | 28000 | - | - | N[8] |
| Sodium, Filtered | 5/6 | 32300 | 133000 | 720 | 105426 | 2WSW2 DISS | 2WSW2 | - | - | 28000 | - | - | N[8] |
| Vanadium | 1/11 | 4.3 J | 4.3 J | 3 - 20 | 4.3 | 2WSW10 | 2WSW10 | 26 | - | - | 50 | - | N |
| Vanadium, Filtered | 1/6 | 3.3 J | 3.3 J | 3 | 3.3 | 2WSW7 DISS | 2WSW7 | 26 | - | - | 50 | - | N |
| Zinc | 6/11 | 10.3 J | 334 | 3 - 16.9 | 334 | 2WSW6 | 2WSW6 | 1100 | 5000 | - | 5000 | 123 | Y |
| Zinc, Filtered | 3/6 | 27.7 | 31.4 | 3 - 17.9 | 28.7 | 2WSW1 DISS | 2WSW1 | 1100 | 5000 | - | 5000 | 123 | N |

TABLE 2-12

COPC SCREENING - SURFACE WATER SAMPLES
SITE 2B - AREA A WETLAND[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Select as COPC? (6) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | |
| Hardness As CaCO3 | 8/9 | 16 | 160 | 1 | 160 | 2WSW12 | 2WSW12 | - | - | - | - | - | N[9] |

1 Includes samples 121090-2WSW1, 121090-2WSW2, 121090-2WSW2-D, 2WSW1, 2WSW1 DISS, 2WSW10, 2WSW11, 2WSW11 DISS, 2WSW12, 2WSW12 DISS, 2WSW2, 2WSW2 DISS, 2WSW6, 2WSW6 DISS, 2WSW7, 2WSW7 DISS, 2WSW8, 2WSW9.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
7 USEPA Region I does not advocate quantitative evaluation of this chemical.
8 Essential nutrient; not evaluated for COPC screening.
9 Not applicable for COPC screening.
- Not available or Not applicable.

TABLE 2-13

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 3 - AREA A DOWNSTREAM WATERCOURSES AND OBDA[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,2-Dichloroethene (total) | 2/25 | 11 J | 28 | 5 - 10 | 28 | 2DGW29S | 2DMW29S | 5.5 | 70/100 | 70/100 | 63 | 14000 | ND | Y |
| Benzene | 1/25 | 1 J | 1 J | 5 - 10 | 1 | 2DGW26S-2 | 2DMW26S | 0.36 | 5 | 5 | 1 | 710 | ND | Y |
| Bromodichloromethane | 1/25 | 2 J | 2 J | 5 - 10 | 2 | 2DGW29S-2 | 2DMW29S | 0.17 | 100/80 | 100 | 0.56 | 660 | ND | Y |
| Chloroform | 3/25 | 5 J | 12 J | 5 - 10 | 12 | 2DGW29S-2 | 2DMW29S | 0.15 | 100/80 | 100 | 6 | 14100 | ND | Y |
| Chloromethane | 1/25 | 2 J | 2 J | 10 | 2 | 2DGW26D | 2DMW26D | 1.5 | - | - | 2.7 | 9400 | 27 | Y |
| Methylene Chloride | 1/25 | 11 | 11 | 5 - 10 | 11 | 2DGW29S-2/ 2DGW29S-2-D | 2DMW29S/ 2DMW29S | 4.1 | 5 | 5 | 5 | 48000 | 4 | Y |
| Vinyl Chloride | 2/25 | 29 J | 130 | 10 | 130 | 2DGW29S | 2DMW29S | 0.019 | 2 | 2 | 2 | 15750 | ND | Y |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Benzoic Acid | 3/24 | 0.6 J | 0.7 J | 50 | 0.7 | 2DGW29S | 2DMW29S | 15000 | - | - | 28000 | - | ND | N |
| Bis(2-Ethylhexyl)phthalate | 3/25 | 6 J | 59 J | 10 | 59 | 2DGW26D-2 | 2DMW26D | 4.8 | 6 | 6 | 2 | 59 | 3 | Y |
| Diethyl Phthalate | 1/24 | 0.7 J | 0.7 J | 10 | 0.7 | 2DGW25S | 2DMW25S | 2900 | - | - | 5600 | 2400000 | ND | N |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 13/25 | 153 | 97400 | 14 - 442 | 97400 | 2DGW30S-2 | 2DMW30S | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Aluminum, Filtered | 4/22 | 138 | 4050 | 10 - 82.6 | 4050 | 2DGW24S DISS | 2DMW24S | - | 50 to 200 | - | - | - | - | N[8] |
| Arsenic | 10/20 | 1.4 J | 23.9 | 2 - 5 | 23.9 | 2DGW30S-2 | 2DMW30S | 0.045 | 50 | 50 | 50 | 4 | 0.64 | Y |
| Arsenic, Filtered | 3/22 | 2.7 J | 6 | 2 - 5 | 6 | 2DGW29S2DISS-D | 2DMW29S | 0.045 | 50 | 50 | 50 | 4 | - | Y |
| Barium | 25/25 | 10.4 J | 835 | - | 195 | 2DGW30S-2 | 2DMW30S | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | Y |
| Barium, Filtered | 22/22 | 10.6 | 363 | - | 91.7 | 2DGW27S DISS | 2DMW27S | 260 | 2000 | 2000 | 1000 | - | - | Y |
| Beryllium | 3/25 | 1 | 4.4 | 1 - 2.4 | 4.4 | 2DGW30S-2 | 2DMW30S | 73 | 4 | 4 | 4 | 4 | 0.33 - 0.41 | Y |
| Beryllium, Filtered | 1/22 | 1 | 1 | 1 | 1 | 2DGW27S DISS | 2DMW27S | 73 | 4 | 4 | 4 | 4 | - | N |
| Boron | 12/22 | 45.975 | 374 | 26.2 - 57.5 | 374 | 3GW12S-2 | 3MW12S | 330 | - | - | 630 | - | 9.3 - 126 | Y |
| Boron, Filtered | 11/22 | 57.8 J | 359 | 29.4 - 58.4 | 359 | 3GW12S2DISS | 3MW12S | 330 | - | - | 630 | - | - | Y |
| Cadmium | 4/25 | 2.8 J | 5.5 | 1 - 2.6 | 5.5 | 3GW12S-2 | 3MW12S | 1.8 | 5 | 5 | 5 | 6 | 1.9 - 26.3 | Y |
| Cadmium, Filtered | 2/22 | 2.5 J | 4.3 J | 2 - 2.9 | 4.3 | 3GW12S DISS | 3MW12S | 1.8 | 5 | 5 | 5 | 6 | - | Y |
| Calcium | 25/25 | 11100 | 73800 | - | 42560 | 3GW12S-2 | 3MW12S | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 22/22 | 8250 | 73200 | - | 41218 | 3GW12S2DISS | 3MW12S | - | - | - | - | - | - | N[9] |
| Chromium | 10/25 | 1.5 J | 84.6 | 3 - 5 | 84.6 | 2DGW24S-2 | 2DMW24S | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | Y |
| Cobalt | 10/25 | 4.6 J | 60.3 | 1 - 25.6 | 60.3 | 2DGW30S-2 | 2DMW30S | 220 | - | - | 420 | - | 1.9 - 6 | N |
| Cobalt, Filtered | 3/22 | 6.1 J | 27.4 | 3 - 26.6 | 27.4 | 2DGW27S2DISS | 2DMW27S | 220 | - | - | 420 | - | - | N |
| Copper | 10/25 | 2.5 J | 370 J | 1 - 11.5 | 370 | 2DGW30S-2 | 2DMW30S | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Copper, Filtered | 1/22 | 2.2 J | 2.2 J | 2 - 16.5 | 2.2 | 2DGW30S2DISS | 2DMW30S | 150 | 1300 | - | 1300 | 48 | - | N[8] |
| Iron | 21/25 | 53.5 | 121000 | 8.4 - 25.6 | 121000 | 2DGW30S-2 | 2DMW30S | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 14/22 | 31.9 | 9690 | 16.3 - 57.5 | 9690 | 2DGW29S2DISS | 2DMW29S | 1100 | 300 | - | - | - | - | N[8] |
| Lead | 8/25 | 3.75 | 220 | 1 - 5.4 | 220 | 2DGW30S-2 | 2DMW30S | - | 15 | - | 15 | 13 | 1 - 264 | Y |
| Lead, Filtered | 6/22 | 1 J | 5.8 | 1 - 2 | 5.8 | 2DGW16S2DISS | 2DMW16S | - | 15 | - | 15 | 13 | - | N |
| Magnesium | 25/25 | 1610 | 62200 | - | 21596 | 3GW12S-2 | 3MW12S | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 22/22 | 1610 | 61000 | - | 61000 | 3GW12S DISS | 3MW12S | - | - | - | - | - | - | N[9] |
| Manganese | 24/25 | 5.6 | 6710 | 2.7 | 6710 | 3GW12S-2 | 3MW12S | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 21/22 | 6.5 | 6620 | 4.5 | 6620 | 3GW12S2DISS | 3MW12S | 84 | 50 | 5000 | 50 | - | - | Y |
| Mercury | 1/25 | 1.1 | 1.1 | 0.2 | 1.1 | 2DGW30S | 2DMW30S | 1.1 | 2 | 2 | 2 | 0.4 | 0.13 - 1.3 | Y |

TABLE 2-13

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 3 - AREA A DOWNSTREAM WATERCOURSES AND OBDA[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| Nickel | 10/25 | 9.2 J | 53.3 | 7 - 12 | 53.3 | 2DGW30S-2 | 2DMW30S | 73 | 100 | 100 | 100 | 880 | 5 - 17.5 | N |
| Nickel, Filtered | 3/22 | 9 J | 56.3 | 7 - 12.9 | 56.3 | 2DGW27S2DISS | 2DMW27S | 73 | 100 | 100 | 100 | 880 | - | N |
| Potassium | 25/25 | 2520 | 46300 | - | 46300 | 2DGW30S-2 | 2DMW30S | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 21/22 | 2510 | 20900 | 2690 | 20900 | 3GW12S DISS | 3MW12S | - | - | - | - | - | - | N[9] |
| Selenium | 2/25 | 3 | 3.9 J | 1 - 5 | 3.9 | 2DGW30S-2 | 2DMW30S | 18 | 50 | 50 | 50 | 50 | 1 - 4.1 | N |
| Silver | 1/25 | 2.4 J | 2.4 J | 1 - 7 | 2.4 | 2DGW16S-2 | 2DMW16S | 18 | 100 | 50 | 36 | 12 | 2 - 5.8 | N |
| Silver, Filtered | 1/22 | 2 J | 2 J | 2 - 3.7 | 2 | 2DGW24S2DISS | 2DMW24S | 18 | 100 | 50 | 36 | 12 | - | N |
| Sodium | 25/25 | 24600 | 569000 | - | 209204 | 3GW12S-2 | 3MW12S | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 22/22 | 24200 | 564000 | - | 197527 | 3GW12S2DISS | 3MW12S | - | - | 28000 | - | - | - | N[9] |
| Thallium | 5/15 | 3.3 J | 10 | 3 - 10 | 5.7535 | 2DGW27S | 2DMW27S | 0.26 | 2 | 2 | 5 | 63 | 1.2 - 4.3 | Y |
| Thallium, Filtered | 7/16 | 5.1 J | 7.7 J | 1 - 20 | 6.7549 | 2DGW26S2DISS | 2DMW26S | 0.26 | 2 | 2 | 5 | 63 | - | Y |
| Vanadium | 8/25 | 3.8 J | 229 | 1 - 20 | 229 | 2DGW30S-2 | 2DMW30S | 26 | - | - | 50 | - | 33.1 | Y |
| Zinc | 14/25 | 4.7 | 800 | 2 - 27.6 | 162 | 2DGW30S-2 | 2DMW30S | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | Y |
| Zinc, Filtered | 6/22 | 3.9 | 39.3 | 2 - 23.7 | 14 | 2DGW30S2DISS | 2DMW30S | 1100 | 5000 | - | 5000 | 123 | - | N |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Hardness As CaCO3 | 19/19 | 43 | 456 | - | 219 | 3GW12S | 3MW12S | - | - | - | - | - | NA | N[10] |

1 Includes samples 010291-2DMW11S, 010291-3MW12S, 010391-2DMW16S, 2DGW11S, 2DGW11S DISS, 2DGW11S-2, 2DGW11S2DISS, 2DGW16S, 2DGW16S DISS, 2DGW16S-2, 2DGW16S2DISS, 2DGW24S, 2DGW24S DISS, 2DGW24S-2, 2DGW24S2DISS, 2DGW25S, 2DGW25S DISS, 2DGW25S-2, 2DGW25S2DISS, 2DGW26D, 2DGW26D DISS, 2DGW26D DISS-D, 2DGW26D-2, 2DGW26D-D, 2DGW26D2DISS, 2DGW26S, 2DGW26S DISS, 2DGW26S-2, 2DGW26S2DISS, 2DGW27S, 2DGW27S DISS, 2DGW27S-2, 2DGW27S2DISS, 2DGW28S, 2DGW28S DISS, 2DGW28S-2, 2DGW28S2DISS, 2DGW29S, 2DGW29S DISS, 2DGW29S-2, 2DGW29S-2-D, 2DGW29S2DISS, 2DGW29S2DISS-D, 2DGW30S, 2DGW30S DISS, 2DGW30S-2, 2DGW30S2DISS, 3GW12S, 3GW12S DISS, 3GW12S-2, 3GW12S2DISS.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 2-14

COPC SCREENING - GROUNDWATER SAMPLES - BEDROCK WELLS
SITE 3 - AREA A DOWNSTREAM WATERCOURSES AND OBDA[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 1/25 | 7 | 7 | 5 - 10 | 7 | 011491-2DMW16D | 2DMW16D | 0.053 | - | - | 0.5 | 110 | ND | Y |
| 1,2-Dichloroethene (total) | 3/25 | 2 J | 13 | 5 - 10 | 13 | 011491-2DMW16D | 2DMW16D | 5.5 | 70/100 | 70/100 | 63 | 14000 | ND | Y |
| Chloroform | 1/25 | 3 J | 3 J | 5 - 10 | 3 | 2DGW25D-2 | 2DMW25D | 0.15 | 100/80 | 100 | 6 | 14100 | ND | Y |
| Methylene Chloride | 1/25 | 7 J | 7 J | 5 - 37 | 7 | 2DGW10D-2 | 2DMW10D | 4.1 | 5 | 5 | 5 | 48000 | 4 | Y |
| Trichloroethene | 4/25 | 1 J | 17 | 5 - 10 | 17 | 011491-2DMW16D | 2DMW16D | 1.6 | 5 | 5 | 5 | 2340 | ND | Y |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Benzo(a)pyrene | 1/25 | 1 J | 1 J | 10 | 1 | 3GW12D | 3MW12D | 0.0092 | 0.2 | 0.2 | 0.2 | 0.3 | ND | Y |
| Benzo(b)fluoranthene | 1/25 | 1 J | 1 J | 10 | 1 | 3GW12D | 3MW12D | 0.092 | - | - | 0.08 | 0.3 | ND | Y |
| Benzo(g,h,i)perylene | 1/25 | 4 J | 4 J | 10 | 4 | 3GW12D | 3MW12D | - | - | - | 200 | 0.3 | ND | Y |
| Benzo(k)fluoranthene | 1/25 | 1 J | 1 J | 10 | 1 | 3GW12D | 3MW12D | 0.92 | - | - | 0.5 | 0.3 | ND | Y |
| Benzoic Acid | 2/25 | 0.5 J | 0.9 J | 50 | 0.9 | 2DGW16D | 2DMW16D | 15000 | - | - | 28000 | - | ND | N |
| Bis(2-Ethylhexyl)phthalate | 5/25 | 2 J | 20 J | 10 | 20 | 2DGW15D-2-D | 2DMW15D | 4.8 | 6 | 6 | 2 | 59 | 3 | Y |
| Di-n-octyl phthalate | 2/25 | 1 J | 5 J | 10 | 5 | 2DGW27D | 2DMW27D | 73 | - | - | 100 | 230 | ND | N |
| Dibenzo(a,h)anthracene | 1/25 | 3 J | 3 J | 10 | 3 | 3GW12D | 3MW12D | 0.0092 | - | - | 0.2 | 0.3 | ND | Y |
| Diethyl Phthalate | 1/24 | 0.8 J | 0.8 J | 10 | 0.8 | 2DGW25D | 2DMW25D | 2900 | - | - | 5600 | 2400000 | ND | N |
| Indeno(1,2,3-cd)pyrene | 1/25 | 3 J | 3 J | 10 | 3 | 3GW12D | 3MW12D | 0.092 | - | - | 0.2 | 0.3 | ND | Y |
| Phenol | 1/25 | 3 J | 3 J | 10 | 3 | 2DGW24D-2 | 2DMW24D | 2200 | - | - | 4000 | 92000000 | ND | N |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 14/25 | 29.15 J | 5380 | 30 - 148 | 5380 | 2DGW15D-2-D | 2DMW15D | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Aluminum, Filtered | 3/20 | 12.4 | 136 | 10 - 82 | 136 | 2DGW25D DISS | 2DMW25D | - | 50 to 200 | - | - | - | - | N[8] |
| Antimony, Filtered | 2/20 | 14.8 J | 20.9 J | 12 - 15 | 20.9 | 2DGW23D DISS | 2DMW23D | 1.5 | 6 | 6 | 6 | 86000 | - | Y |
| Arsenic | 10/23 | 2.1 J | 5.7 J | 1 - 5 | 3.2 | 2DGW11D | 2DMW11D | 0.045 | 50 | 50 | 50 | 4 | 0.64 | Y |
| Arsenic, Filtered | 7/20 | 2.7 | 5.5 | 1 - 5 | 5.5 | 2DGW11D DISS | 2DMW11D | 0.045 | 50 | 50 | 50 | 4 | - | Y |
| Barium | 23/25 | 10.3 J | 336 | 8.6 - 38.4 | 136.9 | 2DGW15D-2-D | 2DMW15D | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | Y |
| Barium, Filtered | 16/20 | 7.4 | 155 | 5 - 34.6 | 155 | 2DGW25D2DISS | 2DMW25D | 260 | 2000 | 2000 | 1000 | - | - | N |
| Beryllium | 1/25 | 0.75 | 1 | 1 | 1 | 3GW12D-D | 3MW12D | 73 | 4 | 4 | 4 | 4 | 0.33 - 0.41 | N |
| Beryllium, Filtered | 1/20 | 0.75 | 1 | 1 - 1.5 | 1 | 3GW12D DISS-D | 3MW12D | 73 | 4 | 4 | 4 | 4 | - | N |
| Boron | 11/20 | 59.7 J | 350 | 22 - 50 | 238.6 | 3GW12D-D | 3MW12D | 330 | - | - | 630 | - | 9.3 - 126 | Y |
| Boron, Filtered | 11/20 | 53.8 | 351 | 34.3 - 54 | 351 | 3GW12D2DISS | 3MW12D | 330 | - | - | 630 | - | - | Y |
| Cadmium | 5/25 | 2.2 J | 16 J | 2 - 3 | 16 | 010791-3MW12D | 3MW12D | 1.8 | 5 | 5 | 5 | 6 | 1.9 - 26.3 | Y |
| Calcium | 25/25 | 7340 | 196000 | - | 77456 | 011491-2DMW16D | 2DMW16D | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 20/20 | 8120 | 176000 | - | 69157 | 2DGW16D2DISS | 2DMW16D | - | - | - | - | - | - | N[9] |
| Chromium | 8/25 | 3.8 J | 22.1 | 3 - 13.2 | 22.1 | 2DGW15D-2-D | 2DMW15D | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | Y |
| Cobalt | 5/25 | 5 J | 38.8 | 3 - 48.7 | 38.8 | 3GW12D-2 | 3MW12D | 220 | - | - | 420 | - | 1.9 - 6 | N |
| Copper | 15/25 | 2.9 J | 40.2 J | 2 - 7.6 | 40.2 | 2DGW15D-2-D | 2DMW15D | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Copper, Filtered | 2/20 | 2.2 | 3.4 | 2 - 5 | 3.4 | 2DGW27D2DISS | 2DMW27D | 150 | 1300 | - | 1300 | 48 | - | N[8] |
| Iron | 25/25 | 83.4 J | 101000 | - | 101000 | 2DGW15D-2-D | 2DMW15D | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 15/20 | 17.2 | 35700 J | 9.3 - 62.1 | 35700 | 3GW12D2DISS | 3MW12D | 1100 | 300 | - | - | - | - | N[8] |
| Lead | 4/22 | 1.5 J | 9.6 | 1 - 10 | 9.6 | 2DGW27D | 2DMW27D | - | 15 | - | 15 | 13 | 1 - 264 | N |
| Lead, Filtered | 1/20 | 1.6 | 2.2 J | 1 - 2 | 2.2 | 2DGW15D2DISS | 2DMW15D | - | 15 | - | 15 | 13 | - | N |
| Magnesium | 25/25 | 1350 | 52300 | - | 52300 | 3GW12D | 3MW12D | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 20/20 | 1110 | 55200 | - | 55200 | 3GW12D2DISS | 3MW12D | - | - | - | - | - | - | N[9] |
| Manganese | 25/25 | 44.2 | 7110 | - | 7110 | 3GW12D | 3MW12D | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 20/20 | 11.1 | 7630 | - | 7630 | 3GW12D2DISS | 3MW12D | 84 | 50 | 5000 | 50 | - | - | Y |

TABLE 2-14

COPC SCREENING - GROUNDWATER SAMPLES - BEDROCK WELLS
SITE 3 - AREA A DOWNSTREAM WATERCOURSES AND OBDA[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| Mercury, Filtered | 1/20 | 0.4 J | 0.4 J | 0.2 | 0.4 | 2DGW15D DISS | 2DMW15D | 1.1 | 2 | 2 | 2 | 0.4 | - | N |
| Nickel | 10/25 | 8.4 J | 61.5 | 7 - 19.9 | 18.5 | 2DGW16D | 2DMW16D | 73 | 100 | 100 | 100 | 880 | 5 - 17.5 | N |
| Nickel, Filtered | 1/20 | 17.1 J | 17.1 J | 7 - 18.1 | 17.1 | 2DGW15D DISS | 2DMW15D | 73 | 100 | 100 | 100 | 880 | - | N |
| Potassium | 24/25 | 714 | 19000 | 1430 | 19000 | 3GW12D/ 3GW12D-D | 3MW12D/ 3MW12D | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 19/20 | 745 | 19200 | 1170 | 19200 | 3GW12D DISS | 3MW12D | - | - | - | - | - | - | N[9] |
| Selenium | 5/22 | 1.8 | 6.3 J | 1 - 5 | 6.3 | 3GW12D-2 | 3MW12D | 18 | 50 | 50 | 50 | 50 | 1 - 4.1 | N |
| Silver | 4/25 | 1.8 | 3.3 J | 2 - 7 | 3.3 | 3GW12D-D | 3MW12D | 18 | 100 | 50 | 36 | 12 | 2 - 5.8 | N |
| Sodium | 24/25 | 5250 | 560000 | 4740 | 560000 | 010791-3MW12D | 3MW12D | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 20/20 | 4580 | 3560000 | - | 948348 | 2DGW16D2DISS | 2DMW16D | - | - | 28000 | - | - | - | N[9] |
| Thallium | 2/16 | 5 J | 10 | 1 - 10 | 10 | 3GW12D-D | 3MW12D | 0.26 | 2 | 2 | 5 | 63 | 1.2 - 4.3 | Y |
| Thallium, Filtered | 1/16 | 6 J | 6 J | 1 - 20 | 6 | 2DGW10D2DISS | 2DMW10D | 0.26 | 2 | 2 | 5 | 63 | - | Y |
| Vanadium | 5/25 | 4.1 | 13.1 | 3 - 20 | 13.1 | 2DGW15D-2-D | 2DMW15D | 26 | - | - | 50 | - | 33.1 | N |
| Zinc | 14/25 | 3.1 J | 75.7 | 5.7 - 27.8 | 22.4 | 2DGW25D-2 | 2DMW25D | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | N |
| Zinc, Filtered | 7/20 | 2.2 J | 16.7 J | 2 - 20 | 6.8117 | 2DGW25D DISS | 2DMW25D | 1100 | 5000 | - | 5000 | 123 | - | N |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Hardness as CaCO3 | 19/19 | 28 | 572 | - | 317 | 2DGW16D-2 | 2DMW16D | - | - | - | - | - | NA | N[10] |

1 Includes samples 010791-2DMW10D, 010791-2DMW10D-D, 010791-2DMW11D, 010791-2DMW15D, 010791-3MW12D, 011491-2DMW16D, 2DGW10D, 2DGW10D DISS, 2DGW10D-2, 2DGW10D2DISS, 2DGW11D, 2DGW11D DISS, 2DGW11D-2, 2DGW11D2DISS, 2DGW15D, 2DGW15D DISS, 2DGW15D-2, 2DGW15D-2-D, 2DGW15D2DISS, 2DGW15D2DISS-D, 2DGW16D, 2DGW16D DISS, 2DGW16D-2, 2DGW16D2DISS, 2DGW23D, 2DGW23D DISS, 2DGW23D-2, 2DGW23D-2DISS, 2DGW24D, 2DGW24D DISS, 2DGW24D-2, 2DGW24D2DISS, 2DGW25D, 2DGW25D DISS, 2DGW25D-2, 2DGW25D2DISS, 2DGW27D, 2DGW27D DISS, 2DGW27D-2, 2DGW27D2DISS, 2DGW28D, 2DGW28D DISS, 2DGW28D-2, 2DGW28D2DISS, 3GW12D, 3GW12D DISS, 3GW12D DISS-D, 3GW12D-2, 3GW12D-D, 3GW12D2DISS.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 2-15

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 4 - RUBBLE FILL AREA AT BUNKER A-86[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | 1/6 | 2 J | 2 J | 10 | 2 | 4GW2S-2 | 4MW2S | 54 | 200 | 200 | 200 | 62000 | ND | N |
| Bromodichloromethane | 1/6 | 1 J | 1 J | 10 | 1 | 4GW2S-2 | 4MW2S | 0.17 | 100/80 | 100 | 0.56 | 660 | ND | Y |
| Chloroform | 3/6 | 3 J | 11 | 10 | 9 | 4GW3S-2 | 4MW3S | 0.15 | 100/80 | 100 | 6 | 14100 | ND | Y |
| Methylene Chloride | 1/6 | 4 J | 4 J | 10 | 4 | 4GW4S-2 | 4MW4S | 4.1 | 5 | 5 | 5 | 48000 | 4 | N |
| Xylenes, Total | 1/6 | 2 J | 2 J | 10 | 2 | 4GW4S | 4MW4S | 1200 | 10000 | 10000 | 530 | 1400000 | 2 | N |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Benzoic Acid | 1/6 | 0.6 J | 0.6 J | 50 | 0.6 | 4GW4S-2 | 4MW4S | 15000 | - | - | 28000 | - | ND | N |
| Bis(2-Ethylhexyl)phthalate | 1/6 | 11 | 11 | 10 | 11 | 4GW2S-2 | 4MW2S | 4.8 | 6 | 6 | 2 | 59 | 3 | Y |
| **PESTICIDES/PCBs (ug/L)** | | | | | | | | | | | | | | |
| Heptachlor | 1/4 | 0.53 J | 0.53 J | 0.05 | 0.53 | 4GW2S | 4MW2S | 0.0023 | 0.4 | 0.4 | 0.4 | 0.05 | ND | Y |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Antimony, Filtered | 1/6 | 6.8 | 6.8 | 5 - 15 | 6.8 | 4GW3S2DISS | 4MW3S | 1.5 | 6 | 6 | 6 | 86000 | - | Y |
| Barium | 6/6 | 28 | 91.7 | - | 88.4 | 4GW4S | 4MW4S | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | N |
| Barium, Filtered | 6/6 | 25.3 | 91.6 | - | 90.8 | 4GW4S DISS | 4MW4S | 260 | 2000 | 2000 | 1000 | - | - | N |
| Boron | 2/6 | 26.6 | 34.4 | 26.3 - 50 | 30.4524 | 4GW2S-2 | 4MW2S | 330 | - | - | 630 | - | 9.3 - 126 | N |
| Boron, Filtered | 3/6 | 24.7 | 49.1 | 50 | 49.1 | 4GW4S-2DISS | 4MW4S | 330 | - | - | 630 | - | - | N |
| Cadmium | 2/6 | 1.1 | 20.2 | 2 | 20.2 | 4GW2S-2 | 4MW2S | 1.8 | 5 | 5 | 5 | 6 | 1.9 - 26.3 | Y |
| Calcium | 6/6 | 14500 | 27700 | - | 25573 | 4GW2S | 4MW2S | - | - | - | - | - | 3110 - 46000 | N[8] |
| Calcium, Filtered | 6/6 | 14800 | 27200 | - | 24938 | 4GW2S DISS | 4MW2S | - | - | - | - | - | - | N[8] |
| Copper | 2/6 | 4 | 28.1 | 2 - 3 | 28.1 | 4GW2S | 4MW2S | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[9] |
| Copper, Filtered | 2/6 | 3.6 | 26.6 | 2 - 3 | 26.6 | 4GW2S DISS | 4MW2S | 150 | 1300 | - | 1300 | 48 | - | N[9] |
| Iron, Filtered | 1/6 | 33.3 | 33.3 | 10.5 - 21.9 | 29.8 | 4GW2S2DISS | 4MW2S | 1100 | 300 | - | - | - | - | N[9] |
| Lead | 2/6 | 15.3 | 16.5 | 2 | 16.5 | 4GW2S-2 | 4MW2S | - | 15 | - | 15 | 13 | 1 - 264 | Y |
| Lead, Filtered | 1/6 | 1.2 | 1.2 | 1 - 2 | 1.2 | 4GW2S2DISS | 4MW2S | - | 15 | - | 15 | 13 | - | N |
| Magnesium | 6/6 | 2270 | 4890 | - | 4465 | 4GW2S | 4MW2S | - | - | - | - | - | 654 - 5810 | N[8] |
| Magnesium, Filtered | 6/6 | 2280 | 4870 | - | 4358 | 4GW2S DISS | 4MW2S | - | - | - | - | - | - | N[8] |
| Manganese | 6/6 | 3.1 | 16.1 | - | 13.3 | 4GW4S | 4MW4S | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | N |
| Manganese, Filtered | 6/6 | 3.2 | 16.1 | - | 12.9 | 4GW4S DISS | 4MW4S | 84 | 50 | 5000 | 50 | - | - | N |
| Potassium | 4/6 | 3180 | 3760 | 2410 - 2780 | 3760 | 4GW4S | 4MW4S | - | - | - | - | - | 290 - 17900 | N[8] |
| Potassium, Filtered | 6/6 | 2470 | 3700 | - | 3496 | 4GW4S DISS | 4MW4S | - | - | - | - | - | - | N[8] |
| Sodium | 6/6 | 28700 J | 62400 | - | 57778 | 4GW3S | 4MW3S | - | - | 28000 | - | - | 3160 - 97700 | N[8] |
| Sodium, Filtered | 6/6 | 27600 J | 66800 | - | 58915 | 4GW3S DISS | 4MW3S | - | - | 28000 | - | - | - | N[8] |
| Thallium, Filtered | 1/3 | 5.7 J | 5.7 J | 2 | 5.7 | 4GW4S-2DISS | 4MW4S | 0.26 | 2 | 2 | 5 | 63 | - | Y |
| Zinc | 4/6 | 10.4 | 32.6 | 10.9 - 20.7 | 32.6 | 4GW4S | 4MW4S | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | N |
| Zinc, Filtered | 5/6 | 1.6 | 30.7 | 14.6 | 30.7 | 4GW4S DISS | 4MW4S | 1100 | 5000 | - | 5000 | 123 | - | N |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Hardness as CaCO3 | 6/6 | 48 | 94 | - | 91 | 4GW2S | 4MW2S | - | - | - | - | - | NA | N[10] |
| Total Phosphorus | 1/2 | 0.12 | 0.12 | 0.1 | 0.12 | 4GW3S | 4MW3S | - | - | - | - | - | NA | N[10] |
| Total Suspended Solids | 1/2 | 139 | 139 | 1 | 139 | 4GW3S | 4MW3S | - | - | - | - | - | NA | N[10] |

1 Includes samples 4GW2S, 4GW2S DISS, 4GW2S-2, 4GW2S2DISS, 4GW3S, 4GW3S DISS, 4GW3S-2, 4GW3S2DISS, 4GW4S, 4GW4S DISS, 4GW4S-2, 4GW4S-2DISS.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for

TABLE 2-15

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 4 - RUBBLE FILL AREA AT BUNKER A-86[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 2

*carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.*

3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 Essential nutrient; not evaluated for COPC screening.
9 USEPA Region I does not advocate quantitative evaluation of this chemical.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 2-16

COPC SCREENING - GROUNDWATER SAMPLES - BEDROCK WELLS
SITE 4 - RUBBLE FILL AREA AT BUNKER A-86[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration Sample Number | Maximum Concentration Location | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] Groundwater Protection | State Remediation Standards[5] Surface Water Protection | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 4-Methyl-2-pentanone | 1/4 | 5 J | 5 J | 10 | 5 | 4GW1S | 4MW1S | 290 | - | - | 350 | - | ND | N |
| Bromodichloromethane | 1/4 | 1 J | 1 J | 10 | 1 | 4GW1S | 4MW1S | 0.17 | 100/80 | 100 | 0.56 | 660 | ND | Y |
| Carbon Disulfide | 1/4 | 2 J | 2 J | 10 | 2 | 4GW1S-2 | 4MW1S | 100 | - | - | 700 | - | ND | N |
| Chloroform | 2/4 | 3 J | 9 J | 10 - 11 | 9 | 4GW1S | 4MW1S | 0.15 | 100/80 | 100 | 6 | 14100 | ND | Y |
| Methylene Chloride | 1/4 | 8 J | 8 J | 10 | 8 | 4GW1S-2 | 4MW1S | 4.1 | 5 | 5 | 5 | 48000 | 4 | Y |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Benzoic Acid | 1/4 | 0.7 J | 0.7 J | 25 - 50 | 0.7 | 4GW1S-2 | 4MW1S | 15000 | - | - | 28000 | - | ND | N |
| Bis(2-Ethylhexyl)phthalate | 1/4 | 2 J | 2 J | 10 - 12 | 2 | 4GW1S-2 | 4MW1S | 4.8 | 6 | 6 | 2 | 59 | 3 | N |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 4/4 | 55.6 J | 3350 | - | 3178 | 4GW1S-2 | 4MW1S | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Aluminum, Filtered | 1/4 | 48.6 | 48.6 | 64.9 - 85.8 | 48.6 | 4GW1S DISS | 4MW1S | - | 50 to 200 | - | - | - | - | N[8] |
| Barium | 4/4 | 40 | 74.1 | - | 74.1 | 4GW1S-2 | 4MW1S | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | N |
| Barium, Filtered | 4/4 | 24.8 | 44.2 J | - | 44.2 | 4GW1S DISS | 4MW1S | 260 | 2000 | 2000 | 1000 | - | - | N |
| Boron, Filtered | 1/4 | 16.7 | 16.7 | 50 - 50.3 | 16.7 | 4GW4D2DISS | 4MW4D | 330 | - | - | 630 | - | - | N |
| Cadmium, Filtered | 1/4 | 5 | 5 | 2 - 3 | 5 | 4GW4D2DISS | 4MW4D | 1.8 | 5 | 5 | 5 | 6 | - | Y |
| Calcium | 4/4 | 15000 | 28600 | - | 28600 | 4GW4D | 4MW4D | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 4/4 | 14500 | 27500 | - | 27500 | 4GW4D DISS | 4MW4D | - | - | - | - | - | - | N[9] |
| Chromium | 1/4 | 12.6 | 12.6 | 3 - 4.9 | 12.6 | 4GW1S-2 | 4MW1S | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | N |
| Copper | 2/4 | 10.4 | 18.1 | 5 - 6.5 | 18.1 | 4GW1S-2 | 4MW1S | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Copper, Filtered | 1/4 | 3.9 J | 3.9 J | 2 - 5 | 3.9 | 4GW1S-2DISS | 4MW1S | 150 | 1300 | - | 1300 | 48 | - | N[8] |
| Iron | 4/4 | 6.8 J | 4430 | - | 4041 | 4GW1S-2 | 4MW1S | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 1/4 | 5.9 J | 5.9 J | 14.1 - 43.7 | 5.9 | 4GW1S DISS | 4MW1S | 1100 | 300 | - | - | - | - | N[8] |
| Lead | 2/4 | 5.2 J | 11.1 J | 1 - 2 | 11.1 | 4GW1S-2 | 4MW1S | - | 15 | - | 15 | 13 | 1 - 264 | N |
| Lead, Filtered | 1/4 | 2.1 | 2.1 | 1 - 2 | 2.1 | 4GW1S-2DISS | 4MW1S | - | 15 | - | 15 | 13 | - | N |
| Magnesium | 4/4 | 2260 | 4830 | - | 4830 | 4GW4D | 4MW4D | - | - | - | - | - | 654 - 5810. | N[9] |
| Magnesium, Filtered | 4/4 | 2160 | 4510 | - | 4510 | 4GW4D DISS | 4MW4D | - | - | - | - | - | - | N[9] |
| Manganese | 4/4 | 13 J | 80.1 | - | 79.9 | 4GW1S-2 | 4MW1S | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 4/4 | 9.3 | 16.1 | - | 16 | 4GW4D DISS | 4MW4D | 84 | 50 | 5000 | 50 | - | - | N |
| Potassium | 3/4 | 2700 J | 4330 | 2990 | 4330 | 4GW4D | 4MW4D | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 4/4 | 2290 J | 3710 | - | 3710 | 4GW4D DISS | 4MW4D | - | - | - | - | - | - | N[9] |
| Sodium | 4/4 | 26900 | 52500 | - | 52500 | 4GW4D | 4MW4D | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 4/4 | 26700 | 52000 | - | 52000 | 4GW4D DISS | 4MW4D | - | - | 28000 | - | - | - | N[9] |
| Thallium | 2/3 | 5.6 J | 5.8 J | 1 | 5.8 | 4GW4D-2 | 4MW4D | 0.26 | 2 | 2 | 5 | 63 | 1.2 - 4.3 | Y |
| Thallium, Filtered | 1/3 | 6 J | 6 J | 1 - 5 | 6 | 4GW1S-2DISS | 4MW1S | 0.26 | 2 | 2 | 5 | 63 | - | Y |
| Vanadium | 1/4 | 4.5 J | 4.5 J | 4 - 6.8 | 4.5 | 4GW1S-2 | 4MW1S | 26 | - | - | 50 | - | 33.1 | N |
| Zinc | 3/4 | 14.5 J | 58.5 | 22.3 | 58.5 | 4GW1S-2 | 4MW1S | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | N |
| Zinc, Filtered | 2/4 | 10.1 | 10.4 J | 15.7 - 21 | 10.4 | 4GW1S DISS | 4MW1S | 1100 | 5000 | - | 5000 | 123 | - | N |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Hardness as CaCO3 | 3/3 | 60 | 90 | - | 90 | 4GW4D | 4MW4D | - | - | - | - | - | NA | N[10] |

1 Includes samples 4GW1S, 4GW1S DISS, 4GW1S-2, 4GW1S-2DISS, 4GW4D, 4GW4D DISS, 4GW4D-2, 4GW4D2DISS.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for

**TABLE 2-16**

**COPC SCREENING - GROUNDWATER SAMPLES - BEDROCK WELLS**
**SITE 4 - RUBBLE FILL AREA AT BUNKER A-86[1]**
**NSB-NLON, GROTON, CONNECTICUT**
**PAGE 2 OF 2**

carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 2-17

COPC SCREENING - SOIL SAMPLES
SITE 7 - TORPEDO SHOPS[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **VOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 1,1-Dichloroethene | 1/27 | 0.003 J | 0.003 J | 0.006 - 0.061 | 0.003 | 7 SO 4S 0103 | 7MW4S | 0.06 | 1.4 | N |
| 2-Butanone | 1/27 | 0.032 | 0.032 | 0.011 - 0.061 | 0.032 | 081090-7TB5(6-8) | 7TB5 | - | 80 | N |
| Acetone | 4/27 | 0.011 J | 0.17 | 0.011 - 0.27 | 0.17 | 081090-7TB5(6-8) | 7TB5 | 16 | 140 | N |
| Benzene | 1/37 | 0.004 J | 0.004 J | 0.0011 - 0.061 | 0.004 | 081090-7TB5(6-8) | 7TB5 | 0.03 | 0.2 | N |
| Carbon Disulfide | 2/27 | 0.003 J | 0.005 J | 0.006 - 0.061 | 0.005 | 081090-7TB5(6-8) | 7TB5 | 32 | 140 | N |
| Methylene Chloride | 14/27 | 0.003 J | 0.42 J | 0.006 - 0.023 | 0.42 | 7MW8S-0408 | 7MW8S | 0.02 | 1 | Y |
| Tetrachloroethene | 5/27 | 0.003 J | 0.018 J | 0.006 - 0.024 | 0.018 | 7MW8S-0408 | 7MW8S | 0.06 | 1 | N |
| Toluene | 6/37 | 0.003 J | 0.008 J | 0.0011 - 0.061 | 0.008 | 7TB160305 | 7TB16 | 12 | 67 | N |
| Xylenes, Total | 6/37 | 0.0005 J | 0.011 J | 0.0011 - 0.061 | 0.011 | 7 SO 4S 0103 | 7MW4S | 190 | 19.5 | N |
| **SEMIVOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 2-Methylnaphthalene | 3/27 | 0.023 J | 0.17 J | 0.35 - 0.5 | 0.17 | 7 SO 4S 0103 | 7MW4S | - | 56 | N |
| 4-Methylphenol | 1/27 | 0.56 | 0.56 | 0.35 - 0.5 | 0.56 | 080990-7MW2(2-4) | 7MW2S | - | 7 | N |
| Acenaphthene | 5/27 | 0.043 J | 0.79 | 0.35 - 0.5 | 0.79 | 7 SO 4S 0103 | 7MW4S | 570 | 84 | N |
| Acenaphthylene | 3/27 | 0.02 J | 0.055 J | 0.35 - 0.5 | 0.055 | 7 SO 10 0103 | 7TB10 | - | 84 | N |
| Anthracene | 6/27 | 0.021 J | 1.3 | 0.35 - 0.5 | 1.3 | 7 SO 10 0103 | 7TB10 | 12000 | 400 | N |
| Benzo(a)anthracene | 9/27 | 0.036 J | 2.7 | 0.35 - 0.5 | 2.7 | 7 SO 10 0103 | 7TB10 | 2 | 1 | Y |
| Benzo(a)pyrene | 12/27 | 0.033 J | 1.9 | 0.35 - 0.5 | 1.9 | 7 SO 10 0103 | 7TB10 | 8 | 1 | Y |
| Benzo(b)fluoranthene | 11/27 | 0.021 J | 3.2 J | 0.35 - 0.5 | 3.2 | 7 SO 10 0103 | 7TB10 | 5 | 1 | Y |
| Benzo(g,h,i)perylene | 10/27 | 0.02 J | 1.3 J | 0.35 - 0.5 | 1.3 | 7 SO 4S 0103 | 7MW4S | - | 40 | N |
| Benzo(k)fluoranthene | 9/27 | 0.024 J | 0.52 | 0.35 - 0.5 | 0.52 | 7TB12-0204 | 7TB12 | 49 | 1 | N |
| Benzoic Acid | 10/27 | 0.023 J | 0.13 J | 1.7 - 2.4 | 0.13 | 7 SO 4S 0103 | 7MW4S | 400 | 5600 | N |
| Bis(2-Ethylhexyl)phthalate | 4/27 | 0.13 J | 0.74 J | 0.17 - 0.5 | 0.74 | 081390-7TB3(4-6) | 7TB3 | 3600 | 11 | N |
| Butylbenzyl Phthalate | 1/27 | 0.026 J | 0.026 J | 0.35 - 0.5 | 0.026 | 7TB7-0406 | 7TB7 | 930 | 200 | N |
| Carbazole | 4/18 | 0.027 J | 0.66 | 0.35 - 0.47 | 0.66 | 7 SO 4S 0103 | 7MW4S | 0.6 | 0.36 | Y |
| Chrysene | 11/27 | 0.025 J | 2.4 | 0.35 - 0.5 | 2.4 | 7 SO 10 0103 | 7TB10 | 160 | 0.96 | Y |
| Di-n-butyl phthalate | 10/27 | 0.02 J | 0.17 J | 0.35 - 0.47 | 0.17 | 081490-7TB4(4-6) | 7TB4 | 2300 | 140 | N |
| Dibenzo(a,h)anthracene | 1/27 | 0.063 J | 0.063 J | 0.35 - 0.5 | 0.063 | 081390-7MW1(0-2) | 7MW1D | 2 | 0.005 | Y |
| Dibenzofuran | 3/27 | 0.027 J | 0.35 J | 0.35 - 0.5 | 0.35 | 7 SO 4S 0103 | 7MW4S | - | 5.6 | N |
| Diethyl Phthalate | 2/27 | 0.094 J | 14 | 0.35 - 0.48 | 14 | 7MW7S-0103 | 7MW7S | 470 | 1100 | N |
| Fluoranthene | 14/27 | 0.018 J | 3.8 J | 0.36 - 0.5 | 3.8 | 7 SO 10 0103 | 7TB10 | 4300 | 56 | N |
| Fluorene | 5/27 | 0.043 J | 0.71 | 0.35 - 0.5 | 0.71 | 7 SO 4S 0103 | 7MW4S | 560 | 56 | N |
| Indeno(1,2,3-cd)pyrene | 10/27 | 0.024 J | 1.2 | 0.35 - 0.5 | 1.2 | 7 SO 10 0103 | 7TB10 | 14 | 0.005 | Y |
| Naphthalene | 2/27 | 0.26 J | 0.31 J | 0.35 - 0.5 | 0.31 | 7 SO 4S 0103 | 7MW4S | 84 | 56 | N |

TABLE 2-17

COPC SCREENING - SOIL SAMPLES
SITE 7 - TORPEDO SHOPS[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| Phenanthrene | 10/27 | 0.025 J | 4.3 J | 0.35 - 0.5 | 4.3 | 7 SO 4S 0103 | 7MW4S | - | 40 | N |
| Pyrene | 14/27 | 0.021 J | 4.2 J | 0.36 - 0.5 | 4.2 | 7 SO 10 0103 | 7TB10 | 4200 | 40 | N |
| **PESTICIDES/PCBs (mg/kg)** | | | | | | | | | | |
| 4,4'-DDD | 4/23 | 0.0044 J | 0.025 J | 0.02 - 0.047 | 0.0168 | 7MW7S-0103 | 7MW7S | 16 | 0.029 | N |
| 4,4'-DDE | 4/23 | 0.0054 J | 0.21 | 0.02 - 0.047 | 0.21 | 081390-7TB3(4-6) | 7TB3 | 54 | 0.021 | Y |
| 4,4'-DDT | 5/23 | 0.0049 J | 0.026 J | 0.02 - 0.047 | 0.0167 | 7TB160305 | 7TB16 | 32 | 0.021 | Y |
| Aroclor-1254 | 1/23 | 0.66 | 0.66 | 0.2 - 0.47 | 0.66 | 080990-7MW2(2-4) | 7MW2S | - | 0.1 | Y |
| Endosulfan Sulfate | 2/23 | 0.013 J | 0.035 J | 0.02 - 0.047 | 0.035 | 7MW7S-0103 | 7MW7S | 18 | 8.4 | N |
| Endrin Aldehyde | 2/14 | 0.0055 J | 0.0055 J | 0.035 - 0.047 | 0.0055 | 7TB7-0406/ 7TB8-0202.9 | 7TB7/ 7TB8 | 1 | 0.42 | N |
| Endrin Ketone | 1/23 | 0.0068 J | 0.0068 J | 0.02 - 0.047 | 0.0068 | 7 SO 4S 0103 | 7MW4S | 1 | 0.42 | N |
| Heptachlor | 1/23 | 0.0047 J | 0.0047 J | 0.0098 - 0.024 | 0.0047 | 7 SO 4S 0103 | 7MW4S | 23 | 0.013 | N |
| Methoxychlor | 1/23 | 0.032 J | 0.032 J | 0.098 - 0.24 | 0.032 | 7 SO 4S 0103 | 7MW4S | 160 | 8 | N |
| **INORGANICS (mg/kg)** | | | | | | | | | | |
| Aluminum | 27/27 | 3730 | 20000 | - | 13301 | 7 SO 6S 0507 | 7MW6S | - | - | N[6] |
| Antimony | 12/26 | 3.4 | 19.4 J | 3 - 18.2 | 19.4 | 080990-7TB2(2-4)/ 081390-7MW1(0-2) | 7TB2/ 7MW1D | 5 | 1.2 | Y |
| Arsenic | 25/27 | 0.82 J | 8.1 | 1.6 - 4.6 | 3.19 | 7MW9S-0608 | 7MW9S | 29 | 10 | N |
| Barium | 27/27 | 17.4 J | 506 | - | 112.1 | 7 SO 6S 0507 | 7MW6S | 1600 | 200 | Y |
| Beryllium | 24/27 | 0.21 J | 1 | 0.2 - 0.23 | 0.55 | 080990-7TB1(2-4)-D | 7TB1 | 63 | 0.8 | Y |
| Cadmium | 13/27 | 0.47 J | 5.1 | 0.4 - 1 | 5.1 | 080990-7TB1(2-4)-D | 7TB1 | 8 | 1 | N[5] |
| Calcium | 27/27 | 600 J | 5830 | - | 1876 | 081390-7MW1(0-2) | 7MW1D | - | - | N[7] |
| Chromium | 27/27 | 6.8 | 61.1 | - | 21.5 | 7 SO 6S 0507 | 7MW6S | - | 10 | Y |
| Cobalt | 22/27 | 4.7 J | 19.2 J | 1.8 - 3.9 | 19.2 | 7 SO 6S 0507 | 7MW6S | - | 84 | N |
| Copper | 27/27 | 7.6 | 45 | - | 24 | 7TB7-0406 | 7TB7 | - | 260 | N[6] |
| Iron | 27/27 | 4580 | 32900 | - | 16500 | 7 SO 6S 0507 | 7MW6S | - | - | N[6] |
| Lead | 22/27 | 3.3 J | 27.5 J | 2.5 - 9.1 | 13 | 7TB12-0204 | 7TB12 | - | 3 | Y |
| Magnesium | 27/27 | 1510 | 19500 | - | 5363 | 7 SO 6S 0507 | 7MW6S | - | - | N[7] |
| Manganese | 27/27 | 60.7 | 725 | - | 303 | 7 SO 6S 0507 | 7MW6S | - | 10 | Y |
| Mercury | 5/27 | 0.11 J | 1.2 J | 0.1 - 0.14 | 1.2 | 7MW10S-0608 | 7MW10S | 2 | 0.4 | Y |
| Nickel | 27/27 | 5.1 | 42.1 J | - | 14.2 | 7 SO 6S 0507 | 7MW6S | 130 | 20 | Y |
| Potassium | 27/27 | 575 J | 18400 J | - | 4366 | 7 SO 6S 0507 | 7MW6S | - | - | N[7] |

# TABLE 2-17

## COPC SCREENING - SOIL SAMPLES
## SITE 7 - TORPEDO SHOPS[1]
## NSB-NLON, GROTON, CONNECTICUT
## PAGE 3 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| Selenium | 1/27 | 0.77 | 0.77 | 0.44 - 0.85 | 0.77 | 081090-7TB5(6-8) | 7TB5 | 5 | 10 | N |
| Silver | 11/27 | 0.5 | 5.5 J | 0.4 - 2.4 | 5.5 | 081390-7MW1(0-2) | 7MW1D | 34 | 7.2 | N |
| Sodium | 26/27 | 54.8 J | 708 | 103 | 245.8 | 7 SO 4S 0103 | 7MW4S | - | - | N[7] |
| Thallium | 4/27 | 0.26 | 1 J | 0.2 - 1.2 | 1 | 7 SO 6S 0507 | 7MW6S | 0.7 | 1 | Y |
| Vanadium | 22/27 | 7.7 | 86.7 | 14.3 - 38.4 | 35 | 7 SO 6S 0507 | 7MW6S | 6000 | 10 | Y |
| Zinc | 27/27 | 13.8 | 133 J | - | 60.4 | 7 SO 4S 0103 | 7MW4S | 12000 | 1000 | N |
| **TOTAL PETROLEUM HYDROCARBONS (mg/kg)** | | | | | | | | | | |
| TPH | 12/20 | 28 | 898 J | 11.1 - 14.2 | 898 | 7MW8S-0408 | 7MW8S | - | 2500 | N |
| **MISCELLANEOUS PARAMETERS (mg/kg)** | | | | | | | | | | |
| Total Organic Carbon | 5/5 | 2740 | 18800 | - | 18800 | 7 SO 4S 0103 | 7MW4S | - | - | N[8] |

1 Includes samples 080990-7MW2(2-4), 080990-7TB1(2-4), 080990-7TB1(2-4)-D, 080990-7TB2(2-4), 081090-7TB5(6-8), 081390-7MW1(0-2), 081390-7TB3(4-6), 081490-7MW3(6-8), 081490-7TB4(4-6), 081490-7TB6(6-8), 7 SO 10 0103, 7 SO 4S 0103, 7 SO 6S 0305, 7 SO 6S 0507, 7MW10S-0608, 7MW11S-0507, 7MW5S-1011, 7MW7S-0103, 7MW8S-0408, 7MW9S-0608, 7MW9S-0608-D, 7TB12-0204, 7TB13-0001, 7TB1301.5 03.5, 7TB14-0507, 7TB15-0608, 7TB160305, 7TB7-0406, 7TB8-0202.9, 7TB8-0202.9-D, 7TB9-0002, B325-SO01-0204, B25-SO01-0406, B325-SO03-0002, B325-SO03-0408, B325-SO04-0406, B325-SO04-0608, B325-SO05-0002, B325-SO05-0406, B325-SO06-0002, B325-SO06-0002-D, B325-SO07-0003, B325SS-0203, B325SW-0203.

2 USEPA Soil Screening Levels (USEPA, May 1996). See Table 1-2 for futher details regarding surrogate and/or calculated values.

3 CTDEP, 1996. See Table 1-2 for futher details regarding surrogate and/or calculated values.

4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.

5 TCLP extraction followed by analysis for metals was also performed for the soil sample associated with the maximum concentration of this chemical. The resulting TCLP data indicate that pollutant mobility is not anticipated to be of concern for this chemical in the soil matrix in this area (i.e., this chemical was not detected in associated TCLP leachates or was detected at concentrations less than the associated Connecticut pollutant mobility standard for GB areas and the federal toxicity characteristic regulatory level).

6 USEPA Region I does not advocate quantitative evaluation of this chemical.

7 Essential nutrient; not evaluated for COPC selection.

8 Not applicable for COPC screening.

\- Not Applicable or Not Available.

## TABLE 2-18

## COPC SCREENING - TCLP SOIL SAMPLES
## SITE 7 - TORPEDO SHOPS[1]
## NSB-NLON, GROTON, CONNECTICUT

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | Federal Pollutant Mobility (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **TCLP METALS (mg/L)** | | | | | | | | | | |
| Arsenic | 7/10 | 0.13 J | 0.38 J | 0.05 - 0.1 | 0.22 | 081090-7TB5(6-8)-T | 7TB5 | 5 | 0.5 | N |
| Barium | 10/10 | 0.145 | 0.49 J | - | 0.37 | 080990-7TB2(2-4)-T | 7TB2 | 100 | 10 | N |
| Cadmium | 1/10 | 0.0095 J | 0.0095 J | 0.003 - 0.005 | 0.0095 | 081390-7TB3(4-6)-T | 7TB3 | 1 | 0.05 | N |
| Selenium | 2/10 | 0.11 J | 0.14 J | 0.01 - 0.1 | 0.14 | 080990-7TB2(2-4)-T | 7TB2 | 1 | 0.5 | N |

1 Includes samples 080990-7MW2(2-4)-T, 080990-7TB2(2-4)-T, 081090-7TB5(6-8)-T, 081390-7MW1(0-2)-T, 081390-7TB3(4-6)-T, 081490-7MW3(6-8)-T, 081490-7TB4(4-6)-T, 081490-7TB6(6-8)-T, 7MW8S-0408-T, 7TB1(2-4)-D-T, 7TB1(2-4)-T.
2 Federal Toxicity Characteristic Regulatory Level (58 FR 46049).
3 CTDEP, 1996.
4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.

TABLE 2-19

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 7 - TORPEDO SHOPS[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | 6/20 | 2 J | 42 | 5 - 10 | 42 | 120690-7MW3 | 7MW3S | 54 | 200 | 200 | 200 | 62000 | ND | N |
| 1,1-Dichloroethane | 6/20 | 2 J | 30 | 10 | 30 | 120690-7MW3 | 7MW3S | 80 | - | - | 70 | - | ND | N |
| 1,1-Dichloroethene | 4/20 | 1 J | 2 J | 5 - 10 | 2 | 7GW3D-2/ 7GW3S/ 7GW3S-2 | 7MW3D/ 7MW3S/ 7MW3S | 0.044 | 7 | 7 | 7 | 96 | ND | Y |
| 2-Butanone | 1/20 | 10 | 10 | 10 | 10 | 7GW8S-2 | 7MW8S | 190 | - | - | 400 | - | ND | N |
| Carbon Disulfide | 2/20 | 2 J | 2 J | 5 - 10 | 2 | 7GW3S/ 7GW9S-D | 7MW3S/ 7MW9S | 100 | - | - | 700 | - | ND | N |
| Chlorobenzene | 1/20 | 3 J | 3 J | 5 - 10 | 3 | 7GW3D-2 | 7MW3D | 3.5 | 100 | 100 | 100 | 420000 | ND | N |
| Chloroform | 1/20 | 4 J | 4 J | 5 - 10 | 4 | 7GW3S | 7MW3S | 0.15 | 100/80 | 100 | 6 | 14100 | ND | Y |
| Methylene Chloride | 1/20 | 4 J | 4 J | 5 - 14 | 4 | 7GW8S-2 | 7MW8S | 4.1 | 5 | 5 | 5 | 48000 | 4 | N |
| Trichloroethene | 1/20 | 1 J | 1 J | 5 - 10 | 1 | 7GW3S | 7MW3S | 1.6 | 5 | 5 | 5 | 2340 | ND | N |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,4-Dichlorobenzene | 1/20 | 2 J | 2 J | 10 | 2 | 7GW3S | 7MW3S | 0.47 | 75 | 75 | 75 | 26000 | ND | Y |
| 2-Methylnaphthalene | 1/20 | 9 J | 9 J | 10 | 9 | 7GW8S | 7MW8S | 150 | - | - | 280 | - | ND | N |
| Acenaphthene | 2/20 | 2 J | 4 J | 10 | 4 | 7GW8S | 7MW8S | 220 | - | - | 420 | 27000 | ND | N |
| Acenaphthylene | 1/20 | 0.5 J | 0.5 J | 10 | 0.5 | 7GW8S-2 | 7MW8S | - | - | - | 420 | 0.3 | ND | Y |
| Anthracene | 1/20 | 0.8 J | 0.8 J | 10 | 0.8 | 7GW8S | 7MW8S | 1100 | - | - | 2000 | 1100000 | ND | N |
| Benzoic Acid | 6/20 | 0.5 J | 2 J | 25 - 50 | 2 | 7GW10S-2/ 7GW3D | 7MW10S/ 7MW3D | 15000 | - | - | 28000 | - | ND | N |
| Bis(2-Ethylhexyl)phthalate | 1/20 | 380 | 380 | 10 - 68 | 380 | 7GW5S | 7MW5S | 4.8 | 6 | 6 | 2 | 59 | 3 | Y |
| Di-n-butyl phthalate | 4/20 | 0.5 J | 2 J | 10 | 2 | 7GW8S | 7MW8S | 370 | - | - | 700 | 120000 | ND | N |
| Dibenzofuran | 2/20 | 1 J | 3 J | 10 | 3 | 7GW8S | 7MW8S | 2.4 | - | - | 28 | - | ND | Y |
| Diethyl Phthalate | 1/20 | 1 J | 1 J | 10 | 1 | 7GW3D | 7MW3D | 2900 | - | - | 5600 | 2400000 | ND | N |
| Fluorene | 2/20 | 2 J | 5 J | 10 | 5 | 7GW8S | 7MW8S | 150 | - | - | 280 | 140000 | ND | N |
| Phenanthrene | 1/20 | 6 J | 6 J | 10 | 6 | 7GW8S | 7MW8S | - | - | - | 200 | 0.3 | ND | Y |
| Phenol | 1/20 | 2 J | 2 J | 10 | 2 | 7GW3D | 7MW3D | 2200 | - | - | 4000 | 92000000 | ND | N |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 9/20 | 32.2 J | 18500 | 26.3 - 344 | 18500 | 7GW2S-2/ 7GW3D | 7MW2S/ 7MW3D | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Antimony | 1/18 | 108 J | 108 J | 12 - 25 | 108 | 120690-7MW3 | 7MW3S | 1.5 | 6 | 6 | 6 | 86000 | ND | Y |
| Antimony, Filtered | 1/16 | 15.8 J | 15.8 J | 12 - 19.8 | 15.8 | 7GW2S DISS | 7MW2S | 1.5 | 6 | 6 | 6 | 86000 | - | Y |
| Arsenic | 4/20 | 2.2 J | 8.9 J | 2 - 7.4 | 8.9 | 7GW3D | 7MW3D | 0.045 | 50 | 50 | 50 | 4 | 0.64 | Y |
| Arsenic, Filtered | 3/18 | 1.55 | 4.5 J | 2 - 5.1 | 4.5 | 7GW2S DISS | 7MW2S | 0.045 | 50 | 50 | 50 | 4 | - | Y |
| Barium | 18/20 | 10.8 J | 256 | 10.4 - 15 | 109 | 7GW3D | 7MW3D | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | N |
| Barium, Filtered | 16/18 | 9.3 | 153 | 6 - 10.1 | 153 | 7GW10S2DISS | 7MW10S | 260 | 2000 | 2000 | 1000 | - | - | N |
| Beryllium | 1/20 | 2.1 J | 2.1 J | 1 | 2.1 | 7GW3D | 7MW3D | 73 | 4 | 4 | 4 | 4 | 0.33 - 0.41 | N |
| Boron | 11/18 | 12.5 J | 185 | 11.1 - 50 | 185 | 7GW3D | 7MW3D | 330 | - | - | 630 | - | 9.3 - 126 | N |
| Boron, Filtered | 12/18 | 9.6 | 187 | 36.5 - 50 | 187 | 7GW3D DISS | 7MW3D | 330 | - | - | 630 | - | - | N |
| Cadmium | 3/20 | 2.6 | 4 | 2 - 3 | 4 | 120690-7MW3 | 7MW3S | 1.8 | 5 | 5 | 5 | 6 | 1.9 - 26.3 | Y |
| Calcium | 20/20 | 6020 | 45300 | - | 32360 | 7GW3D | 7MW3D | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 18/18 | 5850 | 44500 | - | 32325 | 7GW6S DISS | 7MW6S | - | - | - | - | - | - | N[9] |
| Chromium | 3/20 | 7.1 | 35.2 | 3 - 11.3 | 35.2 | 7GW3D | 7MW3D | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | Y |
| Cobalt | 4/20 | 4.4 J | 28.8 J | 3 - 10.3 | 28.8 | 7GW3D | 7MW3D | 220 | - | - | 420 | - | 1.9 - 6 | N |
| Cobalt, Filtered | 1/18 | 13.6 J | 13.6 J | 3 - 11.4 | 13.6 | 7GW2S DISS | 7MW2S | 220 | - | - | 420 | - | - | N |

TABLE 2-19

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 7 - TORPEDO SHOPS[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration Sample Number | Maximum Concentration Location | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] Groundwater Protection | State Remediation Standards[5] Surface Water Protection | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Copper | 7/20 | 2.3 J | 38.9 | 2 - 6.3 | 38.9 | 7GW3D | 7MW3D | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Iron | 17/20 | 140 J | 32700 | 22.3 - 76 | 32700 | 7GW2S-2 | 7MW2S | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 13/18 | 55.9 J | 14200 | 5.3 - 76.8 | 14200 | 7GW2S2DISS | 7MW2S | 1100 | 300 | - | - | - | - | N[8] |
| Lead | 8/20 | 1.65 J | 23 | 2 - 12.4 | 23 | 7GW3D-2 | 7MW3D | - | 15 | - | 15 | 13 | 1 - 264 | Y |
| Lead, Filtered | 8/18 | 2.1 J | 8.3 J | 2 - 2.2 | 8.3 | 7GW11S2DISS | 7MW11S | - | 15 | - | 15 | 13 | - | N |
| Magnesium | 20/20 | 923 J | 18200 | - | 8712 | 7GW3D | 7MW3D | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 18/18 | 890 | 11600 | - | 11600 | 7GW3D2DISS | 7MW3D | - | - | - | - | - | - | N[9] |
| Manganese | 20/20 | 8.3 | 1760 | - | 906 | 7GW6S | 7MW6S | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 18/18 | 1.8 J | 1780 | - | 842 | 7GW6S DISS | 7MW6S | 84 | 50 | 5000 | 50 | - | - | Y |
| Nickel | 1/20 | 24.3 J | 24.3 J | 7 - 13 | 24.3 | 7GW3D | 7MW3D | 73 | 100 | 100 | 100 | 880 | 5 - 17.5 | N |
| Nickel, Filtered | 1/18 | 24.9 J | 24.9 J | 7 - 11 | 24.9 | 7GW8S DISS | 7MW8S | 73 | 100 | 100 | 100 | 880 | - | N |
| Potassium | 19/20 | 1170 J | 11600 | 3090 | 6355 | 7GW3D | 7MW3D | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 16/18 | 1180 | 8720 | 2060 - 2760 | 5736 | 7GW10S2DISS | 7MW10S | - | - | - | - | - | - | N[9] |
| Silver | 1/20 | 38.9 | 38.9 | 2 - 7 | 38.9 | 120690-7MW3 | 7MW3S | 18 | 100 | 50 | 36 | 12 | 2 - 5.8 | Y |
| Sodium | 20/20 | 3250 J | 194000 | - | 90100 | 7GW10S-2 | 7MW10S | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 18/18 | 3240 J | 212000 | - | 95644 | 7GW10S2DISS | 7MW10S | - | - | 28000 | - | - | - | N[9] |
| Thallium | 3/20 | 2.8 J | 11 | 1 - 10 | 11 | 7GW11S | 7MW11S | 0.26 | 2 | 2 | 5 | 63 | 1.2 - 4.3 | Y |
| Thallium, Filtered | 2/18 | 4.4 J | 6.4 J | 1 - 10 | 6.4 | 7GW3S2DISS-D | 7MW3S | 0.26 | 2 | 2 | 5 | 63 | - | Y |
| Vanadium | 4/20 | 7.5 | 57.5 | 3 - 20 | 57.5 | 7GW3D | 7MW3D | 26 | - | - | 50 | - | 33.1 | Y |
| Zinc | 12/20 | 6.4 J | 76.5 | 2 - 23.8 | 36.4 | 7GW3D-2 | 7MW3D | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | N |
| Zinc, Filtered | 4/18 | 5.1 J | 46.2 | 2 - 20.9 | 46.2 | 7GW3D2DISS | 7MW3D | 1100 | 5000 | - | 5000 | 123 | - | N |
| **TOTAL PETROLEUM HYDROCARBONS (ug/L)** | | | | | | | | | | | | | | |
| Oil & Grease | 1/4 | 600 | 600 | 500 | 600 | 7GW3D-2 | 7MW3D | - | - | - | - | - | NA | N[10] |
| TPH | 2/9 | 700 | 1200 | 500 | 1200 | 7GW8S | 7MW8S | - | - | - | 500 | - | NA | Y |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Chemical Oxygen Demand | 1/4 | 22 | 22 | 10 | 22 | 7GW3D-2 | 7MW3D | - | - | - | - | - | NA | N[10] |
| Hardness As CaCO3 | 18/18 | 20 | 190 | - | 120 | 7GW3D | 7MW3D | - | - | - | - | - | NA | N[10] |
| Hardness As CaCO3, Filtered | 4/4 | 18 | 152 | - | 152 | 7GW6S DISS | 7MW6S | - | - | - | - | - | NA | N[10] |
| Total Phosphorus | 2/4 | 0.22 | 3.61 | 0.1 | 3.61 | 7GW3D | 7MW3D | - | - | - | - | - | NA | N[10] |
| Total Suspended Solids | 4/4 | 3 | 7840 | - | 7840 | 7GW3D | 7MW3D | - | - | - | - | - | NA | N[10] |

1 Includes samples 120690-7MW2, 120690-7MW3, 7GW10S, 7GW10S DISS, 7GW10S-2, 7GW10S2DISS, 7GW11S, 7GW11S DISS, 7GW11S-2, 7GW11S2DISS, 7GW2S, 7GW2S DISS, 7GW2S-2, 7GW2S2DISS, 7GW3D, 7GW3D DISS, 7GW3D-2, 7GW3D2DISS, 7GW3S, 7GW3S DISS, 7GW3S-2, 7GW3S-2-D, 7GW3S2DISS, 7GW3S2DISS-D, 7GW5S, 7GW5S DISS, 7GW5S-2, 7GW5S2DISS, 7GW6S, 7GW6S DISS, 7GW6S-2, 7GW6S2DISS, 7GW8S, 7GW8S DISS, 7GW8S-2, 7GW8S2DISS, 7GW9S, 7GW9S DISS, 7GW9S DISS-D, 7GW9S-2, 7GW9S-D, 7GW9S2DISS, B325-GW01, B325-GW03, B325-GW04.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.

TABLE 2-19

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 7 - TORPEDO SHOPS[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 3 OF 3

9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 2-20

COPC SCREENING - GROUNDWATER SAMPLES - BEDROCK WELLS
SITE 7 - TORPEDO SHOPS[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | 1/11 | 2 J | 2 J | 5 - 10 | 2 | 7GW5D-2 | 7MW5D | 54 | 200 | 200 | 200 | 62000 | ND | N |
| 4-Methyl-2-pentanone | 1/11 | 21 | 21 | 10 | 21 | 7GW4S | 7MW4S | 290 | - | - | 350 | - | ND | N |
| Methylene Chloride | 2/11 | 1 J | 1 J | 5 - 14 | 1 | 7GW2D-2/ 7GW5D-2 | 7MW2D/ 7MW5D | 4.1 | 5 | 5 | 5 | 48000 | 4 | N |
| Xylenes, Total | 1/12 | 1.2 | 1.2 | 1 - 10 | 1.2 | B325-GW02 | B325-MW2 | 1200 | 10000 | 10000 | 530 | - | 2 | N |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Benzoic Acid | 1/11 | 0.7 J | 0.7 J | 25 - 50 | 0.7 | 7GW5D | 7MW5D | 15000 | - | - | 28000 | - | ND | N |
| Phenol | 1/11 | 0.8 J | 0.8 J | 10 | 0.8 | 7GW5D | 7MW5D | 2200 | - | - | 4000 | 92000000 | ND | N |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 6/11 | 105 | 56200 | 20.3 - 73.5 | 56200 | 7GW5D | 7MW5D | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Antimony | 1/8 | 13 | 13 | 12 - 25 | 13 | 7GW5D | 7MW5D | 1.5 | 6 | 6 | 6 | 86000 | ND | Y |
| Antimony, Filtered | 2/7 | 15.7 | 17.1 J | 12 - 27.4 | 14.278 | 7GW1D DISS | 7MW1D | 1.5 | 6 | 6 | 6 | 86000 | - | Y |
| Arsenic | 4/11 | 2.1 J | 112 | 2 - 10.7 | 112 | 7GW4S | 7MW4S | 0.045 | 50 | 50 | 50 | 4 | 0.64 | Y |
| Barium | 8/11 | 18.5 J | 585 | 12.3 - 24.5 | 365 | 7GW5D | 7MW5D | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | Y |
| Barium, Filtered | 6/10 | 13.9 | 82.2 | 9.3 - 24.2 | 82.2 | 7GW5D2DISS | 7MW5D | 260 | 2000 | 2000 | 1000 | - | - | N |
| Beryllium | 2/11 | 1.5 J | 3.3 J | 1 | 3.3 | 7GW5D | 7MW5D | 73 | 4 | 4 | 4 | 4 | 0.33 - 0.41 | N |
| Boron | 2/10 | 97.6 | 110 | 13.6 - 220 | 110 | 7GW4S | 7MW4S | 330 | - | - | 630 | - | 9.3 - 126 | N |
| Boron, Filtered | 3/10 | 20 | 204 | 10.5 - 50 | 140 | 7GW4S2DISS | 7MW4S | 330 | - | - | 630 | - | - | N |
| Cadmium | 2/11 | 2.9 J | 3 | 2 - 3 | 3 | 7GW5D | 7MW5D | 1.8 | 5 | 5 | 5 | 6 | 1.9 - 26.3 | Y |
| Cadmium, Filtered | 1/10 | 3.1 J | 3.1 J | 2 - 3 | 3.1 | 7GW1D2DISS | 7MW1D | 1.8 | 5 | 5 | 5 | 6 | - | Y |
| Calcium | 11/11 | 8880 | 79600 | - | 56991 | 7GW5D-2 | 7MW5D | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 10/10 | 8510 | 81500 | - | 46473 | 7GW5D2DISS | 7MW5D | - | - | - | - | - | - | N[9] |
| Chromium | 3/11 | 6.4 J | 104 | 3 - 5 | 104 | 7GW5D | 7MW5D | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | Y |
| Cobalt | 3/11 | 6.2 J | 41.7 J | 3 - 5 | 41.7 | 7GW5D | 7MW5D | 220 | - | - | 420 | - | 1.9 - 6 | N |
| Copper | 9/11 | 7.7 J | 797 | 2 - 6.9 | 492.6 | 7GW5D | 7MW5D | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Copper, Filtered | 3/10 | 9.2 | 11.7 | 2 - 6.2 | 11.7 | 7GW7S DISS | 7MW7S | 150 | 1300 | - | 1300 | 48 | - | N[8] |
| Iron | 7/11 | 166 J | 81800 | 27.4 - 96.7 | 81800 | 7GW1D-2 | 7MW1D | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 4/10 | 90.8 J | 397 | 9.4 - 67.5 | 397 | 7GW4S2DISS | 7MW4S | 1100 | 300 | - | - | - | - | N[8] |
| Lead | 5/11 | 2.7 J | 84.1 | 2 - 12.4 | 35.7 | 7GW5D | 7MW5D | - | 15 | - | 15 | 13 | 1 - 264 | Y |
| Lead, Filtered | 3/10 | 2 J | 5.9 | 2 | 5.9 | 7GW2D2DISS | 7MW2D | - | 15 | - | 15 | 13 | - | N |
| Magnesium | 11/11 | 821 J | 29300 | - | 17759 | 7GW5D | 7MW5D | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 10/10 | 778 J | 11700 | - | 11692 | 7GW4S2DISS | 7MW4S | - | - | - | - | - | - | N[9] |
| Manganese | 11/11 | 21.8 J | 7830 | - | 7647.7 | 7GW5D | 7MW5D | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 10/10 | 12.2 J | 3530 | - | 3530 | 7GW5D DISS | 7MW5D | 84 | 50 | 5000 | 50 | - | - | Y |
| Mercury | 2/11 | 0.99 | 3 | 0.2 | 3 | 7GW5D | 7MW5D | 1.1 | 2 | 2 | 2 | 0.4 | 0.13 - 1.3 | Y |
| Nickel | 1/11 | 94 | 94 | 7 - 24.6 | 94 | 7GW5D | 7MW5D | 73 | 100 | 100 | 100 | 880 | 5 - 17.5 | Y |
| Nickel, Filtered | 2/10 | 20.2 | 21 | 7 - 11 | 21 | 7GW5D DISS | 7MW5D | 73 | 100 | 100 | 100 | 880 | - | N |
| Potassium | 9/11 | 970 J | 29100 | 2300 - 2810 | 13128 | 7GW5D | 7MW5D | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 8/10 | 1080 J | 8470 | 1900 - 2110 | 5551 | 7GW4S2DISS | 7MW4S | - | - | - | - | - | - | N[9] |
| Selenium | 3/11 | 1.2 J | 18.8 | 1 - 5 | 18.8 | 7GW4S | 7MW4S | 18 | 50 | 50 | 50 | 50 | 1 - 4.1 | Y |
| Silver | 1/11 | 5 J | 5 J | 2 - 7 | 5 | 7GW5D | 7MW5D | 18 | 100 | 50 | 36 | 12 | 2 - 5.8 | N |
| Sodium | 11/11 | 3780 J | 146000 | - | 146000 | 7GW4S-2 | 7MW4S | - | - | 28000 | - | - | 3160 - 97700 | N[9] |

TABLE 2-20

COPC SCREENING - GROUNDWATER SAMPLES - BEDROCK WELLS
SITE 7 - TORPEDO SHOPS[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| Sodium, Filtered | 10/10 | 3060 J | 143000 | - | 143000 | 7GW4S2DISS | 7MW4S | - | - | 28000 | - | - | - | N[9] |
| Thallium | 1/11 | 10 | 10 | 1 - 10 | 5.5 | 7GW4S | 7MW4S | 0.26 | 2 | 2 | 5 | 63 | 1.2 - 4.3 | Y |
| Vanadium | 3/11 | 9.1 J | 114 | 3 - 20 | 54.8 | 7GW5D | 7MW5D | 26 | - | - | 50 | - | 33.1 | Y |
| Zinc | 10/11 | 18.7 J | 412 | 9.3 | 336 | 7GW5D | 7MW5D | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | Y |
| Zinc, Filtered | 6/10 | 34.1 | 77.2 | 8.1 - 16.1 | 51.1 | 7GW1D DISS | 7MW1D | 1100 | 5000 | - | 5000 | 123 | - | N |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Ammonia, As Nitrogen | 2/4 | 0.2 | 0.58 | 0.1 | 0.58 | 7GW5D | 7MW5D | - | - | - | - | - | NA | N[10] |
| Chemical Oxygen Demand | 2/4 | 48 | 84 | 10 | 80 | 7GW5D-2 | 7MW5D | - | - | - | - | - | NA | N[10] |
| Hardness As CaCO3 | 10/10 | 26 | 240 | - | 160 | 7GW5D | 7MW5D | - | - | - | - | - | NA | N[10] |
| Hardness As CaCO3, Filtered | 3/3 | 32 | 156 | - | 156 | 7GW4S DISS | 7MW4S | - | - | - | - | - | NA | N[10] |
| Total Organic Carbon | 2/4 | 2.9 | 6.7 | 2 | 6.7 | 7GW5D | 7MW5D | - | - | - | - | - | NA | N[10] |
| Total Phosphorus | 2/4 | 1:2 | 7.5 | 0.1 | 7.5 | 7GW5D | 7MW5D | - | - | - | - | - | NA | N[10] |
| Total Suspended Solids | 3/4 | 84 | 16400 | 1 | 16400 | 7GW5D | 7MW5D | - | - | - | - | - | NA | N[10] |

1 Includes samples 120790-7MW1, 120790-7MW1-D, 7GW1D, 7GW1D DISS, 7GW1D-2, 7GW1D2DISS, 7GW2D, 7GW2D DISS, 7GW2D-2, 7GW2D2DISS, 7GW4S, 7GW4S DISS, 7GW4S-2, 7GW4S2DISS, 7GW5D, 7GW5D DISS, 7GW5D-2, 7GW5D2DISS, 7GW7S, 7GW7S DISS, 7GW7S-2, 7GW7S2DISS, B325-GW02, B325-GW02-D.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 2-21

COPC SCREENING - SOIL SAMPLES
SITE 14 - OBDANE[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **VOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | 1/10 | 0.002 J | 0.002 J | 0.005 - 0.018 | 0.002 | 14SS3 | 14SS3 | 0.003 | 0.1 | N |
| 1,1,2-Trichloroethane | 1/10 | 0.003 J | 0.003 J | 0.005 - 0.018 | 0.003 | 14SS3 | 14SS3 | 0.02 | 1 | N |
| 1,1-Dichloroethene | 1/10 | 0.002 J | 0.002 J | 0.005 - 0.018 | 0.002 | 14SS3 | 14SS3 | 0.06 | 1.4 | N |
| Benzene | 1/10 | 0.002 J | 0.002 J | 0.005 - 0.018 | 0.002 | 14SS3 | 14SS3 | 0.03 | 0.2 | N |
| Bromodichloromethane | 1/10 | 0.002 J | 0.002 J | 0.005 - 0.018 | 0.002 | 14SS3 | 14SS3 | 0.6 | 0.11 | N |
| Chloromethane | 1/10 | 0.008 J | 0.008 J | 0.011 - 0.018 | 0.008 | 14SS3 | 14SS3 | - | 0.54 | N |
| cis-1,3-Dichloropropene | 1/10 | 0.002 J | 0.002 J | 0.005 - 0.018 | 0.002 | 14SS3 | 14SS3 | 0.004 | 0.1 | N |
| Methylene Chloride | 1/10 | 0.007 J | 0.007 J | 0.005 - 0.018 | 0.007 | 14TB2A-0204 | 14TB2A | 0.02 | 1 | N |
| Tetrachloroethene | 2/10 | 0.002 J | 0.003 J | 0.005 - 0.018 | 0.003 | 14SS3 | 14SS3 | 0.06 | 1 | N |
| Toluene | 1/10 | 0.018 | 0.018 | 0.005 - 0.017 | 0.011 | 14MW1S-0002 | 14MW1S | 12 | 67 | N |
| Xylenes, Total | 1/10 | 0.002 J | 0.002 J | 0.005 - 0.018 | 0.002 | 14SS3 | 14SS3 | 190 | 19.5 | N |
| **SEMIVOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| Benzo(a)anthracene | 4/8 | 0.027 J | 0.086 J | 0.4 - 3.3 | 0.086 | 14TB1-0810 | 14TB1 | 2 | 1 | N |
| Benzo(a)pyrene | 3/8 | 0.043 J | 0.11 J | 0.4 - 3.3 | 0.11 | 14TB1-0810 | 14TB1 | 8 | 1 | N |
| Benzo(b)fluoranthene | 3/8 | 0.082 J | 0.097 J | 0.4 - 3.3 | 0.097 | 14TB1-0810 | 14TB1 | 5 | 1 | N |
| Benzo(g,h,i)perylene | 2/8 | 0.057 J | 0.075 J | 0.4 - 3.3 | 0.075 | 14TB1-0810 | 14TB1 | - | 40 | N |
| Benzo(k)fluoranthene | 2/8 | 0.074 J | 0.093 J | 0.4 - 3.3 | 0.093 | 14TB1-0810 | 14TB1 | 49 | 1 | N |
| Benzoic Acid | 4/8 | 0.026 J | 0.064 J | 1.8 - 16 | 0.064 | 14SS3 | 14SS3 | 400 | 5600 | N |
| Chrysene | 4/8 | 0.044 J | 0.11 J | 0.4 - 3.3 | 0.11 | 14TB1-0810 | 14TB1 | 160 | 0.96 | N |
| Fluoranthene | 5/8 | 0.025 J | 0.1 J | 0.4 - 3.3 | 0.1 | 14TB1-0810 | 14TB1 | 4300 | 56 | N |
| Indeno(1,2,3-cd)pyrene | 2/8 | 0.06 J | 0.076 J | 0.4 - 3.3 | 0.076 | 14TB1-0810 | 14TB1 | 14 | 0.005 | Y |
| Phenanthrene | 4/8 | 0.026 J | 0.04 J | 0.4 - 3.3 | 0.04 | 14TB1-0810 | 14TB1 | - | 40 | N |
| Pyrene | 5/8 | 0.028 J | 0.09 J | 0.4 - 3.3 | 0.09 | 14TB1-0002/ 14TB1-0810 | 14TB1/ 14TB1 | 4200 | 40 | N |
| **PESTICIDES/PCBs (mg/kg)** | | | | | | | | | | |
| 4,4'-DDD | 1/2 | 0.011 J | 0.011 J | 0.018 | 0.011 | 14SS3 | 14SS3 | 16 | 0.029 | N |
| 4,4'-DDE | 1/2 | 0.074 J | 0.074 J | 0.018 | 0.074 | 14SS3 | 14SS3 | 54 | 0.021 | Y |
| 4,4'-DDT | 1/2 | 0.4 J | 0.4 J | 0.018 | 0.4 | 14SS3 | 14SS3 | 32 | 0.021 | Y |

TABLE 2-21

COPC SCREENING - SOIL SAMPLES
SITE 14 - OBDANE[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **INORGANICS (mg/kg)** | | | | | | | | | | |
| Aluminum | 8/8 | 4360 | 18900 | - | 15528 | 14TB2A-0204 | 14TB2A | - | - | N[5] |
| Antimony | 1/6 | 4.9 J | 4.9 J | 3.7 - 31 | 4.9 | 14TB2A-0002 | 14TB2A | 5 | 1.2 | Y |
| Arsenic | 8/8 | 1.3 | 16.3 | - | 14.2 | 14SS3 | 14SS3 | 29 | 10 | Y |
| Barium | 8/8 | 13 | 84.1 | - | 65.3 | 14TB1-0002 | 14TB1 | 1600 | 200 | N |
| Beryllium | 8/8 | 0.25 J | 0.61 J | - | 0.57 | 14MW1S-0204 | 14MW1S | 63 | 0.8 | N |
| Boron | 1/7 | 27.6 J | 27.6 J | 11.2 - 18.4 | 27.6 | 14SS3 | 14SS3 | - | 130 | N |
| Cadmium | 3/8 | 0.64 J | 1.2 | 0.45 - 0.83 | 1.02 | 112890-14SS3C | 14SS3 | 8 | 1 | Y |
| Calcium | 8/8 | 490 | 1950 | - | 1454 | 14MW1S-0002 | 14MW1S | - | - | N[7] |
| Chromium | 8/8 | 7.3 | 61.8 | - | 51.1 | 14MW1S-0002 | 14MW1S | - | 10 | N[6] |
| Cobalt | 8/8 | 2.6 | 6.7 | - | 5.6 | 14MW1S-0002 | 14MW1S | - | 84 | N |
| Copper | 8/8 | 6.4 | 24.5 | - | 19.3 | 14MW1S-0002 | 14MW1S | - | 260 | N[5] |
| Iron | 8/8 | 7320 | 38000 | - | 32082 | 14MW1S-0002 | 14MW1S | - | - | N[5] |
| Lead | 5/8 | 9 | 403 J | 2.9 - 193 | 403 | 14SS3 | 14SS3 | - | 3 | Y |
| Magnesium | 8/8 | 1400 | 6750 | - | 4956 | 14MW1S-0002 | 14MW1S | - | - | N[7] |
| Manganese | 8/8 | 55.1 | 330 J | - | 240.1 | 14TB1-0002 | 14TB1 | - | 10 | Y |
| Mercury | 1/8 | 0.15 | 0.15 | 0.11 - 0.18 | 0.15 | 14MW1S-0204 | 14MW1S | 2 | 0.4 | N |
| Nickel | 8/8 | 6.5 | 18.8 | - | 15.2 | 14MW1S-0002 | 14MW1S | 130 | 20 | N |
| Potassium | 8/8 | 491 | 4190 | - | 4190 | 14TB1-0002 | 14TB1 | - | - | N[7] |
| Selenium | 2/8 | 0.52 J | 0.92 | 0.67 - 1.1 | 0.63 | 14MW1S-0204 | 14MW1S | 5 | 10 | N |
| Silver | 1/8 | 0.61 | 0.61 | 0.45 - 1.6 | 0.61 | 14MW1S-0204 | 14MW1S | 34 | 7.2 | N |
| Sodium | 4/8 | 181 | 418 | 57.5 - 231 | 418 | 14MW1S-0002 | 14MW1S | - | - | N[7] |
| Vanadium | 8/8 | 12.9 | 56.3 | - | 49.2 | 14MW1S-0002 | 14MW1S | 6000 | 10 | Y |
| Zinc | 8/8 | 13.7 | 52.8 | - | 43.9 | 14MW1S-0002 | 14MW1S | 12000 | 1000 | N |

1 Includes samples 112890-14SS1D, 112890-14SS2D, 112890-14SS2S, 112890-14SS3C, 112890-14SS3C-D, 14MW1S-0002, 14MW1S-0204, 14SS3, 14TB1-0002, 14TB1-0810, 14TB2A-0002, 14TB2A-0204.
2 USEPA Soil Screening Levels (USEPA, May 1996). See Table 1-2 for futher details regarding surrogate and/or calculated values.
3 CTDEP, 1996. See Table 1-2 for futher details regarding surrogate and/or calculated values.

**TABLE 2-21**

**COPC SCREENING - SOIL SAMPLES**
**SITE 14 - OBDANE[1]**
**NSB-NLON, GROTON, CONNECTICUT**
**PAGE 3 OF 3**

4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.
5 USEPA Region I does not advocate quantitative evaluation of this chemical.
6 TCLP extraction followed by analysis for metals was also performed for the soil sample associated with the maximum concentration of this chemical. The resulting TCLP data indicate that pollutant mobility is not anticipated to be of concern for this chemical in the soil matrix in this area (i.e., this chemical was not detected in associated TCLP leachates or was detected at concentrations less than the associated Connecticut pollutant mobility standard for GB areas and the federal toxicity characteristic regulatory level).
7 Essential nutrient; not evaluated for COPC selection.
- Not Applicable or Not Available.

## TABLE 2-22

## COPC SCREENING - TCLP SOIL SAMPLES
## SITE 14 - OBDANE[1]
## NSB-NLON, GROTON, CONNECTICUT

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | Federal Pollutant Mobility (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **TCLP METALS (mg/L)** | | | | | | | | | | |
| Barium | 2/4 | 0.1 J | 0.11 J | 0.0357 - 0.0537 | 0.11 | 112890-14SS2S-T | 14SS2 | 100 | 10 | N |
| Cadmium | 1/4 | 0.0079 | 0.0079 | 0.002 - 0.005 | 0.0079 | 112890-14SS1S(0-0.5)-T | 14SS1 | 1 | 0.05 | N |
| Chromium | 1/4 | 0.0032 J | 0.0032 J | 0.003 - 0.05 | 0.0032 | 14MW1S-0002-T | 14MW1S | 5 | 0.5 | N |
| Lead | 1/4 | 0.0306 | 0.0306 | 0.014 - 0.3 | 0.0306 | 14MW1S-0002-T | 14MW1S | 5 | 0.15 | N |

1 Includes samples 112890-14SS1S (0-0.5)-T, 112890-14SS2S-T, 14MW1S-0002-T, 14MW1S-0204-T.
2 Federal Toxicity Characteristic Regulatory Level (58 FR 46049).
3 CTDEP, 1996.
4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.

TABLE 2-23

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 14 - OBDANE[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Carbon Disulfide | 1/2 | 1 J | 1 J | 10 | 1 | 14GW1S | 14MW1S | 100 | - | - | 700 | - | ND | N |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Bis(2-Ethylhexyl)phthalate | 1/2 | 1 J | 1 J | 10 | 1 | 14GW1S-2 | 14MW1S | 4.8 | 6 | 6 | 2 | 59 | 3 | N |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 1/2 | 171 | 171 | 66 | 171 | 14GW1S | 14MW1S | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Arsenic, Filtered | 1/2 | 2.1 | 2.1 | 5 | 2.1 | 14GW1S DISS | 14MW1S | 0.045 | 50 | 50 | 50 | 4 | - | Y |
| Barium | 2/2 | 35.5 | 39.3 | - | 39.3 | 14GW1S | 14MW1S | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | N |
| Barium, Filtered | 2/2 | 35.1 | 37.9 | - | 37.9 | 14GW1S DISS | 14MW1S | 260 | 2000 | 2000 | 1000 | - | - | N |
| Boron | 2/2 | 89.3 J | 130 | - | 130 | 14GW1S-2 | 14MW1S | 330 | - | - | 630 | - | 9.3 - 126 | N |
| Boron, Filtered | 2/2 | 99.8 J | 120 | - | 120 | 14GW1S2DISS | 14MW1S | 330 | - | - | 630 | - | - | N |
| Calcium | 2/2 | 4190 | 6600 | - | 6600 | 14GW1S | 14MW1S | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 2/2 | 4430 | 6730 | - | 6730 | 14GW1S DISS | 14MW1S | - | - | - | - | - | - | N[9] |
| Cobalt | 1/2 | 7 | 7 | 22.6 | 7 | 14GW1S-2 | 14MW1S | 220 | - | - | 420 | - | 1.9 - 6 | N |
| Iron | 2/2 | 2260 | 4430 | - | 4430 | 14GW1S-2 | 14MW1S | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 2/2 | 2040 | 4680 J | - | 4680 | 14GW1S2DISS | 14MW1S | 1100 | 300 | - | - | - | - | N[8] |
| Lead, Filtered | 1/2 | 2.2 J | 2.2 J | 2 | 2.2 | 14GW1S2DISS | 14MW1S | - | 15 | - | 15 | 13 | - | N |
| Magnesium | 2/2 | 2780 | 3700 | - | 3700 | 14GW1S | 14MW1S | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 2/2 | 2820 | 3600 | - | 3600 | 14GW1S DISS | 14MW1S | - | - | - | - | - | - | N[9] |
| Manganese | 2/2 | 458 | 770 | - | 770 | 14GW1S | 14MW1S | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 2/2 | 476 | 779 | - | 779 | 14GW1S DISS | 14MW1S | 84 | 50 | 5000 | 50 | - | - | Y |
| Potassium | 2/2 | 4080 | 4460 | - | 4460 | 14GW1S | 14MW1S | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 2/2 | 4390 | 4510 | - | 4510 | 14GW1S DISS | 14MW1S | - | - | - | - | - | - | N[9] |
| Sodium | 2/2 | 43800 | 45800 | - | 45800 | 14GW1S-2 | 14MW1S | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 2/2 | 44000 | 47400 | - | 47400 | 14GW1S2DISS | 14MW1S | - | - | 28000 | - | - | - | N[9] |
| Vanadium, Filtered | 1/2 | 8.9 | 8.9 | 1 | 8.9 | 14GW1S DISS | 14MW1S | 26 | - | - | 50 | - | - | N |
| Zinc | 1/2 | 9.1 | 9.1 | 9.1 | 9.1 | 14GW1S | 14MW1S | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | N |
| Zinc, Filtered | 1/2 | 6.5 | 6.5 | 12.6 | 6.5 | 14GW1S DISS | 14MW1S | 1100 | 5000 | - | 5000 | 123 | - | N |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Hardness as CaCO3 | 2/2 | 24 | 32 | - | 32 | 14GW1S | 14MW1S | - | - | - | - | - | NA | N[10] |

1 Includes samples 14GW1S, 14GW1S DISS, 14GW1S-2, 14GW1S2DISS.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.

TABLE 2-23

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 14 - OBDANE[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 2

9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 2-24

COPC SCREENING - SOIL SAMPLES
SITE 20 - AREA A WEAPONS CENTER[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **VOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 2-Butanone | 3/11 | 0.04 | 0.24 J | 0.01 - 0.017 | 0.24 | 2WCTB6-0810 | 2WCTB6 | - | 80 | N |
| Acetone | 1/11 | 0.69 | 0.69 | 0.006 - 0.16 | 0.69 | 2WCTB6-0810 | 2WCTB6 | 16 | 140 | N |
| Carbon Disulfide | 1/11 | 0.006 J | 0.011 J | 0.005 - 0.017 | 0.008 | 2WCMW3S-1618 | 2WCMW3S | 32 | 140 | N |
| Toluene | 2/11 | 0.002 J | 0.008 J | 0.005 - 0.017 | 0.007 | 2WCTB6-0810 | 2WCTB6 | 12 | 67 | N |
| Trichloroethene | 1/11 | 0.003 J | 0.003 J | 0.005 - 0.017 | 0.003 | 2WCTB6-0810 | 2WCTB6 | 0.06 | 1 | N |
| **SEMIVOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 2-Methylnaphthalene | 2/11 | 0.038 J | 0.054 J | 0.35 - 1.1 | 0.054 | 2WCTB1-0002 | 2WCTB1 | - | 56 | N |
| Acenaphthene | 1/11 | 0.14 J | 0.14 J | 0.34 - 1.1 | 0.14 | 2WCTB2-0002 | 2WCTB2 | 570 | 84 | N |
| Acenaphthylene | 1/11 | 0.031 J | 0.031 J | 0.34 - 1.1 | 0.031 | 2WCTB1-0002 | 2WCTB1 | - | 84 | N |
| Anthracene | 4/11 | 0.03 J | 0.8 J | 0.34 - 0.57 | 0.53 | 2WCTB2-0002-D | 2WCTB2 | 12000 | 400 | N |
| Benzo(a)anthracene | 7/11 | 0.031 J | 2.1 | 0.34 - 0.56 | 0.97 | 2WCTB2-0002-D | 2WCTB2 | 2 | 1 | Y |
| Benzo(a)pyrene | 8/11 | 0.021 J | 1.8 | 0.34 - 0.35 | 1.28 | 2WCTB2-0002-D | 2WCTB2 | 8 | 1 | Y |
| Benzo(b)fluoranthene | 7/11 | 0.027 J | 3.2 | 0.34 - 0.56 | 3.2 | 2WCTB2-0002-D | 2WCTB2 | 5 | 1 | Y |
| Benzo(g,h,i)perylene | 5/11 | 0.06 J | 0.96 J | 0.34 - 0.56 | 0.40 | 2WCTB2-0002-D | 2WCTB2 | - | 40 | N |
| Benzo(k)fluoranthene | 5/11 | 0.024 J | 0.26 J | 0.34 - 1.1 | 0.26 | 2WCTB6-0810 | 2WCTB6 | 49 | 1 | N |
| Benzoic Acid | 5/11 | 0.047 J | 0.48 J | 1.7 - 5.4 | 0.48 | 2WCTB5-0608 | 2WCTB5 | 400 | 5600 | N |
| Bis(2-Ethylhexyl)phthalate | 2/11 | 0.035 J | 0.36 J | 0.35 - 0.75 | 0.29 | 2WCTB8-1012.6 | 2WCTB8 | 3600 | 11 | N |
| Carbazole | 1/10 | 0.4 J | 0.72 J | 0.34 - 0.57 | 0.72 | 2WCTB2-0002-D | 2WCTB2 | 0.6 | 0.36 | Y |
| Chrysene | 7/11 | 0.035 J | 2.3 | 0.34 - 0.56 | 1.03 | 2WCTB2-0002-D | 2WCTB2 | 160 | 0.96 | Y |
| Di-n-octyl phthalate | 3/11 | 0.029 J | 0.089 J | 0.35 - 1.1 | 0.089 | 2WCTB4-0204 | 2WCTB4 | 10000 | 20 | N |
| Dibenzo(a,h)anthracene | 2/11 | 0.068 J | 0.57 J | 0.34 - 0.57 | 0.34 | 2WCTB2-0002-D | 2WCTB2 | 2 | 0.005 | Y |
| Dibenzofuran | 2/11 | 0.031 J | 0.084 J | 0.34 - 1.1 | 0.084 | 2WCTB2-0002 | 2WCTB2 | - | 5.6 | N |
| Diethyl Phthalate | 2/11 | 0.028 J | 0.032 J | 0.34 - 1.1 | 0.032 | 2WCTB6-0810 | 2WCTB6 | 470 | 1100 | N |
| Fluoranthene | 7/11 | 0.032 J | 5.7 | 0.34 - 0.42 | 5.7 | 2WCTB2-0002-D | 2WCTB2 | 4300 | 56 | N |
| Fluorene | 2/11 | 0.085 J | 0.18 J | 0.34 - 0.57 | 0.18 | 2WCTB2-0002 | 2WCTB2 | 560 | 56 | N |
| Indeno(1,2,3-cd)pyrene | 5/11 | 0.056 J | 1 J | 0.34 - 0.56 | 1 | 2WCTB2-0002-D | 2WCTB2 | 14 | 0.005 | Y |
| Phenanthrene | 6/11 | 0.054 J | 4.2 | 0.34 - 0.56 | 4.2 | 2WCTB2-0002-D | 2WCTB2 | - | 40 | N |
| Pyrene | 7/11 | 0.05 J | 4 | 0.34 - 0.42 | 1.59 | 2WCTB2-0002-D | 2WCTB2 | 4200 | 40 | N |
| **PESTICIDES/PCBs (mg/kg)** | | | | | | | | | | |
| 4,4'-DDE | 1/7 | 0.004 J | 0.0074 J | 0.017 - 0.056 | 0.0074 | 2WCTB2-0002-D | 2WCTB2 | 54 | 0.021 | N |
| Aroclor-1260 | 1/7 | 0.05 J | 0.05 J | 0.34 - 0.56 | 0.05 | 092690-2WMW4(0-2) | 2WMW4S | - | 0.1 | N |
| Endrin | 2/7 | 0.011 J | 0.014 J | 0.017 - 0.056 | 0.014 | 2WCTB2-0002-D | 2WCTB2 | 1 | 0.42 | N |

TABLE 2-24

COPC SCREENING - SOIL SAMPLES
SITE 20 - AREA A WEAPONS CENTER[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| Endrin Aldehyde | 2/6 | 0.0064 J | 0.007 J | 0.034 - 0.056 | 0.007 | 2WCTB2-0002 | 2WCTB2 | 1 | 0.42 | N |
| **INORGANICS (mg/kg)** | | | | | | | | | | |
| Aluminum | 11/11 | 4810 | 18200 | - | 14379 | 2WCTB3-0406 | 2WCTB3 | - | - | N[6] |
| Antimony | 2/9 | 4.7 J | 5.4 J | 6.7 - 24 | 5.4 | 2WCTB1-0002 | 2WCTB1 | 5 | 1.2 | Y |
| Arsenic | 8/11 | 0.77 | 10.8 | 1.6 - 1.9 | 10.8 | 2WCTB3-0406 | 2WCTB3 | 29 | 10 | Y |
| Barium | 11/11 | 27.4 | 131 | - | 71.6 | 2WCTB4-0204 | 2WCTB4 | 1600 | 200 | N |
| Beryllium | 10/11 | 0.23 J | 0.84 | 0.21 | 0.59 | 2WCMW3S-1618 | 2WCMW3S | 63 | 0.8 | Y |
| Boron | 4/10 | 16.6 J | 51.8 | 10.4 - 13.1 | 51.8 | 2WCMW3S-1618 | 2WCMW3S | - | 130 | N |
| Cadmium | 2/11 | 0.43 J | 1.2 | 0.42 - 0.68 | 1.2 | 092690-2WMW4(0-2) | 2WMW4S | 8 | 1 | N[5] |
| Calcium | 11/11 | 758 J | 5050 | 1310 | 3078 | 2WCMW3S-1618 | 2WCMW3S | - | - | N[7] |
| Chromium | 11/11 | 5.9 J | 78.7 | - | 66.7 | 2WCTB3-0406 | 2WCTB3 | - | 10 | Y |
| Cobalt | 11/11 | 2.7 | 8.6 J | - | 6.7 | 2WCTB4-0204 | 2WCTB4 | - | 84 | N |
| Copper | 11/11 | 6.7 J | 41.4 | - | 28.5 | 2WCTB3-0406 | 2WCTB3 | - | 260 | N[6] |
| Iron | 11/11 | 6540 | 28600 | - | 25279 | 2WCTB3-0406 | 2WCTB3 | - | - | N[6] |
| Lead | 11/11 | 2.4 J | 66.1 J | - | 53.4 | 2WCTB3-0406 | 2WCTB3 | - | 3 | Y |
| Magnesium | 11/11 | 1660 J | 8450 | - | 7132 | 2WCMW3S-1618 | 2WCMW3S | - | - | N[7] |
| Manganese | 11/11 | 121 | 390 | - | 294 | 2WCTB4-0204 | 2WCTB4 | - | 10 | Y |
| Mercury | 2/11 | 0.19 | 0.29 | 0.1 - 0.17 | 0.29 | 2WCTB3-0406 | 2WCTB3 | 2 | 0.4 | N |
| Nickel | 11/11 | 4.4 | 22.7 | - | 20 | 2WCTB3-0406/ 2WCTB5-0608 | 2WCTB3/ 2WCTB5 | 130 | 20 | Y |
| Potassium | 11/11 | 849 J | 6300 | - | 4048 | 2WCTB4-0204 | 2WCTB4 | - | - | N[7] |
| Silver | 3/11 | 0.65 J | 1.5 | 0.42 - 1.7 | 0.88 | 2WCTB3-0406 | 2WCTB3 | 34 | 7.2 | N |
| Sodium | 11/11 | 152 J | 7390 | - | 3195 | 2WCMW3S-1618 | 2WCMW3S | - | - | N[7] |
| Vanadium | 11/11 | 9.8 | 49.6 | - | 46.0 | 2WCTB3-0406 | 2WCTB3 | 6000 | 10 | Y |
| Zinc | 11/11 | 17.8 J | 69.3 | - | 54 | 2WCMW3S-1618 | 2WCMW3S | 12000 | 1000 | N |

1 Includes samples 2WMW4(0-2), 2WCMW1S-0002, 2WCMW3S-1618, 2WCMW3S-1618-D, 2WCTB1-0002, 2WCTB2-0002, 2WCTB2-0002-D, 2WCTB3-0406, 2WCTB4-0204, 2WCTB5-0608, 2WCTB6-0810, 2WCTB7-0810, 2WCTB8-1012.6, 2WCTB7-0810, 2WCTB8-1012.6.
2 USEPA Soil Screening Levels (USEPA, May 1996). See Table 1-2 for futher details regarding surrogate and/or calculated values.
3 CTDEP, 1996. See Table 1-2 for futher details regarding surrogate and/or calculated values.
4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.

**TABLE 2-24**

**COPC SCREENING - SOIL SAMPLES**
**SITE 20 - AREA A WEAPONS CENTER[1]**
**NSB-NLON, GROTON, CONNECTICUT**
**PAGE 3 OF 3**

5 TCLP extraction followed by analysis for metals was also performed for the soil sample associated with the maximum concentration of this chemical. The resulting TCLP data indicate that pollutant mobility is not anticipated to be of concern for this chemical in the soil matrix in this area (i.e., this chemical was not detected in associated TCLP leachates or was detected at concentrations less than the associated Connecticut pollutant mobility standard for GB areas and the federal toxicity characteristic regulatory level).
6 USEPA Region I does not advocate quantitative evaluation of this chemical.
7 Essential nutrient; not evaluated for COPC selection.
- Not Applicable or Not Available.

TABLE 2-25

COPC SCREENING - TCLP SOIL SAMPLES
SITE 20 - AREA A WEAPONS CENTER[1]
NSB-NLON, GROTON, CONNECTICUT

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | Federal Pollutant Mobility (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **TCLP METALS (mg/L)** | | | | | | | | | | |
| Arsenic | 1/3 | 0.0317 J | 0.0317 J | 0.026 - 0.1 | 0.0317 | 2WCTB5-0608-T | 2WCTB5 | 5 | 0.5 | N |
| Barium | 3/3 | 0.0317 | 0.248 | - | 0.248 | 2WCSD2-T | 2WCSD2 | 100 | 10 | N |
| Chromium | 1/3 | 0.0043 J | 0.0043 J | 0.003 - 0.05 | 0.0043 | 2WCTB5-0608-T | 2WCTB5 | 5 | 0.5 | N |
| Selenium | 1/3 | 0.209 | 0.209 | 0.024 - 0.1 | 0.209 | 2WCTB5-0608-T | 2WCTB5 | 1 | 0.5 | N |

1 Includes samples 092690-2WMW4(0-2)-T, 2WCSD2-T, 2WCTB5-0608-T.
2 Federal Toxicity Characteristic Regulatory Level (58 FR 46049).
3 CTDEP, 1996.
4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.

TABLE 2-26

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 20 - WEAPONS CENTER[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,3-Dichlorobenzene | 1/6 | 0.6 J | 0.6 J | 10 | 0.6 | 2WCGW1S | 2WCMW1S | 1.4 | 600 | - | 210 | 26000 | ND | N |
| Benzo(g,h,i)perylene | 1/6 | 1 J | 1 J | 10 | 1 | 2WCGW1S-2 | 2WCMW1S | - | - | - | 200 | 0.3 | ND | Y |
| Bis(2-Ethylhexyl)phthalate | 3/6 | 2 J | 3 J | 10 - 42 | 3 | 2WCGW1S-2 | 2WCMW1S | 4.8 | 6 | 6 | 2 | 59 | 3 | Y |
| Dibenzo(a,h)anthracene | 1/6 | 0.8 J | 0.8 J | 10 | 0.8 | 2WCGW1S-2 | 2WCMW1S | 0.0092 | - | - | 0.2 | 0.3 | ND | Y |
| Indeno(1,2,3-cd)pyrene | 1/6 | 1 J | 1 J | 10 | 1 | 2WCGW1S-2 | 2WCMW1S | 0.092 | - | - | 0.2 | 0.3 | ND | Y |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 4/6 | 1090 J | 9210 J | 56.6 - 103 | 9210 | 2WCGW3S-2 | 2WCMW3S | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Antimony, Filtered | 1/6 | 15.2 J | 15.2 J | 12 - 16.4 | 15.2 | 2WCGW3S DISS | 2WCMW3S | 1.5 | 6 | 6 | 6 | 86000 | - | Y |
| Arsenic | 5/6 | 4.9 J | 19.9 J | 5 | 16.1 | 2WCGW3S-2 | 2WCMW3S | 0.045 | 50 | 50 | 50 | 4 | 0.64 | Y |
| Arsenic, Filtered | 5/6 | 3.1 J | 8.4 J | 5 | 7.4 | 2WCGW3S2DISS | 2WCMW3S | 0.045 | 50 | 50 | 50 | 4 | - | Y |
| Barium | 6/6 | 42.3 | 189 J | - | 156 | 2WCGW1S-2 | 2WCMW1S | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | N |
| Barium, Filtered | 6/6 | 44.3 | 210 J | - | 142.4 | 2WCGW1S2DISS | 2WCMW1S | 260 | 2000 | 2000 | 1000 | - | - | N |
| Beryllium | 4/6 | 0.85 | 1.4 J | 1 | 1.16 | 2WCGW3S-2 | 2WCMW3S | 73 | 4 | 4 | 4 | 4 | 0.33 - 0.41 | N |
| Beryllium, Filtered | 1/6 | 1.2 J | 1.2 J | 1 - 1.2 | 1.2 | 2WCGW3S DISS | 2WCMW3S | 73 | 4 | 4 | 4 | 4 | - | N |
| Boron | 5/6 | 82.4 | 3550 J | 75.1 | 3550 | 2WCGW1S-2 | 2WCMW1S | 330 | - | - | 630 | - | 9.3 - 126 | Y |
| Boron, Filtered | 6/6 | 72.2 | 3810 J | - | 3810 | 2WCGW3S2DISS | 2WCMW3S | 330 | - | - | 630 | - | - | Y |
| Calcium | 6/6 | 26500 | 264000 J | - | 252667 | 2WCGW3S-2 | 2WCMW3S | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 6/6 | 26400 | 298000 J | - | 256896 | 2WCGW3S2DISS | 2WCMW3S | - | - | - | - | - | - | N[9] |
| Chromium | 4/6 | 4.2 J | 24.9 | 3 - 4 | 24.9 | 2WCGW3S | 2WCMW3S | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | Y |
| Cobalt | 5/6 | 4.8 J | 15.5 J | 3 | 13.4382 | 2WCGW1S | 2WCMW1S | 220 | - | - | 420 | - | 1.9 - 6 | N |
| Copper | 4/6 | 6 J | 38.5 J | 2 - 5 | 38.5 | 2WCGW3S-2 | 2WCMW3S | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Copper, Filtered | 1/6 | 23 J | 23 J | 2 - 7.9 | 23 | 2WCGW3S2DISS | 2WCMW3S | 150 | 1300 | - | 1300 | 48 | - | N[8] |
| Iron | 6/6 | 13800 J | 68000 | - | 58218 | 2WCGW2S | 2WCMW2S | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 6/6 | 4610 | 69200 | - | 44812 | 2WCGW2S DISS | 2WCMW2S | 1100 | 300 | - | - | - | - | N[8] |
| Lead | 2/6 | 2.7 J | 16.8 J | 2 - 5.1 | 14.9 | 2WCGW3S-2 | 2WCMW3S | - | 15 | - | 15 | 13 | 1 - 264 | Y |
| Magnesium | 6/6 | 3560 | 448000 J | - | 448000 | 2WCGW3S-2 | 2WCMW3S | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 6/6 | 3520 | 471000 J | - | 471000 | 2WCGW3S2DISS | 2WCMW3S | - | - | - | - | - | - | N[9] |
| Manganese | 6/6 | 2800 | 6500 J | - | 5225 | 2WCGW3S-2 | 2WCMW3S | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 6/6 | 2820 | 6540 J | - | 5503 | 2WCGW3S2DISS | 2WCMW3S | 84 | 50 | 5000 | 50 | - | - | Y |
| Nickel | 1/6 | 20 J | 20 J | 7 - 11 | 20 | 2WCGW3S | 2WCMW3S | 73 | 100 | 100 | 100 | 880 | 5 - 17.5 | N |
| Nickel, Filtered | 2/6 | 9.75 | 14 | 7 - 11 | 11.59 | 2WCGW1S DISS-D | 2WCMW1S | 73 | 100 | 100 | 100 | 880 | - | N |
| Potassium | 6/6 | 7150 | 173000 J | - | 173000 | 2WCGW3S-2 | 2WCMW3S | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 6/6 | 7190 | 182000 J | - | 182000 | 2WCGW3S2DISS | 2WCMW3S | - | - | - | - | - | - | N[9] |
| Silver, Filtered | 1/6 | 3.7 | 3.7 | 2 | 3.7 | 2WCGW2S DISS | 2WCMW2S | 18 | 100 | 50 | 36 | 12 | - | N |
| Sodium | 6/6 | 43900 | 3570000 J | - | 3570000 | 2WCGW3S-2 | 2WCMW3S | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 6/6 | 44000 | 3580000 J | - | 3580000 | 2WCGW3S2DISS | 2WCMW3S | - | - | 28000 | - | - | - | N[9] |
| Thallium | 3/6 | 5.6 J | 13.8 J | 1 - 10 | 13.8 | 2WCGW2S | 2WCMW2S | 0.26 | 2 | 2 | 5 | 63 | 1.2 - 4.3 | Y |
| Vanadium | 3/6 | 9.8 J | 25.3 J | 3 - 4 | 25.3 | 2WCGW3S-2 | 2WCMW3S | 26 | - | - | 50 | - | 33.1 | N |
| Vanadium, Filtered | 2/6 | 2.9 J | 3.1 J | 1 - 4 | 3.1 | 2WCGW3S2DISS | 2WCMW3S | 26 | - | - | 50 | - | - | N |
| Zinc | 4/6 | 5.4 | 52 | 3.4 - 7.4 | 37.8 | 2WCGW3S | 2WCMW3S | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | N |
| Zinc, Filtered | 1/6 | 14.2 J | 14.2 J | 2 - 19.6 | 9.7 | 2WCGW3S DISS | 2WCMW3S | 1100 | 5000 | - | 5000 | 123 | - | N |

TABLE 2-26

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 20 - WEAPONS CENTER[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Hardness As CaCO3 | 6/6 | 64 | 4000 | - | 4000 | 2WCGW3S-2 | 2WCMW3S | - | - | - | - | - | NA | N[10] |
| Hardness As CaCO3, Filtered | 2/2 | 125 | 436 | - | 432 | 2WCGW1S DISS | 2WCMW1S | - | - | - | - | - | NA | N[10] |

1 Includes samples 2WCGW1S, 2WCGW1S DISS, 2WCGW1S DISS-D, 2WCGW1S-2, 2WCGW1S-D, 2WCGW1S2DISS, 2WCGW2S, 2WCGW2S DISS, 2WCGW2S-2, 2WCGW2S2DISS, 2WCGW3S, 2WCGW3S DISS, 2WCGW3S-2, 2WCGW3S2DISS.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 2-27

COPC SCREENING - GROUNDWATER SAMPLES - BEDROCK WELLS
SITE 20 - WEAPONS CENTER[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,1,2-Trichloroethane | 1/3 | 2 J | 2 J | 5 - 10 | 2 | 2WGW4D | 2WMW4D | 0.19 | 5 | 5 | 5 | 1260 | ND | Y |
| 1,2-Dichloroethane | 1/3 | 1 J | 1 J | 5 - 10 | 1 | 2WGW4D | 2WMW4D | 0.12 | 5 | 5 | 1 | 2970 | ND | Y |
| 2-Butanone | 1/3 | 4 J | 4 J | 10 | 4 | 2WGW4D-2 | 2WMW4D | 190 | - | - | 400 | - | ND | N |
| 2-Hexanone | 1/3 | 12 | 12 | 10 | 12 | 2WGW4D | 2WMW4D | 150 | - | - | 280 | - | ND | N |
| 4-Methyl-2-pentanone | 1/3 | 12 | 12 | 10 | 12 | 2WGW4D | 2WMW4D | 290 | - | - | 350 | - | ND | N |
| Trichloroethene | 1/3 | 2 J | 2 J | 5 - 10 | 2 | 2WGW4D | 2WMW4D | 1.6 | 5 | 5 | 5 | 2340 | ND | Y |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Benzoic Acid | 1/3 | 7 J | 7 J | 50 | 7 | 2WGW4D | 2WMW4D | 15000 | - | - | 28000 | - | ND | N |
| Bis(2-Ethylhexyl)phthalate | 2/3 | 2 J | 2 J | 36 | 2 | 012491-2WMW4D/ 2WGW4D-2 | 2WMW4D/ 2WMW4D | 4.8 | 6 | 6 | 2 | 59 | 3 | N |
| Di-n-octyl phthalate | 1/3 | 2 J | 2 J | 10 | 2 | 2WGW4D | 2WMW4D | 73 | - | - | 100 | 230 | ND | N |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 1/3 | 291 | 291 | 30 - 182 | 291 | 2WGW4D-2 | 2WMW4D | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Antimony, Filtered | 1/2 | 16.9 | 16.9 | 12.9 | 16.9 | 2WGW4D DISS | 2WMW4D | 1.5 | 6 | 6 | 6 | 86000 | - | Y |
| Barium | 3/3 | 70.1 | 135 | - | 135 | 2WGW4D-2 | 2WMW4D | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | N |
| Barium, Filtered | 2/2 | 81.9 | 113 | - | 113 | 2WGW4D2DISS | 2WMW4D | 260 | 2000 | 2000 | 1000 | - | - | N |
| Calcium | 3/3 | 28700 | 40900 | - | 40900 | 2WGW4D-2 | 2WMW4D | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 2/2 | 32400 | 40700 | - | 40700 | 2WGW4D2DISS | 2WMW4D | - | - | - | - | - | - | N[9] |
| Copper | 1/3 | 3.9 J | 3.9 J | 5 | 3.9 | 2WGW4D-2 | 2WMW4D | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Iron | 3/3 | 65.2 J | 7180 | - | 7180 | 2WGW4D-2 | 2WMW4D | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Lead | 1/2 | 2.7 J | 2.7 J | 5 | 2.7 | 2WGW4D | 2WMW4D | - | 15 | - | 15 | 13 | 1 - 264 | N |
| Magnesium | 3/3 | 2850 | 3520 | - | 3520 | 2WGW4D-2 | 2WMW4D | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 2/2 | 3110 | 3460 | - | 3460 | 2WGW4D2DISS | 2WMW4D | - | - | - | - | - | - | N[9] |
| Manganese | 3/3 | 31.1 | 405 | - | 405 | 2WGW4D-2 | 2WMW4D | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 2/2 | 33.6 | 267 | - | 267 | 2WGW4D2DISS | 2WMW4D | 84 | 50 | 5000 | 50 | - | - | Y |
| Nickel | 1/3 | 18.6 J | 18.6 J | 7 - 11 | 18.6 | 012491-2WMW4D | 2WMW4D | 73 | 100 | 100 | 100 | 880 | 5 - 17.5 | N |
| Potassium | 3/3 | 1170 | 1570 | - | 1570 | 2WGW4D-2 | 2WMW4D | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 1/2 | 1390 | 1390 | 1920 | 1390 | 2WGW4D DISS | 2WMW4D | - | - | - | - | - | - | N[9] |
| Selenium | 1/3 | 6 J | 6 J | 1 | 6 | 2WGW4D-2 | 2WMW4D | 18 | 50 | 50 | 50 | 50 | 1 - 4.1 | N |
| Sodium | 3/3 | 8270 | 9020 J | - | 9020 | 012491-2WMW4D | 2WMW4D | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 2/2 | 8420 | 9360 | - | 9360 | 2WGW4D2DISS | 2WMW4D | - | - | 28000 | - | - | - | N[9] |
| Zinc | 2/3 | 8.8 J | 15 J | 20 | 15 | 012491-2WMW4D | 2WMW4D | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | N |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Hardness As CaCO3 | 2/2 | 92 | 118 | - | 118 | 2WGW4D-2 | 2WMW4D | - | - | - | - | - | NA | N[10] |
| Hardness As CaCO3, Filtered | 1/1 | 94 | 94 | - | 94 | 2WGW4D DISS | 2WMW4D | - | - | - | - | - | NA | N[10] |

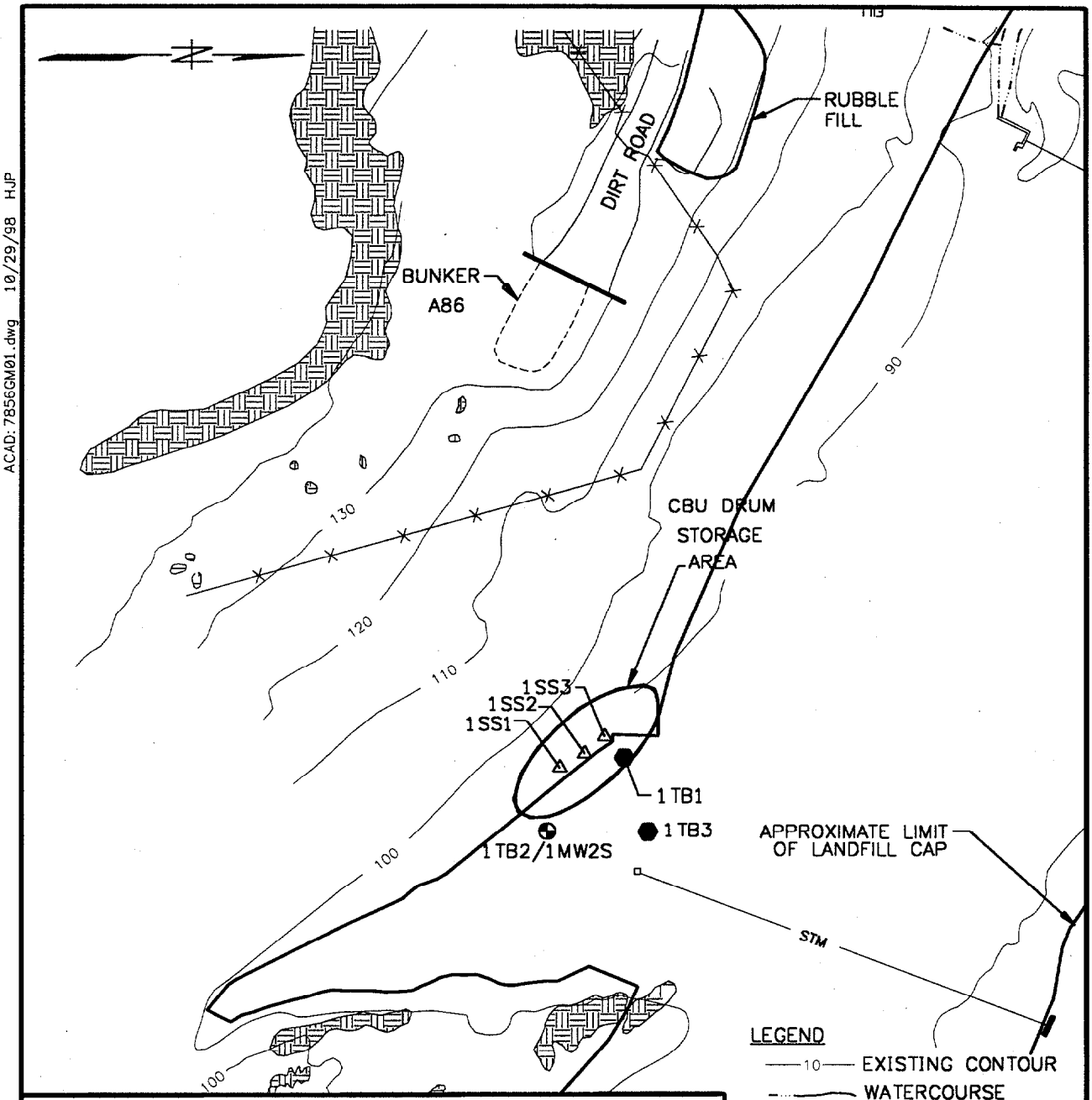
1 Includes samples 012491-2WMW4D, 2WGW4D, 2WGW4D DISS, 2WGW4D-2, 2WGW4D2DISS.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.

TABLE 2-27

COPC SCREENING - GROUNDWATER SAMPLES - BEDROCK WELLS
SITE 20 - WEAPONS CENTER[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 2

3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

ACAD: 7856GM01.dwg 10/29/98 HJP




NOTES:
1. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE.
2. BASE MAP AND UTILITY INFORMATION FROM MAPS OF NSB-NLON AND PHASE II RI WORK PLAN.
3. SOIL SAMPLING LOCATIONS HAVE BEEN COVERED DURING THE INSTALLATION OF THE CAP ON THE AREA A LANDFILL.

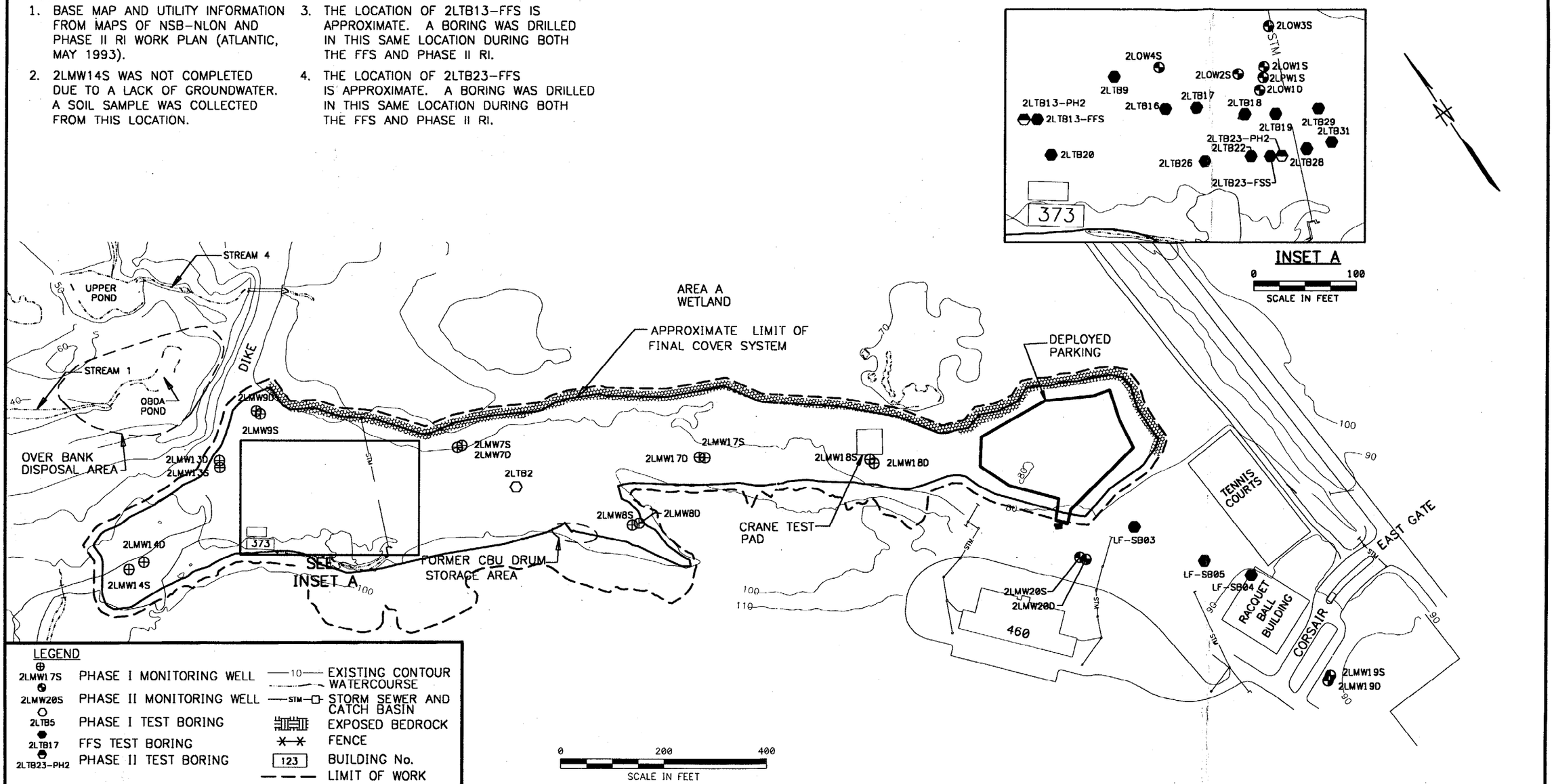
| | | | |
|---|---|---|---|
| DRAWN BY HJP DATE 10/29/98 | Tetra Tech NUS, Inc. | CONTRACT NO. 7856 | OWNER NO. 312 |
| CHECKED BY DATE | SITE MAP<br>SITE 1-CBU DRUM STORAGE AREA<br>NSB-NLON, GROTON, CONNECTICUT | APPROVED BY DATE 11/5/98 | |
| COST/SCHED-AREA | | APPROVED BY DATE | |
| SCALE AS NOTED | | DRAWING NO. FIGURE 2-1 | REV. 0 |

FORM CADD NO. T\NUS_AV.DWG - REV 0 - 1/22/98

This page intentionally left blank.

ACAD: 7856GM02.dwg 10/29/98 HJP

NOTE:
1. BASE MAP AND UTILITY INFORMATION FROM MAPS OF NSB-NLON AND PHASE II RI WORK PLAN (ATLANTIC, MAY 1993).
2. 2LMW14S WAS NOT COMPLETED DUE TO A LACK OF GROUNDWATER. A SOIL SAMPLE WAS COLLECTED FROM THIS LOCATION.
3. THE LOCATION OF 2LTB13-FFS IS APPROXIMATE. A BORING WAS DRILLED IN THIS SAME LOCATION DURING BOTH THE FFS AND PHASE II RI.
4. THE LOCATION OF 2LTB23-FFS IS APPROXIMATE. A BORING WAS DRILLED IN THIS SAME LOCATION DURING BOTH THE FFS AND PHASE II RI.




LEGEND

| | | | |
|---|---|---|---|
| 2LMW17S | PHASE I MONITORING WELL | 10 | EXISTING CONTOUR |
| 2LMW20S | PHASE II MONITORING WELL | | WATERCOURSE |
| 2LTB5 | PHASE I TEST BORING | STM | STORM SEWER AND CATCH BASIN |
| 2LTB17 | FFS TEST BORING | | EXPOSED BEDROCK |
| 2LTB23-PH2 | PHASE II TEST BORING | | FENCE |
| | | 123 | BUILDING No. |
| | | | LIMIT OF WORK |

| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY HJP DATE 10/29/98
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

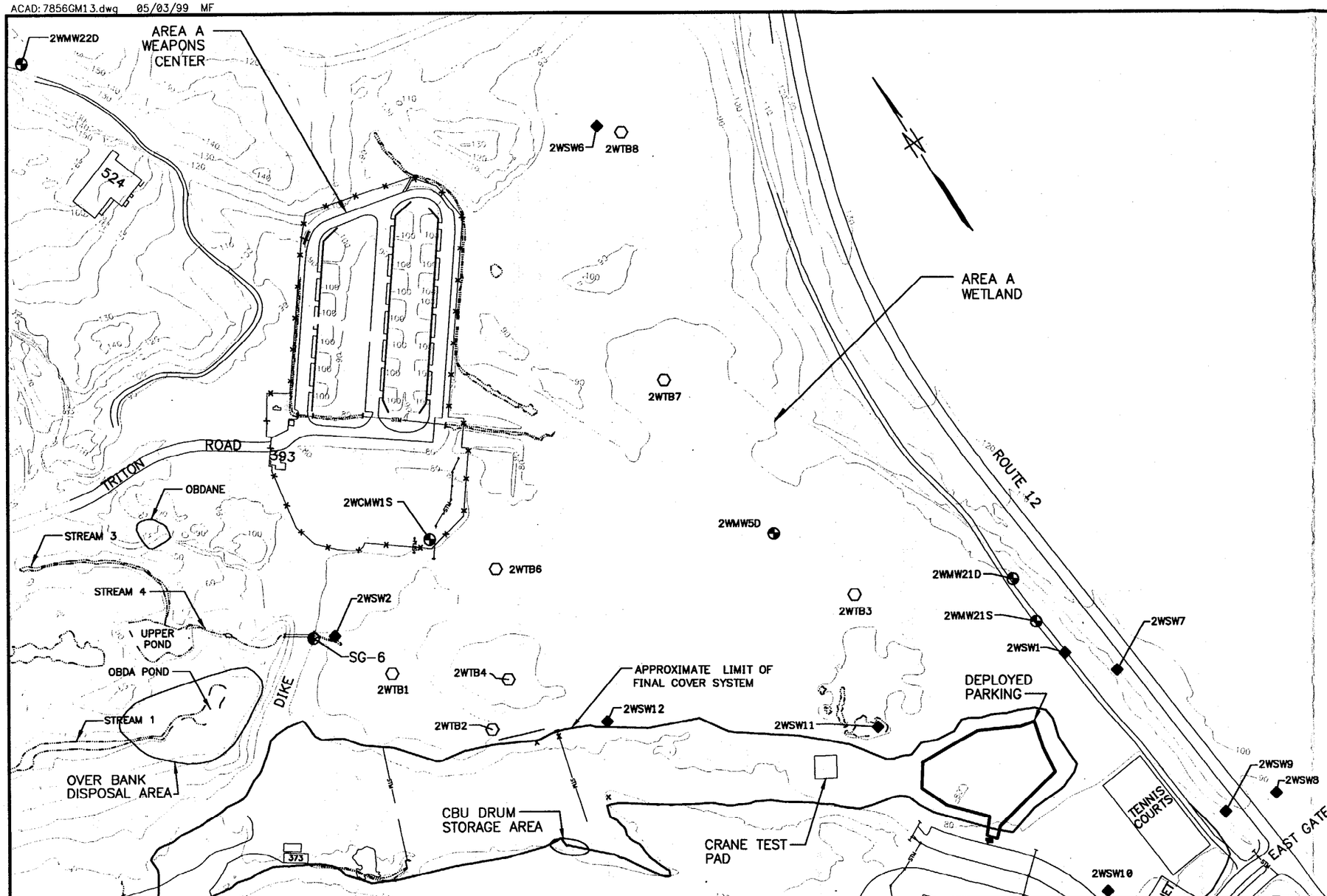
Tetra Tech NUS, Inc.

SITE MAP
SITE 2-AREA A LANDFILL
NSB-NLON, GROTON, CONNECTICUT

CONTRACT NO. 7856
OWNER NO. 312
APPROVED BY Corey A. Reid DATE 11/5/98
APPROVED BY DATE
DRAWING NO. FIGURE 2-2
REV. 0

FORM CADD NO. TtNUS_BH.DGN - REV 0 - 1/20/98

ACAD: 7856GM13.dwg 05/03/99 MF




NOTE:
1. BASE MAP AND UTILITY INFORMATION FROM MAPS OF NSB-NLON AND PHASE II RI WORK PLAN (ATLANTIC, MAY 1993).
2. 2WMW2S WAS NOT COMPLETED DUE TO A LACK OF GROUNDWATER. A SOIL SAMPLE WAS COLLECTED FROM THIS LOCATION.

LEGEND

- 2WMW5S — PHASE I MONITORING WELL
- 2WMW5D — PHASE II MONITORING WELL
- 2WTB3 — PHASE I TEST BORING
- SG-6 — PHASE II STAFF GAUGE
- 2WSW1 — PHASE II SURFACE WATER SAMPLE
- 10 — EXISTING CONTOUR
- 123 — BUILDING No.
- WATERCOURSE
- STM — STORM SEWER AND CATCH BASIN
- EXPOSED BEDROCK
- FENCE

0 250 500
SCALE IN FEET

| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY HJP DATE 10/29/98
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

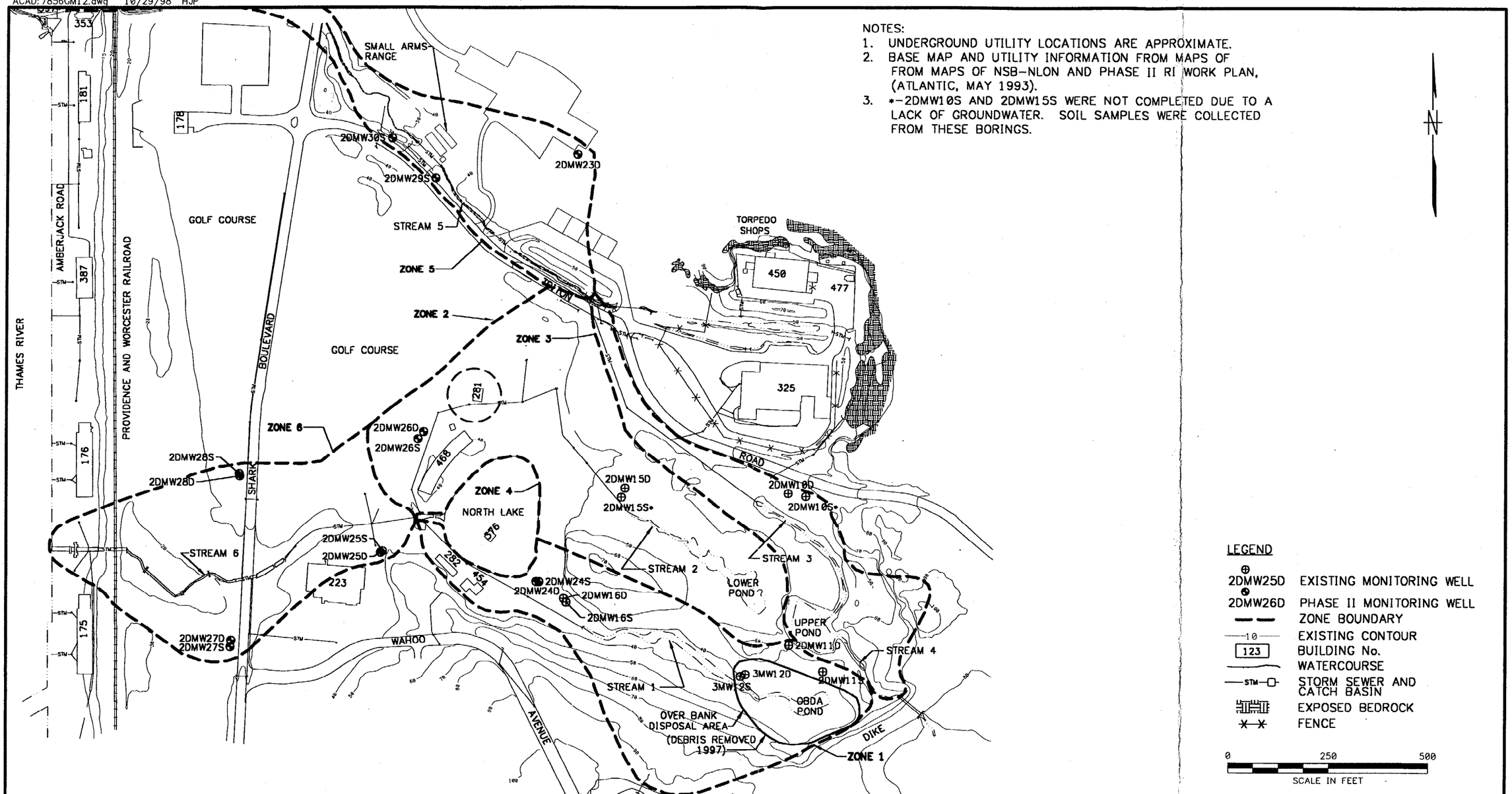
Tetra Tech NUS, Inc.

SITE MAP
SITE 2- AREA A WETLAND
NSB-NLON, GROTON, CONNECTICUT

CONTRACT NO. 7856
OWNER NO. 312
APPROVED BY Larry A. Rich DATE 5/10/99
APPROVED BY DATE
DRAWING NO. FIGURE 2-3
REV. 0

FORM CADD NO. TINUS_BH.DGN – REV 0 – 1/20/98

ACAD: 7856GM12.dwg 10/29/98 HJP




| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY HJP DATE 10/29/98
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

SITE 3-SITE MAP
AREA A DOWNSTREAM WATERCOURSES/OBDA
NSB-NLON, GROTON, CONNECTICUT

CONTRACT NO. 7856
OWNER NO. 312
APPROVED BY DATE 11/5/98
APPROVED BY DATE
DRAWING NO. FIGURE 2-4
REV. 0

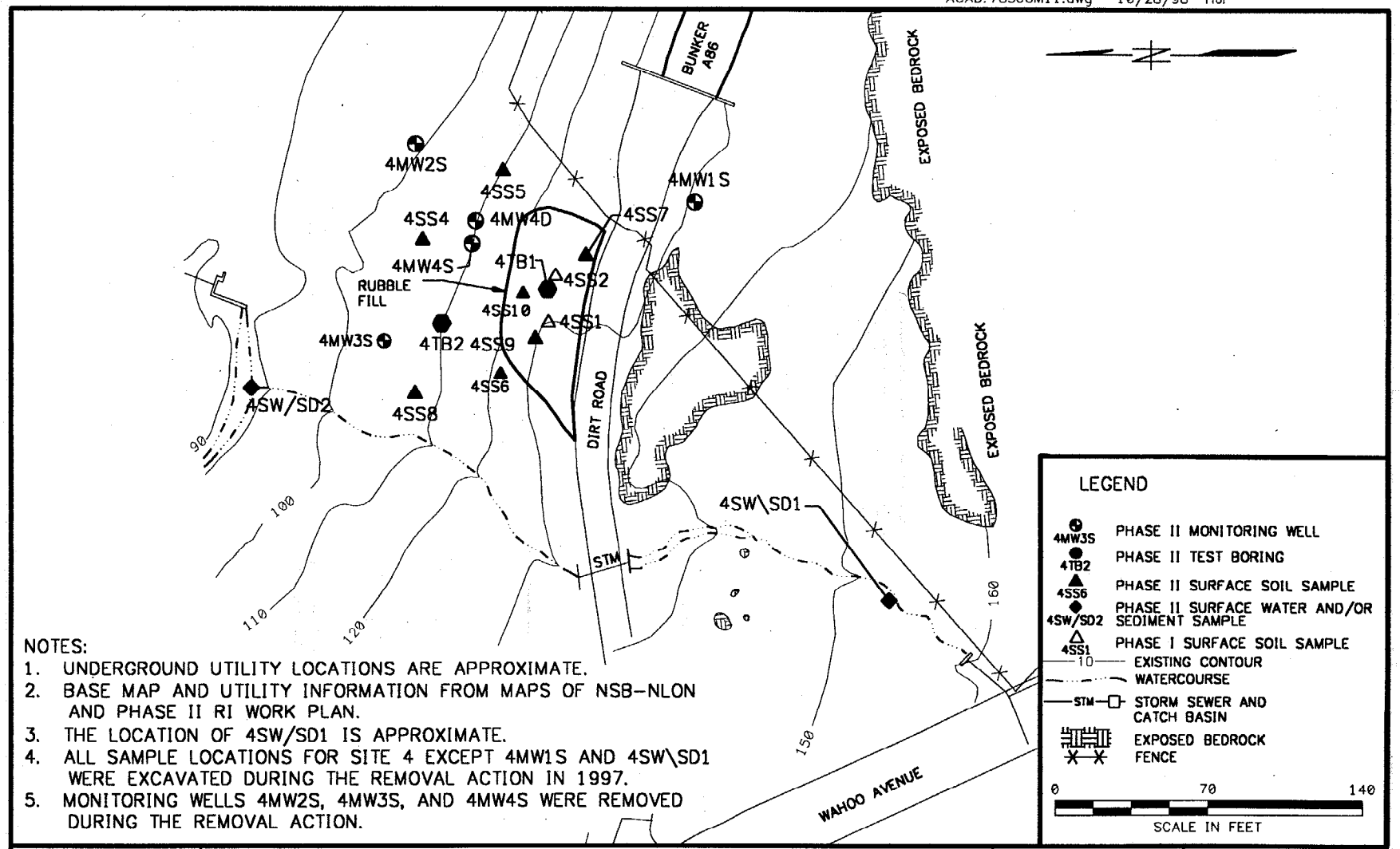
FORM CADD NO. TINUS_8H.DGN - REV 0 - 1/20/98

119802/P



01639052 CTO 0312

ACAD: 7856GM11.dwg 10/28/98 HJP

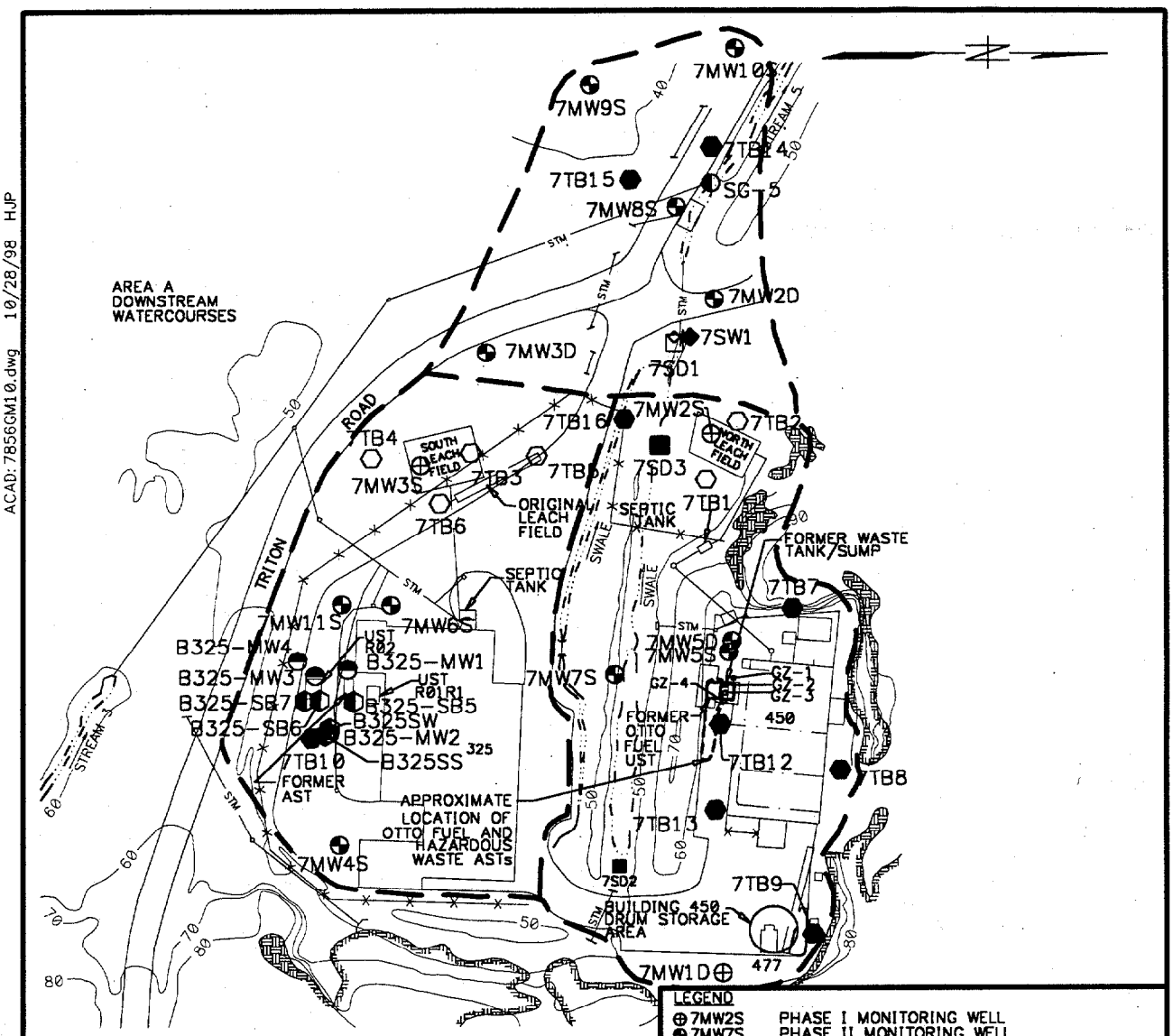



NOTES:
1. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE.
2. BASE MAP AND UTILITY INFORMATION FROM MAPS OF NSB-NLON AND PHASE II RI WORK PLAN.
3. THE LOCATION OF 4SW/SD1 IS APPROXIMATE.
4. ALL SAMPLE LOCATIONS FOR SITE 4 EXCEPT 4MW1S AND 4SW\SD1 WERE EXCAVATED DURING THE REMOVAL ACTION IN 1997.
5. MONITORING WELLS 4MW2S, 4MW3S, AND 4MW4S WERE REMOVED DURING THE REMOVAL ACTION.

| | | | |
|---|---|---|---|
| DRAWN BY HJP DATE 10/28/98 | Tetra Tech NUS, Inc. | CONTRACT NO. 7856 | OWNER NO. 312 |
| CHECKED BY DATE | SITE MAP<br>SITE 4-RUBBLE FILL AREA<br>AT BUNKER A86<br>NSB-NLON, GROTON, CONNECTICUT | APPROVED BY [signature] DATE 11/5/98 | |
| COST/SCHED-AREA | | APPROVED BY DATE | |
| SCALE AS NOTED | | DRAWING NO. FIGURE 2-5 | REV. 0 |

FORM CADD NO. TtNUS_AH.DWG - REV 0 - 1/22/98

ACAD: 7856GM10.dwg 10/28/98 HJP




NOTES:

1. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE.
2. BASE MAP AND UTILITY INFORMATION FROM MAPS OF NSB-NLON AND PHASE II RI WORK PLAN.
3. B325SS IS A CONFIRMATION SOIL(S) SAMPLE COLLECTED FROM THE SOUTH(S) END OF THE EXCAVATION.
4. B325SW IS A CONFIRMATION SOIL(S) SAMPLE COLLECTED FROM THE WEST(W) END OF THE EXCAVATION.

0 150 300
SCALE IN FEET

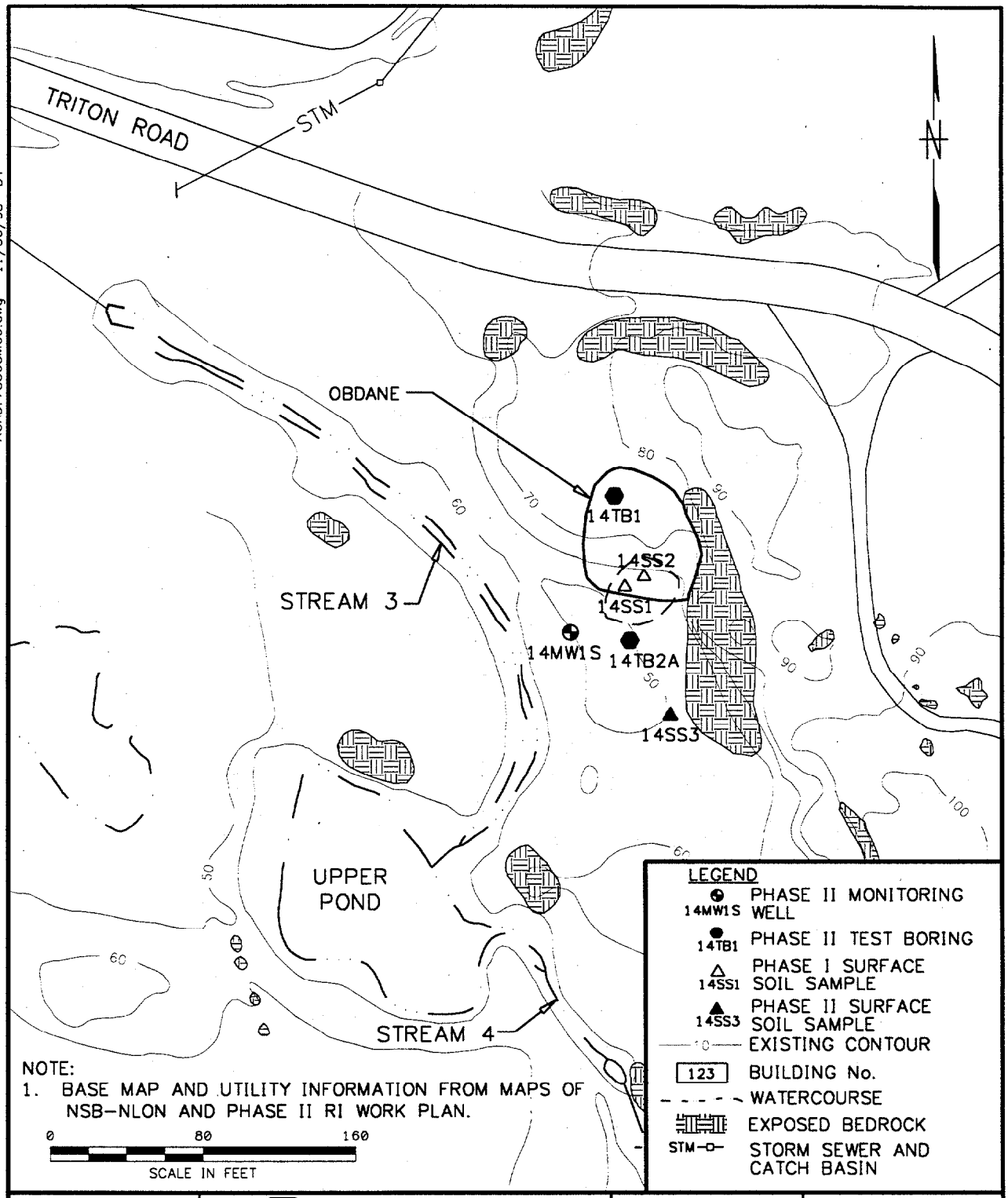
LEGEND

| | |
|---|---|
| 7MW2S | PHASE I MONITORING WELL |
| 7MW7S | PHASE II MONITORING WELL |
| B325-MW1 | SITE CHARACTERIZATION MONITORING WELL |
| 7TB1 | PHASE I TEST BORING |
| 7TB12 | PHASE II TEST BORING |
| B325-SB6 | SITE CHARACTERIZATION SOIL BORING |
| 7SW1 | PHASE I EXISTING SURFACE WATER SAMPLE |
| 7SW1 | PHASE II SURFACE WATER SAMPLE |
| 7SD1 | PHASE I SEDIMENT SAMPLE |
| 7SD3 | PHASE II SEDIMENT SAMPLE |
| SG-5 | PHASE II STAFF GAUGE |
| 10 | EXISTING CONTOUR |
| 123 | BUILDING No. |
| | WATERCOURSE |
| STM | STORM SEWER AND CATCH BASIN |
| | EXPOSED BEDROCK |
| | FENCE |
| | ZONE BOUNDARY |

| | | | |
|---|---|---|---|
| DRAWN BY HJP DATE 10/28/98 | Tetra Tech NUS, Inc. | CONTRACT NO. 7856 | OWNER NO. 312 |
| CHECKED BY DATE | SITE MAP<br>SITE 7-TORPEDO SHOPS<br>NSB-NLON, GROTON, CONNECTICUT | APPROVED BY DATE 11/5/98 | |
| COST/SCHED-AREA | | APPROVED BY DATE | |
| SCALE AS NOTED | | DRAWING NO. FIGURE 2-6 | REV. 0 |

FORM CADD NO. TtNUS_AV.DWG - REV 0 - 1/22/98

ACAD: 7856GM09.dwg 11/30/98 DT

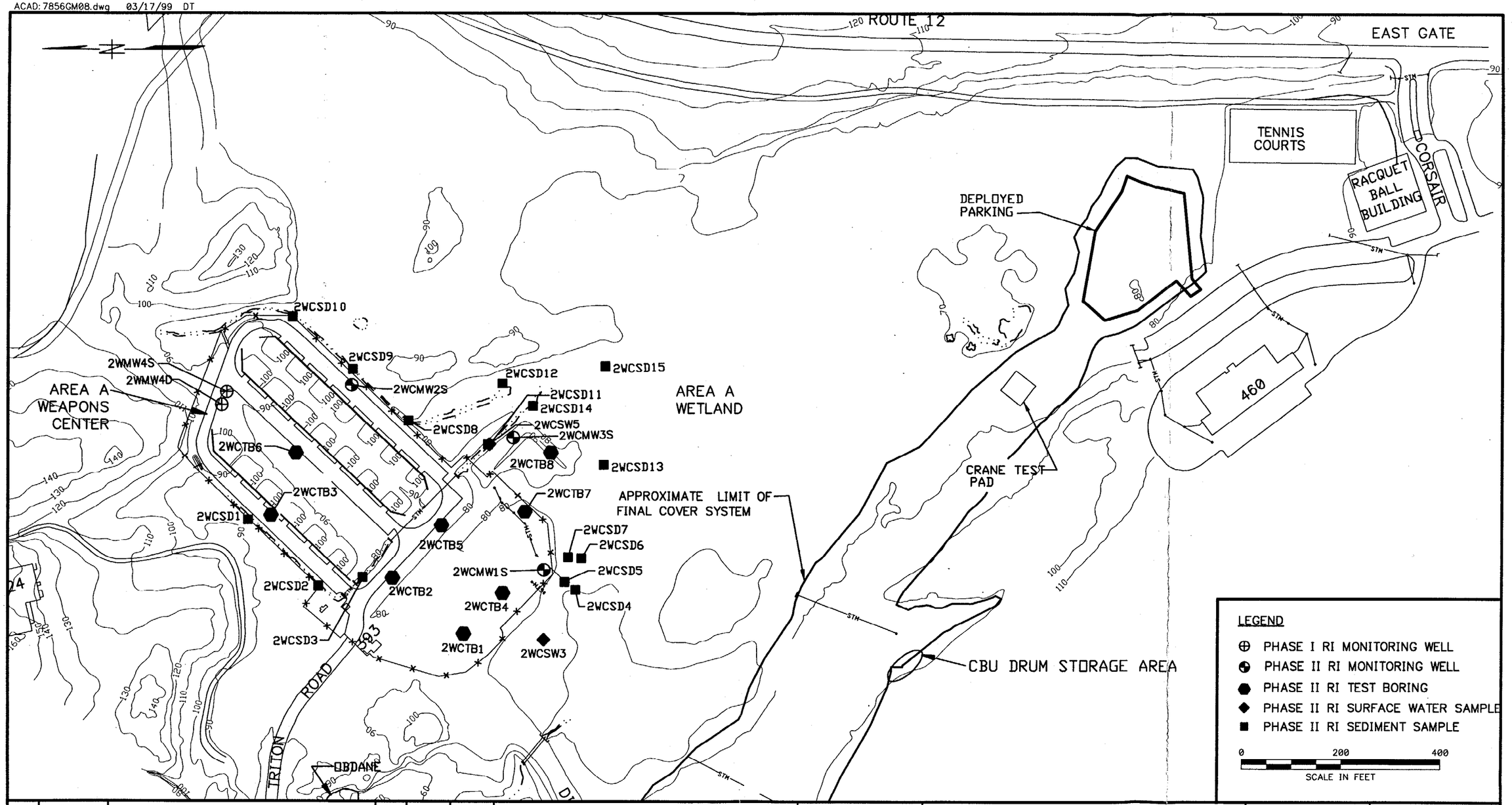



| | | | |
|---|---|---|---|
| DRAWN BY HJP DATE 10/28/98 | Tetra Tech NUS, Inc. | CONTRACT NO. 7856 | OWNER NO. 312 |
| CHECKED BY DATE | SITE MAP<br>SITE 14—OBDANE<br>NSB—NLON, GROTON, CONNECTICUT | APPROVED BY Corey A. Rice DATE 12/9/98 | |
| COST/SCHED-AREA | | APPROVED BY DATE | |
| SCALE AS NOTED | | DRAWING NO. FIGURE 2-7 | REV. 0 |

FORM CADD NO. TtNUS_AV.DWG — REV 0 — 1/22/98

This page intentionally left blank.

ACAD: 7856GM08.dwg 03/17/99 DT




| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY HJP DATE 10/28/98
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

SITE MAP
SITE 20-AREA A WEAPONS CENTER
NSB-NLON, GROTON, CONNECTICUT

CONTRACT NO. 7856
OWNER NO. 312
APPROVED BY Cory A. Pel DATE 5/10/99
APPROVED BY DATE
DRAWING NO. FIGURE 2-8
REV. 0

FORM CADD NO. T+NUS_BH.DGN - REV 0 - 1/20/98



01639062

# 3.0 CENTRAL REGION OF NSB-NLON

The boundaries of the central region are shown on Drawing 2. As discussed in Section 1.0, the boundaries were chosen using existing topographic and hydrogeologic information. Site 16 is the only IRP site located within the central region of NSB-NLON. Existing information for the site is summarized in the following sections.

## 3.1 SITE 16 – HOSPITAL INCINERATOR

### 3.1.1 Site Description

Site 16 consists of the hospital incinerator. In the 1980s, the Naval Hospital Groton operated a skid-mounted waste incinerator at two sites adjacent to the hospital. The two sites are located west of Tautog Road, adjacent to Building 449 and Building 452. The sites are shown on Figure 3-1 and Drawing 1.

According to the FFA, the incinerator was used to destroy medical records and medical waste contaminated with pathological agents. Ash generated by the waste incinerator was transferred to dumpsters for disposal at the municipal landfill.

### 3.1.2 Site Investigations

Site 16 was evaluated during the IAS for NSB-NLON that was conducted in March 1983. No sampling activities were conducted as part of the study. The study's recommendation for this site was to not pursue further investigation of the site because, at the time of the IAS study, the site was still operational. As a result of this, no investigation of Site 16 was conducted during either the Phase I or Phase II RIs. The Navy has subsequently ceased operation of the incinerators at the hospital.

### 3.1.3 Physical Characteristics

This section presents a summary of physical characteristics for the Hospital Incinerator site, based on information taken from the FFA, Phase II RI, and literature sources. Topography and surface features, surface water, soils, geology, and hydrogeology are discussed in the following subsections.

#### 3.1.3.1 Surrounding Topography and Surface Features

The skid-mounted incinerator was operated in two areas, one adjacent to Building 449 and the other adjacent to Building 452. Based on mapping provided in the FFA, it appears that these two areas are within or directly adjacent to parking lots.

The hospital complex is located on the top of the bedrock hill located in the central portion of NSB-NLON. Surface topography for this site is shown on Drawing 2. Maximum elevations in this area exceed 200 feet above msl. The topography in this area indicates that surface water would flow toward the west and ultimately discharge into the Thames River.

#### 3.1.3.2 Surface Water

Surface water runoff from the hospital parking lot is collected by a storm sewer system. The surface water is discharged to drainage swales outside of the parking lot.

#### 3.1.3.3 Soil Characteristics

The SCS Soils Map (SCS, 1983) classifies the soil around the hospital complex as urban land. Bedrock exposures (Hollis-Charlton-Rock outcrop complex) are prevalent because the central bedrock high extends toward the south and west. The soils overlying the bedrock range from very stony fine sandy loam to gravelly loam.

#### 3.1.3.4 Geology and Hydrogeology

Geology

No geologic investigations have been conducted at this site to date.

Hydrogeology

The inferred bedrock groundwater potentiometric surface in the vicinity of the hospital is shown on Drawing 4. The drawing shows that groundwater flows in a southwestward direction toward the Lower Subase and the Thames River. Fractures may be present in the bedrock underlying the site that would also influence the direction of groundwater flow from the site.

### 3.1.4 Nature and Extent of Contamination

No analytical data are currently available for Site 16; therefore, the nature and extent of contamination is unknown.

### 3.1.5 Data Evaluation

No analytical data are currently available for Site 16; therefore, no evaluation was completed for the site.

### 3.1.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Site 16 using the decision tree approach is as follows:

- There are no existing data for this site. Information describing the site, the incinerator, and physical characteristics of the site are necessary for the evaluation of Site 16.

- Because there is no data available for this site, it is unknown whether it poses a threat to public health or the environment.

- Data are required to determine the nature and extent of contamination, contaminant fate, and human health risks for the site.

- Further action is required for Site 16 and is discussed in Section 3.1.7.

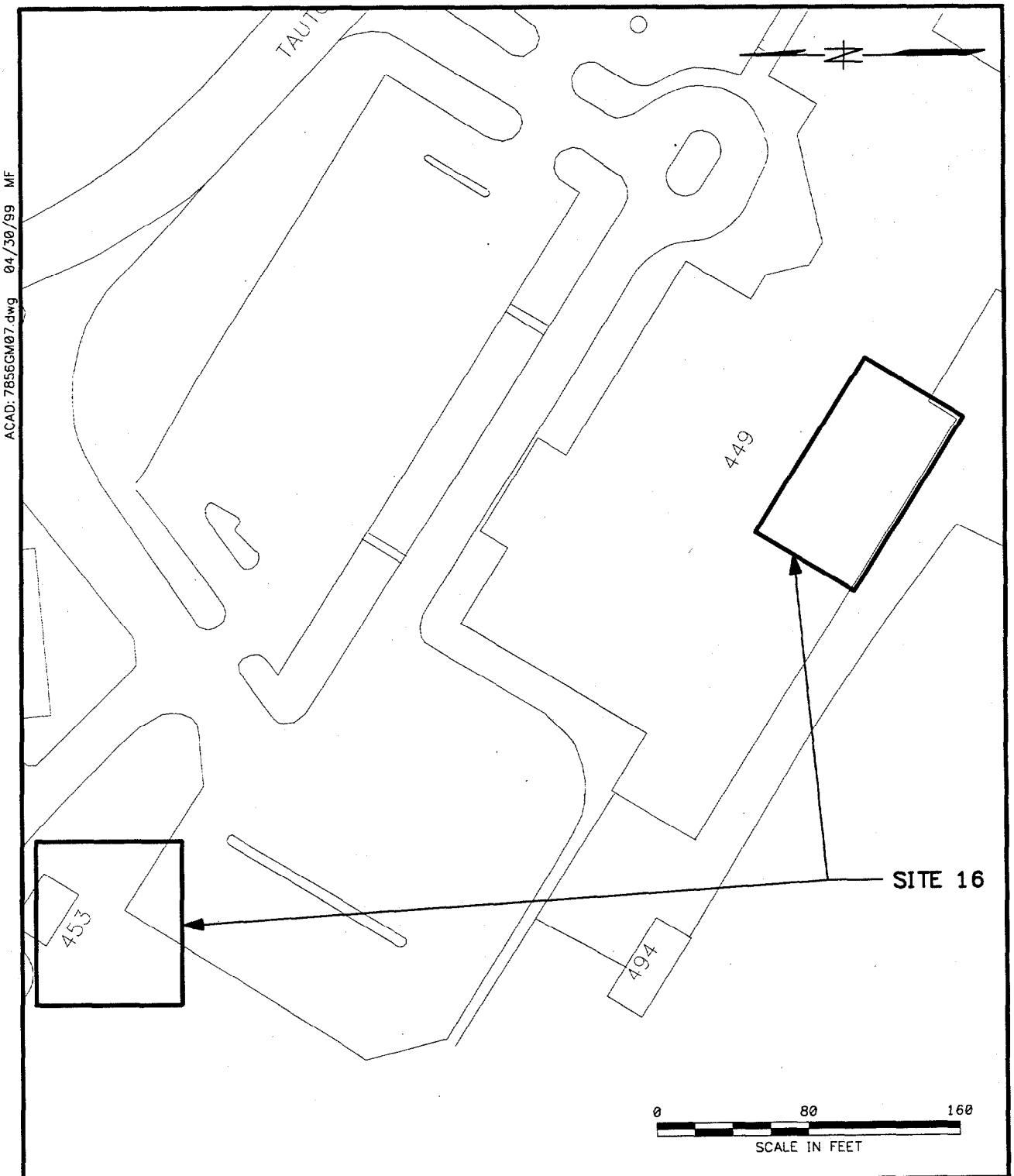
### 3.1.7 Recommendations

An investigation of Site 16 has not been conducted. The following tasks must be completed to provide a basic understanding of the site: collect and review historical information (i.e., operating parameters of the incinerator and a summary of the waste incinerated), conduct interviews with base personnel, and conduct a site visit. This information is necessary to determine potential contaminants and media of concern.

After review and evaluation of the background information have been completed, a sampling and analysis program can be developed. It is likely that soil, groundwater, and sediments associated with drainage structures will be sampled during the initial sampling activities conducted at the site. The sampling activities should be limited and focused on the locations expected to have the highest level of contamination. The analytical program for this site should include TCL VOCs, TCL SVOCs, TCL Pesticides/PCBs, TAL metals, and dioxins. SPLP extraction followed by analysis for TCL PCBs and TAL metals should also be completed for soil samples. If contaminated media are identified during this initial investigation, further sampling and analysis may be necessary to completely determine the nature and extent of contamination and to obtain sufficient data to perform a risk assessment for the site.

This page intentionally left blank.

ACAD: 7856GM07.dwg 04/30/99 MF




| | | | |
|---|---|---|---|
| DRAWN BY HJP DATE 10/28/98 | Tetra Tech NUS, Inc. | CONTRACT NO. 7856 | OWNER NO. 312 |
| CHECKED BY DATE | SITE MAP<br>SITE 16–HOSPITAL INCINERATORS<br>NSB–NLON, GROTON, CONNECTICUT | APPROVED BY Corey A. Pal | DATE 5/10/99 |
| COST/SCHED–AREA | | APPROVED BY | DATE |
| SCALE AS NOTED | | DRAWING NO. FIGURE 3–1 | REV. 0 |

FORM CADD NO. TtNUS_AV.DWG - REV 0 - 1/22/98

# 4.0 SOUTHERN REGION OF NSB-NLON

The Southern Region extends southward from the southern boundary of the Central Region. The Southern Region is bordered by Highway 12 to the east, Crystal Lake Road and Goss Cove to the south, and the Thames River or Shark Boulevard to the west (see Drawing 2). The following sites are located within the Southern Region:

- Site 8 – Goss Cove Landfill
- Site 12 – NEX Gas Station
- Site 15 – Spent Acid Storage and Disposal Area
- Site 18 – Solvent Storage Area
- Site 23 – Tank Farm (including Site 9 – OT-5 Waste Water Tank)

The existing data for each of these sites are summarized and evaluated in the following sections.

## 4.1 SITE 8 – GOSS COVE LANDFILL

### 4.1.1 Site Description

The Goss Cove Landfill is located in the southwestern portion of NSB-NLON, adjacent to the Thames River. It is west of Shark Boulevard and the intersection of Crystal Lake Road and Military Highway, east of the Thames River and north of Goss Cove. The site location is depicted on Drawing 1. Figure 4-1 displays the general site arrangement and historical sampling locations. The Nautilus Museum and a paved parking lot are constructed directly over the site of the former landfill. The Nautilus Museum is a submarine museum operated by the Navy that is open to the public.

The IAS report indicated that a landfill was operated at this site from 1946 through 1957. Incinerator ash and inert rubble were disposed at the site, in what was then the northern portion of Goss Cove. It is not known if any other materials were disposed in the former landfill. It has been reported that several large compressed gas cylinders were uncovered during the excavation of a utility trench in the parking area north of the Nautilus Museum building. One of the cylinders was leaking propane, one was filled with ammonia, and the others were empty.

Atlantic personnel reviewed archive photographs for the Goss Cove area available at the Connecticut State Library. In a 1934 aerial photograph, the limits of Goss Cove appeared to be open water with no evidence of fill. Railroad tracks are shown at their present position between the cove and the Thames River. In 1951 aerial photographs, the fill extended southward to approximately the location of an access

driveway to the museum. The 1965 aerial photographs show the landfill extending to the present limit of encroachment on Goss Cove. Aerial photographs from 1965, 1970, 1975, and 1980 show cars parked on the landfill surface. In 1986 photographs, the Nautilus Museum is present on the southern limits of the landfill and a paved parking area extends over the remaining limit of the landfill to the north. Construction of the Nautilus Museum was completed in 1985.

Atlantic personnel reviewed boring logs generated during the construction of the Nautilus Museum. The boring logs indicated the presence of fill material consisting of cinders, metal, brick, glass, and sand and gravel to a depth of 15 feet. Beneath the fill is a layer of organic silt approximately 10 to 15 feet thick. This material is presumably the sediment bottom of the former cove. The silt is underlain by fine sand to depths ranging from 25 to 100 feet below the surface. The thickness of overburden increases from east to west, toward the river.

### 4.1.2 Site Investigations

The following investigations have been completed at Goss Cove and are discussed in the subsections that follow:

- Phase I RI (Atlantic, 1992)
- Phase II RI (B&R Environmental, 1997a)
- Data Gap Investigation Report (B&R Environmental, 1997d)
- Wetlands Function and Values Assessment (TtNUS, 1998)
- Phase I/II Environmental Site Assessment Report for Fusconi Dry Cleaners (CTDEP, 1999)
- Evaluation of Chemical and Toxicological Data for Goss Cove (SAIC, 1999)

#### 4.1.2.1 Phase I Remedial Investigation

An investigation of 11 sites was completed at NSB-NLON by Atlantic Environmental Services, Inc. from 1990 through 1992. Atlantic investigated seven of the 11 sites as Initial Site Inspections (ISIs) and four sites under a Phase I RI. The investigation at Goss Cove Landfill was an ISI.

The Phase I RI field investigation at this site consisted of a soil gas survey, test borings, monitoring well installation, and soil, surface water, and groundwater sampling. A soil gas survey was conducted in an attempt to locate potential sources of volatile organic contamination. Seven subsurface (3 feet deep) soil samples plus one field duplicate were collected from three test borings and four monitoring well borings to confirm the soil gas survey results. The soil borings showed the thickness of fill to range from 10 to 20 feet. Fill materials consist of sand and gravel with small quantities of brick, glass, sandblast grit, ash, wood, and metal. All soil samples were collected from within the landfill material, generally at or below

the water table. Four overburden monitoring wells were installed within the former landfill and one groundwater sample was obtained from each well. One surface water sample was collected in the Thames River downstream of the landfill.

As a result of the investigation of this site, Atlantic recommended that this site proceed to Step I of the IRP and additional investigations be conducted at the site.

#### 4.1.2.2 Phase II Remedial Investigation

B&R Environmental conducted a Phase II RI at 13 sites at NSB-NLON. The Goss Cove Landfill was one of the sites included in the investigation. Five surface (less than 3 feet deep) and four subsurface (greater than 3 feet deep) soil samples were collected during the installation of six monitoring wells during Round 1 of the Phase II RI. In addition, four surface and 11 subsurface soil samples plus two field duplicates were collected from 12 test borings during the Round 1 sampling event. Three supplemental surface soil samples plus a field duplicate were collected during the Round 3 sampling event. Three shallow and four deep monitoring wells were also installed during the Phase II RI. Eleven groundwater samples (plus two field duplicates) were collected from the seven new and four previously installed monitoring wells during both Rounds 1 and 2.

Surface water and sediment sampling during the Phase II RI focused on Goss Cove. Five surface water samples (plus one field duplicate) and five sediment samples (plus one field duplicate) were collected from the perimeter of the cove. One additional sediment sample was collected from Goss Cove during the supplemental ecological sampling round of the Phase II RI.

Three rounds of air sampling were performed during the Phase II RI. Air samples were collected from three locations in or near the Nautilus Museum during Round 1; these locations included the ledge above the sump in the boiler room of the museum (8AS1), the museum floor on top of the USS Plunger showcase (8AS2), and the top of the rail on the deck outside the museum (8AS3). Samples were collected from these same three locations during Round 2. A fourth location, the pipe chase area beneath the western end of the museum that leads to the docked Nautilus submarine, was also sampled during Round 2 (8AS4). Samples collected during Rounds 1 and 2 were analyzed for TCL VOCs using EPA methodology (Method TO-1).

A confirmatory third round of air sampling was performed using sampling and analysis methods specified by the National Institute for Occupational Safety and Health (NIOSH) since it had been determined that these methods may be more appropriate in evaluating the air at the museum. Four air samples plus one field duplicate were collected from the same four locations used for air sampling during Round 2. Three tubes were used for sample collection at each location; these included two tubes in series (T1 and T2),

which were filled with coconut charcoal, and a third tube (T3) filled with Anasorb. Tubes T1 and T2 were used for the analysis of acetone, toluene, ethylbenzene, methyl chloride, methylene chloride, and 1,1,1-trichloroethane. Tube T3 was used for the analysis of 2-butanone. Most of these compounds were previously detected in sample Rounds 1 and 2, which served as the basis for selection and analysis during sample Round 3.

The Navy initiated additional sampling at the Goss Cove Landfill and Nautilus Memorial Museum (Site 8) because of public concern for the possible unacceptable risks at the site reported in the Draft Phase II RI report. The additional sampling was conducted by B&R Environmental in July 1995 and consisted of the collection of four soil samples and two rounds of air sampling within and outside the museum. The letter report concluded that no unacceptable risks associated with exposure to the air or soil at Goss Cove exist.

The Phase II RI report recommended that a FS of remedial alternatives be conducted at the Goss Cove Landfill site. The report indicated that a phased approach should be used to proceed to the FS. The report indicated that sufficient data had been collected for the sediment and surface water media and a FS could be completed for these media. Additional investigation of the soil and groundwater was recommended to verify the source and extent of the PCE contamination detected in the upgradient wells. It was recommended that groundwater be evaluated separately in a base-wide groundwater FS.

#### 4.1.2.3 Data Gap Investigation

B&R Environmental conducted a data gap investigation at the Goss Cove Landfill to address the source of chlorinated VOC contamination detected in the groundwater of upgradient wells at the site. Borings and wells were installed and soil and groundwater samples were collected during the investigation. The results of the investigation concluded that chlorinated compounds are migrating onto the site from an upgradient off-site source. The report recommended that further groundwater characterization be completed to address the contaminant source. The report also recommended that the upcoming FS for the Goss Cove Landfill should be prepared separately from the ongoing upgradient groundwater characterization activities.

#### 4.1.2.4 Wetlands Function and Values Assessment

A Wetlands Function and Values Assessment was completed by Connecticut College for TtNUS in July 1998 to evaluate if the ecological stress in the Goss Cove water body was a result of natural conditions or due to contaminant migration from other NSB-NLON sites. This study evaluated the marginal cove vegetation in terms of its ecological functions and values and identified the wetland species associated with the fringing belt. A detailed vegetation inventory of the taxa which included an inventory of all

species of vascular plants present above mean high tide and an examination of the biota associated with the intertidal zone was undertaken.

No discrete wetland plant communities were identified. A few wetland species were found. The results of this assessment concluded that the contrast between the Thames River and cove side is dramatic due to the lack of tidal flushing. Although the tidal range is reflected within the cove, it does not appear adequate to aid in supporting a rich viable intertidal algal population and invertebrate biota. This may be related to water quality since it appears that estuarine organisms can and have become established in the cove in the past but fail to thrive. Although there are tidal fluctuations, the absence of regular tidal flushing may concentrate any constituents that may be present.

#### 4.1.2.5 Phase I/II Environmental Site Assessment of Fusconi Dry Cleaners

The CTDEP conducted a Phase I/II Environmental Site Assessment of Fusconi Dry Cleaners in July and August of 1998. The dry cleaner is located east and upgradient of the Goss Cove Landfill site on the corner of Crystal Lake Road and Military Highway. The dry cleaner has operated at this location for approximately 50 years. The dry cleaner uses tetrachloroethene in their cleaning process. Tetrachloroethene has been detected in the groundwater at the Goss Cove Landfill. The purpose of the investigation was to assess the dry cleaner's operation and to determine if a release of tetrachloroethene has occurred onsite.

The assessment involved interviewing the operator of the dry cleaner and collecting media-specific samples. The interview revealed that historically it was common practice to dump spent (i.e., used) tetrachloroethene out the back door of the facility on to the ground. The dry cleaner now retains the services of Safety Kleen to dispose of spent filters and product. It was also determined that the building was historically hooked up to a septic system and leachfield but currently utilizes municipal sewer.

Thirteen soil samples, two groundwater samples, and one aqueous drum sample were collected by the CTDEP during the investigation. The samples were obtained and collected utilizing a Geoprobe®/microwell system. The samples were analyzed for VOCs. Tetrachloroethene was detected in each of the media sampled in nearly all of the samples. Several other VOCs were also detected.

The results of the investigation conclusively showed that a release of tetrachloroethene occurred at the site. This suggests that the dry cleaner is the source of the tetrachloroethene that was detected in the downgradient groundwater at the Goss Cove Landfill. Fusconi Dry Cleaners has procured a consultant to help them address their environmental concerns. They voluntarily removed the drum and completed a soil removal action in the vicinity of the drum. The consultant will also perform further investigations to

determine the nature and extent of the contamination, and produce a remedial action plan to address site issues.

#### 4.1.2.6 Evaluation of Chemical and Toxicological Data for Goss Cove

The purpose of this study, conducted by Science Applications International Corporation (SAIC) in 1998, was to provide the necessary information to reach conclusions regarding the degree and extent of ecological risk posed by chemical contamination for Goss Cove. The objectives of the study were to establish toxicological response relationships to contaminants in Goss Cove sediments, to describe the extent of ecological risks associated with chemical contaminants in Goss Cove sediments, and to identify risks for biological effects. Based on data needs, 10 stations were sampled for chemical, toxicological, and Toxicity Identification Evaluation (TIE). The TIE involves chemical manipulation of the sediment to separate contaminant classes. The TIE employed three manipulations, including C18 column extraction, EDTA chelation, and an aeration/ULVA treatment. These three steps remove organic compounds, metals, and hydrogen sulfide/ammonia, respectively.

The results of the study clearly support the conclusion that a complete pathway does not exist between site-specific contaminants and observed ecological effects. The likely source of toxicity in one of two species where toxicity was observed was ammonia from natural sources. It may be possible to improve benthic habitat quality by reducing the hypoxic conditions in the cove, thereby reducing the ammonia concentrations which appear to be the cause of the depauperate aquatic community.

### 4.1.3 Physical Characteristics

This section presents a summary of physical characteristics for the Goss Cove Landfill based on information generated during the Phase I and Phase II RIs. Topography and surface features, surface water, soils, geology, and hydrogeology are discussed in the following subsections.

#### 4.1.3.1 Surrounding Topography and Surface Features

Drawing 2 shows the topography and surface features at the Goss Cove Landfill. An exposed bedrock high is located along the northeastern edge of the landfill. In the most northern portion of the landfill, the ground surface has an approximate slope along the bedrock ridge of 50 percent. The slope of the hill is steeper in the central part of the landfill. The ground surface across the remainder of the site slopes mildly toward the Thames River.

The Nautilus Museum and a paved parking lot are constructed directly over the site of the former landfill. Railroad tracks are located between the site and the Thames River. Remaining portions of the site are grass covered.

#### 4.1.3.2 Surface Water Features

The Goss Cove Landfill is located along the eastern bank of the Thames River. Goss Cove borders the site to the south. Several storm sewer systems transect the site, running east-west, and discharge to the Thames River. All drainage from the site flows west and southwest to the Thames River and Goss Cove.

#### 4.1.3.3 Soil Characteristics

The SCS Soils Map (SCS, 1983) classifies the soil at the Goss Cove Landfill as Rock Outcrop-Hollis. This soil is defined as rock outcrop covered by Hollis soil and Urban land. The bedrock outcrop occurs along the northeastern border of the site. The overlying Hollis soil is a very dark brown, fine, sandy loam. As a result of landfilling activity, urban land exists across most of the site.

#### 4.1.3.4 Geology and Hydrogeology

Geology

The geology of the Goss Cove Landfill generally consists of alluvial deposits overlying metamorphic bedrock. Fill overlies the natural geologic materials within the landfill area. A bedrock hill at the site rises toward the northeast and a cove borders the site to the south. The site contains fill materials (primarily sand and gravel with miscellaneous rubble) that slightly thicken as the bedrock surface slopes to the southwest toward the Thames River.

Across most of the landfill, the overburden immediately beneath the fill consists of clayey silt that thickens toward the southwest. Beneath the clayey silt, or beneath the fill where the clayey silt is not present, the overburden consists of irregular thicknesses of fine to medium sand with intervals that contain gravel and rock fragments. The natural materials are mapped as stratified drift of glacial outwash streams (USGS, 1960) but may also be modern-day stream deposits.

The bedrock at the 8MW8 well cluster has been identified as the Mamacoke Formation. The bedrock surface was identified only in the northern outcrop area and at 8MW8D at an elevation of 7.8 feet. Although the bedrock surface was not encountered at 8MW2D and 8MW6D, the depths of the borings indicate that the bedrock surface elevation at these locations is lower than 50 and 60 feet below msl, respectively.

Hydrogeology

Groundwater is found within both the overburden and bedrock. The depth to groundwater averages about 7 feet, and the water table extends up into the landfill materials over most of the site. Drawing 3 shows shallow overburden groundwater contours for the Goss Cove Landfill. Groundwater flows west and southwest through the Goss Cove area toward the Thames River. There is a downward component of flow from the overburden to the bedrock at the 8MW8 well cluster. There was also a downward component of flow from the shallow to the deeper overburden for two of the three comprehensive water-level measurement rounds at the 8MW2 and 8MW6 well clusters. Based on tidal studies performed at the Lower Subase, it is expected that shallow overburden groundwater levels will fluctuate with the tide over most of the area of the Goss Cove Landfill.

Slug tests were performed at the 8MW2S and 8MW2D wells during the Phase II RI. The estimated hydraulic conductivities based on these slug tests are 3.9 feet/day (1.4E-3 cm/sec) at 8MW2S and 0.4 feet/day (1.4E-4 cm/sec) at 8MW2D. 8MW2S is completed in landfill materials, and 8MW2D is completed in fine to medium-grained sandy alluvium.

An average hydraulic conductivity for the shallow overburden (43 feet/day) at the site was estimated by taking the geometric mean of Goss Cove-specific hydraulic conductivities (Phase I and Phase II RI) from wells completed within 20 feet of the ground surface. Hydraulic conductivities from overburden wells 8MW1 (109 ft/day), 8MW2S (3.9 ft/day), 8MW3 (101 ft/day), and 8MW4 (78 feet/day) were used to estimate the geometric mean. Hydraulic conductivities were estimated at these wells using slug test results. An average hydraulic gradient (0.012) was calculated using groundwater level measurements taken on August 23 and 24, 1994.

### 4.1.4 Nature and Extent of Contamination

Soil, overburden groundwater, and bedrock groundwater sampling was conducted at the Goss Cove Landfill during the Phase I and Phase II RIs and the Data Gap Investigation. Based upon the results of these investigations, the nature and extent of contamination of the soil and groundwater at the Goss Cove Landfill are discussed on a matrix-specific basis in the following subsections. The complete analytical database for soil and groundwater is contained in Appendix A.

#### 4.1.4.1 Soil

Table 4-1 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location

associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in soil samples collected from the Goss Cove Landfill. Table 4-2 presents similar information for TCLP results. Based upon the screening level assessment for the Goss Cove Landfill (Section 4.1.5.3) and the procedures for the preparation of soil tag maps (Section 1.4.3.1), analytical results for primary COPCs in Goss Cove Landfill soil samples and associated TCLP leachates are presented on Drawing 12 (Volume II).

As shown on Table 4-1, several VOCs, including three ketones, five monocyclic aromatics, five chlorinated aliphatics, and carbon disulfide were detected in the Goss Cove Landfill soil samples. With the exception of acetone, 2-butanone, ethylbenzene, PCE, toluene, and total xylenes, VOCs were infrequently detected (i.e., in from one to four of 39 samples) in soil samples. Acetone and 2-butanone, which are both common laboratory contaminants, were detected at concentrations ranging from 0.053 mg/kg to 23 mg/kg and from 0.028 mg/kg to 0.12 mg/kg, respectively.

Two of the five detected monocyclic aromatic compounds were present at relatively high concentrations in the soil sample collected from a depth interval of 10 to 12 feet from boring 8TB8 (ethylbenzene at 69 mg/kg, toluene at 15 mg/kg, and total xylenes at 480 mg/kg), which is located in the central portion of the site. These results indicate the presence of fuel-related contamination. The maximum detection of toluene was found in location 8MW3 at 22 mg/kg. Ethylbenzene, toluene, and total xylenes were also detected at substantially lower concentrations in from 11 to 19 of the other soil samples. PCE was the most frequently detected VOC (15 out of 39 samples). PCE was detected at a maximum concentration of 0.086 mg/kg in boring 8SB10S. Concentrations of VOCs were generally higher in soil samples collected at depths greater than 6 feet.

Thirty-one SVOCs were detected in the Goss Cove Landfill soil samples. As shown on Table 4-1, 16 of these SVOCs were PAHs. Maximum concentrations of eight SVOCs were detected in the soil sample collected from a depth interval of 0 to 2 feet bgs from boring 8MW8S (collected just outside the eastern border of the former landfill). Maximum concentrations of eight more SVOCs were detected in the soil sample collected from a depth interval of 8 to 9 feet bgs from boring 8TB6. PAHs were the most prevalent class of SVOCs and were generally detected at the highest concentrations. PAHs were detected in from 22 to 34 samples out of 34 samples collected, making PAHs the most frequently detected class of SVOCs. Maximum concentrations of PAHs ranged from 7.5 mg/kg [benzo(g,h,i)perylene] to 500 mg/kg (chrysene). 2,4-Dimethylphenol, 2-methylphenol, 3,3'-dichlorobenzidine, 4-methylphenol, benzoic acid, bis(2-ethylhexyl)phthalate, butyl benzyl phthalate, di-n-butyl phthalate, di-n-octyl phthalate, dibenzofuran, diethylphthalate, isophorone, and phenol were also each detected in from one to nine samples.

Seventeen pesticides and three PCBs were detected in the Goss Cove Landfill soil samples. Maximum detected concentrations of five pesticides and two PCBs were found in the soil sample collected at a depth interval of 14 to 16 feet from boring 8TB5. 4,4'-DDT, 4,4'-DDD, and 4,4'-DDE were the most frequently detected pesticides. 4,4'-DDT and its breakdown products were also detected at higher concentrations than other pesticides. The maximum concentrations of the three detected PCBs ranged from 0.5 mg/kg (Aroclor-1260) to 33 mg/kg (Aroclor-1254), and the maximum concentrations of 4,4'-DDT and its breakdown products were 1.2 mg/kg (4,4'-DDE) and 3.4 mg/kg (4,4'-DDT). Endrin, endrin aldehyde, and heptachlor were detected in from 11 to 17 samples collected. The remaining pesticides and PCBs were detected in from one to nine soil samples.

Of the two soil samples collected, OCDD was detected in one sample (8TB5-1416) at a maximum concentration of 0.0028 mg/kg in Goss Cove soil samples.

As shown in Table 4-1, 24 metals were detected in the Goss Cove Landfill soil samples. Fourteen of these metals were detected in 34 out of 34 soil samples. Maximum concentrations of 12 metals were detected in the soil sample collected from a depth interval of 4 to 6 feet but in various different sample locations. Antimony, selenium, and thallium were detected the least frequently, in from two to five soil samples.

TCLP extraction followed by analysis for metals was performed for 17 Goss Cove Landfill soil samples. As shown on Table 4-2, seven metals were detected in TCLP leachates of the soil samples. Barium, cadmium, chromium, and lead were detected in eight or more of the leachates (i.e., in from eight to 17 of the 17 leachates). Maximum concentrations of arsenic, selenium, and silver were detected in from three to four of the 17 leachates. Lead was detected at the highest concentration (4.8 mg/L).

#### 4.1.4.2 Groundwater

Groundwater samples from both overburden and bedrock wells were collected at the Goss Cove Landfill. Well 8MW8S was screened at an interval that spans both the overburden and bedrock aquifers. Groundwater samples collected from this well are considered to be representative of the overburden aquifer for purposes of data evaluation: Table 4-3 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in groundwater samples collected from overburden wells at the Goss Cove Landfill. Table 4-4 presents similar information for groundwater samples collected from bedrock wells at the Goss Cove Landfill. Based upon the screening level assessment for the Goss Cove Landfill (Section 4.1.5.3) and the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary COPCs in Goss Cove Landfill

overburden and bedrock groundwater samples are presented on Drawings 9 and 10, respectively (Volume II).

Overburden Wells

Fifteen VOCs, including four monocyclic aromatics, seven chlorinated aliphatics, three ketones, and carbon disulfide, were detected in the groundwater samples collected from overburden wells. The reported concentrations of most of these VOCs were relatively low, ranging from 1 µg/L to 12 µg/L. However, reported maximum concentrations of the fuel-related monocyclic aromatics (ethylbenzene, toluene, and total xylenes) ranged from 120 µg/L (ethylbenzene) to 610 µg/L (total xylenes). Benzene, ethylbenzene, and total xylenes were the most frequently detected VOCs (detected in from eight to 16 out of 27 groundwater samples). Additionally, the maximum reported concentrations for acetone and 4-methyl-2-pentanone were also relatively high (700 and 200 µg/L, respectively) but these VOCs were only detected in from one to three of 27 samples. PCE was detected in 11 of 27 wells at a maximum concentration of 120 µg/L in well 8MW8S (which is located northwest of the dry cleaners). The maximum concentrations of 1,2-dichloroethene (total), 4-methyl-2-pentanone, acetone, benzene, ethylbenzene, toluene, and total xylenes were associated with groundwater samples collected from well 8MW3S (note that 8MW3S is shown on Figure A-1 as 8MW3). Total xylenes were also detected in the off-site residential wells at a concentration of 2 µg/L.

As shown on Table 4-3, 30 SVOCs were detected in the groundwater samples collected from Goss Cove Landfill overburden wells. Various classes of SVOCs, including substituted phenols, PAHs, and phthalates, as well as benzoic acid, carbazole, dibenzofuran, 4-bromophenyl phenyl ether, and n-nitrosodiphenylamine, were detected. In general, SVOCs were infrequently detected at relatively low concentrations. With the exception of PAHs, 2,4-dimethylphenol, and 2-methylnaphthalene, the remaining SVOCs were detected in from one to eight samples. Concentrations of all but five SVOCs [2,4-dimethylphenol, 2-methylphenol, 4-methylphenol, bis(2-ethylhexyl)phthalate, and naphthalene] ranged from 0.5 µg/L to 26 µg/L. The concentrations of the other five SVOCs ranged from 0.6 µg/L to 500 µg/L. Bis(2-ethylhexyl)phthalate was also detected, at a concentration of 3 µg/L, in one of the off-site residential wells. Maximum concentrations of 19 of the 25 SVOCs were associated with groundwater samples collected from well 8MW3.

Twenty-four metals were detected in the unfiltered groundwater samples collected from the Goss Cove Landfill overburden wells, and 20 metals were detected in the associated filtered groundwater samples. In general, reported concentrations of metals in filtered and unfiltered samples were relatively similar (i.e., at the same order of magnitude). Exceptions to this statement include reported results for copper; the maximum concentration reported for this metal in unfiltered groundwater samples was approximately 80

times larger than the maximum concentration reported for the filtered groundwater samples. As shown on Table 4-3, maximum concentrations of all metals except cadmium in unfiltered samples, copper in filtered samples, mercury in filtered samples, and silver in filtered samples exceeded respective concentrations of these metals detected in unfiltered samples collected from off-site residential wells. A majority of the maximum concentrations were associated with samples collected from well 8MW7S.

Radionuclide analyses (gross alpha and gross beta) were performed for groundwater samples collected from six overburden wells during the Phase I RI. Complete gamma spectrum analysis was performed on three samples and gross alpha and gross beta analyses were performed on seven groundwater samples collected from overburden wells during the Phase II RI. Analytical results for radionuclide analyses are provided in the database tables in Appendix A. Based on the levels of uncertainty reported with the results (i.e., uncertainty levels are greater than results themselves), gross alpha levels in groundwater samples collected from all overburden wells except 8MW1 (Phase I result) and 8MW4 (Phase II Round 2 results) are considered to be not detected. Gross alpha was positively detected at concentrations of 28.9 pCi/L, (Phase I), and 21 pCi/L (Phase II Round 2) in samples from overburden wells 8MW1 and 8MW4, respectively. Gross beta was detected in groundwater samples from Goss Cove Landfill overburden wells at concentrations ranging from 21.7 pCi/L to 170 pCi/L.

The only radionuclide identified by complete gamma spectrum analysis was naturally occurring potassium-40. Based on the levels of uncertainty reported with the results, potassium-40 is considered to be not detected in the groundwater samples collected from well 8MW4 during Rounds 1 and 2 of the Phase II RI. Potassium-40 was positively detected at concentrations of 130 pCi/L and 160 pCi/L in the field duplicate pair collected from well 8MW1 during Round 2 of the Phase II RI.

Analyses for several general chemistry parameters, including ammonia, BOD, COD, hardness, chloride, nitrite, TOC, sulfate, and TSS, were also performed for selected groundwater samples collected from the Goss Cove Landfill overburden wells. Analytical results for these parameters are summarized on Table 4-3.

Bedrock Wells

Seven VOCs, including one monocyclic aromatic, three chlorinated aliphatics, two ketones, and carbon disulfide, were detected in from one to two of the eight groundwater samples collected from Goss Cove Landfill bedrock wells. The only exception was PCE, which was detected in all eight samples collected. Total xylenes was detected at a concentration of 58 µg/L. 1,2-Dichloroethene (total) and TCE were detected at maximum concentrations of 1 and 25 µg/L, respectively. Maximum concentrations of acetone and 2-hexanone were 220 and 49 µg/L, respectively. Concentrations of PCE ranged from 120 to 5,600

µg/L. Maximum concentrations of all the VOCs were found in groundwater samples collected from well 8MW8D. Unlike the groundwater samples collected from the Goss Cove overburden wells, monocyclic aromatics were not detected at significant concentrations in groundwater samples from the Goss Cove Landfill bedrock wells. As previously noted, total xylenes was also detected in the off-site residential wells at a concentration of 2 µg/L, respectively.

Only three SVOCs [benzoic acid, bis(2-ethylhexyl)phthalate, and phenol] were detected in groundwater samples from Goss Cove Landfill bedrock. These compounds were only detected each in one out of two samples collected, with the maxima all occurring in well 8MW8D. The maximum detected concentrations for these SVOCs ranged from 0.8 to 17 µg/L.

Eighteen metals were detected in the unfiltered groundwater samples collected from the Goss Cove Landfill bedrock wells, and 10 metals were detected in the associated filtered groundwater samples. Reported concentrations of metals in filtered and unfiltered samples were relatively similar (i.e., at the same order of magnitude). Exceptions to this statement include reported results for copper and iron; maximum concentrations reported for each of these metals in unfiltered groundwater samples from bedrock wells were from approximately 17 to 190 times the maximum concentrations reported for the respective filtered groundwater samples. Unlike the overburden groundwater samples, the majority of maximum concentrations of the detected metals were below respective concentrations of these metals detected in unfiltered samples collected from off-site residential wells. The only exceptions were aluminum in unfiltered samples, arsenic in unfiltered samples, chromium in unfiltered samples, cobalt in unfiltered samples, magnesium in unfiltered and filtered samples, and vanadium in unfiltered samples. Maximum concentrations of metals detected in groundwater samples from bedrock wells were less than maximum concentrations of respective metals detected in groundwater samples from overburden wells.

Three of the groundwater samples collected from the Goss Cove Landfill bedrock wells were analyzed for chloride, hardness, nitrite, sulfate, and total organic carbon.

### 4.1.5 Data Evaluation

This section summarizes evaluation procedures performed for site data. A discussion of contaminant fate and transport, a summary of the historical human health risk assessment(s) performed for the site, and a screening level assessment of site data are provided in this section.

#### 4.1.5.1 Contaminant Fate and Transport

The analytical results presented in the previous section indicate that the landfill acts as a source of contamination. Various mobile chemicals were found in the deep and shallow soil samples collected

during the Phase II RI field investigation. Many of these chemicals were also detected in the overburden and bedrock groundwater confirming the occurrence of contaminant transport from the site.

VOCs detected in the soil (ketones, halogenated aliphatics, monocyclic aromatics) are relatively mobile and can leach to groundwater via infiltrating precipitation. Less soluble, more persistent chemicals found in the soil consist primarily of phthalate esters, PAHs, and inorganics. Since sorption of these chemicals to soil is strong (as evidenced by high $K_{ocs}$ and/or $K_d$s), they are more likely to be transported via erosional processes than to migrate to the water table. Surface water runoff from the parking lot and the landfill may carry these contaminants to downslope locations.

The Thames River is the eventual discharge point for groundwater at the site. The sediment in the river will most likely serve as a sink for PAHs, phthalate esters, and some metals. Volatile organics will most likely remain in the dissolved phase (surface water).

#### 4.1.5.2 Summary of Historical Human Health Risk Assessment

The baseline HHRA conducted during the Phase II RI focused on CTE and RME exposure scenarios for multiple receptor groups: full-time employees, older child trespassers, future residents, and construction workers. Future potential residents, are not expected to come in contact with groundwater at the site because saline conditions that exist near the Thames River would prevent domestic use of groundwater. Therefore, groundwater was not considered to be a potential medium of exposure for the future resident. In addition, groundwater was not considered to be a potential medium of exposure for the full-time employee or the older child trespasser. Dermal contact with groundwater during intrusive activities was evaluated as a potential route of exposure for the construction worker.

The noncarcinogenic risk associated with dermal contact with groundwater for the construction worker was less than one for the CTE scenario but exceeded one (4.8) for the RME scenario. Elevated hazards for this receptor were primarily attributed to PCE in groundwater. The chemical-specific HQ for PCE via dermal contact with groundwater exceeded one (3.6).

Carcinogenic risks associated with dermal contact with groundwater were within USEPA's acceptable target risk range of 1E-4 to 1E-6 for the construction worker under CTE and RME. However, the carcinogenic risk associated with this exposure route under RME (2.8E-5) exceeded the CTDEP target cancer risk level (1E-5). The primary contributor to this risk was PCE, with a chemical-specific risk of 2.7E-5.

#### 4.1.5.3 Screening Level Assessment

COPCs at this site were selected using the risk-based COPC screening levels described in Section 1.4.2. All data collected during the Phase I and II RIs and Data Gap Investigation were used to select COPCs for soil and groundwater. Maximum and 95% UCL chemical concentrations are presented in the summary tables. Although the maximum concentration of a chemical may exceed an associated criterion, the distribution of the chemical in the medium is also important with respect to decision making. Therefore, the 95% UCL chemical concentration was included to provide some information on the potential distribution of the chemical. In addition, the summary tables for groundwater samples present the range of concentrations detected in off-site residential wells for each detected chemical to enable comparison of site groundwater data with groundwater data collected from wells unaffected by the site. A brief narrative of the findings of this qualitative analysis is provided in the remainder of this section.

The following parameters were selected as COPCs for Goss Cove Landfill soils based upon the COPC screening analysis presented in Table 4-1 and Table 4-2:

- Chlorinated aliphatic hydrocarbons (PCE and methylene chloride)
- Monocyclic aromatic hydrocarbons (ethylbenzene, toluene, and total xylenes)
- Ketones (acetone)
- PAHs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene]
- SVOCs [3,3'-dichlorobenzidine, 4-methylphenol, bis(2-ethylhexyl)phthalate, carbazole, dibenzofuran, and phenol]
- Pesticides (4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, dieldrin, endrin, endrin aldehyde, endrin ketone, gamma-chlordane, heptachlor, heptachlor epoxide, and alpha-BHC)
- PCBs (Aroclor-1248, Aroclor-1254, and Aroclor-1260)

- Dioxins/furans (OCDD)

- Inorganics (antimony, beryllium, cadmium, cobalt, lead, manganese, nickel, silver, vanadium, and zinc).

Based upon the procedures for the preparation of soil tag maps (Section 1.4.3.1), analytical results for primary soil COPCs [all aforementioned COPCs except methylene chloride, toluene, acetone, 3,3'-dichlorobenzidine, 4-methylphenol, bis(2-ethylhexy)phthalate, phenol, aldrin, dieldrin, endrin ketone, gamma-chlordane, heptachlor epoxide, alpha-BHC, Aroclor-1248, Aroclor-1254, Aroclor-1260, OCCD, antimony, and silver] associated with Goss Cove Landfill soil samples and TCLP leachates are presented on Drawing 12 (Volume II).

Maximum concentrations of acetone, PCE, and toluene exceeded the USEPA SSLs for migration to groundwater. Maximum concentrations of benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, 4-methylphenol, dibenzofuran, fluoranthene, fluorene, phenanthrene, pyrene, 4,4'-DDT, 4,4'-DDD, 4,4'-DDE, aldrin, Aroclor-1248, Aroclor-1254, Aroclor-1260, endrin aldehyde, endrin ketone, gamma-chlordane, heptachlor, heptachlor epoxide, OCDD, beryllium, chromium, cobalt, copper, lead, manganese, vanadium, and zinc exceeded the Connecticut remediation standards for pollutant mobility for groundwater classified as GB. Maximum concentrations of ethylbenzene, methylene chloride, xylenes, 3,3'-dichlorobenzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, carbazole, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, phenol, dieldrin, endrin, alpha-BHC, antimony, arsenic, barium, cadmium, mercury, and nickel exceeded both USEPA SSLs for migration to groundwater and Connecticut remediation standards for pollutant mobility for groundwater classified as GB. However, 3,3'-dichlorobenzidine was detected in less than 5 percent of the samples collected. Chemical concentrations in excess of the SSLs and/or Connecticut remediation standards for pollutant mobility indicate the potential for these chemicals to migrate to groundwater and potentially impact the quality of the groundwater.

The maximum concentration of cadmium and several reported concentrations of lead detected in TCLP leachates exceeded the Connecticut pollutant mobility standards for GB areas, further indicating the potential for cadmium and lead to migrate from site soils to groundwater. In addition, the concentration of silver reported for one TCLP leachate exceeded the associated Connecticut pollutant mobility standard for GB areas. Therefore, silver was also selected as a COPC for Goss Cove soils. However, the TCLP leachate concentrations do not exceed the federal toxicity characteristic regulatory levels.

As previously noted, arsenic, barium, chromium, and mercury were detected in soil samples at maximum concentrations exceeding USEPA SSLs for migration to groundwater and/or Connecticut remediation standards for pollutant mobility. However the soil samples associated with the maximum concentrations of these four metals were also subjected to TCLP analysis. Arsenic, barium, chromium, and mercury were not detected at concentrations exceeding the associated Connecticut pollutant mobility standards for GB areas or the federal toxicity characteristic regulatory levels in any of the TCLP leachates. Therefore, the TCLP data indicate that pollutant mobility is not anticipated to be of concern for arsenic, barium, chromium, and mercury in the soil matrix at this site, and these four metals were not selected as COPCs. Aluminum, copper, and iron were not evaluated for COPC selection; USEPA Region I does not advocate the quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for these chemicals are provisional references doses based on allowable intakes rather than adverse effect levels. Additionally, USEPA SSLs and CTDEP pollutant mobility criteria were not available for calcium, magnesium, sodium, and potassium because these chemicals are considered to be essential nutrients.

Of the aforementioned COPCs, the following were also detected in Goss Cove groundwater wells: acetone, ethylbenzene, PCE, toluene, total xylenes, 4-methylphenol, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, carbazole, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, phenol, pyrene, heptachlor, antimony, beryllium, cadmium, cobalt, lead manganese, nickel, silver, vanadium, and zinc.

The following parameters were selected as COPCs for Goss Cove Landfill overburden groundwater based upon the COPC screening analysis presented on Table 4-3:

- Chlorinated aliphatic hydrocarbons [chloroform, 1,2-dichloroethene (total), bromodichloromethane, PCE, TCE, and vinyl chloride]
- Monocyclic aromatic hydrocarbons (benzene, toluene, and total xylenes)
- Ketones (acetone)
- PAHs [acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and phenanthrene]

- SVOCs [carbazole, 2,4-dimethylphenol, 4-methylphenol, dibenzofuran, and bis(2-ethylhexyl)phthalate]

- Inorganics (antimony, arsenic, barium, beryllium, boron, cadmium, chromium, lead, manganese, mercury, nickel, silver, thallium, vanadium, and zinc).

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary overburden groundwater COPCs [1,2-dichloroethene (total), benzene, phenanthrene, bis(2-ethylhexyl)phthalate, arsenic, barium, boron, lead, manganese, nickel, vanadium, and zinc] associated with Goss Cove Landfill overburden groundwater samples are presented on Drawing 9 (back pocket).

Maximum concentrations of PCE, TCE, vinyl chloride, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, antimony (filtered and unfiltered), cadmium (unfiltered), chromium (unfiltered), mercury (unfiltered), nickel (unfiltered), and thallium (unfiltered) exceeded the COPC screening level, the federal MCL, and the state MCL. Maximum concentrations of 1,2-dichloroethene (total), acetone, benzene, bromodichloromethane, chloroform, toluene, 2,4-dimethylphenol, 4-methylphenol, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, carbazole, dibenzo(a,h)anthracene, dibenzofuran, indeno(1,2,3-cd)pyrene, arsenic (filtered and unfiltered), barium (filtered and unfiltered), boron (filtered and unfiltered), chromium (filtered), silver (unfiltered), vanadium (filtered and unfiltered), and zinc (filtered and unfiltered) exceeded only the COPC screening level. The maximum concentration of lead (unfiltered) was in excess of the federal MCL. It should also be noted that acetone, bromodichloromethane, chloroform, vinyl chloride, acenaphthylene, and dibenzofuran were detected in less than 5 percent of the samples collected.

Concentrations of iron (filtered and unfiltered) and copper (unfiltered) exceeded both COPC screening levels as well as the federal MCLs Aluminum (filtered and unfiltered) was detected at maximum concentrations in excess of the federal secondary MCL. However, aluminum, copper, and iron were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for these chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium was detected at maximum concentrations in excess of the state MCL. However, sodium was not selected as a COPC because this chemical is considered to be an essential nutrient. Additionally, no screening criteria were available for calcium, magnesium, and potassium because these inorganics are considered to be essential nutrients.

Maximum concentrations of benzene, bromodichloromethane, chloroform, PCE, TCE, vinyl chloride, total xylenes, 2,4-dimethylphenol, 4-methylphenol, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, carbazole, chrysene, indeno(1,2,3-cd)pyrene, antimony

(filtered and unfiltered), barium (filtered and unfiltered), boron (filtered and unfiltered), cadmium (unfiltered), chromium (filtered and unfiltered), copper (filtered and unfiltered), lead (unfiltered), manganese (filtered and unfiltered), mercury (unfiltered), nickel (unfiltered), thallium (unfiltered), and vanadium (filtered and unfiltered) detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. Groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment. However, copper was not selected as a COPC; USEPA Region I does not advocate quantitative evaluation of exposure to this chemical because the only available toxicity criteria for this chemical provisional reference doses based on allowable intakes rather than adverse effect levels.

Because groundwater eventually discharges to a surface water body (i.e., the Thames River), site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection. PCE, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, dibenzo(a,h) anthracene, indeno(1,2,3-cd)pyrene, phenanthrene, arsenic (filtered and unfiltered), cadmium (unfiltered), chromium (unfiltered), copper (unfiltered), lead (unfiltered), mercury (unfiltered), silver (unfiltered), and zinc (unfiltered) were detected at maximum concentrations exceeding the surface water protection criteria. However, copper was not selected as a COPC; USEPA Region I does not advocate quantitative evaluation of exposure to this chemical because the only available toxicity criteria for this chemical are provisional reference doses based on allowable intakes rather than adverse effect levels.

Maximum concentrations of all the inorganic chemicals in Goss Cove Landfill overburden groundwater samples exceeded detected concentrations of these chemicals in off-site residential wells.

The following parameters were selected as COPCs for Goss Cove Landfill bedrock groundwater based upon the COPC screening analysis presented on Table 4-4:

- Chlorinated aliphatic hydrocarbons (PCE and TCE)
- SVOCs [bis(2-ethylhexyl)phthalate]
- Inorganics (arsenic, lead, manganese, and vanadium)

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary bedrock groundwater COPCs (all aforementioned COPCs except TCE) associated with Goss Cove Landfill bedrock groundwater samples are presented on Drawing 10 (back pocket).

Maximum concentrations of PCE, TCE, and bis(2-ethylhexyl)phthalate exceeded the COPC screening level, the federal MCL, and the state MCL. Maximum concentrations of arsenic (unfiltered) and vanadium (unfiltered) exceeded only the COPC screening levels. Maximum concentrations of manganese (filtered and unfiltered) exceeded both the COPC screening level and the federal MCL. The maximum concentration of lead (unfiltered) was in excess of the state MCL.

Concentrations of iron (unfiltered) exceeded COPC screening levels and the federal MCL. Aluminum (unfiltered) concentrations were in excess of the federal secondary MCL. However, aluminum and iron were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for both chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium was detected at a maximum concentration in excess of the state MCL. However, sodium was not selected as a COPC because it is considered to be an essential nutrient. Additionally, no screening criteria were available for calcium, magnesium, and potassium because these inorganics are considered to be essential nutrients.

Maximum concentrations of PCE, TCE, bis(2-ethylhexyl)phthalate, lead (unfiltered), and manganese (filtered and unfiltered) detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. As previously noted, groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used for the screening regardless of the classification. This approach results in a conservative screening level assessment.

Because groundwater at the Goss Cove Landfill eventually discharges to a surface water body (i.e., the Thames River), site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection. PCE, arsenic (unfiltered), copper (unfiltered), and lead (unfiltered) were detected at maximum concentrations exceeding the surface water protection criteria.

Maximum concentrations of bis(2-ethylhexyl)phthalate, arsenic, manganese, and vanadium were in excess of the maximum detected concentrations of these chemicals in off-site residential wells. Conversely, the concentration of lead detected at Goss Cove Landfill was below the concentrations detected in off-site residential wells.

### 4.1.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Goss Cove Landfill using the decision tree approach is as follows:

- The Goss Cove Landfill was investigated during three investigations. The information collected during these investigations is sufficient to describe the site and physical characteristics of the site.

- An evaluation of existing data indicates that the site poses a threat to human health and the environment. A time-critical removal action is not warranted, but further actions are required at the site.

- Existing analytical data are currently being used to perform a FS of remedial alternatives for soil. It is likely that capping and a groundwater monitoring program will be selected as the preferred remedial strategy for the landfill. Capping the landfill material and contaminated soil will eliminate potential exposure routes and minimize contaminant migration to the groundwater and the Thames River.

- Additional testing and analysis of the sediment and surface water media in Goss Cove have been recently conducted by the Navy. These results indicate that toxicity in the cove is not a result of contaminant migration from the landfill, but due to ammonia buildup caused by the lack of a direct hydraulic connection between the cove and the Thames River.

- Significant concentrations of PCE have been detected in the bedrock groundwater upgradient of the site. A Data Gap Investigation was conducted to determine the source of the contamination. The results of the investigation indicated that the source of the contamination is from an upgradient, off-site location and not the landfill material. This result was confirmed during the recent Phase I/II Environmental Site Assessment of Fusconi Dry Cleaners completed by the Connecticut Department of Environmental Protection (March, 1999). This source is impacting the groundwater at the Goss Cove Landfill. The extent of the PCE in the bedrock groundwater is unknown. The dry cleaner has contracted a consultant who will perform additional investigations to determine the extent of the contamination, and produce a remedial action plan to address site issues.

### 4.1.7 Recommendations

Four investigations have been completed and documented at the Goss Cove Landfill site. The soil, sediment, and surface water media at this site have been sufficiently characterized. A final FS should be prepared for this site which covers the soil, sediment, and surface water media.

PCE has been detected at significant concentrations in the bedrock groundwater upgradient of the landfill. The source of the PCE is an upgradient dry cleaning facility. The dry cleaner will conduct further investigations to determine the extent of the PCE contamination and will produce a remedial action plan.

The extent of site-specific contaminants in the overburden groundwater should be further characterized by sampling and analysis of the existing overburden wells. Many of the overburden wells have not been sampled recently and the results from the proposed sampling effort will provide baseline information for the planned groundwater monitoring program. The groundwater samples should be analyzed for TCL VOCs, TCL SVOCs, TCL Pesticides/PCBs, and TAL metals.

## 4.2 SITE 12 – NEX GAS STATION (BUILDING 428)

### 4.2.1 Site Description

Site 12 includes the USTs for the Naval Exchange (NEX) gas station. This site is located just north of the Tank Farm (See Drawing 1). Figure 4-2 shows the general site arrangement and historical sampling locations in the vicinity of the NEX gas station. Other historical sampling locations are shown on Figure 4-6. Leaking USTs were discovered in two areas of the site during past investigations. Gasoline and diesel fuels were dispensed at the NEX facility in the past; only gasoline is currently available.

In 1994, HRP Associates designed an Air Sparging/Soil Vapor Extraction (AS/SVE) system to remediate gasoline in the soil and groundwater at Site 12. The AS/SVE system was installed by OHM Corporation in 1995. The system layout is shown on Figure 4-3. The system is currently in operation.

### 4.2.2 Site Investigations

Two investigations were completed at the NEX gas station in the early 1990s and are discussed in the following subsections:

- OBG Investigation (O'Brien and Gere, 1990)
- ERM Investigation (Environmental Resources Management, 1992)

#### 4.2.2.1 OBG Investigation

OBG conducted a two-phase field investigation in 1989/1990 that included the installation of nine soil borings and monitoring wells, soil sampling, groundwater sampling, slug testing of wells, air sampling, sampling of the storm sewer outfall area, manhole inspections, and an elevation survey on site. The principle findings and conclusions of the investigations are summarized below.

- The highest BTEX concentration (9.38 ppm total) was detected in surface water in the downstream catch basin (CB-1) closest to the pump islands' leak area. These concentrations decreased significantly after the discovery and repair of the valve and pipe leaks.

- The highest BTEX concentrations detected in soil (4 to 290 ppm) were found between 6 and 11 feet bgs in wells OBG-2, OBG-6, and OBG-9. The wells away from the UST area (OBG-4, OBG-7, and OBG-8) had no BTEX detections in soil but some moderate TPH levels (52 to 526 ppm), which were not believed to be related to the gasoline releases.

- Several inches of floating product, identified as weathered gasoline, were found in wells OBG-1 and OBG-2, which were installed in the pea gravel backfill of the UST. The highest BTEX concentrations in groundwater were found in wells OBG-1 and OBG-2 (200 to 220 ppm) and in well OBG-9 (10 ppm). The contaminants found in OBG-9 appear to be related to the former USTs to the west.

- Well OBG-6, at the southwestern corner of the active UST, had 2.5 ppm of total BTEX. One plume of dissolved gasoline constituents on the eastern side appears elongated in a southwestward direction and limited in the vicinity of wells OBG-1, OBG-2, and OBG-2.

- A second plume of contaminated groundwater exists on the western side of the former UST area; however, its downgradient extent is not defined.

#### 4.2.2.2 ERM Investigation

ERM conducted an investigation of the NEX gas station from December 1991 to January 1992. The investigation included drilling and installing new monitoring wells and sampling and analyzing of new and existing monitoring wells. The principle findings and conclusions of the investigations are summarized below.

Soil

- Seven soil samples were collected during the well installations at the NEX gas station. The most heavily contaminated sample was from well ERM-14, which contained 70.27 ppm total BTEX and 4,200 ppm TPH. The soils were visibly stained black and had an obvious petroleum odor.

- No other soil samples had total BTEX concentrations exceeding 18 ppm.

- In three of the four wells installed across the station along the southern side of Tang Avenue, the soil contamination 2 to 3 feet above the water table was characterized by TPH concentrations ranging from 130 to 2,600 ppm and no BTEX. These results are not characteristic of gasoline contamination. This would suggest that the TPH soil contamination is not a result of gasoline impact from the former

and active UST areas across Tang Avenue but is possibly associated with the now inactive diesel underground line along Tang Avenue that is related to the oil tank farm.

- Lead was detected in the soil at concentrations ranging from 3.3 ppm (ERM-13) to 19 ppm (ERM-17).

Groundwater

Eighteen monitoring wells were sampled and analyzed for BTEX, MTBE, TPH, and lead. Selected samples were analyzed for petroleum fingerprinting for three grades of gasoline, and/or diesel fuel and No. 6 fuel oil. No. 6 fuel oil was not identified in any sample.

- Groundwater analytical results indicated two distinct and separate plumes, southeast and southwest of the NEX service station building. Separating the two plumes was a north-south row of three wells (i.e., OBG-7, OBG-8, and ERM-6) in which no BTEX was detected and no dissolved gasoline was identified. Bordering the western plume was a string of three clean wells: ERM-1, ERM-2, and ERM-19. ERM-13, located to the north, was not contaminated with BTEX and provided an upgradient clean limit to this western plume.

- The most contaminated groundwater in the western plume covered an area stretching from OBG-9 and ERM-14 in the north to ERM-5, ERM-15, and ERM-18 to the south. OBG-9 is the closest well to the former UST area; it contained floating free-phase product identified by fingerprinting as unleaded gasoline. The highest dissolved concentrations were in ERM-8 with 4,328 µg/L of BTEX, ERM-14 with 3,690 µg/L of BTEX, and ERM-15 with 1,310 µg/L of BTEX, coupled with the highest dissolved gasoline concentrations identified by fingerprinting. For these three most contaminated wells in the center of the western plume, benzene was detected at each occurrence at levels above current drinking water standards, and ethylbenzene and toluene were each detected once at levels above drinking water standards.

- The three wells ERM-5, ERM-18, and ERM-7 were much less contaminated than the four wells forming the center of the plume, as discussed above. These three wells represented the outer edges of the western plume to the east, west, and south. The level of total BTEX in these three wells ranged from 5 µg/L (ERM-7) to 55 µg/L (ERM-5), and 319 µg/L (ERM-18). It should also be noted that, in ERM-18, located along Tang Avenue, the highest levels of TPH and dissolved diesel (quantified by fingerprinting) were detected in the groundwater. This suggested that a problem associated with the now-inactive underground diesel line, associated with the fuel oil tank farm, may have existed.

- The eastern plume of contaminated groundwater was centered around the currently active gasoline station UST area. This plume was delineated by the following wells:

  - Upgradient well OBG-7, well OBG-8 to the west, well OBG-3 to the east, wells ERM-9 and ERM-12 [sampled in 1991 as part of the ERM fuel oil tank investigation (ERM-Northeast, June 1991)], and wells ERM-16 and ERM-17 to the southwest. BTEX was not detected in these two wells; but the samples did contain some dissolved gasoline identified by fingerprinting, indicating an impact from the UST area. The most contaminated groundwater was in the immediate vicinity of the UST area. Consistent with the OBG findings, a thin layer of gasoline existed in wells OBG-1 and OBG-2. Wells immediately to the north (OBG-4) and to the south (OBG-5) of the UST area had much lower levels of dissolved gasoline (87 and 30 µg/L of total BTEX).

- Compared with the 1990 OBG findings for this eastern plume, 1991 results indicated that the floating product layer in wells OBG-1 and OBG-2 slightly decreased (from 0.08/0.25 feet to 0.05/0.07 feet) and that the dissolved VOC concentrations in wells OBG-4, OBG-5, and OBG-6 decreased.

Recommendations

ERM recommended the installation of an AS/SVE system. The system could be installed in and around an existing facility with little disruption. The system would remediate floating product, contaminated soil, and the highest dissolved VOCs in groundwater existing at the two separate "hot spot" areas of residual contamination.

### 4.2.3 Physical Characteristics

This section presents a summary of physical characteristics for the NEX Gas Station site based on information generated during the OBG and ERM investigations. Topography and surface features, surface water, soils, geology, and hydrogeology are discussed in the following subsections.

#### 4.2.3.1 Surrounding Topography and Surface Features

The area around the NEX gas station is fairly flat, with elevations ranging from 21 to 25 feet. Buildings and paving cover approximately 95 percent of the area immediately around the station. About 2,000 feet to the east and 1,500 feet to the north, highlands rise 200 feet above the station.

A shallow lake, Crystal Lake, formerly occupied the area south of the station. In the early to middle 1940s, the lake was drained, dredged, and filled with upland soils. This area south of the station across

Tang Avenue is now occupied by a parking lot and baseball fields. Three USTs (OT-1, OT-2, and OT-3) formerly lay beneath this area.

#### 4.2.3.2 Surface Water

Surface water runoff from this site is collected by a storm sewer system. The storm sewer system passes through the Tank Farm and Goss Cove Landfill sites and eventually discharges to the Thames River.

#### 4.2.3.3 Soils

The SCS Soils Map (SCS, 1983) classifies the soil at the NEX Gas Station as Urban Land. This description indicates that more than 85 percent of the land surface is covered by streets, parking lots, buildings, and other structures. Most of the original soils underlying Urban Land have been altered by excavating or have been covered with fill material.

#### 4.2.3.4 Geology and Hydrogeology

Geology

The soil consists of fine to coarse sand with traces of gravel and pebbles. Distinct bedding or layering structures were observed in only two boring logs. Occasional thin layers of black or brown peat, gray silt, or gravel were unevenly distributed throughout the area. The soil color varied irregularly from brown to dark brown to olive to yellow brown to gray. It appears that the soil column is likely composed of imported fill materials and reworked native soil.

Hydrogeology

Groundwater occurring under water-table conditions was found from 4 to 9 feet below grade in the area of the NEX Gas Station. Water levels taken on January 24, 1992 indicate that the water table forms a fairly regular surface, indicating a flow direction to the south-southwest, with hydraulic gradients increasing gradually from 0.8 percent to approximately 2 percent in a south-southwestward direction. Potentiometric surface maps for the overburden and bedrock units are shown on Drawings 3 and 4, respectively. These maps were created using data collected in November 1995.

Hydraulic conductivities measured around the active UST area to the east ranged from 0.076 feet/day to 0.35 feet/day. These values are generally representative of fine, silty sand deposits. Hydraulic conductivities measured to the west (i.e., 0.48 to 5.5 feet/day), around the former UST area, are higher

than those measured to the east, which is consistent with the slightly coarser sand deposits observed in this area during drilling.

### 4.2.4 Nature and Extent of Contamination

The nature and extent of contamination, as described by the results of the historic OBG and ERM investigations, are summarized above in Section 4.2.2. The site is currently being remediated by the Navy under the UST program. No recent data for the NEX station or the AS/SVE system have been incorporated into the analytical database for the NSB-NLON EGIS. Therefore, no further evaluation of nature and extent of contamination is provided in this report.

### 4.2.5 Data Evaluation

No further data evaluation was completed for this site because the site is currently being remediated by the Navy under the UST program. No recent data for the NEX station or the AS/SVE system has been incorporated into the analytical database for NSB-NLON EGIS.

### 4.2.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Site 12 using the decision tree approach is as follows:

- The NEX Gas Station site was investigated by OBG and ERM in the early 1990s. The information collected during these investigations is sufficient to describe the site and its physical characteristics.

- Historically, the site posed an imminent threat to public health and the environment. However, an AS/SVE system was designed and installed to remediate the site and eliminate the threat posed by the contaminated soil and groundwater. The system is currently operating.

- Even though the site is currently being remediated using an AS/SVE system, recent data from the AS/SVE system and groundwater monitoring program are required to determine the current extent of contamination, contaminant fate, and risks for an adjacent site (Site 23). The current monitoring well network used for the groundwater monitoring program is sufficient, and it is recommended that no additional wells be installed or sampling be completed.

- Limited further action is required for Site 12 and is discussed in Section 3.1.7.

### 4.2.7 Recommendations

Site 12 was thoroughly investigated in the early 1990s by OBG and ERM. The site is currently being remediated using an AS/SVE system; however, Site 12 is located upgradient and within close proximity of Site 23 Tank Farm. As shown on Figure 4-3, a portion of the AS/SVE system for Site 12 is located within Site 23 because the groundwater at both sites is hydraulically connected and contamination from Site 12 has impacted the groundwater of Site 23. Recent data from the AS/SVE system and groundwater monitoring program are not currently included in the NSB-NLON EGIS database, and an evaluation of the recent data could not be completed. Therefore, the data should be incorporated into the database and an evaluation of the data should be completed during the Basewide Groundwater OU RI. The data can be used to determine the current extent of contamination, contaminant fate, and risks for Site 23. No additional sampling efforts are recommended for this site for the Basewide Groundwater OU RI.

## 4.3 SITE 15 – SPENT ACID STORAGE AND DISPOSAL AREA

### 4.3.1 Site Description

The Spent Acid Storage and Disposal Area (SASDA) was located in the southeastern section of NSB-NLON between the southern sides of Buildings 409 and 410. The former site location and historical sampling locations are shown on Figure 4-4. The site's location relative to other IRP sites is depicted on Drawing 1. The site is a relatively flat area completely covered with concrete or bituminous pavement.

The IAS report indicated that this area was used before and after World War II for the temporary storage of waste battery acid in a rubber-lined underground tank. The tank was reportedly 12 feet long by 4 feet wide by 4 feet high. The batteries were placed on a concrete pad next to the tank where some acids occasionally leaked. No major spills were ever recorded. A 1951 aerial photograph shows that the area around the tank was not paved. Acid from the batteries was stored in the tank and was subsequently pumped into a tank truck and disposed in the Area A Landfill.

Atlantic personnel inspected the site and found the outline of the top of the tank. The area was completely covered with concrete and only the top of the tank was visible. The tank had been filled in place with soil and capped with bituminous pavement.

A time-critical removal action was completed at the SASDA during the course of the Phase II RI. The removal action was completed in January 1995 and included removal of the tank, tank contents, contaminated pavement, and approximately 318 tons of lead-contaminated soil. Soil with lead concentrations in excess of 500 mg/kg or TCLP leachate results for lead in excess of 5.0 mg/L were removed by OHM Remediation Services Corporation. The excavated materials were transported off site

and disposed in a RCRA landfill (Environmental Quality Company) in Bellville, Michigan. The excavation was backfilled with clean borrow material from an offsite location. The excavated area was covered with bituminous pavement.

The Navy, USEPA, and CTDEP signed a No Further Action Source Control ROD for this site in 1997.

### 4.3.2 Site Investigations

The following five investigations have been completed at SASDA and are discussed in the subsections that follow:

- Phase I RI (Atlantic, 1992)
- FFS (Atlantic, 1994a)
- Phase II RI (B&R Environmental, 1997a)
- Time-Critical Removal Action (Atlantic, 1995a and OHM, 1995)
- CTDEP Supplemental Sampling Event (CTDEP, 1997)

#### 4.3.2.1 Phase I Remedial Investigation

An investigation of 11 sites was completed at NSB-NLON by Atlantic Environmental Services, Inc., from 1990 through 1992. The SASDA was one of the sites investigated during the Phase I RI. Four surface (less than 4 feet deep) and three subsurface (greater than 4 feet deep) soil samples were collected during the Phase I RI. One surface sample (15SS1) was collected from gravel inside the tank. The remaining six samples were collected from two test borings adjacent to the underground tank and a third test boring was located approximately 15 feet south of the SASDA. One surface and one subsurface soil sample were collected from each test boring. The Phase I RI recommended that this site proceed to Step II of the IRP.

#### 4.3.2.2 Focused Feasibility Study

Atlantic also conducted supplemental sampling and analysis at the site in support of an FFS. Six surface soil samples (plus one field duplicate) were collected from six test borings. The report concluded that off-site landfilling was the alternative that provided superior protection of the environment, was easiest to implement, and was most cost effective.

#### 4.3.2.3 Phase II Remedial Investigation

B&R Environmental conducted a Phase II RI at 13 sites at NSB-NLON. The SASDA was included in the investigation. Four shallow and one deep groundwater monitoring wells were installed during the Phase II RI. Two rounds of groundwater sampling were completed, and five samples (plus one field duplicate sample during Round 2 only) were collected during each sampling round. Two surface and two subsurface soil samples were collected from the four shallow monitoring well borings. Additionally, one sediment sample was collected from a stormwater drainage ditch downstream of the site.

#### 4.3.2.4 Time-Critical Removal Action

OHM completed a time-critical removal action at SASDA in January 1995. The remedial action taken at the site was documented in the Action Memorandum for the Spent Acid Storage and Disposal Area (Atlantic, 1995a) and the Final Report for Soil Remediation, Spent Acid Storage and Disposal Area (OHM, 1995). OHM collected and analyzed five composite soil samples (plus one field duplicate) to confirm that all contaminated soils had been removed during the time-critical removal action. Composite samples were collected from the bottom (16600-BC) and the north, east, south, and west sidewalls (16600-NC, -EC, -SC, and -WC, respectively) of the excavation pit. A field duplicate of 16600-WC was also collected. The depths of these samples were not specified by the remedial contractor; however, since the maximum depth of excavation was reported as 4 feet, these samples will be evaluated as surface soils.

#### 4.3.2.5 CTDEP Supplemental Sampling Event

CTDEP completed additional sampling of the soil at this site in June 1997 and analyzed the samples for lead by the SPLP. CTDEP did not provide the Navy with a map showing the locations of the samples that they collected or the analytical results. The sampling and analysis were conducted to determine if remaining soils could act as a potential source of contamination to the groundwater. The results indicated that the remaining soils did not pose a potential contaminant migration problem. CTDEP issued a letter on September 15, 1997 in which they provided concurrence with the No Further Action remedy for the SASDA.

### 4.3.3 Physical Characteristics

This section presents a summary of physical characteristics for the SASDA site based on information generated during the Phase I and Phase II RIs. Topography and surface features, surface water, soils, geology, and hydrogeology are discussed in the following subsections.

#### 4.3.3.1 Topography and Surface Features

Drawing 2 shows the topography and surface features of the SASDA. The entire area is covered with concrete or bituminous pavement. The site is located southwest of the central bedrock high, which narrowly extends to the south. The ground surface slopes downward from the bedrock high to the southwest. Based on the topographic contours on Drawing 2, the ground surface slope in the vicinity of the site is relatively flat but ranges up to approximately 20 percent in areas to the north and east of the site. Ground elevations of the site monitoring wells are between 25 and 30 feet msl. The ground surface is also relatively flat southwest of the site.

#### 4.3.3.2 Surface Water

Surface water runoff from this site is collected by a storm sewer system. The storm sewer system passes through the Tank Farm and Goss Cove Landfill sites and eventually discharges to the Thames River.

#### 4.3.3.3 Soil Characteristics

The SCS Soils Map (SCS, 1983) classifies the soil at the SASDA as Urban Land. Upgradient of the site (east), bedrock exposures are prevalent as the central bedrock high extends toward the south. Overlying soils are classified as the Hollis-Charlton-Rock complex. Stones and boulders are intermingled with a dark, fine, sandy loam.

#### 4.3.3.4 Geology and Hydrogeology

Geology

Geologic conditions at the SASDA consist of variable thicknesses of fill and natural alluvial deposits overlying metamorphic bedrock. The overburden at the SASDA consists primarily of silty sand alluvium. Boring logs indicate that, in some intervals, there are traces of clay and in others, there are traces of gravel and rock fragments. The SASDA has been mapped as stratified drift that was deposited by glacial meltwater streams (USGS, 1960). Minor thicknesses of fill may be present overlying the silty sand in some places. The borings for wells 15MW1D and 15MW4S encountered silt layers of 26- and 24-foot thicknesses, respectively, beneath the silty sand interval. These deposits are also most likely stratified drift.

The bedrock surface slopes to the southwest across the site. Monitoring well 15MW1D was drilled to a depth of 46.5 feet, where gneiss fragments of the Mamacoke Formation were encountered. The bedrock elevation at well 15MW1D is 17.5 feet below msl (-17.5 feet). Monitoring well 15MW4S was drilled to an elevation of 17 feet below msl (a total depth of 43 feet). Bedrock was not positively identified in this

boring; however, auger refusal was reached, suggesting that the bedrock surface may have been encountered. Northeast of the site, along Rasher Avenue, bedrock outcrops at ground surface.

Hydrogeology

Groundwater was encountered in the alluvium at depths of less than 10 feet at the site. Most overburden groundwater flow is expected to be through the silty sand layer, with the underlying silt deposit acting as a semi-confining unit to groundwater flow. Drawings 3 and 4 show the overburden and bedrock groundwater flow directions, respectively, beneath the SASDA site. The drawings show that groundwater generally flows to the south-southeast. There is a downward vertical component of flow at the 15MW1 well cluster. No bedrock monitoring wells were installed at the site and the contours shown on Drawing 4 were inferred.

The shallow overburden flow gradient across the site is approximately 1 percent. Downgradient of the site, toward the Goss Cove Landfill, the hydraulic gradient flattens out. During the Phase II RI field work, slug tests were performed at wells 15MW1S and 15MW3S. The geometric mean of the calculated hydraulic conductivities is 0.76 feet/day (2.7E-4 cm/sec). This value is typical of literature values for silty sand that was the identified material in the overburden. Assuming a porosity of 0.30, the estimated groundwater seepage velocity is 0.025 feet/day.

### 4.3.4 Nature and Extent of Contamination

Soil, groundwater, and sediment sampling was conducted at the SASDA during the Phase I RI, FFS, Phase II RI, and Time-Critical Removal Action. Based upon the results of these investigations, the nature and extent of contamination of groundwater at the SASDA are discussed in the following subsection. The complete analytical database for groundwater is contained in Appendix A. Analytical results for soil samples will not be discussed because contaminated soils from the area of the former UST and former concrete storage pad have been removed and are therefore no longer a potential source of contamination for the groundwater at this site. Analytical testing conducted by the CTDEP (SPLP, followed by analysis for lead) of the soil remaining after the Time-Critical Removal Action indicated that the lead present in the remaining soils was not mobile and, therefore, does not pose a threat to groundwater. Thus, a ROD was signed for this site that documented the selected remedy as No Further Action. Analytical results for the single sediment sample collected from a stormwater drainage ditch downstream of the site will not be discussed because contamination in this medium is not expected to impact the groundwater at this site.

#### 4.3.4.1 Groundwater

A total of 10 groundwater samples were collected from five overburden wells at the SASDA during Rounds 1 and 2 of the Phase II RI. Table 4-5 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in the SASDA groundwater samples. Based upon the screening level assessment for the SASDA (Section 4.5.5.3) and the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary COPCs in SASDA overburden groundwater samples are presented on Drawing 9 (Volume II).

Carbon disulfide was detected at a concentration of 3 µg/L in the groundwater sample collected from well 15MW1D during Round 1 of the Phase II RI. No other VOCs were detected. Five SVOCs [1,4-dichlorobenzene, bis(2-ethylhexyl)phthalate, di-n-butylphthalate, naphthalene, and phenanthrene] were detected in the groundwater samples. The two phthalates, plasticizers that are common field and laboratory contaminants, were each detected in four of the 10 samples. The remaining SVOCs were each detected in one or two of the 10 samples. Concentrations of bis(2-ethylhexyl)phthalate ranged from 0.6 µg/L to 45 µg/L. Bis(2-ethylhexyl)phthalate (3 µg/L) was also detected in one of the groundwater samples collected from the off-site residential wells. Concentrations of the remaining SVOCs detected in the SASDA groundwater samples ranged from only 0.5 µg/L to 1 µg/L. A single pesticide, heptachlor, was also detected in a groundwater sample at a concentration of 0.54 µg/L.

Twenty-one metals were detected in the unfiltered groundwater samples collected from the SASDA wells, and 17 metals were detected in the corresponding filtered groundwater samples. A majority of the maximum concentrations were associated with samples collected from wells 15MW3S and 15MW2S, located downgradient and upgradient, respectively, of the SASDA. As shown on Table 4-5, maximum concentrations of aluminum (unfiltered samples only), antimony, arsenic, beryllium, cobalt, magnesium, manganese, and zinc exceeded concentrations of respective metals detected in unfiltered groundwater samples from the off-site residential wells. Notable results reported for SASDA groundwater samples include maximum concentrations of manganese in both filtered and unfiltered groundwater samples at 3080 µg/L and maximum concentrations of zinc in filtered and unfiltered groundwater samples at 450 µg/L and 453 µg/L, respectively. The maximum lead concentration in one unfiltered groundwater sample from 15MW3S (21.2 µg/L) was significantly higher than subsequent filtered (2 µg/L) and unfiltered (4.4 µg/L) samples collected from the same well.

Analyses for oil and grease, COD, hardness, and TSS were also performed for selected SASDA groundwater samples. Table 4-5 provides a summary of the results of these analyses.

### 4.3.5 Data Evaluation

This section summarizes data evaluation procedures performed for site data. A discussion of contaminant fate and transport, a summary of the historical human health risk assessment(s) performed for the site, and a screening level assessment of site data are provided.

#### 4.3.5.1 Contaminant Fate and Transport

The site area of concern consists of a relatively flat area completely covered with concrete or pavement. Surface water from the SASDA drains to a catch basin and storm sewers, located south of the site. The ultimate drainage point for the storm sewers is the Thames River at Goss Cove.

The chemicals identified as contaminants at the site include PAHs, pesticides, and metals. In general, these classes of chemicals have low water solubilities and high $K_{oc}$s and/or $K_d$s, indicating that they preferentially adhere to soil. PAHs and metals may to be transported downstream via surface water drainage.

Lead was detected in the soil at the site. Although this chemical is typically considered to be strongly absorbed to organic matter in soil, the presence of battery acid can result in the mobilization of lead. Under acidic conditions (i.e., a soil pH lower than 6), lead complexes can become soluble and subject to migration. However, soil containing elevated lead concentrations was removed during the Time-Critical Removal Action conducted by OHM in January 1995. Although lead was detected in one unfiltered shallow groundwater sample during Round 1 of the Phase II RI at a concentrations of 21.2 µg/L, subsequent lead concentrations detected in the same well during Round 2 were significantly lower (4.4 µg/L in the unfiltered sample and 2.0 µg/L in the filtered sample). Therefore, the detection of lead at 21.2 µg/L in this well is most likely the result of suspended sediments in the unfiltered sample. Because the lead was not detected in the groundwater in the dissolved phase, it is unlikely that lead is migrating via the groundwater.

The analytical results presented in the previous section do not appear to indicate the vertical migration of contaminants. No volatile organics were detected in the shallow groundwater wells. Carbon disulfide was reported at a concentration of 3 µg/L in the deep well installed during the Phase II RI. Ethylbenzene, toluene, and xylenes were detected infrequently and at low concentrations.

#### 4.3.5.2 Summary of Historical Human Health Risk Assessment

The baseline human health risk assessment conducted during the Phase II RI evaluated construction workers and future residents as potential receptors at the SASDA. CTE and RME scenarios were

evaluated for both of these receptors. Dermal contact was considered to be a potential route of exposure for the construction worker. Dermal contact with, ingestion of, and inhalation of volatiles in groundwater were considered to be potential routes of exposure for the future resident.

Noncarcinogenic risks associated with exposure to groundwater for the construction worker under the CTE and RME scenarios and for the future resident under the CTE scenario were less than one. However, noncarcinogenic risk associated with exposure to groundwater for the RME future resident exceeded one. Elevated noncarcinogenic hazards for this receptor were attributed to exposure to manganese in groundwater via ingestion. The chemical-specific HI for manganese exceeded one for direct ingestion (2.2) under the RME scenario. Calculated risks for dermal contact with groundwater and inhalation of volatiles in groundwater while showering/bathing were relatively insignificant. This conclusion was similar to that determined for many other sites at NSB-NLON (i.e., manganese is a commonly found naturally occurring metal and the primary contributor to site noncarcinogenic risks).

The incremental cancer risk associated with exposure to groundwater for the construction worker under both RME and CTE scenarios was less than the USEPA and CTDEP target cancer risks. The cumulative incremental cancer risk associated with exposure to groundwater for the future resident under CTE conditions (9.3E-6) was within USEPA's target risk range (1E-4 to 1E-6) and was less than the CTDEP target cancer risk (1E-5). However, the cumulative carcinogenic risk associated with exposure to groundwater for the future resident under the RME scenario (1.6E-4) exceeded 1E-5 and 1E-4. Direct ingestion of groundwater was the primary exposure route of concern for the potential future resident; the associated incremental cancer risk for this exposure route alone exceeded 1E-4. Carcinogenic chemicals selected as COCs for groundwater included bis(2-ethylhexyl)phthalate, 1,4-dichlorobenzene, heptachlor, arsenic, and beryllium. Although risks for these chemicals were similar (i.e., within an order of magnitude), the largest contributor to the risks associated with direct ingestion of groundwater was beryllium with an incremental cancer risk of 8.0E-5.

#### 4.3.5.3 Screening Level Assessment

COPCs at this site were selected using the risk-based COPC screening levels described in Section 1.4.2. All data collected during the Phase I and II RIs were used to select COPCs for soil and groundwater. Maximum and 95% UCL chemical concentrations are presented in the summary tables. Although the maximum concentration of a chemical may exceed an associated criterion, the distribution of the chemical in the medium is also important with respect to decision making. Therefore, the 95% UCL chemical concentration was included to provide some information on the potential distribution of the chemical. In addition, the summary tables for groundwater samples present the range of concentrations detected in off-site residential wells for each detected chemical to enable comparison of site groundwater

data with groundwater data collected from wells unaffected by the site. A brief narrative of the findings of this qualitative analysis is provided in the remainder of this section.

The following parameters were selected as COPCs for SASDA overburden groundwater based upon the COPC screening analysis presented on Table 4-5:

- Monocyclic aromatic hydrocarbons (1,4-dichlorobenzene)
- PAHs (phenanthrene)
- SVOCs [bis(2-ethylhexyl)phthalate]
- Pesticides (heptachlor)
- Inorganics (antimony, arsenic, barium, cadmium, lead, manganese, and zinc)

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary overburden groundwater COPCs (all aforementioned COPCs except 1,4-dichlorobenzene, heptachlor, antimony, and cadmium) associated with SASDA overburden groundwater samples are presented on Drawing 9 (Volume II).

Maximum concentrations of bis(2-ethylhexyl)phthalate, heptachlor, antimony (filtered), and cadmium (filtered and unfiltered) exceeded the COPC screening level, the federal MCL, and the state MCL. Maximum concentrations of 1,4-dichlorobenzne, antimony (unfiltered), and arsenic (unfiltered) exceeded only the COPC screening level. The maximum concentration of manganese (filtered and unfiltered) was in excess of both the federal MCL and state MCL. The maximum concentration of lead (unfiltered) was in excess of the federal MCL. Bromomethane, benzo(a)anthracene, carbazole, chrysene, dibenzofuran, and heptachlor were detected in less than 5 percent of the samples collected.

Concentrations of iron (filtered and unfiltered) and copper (unfiltered) exceeded both COPC screening levels and the federal MCL. Aluminum (unfiltered) was detected at maximum concentrations in excess of the federal secondary MCL. However, aluminum and iron were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for these chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium (filtered and unfiltered) was detected at maximum concentrations in excess of the state MCL. However, sodium was not selected as a COPC because this chemical is considered to be an essential nutrient. Additionally, no screening criteria were available for calcium, magnesium, and potassium because these chemicals are considered to be essential nutrients.

Maximum concentrations of bis(2-ethylhexyl)phthalate, heptachlor, antimony (filtered), cadmium (filtered and unfiltered), lead (unfiltered), and manganese (filtered and unfiltered) detected in groundwater

samples exceeded the Connecticut remediation standards for groundwater protection. Groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment.

Because groundwater eventually discharges to a surface water body (i.e., the Thames River), site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection. Phenanthrene, heptachlor, lead (unfiltered), and zinc (unfiltered) were detected at maximum concentrations exceeding the surface water protection criteria.

Of the selected COPCs, maximum concentrations of bis(2-ethylhexyl)phthalate, antimony, arsenic, manganese, and zinc in SASDA overburden groundwater samples exceeded detected concentrations of these chemicals in off-site residential wells. Conversely, the maximum detected concentrations of barium, cadmium, and lead were less than the maximum concentrations of respective metals detected in unfiltered groundwater samples from off-site residential groundwater wells.

#### 4.3.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Site 15 using the decision tree approach is as follows:

- The SASDA was investigated during five investigations. The information collected during these investigations is sufficient to describe the site and physical characteristics of the site.

- Historically, the soil at the site posed an imminent threat to public health and the environment. A time-critical removal action was completed to eliminate the threat. Confirmation sampling completed during the removal action and subsequent to the removal action verified that the threat from the soil has been eliminated. A No Further Action Source Control ROD was signed in 1997 for the site.

- Further information is required to determine the current nature and extent of contamination in the groundwater. The data will be used to verify the effectiveness of the removal action and to provide information regarding contaminant concentrations in groundwater upgradient of the Tank Farm.

- The monitoring wells installed during the investigation of this site still exist and should be sampled during the Basewide Groundwater OU RI.

### 4.3.7 Recommendations

Site 15 was thoroughly investigated during five previous investigations. A Time-Critical Removal Action was completed at the site that remediated contaminated soil. A No Further Action Source Control ROD was signed for the site in 1997. Therefore, no additional soil sampling or analysis is recommended.

Monitoring wells installed during the investigation of the site still exist. The existing wells (except for 15MW4S which was destroyed) should be sampled and analyzed during the Basewide Groundwater OU RI to verify the effectiveness of the removal action and to determine chemical concentrations in the groundwater upgradient of the Tank Farm (Site 23). The groundwater samples should be analyzed for TCL VOCs, TCL SVOCs, and TAL metals.

## 4.4 SITE 18 – SOLVENT STORAGE AREA (BUILDING 33)

### 4.4.1 Site Description

Site 18 consists of Building 33, the Solvent Storage Area. The location of Building 33 is shown on Drawing 1 and Figure 4-5. According to the FFA (1995), this building has been used for the storage of 55-gallon drums of solvents such as TCE and dichloroethene and gas cylinders.

### 4.4.2 Site Investigations

The solvent storage area at Building 33 was identified during the IAS for NSB-NLON that was conducted in March 1983. The site was identified as Study Area F in the FFA and is now identified as Site 18 for the IRP. No sampling activities have been conducted at this site.

### 4.4.3 Physical Characteristics

This section presents a summary of physical characteristics for Site 18 based on information generated during the Phase II RI and reference documents. Topography and surface features, surface water, soils, geology, and hydrogeology are discussed in the following subsections.

#### 4.4.3.1 Topography and Surface Features

Site 18 is located north of the SASDA (Site 15) and the Tank Farm (Site 23). The ground surface topography around Building 33 is shown on Drawing 2. As shown on the drawing, a steep embankment exists on the northern and eastern sides of Building 33. The embankment slopes at an approximate gradient of 50 percent toward the south and west. The gradient flattens to approximately 5 percent on the southern and eastern sides of Building 33.

#### 4.4.3.2 Surface Water

Surface water runoff from this site is collected by a storm sewer system. The storm sewer system passes through the Tank Farm and Goss Cove Landfill sites and eventually discharges to the Thames River.

#### 4.4.3.3 Soil Characteristics

The SCS Soils Map (SCS, 1983) classifies the soil on the southern and western sides of Building 33 as Urban Land. Upgradient of the site (north and east), bedrock exposures (Hollis-Charlton-Rock outcrop complex) are prevalent as the central bedrock high extends toward the south. The soils overlying the bedrock range from very stony fine sandy loam to gravelly loam.

#### 4.4.3.4 Geology and Hydrogeology

Geology

No investigations have been conducted at this site to determine site-specific geologic conditions. It is likely that the geology at this site is similar to the geology encountered at the SASDA.

Hydrogeology

Inferred shallow overburden and bedrock potentiometric surfaces in the vicinity of Building 33 are shown on Drawings 3 and 4. The contours indicate that groundwater in both units flows in a southwestward direction toward the SASDA and Tank Farm. Groundwater from this site will eventually discharge to the Thames River.

### 4.4.4 Nature and Extent of Contamination

No analytical data are currently available for Site 18; therefore, the nature and extent of contamination is unknown.

### 4.4.5 Data Evaluation

No analytical data are currently available for Site 18; therefore, no evaluation was completed for the site.

### 4.4.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Site 18 using the decision tree approach is as follows:

- There are no existing data for this site. Information describing the site, historical operations at the site, and physical characteristics of the site are necessary for the evaluation of Site 18.
- It is unknown whether this site poses a threat to public health or the environment.
- Data are required to determine the nature and extent of contamination, contaminant fate, and human health risks for the site.
- Further action is required for Site 18 and is discussed in Section 4.4.7.

### 4.4.7 Recommendations

An investigation of Site 18 has not been conducted. The following tasks must be completed to provide a basic understanding of the site: collect and review historical information, conduct interviews with base personnel, and conduct a site visit. This information is necessary to determine potential contaminants and media of concern. Chemicals commonly stored at the site include TCE and dichloroethene.

After review and evaluation of the background information have been completed, a sampling and analysis program can be developed. It is recommended that soil and groundwater at the site be sampled during the Basewide Groundwater OU RI. The sampling activities should be limited and focused on the locations expected to have the highest level of contamination. The analytical program for this site should include TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and TAL metals. SPLP extraction followed by analysis for TCL PCBs and TAL metals should also be completed for the soil samples. If contaminated media are identified during this initial investigation, further sampling and analysis may be necessary to completely determine the nature and extent of contamination and to obtain sufficient data to perform a risk assessment for the site.

## 4.5 SITE 23 – TANK FARM

### 4.5.1 Site Description

In the early 1940s, Crystal Lake was drained and dredged to allow for construction of the nine concrete USTs (see Figure 4-6). When construction was complete, the former lake bed was reportedly filled with

soils excavated from a small hill west of the tank area and graded to create a level surface for development at NSB-NLON.

Each of the nine USTs had a holding capacity of 750,000 gallons. No. 6 fuel oil was stored in tanks OT-1 through OT-3 from the date of construction until they were removed from service in the summer of 1991. Tanks OT-7 through OT-9 were decommissioned in the summer of 1990 and were used exclusively for storage of diesel during all 48 years of service.

A reduced demand for diesel fuel at NSB-NLON, in the mid-1970s, led to the decommissioning and demolition of tank OT-6. Details regarding demolition procedures were not on file at NSB-NLON. The reduced demand for diesel also led to the modification of tank OT-5 for waste oil storage purposes. Tank OT-4 was used to store tank bottom wastes from OT-1. Tank OT-5 was used as part of an oil/water separator system. Tanks OT-4 and OT-5 were reportedly decommissioned after the installation of a new, 30,000-gallon waste oil underground tank (OT-10) in 1990. Tanks OT-1 through OT-9 have been demolished and closed in place. Tank closure was accomplished by demolishing the tank roof supports and allowing the roof to collapse into the tank. The void was then filled with gravel and the site restored using soil and topsoil.

Evidence of releases of petroleum products from these tanks and their associated piping and, possibly, from other nearby sources was detected during previous investigations. Historical sampling locations are shown on Figure 4-6. Both soil and groundwater contamination have been identified. Petroleum hydrocarbons have been detected at the outfall of the Tank Farm storm sewer system on a number of occasions. A number of petroleum spills have been documented by the Navy in the vicinity of the Tank Farm at NSB-NLON. Each incident described in Navy spill reports is listed below.

- **August 28, 1989:** Oil was discovered in an excavation for new waste oil tank OT-10. The source of the oil was determined to be the french drain around waste oil tank OT-5 located adjacent to the excavation. In accordance with CTDEP regulations, a spill report was filed. Tank OT-5 was decommissioned shortly thereafter. Oil present in the excavation for tank OT-10 was pumped out and disposed off site. There is no record that samples were collected or that soil was removed.

- **January 1990:** The waste oil collection tank overflowed during a rain storm as a result of inoperative controls. An oil/water mixture entered the storm drainage system and discharged into a permanently boomed area at the storm sewer outfall. Approximately 14.6 gallons of petroleum were recovered by the Navy's Oil Spill Response Team (NOSRT).

- **April 1990:** A hydraulic oil mixture and creosote were discovered at the outfall of the storm drainage system. Approximately 0.5 gallon of petroleum was recovered by NOSRT.

- **May 1990:** A hydraulic oil mixture and waste oil were discovered at the outfall of the storm drainage system. Approximately 1.5 gallons were recovered by NOSRT.

- **June 1990:** A hydraulic oil mixture and diesel fuel mixture were discovered at the outfall of the storm drainage system. Approximately 1.5 gallons of petroleum were recovered by NOSRT.

- **July 1990:** A hydraulic oil mixture was discovered at the outfall of the storm drainage system. Approximately 11.5 gallons of petroleum were recovered by NOSRT.

- **August 1990:** A mixture of No. 6 fuel oil, hydraulic oil, and diesel fuel was discovered at the outfall of the storm drainage system. Approximately 4 gallons of petroleum were recovered by NOSRT.

- **August 1990:** An oil line in oil pit No. 1 (located near tank OT-1) ruptured. Heavy rains caused No. 6 fuel oil to enter drainage system and discharge into a permanently boomed area at the storm sewer outfall. Approximately 14.6 gallons of petroleum were recovered by NOSRT.

**Tank Farm Features**

The Tank Farm is located at the southern end of NSB-NLON (see Drawing 1) and covers an area of approximately 36 acres. The Tank Farm features are shown on Figure 4-6 and include the following:

- Nine former 110-foot-diameter, 11-foot-high USTs (OT-1 to OT-9)
- A 30,000-gallon, double-walled UST (OT-10)
- An oil/water separator (at OT-10)
- A 10,000-gallon waste oil tank (at OT-10)
- A fuel oil loading area adjacent to Building 482
- Tanker truck dumping pad and trough (at OT-10)
- Associated UST piping systems
- The MWR Recreation Center (Building 461)
- Buildings 310, 322, and O-831
- Six baseball/softball fields
- A restroom facility (Building 445)
- AS/SVE facility for NEX service station
- Two 150,000-gallon diesel above-ground storage tanks

East of the Tank Farm are two high-rise barracks (Buildings 442 and 447). The site is bounded to the south by Crystal Lake Road. Located on Crystal Lake Road are four rental units, a long-term parking facility, and a dry cleaning facility.

The Base command building (Building 138), legal services (Building 137), and public works (Building 135) lie to the west. The Tank Farm is bounded on the north side by Tang Avenue. A carpentry and maintenance building (Building 406), the Naval Exchange (NEX) department store and grocery store, the NEX gasoline service station (Building 428), and warehouses (Buildings 408, 409, and 410) are located on the north side of Tang Avenue. Six baseball/recreational fields and a number of parking areas are located above the Tank Farm.

Product Transfer Lines

Product (No. 6 fuel oil or diesel fuel) was historically delivered via barge to a pier where it was pumped via pipelines to the Tank Farm USTs through the Building 332 valve house. Product was transferred via pipeline from the USTs to the power plant or the submarines at the Lower Subase on an as-needed basis.

The No. 6 fuel oil transfer lines are situated within concrete-lined trenches. The diesel lines have no trenches. Currently, neither set of lines is cathodically protected. The ages of the No. 6 oil lines are unknown (possibly original lines), and the diesel lines are approximately 11 years old.

Storm Drainage System

The UST farm contains an extensive drainage system consisting of numerous catch basins, corrugated metal pipe, perforated corrugated metal pipe, vitrified clay pipe, and reinforced concrete pipe. According to NSB-NLON personnel, the drainage system serves approximately one-third of the entire facility. Portions of the drainage system were installed with perforated corrugated metal pipe to depress the water table in the Tank Farm. The surface water and groundwater collected by the storm sewer system ultimately discharges to a boomed area of the Thames River adjacent to the Goss Cove Landfill. Based on known elevations of storm sewer catch basins, the elevation of the drainage system is below the process piping.

The central drainage line of this system (constructed of perforated corrugated metal pipe) is known to be corroded. The Navy attempted to videotape the storm sewer system but could not move the camera

assembly through sections of the pipe. The Navy is currently designing a replacement storm sewer system. The new system will largely follow the existing piping.

Tank Underdrain System

The nine former USTs (OT-1 to OT-9) at the Tank Farm were each rated for a nominal capacity of 750,000 gallons or approximately 100,000 cubic feet. Each tank was approximately 110 feet in diameter and 11 feet in depth. Depending on the season, the depth to groundwater in some areas of the site may be as little as 2 feet below grade. Groundwater at a depth of 2 feet would convert to a hydraulic pressure of 2.6 pounds per square inch exerted over the entire floor of one empty tank or an upward force of approximately 1,400 tons. The floor of the tank would rise, with or without its walls.

Tank stability was obtained using a combination of a site-wide drainage system, a series of columns inside the tanks, and an underdrain system. A site-wide storm water drainage/dewatering system was installed and french drains were installed around OT-1, OT-2, OT-3, OT-4, and OT-5. A series of 37 columns transmitted the weight of the tank roof and overlying fill to the floor of the tank.

### 4.5.2 Site Investigations

The following seven investigations have been completed at the Tank Farm and are discussed in the subsections that follow:

- Diesel Tank Investigation (Fuss & O'Neill, 1989)
- No. 6 UST Tank Investigation (ERM, 1991)
- Waste Oil Tank OT-5 Investigation (GZA, 1991)
- Site Characterization of Waste Oil Tank OT-5 (Halliburton NUS, 1994a)
- Site Characterization of OT-10, Building 325, and Building 89 (Halliburton NUS, 1995a)
- Site Investigation for the Tank Farm (B&R Environmental, 1997e)
- Hydrogeologic Study at the Tank Farm (TtNUS, 1999a)

#### 4.5.2.1 Diesel Tank Investigation

In June 1989, Fuss & O'Neill, Incorporated (F&O) was contracted by the Department of the Navy to perform a soil and groundwater investigation near storage tanks OT-4, OT-7, OT-8, and OT-9 (F&O, September 1989). The investigation was conducted at the request of CTDEP to confirm that the tanks were intact and leakage was not occurring. Prior to the investigation, CTDEP had recommended that the tanks be decommissioned because of their age. As an alternative, an agreement was reached between

the Navy and CTDEP, which would allow the tanks to remain in service pending the outcome of the F&O investigation.

During the F&O investigation, dissolved-phase constituents of petroleum were detected in groundwater samples collected from monitoring wells (MW-1 through MW-12 on Figure 1-3) near tanks OT-7 through OT-9. BTEX and a petroleum scan were the only constituents analyzed at these tanks. No. 2 fuel oil, as well as benzene (2.4 µg/L), was detected in the groundwater near tank OT-7 at MW-1. No. 2 fuel oil was detected in the groundwater near tank OT-8 at monitoring wells MW-6 and MW-7 at 52 mg/L and 5.0 mg/L, respectively. Benzene, toluene, ethylbenzene, and xylenes (BTEX) were also detected in the groundwater sample from MW-7 at 47 µg/L, 7.2 µg/L, 55 µg/L and 81 µg/L, respectively. No volatile aromatics were detected at other well locations constructed in proximity to this tank. No. 2 fuel oil was also detected in the groundwater near tank OT-9. Water samples obtained from monitoring wells MW-9, MW-10 and MW-11 showed levels of No. 2 fuel oil at 10.6, 4.8, and 14 mg/L, respectively.

Monitoring wells were not installed at OT-4; however, four test borings (TB-1 through TB-4 on Figure 1-3) were installed in the vicinity of the tank. TPH was detected at 940 mg/kg in a soil sample collected at the top of the water table in nearby boring TB-4. Benzene was also detected at 2.4 µg/kg. These findings, combined with the later discovery of fuel oil in the UST farm storm drainage system, prompted the Department of the Navy to also evaluate the condition of the three No. 6 fuel oil tanks (OT-1, OT-2 and OT-3).

It should be noted that F&O did not report the presence of free-phase oil in any of the 12 monitoring wells (MW-1 to MW-12) installed during this 1989 investigation.

#### 4.5.2.2 No. 6 Oil Tank Investigation

An investigation of No. 6 fuel oil tanks OT-1 through OT-3 was conducted by ERM in the spring of 1991 (ERM, 1991). The investigation revealed the presence of soil and groundwater contamination near tank OT-2. For this investigation, monitoring wells ERM-1 through ERM-19 were installed. TPH was detected in soil samples from ERM-5 (2 to 4 feet) and ERM-7 (4 to 6 feet) at 545 µg/Kg and 6,930 µg/Kg, respectively. Dissolved-phase constituents of petroleum were detected in groundwater samples collected from monitoring wells on the north (ERM-5, 2,586 µg/L total BTEX), west (ERM-7 70 µg/L total BTEX), and southwest (ERM-8 3,755 µg/L total BTEX) side of the tank. Soil and groundwater contamination near tank OT-1 was not detected. At OT-3,25 µg/L of total BTEX was detected in well ERM-11, north of the tank.

Free-phase fuel was discovered by ERM in well MW-7 during a well gauging task. The discovery was immediately reported to the NSB-NLON Public Works Department manager. Recommendations included investigating the extent of free-phase fuel and remediation efforts.

#### 4.5.2.3 Waste Oil Tank OT-5

GZA conducted a limited environmental study in 1991 at the Waste Oil Tank No. 5 (OT-5) site, located between Tang Avenue and Sculpin Avenue at NSB-NLON (GZA, December 1991). The study included the development of a site topographic plan, a limited subsurface exploration program, the sampling of residual waste in OT-5, and the chemical screening and/or analyses of soil, waste oil, and sludge samples. The purpose of the study was to characterize the nature and extent of contaminants at the site to aid in the development of specifications for the abandonment of Tank OT-5 in place.

On the basis of the work conducted as part of this study, GZA reached the following conclusions:

- Tank OT-5 is a 750,000-gallon underground concrete tank constructed in the early 1940s. OT-5 was initially used as a No. 6 fuel oil storage tank but was converted between 1976 and 1981 to a waste oil storage tank. The waste deposited in OT-5 was reported to consist predominantly of oily bilge water pumped from Navy vessels. Abandonment of OT-5 began in 1989; demolition work was terminated when polychlorinated biphenyls (PCBs) were discovered in the waste oil sludge at the bottom of the tank.

- Four shallow auger borings (GZ-1 through GZ-4) were completed as part of this study to depths of 20 to 22 feet around the perimeter of OT-5. The subsurface conditions in the vicinity of OT-5 consist of sand and gravel fill to a depth of less than 5 feet, underlain by a silty fine sand fill, with trace amounts of organics, to depths of 14 to 18 feet below ground surface. Underlying the fill is a stratum of dense, naturally deposited, stratified sand, gravel, and silt. Groundwater was encountered at depths ranging from 5.7 to 8.2 feet below existing ground surface. Based on the area geology and surrounding topography, GZA anticipates that groundwater flow across the site is generally to the west, toward the Thames River.

- During the field exploration and sampling program, a total of 39 soil samples were collected from the auger borings. Additionally, two waste oil sludge and two waste oil samples were collected from within OT-5. A series of chemical screenings and/or analyses were performed on the samples.

- The results of the chemical screening and analyses performed on soil samples identified at least two areas of contamination in the soil surrounding OT-5. One area was detected by analyses of a sample collected from a depth of 10 to 12 feet at boring GZ-1, about 4 to 6 feet below the existing

groundwater table. The soil sample at this location contained fuel oil and pesticides. Boring GZ-1 is located on the downgradient side of OT-5. The occurrence of petroleum contamination below the groundwater level may indicate that leakage from OT-5 has occurred. The second area of contaminated soil was detected in samples collected from depths of 0 to 2 and 5 to 7 feet at boring GZ-4. The soil samples collected at this location contained fuel oil and pesticides. The sample collected from 0 to 2 feet also contained PCBs. The occurrence of contamination above the groundwater table and the proximity of GZ-4 to the former fill opening and current truck dumping pad suggest that surficial spills have occurred in the past.

- The 3.3 feet of residual material inside OT-5 consisted of three separate layers: floating oil product, water, and sludge/sediments. The floating oil layer was approximately 1 to 2 inches in thickness, whereas the sludge layer was roughly 6 inches thick; the remainder was water. The sludge thickness was observed to be greater in one of two sump pits located in the floor of OT-5. The waste oil and waste oil sludge were very high in petroleum hydrocarbon content, with measured levels ranging from 110,000 to 540,000 ppm. Aroclor-1260 was detected at concentrations ranging from 36,000 to 650,000 ppb. Several pesticide compounds were also detected. Total organics analysis indicated the presence of the following compounds: methylene chloride, PCE, toluene, ethylbenzene, acetone, 2-butanone (MEK), and total xylenes. Concentrations of these compounds ranged from 7.7 to 52 ppm. The use of detergents to clean the bilges or lower hulls of the submarines serviced at NSB-NLON suggests that emulsified hydrocarbons may have been present in the water layer, in addition to volatiles.

In 1993, the floating product and some tank sludge were removed and incinerated off site as Toxic Substance Control Act (TSCA) waste.

#### 4.5.2.4 Site Characterization - Waste Oil Tank OT-5

A site characterization was conducted in 1994 by Halliburton NUS to collect the necessary data to further determine the environmental impact of OT-5 on the surrounding media and to collect the necessary data to adequately abandon or close the tank. The Site Characterization Report (Halliburton NUS, 1994a) concluded that, based on the analytical results obtained from the investigation, the contents of OT-5 have not significantly affected the subsurface soil below the tank or the underlying groundwater. The majority of soil contamination was detected at a depth of 2 to 4 feet, which is above the tank. With the exception of a single detection of PCE (6 µg/L), no contaminants were detected in the groundwater at concentrations exceeding federal drinking water standards.

During 1994, Halliburton NUS prepared a design for the closure of OT-5. This design included removal and treatment of approximately 710,000 gallons of water and 40,000 gallons of thick sludge. Tank contents have been removed, and the tank has been cleaned. In addition, at the time of the Tank Farm Site Investigation, the tank had been demolished and closed in-place, and the site was backfilled and restored.

#### 4.5.2.5 Site Characterization - OT-10, Building 325, and Building 89

Sampling activities were conducted in 1995 by Halliburton NUS to characterize the conditions of the soil and groundwater around the waste oil tanks at OT-10, the No. 2 fuel oil tanks at Building 325, and the fuel oil tank at Building 89. Because of the differences in the proposed future use of each tank and the regulatory requirements associated with each, the field activities that were performed at each tank were conducted independently. The OT-10 tanks will be kept in service; therefore, field samples were collected to confirm that the tanks are operating properly and can remain in service.

The samples that were collected were analyzed and the results were summarized and compared to CTDEP cleanup standards in the Site Characterization Report (Halliburton NUS, 1995a). Based on the comparisons, it was determined that unacceptable levels of contamination were not detected at OT-10 and, therefore, no remediation is necessary. However, continued monitoring of the groundwater using the monitoring wells that were installed is suggested. If, during the course of monitoring, the conditions at the site show signs of degradation, then additional actions may be necessary.

#### 4.5.2.6 Site Investigation for the Tank Farm

B&R Environmental conducted an investigation of the Tank Farm during 1995 and 1996. The primary objectives of the investigation were to define the extent of soil and groundwater contamination in the UST farm, evaluate the impacts of the UST farm on the stormwater discharge, and develop preliminary recommendations for remedial action, should it be necessary. To characterize the site, B&R Environmental performed an integrated field investigation consisting of subsurface geophysical surveys, soil borings, monitoring well installation, investigation of underground pipelines, sediment sampling, and surface water sampling.

The results of previous investigations were used to guide the scope of this investigation. In addition, a Site Characterization and Analysis Penetrometer System (SCAPS) investigation as well as a subsurface geophysical survey were performed prior to the field investigation. The SCAPS investigation was performed by NFESC and the Public Works Center, Jacksonville, Florida. The SCAPS investigation was used to collect real-time analytical data for PAH components of petroleum hydrocarbons using a specially

engineered, truck-mounted cone penetrometer system. The system incorporates a laser fluorescent system that is used to excite the electrons of PAHs. When the laser is extinguished, light is emitted as the electrons return to their normal state. The resulting fluorescent light signal is sent back to the surface where it is spectrally dispersed and an examination of the energy is performed. Collected data on spectral wavelengths are then compared to wavelengths associated with standard solutions containing known concentrations of site contaminants.

A geophysical survey was performed to locate the existing storm sewer system. The survey was also used to assist in safe placement of soil borings and groundwater monitoring wells.

Once the preliminary field investigation activities were completed, a field investigation was performed from September through November 1995. The field investigation included installation and sampling of soil borings, permanent groundwater monitoring wells, and temporary groundwater monitoring wells. In addition, Geoprobe® soil sampling, surface water, stream sediment, and catch basin sediment sampling were performed.

Based on the results of the 1995 field investigation, several data gaps were identified within the UST farm. In December 1996, B&R Environmental performed additional field investigation activities including the installation and sampling of soil borings and temporary wells. In addition, test pits were excavated to verify the perimeter location of one tank.

The results of the 1995 and 1996 investigations were compared to state and federal cleanup criteria. Site contaminants that were present above detection limits were compared to the applicable medium-specific cleanup criteria. Each UST, the loading area, the fuel pipeline, and the results of the site-wide investigation were then evaluated to determine if chemicals exist at levels that exceed the cleanup criteria.

The most prevalent COCs were TPH and inorganics. The presence of inorganics, however, appears to be a result of the type of fill material used to construct the UST farm and of the high background levels throughout the NSB-NLON. Therefore, it was determined that there is no cost-effective means for reducing concentrations of inorganic contamination within the UST farm.

After each site was evaluated, the need for either No Further Action or remedial action was determined. The following criteria were used to determine the type of action for each site:

- Detection of COCs in specific site media
- Requirements for interim remedial action due to immediate human or environmental hazards.

No Further Action was recommended at OT-1, OT-2, OT-3, OT-4, OT-5, OT-6, OT-7, OT-9 and the loading area. OT-8 was found to have free product in one of the associated wells and TPH contamination in the soil and groundwater. Therefore, two options, one consisting of the modification of an existing interim product removal system and a second consisting of the excavation of contaminated soil and product removal, were recommended at OT-8. Excavation and off-site disposal were recommended at two locations on the Upper Subase fuel pipeline system to remediate soil contaminated with TPH. It was also recommended that TPH contamination detected in the soil at the Lower Subase be further addressed in the upcoming Lower Subase RI. Replacement of the existing storm sewer will address the site-wide area of concern and ensure that off-site sources no longer have a pathway to the UST farm.

#### 4.5.2.7 Hydrogeologic Study at the Tank Farm

B&R Environmental conducted a hydrogeologic study at the Tank Farm between May 1998 and August 1998. The study was completed to provide information required to complete the design of the replacement storm sewer system for the Tank Farm. The following tasks were completed as part of the study:

- Water level elevations were measured in the stream east of Building 447.
- Dry weather groundwater flow rates were measured in the Tank Farm storm sewer system.
- Four bedrock monitoring wells (23MW01D through 23MW04D) were installed in the vicinity of the Tank Farm.
- Two rounds of water levels were measured in the Tank Farm monitoring wells.
- A groundwater flow model (MODFLOW) was developed for the Tank Farm and surrounding area, and the model was used to evaluate existing conditions and potential design scenarios.

Additional field work (i.e., camera study and survey) is currently being conducted by a Navy contractor at the Tank Farm. The data collected by them will be used to update the existing model and finalize the design of the replacement storm sewer system.

### 4.5.3 Physical Characteristics

This section presents a summary of physical characteristics for the Tank Farm based on information generated during the Site Investigation for the Tank Farm and the Phase II RI. Topography and surface features, surface water, soils, geology, and hydrogeology are discussed in the following subsections.

#### 4.5.3.1 Topography and Surface Features

At NSB-NLON, the bedrock highs slope downward to two small, west-trending valleys. Bedrock outcrops are prevalent along steep topographic slopes. In addition to the large bedrock highs, there are several small sub-ridges that are visible as bedrock outcrops at the facility.

In the southern valley, the ground elevation slopes mildly from approximately 50 feet in the eastern portion to near sea-level along the Thames River. Historically, in the area of the Tank Farm, there was a topographic depression at the former Crystal Lake between Tang Avenue and Crystal Lake Road. The topographic depression was filled during construction of the Tank Farm. Surface elevations at the Tank Farm range from 18 to 25 feet msl. Drawing 2 shows surface topography at the Tank Farm.

#### 4.5.3.2 Surface Water

Due to the cover material and topography of the Tank Farm, a majority of the rain that falls on this site will infiltrate into the ground. Groundwater at this site is collected by a storm water/de-watering system. Groundwater and surface water collected by this system discharge to the Thames River at the Goss Cove Landfill.

#### 4.5.3.3 Soil Characteristics

The United States SCS soils map of NSB-NLON (SCS, 1983) classifies the soils at the Tank Farm as Udorthents-Urban land. The Udorthents-Urban land is defined as excessively to moderately drained soils that have been disturbed by cutting and filling.

#### 4.5.3.4 Geology and Hydrogeology

Geology

The predominant geology observed during the Tank Farm Site Investigation was fill and re-worked soils. These soils were generally silty, fine- to medium-textured sands with trace amounts of rock fragments present. These soils were typically classified as SM under the Unified Soil Classification System. Soil color varied from shades of brown to gray, and soil density was variable.

Hydrogeology

Four comprehensive rounds of water-level measurements (November 1995, December 1996, May 1998, and August 1998) have been taken in the Tank Farm overburden monitoring wells. Drawing 3 shows the shallow overburden potentiometric surface that was created using the November 1995 water levels. Inferred bedrock groundwater contours are shown on Drawing 4.

Drawing 3 shows that shallow overburden groundwater generally flows to the southwest toward the Thames River. A groundwater mound was observed in the vicinity of OT-8, and two groundwater sinks were observed; one near OT-3 and the other west of OT-5. Groundwater flow paths in the vicinity of the mound are in a radial direction away from the center of the mound. Groundwater flow paths in the vicinity of the sinks are in a radial direction toward the center of the sink.

Rising-head slug tests were performed in five water table monitoring wells (HNUS-4, HNUS-8, HNUS-12, HNUS-18, and HNUS-22) during the Tank Farm Site Investigation. The tests were performed to determine the hydraulic conductivity of the aquifer in areas where groundwater contamination was identified. The five wells were all screened in shallow overburden at depths of less than 20 feet below grade. The data were analyzed using the Hvorslev Method. The resulting hydraulic conductivities ranged from 1.67 feet/day (HNUS-18) to 6.76 feet/day (HNUS-22).

Four bedrock monitoring wells were installed in the vicinity of the Tank Farm during the hydrogeologic investigation that was conducted in 1998. The depth to bedrock encountered during the installation of these wells varied between 15 feet and 58 feet depending on location. The greatest depths to bedrock were encountered in wells 23MW01D and 23MW04D along the eastern and western boundaries, respectively, of the Tank Farm. The shallowest depths to bedrock were encountered in wells 23MW02D and 23MW03D in the central portion of the Tank Farm along its northern and southern boundaries, respectively. Completion depths of the four wells varied between 28.5 feet and 96.5 feet below grade. The completion depth depended on the depth of the first significant water-bearing zone.

### 4.5.4 Nature and Extent of Contamination

Soil, overburden groundwater, surface water, and sediment sampling was conducted at the Tank Farm during the Site Investigation at the Tank Farm (B&R Environmental, 1997e). Based upon the results of the aforementioned investigation, the nature and extent of contamination of the soil and groundwater at the Tank Farm are discussed on a matrix-specific basis in the following subsections. The complete analytical database for soil and groundwater is contained in Appendix A.

#### 4.5.4.1 Soil

Table 4-6 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in soil samples collected from the Tank Farm. Based upon the screening level assessment for the Tank Farm (Section 4.5.5.3) and the procedures for the preparation of soil tag maps (Section 1.4.3.1), analytical results for primary COPCs in Tank Farm soil samples are presented on Drawing 11 (Volume II).

As shown on Table 4-6, several VOCs, including one ketone, four monocyclic aromatics, four chlorinated aliphatics, and carbon disulfide were detected in the Tank Farm soil samples. With the exception of methylene chloride, the aforementioned VOCs were infrequently detected (i.e., approximately 10 percent of the samples). Methylene chloride, which is a common laboratory contaminant, was detected at concentrations ranging from 0.003 mg/kg to 0.009 mg/kg.

Four monocyclic aromatic compounds were detected at relatively high concentrations but at various sample locations and various depths. Benzene was detected at a maximum concentration of 0.0335 mg/kg. Ethylbenzene was reported at maximum concentration of 0.4 mg/kg, and total xylenes was reported at a maximum concentration of 0.656 mg/kg. The data suggest that contamination is spread across the site and may not be related to a specific tank.

Twenty-five SVOCs were detected in the Tank Farm soil samples. As shown on Table 4-6, 15 of these SVOCs were PAHs. Maximum concentrations of 11 of these 15 PAHs were detected in the soil sample collected from a depth interval of 4 to 6 feet bgs from location HNUS-24. Maximum concentrations of PAHs ranged from 0.021 mg/kg (acenaphthylene) to 1.7 mg/kg [benzo(a)pyrene]. 2-Methylnaphthalene, 4-chloro-3-methylphenol, benzoic acid, di-n-butylphthalate, di-n-octylphthalate, diethylphthalate, dimethylphthalate, and dibenzofuran were also each detected in from one to eight samples. Bis(2-ethylhexyl)phthalate was detected in 12 of 36 samples collected.

Eight pesticides were detected in the Tank Farm soil samples. Maximum detected concentrations were associated with sample locations HNUS 23 and 24. These two borings were located very close to (less than 50 feet from) Crystal Lake Road. 4,4'-DDT and 4,4'-DDE were the most frequently detected pesticides (detected in six and five out of 33 soil samples, respectively). The remaining pesticides and PCBs were detected in from one to three soil samples. 4,4'-DDT was detected at a maximum concentration of 0.11 mg/kg.

As shown in Table 4-6, 22 metals and cyanide were detected in the Tank Farm soil samples. Nine of these metals were detected in 36 out of 36 soil samples and four other metals were detected in 35 out of 36 samples. Maximum concentrations of 10 metals were detected in the soil sample collected from a depth interval of 19 to 21 feet from boring OT-S004. The entire Tank Farm was constructed on fill material.

#### 4.5.4.2 Groundwater

Table 4-7 presents descriptive statistics (i.e., frequency of detection, minimum and maximum concentrations, range of detection limits for nondetects, 95% UCL, and sample number and location associated with maximum concentration) and associated COPC screening criteria for each analyte detected at least once in groundwater samples collected from overburden wells at the Tank Farm. Based upon the screening level assessment for the Tank Farm (Section 4.5.5.3) and the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary COPCs in Tank Farm overburden groundwater samples are presented on Drawing 9 (Volume II).

Overburden Wells

Twelve VOCs, including four monocyclic aromatics, six chlorinated aliphatics, one ketone, and methyl-tert-butyl-ether, were detected in the groundwater samples collected from overburden wells. The reported concentrations of most of these VOCs were relatively low, ranging from 1 µg/L to 18 µg/L. However, reported concentrations of the monocyclic aromatics (benzene, ethylbenzene, toluene, and total xylenes) ranged from 0.5 µg/L (benzene and total xylenes) to 4,810 µg/L (total xylenes). The maximum concentrations of these chemicals were associated with groundwater samples collected from wells ERM-14 and ERM-15, which are located near the intersection of Flier Avenue and Tang Avenue.

As shown on Table 4-7, 16 SVOCs were detected in the groundwater samples collected from Tank Farm overburden wells. Various classes of SVOCs, including PAHs and phthalates, as well as 2,6-dinitrotoluene, 2-methylnaphthalaene, carbazole, and dibenzofuran were detected. In general, SVOCs were infrequently detected (detected in from one to four samples out of a total of 27 samples) at relatively low concentrations. Concentrations of all but four SVOCs (2-methylnaphthalene, fluorene, naphthalene, and phenanthrene) ranged from 0.5 µg/L to 16 µg/L. The concentrations of the four aforementioned SVOCs ranged from 0.7 µg/L to 740 µg/L. Bis(2-ethylhexyl)phthalate was also detected at a concentration of 3 µg/L in one of the off-site residential wells.

Heptachlor was detected at a concentration of 0.05 µg/L in one groundwater sample collected from temporary well SB/TW-7. No other pesticides or PCBs were detected in any of the groundwater samples collected from the overburden wells at the Tank Farm.

Twenty-one metals were detected in the unfiltered groundwater samples collected from the Tank Farm overburden wells, and 13 metals were detected in the associated filtered groundwater samples. In general, reported concentrations of metals in filtered and unfiltered samples were relatively similar (i.e., at the same order of magnitude). Exceptions to this statement include reported results for aluminum, chromium, copper, iron, and zinc. As shown on Table 4-7, maximum concentrations of all metals except aluminum, barium, chromium, copper, iron, manganese, mercury, potassium, silver, sodium, and zinc in filtered samples and of copper, lead, and zinc in unfiltered samples exceeded respective concentrations of these metals detected in unfiltered samples collected from off-site residential wells. A majority of the maximum concentrations were associated with samples collected from wells TW-6 and OT-GW04.

Diesel Range Organics (DRO), Gasoline Range Organics (GRO), and TPH were also detected in the overburden groundwater samples. DRO was detected in eight out of eight samples analyzed, at concentrations ranging from 210 to 2,800 µg/L. GRO was detected in six out of eight samples, at concentrations ranging from 10 to 140 µg/L. TPH was detected in 17 out of 89 samples analyzed, at concentrations ranging from 500 to 4,920,000 µg/L.

Analyses for several general chemistry parameters, including chloride, methane, nitrite, sulfate, and TOC, were also performed for selected groundwater samples collected from the Tank Farm overburden wells. Analytical results for these parameters are summarized on Table 4-7.

### 4.5.5 Data Evaluation

This section summarizes data evaluation procedures performed for site data. A discussion of contaminant fate and transport, a summary of the historical human health risk assessment(s) performed for the site, and a screening level assessment of site data are provided.

#### 4.5.5.1 Contaminant Fate and Transport

Chemical constituents detected in soil and groundwater at the Tank Farm are indicative of petroleum contamination. Concentrations of BTEX in soil ranged from 0.001 mg/kg up to 0.656 mg/kg, and concentrations of PAHs in soils ranged from 0.021 mg/kg to 1.7 mg/kg. The BTEX compounds were also detected in overburden groundwater wells at concentrations ranging from 0.5 µg/L to 4,810 µg/L. The presence of BTEX in both soil and groundwater indicates that vertical transport of these relatively soluble monocylcic aromatics has occurred. The presence of BTEX in groundwater is also the result of the leaking USTs at the NEX gas station (i.e., upgradient source). Naphthalene was the most frequently detected PAH in groundwater samples. The concentrations of naphthalene in overburden groundwater ranged from 0.7 µg/L to 200 µg/L. PAHs are typically less soluble than VOCs (i.e., BTEX) and therefore

are most likely to migrate via erosional processes. However, the depth to groundwater at some locations in the Tank Farm is as shallow as 2 feet, so the possibility of PAHs migrating to groundwater exists.

#### 4.5.5.2 Summary of Historical Human Health Risk Assessment

A quantitative HHRA based upon groundwater analytical data has not been performed to date for the Tank Farm. However, qualitative evaluations of data (screening level assessments) were performed for groundwater samples collected from the Tank Farm as part of the Site Characterization of Waste Oil Tank 5 (HNUS, 1994a) and the Site Investigation of the Tank Farm (B&R Environmental, 1997e). The screening levels used during the historical screening level assessments differ from those that are included in the current COPC screening table (Table 4-7). This section lists the criteria that were included in the historical assessments of groundwater data and provides summaries of the results of the assessments.

Only four groundwater samples were collected and analyzed during the Site Characterization of Waste Oil Tank 5 (HNUS, 1994a). Analytical results for these samples were evaluated against federal and CTDEP MCLs. PCE, which was detected in only one groundwater sample at a concentration of 6 µg/L, was the only chemical detected at a concentration exceeding one of the criteria (federal MCL of 5 µg/L).

The historical screening level assessment described in the Site Investigation Report for Tank Farm Investigation (B&R Environmental, 1997e) considered CTDEP surface water protection criteria, as included in the current assessment (Table 4-7), as well as CTDEP volatilization criteria for industrial land use. The volatilization criteria were developed to ensure that human health is not adversely affected from inhalation of volatile pollutants that have entered or may enter a building or other structure. The volatilization criteria apply to any site that has groundwater contaminated with VOCs and the water table is within 15 feet of the ground surface or any building. USEPA Region III Tap Water Ingestion Values, CTDEP groundwater protection criteria, and federal and CTDEP MCLs were not used in the historical screening level assessment since the groundwater at NSB-NLON is classified as GB and is not used for drinking water or other domestic purposes. Volatilization criteria were not considered in the current screening level assessment because they are less conservative than the direct ingestion criteria that were included. The following 12 chemicals exceeded at least one of the two groundwater criteria included in the historical screening level assessment (B&R Environmental, 1997e):

- benzene
- acenaphthene
- benz(a)anthracene
- phenanthrene
- arsenic
- beryllium
- chromium
- copper
- lead
- mercury
- nickel
- zinc

#### 4.5.5.3 Screening Level Assessment

COPCs at this site were selected using the risk-based COPC screening levels described in Section 1.4.2. All data collected during the Phase I and II RIs were used to select COPCs for soil and groundwater. Maximum and 95% UCL chemical concentrations are presented in the summary tables. Although the maximum concentration of a chemical may exceed an associated criterion, the distribution of the chemical in the medium is also important with respect to decision making. Therefore, the 95% UCL chemical concentration was included to provide some information on the potential distribution of the chemical. In addition, the summary tables for groundwater samples present the range of concentrations detected in off-site residential wells for each detected chemical to enable comparison of site groundwater data with groundwater data collected from wells unaffected by the site. A brief narrative of the findings of this qualitative analysis is provided in the remainder of this section.

The following parameters were selected as COPCs for OT-5/Tank Farm soils based upon the COPC screening analysis presented in Table 4-6:

- Monocyclic aromatic hydrocarbons (benzene)
- PAHs [benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene]
- Pesticides (4,4'-DDE and 4,4'-DDT)
- Miscellaneous (TPH)
- Inorganics (antimony, arsenic, chromium, lead, manganese, nickel, and vanadium)

Based upon the procedures for the preparation of soil tag maps (Section 1.4.3.1), analytical results for primary soil COPCs (all aforementioned COPCs except benzene and antimony) associated with Tank Farm soil samples are presented on Drawing 11 (Volume II).

The maximum concentration of benzene exceeded the USEPA SSLs for migration to groundwater, and the maximum concentration of antimony exceeded both the USEPA SSLs for migration to groundwater and the Connecticut remediation standards for pollutant mobility for groundwater classified as GB. Maximum concentrations of the remaining COPCs exceeded only the Connecticut remediation standards for pollutant mobility for groundwater classified as GB. However, benzene and dibenzo(a,h)anthracene were detected in less than 3 percent of the samples collected. Chemical concentrations in excess of the SSLs and/or Connecticut remediation standards for pollutant mobility indicate the potential for these chemicals to migrate to groundwater and potentially impact the quality of the groundwater. Of the aforementioned COPCs, benzene, arsenic, chromium, lead, manganese, nickel, and vanadium were detected in overburden groundwater wells.

4-Chloro-3-methylphenol was detected in a single soil sample from the site but was not identified as a COPC for soils because USEPA SSLs and CTDEP pollutant mobility criteria were not available for this chemical. Also, aluminum, copper, and iron were not evaluated for COPC selection; USEPA Region I does not advocate the quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for these chemicals are provisional references doses based on allowable intakes rather than adverse effect levels. Additionally, USEPA SSLs and CTDEP pollutant mobility criteria were not available for calcium, magnesium, sodium, and potassium because these chemicals are considered to be essential nutrients.

The following parameters were selected as COPCs for OT-5/Fuel Farm overburden groundwater based upon the COPC screening analysis presented on Table 4-7:

- Chlorinated aliphatic hydrocarbons (chloroform, bromodichloromethane, bromomethane, and PCE)
- Monocyclic aromatic hydrocarbons (benzene, ethylbenzene, toluene, and total xylenes)
- PAHs [benzo(a)anthracene, naphthalene, and phenanthrene]
- SVOCs [2-methylnaphthalene, carbazole, dibenzofuran, and bis(2-ethylhexyl)phthalate]
- Pesticides (heptachlor)
- Inorganics (arsenic, barium, beryllium, chromium, lead, manganese, mercury, nickel, thallium, vanadium, and zinc).

Based upon the procedures for the preparation of groundwater tag maps (Section 1.4.3.2), analytical results for primary overburden groundwater COPCs [benzene, phenathrene, bis(2-ethylhexyl)phthalate, arsenic, barium, lead, manganese, nickel, vanadium, and zinc] associated with Tank Farm overburden groundwater samples are presented on Drawing 9 (Volume II).

Maximum concentrations of benzene, PCE, toluene, arsenic (unfiltered), chromium (unfiltered), manganese (unfiltered), mercury (unfiltered), nickel (unfiltered), and thallium (unfiltered) exceeded the COPC screening level, the federal MCL, and the state MCL. Maximum concentrations of bromodichloromethane, bromomethane, ethylbenzene, chloroform, xylenes, 2-methylnaphthalene, benzo(a)anthracene, bis(2-ethylhexyl)phthalate, dibenzofuran, naphthalene, heptachlor, barium (unfiltered), and thallium (unfiltered) exceeded only the COPC screening level. The maximum concentration of beryllium (unfiltered) was in excess of both the federal MCL and state MCL. The maximum concentration of lead (unfiltered) was in excess of the federal MCL. Bromomethane, benzo(a)anthracene, carbazole, chrysene, dibenzofuran, and heptachlor were detected in less than 5 percent of the samples collected.

Concentrations of iron (filtered and unfiltered) and copper (unfiltered) exceeded both COPC screening levels and the federal MCL. Aluminum (unfiltered) was detected at maximum concentrations in excess of the federal secondary MCL. Copper (unfiltered) was detected at maximum concentrations in excess of the federal MCL. However, aluminum, copper, and iron were not selected as COPCs; USEPA Region I does not advocate quantitative evaluation of exposure to these chemicals because the only available toxicity criteria for these chemicals are provisional reference doses based on allowable intakes rather than adverse effect levels. Sodium was detected at maximum concentrations in excess of the state MCL. However, sodium was not selected as a COPC because this chemical is considered to be an essential nutrient. Additionally, no screening criteria were available for calcium, magnesium, and potassium because these chemicals are considered to be essential nutrients.

Maximum concentrations of benzene, bromodichloromethane, chloroform, tetrachloroethene, toluene, total xylenes, 2-methylnaphthalene, benzo(a)anthracene, bis(2-ethylhexyl)phthalate, carbazole, arsenic (unfiltered), beryllium (unfiltered), chromium (unfiltered), lead (unfiltered), manganese (filtered and unfiltered), mercury (unfiltered), nickel (unfiltered), thallium (unfiltered), and vanadium (filtered and unfiltered) detected in groundwater samples exceeded the Connecticut remediation standards for groundwater protection. Groundwater protection criteria specific to GB designated groundwater are not available; therefore, the groundwater protection criteria applicable for GA or GAA designated groundwater are used to protect existing groundwater regardless of the classification. This approach results in a conservative screening level assessment. However, copper was not selected as a COPC; USEPA Region I does not advocate quantitative evaluation of exposure to this chemical because the only available toxicity criteria for this chemical is provisional reference doses based on allowable intakes rather than adverse effect levels.

Because groundwater eventually discharges to a surface water body (i.e., the Thames River), site-specific groundwater data were also compared to Connecticut remediation standards for surface water protection. Benzene, benzo(a)anthracene, chrysene, phenanthrene, arsenic (unfiltered), beryllium (unfiltered), chromium (unfiltered), lead (unfiltered), mercury (filtered and unfiltered), nickel (unfiltered), and zinc (unfiltered) were detected at maximum concentrations exceeding the surface water protection criteria. However, copper was not selected as a COPC; USEPA Region I does not advocate quantitative evaluation of exposure to this chemical because the only available toxicity criteria for this chemical are provisional reference doses based on allowable intakes rather than adverse effect levels.

Maximum concentrations of total xylenes, bis(2-ethylhexyl)phthalate, arsenic, barium, beryllium, chromium, manganese, mercury, nickel, thallium, and vanadium in the Tank Farm overburden groundwater samples exceeded detected concentrations of these chemicals in unfiltered groundwater

samples from off-site residential wells. Conversely, the maximum detected concentrations of lead and zinc were less than the respective maximum concentrations detected in unfiltered groundwater samples from off-site residential wells.

### 4.5.6 Decision Tree

The general decision tree for the evaluation of sites is provided in Figure 1-2. The evaluation of Sites 23 and 9 using the decision tree approach is as follows:

- Seven investigations have been conducted at the Tank Farm (Sites 23 and 9) by various Navy contractors between 1989 and 1998. The information collected during these investigations is sufficient to describe the site and its physical characteristics.

- An evaluation of historical data indicates that certain portions of the site once posed a threat to human health and the environment. However, remedial actions have been completed to minimize or eliminate the threats.

- The soil and groundwater contamination associated with the NEX Gas Station is currently being remediated by an AS/SVE system. The BTEX plume from the NEX Gas Station extends into the Tank Farm and this portion of the plume is also being remediated by the AS/SVE system. The system is currently active; however, no current data from the system and the groundwater monitoring program have been incorporated into the NSB-NLON EGIS database. Therefore, the current concentrations of BTEX are unknown.

- A removal action was completed by the Navy in 1998. The contaminated soil and free-product that were identified at OT-8 in the Site Investigation of the Tank Farm were removed and disposed off-site during the action. Documentation of this activity was not available at the time of preparation of this report. The documentation will be obtained and summarized in the Basewide Groundwater OU RI report.

- The nature and extent of contamination in the deep overburden and bedrock groundwater at the Tank Farm has not been characterized. Additional investigations should be completed to determine the extent of contamination in these two units.

### 4.5.7 Recommendations

Seven investigations have been completed at the Tank Farm. Site 12 is located upgradient and within close proximity of Site 23 Tank Farm. As shown on Figure 4-3, a portion of the AS/SVE system for Site 12 is located within Site 23 because the groundwater at both sites is hydraulically connected and contamination from Site 12 has impacted the groundwater of Site 23. Recent data from the AS/SVE system are not currently included in the NSB-NLON EGIS database and an evaluation of the recent data could not be completed. Therefore, the data should be incorporated into the database and an evaluation of the data should be completed during the Basewide Groundwater OU RI. The data can be used to determine the current extent of contamination, contaminant fate, and risks for Site 23.

Documentation of the removal action completed at OT-8 should be obtained and summarized in the Basewide Groundwater OU RI report.

PCE has been detected at significant concentrations in the bedrock groundwater adjacent to the Tank Farm at the entrance to NSB-NLON. This contaminated groundwater could flow toward the Tank Farm because the bedrock slopes in the direction of the site. The CTDEP identified Fusconi Dry Cleaners as the source of the PCE. The dry cleaners will conduct further investigations to characterize the extent of contamination and produce a remedial action plan to address site issues.

Recently, four bedrock wells were installed as part of the hydrogeologic study of the Tank Farm. The wells were used to determine the potentiometric surface in the bedrock and were not sampled. Therefore, it is recommended that these wells be sampled during the Basewide Groundwater OU RI. In addition, a limited number of deep overburden wells (i.e., wells screened just above the bedrock/overburden interface) should be installed and sampled during the Basewide Groundwater OU RI to determine the extent of contamination. It is also recommended that a select number of existing shallow overburden wells be sampled during the Basewide Groundwater OU RI. All groundwater samples collected during the RI should be analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and TAL metals.

This page intentionally left blank.

TABLE 4-1

COPC SCREENING - SOIL SAMPLES
SITE 8 - GOSS COVE LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 4

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **VOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 1,2-Dichloroethene (total) | 1/37 | 0.024 J | 0.024 J | 0.005 - 55 | 0.024 | 8TB9-0406 | 8TB9 | 0.4/0.7 | 12 | N |
| 2-Butanone | 8/39 | 0.028 | 0.12 J | 0.01 - 110 | 0.12 | 8MW6D-0406 | 8MW6D | - | 80 | N |
| 4-Methyl-2-pentanone | 2/39 | 0.007 J | 0.19 | 0.01 - 110 | 0.19 | 8TB14-1214-D | 8TB14 | - | 14 | N |
| Acetone | 10/39 | 0.053 | 23 J | 0.01 - 200 | 23 | 8TB8-1012 | 8TB8 | 16 | 140 | Y |
| Benzene | 1/39 | 0.003 J | 0.003 J | 0.005 - 55 | 0.003 | 110690-8MW2(10-12) | 8MW2S | 0.03 | 0.2 | N |
| Carbon Disulfide | 5/39 | 0.002 J | 0.005 J | 0.005 - 55 | 0.005 | 8TB14-1214 | 8TB14 | 32 | 140 | N |
| Chloromethane | 3/39 | 0.004 J | 0.008 J | 0.01 - 110 | 0.008 | 8MW2D-0103 | 8MW2D | - | 0.54 | N |
| Ethylbenzene | 12/39 | 0.001 J | 69 | 0.005 - 55 | 69 | 8TB8-1012 | 8TB8 | 13 | 10.1 | Y |
| Methylene Chloride | 4/39 | 0.057 J | 38 | 0.003 - 55 | 38 | 8TB8-1012 | 8TB8 | 0.02 | 1 | Y |
| Styrene | 2/39 | 0.004 J | 0.01 J | 0.005 - 55 | 0.01 | 103090-8TB2(6-8) | 8TB2 | 4 | 20 | N |
| Tetrachloroethene | 15/39 | 0.001 J | 0.086 | 0.005 - 55 | 0.086 | 08SB10S10 | 8SB10S | 0.06 | 1 | Y |
| Toluene | 11/39 | 0.001 J | 22 J | 0.005 - 1.4 | 22 | 110690-8MW3(8-10) | 8MW3 | 12 | 67 | Y |
| Trichloroethene | 4/39 | 0.001 J | 0.008 J | 0.005 - 55 | 0.008 | 8TB9-0406 | 8TB9 | 0.06 | 1 | N |
| Xylenes, Total | 19/39 | 0.004 J | 480 | 0.005 - 55 | 480 | 8TB8-1012 | 8TB8 | 190 | 19.5 | Y |
| **SEMIVOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 2,4-Dimethylphenol | 2/34 | 0.14 J | 0.16 J | 0.35 - 230 | 0.16 | 8TB10-1820 | 8TB10 | 9 | 28 | N |
| 2-Methylnaphthalene | 23/34 | 0.029 J | 40 | 0.35 - 230 | 9.66 | 8TB6-0809 | 8TB6 | - | 56 | N |
| 2-Methylphenol | 3/34 | 0.029 J | 3.4 J | 0.35 - 230 | 3.4 | 8TB5-1416-D | 8TB5 | 15 | 70 | N |
| 3,3'-Dichlorobenzidine | 1/34 | 15 | 15 | 0.35 - 230 | 15 | 103090-8TB2(6-8) | 8TB2 | 0.007 | 0.016 | Y |
| 4-Methylphenol | 9/34 | 0.033 J | 11 | 0.35 - 230 | 11 | 8TB8-1012 | 8TB8 | - | 7 | Y |
| Acenaphthene | 27/34 | 0.051 J | 65 | 0.35 - 230 | 65 | 8TB6-0809 | 8TB6 | 570 | 84 | N |
| Acenaphthylene | 18/34 | 0.025 J | 11 J | 0.35 - 230 | 11 | 8MW8S-0002 | 8MW8S | - | 84 | N |
| Anthracene | 30/34 | 0.043 J | 55 | 0.35 - 1.8 | 22.65 | 8TB6-0809 | 8TB6 | 12000 | 400 | N |
| Benzo(a)anthracene | 34/34 | 0.13 J | 490 J | - | 76.25 | 8TB5-1416 | 8TB5 | 2 | 1 | Y |
| Benzo(a)pyrene | 31/34 | 0.15 J | 44 | 0.36 - 230 | 14.10 | 8MW8S-0002 | 8MW8S | 8 | 1 | Y |
| Benzo(b)fluoranthene | 33/34 | 0.17 J | 40 | 1.8 - 230 | 24.19 | 8MW8S-0002 | 8MW8S | 5 | 1 | Y |
| Benzo(g,h,i)perylene | 25/34 | 0.097 J | 7.5 J | 0.35 - 230 | 7.5 | 8MW8S-0002 | 8MW8S | - | 40 | N |
| Benzo(k)fluoranthene | 25/34 | 0.099 J | 33 | 0.35 - 230 | 33 | 8MW8S-0002 | 8MW8S | 49 | 1 | Y |
| Benzoic Acid | 6/31 | 0.063 J | 0.42 J | 0.36 - 230 | 0.42 | 8TB12-0507 | 8TB12 | 400 | 5600 | N |
| Bis(2-Ethylhexyl)phthalate | 8/34 | 0.12 J | 31 | 0.15 - 230 | 31 | 8TB9-0406 | 8TB9 | 3600 | 11 | Y |
| Butylbenzyl Phthalate | 2/34 | 0.028 J | 0.03 J | 0.35 - 230 | 0.03 | 8TB11-0002 | 8TB11 | 930 | 200 | N |
| Carbazole | 23/27 | 0.083 J | 35 J | 0.35 - 230 | 35 | 8TB6-0809 | 8TB6 | 0.6 | 0.36 | Y |

TABLE 4-1

COPC SCREENING - SOIL SAMPLES
SITE 8 - GOSS COVE LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 4

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| Chrysene | 34/34 | 0.19 J | 500 J | - | 500 | 8TB5-1416 | 8TB5 | 160 | 0.96 | Y |
| Di-n-butyl phthalate | 6/34 | 0.02 J | 0.19 J | 0.35 - 230 | 0.19 | 8MW5S-0103 | 8MW5S | 2300 | 140 | N |
| Di-n-octyl phthalate | 1/34 | 0.02 J | 0.02 J | 0.35 - 230 | 0.02 | 8TB11-0002 | 8TB11 | 10000 | 20 | N |
| Dibenzo(a,h)anthracene | 22/34 | 0.39 J | 10 J | 0.35 - 230 | 10 | 8MW8S-0002 | 8MW8S | 2 | 0.005 | Y |
| Dibenzofuran | 26/34 | 0.037 J | 42 | 0.35 - 230 | 42 | 8TB6-0809 | 8TB6 | - | 5.6 | Y |
| Diethyl Phthalate | 5/34 | 0.022 J | 12 J | 0.35 - 12 | 12 | 8TB5-1416 | 8TB5 | 470 | 1100 | N |
| Fluoranthene | 34/34 | 0.29 J | 110 | - | 110 | 8TB6-0809 | 8TB6 | 4300 | 56 | Y |
| Fluorene | 29/34 | 0.053 J | 65 | 0.35 - 1.8 | 65 | 8TB6-0809 | 8TB6 | 560 | 56 | Y |
| Indeno(1,2,3-cd)pyrene | 27/34 | 0.1 J | 25 | 0.35 - 230 | 7.6 | 8MW8S-0002 | 8MW8S | 14 | 0.005 | Y |
| Isophorone | 1/34 | 0.44 J | 0.44 J | 0.35 - 230 | 0.44 | 103090-8TB1(4-6) | 8TB1 | 0.5 | 7.37 | N |
| Naphthalene | 25/34 | 0.027 J | 99 | 0.35 - 3.7 | 19.6 | 8TB6-0809 | 8TB6 | 84 | 56 | Y |
| Phenanthrene | 34/34 | 0.16 J | 190 | - | 190 | 8TB6-0809 | 8TB6 | - | 40 | Y |
| Phenol | 6/34 | 0.4 | 1600 J | 0.35 - 9.3 | 1600 | 8TB5-1416 | 8TB5 | 100 | 800 | Y |
| Pyrene | 34/34 | 0.26 J | 77 | 230 | 77 | 8MW8S-0002 | 8MW8S | 4200 | 40 | Y |
| **PESTICIDES/PCBs (mg/kg)** | | | | | | | | | | |
| 4,4'-DDD | 17/34 | 0.0052 J | 1.7 J | 0.0034 - 0.17 | 0.1665 | 110690-8MW2(10-12) | 8MW2S | 16 | 0.029 | Y |
| 4,4'-DDE | 19/33 | 0.0019 J | 1.2 | 0.0034 - 0.17 | 1.2 | 8TB14-1214 | 8TB14 | 54 | 0.021 | Y |
| 4,4'-DDT | 25/34 | 0.0054 | 3.4 J | 0.0034 - 0.039 | 3.4 | 110690-8MW2(10-12) | 8MW2S | 32 | 0.021 | Y |
| Aldrin | 4/34 | 0.0074 J | 0.062 J | 0.0017 - 0.085 | 0.062 | 8TB6-0809 | 8TB6 | 0.5 | 0.00041 | Y |
| Alpha-Chlordane | 5/34 | 0.0021 J | 0.0083 J | 0.0017 - 0.85 | 0.0083 | 8MW7S-0002 | 8MW7S | 10 | 0.066 | N |
| Aroclor-1248 | 4/34 | 0.091 | 19 J | 0.034 - 0.85 | 19 | 8TB5-1416 | 8TB5 | - | 0.1 | Y |
| Aroclor-1254 | 10/34 | 0.062 J | 33 J | 0.039 - 1.7 | 33 | 8TB5-1416-D | 8TB5 | - | 0.1 | Y |
| Aroclor-1260 | 4/32 | 0.18 J | 0.5 J | 0.039 - 1.7 | 0.5 | 8MW6D-0103 | 8MW6D | - | 0.1 | Y |
| Dieldrin | 7/34 | 0.0042 J | 0.13 J | 0.0034 - 0.17 | 0.13 | 8TB6-0809 | 8TB6 | 0.004 | 0.007 | Y |
| Endosulfan II | 6/34 | 0.0074 J | 0.28 J | 0.0034 - 0.17 | 0.28 | 8TB5-1416 | 8TB5 | 18 | 8.4 | N |
| Endosulfan Sulfate | 4/34 | 0.008 J | 0.65 J | 0.0034 - 0.17 | 0.65 | 8TB5-1416 | 8TB5 | 18 | 8.4 | N |
| Endrin | 17/34 | 0.0045 J | 1.5 J | 0.0034 - 0.17 | 1.5 | 8TB5-1416-D | 8TB5 | 1 | 0.42 | Y |
| Endrin Aldehyde | 12/27 | 0.0044 J | 1 | 0.0034 - 0.039 | 1 | 8TB5-1416 | 8TB5 | 1 | 0.42 | Y |
| Endrin Ketone | 8/32 | 0.005 J | 0.43 J | 0.0034 - 0.17 | 0.43 | 8TB6-0809 | 8TB6 | 1 | 0.42 | Y |
| Gamma-Chlordane | 9/34 | 0.003 J | 0.17 J | 0.0017 - 0.85 | 0.17 | 8TB14-1214 | 8TB14 | 10 | 0.066 | Y |
| Heptachlor | 11/34 | 0.002 J | 0.03 J | 0.0017 - 0.085 | 0.03 | 8TB14-1214 | 8TB14 | 23 | 0.013 | Y |
| Heptachlor Epoxide | 5/34 | 0.0032 J | 0.092 J | 0.0017 - 0.085 | 0.092 | 8TB6-0809 | 8TB6 | 0.7 | 0.02 | Y |
| Methoxychlor | 4/32 | 0.052 J | 1 J | 0.017 - 0.85 | 1 | 8TB5-1416-D | 8TB5 | 160 | 8 | N |

TABLE 4-1

COPC SCREENING - SOIL SAMPLES
SITE 8 - GOSS COVE LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 3 OF 4

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| alpha-BHC | 2/34 | 0.0021 J | 0.0034 J | 0.0017 - 0.085 | 0.0034 | 8TB8-1012 | 8TB8 | 0.0005 | 0.0011 | Y |
| gamma-BHC (Lindane) | 2/34 | 0.003 J | 0.0033 J | 0.0017 - 0.085 | 0.0033 | 8MW8S-0002 | 8MW8S | 0.009 | 0.04 | N |
| **DIOXINS/FURANS (mg/kg)** | | | | | | | | | | |
| OCDD | 1/2 | 0.0016 J | 0.0028 J | 0.0007 | 0.0028 | 8TB5-1416-D | 8TB5 | - | 0.0000467 | Y |
| **INORGANICS (mg/kg)** | | | | | | | | | | |
| Aluminum | 34/34 | 3860 | 31200 | - | 9812 | 103090-8TB1(4-6) | 8TB1 | - | - | N[6] |
| Antimony | 5/26 | 5.2 | 43.3 J | 2 - 12.3 | 43.3 | 8MW7S-1416 | 8MW7S | 5 | 1.2 | Y |
| Arsenic | 34/34 | 1.3 | 121 | - | 121 | 103090-8TB1(4-6) | 8TB1 | 29 | 10 | N[5] |
| Barium | 34/34 | 38.9 | 5620 J | - | 5620 | 8TB5-1416-D | 8TB5 | 1600 | 200 | N[5] |
| Beryllium | 21/34 | 0.24 | 4.2 | 0.17 - 0.58 | 0.76 | 8MW2D-0103 | 8MW2D | 63 | 0.8 | Y |
| Boron | 11/15 | 11.5 | 25.4 J | 11.1 - 11.8 | 25.4 | 8TB14-1214-D | 8TB14 | - | 130 | N |
| Cadmium | 17/31 | 0.51 J | 20.7 | 0.29 - 1.3 | 2.15 | 103090-8TB1(4-6) | 8TB1 | 8 | 1 | Y |
| Calcium | 34/34 | 1050 | 14400 | - | 14400 | 8TB9-0406 | 8TB9 | - | - | N[7] |
| Chromium | 34/34 | 8.8 | 298 J | - | 298 | 8TB9-0406 | 8TB9 | - | 10 | N[5] |
| Cobalt | 33/34 | 3.5 | 106 | 5.2 - 6.2 | 106 | 103090-8TB1(4-6) | 8TB1 | - | 84 | Y |
| Copper | 34/34 | 16.2 J | 14300 | - | 1705 | 110690-8MW2(10-12) | 8MW2S | - | 260 | N[6] |
| Iron | 34/34 | 8220 | 139000 J | - | 139000 | 8TB8-1012 | 8TB8 | - | - | N[6] |
| Lead | 34/34 | 8.9 | 3540 J | - | 1241 | 8TB9-0406 | 8TB9 | - | 3 | Y |
| Magnesium | 34/34 | 1710 | 6910 | - | 3636 | 110690-8MW3(8-10) | 8MW3 | - | - | N[7] |
| Manganese | 34/34 | 123 J | 1080 | - | 1080 | 110690-8MW2(10-12) | 8MW2S | - | 10 | Y |
| Mercury | 31/34 | 0.12 | 63.6 | 0.11 - 0.19 | 5.83 | 8MW5S-0103 | 8MW5S | 2 | 0.4 | N[5] |
| Nickel | 34/34 | 3.7 J | 183 | - | 183 | 8MW6D-0406 | 8MW6D | 130 | 20 | Y |
| Potassium | 34/34 | 615 | 6310 J | - | 6310 | 110690-8MW3(8-10) | 8MW3 | - | - | N[7] |
| Selenium | 5/34 | 0.35 | 1.2 J | 0.32 - 0.5 | 1.2 | 8MW6D-0406 | 8MW6D | 5 | 10 | N |
| Silver | 16/34 | 0.51 J | 6.5 | 0.36 - 1.7 | 6.5 | 8TB9-0406 | 8TB9 | 34 | 7.2 | N |
| Sodium | 22/32 | 73.8 | 1660 J | 239 - 648 | 1660 | 8MW6D-0406 | 8MW6D | - | - | N[7] |
| Thallium | 2/34 | 0.23 J | 0.3 | 0.22 - 0.73 | 0.3 | 8TB8-0.5 2.5 | 8TB8 | 0.7 | 1 | N |
| Vanadium | 34/34 | 12.5 J | 64.8 | - | 30.6 | 103090-8TB1(4-6) | 8TB1 | 6000 | 10 | Y |
| Zinc | 34/34 | 24.6 J | 7580 | - | 1993.4 | 110690-8MW2(10-12) | 8MW2S | 12000 | 1000 | Y |
| **MISCELLANEOUS PARAMETERS (mg/kg)** | | | | | | | | | | |
| Total Organic Carbon | 7/7 | 3200 | 18000 | - | 12082 | 8MW8S-0002 | 8MW8S | - | - | N[8] |

**TABLE 4-1**

**COPC SCREENING - SOIL SAMPLES**
**SITE 8 - GOSS COVE LANDFILL[1]**
**NSB-NLON, GROTON, CONNECTICUT**
**PAGE 4 OF 4**

1 Includes samples 08SB10S10, 08SB9S06, 08TB1608, 08TB1608-D, 08TB1706, 08TB1812, 103090-8MW1(6-8), 103090-8TB1(4-6), 103090-8TB2(6-8), 110690-8MW2(10-12), 110690-8MW3(8-10), 110690-8MW3(8-10)-D, 110690-8MW4(4-6), 110690-8TB3(10-12), 8-SS01-03, 8-SS02-03, 8SS03-03, 8-SS03-03-D, 8MW2D-0103, 8MW2D-0507, 8MW5S-0103, 8MW6D-0103, 8MW6D-0406, 8MW6S-0406, 8MW7S-0002, 8MW7S-1416, 8MW8S-0002, 8TB10-1820, 8TB11-0002, 8TB12-0507, 8TB13-0406, 8TB14-1214, 8TB14-1214-D, 8TB15-1113, 8TB4-0.52.5, 8TB4-0406, 8TB5-1416, 8TB5-1416-D, 8TB6-0002, 8TB6-0809, 8TB7-0406, 8TB8-0.52.5, 8TB8-1012, 8TB9-0406.
2 USEPA Soil Screening Levels (USEPA, May 1996). See Table 1-2 for futher details regarding surrogate and/or calculated values.
3 CTDEP, 1996. See Table 1-2 for futher details regarding surrogate and/or calculated values.
4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.
5 TCLP extraction followed by analysis for metals was also performed for the soil sample associated with the maximum concentration of this chemical. The resulting TCLP data indicate that pollutant mobility is not anticipated to be of concern for this chemical in the soil matrix in this area (i.e., this chemical was not detected in associated TCLP leachates or was detected at concentrations less than the associated Connecticut pollutant mobility standard for GB areas and the federal toxicity characteristic regulatory level).
6 USEPA Region I does not advocate quantitative evaluation of this chemical.
7 Essential nutrient; not evaluated for COPC selection.
8 Not applicable for COPC screening.
- Not Applicable or Not Available.

## TABLE 4-2

### COPC SCREENING - TCLP SOIL SAMPLES
### SITE 8 - GOSS COVE LANDFILL[1]
### NSB-NLON, GROTON, CONNECTICUT

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | Federal Pollutant Mobility (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **TCLP METALS (mg/L)** | | | | | | | | | | |
| Arsenic | 3/17 | 0.14 | 0.17 | 0.018 - 0.5 | 0.17 | 103090-8MW1(6-8)-T | 8MW1 | 5 | 0.5 | N |
| Barium | 17/17 | 0.0135 | 2.67 | - | 2.67 | 8TB8-1012-T | 8TB8 | 100 | 10 | N |
| Cadmium | 8/17 | 0.0052 | 0.109 | 0.002 | 0.109 | 8MW6D-0406-T | 8MW6D | 1 | 0.05 | Y |
| Chromium | 8/16 | 0.0045 J | 0.27 | 0.0036 - 0.0222 | 0.1389 | 103090-8TB2(6-8)-T | 8TB2 | 5 | 0.5 | N |
| Lead | 11/17 | 0.0169 | 4.8 | 0.035 - 0.1 | 4.8 | 110690-8MW2(10-12)-T | 8MW2S | 5 | 0.15 | Y |
| Selenium | 3/17 | 0.0443 | 0.117 | 0.085 - 0.2 | 0.117 | 8TB9-0406-T | 8TB9 | 1 | 0.5 | N |
| Silver | 4/15 | 0.0086 J | 0.39 J | 0.002 - 0.007 | 0.39 | 103090-8TB2(6-8)-T | 8TB2 | 5 | 0.36 | Y |

1 Includes samples 13090-8MW1(6-8)-T, 13090-8TB1(4-6)-T, 103090-8TB2(6-8)-T, 110690-8MW2(10-12)-T, 110690-8MW4(4-6)-T, 110690-8TB3(10-12)-T, 8MW2D-0103-T, 8MW3(8-10)-D-T, 8MW3(8-10)-T, 8MW5S-0103-T, 8MW6D-0406-T, 8MW7S-1416-T, 8SD3-T, 8TB4-0406-T, 8TB5-1416-D-T, 8TB5-1416-T, 8TB6-0809-T, 8TB8-1012-T, 8TB9-0406-T.
2 CTDEP, 1996.
3 Federal Toxicity Characteristic Regulatory Level (58 FR 46049).
4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.

TABLE 4-3

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 8 - GOSS COVE LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | 1/27 | 1 J | 1 J | 5 - 50 | 1 | 8GW6S-2 | 8MW6S | 54 | 200 | 200 | 200 | 62000 | ND | N |
| 1,2-Dichloroethene (total) | 9/27 | 1 J | 12 J | 10 | 12 | 121890-8MW3S | 8MW3 | 5.5 | 70/100 | 70/100 | 63 | 14000 | ND | Y |
| 2-Butanone | 1/27 | 5 J | 5 J | 10 - 100 | 5 | 8GW6D-2 | 8MW6D | 190 | - | - | 400 | - | ND | N |
| 4-Methyl-2-pentanone | 3/27 | 2 J | 200 | 10 | 200 | 121890-8MW3S | 8MW3 | 290 | - | - | 350 | - | ND | N |
| Acetone | 1/27 | 700 | 700 | 10 - 28 | 700 | 121890-8MW3S | 8MW3 | 370 | - | - | 700 | - | ND | Y |
| Benzene | 8/27 | 1 J | 5 J | 5 - 50 | 5 | 8GW3 | 8MW3 | 0.36 | 5 | 5 | 1 | 710 | ND | Y |
| Bromodichloromethane | 1/27 | 6 J | 6 J | 5 - 50 | 6 | 8GW6D | 8MW6D | 0.17 | 100/80 | 100 | 0.56 | 660 | ND | Y |
| Carbon Disulfide | 4/27 | 1 J | 7 J | 5 - 50 | 7 | 8GW8S-2 | 8MW8S | 100 | - | - | 700 | - | ND | N |
| Chloroform | 1/27 | 18 | 18 | 5 - 50 | 18 | 8GW6D | 8MW6D | 0.15 | 100/80 | 100 | 6 | 14100 | ND | Y |
| Ethylbenzene | 14/27 | 1 J | 120 | 10 | 120 | 121890-8MW3S/ 121890-8MW2S | 8MW3/ 8MW2S | 130 | 700 | 700 | 700 | 580000 | ND | N |
| Tetrachloroethene | 11/27 | 1 J | 120 | 5 - 50 | 120 | 8GW8S-2 | 8MW8S | 1.1 | 5 | 5 | 5 | 88 | ND | Y |
| Toluene | 5/27 | 1 J | 450 | 5 - 11 | 450 | 121890-8MW3S | 8MW3 | 75 | 1000 | 1000 | 1000 | 4000000 | ND | Y |
| Trichloroethene | 2/27 | 7 J | 8 J | 5 - 50 | 8 | 8GW2D | 8MW2D | 1.6 | 5 | 5 | 5 | 2340 | ND | Y |
| Vinyl Chloride | 1/27 | 5 J | 5 J | 10 - 100 | 5 | 121890-8MW2S | 8MW2S | 0.019 | 2 | 2 | 2 | 15750 | ND | Y |
| Xylenes, Total | 16/27 | 2 J | 610 | 10 | 610 | 121890-8MW3S | 8MW3 | 1200 | 10000 | 10000 | 530 | - | 2 | Y |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | 15/25 | 0.6 J | 320 | 10 | 320 | 8GW3 | 8MW3 | 73 | - | - | 140 | - | ND | Y |
| 2-Methylnaphthalene | 13/25 | 1 J | 12 J | 10 | 12 | 121890-8MW3S | 8MW3 | 150 | - | - | 280 | - | ND | N |
| 2-Methylphenol | 7/25 | 3 J | 140 | 10 | 140 | 121890-8MW3S | 8MW3 | 180 | - | - | 350 | - | ND | N |
| 4-Bromophenyl Phenyl Ether | 1/25 | 2 J | 2 J | 10 - 50 | 2 | 8GW1S | 8MW1 | - | - | - | - | - | ND | N |
| 4-Methylphenol | 8/25 | 4 J | 500 | 10 | 500 | 121890-8MW2S | 8MW2S | 18 | - | - | 35 | - | ND | Y |
| Acenaphthene | 12/25 | 0.6 J | 11 J | 10 - 50 | 11 | 121890-8MW2S | 8MW2S | 220 | - | - | 420 | 27000 | ND | N |
| Acenaphthylene | 1/25 | 0.7 J | 0.7 J | 10 - 50 | 0.7 | 8GW6S | 8MW6S | - | - | - | 420 | 0.3 | ND | Y |
| Anthracene | 6/25 | 1 J | 3 J | 10 - 50 | 3 | 8GW3 | 8MW3 | 1100 | - | - | 2000 | 1100000 | ND | N |
| Benzo(a)anthracene | 4/25 | 0.6 J | 4 J | 10 - 50 | 4 | 8GW3 | 8MW3 | 0.092 | - | - | 0.06 | 0.3 | ND | Y |
| Benzo(a)pyrene | 4/25 | 0.6 J | 4 J | 10 - 50 | 4 | 8GW3 | 8MW3 | 0.0092 | 0.2 | 0.2 | 0.2 | 0.3 | ND | Y |
| Benzo(b)fluoranthene | 4/25 | 1 J | 4 J | 10 - 50 | 4 | 8GW3 | 8MW3 | 0.092 | - | - | 0.08 | 0.3 | ND | Y |
| Benzo(g,h,i)perylene | 3/25 | 1 J | 4 J | 10 - 50 | 4 | 8GW3 | 8MW3 | - | - | - | 200 | 0.3 | ND | Y |
| Benzo(k)fluoranthene | 5/25 | 0.6 J | 5 J | 10 - 50 | 5 | 8GW3 | 8MW3 | 0.92 | - | - | 0.5 | 0.3 | ND | Y |
| Benzoic Acid | 9/24 | 0.8 J | 21 J | 50 - 250 | 21 | 8GW6D-2 | 8MW6D | 15000 | - | - | 28000 | - | ND | N |
| Bis(2-Ethylhexyl)phthalate | 9/25 | 1 J | 140 | 10 - 50 | 140 | 8GW8S | 8MW8S | 4.8 | 6 | 6 | 2 | 59 | 3 | Y |
| Butylbenzyl Phthalate | 2/25 | 0.6 J | 0.7 J | 10 - 50 | 0.7 | 8GW5S | 8MW5S | 730 | - | - | 1000 | 52000 | ND | N |
| Carbazole | 9/21 | 0.6 J | 16 | 10 | 16 | 8GW3 | 8MW3 | 3.3 | - | - | 1.8 | 29 | ND | Y |
| Chrysene | 5/25 | 0.8 J | 7 J | 10 - 50 | 7 | 8GW3 | 8MW3 | 9.2 | - | - | 4.8 | 0.3 | ND | Y |
| Di-n-butyl phthalate | 2/25 | 0.5 J | 0.6 J | 10 - 50 | 0.6 | 8GW5S-D | 8MW5S | 370 | - | - | 700 | 120000 | ND | N |
| Di-n-octyl phthalate | 1/25 | 0.7 J | 0.7 J | 10 - 50 | 0.7 | 8GW3 | 8MW3 | 73 | - | - | 100 | - | ND | N |
| Dibenzo(a,h)anthracene | 1/25 | 0.8 J | 0.8 J | 10 - 50 | 0.8 | 8GW2S | 8MW2S | 0.0092 | - | - | 0.2 | 0.3 | ND | Y |
| Dibenzofuran | 9/25 | 0.8 J | 4 J | 10 - 50 | 4 | 121890-8MW2S/ 121890-8MW3S | 8MW2S/ 8MW3 | 2.4 | - | - | 28 | - | ND | Y |
| Fluoranthene | 13/25 | 0.6 J | 15 | 10 - 50 | 15 | 8GW3 | 8MW3 | 150 | - | - | 280 | 3700 | ND | N |
| Fluorene | 16/25 | 0.6 J | 8 J | 10 | 8 | 121890-8MW2S | 8MW2S | 150 | - | - | 280 | 140000 | ND | N |
| Indeno(1,2,3-cd)pyrene | 3/25 | 0.9 J | 4 J | 10 - 50 | 4 | 8GW3 | 8MW3 | 0.092 | - | - | 0.2 | 0.3 | ND | Y |
| N-Nitrosodiphenylamine | 1/25 | 1 J | 1 J | 10 - 50 | 1 | 8GW3 | 8MW3 | 14 | - | - | 7.1 | 480 | ND | N |

TABLE 4-3

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 8 - GOSS COVE LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration Sample Number | Maximum Concentration Location | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] Groundwater Protection | State Remediation Standards[5] Surface Water Protection | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Naphthalene | 15/25 | 2 J | 62 | 10 | 62 | 121890-8MW3S | 8MW3 | 150 | - | - | 280 | - | ND | N |
| Phenanthrene | 16/25 | 0.7 J | 14 J | 10 - 50 | 7.5 | 8GW3/ 121890-8MW2S | 8MW3/ 8MW2S | - | - | - | 200 | 0.3 | ND | Y |
| Phenol | 6/25 | 1 J | 26 | 10 - 50 | 26 | 121890-8MW2S | 8MW2S | 2200 | - | - | 4000 | 92000000 | ND | N |
| Pyrene | 10/25 | 0.5 J | 11 | 10 - 50 | 11 | 8GW3 | 8MW3 | 110 | - | - | 200 | 110000 | ND | N |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 12/25 | 36.6 | 53200 | 10 - 85.5 | 53200 | 8GW7S | 8MW7S | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Aluminum, Filtered | 2/20 | 16.2 J | 9160 | 10 - 30.9 | 9160 | 8GW7S DISS | 8MW7S | - | 50 to 200 | - | - | - | - | N[8] |
| Antimony | 2/24 | 17.8 J | 157 J | 2 - 25 | 157 | 8GW7S | 8MW7S | 1.5 | 6 | 6 | 6 | 86000 | ND | Y |
| Antimony, Filtered | 4/20 | 4.55 | 53.5 | 5 - 35.9 | 53.5 | 8GW7S DISS | 8MW7S | 1.5 | 6 | 6 | 6 | 86000 | - | Y |
| Arsenic | 13/25 | 2.3 J | 29.8 J | 1 - 20 | 8.6481 | 8GW2D | 8MW2D | 0.045 | 50 | 50 | 50 | 4 | 0.64 | Y |
| Arsenic, Filtered | 10/20 | 2.5 J | 44.9 J | 1 - 20 | 44.9 | 8GW2D DISS | 8MW2D | 0.045 | 50 | 50 | 50 | 4 | - | Y |
| Barium | 25/25 | 30.8 J | 1340 J | - | 1340 | 8GW4-2 | 8MW4 | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | Y |
| Barium, Filtered | 20/20 | 30 | 1380 | - | 1380 | 8GW42DISS | 8MW4 | 260 | 2000 | 2000 | 1000 | - | - | Y |
| Beryllium | 1/25 | 3.2 | 3.2 | 1 | 3.2 | 8GW7S | 8MW7S | 73 | 4 | 4 | 4 | 4 | 0.33 - 0.41 | N |
| Beryllium, Filtered | 1/20 | 1.6 J | 1.6 J | 1 | 1.6 | 8GW7S DISS | 8MW7S | 73 | 4 | 4 | 4 | 4 | - | N |
| Boron | 20/20 | 59.4 | 3360 | - | 3360 | 8GW6D | 8MW6D | 330 | - | - | 630 | - | 9.3 - 126 | Y |
| Boron, Filtered | 20/20 | 63.5 | 3530 | - | 3530 | 8GW6D DISS | 8MW6D | 330 | - | - | 630 | - | - | Y |
| Cadmium | 4/23 | 2 J | 8.1 | 1 - 2 | 8.1 | 8GW8S-2 | 8MW8S | 1.8 | 5 | 5 | 5 | 6 | 1.9 - 26.3 | Y |
| Calcium | 25/25 | 30100 | 360000 | - | 110928 | 8GW6D-2 | 8MW6D | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 20/20 | 29900 | 294000 | - | 120587 | 8GW6D2DISS | 8MW6D | - | - | - | - | - | - | N[9] |
| Chromium | 9/23 | 1.1 | 221 | 1 - 5 | 221 | 8GW7S | 8MW7S | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | Y |
| Chromium, Filtered | 2/20 | 1.1 | 71.9 | 1 - 10.1 | 71.9 | 8GW7S DISS | 8MW7S | 18 | 100 | 100 | 50 | 110 | - | Y |
| Cobalt | 3/25 | 4.2 J | 35.9 | 1 - 5 | 35.9 | 8GW7S | 8MW7S | 220 | - | - | 420 | - | 1.9 - 6 | N |
| Cobalt, Filtered | 2/20 | 7.4 J | 10.7 | 1 - 4 | 10.7 | 8GW7S DISS | 8MW7S | 220 | - | - | 420 | - | - | N |
| Copper | 20/25 | 1.9 J | 3850 | 2 - 5 | 3850 | 8GW7S | 8MW7S | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Copper, Filtered | 12/20 | 3.1 J | 47.8 J | 2 - 3 | 47.8 | 8GW6D2DISS | 8MW6D | 150 | 1300 | - | 1300 | 48 | - | N[8] |
| Iron | 25/25 | 235 | 141000 | - | 141000 | 8GW7S | 8MW7S | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 15/20 | 94.6 | 86600 | 17 - 1100 | 59292 | 8GW7S DISS | 8MW7S | 1100 | 300 | - | - | - | - | N[8] |
| Lead | 14/25 | 1.1 | 1600 J | 1 - 50 | 1600 | 8GW7S | 8MW7S | - | 15 | - | 15 | 13 | 1 - 264 | Y |
| Magnesium | 25/25 | 7530 | 765000 | - | 765000 | 8GW6D | 8MW6D | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 20/20 | 184 J | 585000 | - | 585000 | 8GW5S2DISS | 8MW5S | - | - | - | - | - | - | N[9] |
| Manganese | 25/25 | 53.8 | 3250 | - | 3250 | 8GW6D | 8MW6D | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 19/20 | 47.6 | 3380 | 2.2 | 3380 | 8GW6D DISS | 8MW6D | 84 | 50 | 5000 | 50 | - | - | Y |
| Mercury | 4/25 | 0.24 J | 3.9 | 0.2 | 3.9 | 8GW7S | 8MW7S | 1.1 | 2 | 2 | 2 | 0.4 | 0.13 - 1.3 | Y |
| Mercury, Filtered | 3/20 | 0.2 J | 0.22 J | 0.2 | 0.22 | 8GW4S DISS/ 8GW4S DISS-D | 8MW4/ 8MW4 | 1.1 | 2 | 2 | 2 | 0.4 | - | N |
| Nickel | 5/25 | 4.8 J | 138 | 1 - 10 | 138 | 8GW7S | 8MW7S | 73 | 100 | 100 | 100 | 880 | 5 - 17.5 | Y |
| Nickel, Filtered | 2/20 | 10.1 J | 43.1 | 3 - 14.1 | 43.1 | 8GW7S DISS | 8MW7S | 73 | 100 | 100 | 100 | 880 | - | N |
| Potassium | 25/25 | 8700 | 436000 | - | 139182 | 8GW6D | 8MW6D | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 20/20 | 7580 J | 468000 | - | 184000 | 8GW6D DISS | 8MW6D | - | - | - | - | - | - | N[9] |
| Selenium | 1/25 | 7 J | 7 J | 1 - 30 | 7 | 121890-8MW1S | 8MW1 | 18 | 50 | 50 | 50 | 50 | 1 - 4.1 | N |
| Silver | 2/25 | 10.5 J | 28.7 | 2 - 7 | 28.7 | 121890-8MW2S | 8MW2S | 18 | 100 | 50 | 36 | 12 | 2 - 5.8 | Y |

TABLE 4-3

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 8 - GOSS COVE LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 3 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| Silver, Filtered | 1/20 | 3.5 J | 3.5 J | 2 - 3 | 3.5 | 8GW6D DISS | 8MW6D | 18 | 100 | 50 | 36 | 12 | - | N |
| Sodium | 25/25 | 16700 | 7800000 | - | 6655279 | 8GW6D | 8MW6D | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 19/20 | 15600 J | 5050000 | 774000 | 5050000 | 8GW5S2DISS | 8MW5S | - | - | 28000 | - | - | - | N[9] |
| Thallium | 1/25 | 10.2 | 10.2 | 1 - 20 | 10.2 | 8GW7S | 8MW7S | 0.26 | 2 | 2 | 5 | 63 | 1.2 - 4.3 | Y |
| Vanadium | 5/23 | 1.1 | 136 | 1 - 20 | 136 | 8GW7S | 8MW7S | 26 | - | - | 50 | - | 33.1 | Y |
| Vanadium, Filtered | 3/20 | 1.1 | 50.2 | 1 - 5.6 | 50.2 | 8GW7S DISS | 8MW7S | 26 | - | - | 50 | - | - | Y |
| Zinc | 21/25 | 5.4 | 4530 | 2 - 9.5 | 218 | 8GW7S | 8MW7S | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | Y |
| Zinc, Filtered | 5/20 | 1 | 1130 | 2 - 9.2 | 1130 | 8GW7S DISS | 8MW7S | 1100 | 5000 | - | 5000 | 123 | - | Y |
| **TOTAL PETROLEUM HYDROCARBONS (ug/L)** | | | | | | | | | | | | | | |
| TPH | 1/1 | 1000 | 1000 | - | 1000 | SW-8MW4 (95) | 8MW4 | - | - | - | 500 | - | NA | Y |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Ammonia, As Nitrogen | 1/1 | -2.2 | 2.2 | - | 2.2 | 8GW7S-2 | 8MW7S | - | - | - | - | - | NA | N[10] |
| Biochemical Oxygen Demand | 1/1 | 2.1 | 2.1 | - | 2.1 | 8GW7S-2 | 8MW7S | - | - | - | - | - | NA | N[10] |
| Chemical Oxygen Demand | 1/1 | 22 | 22 | - | 22 | 8GW7S-2 | 8MW7S | - | - | - | - | - | NA | N[10] |
| Chloride | 1/1 | 5.6 | 5.6 | - | 5.6 | 08GW8S 03 | 8MW8S | - | - | - | - | - | 3 - 180 | N[10] |
| Hardness As CaCO3 | 17/17 | 148 | 5200 | - | 3056 | 8GW6D | 8MW6D | - | - | - | - | - | NA | N[10] |
| Nitrite, As Nitrogen | 1/1 | 3 | 3 | - | 3 | 08GW8S 03 | 8MW8S | - | - | - | - | - | NA | N[10] |
| Sulfate | 1/1 | 29 | 29 | - | 29 | 08GW8S 03 | 8MW8S | - | - | - | - | - | NA | N[10] |
| Total Organic Carbon | 2/2 | 4 | 5 | - | 5 | 08GW8S 03 | 8MW8S | - | - | - | - | - | NA | N[10] |
| Total Suspended Solids | 1/1 | 22 | 22 | - | 22 | 8GW7S-2 | 8MW7S | - | - | - | - | - | NA | N[10] |

1 Includes samples 08GW8S 03, 08GW8S DL, 121890-8MW1S, 121890-8MW2S, 121890-8MW3S, 121890-8MW4S, 8GW1S, 8GW1S DISS, 8GW1S-2, 8GW1S-2-D, 8GW1S2DISS, 8GW1S2DISS-D, 8GW2D, 8GW2D DISS, 8GW2D-2, 8GW2D2DISS, 8GW2S, 8GW2S DISS, 8GW2S-2, 8GW2S2DISS, 8GW3, 8GW3 DISS, 8GW3-2, 8GW32DISS, 8GW4-2, 8GW42DISS, 8GW4S, 8GW4S DISS, 8GW4S DISS-D, 8GW4S-D, 8GW5S, 8GW5S DISS, 8GW5S DISS-D, 8GW5S-2, 8GW5S-D, 8GW5S2DISS, 8GW6D, 8GW6D DISS, 8GW6D-2, 8GW6D2DISS, 8GW6S, 8GW6S DISS, 8GW6S-2, 8GW6S2DISS, 8GW7S, 8GW7S DISS, 8GW7S-2, 8GW7S-2-D, 8GW7S2DISS, 8GW7S2DISS-D, 8GW8S, 8GW8S DISS, 8GW8S-2, 8GW8S2DISS, SW-8MW4 (95).
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 4-4

COPC SCREENING - GROUNDWATER SAMPLES - BEDROCK WELLS
SITE 8 - GOSS COVE LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,2-Dichloroethene (total) | 1/8 | 1 J | 1 J | 10 - 400 | 1 | 08GW8D DL | 8MW8D | 5.5 | 70/100 | 70/100 | 63 | 14000 | ND | N |
| 2-Hexanone | 1/8 | 49 J | 49 J | 10 - 250 | 49 | 8GW8D-2 | 8MW8D | 150 | - | - | 280 | - | ND | N |
| Acetone | 1/8 | 220 J | 220 J | 10 - 410 | 220 | 8GW8D | 8MW8D | 370 | - | - | 700 | - | ND | N |
| Carbon Disulfide | 1/8 | 58 J | 58 J | 10 - 250 | 58 | 8GW8D-2 | 8MW8D | 100 | - | - | 700 | - | ND | N |
| Tetrachloroethene | 8/8 | 120 | 5600 | - | 3367 | 8GW8D-2 | 8MW8D | 1.1 | 5 | 5 | 5 | 88 | ND | Y |
| Trichloroethene | 2/8 | 3 J | 25 | 10 - 400 | 25 | 08GW8D DL | 8MW8D | 1.6 | 5 | 5 | 5 | 2340 | ND | Y |
| Xylenes, Total | 1/8 | 58 J | 58 J | 10 - 400 | 58 | 8GW8D | 8MW8D | 1200 | 10000 | 10000 | 530 | - | 2 | N |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Benzoic Acid | 1/2 | 1 J | 1 J | 50 | 1 | 8GW8D | 8MW8D | 15000 | - | - | 28000 | - | ND | N |
| Bis(2-Ethylhexyl)phthalate | 1/2 | 17 | 17 | 10 | 17 | 8GW8D | 8MW8D | 4.8 | 6 | 6 | 2 | 59 | 3 | Y |
| Phenol | 1/2 | 0.8 J | 0.8 J | 10 | 0.8 | 8GW8D | 8MW8D | 2200 | - | - | 4000 | 92000000 | ND | N |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 2/2 | 5410 | 13700 J | - | 13700 | 8GW8D-2 | 8MW8D | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Arsenic | 1/2 | 6.1 | 6.1 | 4.1 | 6.1 | 8GW8D-2 | 8MW8D | 0.045 | 50 | 50 | 50 | 4 | 0.64 | Y |
| Barium | 2/2 | 117 | 182 J | - | 182 | 8GW8D-2 | 8MW8D | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | N |
| Barium, Filtered | 2/2 | 44.6 | 51.9 | - | 51.9 | 8GW8D DISS | 8MW8D | 260 | 2000 | 2000 | 1000 | - | - | N |
| Boron | 1/2 | 74.3 | 74.3 | 51.4 | 74.3 | 8GW8D | 8MW8D | 330 | - | - | 630 | - | 9.3 - 126 | N |
| Boron, Filtered | 1/2 | 58.4 | 58.4 | 44.8 | 58.4 | 8GW8D DISS | 8MW8D | 330 | - | - | 630 | - | - | N |
| Cadmium | 1/2 | 1 J | 1 J | 2 | 1 | 8GW8D-2 | 8MW8D | 1.8 | 5 | 5 | 5 | 6 | 1.9 - 26.3 | N |
| Calcium | 2/2 | 36000 | 40800 | - | 40800 | 8GW8D | 8MW8D | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 2/2 | 29900 | 35100 | - | 35100 | 8GW8D DISS | 8MW8D | - | - | - | - | - | - | N[9] |
| Chromium | 2/2 | 9.9 J | 16.3 J | - | 16.3 | 8GW8D-2 | 8MW8D | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | N |
| Cobalt | 1/2 | 12.5 | 12.5 | 4 | 12.5 | 8GW8D-2 | 8MW8D | 220 | - | - | 420 | - | 1.9 - 6 | N |
| Copper | 2/2 | 30.9 | 71.3 | - | 71.3 | 8GW8D | 8MW8D | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Copper, Filtered | 1/2 | 4.2 | 4.2 | 3 | 4.2 | 8GW8D DISS | 8MW8D | 150 | 1300 | - | 1300 | 48 | - | N[8] |
| Iron | 2/2 | 7870 | 19300 | - | 19300 | 8GW8D-2 | 8MW8D | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 1/2 | 99.5 J | 99.5 J | 17 | 99.5 | 8GW8D DISS | 8MW8D | 1100 | 300 | - | - | - | - | N[8] |
| Lead | 2/2 | 19.5 | 49.6 J | - | 49.6 | 8GW8D | 8MW8D | - | 15 | - | 15 | 13 | 1 - 264 | Y |
| Magnesium | 2/2 | 10100 | 11600 | - | 11600 | 8GW8D-2 | 8MW8D | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 2/2 | 5010 | 7320 | - | 7320 | 8GW8D DISS | 8MW8D | - | - | - | - | - | - | N[9] |
| Manganese | 2/2 | 635 J | 757 | - | 757 | 8GW8D | 8MW8D | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 2/2 | 24.9 J | 523 | - | 523 | 8GW8D DISS | 8MW8D | 84 | 50 | 5000 | 50 | - | - | Y |
| Nickel | 1/2 | 12.1 | 12.1 | 10 | 12.1 | 8GW8D-2 | 8MW8D | 73 | 100 | 100 | 100 | 880 | 5 - 17.5 | N |
| Potassium | 2/2 | 9950 | 11700 | - | 11700 | 8GW8D-2 | 8MW8D | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 2/2 | 7110 | 7550 | - | 7550 | 8GW8D DISS | 8MW8D | - | - | - | - | - | - | N[9] |
| Sodium | 2/2 | 46700 | 53000 | - | 53000 | 8GW8D | 8MW8D | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 2/2 | 46000 | 50400 | - | 50400 | 8GW8D DISS | 8MW8D | - | - | 28000 | - | - | - | N[9] |
| Vanadium | 2/2 | 18.6 | 46.3 J | - | 46.3 | 8GW8D-2 | 8MW8D | 26 | - | - | 50 | - | 33.1 | Y |
| Zinc | 2/2 | 101 J | 113 | - | 113 | 8GW8D | 8MW8D | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | N |

TABLE 4-4

COPC SCREENING - GROUNDWATER SAMPLES - BEDROCK WELLS
SITE 8 - GOSS COVE LANDFILL[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| Zinc, Filtered | 2/2 | 17.5 | 56.4 | - | 56.4 | 8GW8D DISS | 8MW8D | 1100 | 5000 | - | 5000 | 123 | - | N |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Chloride | 3/3 | 7.8 | 120 | - | 120 | 08GW8D 03 | 8MW8D | - | - | - | - | - | 3 - 180 | N[10] |
| Hardness As CaCO3 | 2/2 | 100 | 140 | - | 140 | 8GW8D | 8MW8D | - | - | - | - | - | NA | N[10] |
| Nitrite, As Nitrogen | 2/3 | 0.23 | 0.3 | 0.1 | 0.3 | 08GW8D 03 | 8MW8D | - | - | - | - | - | NA | N[10] |
| Sulfate | 3/3 | 9.6 | 35 | - | 35 | 08GW8D 03 | 8MW8D | - | - | - | - | - | NA | N[10] |
| Total Organic Carbon | 3/3 | 1 | 2.1 | - | 2.1 | 08GW8D 03 | 8MW8D | - | - | - | - | - | NA | N[10] |

1 Includes samples 08GW10S 01, 08GW10S DL, 08GW8D 03, 08GW8D DL 08GW9S 01, 08GW9S DL, 8GW8D, 8GW8D DISS, 8GW8D-2, 8GW8D2DISS.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 4-5

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 15 - SASDA[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Carbon Disulfide | 1/10 | 3 J | 3 J | 10 | 3 | 15GW1D | 15MW1D | 100 | - | - | 700 | - | ND | N |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,4-Dichlorobenzene | 1/10 | 1 J | 1 J | 10 | 1 | 15GW2S-2 | 15MW2S | 0.47 | 75 | 75 | 75 | 26000 | ND | Y |
| Bis(2-Ethylhexyl)phthalate | 4/10 | 0.6 J | 45 | 10 | 45 | 15GW1D | 15MW1D | 4.8 | 6 | 6 | 2 | 59 | 3 | Y |
| Di-n-butyl phthalate | 4/10 | 0.5 J | 0.9 J | 10 | 0.9 | 15GW1D-2-D | 15MW1D | 370 | - | - | 700 | 120000 | ND | N |
| Naphthalene | 1/10 | 1 J | 1 J | 10 | 1 | 15GW3S | 15MW3S | 150 | - | - | 280 | - | ND | N |
| Phenanthrene | 2/10 | 0.5 J | 0.6 J | 10 | 0.6 | 15GW3S | 15MW3S | - | - | - | 200 | 0.3 | ND | Y |
| **PESTICIDES/PCBs (ug/L)** | | | | | | | | | | | | | | |
| Heptachlor | 1/10 | 0.54 J | 0.54 J | 0.05 | 0.54 | 15GW3S | 15MW3S | 0.0023 | 0.4 | 0.4 | 0.4 | 0.05 | ND | Y |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 9/10 | 114 | 4210 | 42 | 4210 | 15GW3S | 15MW3S | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Aluminum, Filtered | 6/10 | 13.4 | 2980 | 14 - 14.6 | 2980 | 15GW2S2DISS | 15MW2S | - | 50 to 200 | - | - | - | - | N[8] |
| Antimony | 1/10 | 3.6 J | 3.6 J | 3 - 15 | 3.6 | 15GW2S-2 | 15MW2S | 1.5 | 6 | 6 | 6 | 86000 | ND | Y |
| Antimony, Filtered | 1/10 | 14.3 | 14.3 | 12 - 15 | 14.3 | 15GW3S2DISS | 15MW3S | 1.5 | 6 | 6 | 6 | 86000 | - | Y |
| Arsenic | 2/10 | 1.2 J | 1.7 J | 1 - 4.3 | 1.4 | 15GW1D-2 | 15MW1D | 0.045 | 50 | 50 | 50 | 4 | 0.64 | Y |
| Barium | 10/10 | 31.6 | 125 | - | 72.2 | 15GW3S | 15MW3S | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | N |
| Barium, Filtered | 10/10 | 28.3 | 86.1 | - | 62.7 | 15GW3S DISS | 15MW3S | 260 | 2000 | 2000 | 1000 | - | - | N |
| Beryllium, Filtered | 1/10 | 1.5 | 1.5 | 1 | 1.5 | 15GW2S2DISS | 15MW2S | 73 | 4 | 4 | 4 | 4 | - | N |
| Boron | 3/10 | 38.45 | 73.2 J | 50 | 73.2 | 15GW3S-2 | 15MW3S | 330 | - | - | 630 | - | 9.3 - 126 | N |
| Boron, Filtered | 6/10 | 19 | 62.3 | 50 | 43.8 | 15GW3S2DISS | 15MW3S | 330 | - | - | 630 | - | - | N |
| Cadmium | 5/10 | 1.4 J | 5.3 | 1 - 2 | 3.2 | 15GW2S-2 | 15MW2S | 1.8 | 5 | 5 | 5 | 6 | 1.9 - 26.3 | Y |
| Cadmium, Filtered | 2/10 | 4.4 J | 5.5 | 2 | 5.5 | 15GW2S2DISS | 15MW2S | 1.8 | 5 | 5 | 5 | 6 | - | Y |
| Calcium | 10/10 | 11700 | 31900 | - | 31900 | 15GW3S | 15MW3S | - | - | - | - | - | 3110 - 46000 | N[9] |
| Calcium, Filtered | 10/10 | 11800 | 31100 | - | 31100 | 15GW3S DISS | 15MW3S | - | - | - | - | - | - | N[9] |
| Chromium | 4/10 | 0.95 J | 5.9 J | 1 - 3 | 3.06 | 15GW3S | 15MW3S | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | N |
| Chromium, Filtered | 2/10 | 3.1 | 3.4 | 3 | 3.4 | 15GW4S2DISS | 15MW4S | 18 | 100 | 100 | 50 | 110 | - | N |
| Cobalt | 5/10 | 1.1 J | 10.8 | 1 - 8.3 | 6.7 | 15GW2S-2 | 15MW2S | 220 | - | - | 420 | - | 1.9 - 6 | N |
| Cobalt, Filtered | 4/10 | 3.5 | 9 | 3 - 10.6 | 9 | 15GW2S2DISS | 15MW2S | 220 | - | - | 420 | - | - | N |
| Copper | 5/10 | 2.4 J | 12.8 | 1 - 2 | 12.8 | 15GW2S-2 | 15MW2S | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Copper, Filtered | 7/10 | 2.3 J | 11 | 2 | 6 | 15GW2S2DISS | 15MW2S | 150 | 1300 | - | 1300 | 48 | - | N[8] |
| Iron | 9/10 | 83.1 | 7110 | 16 | 7110 | 15GW3S | 15MW3S | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 6/10 | 15 | 2720 | 50 | 2720 | 15GW3S DISS | 15MW3S | 1100 | 300 | - | - | - | - | N[8] |
| Lead | 4/10 | 2.1 J | 21.2 J | 1 - 4.4 | 21.2 | 15GW3S | 15MW3S | - | 15 | - | 15 | 13 | 1 - 264 | Y |
| Magnesium | 10/10 | 2390 | 9490 | - | 9490 | 15GW1D | 15MW1D | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 10/10 | 2160 | 9340 | - | 9340 | 15GW1D DISS | 15MW1D | - | - | - | - | - | - | N[9] |
| Manganese | 10/10 | 27.4 | 3080 | - | 3080 | 15GW3S | 15MW3S | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 10/10 | 26.9 | 3080 | - | 3080 | 15GW3S DISS | 15MW3S | 84 | 50 | 5000 | 50 | - | - | Y |
| Nickel | 1/10 | 10.6 J | 10.6 J | 10 - 12 | 10.6 | 15GW2S | 15MW2S | 73 | 100 | 100 | 100 | 880 | 5 - 17.5 | N |
| Nickel, Filtered | 1/10 | 10.6 | 10.6 | 7 - 10 | 10.6 | 15GW2S2DISS | 15MW2S | 73 | 100 | 100 | 100 | 880 | - | N |
| Potassium | 10/10 | 1550 J | 7020 | - | 5571 | 15GW1D | 15MW1D | - | - | - | - | - | 290 - 17900 | N[9] |

TABLE 4-5

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 15 - SASDA[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 2

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| Potassium, Filtered | 10/10 | 1500 J | 6640 | - | 5321 | 15GW1D DISS | 15MW1D | - | - | - | - | - - | - | N[9] |
| Selenium | 1/10 | 3 J | 3 J | 1 - 2 | 3 | 15GW2S | 15MW2S | 18 | 50 | 50 | 50 | 50 | 1 - 4.1 | N |
| Silver | 1/10 | 1.2 J | 1.9 J | 1 - 2 | 1.9 | 15GW1D-2 | 15MW1D | 18 | 100 | 50 | 36 | 12 | 2 - 5.8 | N |
| Sodium | 10/10 | 24600 | 71000 | - | 71000 | 15GW1D-2-D | 15MW1D | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 10/10 | 25600 | 68900 | - | 68900 | 15GW1D DISS | 15MW1D | - | - | 28000 | - | - | - | N[9] |
| Vanadium | 4/10 | 1 J | 9.3 J | 1 - 5 | 5.1 | 15GW3S | 15MW3S | 26 | - | - | 50 | - | 33.1 | N |
| Zinc | 10/10 | 2.9 J | 453 | - | 453 | 15GW2S-2 | 15MW2S | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | Y |
| Zinc, Filtered | 6/10 | 3.4 | 450 | 2 - 6.4 | 450 | 15GW2S2DISS | 15MW2S | 1100 | 5000 | - | 5000 | 123 | - | Y |
| **TOTAL PETROLEUM HYDROCARBONS (ug/L)** | | | | | | | | | | | | | | |
| Oil & Grease | 1/2 | 500 | 500 | 500 | 500 | 15GW1D | 15MW1D | - | - | - | - | - | NA | N[10] |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Chemical Oxygen Demand | 1/1 | 11 | 11 | - | 11 | 15GW1S-2 | 15MW1S | - | - | - | - | - | NA | N[10] |
| Hardness as CaCO3 | 10/10 | 36 | 116 | - | 98 | 15GW1D | 15MW1D | - | - | - | - | - | NA | N[10] |
| Total Suspended Solids | 2/2 | 5 | 17 | - | 17 | 15GW1S-2 | 15MW1S | - | - | - | - | - | NA | N[10] |

1 Includes samples 15GW1D, 15GW1D DISS, 15GW1D-2, 15GW1D-2-D, 15GW1D2DISS, 15GW1D2DISS-D, 15GW1S, 15GW1S DISS, 15GW1S-2, 15GW1S2DISS, 15GW2S, 15GW2S DISS, 15GW2S-2. 15GW2S2DISS. 15GW3S. 15GW3S DISS. 15GW3S-2. 15GW3S2DISS. 15GW4S. 15GW4SDISS. 15GW4S-2. 15GW4S2DISS.
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

TABLE 4-6

COPC SCREENING - SOIL SAMPLES
SITE 23 - TANK FARM (INCLUDING SITE 9 - OT-5 OILY WASTEWATER TANK)[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| **VOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 2-Butanone | 4/36 | 0.006 J | 0.015 J | 0.01 - 0.058 | 0.015 | T5SO10-04 | HNUS-10 | - | 80 | N |
| Benzene | 2/67 | 0.002 J | 0.0335 | 0.0011 - 0.08 | 0.0335 | T2SO02-13 | SB-2 | 0.03 | 0.2 | Y |
| Chloroform | 1/36 | 0.005 J | 0.005 J | 0.01 - 0.058 | 0.005 | SWTB25-0910 | SB/TW-25 | 0.6 | 1.2 | N |
| Chloromethane | 1/36 | 0.002 J | 0.002 J | 0.01 - 0.058 | 0.002 | SWSO23-08 | HNUS-23 | - | 0.54 | N |
| Ethylbenzene | 4/67 | 0.001 J | 0.4 | 0.0011 - 0.16 | 0.4 | OT-S002-0204 | OT-S002 | 13 | 10.1 | N |
| Methylene Chloride | 6/36 | 0.003 J | 0.009 J | 0.005 - 0.058 | 0.009 | OT-S004-1921 | OT-S004 | 0.02 | 1 | N |
| Tetrachloroethene | 1/36 | 0.011 J | 0.011 J | 0.01 - 0.058 | 0.011 | SWTB10-06 | SB/TW-10 | 0.06 | 1 | N |
| Toluene | 7/67 | 0.001 J | 0.01 J | 0.0011 - 0.16 | 0.01 | SWTB07-1214 | SB/TW-7 | 12 | 67 | N |
| Xylenes, Total | 6/55 | 0.001 J | 0.656 J | 0.0011 - 0.24 | 0.656 | T8TB24-08 | SB/TW-24 | 190 | 19.5 | N |
| **SEMIVOLATILE ORGANICS (mg/kg)** | | | | | | | | | | |
| 2-Methylnaphthalene | 5/36 | 0.042 J | 18 | 0.35 - 0.69 | 18 | T4TB11-08 | SB/TW-11 | - | 56 | N |
| 4-Chloro-3-methylphenol | 1/36 | 0.024 J | 0.024 J | 0.35 - 3.8 | 0.024 | T5SO11-06 | HNUS-11 | - | - | N[5] |
| Acenaphthylene | 1/36 | 0.021 J | 0.021 J | 0.35 - 3.8 | 0.021 | SWSO24-04 | HNUS-24 | - | 84 | N |
| Anthracene | 1/36 | 0.027 J | 0.027 J | 0.35 - 3.8 | 0.027 | SWSO24-04 | HNUS-24 | 12000 | 400 | N |
| Benzo(a)anthracene | 5/36 | 0.021 J | 0.19 J | 0.35 - 3.8 | 0.19 | SWSO24-04 | HNUS-24 | 2 | 1 | N |
| Benzo(a)pyrene | 4/36 | 0.033 J | 1.7 | 0.35 - 3.8 | 1.7 | SWTB09-06 | SB/TW-9 | 8 | 1 | Y |
| Benzo(b)fluoranthene | 4/36 | 0.031 J | 0.2 J | 0.35 - 3.8 | 0.2 | SWSO24-04 | HNUS-24 | 5 | 1 | N |
| Benzo(g,h,i)perylene | 2/36 | 0.035 J | 0.15 J | 0.35 - 3.8 | 0.15 | SWSO24-04 | HNUS-24 | - | 40 | N |
| Benzo(k)fluoranthene | 4/36 | 0.034 J | 0.18 J | 0.35 - 3.8 | 0.18 | SWSO24-04 | HNUS-24 | 49 | 1 | N |
| Benzoic Acid | 2/12 | 0.033 J | 0.044 J | 1.7 - 2 | 0.044 | OT-S001-0204 | OT-S001 | 400 | 5600 | N |
| Bis(2-Ethylhexyl)phthalate | 12/36 | 0.072 J | 0.26 J | 0.25 - 3.8 | 0.26 | OT-S001-0204 | OT-S001 | 3600 | 11 | N |
| Butylbenzyl Phthalate | 1/24 | 0.041 J | 0.041 J | 0.35 - 3.8 | 0.041 | SWTB10-06 | SB/TW-10 | 930 | 200 | N |
| Chrysene | 5/36 | 0.038 J | 0.22 J | 0.35 - 3.8 | 0.22 | SWSO24-04 | HNUS-24 | 160 | 0.96 | N |
| Di-n-butyl phthalate | 8/36 | 0.022 J | 0.035 J | 0.35 - 3.8 | 0.035 | SWTB13-07 | SB/TW-13 | 2300 | 140 | N |
| Di-n-octyl phthalate | 1/36 | 0.037 J | 0.037 J | 0.35 - 3.8 | 0.037 | SWTB14-06 | SB/TW-13 | 10000 | 20 | N |
| Dibenzo(a,h)anthracene | 1/36 | 0.032 J | 0.032 J | 0.35 - 3.8 | 0.032 | SWSO24-04 | HNUS-24 | 2 | 0.005 | Y |
| Dibenzofuran | 2/36 | 0.17 J | 1 J | 0.35 - 0.93 | 1 | T4TB11-08 | SB/TW-11 | - | 5.6 | N |
| Diethyl Phthalate | 3/36 | 0.008 J | 4 | 0.35 - 0.69 | 4 | T4TB11-08 | SB/TW-11 | 470 | 1100 | N |
| Dimethyl Phthalate | 2/36 | 0.057 J | 0.11 J | 0.35 - 3.8 | 0.11 | SWSO24-04 | HNUS-24 | - | 14000 | N |
| Fluoranthene | 6/36 | 0.024 J | 0.37 | 0.35 - 0.55 | 0.37 | SWSO24-04 | HNUS-24 | 4300 | 56 | N |
| Fluorene | 3/36 | 0.045 J | 2 J | 0.35 - 0.69 | 2 | T4TB11-08 | SB/TW-11 | 560 | 56 | N |
| Indeno(1,2,3-cd)pyrene | 2/36 | 0.028 J | 0.17 J | 0.35 - 3.8 | 0.17 | SWSO24-04 | HNUS-24 | 14 | 0.005 | Y |
| Naphthalene | 2/36 | 0.66 | 6.3 | 0.35 - 0.69 | 6.3 | OT-S002-0204 | OT-S002 | 84 | 56 | N |

TABLE 4-6

COPC SCREENING - SOIL SAMPLES
SITE 23 - TANK FARM (INCLUDING SITE 9 - OT-5 OILY WASTEWATER TANK)[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| Phenanthrene | 7/36 | 0.022 J | 3.2 J | 0.35 - 0.55 | 3.2 | T4TB11-08 | SB/TW-11 | - | 40 | N |
| Pyrene | 7/36 | 0.028 J | 0.39 | 0.35 - 3.8 | 0.39 | SWSO24-04 | HNUS-24 | 4200 | 40 | N |
| **PESTICIDES/PCBs (mg/kg)** | | | | | | | | | | |
| 4,4'-DDD | 3/33 | 0.0044 J | 0.017 J | 0.0037 - 0.042 | 0.017 | OT-S003-0204 | OT-S003 | 16 | 0.029 | N |
| 4,4'-DDE | 5/33 | 0.0044 J | 0.044 | 0.0037 - 0.042 | 0.044 | SWSO24-04 | HNUS-24 | 54 | 0.021 | Y |
| 4,4'-DDT | 6/33 | 0.0047 | 0.11 | 0.0037 - 0.042 | 0.11 | SWSO24-04 | HNUS-24 | 32 | 0.021 | Y |
| Alpha-Chlordane | 1/23 | 0.0053 | 0.0053 | 0.0018 - 0.0035 | 0.0053 | SWSO23-08 | HNUS-23 | 10 | 0.066 | N |
| Endrin | 1/33 | 0.0096 | 0.0096 | 0.0037 - 0.042 | 0.0096 | SWSO24-04 | HNUS-24 | 1 | 0.42 | N |
| Endrin Aldehyde | 1/33 | 0.0047 | 0.0047 | 0.0035 - 0.042 | 0.0047 | SWSO23-08 | HNUS-23 | 1 | 0.42 | N |
| Endrin Ketone | 1/33 | 0.0067 | 0.0067 | 0.0037 - 0.042 | 0.0067 | SWSO24-04 | HNUS-24 | 1 | 0.42 | N |
| Gamma-Chlordane | 1/33 | 0.0022 | 0.0022 | 0.0018 - 0.022 | 0.0022 | SWSO23-08 | HNUS-23 | 10 | 0.066 | N |
| **INORGANICS (mg/kg)** | | | | | | | | | | |
| Aluminum | 36/36 | 2510 | 17300 | - | 9115 | OT-S004-1921 | OT-S004 | - | - | N[6] |
| Antimony | 8/36 | 0.61 | 14.8 | 0.42 - 4 | 14.8 | T4SO08-04 | HNUS-8 | 5 | 1.2 | Y |
| Arsenic | 31/36 | 1 | 10.9 | 0.89 - 1.3 | 3.0 | SWTB27-13 | SB/TW-27 | 29 | 10 | Y |
| Barium | 36/36 | 16 | 145 | - | 63 | OT-S004-1921 | OT-S004 | 1600 | 200 | N |
| Beryllium | 20/36 | 0.25 | 0.6 | 0.23 - 0.52 | 0.6 | OT-S004-1921 | OT-S004 | 63 | 0.8 | N |
| Cadmium | 1/36 | 0.58 | 0.58 | 0.21 - 0.53 | 0.58 | OT-S003-1719 | OT-S003 | 8 | 1 | N |
| Calcium | 36/36 | 445 | 7120 | - | 2816 | OT-S003-1719 | OT-S003 | - | - | N[7] |
| Chromium | 35/36 | 6.3 | 30.7 | 4.3 | 16.0 | OT-S001-2022 | OT-S001 | - | 10 | Y |
| Cobalt | 35/36 | 1.3 | 8.8 | 0.52 | 5.1 | OT-S004-1921 | OT-S004 | - | 84 | N |
| Copper | 35/36 | 4.5 | 80.1 | 1.8 | 20.4 | OT-S003-1719D | OT-S003 | - | 260 | N[6] |
| Cyanide | 4/24 | 0.18 | 6.4 | 0.12 - 0.26 | 6.4 | SWTB09-06 | SB/TW-9 | 40 | 40 | N |
| Iron | 36/36 | 2170 | 24000 | - | 12004 | OT-S004-1921 | OT-S004 | - | - | N[6] |
| Lead | 36/36 | 1.4 | 85.1 | - | 85.1 | SWTB28-0607 | SB/TW-28 | - | 3 | Y |
| Magnesium | 36/36 | 767 | 7430 | - | 3711 | OT-S004-1921 | OT-S004 | - | - | N[7] |
| Manganese | 36/36 | 37.9 | 498 | - | 205.9 | OT-S004-1921 | OT-S004 | - | 10 | Y |
| Mercury | 1/36 | 0.14 | 0.14 | 0.11 - 0.26 | 0.14 | SWTB28-0607 | SB/TW-28 | 2 | 0.4 | N |
| Nickel | 35/36 | 3.3 | 32.9 | 2.7 | 12.1 | SWTB26-1011 | SB/TW-26 | 130 | 20 | Y |
| Potassium | 31/36 | 177 | 5900 | 825 - 1440 | 2865 | OT-S004-1921 | OT-S004 | - | - | N[7] |
| Selenium | 7/36 | 0.53 | 3.6 | 0.45 - 0.93 | 3.6 | SWTB25-0910 | SB/TW-25 | 5 | 10 | N |
| Sodium | 28/36 | 61.3 | 550 | 50.6 - 153 | 295.5 | SWTB28-0607 | SB/TW-28 | - | - | N[7] |
| Thallium | 7/36 | 0.26 | 0.6 | 0.22 - 2.1 | 0.6 | OT-S004-1921 | OT-S004 | 0.7 | 1 | N |

## TABLE 4-6

### COPC SCREENING - SOIL SAMPLES
### SITE 23 - TANK FARM (INCLUDING SITE 9 - OT-5 OILY WASTEWATER TANK)(1)
### NSB-NLON, GROTON, CONNECTICUT
### PAGE 3 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | SSL Migration to Groundwater (2) | State Pollutant Mobility (GB) (3) | Select as COPC? (4) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | |
| Vanadium | 36/36 | 7.3 | 49.8 | - | 23.6 | OT-S004-1921 | OT-S004 | 6000 | 10 | Y |
| Zinc | 36/36 | 9.9 | 64.9 | - | 33.8 | OT-S003-1719D | OT-S003 | 12000 | 1000 | N |
| **TOTAL PETROLEUM HYDROCARBONS (mg/kg)** | | | | | | | | | | |
| TPH | 54/121 | 12.5 | 18500 | 10 - 25 | 15950 | FPTB07-07-D | GS-7 | - | 2500 | Y |

1 Includes samples FPTB01-09, FPTB01L-08, FPTB02-09, FPTB02L-06, FPTB03-11, FPTB03L-04, FPTB04-08, FPTB04L-11, FPTB05-07, FPTB06-06, FPTB07-07, FPTB07-07-D, FPTB08-05, FPTB09-07, FPTB10-09, FPTB11-09, FPTB13-11, FPTB14-11, FPTB15-10, FPTB16-12, FPTB17-13, FPTB18-12, FPTB19-06, FPTB20-12, FPTB21-14, FPTB22-08, FPTB22-08-D, FPTB23-19, FPTB24-19, FPTB25-10, FPTB26-14, FPTB27-08, FPTB28-09, FPTB29-08, FPTB31-11, FPTB32-12, FPTB33-12, FPTB34-06, FPTB35-06, FPTB36-07, FPTB37-07, FPTB38-11, FPTB39-10, FPTB40-11, FPTB41-08, FPTB42-11, FPTB44-11, FPTB45-06, FPTB47-09, FPTB51-07, FPTB52-05, FPTB54-08, FPTB55-08, FPTB56-10, FPTB57-07, FPTB58-05, GS5SB04501, GS5SB04601, GS5SB04701, LASO03-06, LASO04-05, OT-S001-0204, OT-S001-1820, OT-S001-1820D, OT-S001-2022, OT-S002-0204, OT-S002-1719, OT-S002-1921, OT-S003-0204, OT-S003-1719, OT-S003-1719D, OT-S003-1921, OT-S004-0204, OT-S004-1719, OT-S004-1921, OT4SB04001, OT4SB04002, OT4SB04002-D, OT4SB04201, OT4SB04301, OT4SB04401, SWSO23-08, SWSO24-04, SWTB05-0910, SWTB06-0607, SWTB07-1214, SWTB09-06, SWTB10-06, SWTB12-06, SWTB13-07, SWTB14-06, SWTB15-08, SWTB16-06, SWTB17-0506, SWTB18-08, SWTB18-08-D, SWTB19-1011, SWTB25-0910, SWTB26-1011, SWTB26-1011-D, SWTB27-13, SWTB28-0607, T1SO01-02, T1SO02-02, T1TB01-07, T1TB02-06, T1TB03-07, T2SO01-04, T2SO02-04, T2SO02-13, T2SO04-02, T2SO04-02-D, T2SO05-04, T2TB04-07, T3SO06-06, T2SO07-06, T4SO08-04, T4SO09-04, T4TB11-08, T5SO10-04, T5SO11-06, T5SO11-06-D, T6SO05-04, T6SO06-04, T6SO12-04, T6SO13-04, T7SO07-06, T7SO14-02, T7SO14-02-D, T7SO15-04, T8SO16-0608, T8SO17-0406, T8SO18-0608, T8TB08-0910, T8TB20-06, T8TB22-06, T8TB23-06, T8TB24-08, TOSO08-04, TOSO09-04, T9SO20-04, TOSO21-06, TOSO22-10.

2 USEPA Soil Screening Levels (USEPA, May 1996). See Table 1-2 for futher details regarding surrogate and/or calculated values.

3 CTDEP, 1996. See Table 1-2 for futher details regarding surrogate and/or calculated values.

4 Contaminant of Potential Concern; Yes (Y) indicates that the maximum concentration exceeds one or more of the criteria; No (N) indicates that the maximum does not exceed any of the criteria.

5 Criteria not available for this chemical.

6 USEPA Region I does not advocate quantitative evaluation of this chemical.

7 Essential nutrient; not evaluated for COPC selection.

\- Not Applicable or Not Available.

TABLE 4-7

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 23 - TANK FARM (INCLUDING SITE 9 - OT-5 OILY WASTEWATER TANK)[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 1 OF 3

| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration Sample Number | Maximum Concentration Location | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] Groundwater Protection | State Remediation Standards[5] Surface Water Protection | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | 4/37 | 2 J | 4 J | 10 | 4 | HNUS23 DL | HNUS-23 | 54 | 200 | 200 | 200 | 62000 | ND | N |
| 1,1-Dichloroethane | 4/37 | 4 J | 5 J | 10 | 5 | HNUS23 02/ HNUS23 02-D/ HNUS23 DL | HNUS-23/ HNUS-23/ HNUS-23 | 80 | - | - | 70 | - | ND | N |
| Acetone | 1/37 | 18 | 18 | 10 - 17 | 18 | OT-GW01 | OT-GW01 | 370 | - | - | 700 | - | ND | N |
| Benzene | 11/94 | 0.5 | 828 | 0.5 - 100 | 828 | ERM-15 (95) | ERM-15 | 0.36 | 5 | 5 | 1 | 710 | ND | Y |
| Bromodichloromethane | 2/37 | 4 J | 9 J | 10 | 9 | OT-GW01 | OT-GW01 | 0.17 | 100/80 | 100 | 0.56 | 660 | ND | Y |
| Bromomethane | 1/37 | 1 J | 1 J | 10 | 1 | SWTW28 (95) | SB/TW-28 | 0.85 | - | - | 9.8 | 80000 | ND | Y |
| Chloroform | 3/37 | 2 J | 18 | 10 | 18 | OT-GW01 | OT-GW01 | 0.15 | 100/80 | 100 | 6 | 14100 | ND | Y |
| Ethylbenzene | 10/94 | 1 | 515 | 1 - 100 | 515 | ERM-15 (95) | ERM-15 | 130 | 700 | 700 | 700 | 580000 | ND | Y |
| Methyl Tert-Butyl Ether | 1/39 | 6 J | 6 J | 10 - 1000 | 6 | T9TW10 (95) | TW-10 | 630 | - | - | 100 | - | ND | N |
| Tetrachloroethene | 5/37 | 2 J | 10 | 10 | 10 | SWTW19 (95) | SB/TW-19 | 1.1 | 5 | 5 | 5 | 88 | ND | Y |
| Toluene | 14/94 | 0.6 J | 3550 | 1 - 100 | 3550 | ERM-14 (95) | ERM-14 | 75 | 1000 | 1000 | 1000 | 4000000 | ND | Y |
| Xylenes, Total | 15/90 | 0.5 J | 4810 | 1 - 100 | 4810 | ERM-14 (95) | ERM-14 | 1200 | 10000 | 10000 | 530 | - | 2 | Y |
| **SEMIVOLATILE ORGANICS (ug/L)** | | | | | | | | | | | | | | |
| 2,6-Dinitrotoluene | 1/27 | 0.6 J | 0.6 J | 10 - 100 | 0.6 | OT-GW03 | OT-GW03 | 3.7 | - | - | 7 | - | ND | N |
| 2-Methylnaphthalene | 2/27 | 73 | 740 | 10 - 11 | 740 | T4TW11 (95) | SB/TW-11 | 150 | - | - | 280 | - | ND | Y |
| Anthracene | 2/27 | 2 J | 5 J | 10 - 11 | 5 | T4TW11 (95) | SB/TW-11 | 1100 | - | - | 2000 | 1100000 | ND | N |
| Benzo(a)anthracene | 1/27 | 0.8 J | 0.8 J | 10 - 100 | 0.8 | SWTW07 (95) | SB/TW-7 | 0.092 | - | - | 0.06 | 0.3 | ND | Y |
| Bis(2-Ethylhexyl)phthalate | 3/27 | 0.8 J | 6 J | 10 - 100 | 6 | OT-GW04-D | OT-GW04 | 4.8 | 6 | 6 | 2 | 59 | 3 | Y |
| Carbazole | 1/23 | 2 J | 2 J | 10 - 100 | 2 | SWTW07 (95) | SB/TW-7 | 3.3 | - | - | 1.8 | 29 | ND | Y |
| Chrysene | 1/27 | 0.7 J | 0.7 J | 10 - 100 | 0.7 | SWTW07 (95) | SB/TW-7 | 9.2 | - | - | 4.8 | 0.3 | ND | Y |
| Di-n-butyl phthalate | 10/27 | 0.5 J | 16 J | 10 - 100 | 16 | SWTW25 (95) | SB/TW-25 | 370 | - | - | 700 | 120000 | ND | N |
| Dibenzofuran | 1/27 | 9 J | 9 J | 10 - 100 | 9 | SWTW07 (95) | SB/TW-7 | 2.4 | - | - | 28 | - | ND | Y |
| Diethyl Phthalate | 2/27 | 0.5 J | 12 | 10 - 100 | 12 | T4GW08 (95) | HNUS-8 | 2900 | - | - | 5600 | 2400000 | ND | N |
| Dimethyl Phthalate | 1/27 | 4 J | 4 J | 10 - 100 | 4 | T4GW08 (95) | HNUS-8 | 37000 | - | - | 70000 | 58000000 | ND | N |
| Fluoranthene | 1/27 | 4 J | 4 J | 10 - 100 | 4 | SWTW07 (95) | SB/TW-7 | 150 | - | - | 280 | 3700 | ND | N |
| Fluorene | 3/27 | 0.7 J | 51 J | 10 - 11 | 51 | T4TW11 (95) | SB/TW-11 | 150 | - | - | 280 | 140000 | ND | N |
| Naphthalene | 4/27 | 0.7 J | 200 | 10 - 11 | 200 | T4TW11 (95) | SB/TW-11 | 150 | - | - | 280 | - | ND | Y |
| Phenanthrene | 2/27 | 23 | 180 | 10 - 11 | 180 | T4TW11 (95) | SB/TW-11 | - | - | - | 200 | 0.3 | ND | Y |
| Pyrene | 1/27 | 2 J | 2 J | 10 - 100 | 2 | SWTW07 (95) | SB/TW-7 | 110 | - | - | 200 | 110000 | ND | N |
| **PESTICIDES/PCBs (ug/L)** | | | | | | | | | | | | | | |
| Heptachlor | 1/27 | 0.05 | 0.05 | 0.05 | 0.05 | SWTW07 (95) | SB/TW-7 | 0.0023 | 0.4 | 0.4 | 0.4 | 0.05 | ND | Y |
| **INORGANICS (ug/L)** | | | | | | | | | | | | | | |
| Aluminum | 26/27 | 32.9 | 115000 | 15.3 - 16.2 | 115000 | T4TW06 (95) | TW-6 | - | 50 to 200 | - | - | - | 15.4 - 3360 | N[8] |
| Aluminum, Filtered | 3/4 | 28.9 | 35.8 | 14 | 35.8 | OT-GW04 DISS | OT-GW04 | - | 50 to 200 | - | - | - | - | N[8] |
| Arsenic | 11/27 | 2.7 | 82.4 | 2 - 4 | 82.4 | T4TW06 (95) | TW-6 | 0.045 | 50 | 50 | 50 | 4 | 0.64 | Y |
| Barium | 27/27 | 27.5 | 689 | - | 689 | SWTW07 (95) | SB/TW-7 | 260 | 2000 | 2000 | 1000 | - | 2.8 - 183 | Y |
| Barium, Filtered | 4/4 | 36.8 | 101 | - | 101 | OT-GW04-D DISS | OT-GW04 | 260 | 2000 | 2000 | 1000 | - | - | N |
| Beryllium | 4/27 | 1.4 | 5.6 | 1 | 5.6 | SWTW07 (95) | SB/TW-7 | 73 | 4 | 4 | 4 | 4 | 0.33 - 0.41 | Y |
| Calcium | 27/27 | 8370 | 74400 | - | 42732 | SWTW05 (95) | SB/TW-5 | - | - | - | - | - | 3110 - 46000 | N[9] |

TABLE 4-7

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 23 - TANK FARM (INCLUDING SITE 9 - OT-5 OILY WASTEWATER TANK)[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 2 OF 3

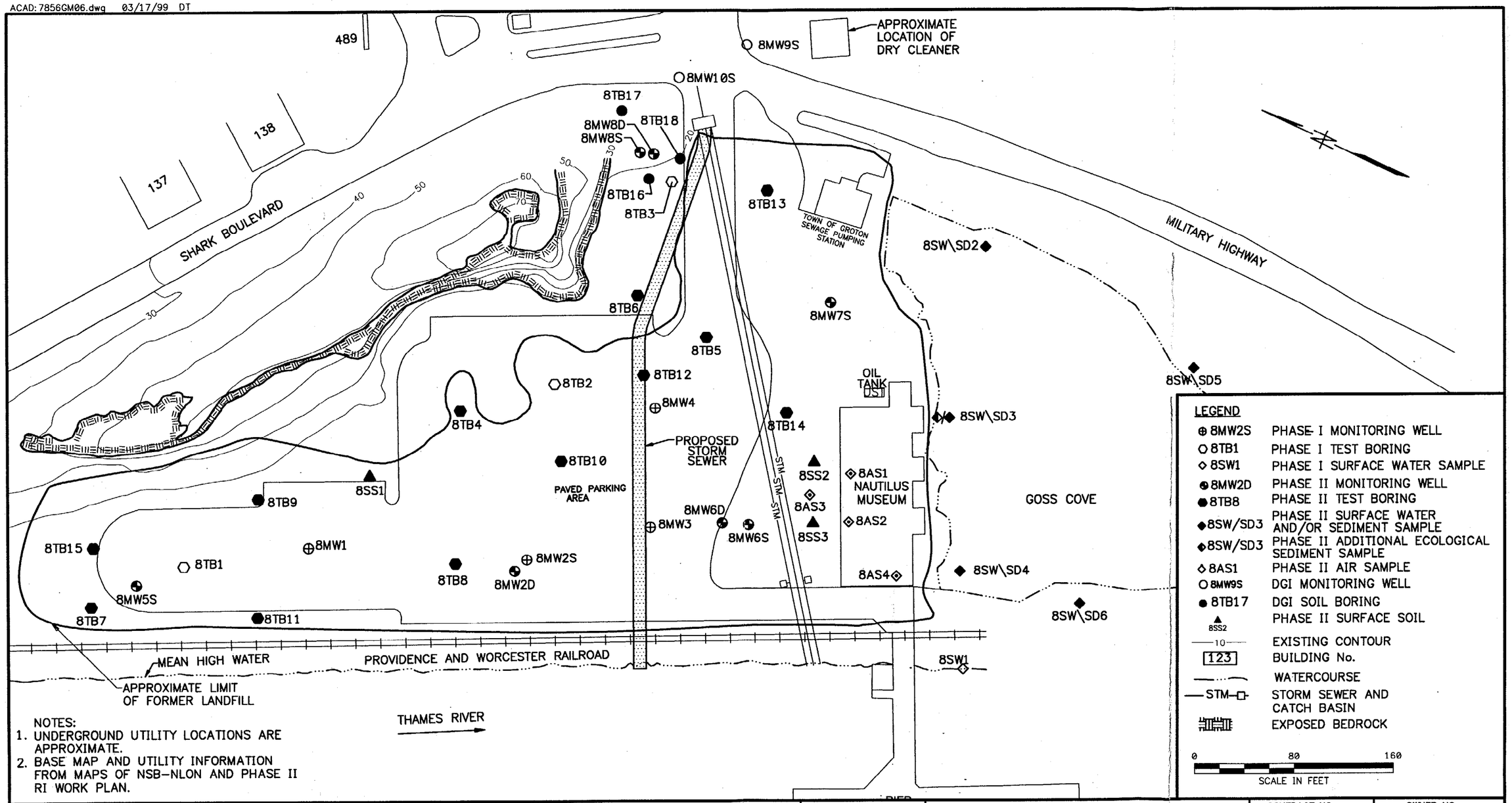
| Analyte | Frequency of Detection | Minimum Concen-tration | Maximum Concen-tration | Range of Nondetects | 95% UCL | Maximum Concentration | | COPC Screening Level (2) | Federal MCL (3) | State MCL (4) | State Remediation Standards[5] | | Offsite Wells Concentration Range (6) | Select as COPC? (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Sample Number | Location | | | | Groundwater Protection | Surface Water Protection | | |
| Calcium, Filtered | 4/4 | 34900 | 50100 | - | 45368 | OT-GW01 DISS | OT-GW01 | - | - | - | - | - | - | N[9] |
| Chromium | 18/27 | 1.4 | 127 | 1 - 9.6 | 127 | T4TW06 (95) | TW-6 | 18 | 100 | 100 | 50 | 110 | 2.7 - 6.7 | Y |
| Chromium, Filtered | 1/4 | 4.9 | 4.9 | 3 | 4.9 | OT-GW03 DISS | OT-GW03 | 18 | 100 | 100 | 50 | 110 | - | N |
| Cobalt | 20/27 | 1.5 | 61.2 | 1 - 4 | 12.7 | T4TW06 (95) | TW-6 | 220 | - | - | 420 | - | 1.9 - 6 | N |
| Copper | 12/27 | 5.8 | 176 | 1 - 4.5 | 176 | T4TW06 (95) | TW-6 | 150 | 1300 | - | 1300 | 48 | 1.6 - 2160 | N[8] |
| Copper, Filtered | 1/4 | 2.8 | 2.8 | 2 | 2.8 | OT-GW03 DISS | OT-GW03 | 150 | 1300 | - | 1300 | 48 | - | N[8] |
| Cyanide | 6/23 | 2.2 | 29.1 | 2 - 3 | 29.1 | T5GW11-D (95) | HNUS-11 | 73 | 200 | 200 | 200 | 52 | 1.2 - 15.5 | N |
| Iron | 26/27 | 145 | 262000 | 33.5 | 120027 | T4TW06 (95) | TW-6 | 1100 | 300 | - | - | - | 4.8 - 21800 | N[8] |
| Iron, Filtered | 4/4 | 24.5 | 1640 | - | 1640 | OT-GW02 DISS | OT-GW02 | 1100 | 300 | - | - | - | - | N[8] |
| Lead | 12/27 | 1 | 165 | 2 - 2.5 | 165 | SWTW07 (95) | SB/TW-7 | - | 15 | - | 15 | 13 | 1 - 264 | Y |
| Magnesium | 27/27 | 1990 | 29100 | - | 12917 | T4TW06 (95) | TW-6 | - | - | - | - | - | 654 - 5810 | N[9] |
| Magnesium, Filtered | 4/4 | 4820 | 7060 | - | 6952 | OT-GW01 DISS | OT-GW01 | - | - | - | - | - | - | N[9] |
| Manganese | 27/27 | 36.1 | 5540 | - | 5540 | T4GW08 (95) | HNUS-8 | 84 | 50 | 5000 | 50 | - | 0.89 - 2130 | Y |
| Manganese, Filtered | 4/4 | 35.7 | 796 | - | 796 | OT-GW01 DISS | OT-GW01 | 84 | 50 | 5000 | 50 | - | - | Y |
| Mercury | 3/27 | 0.21 | 5.8 | 0.2 | 5.8 | SWTW14 (95) | SB/TW-14 | 1.1 | 2 | 2 | 2 | 0.4 | 0.13 - 1.3 | Y |
| Mercury, Filtered | 1/4 | 0.495 | 0.89 | 0.2 | 0.89 | OT-GW04-D DISS | OT-GW04 | 1.1 | 2 | 2 | 2 | 0.4 | - | Y |
| Nickel | 24/27 | 1.6 | 5990 | 1 - 10 | 3165 | SWTW07 (95) | SB/TW-7 | 73 | 100 | 100 | 100 | 880 | 5 - 17.5 | Y |
| Potassium | 27/27 | 2310 | 24300 | - | 10280 | SWTW28 (95) | SB/TW-28 | - | - | - | - | - | 290 - 17900 | N[9] |
| Potassium, Filtered | 4/4 | 4660 | 5440 | - | 5440 | OT-GW04 DISS/ OT-GW04-D DISS | OT-GW04/ OT-GW04 | - | - | - | - | - | - | N[9] |
| Selenium | 8/27 | 1.65 | 13.6 | 2 - 3 | 13.6 | T4TW06 (95) | TW-6 | 18 | 50 | 50 | 50 | 50 | 1 - 4.1 | N |
| Silver, Filtered | 2/4 | 1.8 | 2.6 | 2 | 2.1 | OT-GW04 DISS | OT-GW04 | 180 | 100 | 50 | 36 | 12 | - | N |
| Sodium | 27/27 | 5500 | 134000 | - | 62330 | SWTW28 (95) | SB/TW-28 | - | - | 28000 | - | - | 3160 - 97700 | N[9] |
| Sodium, Filtered | 4/4 | 27400 | 67100 | - | 67100 | OT-GW04-D DISS | OT-GW04 | - | - | 28000 | - | - | - | N[9] |
| Thallium | 9/27 | 3.2 | 7.8 | 1 - 10 | 3.4 | T5GW11-D (95) | HNUS-11 | 0.26 | 2 | 2 | 5 | 63 | 1.2 - 4.3 | Y |
| Vanadium | 20/27 | 1.1 | 193 | 1 - 5 | 193 | T4TW06 (95) | TW-6 | 26 | - | - | 50 | - | 33.1 | Y |
| Zinc | 21/27 | 2.4 | 207 | 2 - 9 | 59.3 | T4TW06 (95) | TW-6 | 1100 | 5000 | - | 5000 | 123 | 4.5 - 445 | Y |
| Zinc, Filtered | 4/4 | 2.2 | 4.2 | - | 3.8 | OT-GW04 DISS | OT-GW04 | 1100 | 5000 | - | 5000 | 123 | - | N |
| **TOTAL PETROLEUM HYDROCARBONS (ug/L)** | | | | | | | | | | | | | | |
| Diesel Range Organics | 8/8 | 210 | 2800 | - | 2800 | OT3GW00702 (96) | HNUS-7 | - | - | - | - | - | NA | N[10] |
| Gasoline Range Organics | 6/8 | 10 | 140 | 10 | 140 | OT3GW00702 (96) | HNUS-7 | - | - | - | - | - | NA | N[10] |
| TPH | 17/89 | 500 | 4920000 | 500 - 1000 | 4920000 | T8TW23 (95) | SB/TW-23 | - | - | - | 500 | - | NA | N[10] |
| **MISCELLANEOUS PARAMETERS (mg/L)** | | | | | | | | | | | | | | |
| Chloride | 4/4 | 10 | 30 | - | 30 | HNUS23 02 | HNUS-23 | - | - | - | - | - | 3 - 180 | N[10] |
| Methane | 2/4 | 0.022 | 0.024 | 0.003 | 0.024 | HNUS23 02 | HNUS-23 | - | - | - | - | - | NA | N[10] |
| Nitrite, As Nitrogen | 4/4 | 0.81 | 4.7 | - | 4.6 | HNUS22 02 | HNUS-22 | - | - | - | - | - | NA | N[10] |
| Sulfate | 4/4 | 9.9 | 22 | - | 22 | HNUS23 02-D | HNUS-23 | - | - | - | - | - | NA | N[10] |
| Total Organic Carbon | 4/4 | 1.4 | 2.3 | - | 2.3 | HNUS23 02/ HNUS23 02-D | HNUS-23/ HNUS-23 | - | - | - | - | - | NA | N[10] |

TABLE 4-7

COPC SCREENING - GROUNDWATER SAMPLES - OVERBURDEN WELLS
SITE 23 - TANK FARM (INCLUDING SITE 9 - OT-5 OILY WASTEWATER TANK)[1]
NSB-NLON, GROTON, CONNECTICUT
PAGE 3 OF 3

1 Includes samples ERM-1 (95), ERM-11 (95), ERM-13 (95), ERM-14 (95), ERM-15 (95), ERM-17 (95), ERM-19 (95), ERM-2 (95), ERM-5 (95), HNUS22 02, HNUS22 DL, HNUS23 02, HNUS23 02-D, HNUS23 DL, HNUS24 02, HNUS24 DL, HNUS24 DL-D, LATW03 (95), MW-11 (95), OT-GW01, OT-GW01 DISS, OT-GW02, OT-GW02 DISS, OT-GW03, OT-GW03 DISS, OT-GW04, OT-GW04 DISS, OT-GW04-D, OT-GW04-D DISS, OT1TW02901 (96), OT1TW03001 (96), OT1TW03101 (96), OT1TW03102 (96), OT3GW00701 (96), OT3GW00702 (96), OT3TW03201 (96), OT3TW03301 (96), OT3TW03401 (96), OT4TW04001 (96), OT4TW04201 (96), OT4TW04301 (96), OT4TW04301-D (96), OT4TW04302 (96), OT4TW04401 (96), OT8TW03501 (96), OT8TW03601 (96), OT8TW03701 (96), OT8TW03801 (96), OT8TW03901 (96), OT8TW04801 (96), SWGW23 (95), SWGW24 (95), SWTEMP12 (95), SWTW05 (95), SWTW06 (95), SWTW07 (95), SWTW09 (95), SWTW10 (95), SWTW10-D (95), SWTW13 (95), SWTW14 (95), SWTW15 (95), SWTW16 (95), SWTW18 (95), SWTW19 (95), SWTW25 (95), SWTW26 (95), SWTW27 (95), SWTW28 (95), T1GW01 (95), T1GW01-D (95), T1GW02 (95), T1TW01 (95), T1TW02 (95), T1TW03 (95), T2GW04 (95), T2GW05 (95), T2TW01 (95), T2TW02 (95), T2TW02-D (95), T2TW03 (95), T2TW04 (95), T2TW04A (95), T3GW06 (95), T3GW07 (95), T3TW05 (95), T3TW08 (95), T3TW08-D (95), T4GW08 (95), T4GW09 (95), T4TW06 (95), T4TW11 (95), T5GW10 (95), T5GW11 (95), T5GW11-D (95), T6GW12 (95), T6W13 (95), T7GW14 (95), T7GW15 (95), T7TW07 (95), T7TW08 (95), T8GW16 (95), T8GW16-D (95), T8GW17 (95), T8GW18 (95), T8TW09 (95), T8TW20 (95), T8TW22 (95), T8TW23 (95), T8TW24 (95), T9GW20 (95), T9GW21 (95), T9GW22 (95), T9TW10 (95), T9TW11 (95).
2 Based on current USEPA Region III guidance (USEPA Region III, April 1, 1998). Tap Water Ingestion Value for noncarcinogens is based on a target hazard quotient of 0.1. Value for carcinogens is based on a cancer risk of 1E-6. See Table 1-3 for further details regarding surrogate values.
3 Maximum Contaminant Level. (USEPA, October 1996). See Table 1-3 for further details.
4 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health. See Table 1-3 for further details.
5 CTDEP, January 1996. See Table 1-3 for further details regarding surrogate and/or calculated values.
6 Atlantic, July 1994.
7 Contaminant of Potential Concern; Yes (Y) indicates the maximum concentration exceeds one or more criteria; Unless otherwise indicated, No (N) indicates the maximum does not exceed any of the criteria.
8 USEPA Region I does not advocate quantitative evaluation of this chemical.
9 Essential nutrient; not evaluated for COPC screening.
10 Not applicable for COPC screening.
- Not available or Not applicable.
NA Not analyzed.
ND Not detected.

ACAD: 7856GM06.dwg 03/17/99 DT




NOTES:
1. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE.
2. BASE MAP AND UTILITY INFORMATION FROM MAPS OF NSB-NLON AND PHASE II RI WORK PLAN.

| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY HJP DATE 10/29/98
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

SITE MAP
SITE 8-GOSS COVE LANDFILL
NSB-NLON, GROTON, CONNECTICUT

CONTRACT NO. 7856
OWNER NO. 312
APPROVED BY Gary A. Pill DATE 5/10/99
APPROVED BY DATE
DRAWING NO. FIGURE 4-1
REV. 0

FORM CADD NO. TINUS_BH.DGN – REV 0 – 1/20/98

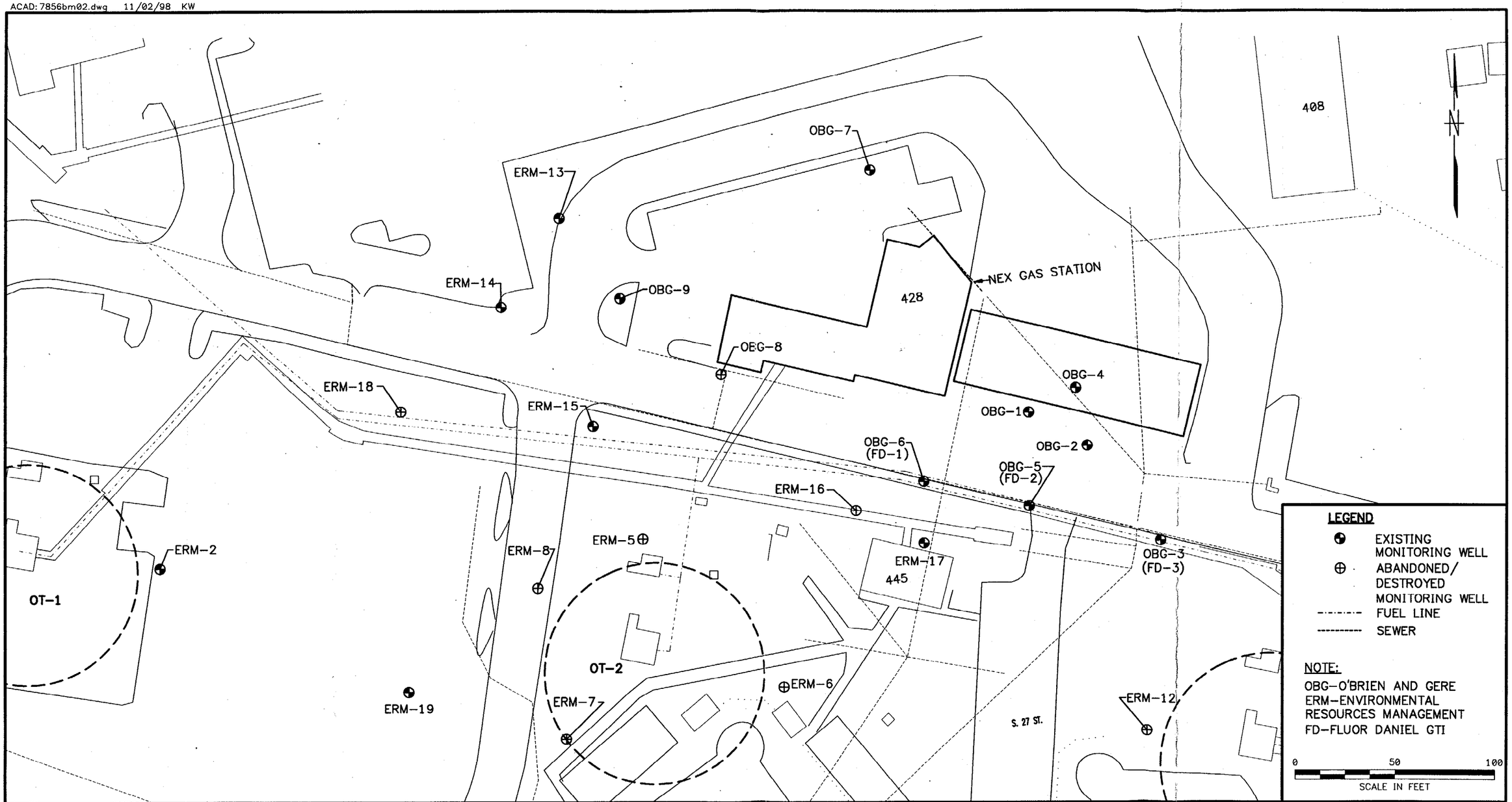
119802/P



CTO 0312

01639072

ACAD: 7856bm02.dwg 11/02/98 KW




| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY KW DATE 11/2/98
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

SITE MAP
SITE 12-NEX GAS STATION
NSB-NLON, GROTON, CONNECTICUT

CONTRACT NO. 7856
OWNER NO. 312
APPROVED BY Corey A. Reid DATE 11/5/98
APPROVED BY DATE
DRAWING NO. FIGURE 4-2
REV. 0

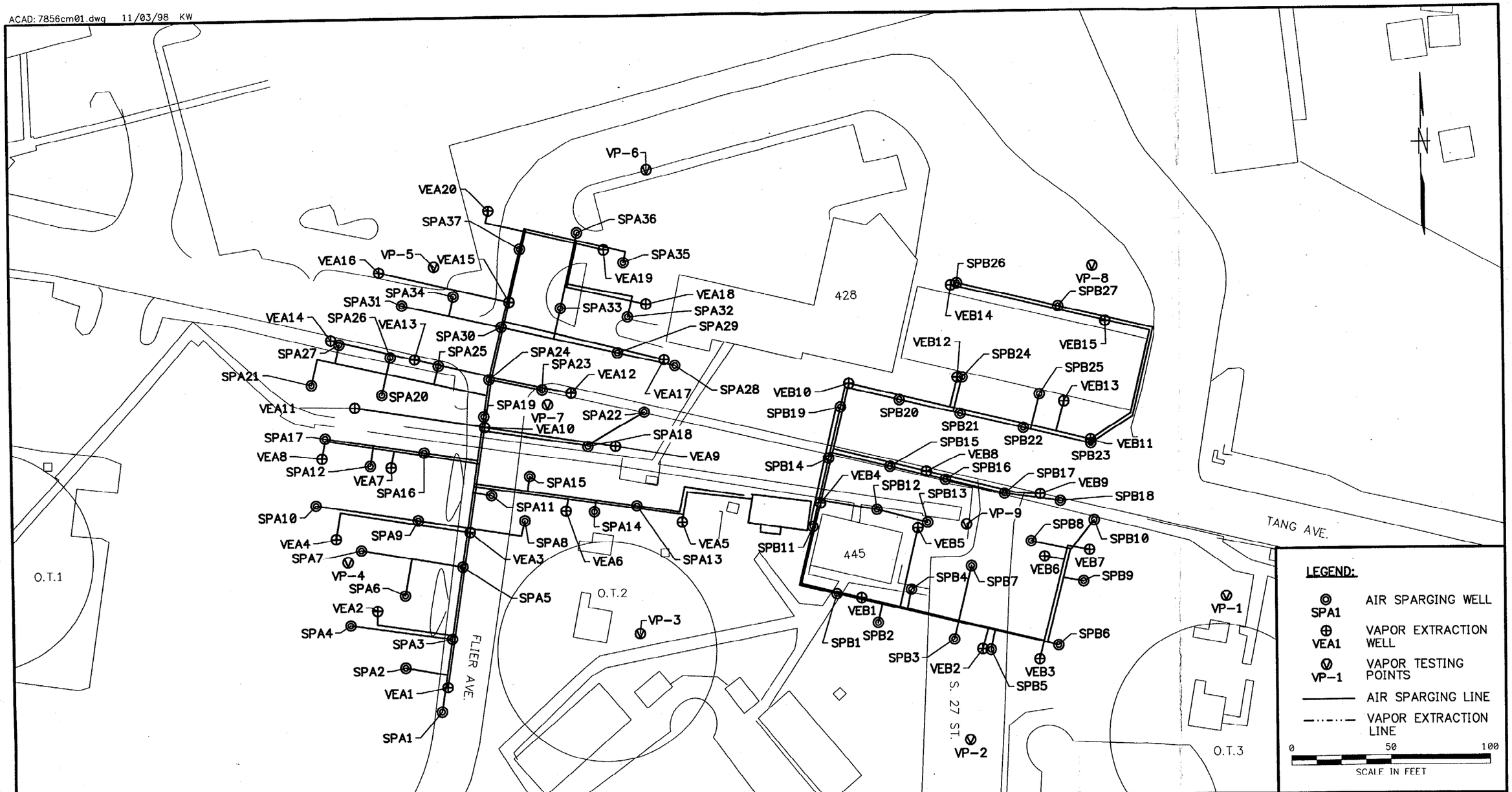
FORM CADD NO. T+NUS_BH.DGN - REV 0 - 1/20/98

119802/P



CTO 0312
01639082

ACAD: 7856cm01.dwg 11/03/98 KW




| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY KW DATE 11/2/98
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

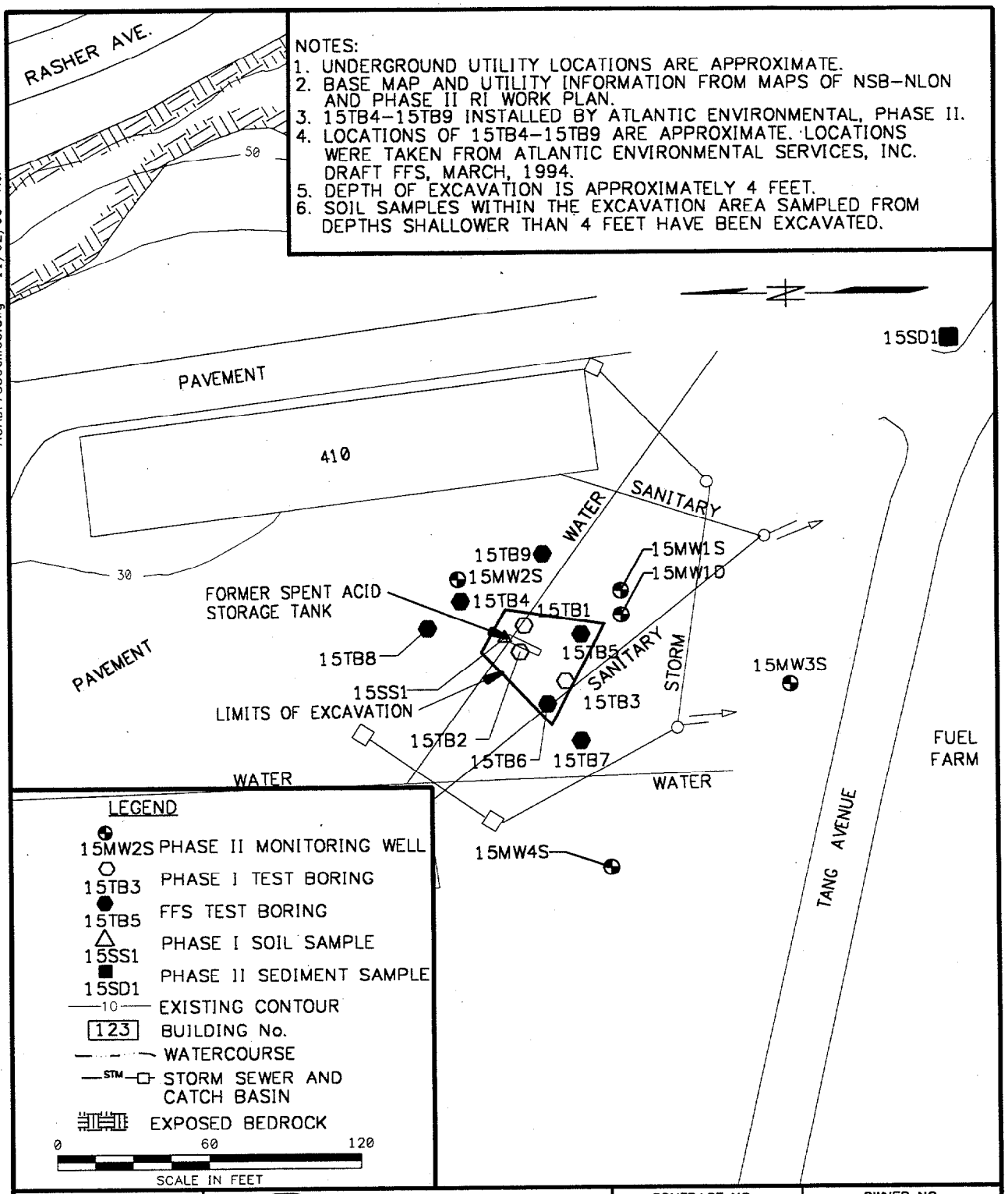
REMEDIATION SYSTEM LAYOUT
NEX SERVICE STATION
NSB-NLON, GROTON, CONNECTICUT

CONTRACT NO. 7856
OWNER NO. 312
APPROVED BY Chris Ch Paul DATE 11/5/98
APPROVED BY DATE
DRAWING NO. 4-3
REV. 0

FORM CADD NO. TtNUS_BH.DGN - REV 0 - 1/20/98

ACAD: 7856GM05.dwg 11/02/98 HJP

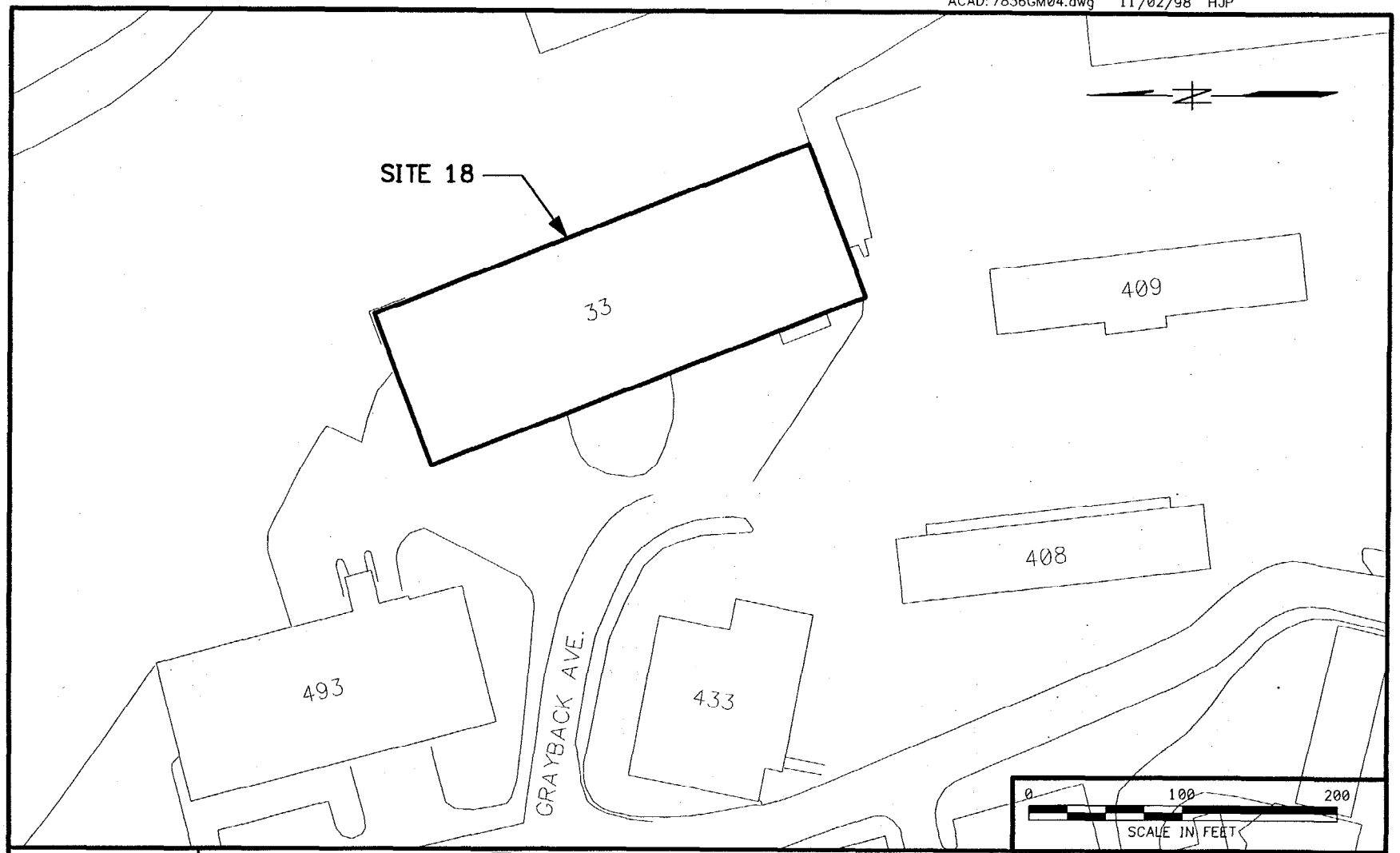
NOTES:
1. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE.
2. BASE MAP AND UTILITY INFORMATION FROM MAPS OF NSB-NLON AND PHASE II RI WORK PLAN.
3. 15TB4-15TB9 INSTALLED BY ATLANTIC ENVIRONMENTAL, PHASE II.
4. LOCATIONS OF 15TB4-15TB9 ARE APPROXIMATE. LOCATIONS WERE TAKEN FROM ATLANTIC ENVIRONMENTAL SERVICES, INC. DRAFT FFS, MARCH, 1994.
5. DEPTH OF EXCAVATION IS APPROXIMATELY 4 FEET.
6. SOIL SAMPLES WITHIN THE EXCAVATION AREA SAMPLED FROM DEPTHS SHALLOWER THAN 4 FEET HAVE BEEN EXCAVATED.




| | | | |
|---|---|---|---|
| DRAWN BY HJP DATE 10/29/98 | Tetra Tech NUS, Inc. | CONTRACT NO. 7856 | OWNER NO. 312 |
| CHECKED BY DATE | SITE MAP<br>SITE 15-SPENT ACID STORAGE AND DISPOSAL AREA<br>NSB-NLON, GROTON, CONNECTICUT | APPROVED BY Gary A. Pill DATE 11/5/98 | |
| COST/SCHED-AREA | | APPROVED BY DATE | |
| SCALE AS NOTED | | DRAWING NO. FIGURE 4-4 | REV. 0 |

FORM CADD NO. TtNUS_AV.DWG - REV 0 - 1/22/98

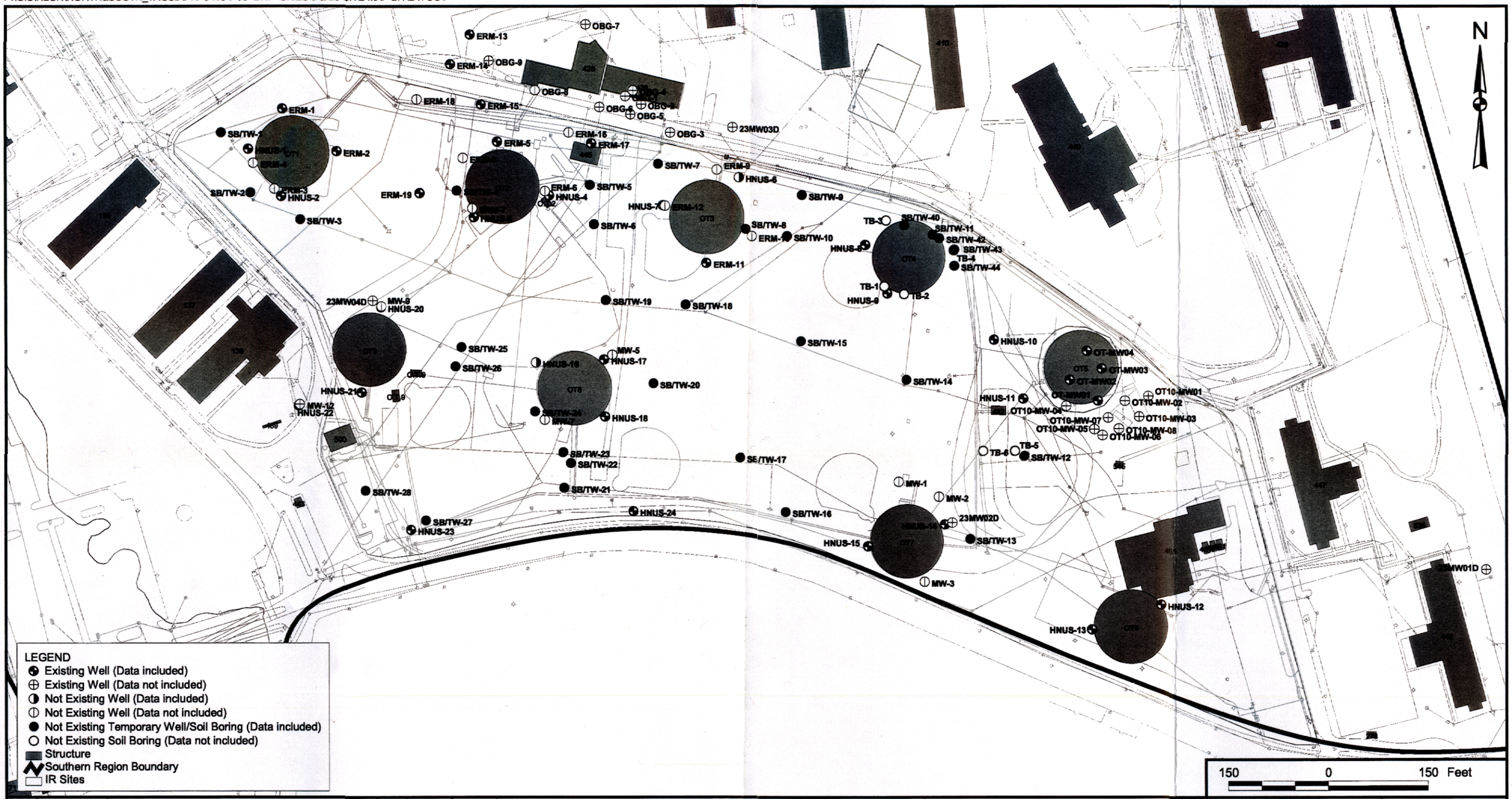
ACAD: 7856GM04.dwg 11/02/98 HJP




| | | | |
|---|---|---|---|
| DRAWN BY HJP DATE 10/29/98 | Tetra Tech NUS, Inc. | CONTRACT NO. 7856 | OWNER NO. 312 |
| CHECKED BY DATE | SITE MAP<br>SITE 18–SOLVENT STORAGE AREA<br>(BUILDING 33)<br>NSB–NLON, GROTON, CONNECTICUT | APPROVED BY Corey A. Pill DATE 11/5/98 | |
| COST/SCHED–AREA | | APPROVED BY DATE | |
| SCALE AS NOTED | | DRAWING NO. FIGURE 4–5 | REV. 0 |

FORM CADD NO. TtNUS_AH.DWG - REV 0 - 1/22/98

P:\GIS\NLON\NORTH&SOUTH_TAGS.APR 3-NOV-98 DNP SITES 9 & 23 SITE MAP BH LAYOUT




| NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES |
|---|---|---|---|---|---|---|
| | | | | | | |

DRAWN BY D. PERRY — DATE 3-NOV-98
CHECKED BY — DATE
COST/SCHEDULE-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

SITE MAP
SITE 9 - OT-5 WASTE WATER TANK AND
SITE 23 - TANK FARM
NSB-NLON, GROTON, CT

CONTRACT NUMBER —
OWNER NUMBER —
APPROVED BY Corey A. Rich — DATE 11/5/98
APPROVED BY — DATE —
DRAWING NO. FIGURE 4-6
REV 0



01639102

# 5.0 SUMMARY AND RECOMMENDATIONS

## 5.1 SUMMARY AND GENERAL RECOMMENDATIONS

Existing data for 14 of the IRP sites (i.e., Sites 1, 2A, 2B, 3, 4, 5, 7, 8, 9, 12, 14, 15, 18, and 23) at NSB-NLON were summarized and evaluated to determine the following:

- If any base-wide groundwater contamination exists at NSB-NLON.
- If any contamination exists in the soil, sediment, or surface water that could be a source of contamination to the groundwater.
- If there are any data gaps in the existing database and if further investigations are warranted to address the data gaps.

To complete the evaluation of existing data, NSB-NLON was separated into three regions (i.e., Northern, Central, and Southern). The regions were selected using topographic and hydrogeologic information so that groundwater in each region was generally isolated from an adjacent region. Historical investigations, physical characteristics, nature and extent of contamination, contaminant fate and transport, and historical HHRA information were summarized for each site. A screening level assessment was completed for the appropriate media (e.g., groundwater, soil, sediment, and surface water) at each site by comparing site-specific concentrations to screening level criteria. From the results of the screening level assessment, primary groundwater, soil, and sediment COPCs were chosen using selected criteria. Regional tag maps showing the concentrations of primary soil, sediment, and groundwater COPCs were prepared and used to determine if base-wide or regional groundwater contamination exists and to determine if contamination in the soil and sediment could potentially be acting as a source to the groundwater.

The results of the screening level assessment and the tag map evaluation indicated the following:

- Groundwater contamination exists in isolated, site-specific areas at NSB-NLON.
- With the exception of Site 8 Goss Cove, Site 12 NEX Gas Station, and Site 23 Tank Farm, there is little correlation between primary soil and sediment COPCs and primary groundwater COPCs.
- Inorganics were the only pervasive constituents detected in the groundwater at NSB-NLON. However, detected concentrations of inorganics appear to be indicative of background conditions.

- Further investigations are recommended for the Northern Region (Area A Landfill, Area A Wetland, Area A Downstream, Bunker A-86, Torpedo Shops, OBDANE, and Area A Weapons Center), Central Region (Hospital Incinerators), and Southern Region [Goss Cove, SASDA, Solvent Storage Area (Building 33), and Tank Farm] to address data gaps. Detailed regional and site-specific recommendations are provided in the following sections.

The following general recommendations are made in addition to the regional and site-specific recommendations.

- Currently, the only data available to evaluate background groundwater concentrations are the data collected from offsite residential wells. These data were collected from a variety of wells (overburden and bedrock) with different types of construction. The data have not been generally accepted by the regulators as representative of background groundwater conditions. Therefore, a limited number of unit-specific (overburden and bedrock) background wells should be selected and sampled to develop background groundwater concentrations for NSB-NLON.

- Because of the isolated/site-specific nature of the groundwater contamination at NSB-NLON, regional groundwater and contaminant fate and transport modeling is not recommended. However, site-specific groundwater and contaminant fate and transport modeling may be necessary to predict exposure point concentrations and clean-up times. Therefore, for the sites where groundwater modeling may be necessary, key groundwater flow and contaminant fate and transport modeling parameters should be collected during the Basewide Groundwater OU RI.

- The primary COPCs at several sites are VOCs that tend to degrade via natural attenuation processes (i.e., BTEX or chlorinated solvents). Therefore, it is recommended that parameters indicative of natural attenuation be included on the analytical parameter lists for the Basewide Groundwater OU RI at those sites.

- A comprehensive round of water-level measurements should be collected in existing and newly installed overburden and bedrock wells at NSB-NLON. The water-level data should be used to update the existing base-wide overburden and bedrock potentiometric surface maps. This information will be useful for understanding groundwater flow conditions at NSB-NLON and for groundwater modeling if it is necessary.

## 5.2 NORTHERN REGION OF NSB-NLON

The boundary of the Northern Region of NSB-NLON is shown on Drawing 2. The following IRP sites are located within the Northern Region.

- Site 1 - CBU Drum Storage Area
- Site 2A - Area A Landfill
- Site 2B - Area A Wetland
- Site 3 - Area A Downstream and OBDA
- Site 4 - Rubble Fill Area at Bunker A-86
- Site 5 - Hazardous Waste Storage Facility at Bunker A-85
- Site 7 - Torpedo Shops
- Site 14 - OBDANE
- Site 20 - Area A Weapons Center

Existing information for these sites was summarized and evaluated within this report. The following site-specific recommendations are made based on the results of the evaluation of the existing data:

- Site 1 – CBU Drum Storage Area: The groundwater at this site will be monitored under the Area A Landfill Groundwater Monitoring Plan. No further action is recommended for the soil at this site.

- Site 2A – Area A Landfill: A groundwater monitoring plan will be implemented at this site. The monitoring well network included in the groundwater monitoring plan should be sampled concurrent with the Basewide Groundwater OU RI and the results should be evaluated within the RI. The analytical program for this site should be consistent with the final, approved Area A Landfill Groundwater Monitoring Plan. In addition, cap maintenance activities should be completed and access use restrictions should be imposed on the landfill.

- Site 2B - Area A Wetland: Since the Area A Weapons Center may be the only remaining source of contamination at the Area A Wetland, a FS of alternatives should be completed for this site to evaluate a limited action effort consisting of a groundwater monitoring program and possibly access/use restrictions. One or more active remediation alternatives should be evaluated in the FS along with several limited action alternatives.

  The groundwater monitoring program for this site should be coordinated with the monitoring program that will be implemented at the Area A Landfill since that program will included sampling points within

the Area A Wetland at the interface with the landfill. The results of this sampling and analysis activities should be evaluated within the Basewide Groundwater OU RI.

- Site 3 - Area A Downstream and OBDA: Additional sampling of the existing overburden and bedrock wells should be completed in the north-central and northwestern portions of the site. The sampling is required to characterize the VOC contamination previously detected in these areas. The VOC contamination may be related to the Torpedo Shop's leach field. Installation of additional monitoring wells (temporary and/or permanent) may also be required. Samples collected during the Basewide Groundwater OU RI should be analyzed for natural attenuation and contaminant fate and transport modeling parameters.

  In addition to the effort required for the VOC contamination, existing monitoring wells within the Area A Downstream site should be sampled and analyzed to verify that pesticides in the overlying soil and sediment are not impacting the groundwater. The groundwater samples should also be analyzed for TCL SVOCs and TAL metals to address the concerns brought up as a result of the screening level analysis.

- Site 4 – Rubble Fill Area at Bunker A-86: This site will be monitored under the Area A Landfill Groundwater Monitoring Plan. The data collected from this program will be evaluated during the Basewide Groundwater OU RI. No further action is recommended for the soil at this site.

- Site 5 – Hazardous Waste Storage Facility at Bunker A-85: Since the Navy intends to remediate approximately 3,000 cubic yards of contaminated soil at the site as part of a RCRA closure plan, it is recommended that no further action take place at Site 5 under CERCLA.

- Site 7 - Torpedo Shops: Additional soil and groundwater (overburden and bedrock) sampling should be conducted to verify the nature and extent of the VOC contamination previously detected at this site. Additional monitoring wells should be installed and sampled as necessary to verify the extent of contamination. The VOC contamination is most likely related to the leach field at this site. Samples collected during the Basewide Groundwater OU RI should be analyzed for natural attenuation and contaminant fate and transport modeling parameters.

  The additional soil and groundwater samples should also be analyzed for TCL SVOCs and TAL metals to address concerns brought up by the screening level analysis. Ammonium perchlorate should also be included for analysis for the groundwater samples because this compound may have been released as a result of maintenance activities on torpedoes.

- Site 14 – OBDANE: A removal action should be completed for the soil at this site in conjunction with the remediation at the Area A Downstream Watercourses site. Confirmation sampling should to completed following the removal action to verify that all contaminated soil at Site 14 has been removed. The existing overburden well should be sampled during the Basewide Groundwater OU RI. The sample should be analyzed for TCL VOCs and TAL metals.

- Site 20 – Area A Weapons Center: Further groundwater sampling activities are recommended for this site during the Basewide Groundwater OU RI. Existing overburden and bedrock wells should be sampled and analyzed for TCL VOCs, TCL SVOCs, TAL metals, and ammonium perchlorate. The additional sampling and analysis will address concerns raised in this EDSR. A FS of alternatives should be completed for the soil and sediment to determine if these media are a source of contamination for the Area A Wetland.

## 5.3 CENTRAL REGION OF NSB-NLON

The boundary of the Central Region of NSB-NLON is shown on Drawing 2. Site 16 – Hospital Incinerators is the only IRP site located within the Central Region. Existing information for this site was summarized and evaluated within this report. The following site-specific recommendations are made based on the results of the evaluation of the existing data:

- Site 16 - Hospital Incinerators: A preliminary Site Investigation should be conducted at this site. Limited soil and groundwater sampling should be completed during the Site Investigation. The analytical program for this site should include TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals, and dioxins. Soil samples should also undergo SPLP extraction followed by analyses for TCL PCBs and TAL metals.

## 5.4 SOUTHERN REGION OF NSB-NLON

The boundary of the Southern Region of NSB-NLON is shown on Drawing 2. The following IRP sites are located within the Southern Region.

- Site 8 - Goss Cove Landfill
- Site 12 - NEX Gas Station
- Site 15 - Spent Acid Storage and Disposal Area
- Site 18 - Solvent Storage Area (Building 33)
- Site 23 - Tank Farm (including Site 9 – Oily Wastewater Tank)

Existing information for these sites was summarized and evaluated within this report. The following site-specific recommendations are made based on the results of the evaluation of the existing data:

- Site 8 – Goss Cove Landfill: Existing overburden wells should be sampled during the Basewide Groundwater OU RI to provide baseline information for the forthcoming groundwater monitoring program. The samples should be analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and TAL metals.

- Site 12 – NEX Gas Station: The AS/SVE system that is currently active at this site should continue to be operated and monitored until the site is remediated. Existing data from the monitoring program should be incorporated into the NSB-NLON EGIS and evaluated during the Basewide Groundwater OU RI.

- Site 15 - Spent Acid Storage and Disposal Area: Existing wells at this site should be sampled during the Basewide Groundwater OU RI. The groundwater samples should be analyzed for TCL VOCs, TCL SVOCs, and TAL metals to verify the effectiveness of the removed action and to provide information regarding contaminant concentrations at locations upgradient of the Tank Farm.

- Site 18 – Solvent Storage Area (Building 33): A preliminary Site Investigation should be conducted at this site. Limited soil and groundwater sampling should be completed during the Site Investigation. The analytical program for this site should include TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and TAL metals. Soil samples should also undergo SPLP extraction followed by analyses for TCL PCBs and TAL metals.

- Site 23 - Tank Farm (including Site 9 – Oily Wastewater Tank): Information related to the removal action completed at OT-8 should be obtained and summarized in the Basewide Groundwater OU RI. Deep overburden wells should be installed adjacent to the existing bedrock wells. The bedrock wells, deep overburden wells, and a limited number of shallow overburden wells should be sampled and analyzed to determine the nature and extent of contamination. All groundwater samples should be analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs and TAL metals. Samples collected during the Basewide Groundwater OU RI should also be analyzed for natural attenuation and contaminant fate and transport modeling parameters.

# REFERENCES

Atlantic (Atlantic Environmental Services, Inc.), August 1992. Phase I Remedial Investigation Naval Submarine Base - New London, Groton, Connecticut. Colchester, Connecticut.

Atlantic (Atlantic Environmental Services, Inc.), March 1994a. Draft Focused Feasibility Study, Spent Acid Storage and Disposal Area Installation Restoration Program, Naval Submarine Base - New London, Groton, Connecticut. Colchester, Connecticut.

Atlantic (Atlantic Environmental Services, Inc.), April 1994b. Draft Focused Feasibility Study, Area A Downstream/OBDA Installation Restoration Program, Naval Submarine Base-New London, Groton, Connecticut. Colchester, Connecticut.

Atlantic (Atlantic Environmental Services, Inc.), May 1994c. Design Analysis – Basis for Design and Calculations for Area A Landfill Cap, Installation Restoration Program, Naval Submarine Base - New London, Groton, Connecticut. Colchester, Connecticut.

Atlantic (Atlantic Environmental Services, Inc.), July 1994d. Off-Site Residential Well Water Evaluation Report, Installation Restoration Program, Naval Submarine Base - New London, Groton, Connecticut. Colchester, Connecticut.

Atlantic (Atlantic Environmental Services, Inc.), March 1995a. Action Memorandum for the DRMO and Spent Acid Storage and Disposal Area, Installation Restoration Program, Naval Submarine Base - New London, Groton, Connecticut. Colchester, Connecticut.

Atlantic (Atlantic Environmental Services, Inc.), April 1995b. Background Concentrations of Inorganics in Soil, Installation Restoration Program, Naval Submarine Base - New London, Groton, Connecticut. Colchester, Connecticut.

Atlantic (Atlantic Environmental Services, Inc.), May 1995c. Focused Feasibility Study – Area A Landfill, Installation Restoration Program, Naval Submarine Base - New London, Groton, Connecticut. Colchester, Connecticut.

Atlantic (Atlantic Environmental Services, Inc.), May 1995d. Proposed Plan for Area A Landfill, Installation Restoration Program, Naval Submarine Base - New London, Groton, Connecticut. Colchester, Connecticut.

Atlantic (Atlantic Environmental Services, Inc.), June 1995e. Draft Record of Decision for Area A Landfill, Installation Restoration Program, Naval Submarine Base - New London, Groton, Connecticut. Colchester, Connecticut.

Bouwer, H. and R. C. Rice, 1976. "A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells." Water Resources Research. Vol. 12, No. 3.

B&R Environmental (Brown & Root Environmental), October 1996a. Groundwater/Leachate Modeling Study, Area A Landfill, Naval Submarine Base - New London, Groton, Connecticut. Wayne, Pennsylvania.

B&R Environmental (Brown & Root Environmental), December 1996b. Revised Design Analysis Report for Area A Landfill, Naval Submarine Base - New London, Groton, Connecticut. Wayne, Pennsylvania.

B&R Environmental (B & R Environmental), June 1996c. Site Characterization Report for OT-10, Building 325 and Building 89, Naval Submarine Base - New London, Groton, Connecticut. Wayne, Pennsylvania.

B&R Environmental (Brown & Root Environmental), March 1997a. Phase II Remedial Investigation Report for Naval Submarine Base - New London, Groton, Connecticut. Wayne, Pennsylvania.

B&R Environmental (Brown & Root Environmental), June 1997b. Verification Sampling Report for Site 4 Removal Action, Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania.

B&R Environmental (Brown & Root Environmental), July 1997c. Proposed Plan for Area A Downstream/OBDA, Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania.

B&R Environmental (Brown & Root Environmental), August 1997d. Data Gap Investigation Report for Goss Cove Landfill, Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania.

B&R Environmental (Brown & Root Environmental), September 1997e. Site Investigation Report for Tank Farm Investigation for Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania.

B&R Environmental (Brown & Root Environmental), December 1997f. Feasibility Study for Soil and Sediment, Area A Downstream/OBDA (Site 3), Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania.

B&R Environmental (Brown & Root Environmental), December 1997g. Draft Final Record of Decision for Soil and Sediment, Area A Downstream Water Courses/Overbank Disposal Area, Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania.

B&R Environmental (Brown & Root Environmental), March 1998. Report for Interim Remedial Action at Area A Landfill, Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania.

Connecticut Geological and Natural History Survey, 1974. Map of Drainage Basins Within Connecticut.

CTDEP (Connecticut Department of Environmental Protection), January 1996. "Remediation Standard Regulations." Bureau of Water Management, Permitting, Enforcement and Remediation Division, Hartford, Connecticut.

CTDEP (Connecticut Department of Environmental Protection), September 1997. Communication from Sidney Holbrook, Commissioner CTDEP to Harley Laing, Director of USEPA Region I and Captain R. N. Nestlerode, Commanding Officer of NSB-NLON.

CTDEP (Connecticut Department of Environmental Protection), March 1999. Phase I/II Environmental Site Assessment Report for Fusconi Dry Cleaners. Bureau of Water Management, Permitting, Enforcement and Remediation Division, Hatford, Connecticut.

Envirodyne (Envirodyne Engineers, Inc.), March 1983. Initial Assessment Study: Naval Submarine Base, New London, Connecticut. Prepared for Naval Assessment and Control of Installation Pollutants Department.

ERM (Environmental Resource Management), June 1991. Installation and Sampling of Monitoring Wells at the Fuel Farm, Naval Submarine Base - New London, Groton, Connecticut. Exton, Pennsylvania.

ERM (Environmental Resource Management), August 1992. Final Remediation of Contaminated Soil and Groundwater, NEX and Dolphin Mart Service Stations, Naval Submarine Base, New London, Groton, Connecticut. Exton, Pennsylvania.

FFA (U.S. Environmental Protection Agency), January 1995. Federal Facility Agreement Under CERCLA 120, In the Matter of The US Department of the Navy, Naval Submarine Base - New London, Groton, Connecticut.

Fuss & O'Neill Engineers, 1989. Hydrogeologic Investigation – Underground Storage Tanks OT-4, OT-7, OT-8, OT-9, and 54-H, Naval Submarine Base - Groton, Connecticut.

FWEC (Foster-Wheeler Environmental Corporation), July 1997a. Final Post Removal Report for Site 4 - Rubble Fill at Bunker A-86, Naval Submarine Base - New London, Groton, Connecticut.

FWEC (Foster Wheeler Environmental Corporation), July 1997b. Final Post Removal Report for Over Bank Disposal Area, Naval Submarine Base - New London, Groton, Connecticut.

GZA (GZA GeoEnvironmental, Inc.), December 1991. UST Removal – Waste Oil Tank 5 (OT-5), Naval Submarine Base - New London, Groton, Connecticut.

GZA (GZA GeoEnvironmental, Inc.), 1992. Environmental Testing – Waste Oil Tank 5 (OT-5), Naval Submarine Base - New London, Groton, Connecticut.

HNUS (Halliburton NUS Corporation), May 1993. Action Memorandum for Building 31, Naval Submarine Base, New London, Groton, Connecticut. Wayne, Pennsylvania.

HNUS (Halliburton NUS Corporation), May 1994a. Site Characterization Report for Waste Oil Tank 5, Naval Submarine Base - New London, Groton, Connecticut. Wayne, Pennsylvania.

HNUS (Halliburton NUS Corporation), December 1994b. Post Removal Action Report for Waste Oil Tank No. 5, Naval Submarine Base - New London, Groton, Connecticut. Wayne, Pennsylvania.

HNUS (Halliburton NUS Corporation), May 1995. Letter Report – Area A Landfill/Wetland Interface Sampling Results, Naval Submarine Base - New London, Groton, Connecticut. Wayne, Pennsylvania.

NAVFAC (Naval Facilities Engineering Command), 1988. Master Plan for Naval Submarine Base – New London, Groton Connecticut. Northern Division, Philadelphia, Pennsylvania.

NEESA (Naval Energy and Environmental Support Act), March 1983. Final Initial Assessment Study of Naval Submarine Base - New London, Groton, Connecticut. 13-025, Port Hueneme, California.

NEESA (Naval Energy and Environmental Support Act), April 1995. Supplement to Initial Assessment Study of Naval Submarine Base - New London, Groton, Connecticut. 13-025, Port Hueneme, California.

NESO (Naval Environmental Support Office), February 1979. Oil Contamination of the Ground Water at SUBASE. 1-026.

NFESC (Naval Facilities Engineer Service Center), April 1995. Draft Final Supplement to Initial Assessment Study. Naval Submarine Base, New London, Groton, Connecticut. Port Huenewe, California.

Niering W.A. and A. H. Brawley, May 1997. Functions and Values Assessment of Area A Downstream Wetlands and Waterways, Naval Submarine Base, New London, Groton, Connecticut. Groton, Connecticut.

O'Brien & Gere, 1989. Additional Site Investigation and Evaluation of Remedial Alternatives for NEX Gas Station, Naval Submarine Base, New London, Groton, Connecticut.

O'Brien & Gere, October 1990. Naval Exchange Gas Station Underground Storage Tank (UST) Spill Investigation, Naval Submarine Base, New London, Groton, Connecticut.

OHM (OHM Remediation Services Corporation), September 1995. Find Report for Soil Remediation, Spent Acid Storage and Disposal Area, Naval Submarine Base, New London, Groton, Connecticut. Hopkinton, Massachusetts.

SAIC (Science Applications International Corporation), March 1999. Evaluation of Chemical and Toxicological Data for Goss Cove. Newport, Rhode Island.

SCS, 1983. Soil Survey of New London County Connecticut. United States Department of Agriculture Soil Conservation Service.

TtNUS (Tetra Tech NUS, Inc.), September 1998. Wetlands Functions and Values Assessment Report. King of Prussia, Pennsylvania.

TtNUS (Tetra Tech NUS, Inc.), February 1999a. Summary Report for Hydrogeologic Study at the Tank Farm, Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania.

TtNUS (Tetra Tech NUS, Inc.), March 1999b. Draft Final Feasibility Study for Goss Cove Landfill, Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania.

TtNUS (Tetra Tech NUS, Inc.), March 1999c. Site Management Plan for Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania.

USEPA (United States Environmental Protection Agency), 1989. Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxin and –Dibenzofurans (CDDs and CDFs) and 1989 Update. EPA/625/3-89/016. Risk Assessment Forum.

USEPA (United States Environmental Protection Agency), 1996. Soil Screening Guidance Technical Background Document. EPA/540/R-95/128. Office of Solid Waste and Emergency Response, Washington, D.C. Directive 9355.4-17A.

USEPA (United States Environmental Protection Agency), Region III, 1997. Risk-Based Concentration Table. Hazardous Waste Management Division.

USEPA (United States Environmental Protection Agency), April 1998. Risk-Based Concentration Tables. Region III, Hazardous Waste Management Division, Philadelphia, Pennsylvania.

USGS (United States Geological Survey), 1960. Geologic Map of the Uncasville Quadrangle, New London County, Connecticut.

USGS (United States Geological Survey), 1967. Bedrock Geologic Map of the Uncasville Quadrangle, New London County, Connecticut.

U.S. Navy (United States Department of the Navy), July 1996. No Further Action Decision Document, Naval Submarine Base - New London, Groton, Connecticut. Northern Division, Lester, Pennsylvania.

U.S. Navy (United States Department of the Navy), July 1997a. Proposed Plan for the Spent Acid Storage and Disposal Area, Naval Submarine Base - New London, Groton, Connecticut. Northern Division, Lester, Pennsylvania.

U.S. Navy (United States Department of the Navy), July 1997b. Action Memorandum for Over Bank Disposal Area, Naval Submarine Base - New London, Groton, Connecticut. Northern Division, Lester, Pennsylvania.

U.S. Navy (United States Department of the Navy), September 1997c. Record of Decision for the Spent Acid Storage and Disposal Area, Naval Submarine Base - New London, Groton, Connecticut. Northern Division, Lester, Pennsylvania.

U.S. Navy (United States Department of the Navy), September 1997d. Action Memorandum for Site 4 - Rubble Fill at Bunker A-86, Naval Submarine Base - New London, Groton, Connecticut. Northern Division, Lester, Pennsylvania.

Wehran (Wehran Engineering Corporation), February 1988. Verification Step 1-A Study, Naval Submarine Base - New London, Groton, Connecticut. Methuen, Massachusetts.