US Army Corps
of Engineers

Remedial Action
Area of Contamination 57
Devens, Massachusetts
DACW33-01-D-0003 Task Order 0002

FINAL
Interim Remedial Action Completion Report

Volume I – Text, Tables, and Figures

Conti Environment & Infrastructure, Inc.
490 Virginia Rd.
Concord, MA 01742

September 2004

RESPONSE TO REGULATORY COMMENTS

INTERIM REMEDIAL ACTION COMPLETION REPORT (DRAFT February 2004)

AREA OF CONTAMINATION 57, DEVENS, MA

DACW33-01-D-0003, Task Order 0002

This document contains the text of individual comments provided by the Massachusetts Department of Environmental Protection (MADEP) and US Environmental Protection Agency regarding the Draft Interim Remedial Action Completion Report for Area of Contamination 57, dated February 2004, prepared by Conti Environment and Infrastructure, Inc. for the US Army Corps of Engineers New England District. The DEP comments were provided in a letter from Dave Salvadore to Ben Goff dated May 21, 2004. The EPA comments were provided via email on September 8, 2004 from Carole A. Keating to Ben Goff. Responses are shown below in italics. Final revisions of the Remedial Action Completion Report are required as a result of some of these comments, as further discussed below.

MADEP Comment:

The Massachusetts Department of Environmental Protection (MADEP) has completed its review of the (AOC) 57 Draft Interim Remedial Action Completion Report and concurs with the data provided in the report and the impacted soil removal action conducted at AOC 57.

Response

No response required.

EPA Comment 1:

Page ES-2, ¶ 2 - Please reference the date of the ESD (date of EPA's conditional approval letter).

Response

We added this reference to the text.

EPA Comment 2:

Conti

Page ES-3, ¶ 5 - Please include a sentence that describes the fate of the CMP sumps discussed in paragraph one.

Response

We added a sentence describing the re-use of the CMP sumps on Page ES-3.

EPA Comment 3:

Page ES-3, ¶ 7 - Please insert "COCs and associated" between "revised" and "cleanup levels" in the first sentence.

Response

We made this change in the final RA Report.

EPA Comment 4:

Page ES-4, ¶ 1 - Please include a description, e.g. waste characterization, volume, and fate of the excavation water stored/treated in the five 20,000 gallon fractionation storage tanks during remedial actions at the site (as discussed on page 16).

Response

This information has been added to the final RA Report text.

EPA Comment 5:

Page ES-4, last paragraph - Please confirm that the total cost of the remedial action includes costs associated with comment 4. above.

Response

Yes, this total cost includes costs of characterizing, obtaining approvals, hauling the excavation water to a nearby drop point for discharge into the Devens Sanitary Sewer System, and final cleanout of the tanks.

EPA Comment 6:

Page 4, ¶ 3 - Please delete reference to the draft ESD, e.g. November 2003, and insert the date of the final ESD (date of EPA's conditional approval letter).

Response

The final RA Report has been revised accordingly.

EPA Comment 7:

Page 19, 12th bullet - See comment 6. above.
Response

We made a similar change at this location in the final RA report in reference to the ESD.

EPA Comment 8:

Page 20, ¶ 2 - Please insert information on final walk-through inspection (since it has occurred).

Response

This information has been added at this location, and also in the Executive Summary, page ES-4.

EPA Comment 9:

Page 20, Section 8.0 - See comment 5. above.

Response

See response to comment 5 above.

US Army Corps
of Engineers

Remedial Action
Area of Contamination 57
Devens, Massachusetts
DACW33-01-D-0003 Task Order 0002

FINAL
Interim Remedial Action Completion Report

Volume I – Text, Tables, and Figures

Conti Environment & Infrastructure, Inc.
490 Virginia Rd.
Concord, MA 01742

September 2004

Interim Remedial Action Completion Report for Contaminated Soil Removal Remedial Action, Area of Contamination 57, Devens, MA

DACW33-01-D-0003 Task Order 0002

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

EXHIBITS

EXECUTIVE SUMMARY

Interim Remedial Action Completion Report for Contaminated Soil Removal Remedial Action, Area of Contamination 57 Devens, MA

DACW33-01-D-0003 Task Order 0002

This Interim Remedial Action Completion Report summarizes work performed to complete remediation of contaminated soils at a site known as Area of Contamination 57 (AOC57), Areas 2 and 3, located in Devens, Massachusetts. Conti Environmental, Inc. (Conti) prepared this document at the request of the U.S. Army Corps of Engineers New England District (USACE). The U.S. Army is performing the remediation work under the regulatory oversight of the United States Environmental Protection Agency (EPA) Region I, and the Massachusetts Department of Environmental Protection (MADEP).

AOC57 is located on the south side of Barnum Road, in an area of the former Fort Devens that was used primarily for the storage and maintenance of military vehicles. AOC57 consists of three subareas (Area 1, Area 2, and Area 3), located south to southeast of former buildings numbered 3713, 3756, 3757, and 3758. These subareas historically received stormwater runoff and wastes from vehicle maintenance at former vehicle storage yards associated with these buildings. Areas 2 and 3 consist of an uplands slope portion and a portion adjacent to and within a wetland area to the south. In Areas 2 and 3, waste disposal of petroleum products and other wastes associated with vehicle maintenance likely occurred on the slope areas and at the base of the slopes.

On December 21, 1989, Fort Devens was placed on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). A Federal Facilities Agreement (FFA) to establish a procedural framework for ensuring that appropriate response actions are implemented at Fort Devens was developed and signed by the Army and the USEPA Region I on May 13, 1991, and finalized on November 15, 1991. AOC57 is considered a sub-site to the entire installation to be addressed under the FFA.

The Army began cleanup work at Areas 2 and 3 in 1992, under the oversight of USEPA Region I and MADEP. Site investigation activities conducted between 1992 and 2000 at Areas 2 and 3 resulted in identification of soil contamination from petroleum wastes and other materials, including polychlorinated biphenyls (PCBs) from unknown sources. Contaminants were present at elevated concentrations, which required risk-based remedial actions to clean up these sites to an acceptable risk level for the designated land use scenarios.

Initial removal activities for soil contamination were conducted at Area 2 in 1994, and in Area 3 in 1999. Other remedial actions at AOC57 have included spill responses, investigations and removal actions at and around the stormwater outfall and drainage ditch at AOC57 Area 1.

A Record of Decision was signed on September 28, 2001 for AOC57 Areas 1, 2 and 3. The September 28, 2001 ROD for AOC57 presented the Army's selected remedial action for soil and groundwater contamination at Areas 1, 2 and 3. The selected remedy for Area 1 was no further action. The selected remedy for Area 2 was excavation (for possible future use) and institutional controls. The selected remedy for Area 3 was excavation (to accelerate groundwater cleanup) and institutional controls.

BCT concerns about persistent separate-phase petroleum waste seepage, and increased volumes of contaminated soils identified during execution of 2002 removal work and 2003 additional investigation work, prompted the Army to modify the remedy resulting in the preparation of an Explanation of Significant Differences (ESD). Also, this ESD identifies the addition of extractable petroleum hydrocarbons (EPH), by the MADEP method as a contaminant of concern (COC) for soil and groundwater at AOC57 Area 2, the addition of polychlorinated biphenyls (PCBs) as a COC for groundwater at Area 2, and documents the identified additional contaminated soil volumes and remedial costs. EPA provided conditional approval of the ESD in a letter dated March 4, 2004.

Final soil cleanup levels for Areas 2 and 3 at AOC57 are as follows:

Area 2 COC:	**Cleanup Level in Soil:**
PCB Aroclor-1260	3.5 mg/kg dry weight by EPA Method 3540C/8082
Lead	600 mg/kg dry weight by EPA Method 3050B/6010B
C11-C22 Aromatic Hydrocarbons	200 mg/kg dry weight for Extractable Petroleum Hydrocarbons (EPH) using MADEP method
Area 3 COC:	**Cleanup Goal in Soil (to document removal of organic material):**
C11-C22 Aromatic Hydrocarbons	930 mg/kg dry weight for Extractable Petroleum Hydrocarbons (EPH) using MADEP method

Contaminated soil removal was initiated in January 2002 based on the selected remedy in the ROD for Areas 2 and 3. Area 3 was excavated to the target limits, and the planned volume of soil was removed within these limits to depths ranging from 2 to 4 feet. All confirmatory samples met the ROD cleanup criterion for EPH, and Area 3 was backfilled and the extent of removal was documented.

In Area 2, the excavation was initiated and expanded beyond the initial excavation limits to remove visible petroleum-contaminated soils and address observed petroleum sheens and globules. The confirmatory samples for the final excavation limits exhibited concentrations of these constituents below the ROD cleanup levels. Prior to backfilling, however, petroleum waste sheen reappeared on the water surface in the excavation.

A total of 2,197 tons of contaminated soils had been removed and stockpiled from AOC57 Areas 2 and 3. Approximately 2,000 tons (1,300 cubic yards) were removed from Area 2 and the remainder from Area 3. All contaminated soils were transported off-site for treatment/recycling in a thermal desorption process at Environmental Soils Management, Inc. (ESMI) in Loudon, NH.

Due to persistent petroleum waste sheens and globules on groundwater during and after the Area 2 removal work, a small portion of the excavation was left open to observe and absorb/remove further sheens or globules on the groundwater surface. During backfilling, four 12-inch diameter corrugated metal pipe sumps (CMP sumps) with vertical slots at locations surrounding this open excavation area were installed to aid in observing the petroleum waste sheen on the groundwater surface.

Following the January 2002 removal work, additional remediation work included deploying/removing absorbent materials at Area 2 from February 2002 to August 2002, and installation and operation of a belt-skimmer based product recovery system from September to November 2002. The system was decommissioned for the winter, and then installed and operated from May 2003 through August 2003. The system, in combination with manual bailing, successfully removed an estimated total of 80 gallons of petroleum waste/water mixture from the subsurface at Area 2.

Supplemental soil sampling at Area 2 was completed in September 2002. The purpose of this sampling was to evaluate the source and delineate the extent of remaining petroleum waste-contaminated soil at AOC57 Area 2. The investigation delineated zones of visibly impacted subsurface soil remaining at the site, immediately surrounding and upgradient of the existing open excavation, and documented that a portion of these soils exceeded ROD cleanup levels.

Between December 2002, and March 2003, additional investigation work was completed at AOC57 Area 2, including drilling twelve soil borings and installing six monitoring wells. Groundwater and surface water level measurements were made in these monitoring wells at surface water stations during 2003. A round of groundwater samples was obtained from the six newly installed wells and analyzed for VOCs, EPH, and Arsenic. The monitoring well installation and soil sampling further reduced uncertainties regarding the extent of subsurface soils exceeding the original ROD cleanup levels at the site, and led to an identified target areas for further removal beyond the extent excavated in 2002.

Based on the December 2002 to March 2003 field investigations, additional areas for soil removal were identified, and a requirement to pump groundwater entering excavations was added. Final removal of contaminated soil at Area 2 began in September 2003, at a small area around newly installed well 57M-03-06X. Confirmatory samples taken from this excavation area around well 57M-03-06X met the cleanup goals, and the area was subsequently backfilled.

Excavation work continued up the slope area at Area 2, and progressed in a southerly direction. This direction of excavation allowed management of the groundwater infiltrating into the excavation bottom as the work progressed. All of the confirmatory samples obtained during the progress of the work met the final soil cleanup levels. An interceptor/monitoring trench was installed, at a location in Area 2 between the 2003 soil excavation area and the wetlands, to monitor any residual floating petroleum waste/sheens following the completion of the source removal work. The CMP sumps previously used for monitoring and recovery, and removed during the final phase of soil excavation, were cleaned and re-used as sumps in the interceptor/monitoring trench.

The 2003 soil removal successfully achieved final cleanup levels, for the revised COCs, for soil at AOC57 Area 2. De-minimus remaining contamination (as evidenced by sheening on infiltrating groundwater observed at the completion of excavation in 2003 at Area 2), is consistent with, and will be addressed by, the planned remediation approach for groundwater contamination in the Long Term Monitoring Plan.

Below are final quantities of wastes removed during 2001-2003 remedial actions at AOC57.

Contaminated Soil Recycled at ESMI facility, Loudon, NH:

Area 2 – 4,361 tons, or approximately 2,800 cubic yards
Area 3 – 197 tons, or approximately 120 cubic yards

Drums containing contaminated absorbent materials and PPE, transported to Onyx facility, TX for thermal destruction: Total of twenty four (24) 55-gallon drums.

Drums containing collected petroleum-contaminated liquids (petroleum waste/water mixture) from skimming operations, two 55-gallon partially full drums, estimated total of 80 gallons.

One 20-cy container of plastic liner co-mingled with contaminated soils

Two 30-cy trash containers of construction wastes and decontaminated liner/cover materials.

Contaminated Excavation Water, total volume of 94,000 gallons, was hauled from the frac tanks for discharge to the Devens Sewer System.under a temporary discharge permit. Characterization data obtained through representative sampling of the excavation water demonstrated that the water met Devens Sewer Discharrge Requirements. An additional approximately 200 gallons of solids/liquids from the tank bottoms was removed and disposed during final tank cleanout.

Final site restoration at AOC57 Areas 2 and 3 was completed in October, 2003. Restoration tasks included placement of topsoil and topsoil/peat mixture, planting of white oak and red maple trees, and placement of seed mixes/mulch including a specialty seed mix within the wetlands boundary. Additional restoration features included placement of stumps from site clearing to create habitat, placement of rip rap stone at Area 2 to control erosion, placement of logs to limit vehicle access to Areas 2 and 3, and installation of staff gauges at Area 2 to monitor wetlands surface water levels.

A final walk-through inspection was conducted at AOC57 Areas 2 and 3 on July 8, 2004. The following individuals were present at the walk-through inspection:

Takashi Taka – Devens BRAC
Carol Keating – USEPA
Jim Murphy – USEPA
David Salvadore – MADEP

Brian Duval - MADEP
Ron Ostrowski – Mass Development
Ellen Iorio – USACE
John McDowell - USACE
Stan Reed – MACTEC

The final remedy for soils remediation, at Areas 2 and 3 combined, completed following execution of the ROD, has a projected at-completion total cost of $ 1,074,213. This cost includes costs of the soil removal work, disposal of all liquid and solid wastes generated, closeout reports, and also some groundwater well installations, which may become part of the long-term monitoring network.

Interim Remedial Action Completion Report for Contaminated Soil Removal Remedial Action, Area of Contamination 57, Devens, MA

DACW33-01-D-0003 Task Order 0002

1.0 Introduction

This Interim Remedial Action Completion Report summarizes work performed to complete remediation of contaminated soils at a site known as Area of Contamination 57 (AOC57), Areas 2 and 3, located in Devens, Massachusetts. Conti Environmental, Inc. (Conti) prepared this document at the request of the U.S. Army Corps of Engineers New England District (USACE). The site designation and participating regulatory agencies are listed below.

Site Name and Location

Site Name:	Area of Contamination 57, Devens, Massachusetts
Site Location:	off Barnum Road, Ayer/Harvard, Massachusetts

Lead and Support Agencies

Lead Agency:	US Environmental Protection Agency
Support Agency:	Massachusetts Department of Environmental Protection

This section (1.0) provides an overview of the site operational, regulatory, enforcement, and remediation history. Section 2.0 presents a more specific background of how the cleanup approach at AOC57 Areas 2 and 3 was developed by the Army and regulatory agencies. Section 3.0 presents a specific chronology of events from initial site investigations through remedial construction. Sections 4.0 to 9.0 provide details on the execution of the remedial construction work at AOC57 Areas 2 and 3.

1.1 Site Operational History

Devens was established in 1917 as Camp Devens, a temporary training camp for soldiers from the New England area. In 1931 the camp became a permanent installation and was renamed Fort Devens. Throughout its history, Fort Devens served as a training and induction center for military personnel, and as a unit mobilization and demobilization site. Fort Devens was identified for cessation of operations and closure under the Defense Base Realignment and Closure Act of 1990 (BRAC), and was officially closed in September 1996.

AOC57 is located on the south side of Barnum Road, in an area of the former Fort Devens that was used primarily for the storage and maintenance of military vehicles. In addition, areas north of Barnum Road have historically been, and continue to be, used as rail yards and for freight handling and

storage. AOC57 consists of three subareas (Area 1, Area 2, and Area 3), located south to southeast of former buildings numbered 3713, 3756, 3757, and 3758. These subareas historically received stormwater runoff and wastes from vehicle maintenance at former vehicle storage yards associated with these buildings. The vehicle storage yards were abandoned in 1998 and the pavement and fencing was removed. The former storage yards are now grass-covered areas.

Areas 2 and 3 consist of an uplands slope portion and a portion adjacent to and within a wetland area to the south. The wetlands are bordering vegetated wetlands associated with nearby Cold Spring Brook, which flows west to east. At Area 2, the flood plain boundary is located approximately 300 feet from Cold Spring Brook, and at Area 3 the flood plain boundary is located approximately 400 feet from the brook. In Areas 2 and 3, waste disposal of petroleum products and other wastes associated with vehicle maintenance likely occurred on the slope areas, within ditches extending down the slopes, and at the base of the slopes.

1.2 Regulatory and Enforcement History

On December 21, 1989, Fort Devens was placed on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). A Federal Facilities Agreement (FFA) to establish a procedural framework for ensuring that appropriate response actions are implemented at Fort Devens was developed and signed by the Army and the United States Environmental Protection Agency (USEPA) Region I on May 13, 1991, and finalized on November 15, 1991. AOC57 is considered a sub-site to the entire installation to be addressed under the FFA.

The Army began cleanup work at Areas 2 and 3 in 1992, under the oversight of EPA Region I and the Massachusetts Department of Environmental Protection (MADEP). A Record of Decision (ROD) was signed on September 28, 2001 for AOC57 Areas 1, 2 and 3. Section 2.0 provides further information on the ROD, and the overall remedial approach.

1.3 Major Findings and Results of Site Investigation Activities

Site investigation activities conducted between 1992 and 2000 at Areas 2 and 3 resulted in identification of soil contamination from petroleum wastes and other materials, including polychlorinated biphenyls (PCBs) from unknown sources. Contaminants were present at elevated concentrations, which required risk-based remedial actions to clean up these sites to an acceptable risk level for the designated land use scenarios. Section 2.0 provides background information on the ROD, assumed land use, and the cleanup program resulting from these investigations. Section 3.0, chronology of events, provides more information on the findings of the investigations at Areas 2 and 3, and Section 5.0 provides details regarding the investigation work conducted as part of the remediation.

1.4 Prior Removal and Remedial Activities

Prior removal activities for soil contamination were conducted at Area 2 in 1994, and in Area 3 in 1999. Remedial Investigations (RIs) were conducted at these areas during the 1990s and 2000. Section 3.0, chronology of events, provides further descriptions of these remediation and investigation activities.

1.5 *Other Remedial Actions at AOC57*

Other remedial actions at AOC57 have included spill responses, investigations and removal actions at and around the stormwater outfall and drainage ditch at AOC57 Area 1. The spill response work was conducted in 1977 to clean up a 50 to 100 gallon fuel oil spill into the storm drain. Investigation work was conducted between 1992 and 1997. The Army conducted a soil removal action in 1997 at Area 1, including 25 cubic yards of contaminated soil. Subsequent risk assessments performed during the RI in 2000 concluded that no further action was required at Area 1. The 2001 ROD documents this decision of "no further action" for Area 1.

2.0 Site Background

2.1 *Record of Decision*

A Record of Decision was signed on September 28, 2001 for AOC57 Areas 1, 2 and 3. The September 28, 2001 ROD for AOC57 presented the Army's selected remedial action for soil and groundwater contamination at Areas 1, 2 and 3. The selected remedy for Area 1 was no further action. The selected remedy for Area 2 was excavation (for possible future use) and institutional controls. The selected remedy for Area 3 was excavation (to accelerate groundwater cleanup) and institutional controls. Key components of the selected remedy are summarized in the next section.

2.2 *Selected Remedy*

Key components of the selected remedy for Area 2, excavation (for possible future use) and institutional controls, are summarized below:

- Soil excavation and treatment/disposal at an off-site treatment, storage, or disposal facility.
- Wetlands protection.
- Institutional controls (existing zoning that prohibits residential use of Area 2 property and proposed deed restrictions that prohibit potable use of Area 2 groundwater and residential use of flood plain property).
- Environmental monitoring (long term groundwater and surface water monitoring).
- Insitutional control inspections.
- Five-year site reviews.

Key components of the selected remedy for Area 3, excavation (to accelerate groundwater cleanup) and institutional controls are summarized below.

- Soil excavation and treatment/disposal at an off-site treatment, storage, or disposal facility.
- Wetlands protection.
- Institutional controls (existing zoning that prohibits residential use of Area 3 property and proposed deed restrictions that prohibit potable use of Area 3 groundwater and residential use of flood plain property).
- Environmental monitoring (long term groundwater and surface water monitoring).
- Insitutional control inspections.
- Five-year site reviews.

2.3 Remedial Action Work Plan

Conti Environmental, Inc., working under contract with USACE, prepared a draft Remedial Action Work Plan in December 2001 and final version in January 2002. The Work Plan addressed requirements of a Statement of Work (SOW) issued to Conti by USACE, dated October 2001. The scope of the Remedial Action Work plan included addressing ROD requirements for completion of remediation of contaminated soil at AOC57 Areas 2 and 3. The technology selected for soil contamination at AOC57 Areas 2 and 3 in the ROD was soil excavation and treatment/disposal at an off-site treatment, storage, or disposal facility. The estimated volumes of soil to be removed from AOC57 in the ROD were 640 cubic yards from Area 2, and 120 cubic yards from Area 3.

The January 2002 Work Plan identified excavation of contaminated soil without the pumping and storage of groundwater as the remedial approach. Therefore, specific means and methods were developed to provide for successful excavation, confirmatory sampling, backfilling, and management of ponded water within the excavations. As further discussed in Section 5.0, this original Work Plan approach was applied in an initial phase of soil removal in January-February 2002. However, the approach was modified, to allow for pumping of excavation water, for the final soil removal in September-October 2003. In addition, amendments to this original Work Plan were issued for investigation work completed as part of the site remediation work, including soil sampling and monitoring well installation, as further described in Section 5.0.

2.4 Explanation of Significant Differences

BCT concerns about persistent separate-phase petroleum waste seepage, and increased volumes of contaminated soils identified during execution of 2002 removal work and 2003 additional investigation work, prompted the Army to modify the remedy resulting in the preparation of an Explanation of Significant Differences (ESD). Also, this ESD identifies the addition of extractable petroleum hydrocarbons (EPH), by the MADEP method as a contaminant of concern (COC) for soil and groundwater at AOC57 Area 2, the addition of polychlorinated biphenyls (PCBs) as a COC for groundwater at Area 2, and documents the identified additional contaminated soil volumes and remedial costs. EPA provided conditional approval of the ESD in a letter dated March 4, 2004.

As stated in the ESD document, the ESD was necessary due to the two circumstances listed below:

1. Increased volume and cost of contaminated soil requiring removal to attain cleanup levels at Area 2.
2. Inclusion of EPH as contaminant of concern for soils at Area 2, in the September 2001 AOC57 ROD, to monitor the presence of petroleum waste encountered during contaminated soil removal.
3. Inclusion of EPH and PCBs as contaminants of concern for Area 2 groundwater in the September 2001 AOC57 ROD.

The ESD resulted in adopting a soil cleanup level of 200 mg/kg (dry weight) for EPH C11-C22 aromatic fraction, which is included with the ROD cleanup criteria in the Performance Standards summarized in Section 3.0. Sections 3.0, and 5.0 provide further information on the sequence of events and data generated which led to the need for the ESD.

3.0 Chronology of Events

Listed below are milestones relevant to the history of investigation and cleanup efforts at Devens AOC57 Areas 2 and 3.

3.1 Area 2 Chronology

1992 – The drainage ditch at Area 2 was investigated as part of the Site Investigation for Groups 2 and 7 Historic Gas Stations. Fingerprint analysis of soil samples collected from the ditch area indicated soil contamination most likely derived from lubricating oil or vehicle crankcase oil.

1994 – The Army performed a soil removal action at Area 2 in response to newly promulgated Massachusetts Contingency Plan (MCP) standards. The 1994 soil removal action was discontinued due to the soil contamination extending below the water table and well beyond the areal limits originally estimated. A total of 1,300 cubic yards of contaminated soil was removed during this 1994 removal action.

1995 – 1998 – The Army conducted site RIs at AOC57 Areas 2 and 3. The most significant soil contaminants identified at Area 2 included petroleum hydrocarbons, PCBs, and lead.

2000 – The Army performed additional soil and groundwater investigations, and completed a Feasibility Study (FS) for selection of final remedies at AOC57 Areas 2 and 3.

2001 – A Record of Decision was signed on September 28, 2001 for AOC57 Areas 1, 2 and 3.

2002 – The Army completed additional soil removal in January-February 2003 at AOC57 Areas 2 and 3 under a Remedial Action Work Plan prepared to address the final ROD remedy for contaminated soils. The Army discontinued the soil removal work at Area 2 in February 2003 due to contamination apparently extending beyond the limits identified in the ROD, and due to observed persistent seepage of petroleum waste into the open excavation after the removal work. The Army performed soil sampling to further delineate the extent of the contaminated soils, and to identify the source of the petroleum waste seepage. The Army installed and operated a petroleum product recovery system in the remaining open excavation and installed collection sumps at Area 2.

2003 – The Army continued to operate the petroleum product recovery system at Area 2 following a winter shutdown. The Army performed additional soil sampling at the request of EPA and MADEP, and developed a Work Plan Amendment to complete remediation of the remaining contaminated soils. The Army executed the Work Plan Amendment including contaminated soil removal, and removal of excavation water to allow access to contaminated soils beneath the groundwater table. The Army completed site restorations at AOC57 Areas 2 and 3 in October 2003, and completed transportation and disposal of remaining stockpiled contaminated soils by the end of December 2003. This RA Report describes the 2002-2003 soil remediation work completed at Area 2 in further detail.

3.2 Area 3 Chronology

1995 – During investigations of Area 2, four test-pits were excavated east of Area 2 where historical photos indicated soil staining. Sample analysis showed the presence of petroleum hydrocarbons and chlorinated volatile organic compounds (VOCs). The area was designated AOC57 Area 3.

1996 through 1998 - RI field investigations were performed to better characterize the nature and extent of contamination at Area 3. The most significant soil contaminants identified at Area 3 included petroleum hydrocarbons, PCBs, some semi-volatile organic compounds, and arsenic. Lower concentrations of VOCs were detected at some locations.

1999 – The Army conducted a soil removal action, which targeted soils with Total Petroleum Hydrocarbon (TPH) and PCB concentrations exceeding soil standards published under the Massachusetts Contingency Plan (MCP). A total of 1,860 cubic yards of material was removed for off-site disposal.

2000 – The Army performed additional soil and groundwater investigations, and competed a Feasibility Study for selection of final remedies at AOC57 Areas 2 and 3.

2001 – A Record of Decision was signed on September 28, 2001 for AOC57 Areas 1, 2 and 3.

2002 – The Army completed additional soil removal in January-February 2003 at AOC57 Areas 2 and 3 under a Remedial Action Work Plan prepared to address the final ROD remedy for contaminated soils. The Army successfully completed soil removal work at Area 3 to meet ROD requirements. This RA Report describes this 2002 soil remediation work in further detail.

4.0 Performance Standards and Construction Quality Control

This section summarizes administrative requirements, cleanup standards, and the contractor's quality assurance/quality control approach to assure and monitor conformance with these requirements.

4.1 ARARs Established in the ROD

The ROD identified Applicable or Relevant and Appropriate Requirements (ARARs), and actions to be taken to attain these requirements, for the selected remedy for each of Areas 2 and 3. Table 14 of the ROD provides a synopsis of these ARARs for the selected alternatives. Major ARARs for AOC57 Areas 2 and 3 soil remediation include state and federal laws related to wetland or floodplain area protection, solid or hazardous waste classification and management, and wastewater discharge/management.

The MCP, at 310 CMR 40.0000 is not considered an ARAR for CERCLA actions at Devens. The MADEP is participating in the cleanup through review of the work and decisions made under CERCLA, and by indicating their concurrence with the ROD. However, the MADEP Bill of Lading process has been applied to the remediation work at Areas 2 and 3 to meet off-site treatment facility waste acceptance requirements.

4.2 Contaminants of Concern and Cleanup Levels

4.2.1 AOC57 Area 2

The original ROD risk-based cleanup levels for Area 2 at AOC57 were established for PCB aroclor-1260 and lead only. Concerns about the persistent separate phase petroleum waste observed during the 2002-2003 removal and investigation work, resulted in the addition of C11-C22 Aromatic Hydrocarbons quantified by Extractable Petroleum Hydrocarbons (EPH), by the MADEP method, as a Contaminant of Concern (COC). The added cleanup level is 200 mg/kg EPH C11-C22 aromatic fraction in Area 2 soils. Subsequently, PCBs were added as a Contaminant of Concern because of their association with the petroleum waste oil.

Final Cleanup levels for Area 2 at AOC57 are as follows:

Area 2 COC:	**Cleanup Level in Soil:**
PCB Aroclor-1260	3.5 mg/kg dry weight by EPA Method 3540C/8082
Lead	600 mg/kg dry weight by EPA Method 3050B/6010B
C11-C22 Aromatic Hydrocarbons	200 mg/kg dry weight for Extractable Petroleum Hydrocarbons (EPH) using MADEP method

4.2.2 AOC57 Area 3

The ROD established cleanup levels for one COC, EPH C11-C22 Aromatic Hydrocarbons, at AOC57 Area 3 as follows:

Area 3 COC:	**Cleanup Goal in Soil:**
C11-C22 Aromatic Hydrocarbons	930 mg/kg dry weight for Extractable Petroleum Hydrocarbons (EPH) using MADEP method

The Area 3 cleanup objective was to remove organic material, which may cause the mobilization of naturally occurring arsenic from soils into groundwater. The cleanup goal of 930 mg/kg EPH was selected as a target goal to help evaluate removal of a sufficient quantity of organic material.

4.3 CQC Program Implementation

As part of the original January 2002 Work Plan, the Army's contractors prepared a Construction Quality Control Plan (CQC Plan) to address both chemical and construction elements of quality assurance/quality control. The CQC Plan was developed in conformance with the U.S. Army Corps of Engineers (USACE) requirements for contractors CQC programs. The remedial contractor is responsible for quality control of the work to meet contract requirements, and the USACE provides quality assurance oversight to monitor performance of the contractor in meeting the contract requirements. Regulatory representatives from EPA and MADEP were provided an opportunity to

participate in the CQC program through review of certain deliverables, and through field visits during remedial construction.

The CQC System implemented involves the following basic elements; Definable Features of Work, Submittals, Project Quality Control Meetings, Three Phases of Control, Tests, Inspections, and Documentation. A full set of CQC documentation was compiled and submitted to USACE as part of execution of the Work Plan. Brief descriptions of how some of the CQC elements were applied to AOC57 are provided below.

4.3.1 Definable Features of Work

The CQC program included identification of several Definable Features of Work (DFOWs). The DFOWs were separate and distinct tasks defined in the statement of work, for which separate control requirements could be developed. Each DFOW had several inter-related subtasks. The original DFOWs and subtasks developed for the initial phase of soil excavation in January 2002 were modified in work plan amendments as additional tasks were added to the original work plan. Final DFOWs developed for the AOC57 soil remediation work at Areas 2 and 3 are listed below:

- General Conditions (management, survey control, site safety/health, mob/demob, RA report)
- Site Preparation
- Excavation Water Pump/Treat
- Excavation
- Confirmatory Soil Sampling
- Transportation & Disposal
- Site Restorations (including wetlands restorations)

Each of these DFOWs was subject to the three phases of control, consistent with USACE guidance, including the preparatory phase, initial phase, and follow-up phase. Results of the three phases of control were documented in a series of quality control reports, which included daily QC reports, and reports of some of the individual meetings.

Three of the DFOWs above involved some chemical sampling and testing, including Excavation Water Pump/Treat, Confirmatory Soil Sampling, and Transportation & Disposal. Therefore, a Sampling and Analysis plan was developed as part of the remedial action work plan to address chemical quality assurance/quality control for these DFOWs.

4.3.2 Chemical Quality Assurance/Quality Control

The Sampling and Analysis Plan (SAP) addressed chemical data quality control for two major categories of sampling and testing, including confirmatory/investigation sampling and testing, and waste characterization sampling and testing.

Confirmatory and Investigation Sampling and Testing

A rigorous chemical quality assurance/quality control approach was implemented for the confirmatory sampling and for the investigation sampling, including blank and duplicate sampling, chain-of-custody documentation, and generation of laboratory data reports consistent with the USACE descriptions of a "definitive data package", as described in Engineer Manual 200-1-6. Katahdin Analytical Laboratories, Inc, a laboratory accredited by the US Army Corps of Engineers, was retained as contract laboratory for all confirmatory sampling and testing, and for the soil investigation sampling and testing.

The remedial contractor, and subcontractors, worked with the contract laboratory to review data packages as they were generated, and address any deviations from quality requirements of the SAP. Although some re-runs of selected samples were performed as part of the laboratory quality assurance plan, all of the final results were identified as acceptable quality for use in decision making and final documentation of the AOC57 soil remediation at Areas 2 and 3.

Waste Characterization Testing

The quality assurance/quality control approach for waste characterization sampling was developed with the primary goal of satisfying acceptance requirements for the various waste treatment or disposal facilities contracted. Laboratories used for waste characterization testing, and associated analytical procedures, were selected to be acceptable to the treatment or disposal facilities, and were not required to be accredited by the USACE. All of the selected laboratories held state and other licenses required to perform the required analyses. Laboratories used for waste characterization testing included Katahdin Analytical Laboratories, AMRO Environmental Laboratories Corporation, and Phoenix laboratories.

Field PID Screening

Field screening of soil samples for Volatile Organic Compounds (VOCs) using a properly calibrated Photoionization Detector (PID) was performed during soil excavation to assist in decision making regarding the extent of excavation and readiness for confirmatory sampling, and the segregation of uncontaminated soil overlying the zones of contaminated soils to be excavated. Although VOCs were not a contaminant of concern for soil cleanup at the site, they were identified to be a reasonable indicator of the presence of the petroleum compounds requiring cleanup. The field screening was intended to provide field approximations of contaminant levels for soil removal decisions, and not to replace the function of the confirmatory sampling program in representing conditions at the completion of remediation. Therefore, less rigorous quality control procedures were applied to the field screening activity, and field PID screening was not addressed as an analytical procedure in the Sampling and Analysis Plan. No statistical or other correlations of the field PID screening data with laboratory tests was planned or implemented, since factors including number of samples, and several sources of bias would not support a valid statistical or other interpretation.

The general approach for the field screening was consistent with the MADEP jar headspace procedures, and included use of a properly calibrated (calibrated with an IsoButylene standard and spanned to Benzene) Thermo Electron Organic Vapor Monitor equipped with a 10.2 eV lamp, field-

cleaned glass jars, and aluminum foil covers. Soil was placed in the jars to between half and three-quarters full, aluminum foil was placed over the top, the jar was agitated, and then the PID probe was inserted through the foil to allow a measurement of the headspace gas within the jar. The results were recorded in a field logbook, and immediate decisions were made based on these results to guide further excavation or preparation for confirmatory sampling. PID calibration results, completed at least once per workday, were also recorded in field logbooks.

The headspace sampling jars were not placed in a warm area and allowed to reach room temperature before obtaining the PID headspace reading as recommended in the MADEP headspace guidance. Instead, due to reasonably high ambient temperatures (45-60 degrees F) during the final removal in the fall of 2003, it was judged that the advantage of immediate results of the PID screening at the point of excavation provided more of a benefit to the quality of the excavation progress as opposed to incurring delays associated with waiting for the samples sit in a temperature-controlled environment before screening.

In most cases, PID screening results of on the order of 10 ppm or less were obtained at the final extent of excavation, before obtaining confirmatory samples and discontinuing excavation. Highest PID screening results in the most highly contaminated materials removed exceeded 100 ppm. The PID field screening methodology used to support decisions on the extent of excavation and confirmatory sampling proved to be a beneficial and prudent rough screening tool, as evidenced by the fact that 100% of the final confirmatory samples acquired in the fall 2003 Area 2 soil excavation met established cleanup levels. PID screening was also used, along with inspections, to confirm the absence of contamination in soils excavated from locations overlying the contaminated soils, which were re-used as backfill. All of the periodic PID readings of the segregated soils used for backfill were 5 ppm or lower.

PID screening results are not reported in this RA report. Although locations of individual headspace jar sample locations were recorded in the field, the data are not considered useful for purposes other than to support field decisions made during excavation.

4.3.3 Construction Quality Control Personnel

The remedial contractor assigned a Construction Quality Control Systems Manager (CQCSM) to support each phase of the remediation work. The CQCSM held primary responsibility for execution of the work to meet quality requirements, and obtained support for several aspects of the quality control including surveying and chemical quality control, from contractor in-house resources or subcontractor resources. CQCSMs assigned to the various major phases of work included:

Soil Removal – January/February 2002 – Glenn Stasiak
Soil Borings/Monitoring Well Installations 2003-2003 –Denis McGrath, alternate Mark Bouvier, (Nobis Engineering)
Soil Removal and Site Restoration, September/December 2003 – Scott R. Freeman, P.E., LSP
Petroleum Waste Recovery Operations 2002-2003 – Scott R. Freeman, P.E., LSP

CQCSMs administrated required CQC meetings, and assembled and submitted to USACE the required project documentation as the work progressed.

4.3.4 Construction Quality Control

The remedial contractor conducted construction quality control as part of the CQC plan. No formal construction testing was required for the construction quality control, due to the scope of work being a relatively simple soil removal. Therefore, construction quality control was accomplished through field inspections and measurements.

Inspections and measurements were made with regard to excavation extent and depth. Initial surveys were performed to map each of Area 2 and Area 3, to identify significant site features including wetlands limits, and to set control points for further field measurements of location and elevation. Measurements were made each workday of the extent of excavation progress, through tape measurement from known points. Elevation measurements of the completed work were made at selected intervals in order to sufficiently document the final grades.

The quality of backfill placement was controlled through inspections, and no formal compaction testing was performed. Observations were made by the CQCSM of the quality and consistency of the backfill material placement and compaction (re-used uncontaminated overburden sands, as well as imported sand backfill). Imported soil backfill materials (sand backfill and topsoil) were obtained from sources previously approved by USACE for use on sites at Devens. Submittals were made to USACE with analytical data generated by previous contractors representative of the soil, as part of the CQC program, documenting that the backfill materials were free of contamination.

5.0 Construction Activities

This section summarizes construction activities and other field work conducted to address contaminated soils at AOC57 Areas 2 and 3 in the time period following the ROD.

5.1 Contaminated Soil Removal - 2002

The original remediation scope addressed removing contaminated soil to achieve cleanup levels for lead and PCB aroclor-1260 in soil at Area 2, (600 mg/kg and 3.5 mg/kg, respectively) and EPH C11-C22 aromatic fraction at Area 3 (930 mg/kg), which were established in the ROD. The remedial contractor under contract to USACE mobilized for the soil removal work on January 23, 2002, began excavation on January 29 within initial excavation limits based on the selected remedy in the ROD for Areas 2 and 3. Area 3 was excavated to the target limits, and the planned volume of soil was removed within these limits to depths ranging from 2 to 4 feet. Some petroleum-stained soils were observed and removed during the excavation work, and confirmatory samples were obtained according to the work plan. All confirmatory samples met the ROD cleanup criterion for EPH (Table 1), and Area 3 was backfilled and the extent of removal was documented (Figure 2). Work then began at Area 2, including first addressing a small area on the far northeast side of the Area 2 planned excavation limit, with elevated lead concentrations. Initial sampling in this area did not show any elevated lead concentrations, so it was concluded that the lead results previously reported were from an isolated point, which was removed and stockpiled. After this initial area was excavated and sampled per the Work Plan, work was conducted on the remaining larger excavation area.

During soil removal work in the larger excavation at Area 2, oil sheening/globules were frequently observed on the groundwater surface in the open excavation. At the direction of the Devens BRAC, the excavation was expanded beyond the initial excavation limits to remove visible petroleum-contaminated soils. The remedial contractor deployed absorbent materials to soak up the petroleum waste sheen/globules, and stored the materials in 55-gallon drums for proper disposal. On February 13, 2002, the remedial contractor completed removal of visibly stained soils, having obtained a full set of representative post-excavation samples from the excavation sides and bottom per the work plan, submitted for chemical analysis for lead and PCB aroclor-1260. The confirmatory samples for the final excavation limits (Figure 3) exhibited concentrations of these constituents below the ROD cleanup levels (Table 2). Prior to backfilling, however, petroleum waste sheen reappeared on the water surface in the excavation (see paragraph below).

A total of 2,197 tons of contaminated soils had been removed and stockpiled from AOC57 Areas 2 and 3. Approximately 2,000 tons (1,300 cubic yards) were removed from Area 2 and the remainder from Area 3. All contaminated soils were transported off-site for treatment/recycling in a thermal desorption process at Environmental Soils Management, Inc. (ESMI) in Loudon, NH.

The last area excavated was at a location on the upgradient side of the initial excavation limits and within the footprint of the previous 1994 removal area, but at a greater depth than the 1994 removal. Up to the endpoint of the soil removal work, petroleum waste sheens and globules persisted on the water surface within the excavation. Due to these persistent petroleum waste sheens and globules on groundwater in this area, a small portion of the excavation was left open to observe and absorb/remove further sheens or globules on the groundwater surface. During backfilling, the remedial contractor also installed four 12-inch diameter corrugated metal pipe sumps (CMP sumps) with vertical slots at locations surrounding this open excavation area to aid in observing the petroleum waste sheen on the groundwater surface. Due to the persistent petroleum waste seepage, the excavation was left open, and additional remediation work was planned and implemented.

At the direction of USACE, the remedial contractor obtained a sample of the floating petroleum waste sheen in the open excavation on February 20, 2002. The separate phase petroleum waste sample was analyzed for TPH and PCBs, and results obtained were consistent with previous results during the 1994 removal action (350,000 mg/kg TPH, and 103 mg/kg total PCBs, fingerprint description as mixture of No. 2 fuel oil and motor oil). (Note that the units of mg/kg were reported by the laboratory for this waste sample, because the laboratory treats waste samples in a manner similar to soil samples as opposed to aqueous samples.)

5.2 Petroleum Waste Recovery February 2002 – August 2003

Following completion of the first phase of contaminated soil removal on February 13, 2002, the remedial contractor deployed and removed absorbent materials to mitigate the petroleum waste sheen and globules in the open excavation. As of August 2003, the open excavation was approximately 30 feet in diameter, and averages 3 to 4 feet in depth, with approximately one to two feet of standing groundwater. Due to the persistence of the petroleum waste sheen at the open excavation, at the authorization of USACE, the remedial contractor installed and operated a belt-skimmer based product recovery system at Area 2 during September – November 2002. The system was decommissioned for the winter, and then installed and operated from May 2003 through August 2003. Throughout 2003,

the open excavation water surface exhibited only isolated oil globules, and therefore the product recovery system was deployed in the two most downgradient CMP sumps. The product recovery system was alternately operated in each of the two most downgradient CMP sumps in 2003, with manual bailing performed on the sump without the skimmer. The system, in combination with manual bailing, successfully removed an estimated total of 80 gallons of petroleum waste/water mixture from operating on the open excavation water surface in 2002, and CMP sumps in 2003.

5.3 September 2002 Supplemental Soil Sampling

The Army planned, and executed through the USACE, supplemental soil sampling at Area 2 in September 2002. The purpose of this sampling was to evaluate the source and delineate the extent of petroleum waste-contaminated soil at AOC57 Area 2. The data would be used to support further decision making on additional remediation work required at Area 2, and would assist in locating monitoring wells for long term monitoring. The work was conducted under a draft Supplemental Soil Sampling Plan, dated August 2002, and results were reported in a draft technical memorandum dated 15 October 2002. The investigation delineated zones of visibly impacted subsurface soil remaining at the site, immediately surrounding and upgradient of the existing open excavation, and documented that a portion of these soils exceeded ROD cleanup levels.

5.4 Monitoring Well Installation and Soil Sampling

Between December 2002, and March 2003, remedial contractors under the oversight of the USACE completed additional investigation field work at AOC57 Area 2, including drilling twelve soil borings and installing six groundwater monitoring wells. The team mobilized a Bombardier all-terrain vehicle (ATV) drill rig equipped with 4.25-inch diameter hollow-stem augers and 2-inch split spoon samplers, to complete the installations. The work was conducted in accordance with the Work Plan Amendment for Monitoring Well Installation and Soil Sampling at Area 2, dated January 2003. Results were reported in a draft Technical Memorandum entitled "Summary of Soil Sampling and Testing Data, and Recommendations for Further Removal Action", dated April 14, 2003. Appendix A contains installation logs for the six monitoring wells installed.

Groundwater and surface water level measurements were made in these monitoring wells at surface water stations during 2003. Tables 3 and 4 present the elevation measurements. In addition, a round of groundwater samples was obtained by the remedial contractor from the six newly installed wells, according to procedures in the Work Plan Amendment. Analytes for the groundwater sampling included VOCs, EPH, and Arsenic. Low-flow sampling procedures were used. Table 5 summarizes results of the groundwater sampling and testing. The round of groundwater sampling provides a baseline data set representing conditions before the completion of the final phase soil remediation at AOC57 Area 2.

The monitoring well installation and soil sampling further reduced uncertainties regarding the extent of subsurface soils exceeding the original ROD cleanup levels at the site, and led to an identified target areas for further removal beyond the extent excavated in 2002. A contaminated layer of soils, approximately 2 to 5 feet in thickness over the identified areas (as evidenced by soil boring logs and analytical testing data) was targeted for further removal. A document titled "Work Plan Amendment for Additional Soil Removal", was prepared in May 2003 and finalized in September 2003 to address

removal of the remaining contaminated soils, including removal of water entering excavations as necessary to access contaminated soils below the water table.

5.5 Final Contaminated Soil Removal - 2003

Mobilization and Site Preparation

The USACE remedial contractor mobilized in September 2003 to execute the final removal of contaminated soil at Area 2, followed by completion of site restoration. Work was executed according to the 2003 Work Plan Amendment for Additional Soil Removal. The contractor completed equipment mobilization activities including receiving heavy equipment, one 20,000-gallon fractionation storage tank for excavation water, pumping equipment, and other support equipment and materials. Site preparation work was also completed including extensions of existing silt fence, set up of site work zones, and construction of lined stockpile areas.

Test Pit Excavations

As planned in the work plan amendment, a series of test pits was excavated to observe subsurface conditions with the intent of "bounding" the planned excavation limits. The test pit locations are shown on Figure 4. Test pits generally confirmed that contamination did not extend substantially at the test pit locations beyond the target area for excavation shown in the work plan amendment. In particular, two large and deep (20 ft. +/- depth) test pits excavated at the top of the slope area did not show any evidence of significant contamination. A bottom sample was obtained from Test Pit TP1 at this location, designated sample EB021; this sample did not exhibit any contamination when tested for the COCs. Also, two shallow test pits (4 foot depth) excavated south of the planned excavation area in backfill previously placed during the 2002 removal did not show significant contamination to extend beyond the assumed limits in a southerly direction.

Contaminated Soil Excavation and Water Management

Excavation work was then initiated at the location in the vicinity of monitoring well 57M-03-06X, on the eastern side of Area 2, where an isolated elevated PCB result was identified during the 2003 soil investigations. A recovery test on the well was performed before excavation, per the approved work plan amendment, and the well was protected during excavation. The area was excavated to the planned limits in the work plan amendment, and confirmatory samples A2-SE-SW-017 through 019, and A2-SE-EB020 were obtained (Figure 4). , These samples were obtained as grab samples biased towards the most contaminated materials, as evidenced by appearance and PID screening results. All confirmatory samples taken from this excavation area around well 57M-03-06X met the cleanup goals, and the area was subsequently backfilled.

Excavation work then began at a point midway up the slope area at Area 2, and progressed in a southerly direction towards the current open excavation area. This direction of excavation allowed management of the groundwater infiltrating into the excavation bottom from upgradient as the work progressed in a downgradient direction. The excavation work was completed in "cells" of varying dimension, which were extended to horizontal and vertical limits exhibiting the following characteristics, as specified in the work plan amendment

1. *Excavation is completed within and as required beyond the preliminary excavation limits, which correspond to locations where a layer of petroleum product impacted soils is expected to exist based on the investigations and historical data.*
2. *Excavation completed to a condition of minimal or no visibly petroleum stained soils, low PID readings, and minimal olfactory evidence of contamination. Glass jars used for the PID headspace screening will help with these observations. Since the PID is in use as a rough screening tool, no individual threshold PID reading will be used for the purpose of confirmatory sampling. However, from past data, samples with PID readings less than approximately 50 ppm did not exhibit COC concentrations exceeding action levels.*
3. *At least one "pump down" of the excavation zone proposed for confirmatory sampling has been performed, using the excavator bucket or excavation water pumping equipment to perform the pump down. This will allow observations for the presence of globules of petroleum product as the groundwater recharges into the excavation, providing further confidence that action levels will be attained.*

In order to meet the above criteria for completion of excavation and obtaining confirmatory samples, the remediation contractor excavated laterally (east and west) beyond the planned excavation limits, and to greater depths than planned. This increase in excavation extent had two impacts on the project execution, including complicating excavation water removal requirements and increasing the volume of contaminated media generated in order to attain the cleanup objectives. At the direction of the Army and USACE, the remedial contractor mobilized additional storage tanks (increased capacity to total of five 20,000 gallon tanks), and constructed additional lined stockpile areas. The remedial contractor placed all soils within the lined stockpile areas (pre-fabricated 20-mil polyethylene liners of 80 by 80 and 90 by 90 ft size). The wetter soils were allowed to drain, and the contractor operated a submersible pump in the stockpile containments to pump drained contaminated liquids to the nearby frac tanks, effectively dewatering the soils and preparing them for loadout. Stockpiles were securely covered with 10-mil thick polyethylene sheeting, anchored by sand bags.

To attain the required excavation depths and manage a reasonable amount of contaminated groundwater, the remedial contractor minimized the size of "cells" excavated, and backfilled the cells immediately following obtaining of confirmatory samples. This approach was a deviation from the work plan amendment procedures, which called for leaving excavations open until confirmatory sample results are received from the testing laboratory. This approach was necessary to allow continuation of the excavation work, as waiting for laboratory results would have made the groundwater infiltration difficult or infeasible to manage. Laboratory results were still obtained on a 48-hour rapid turnaround basis (except for EPH which was 4 days) so that areas failing to meet cleanup criteria could be addressed while equipment was mobilized. All of the confirmatory samples obtained during the progress of the work met the final cleanup levels, and therefore re-excavation of areas previously backfilled was not necessary. Excavation work progressed in a southerly direction, and further soil removal and backfilling was completed up to the final excavation limits shown on Figure 3.

Final Attainment of Cleanup Goals

Confirmatory samples were obtained to meet or exceed the required frequencies in the work plan amendment, which in many cases supercede results of confirmatory samples taken at some sidewalls and bottom locations during the 2002 removal work. Locations of confirmation samples, including 2002 and 2003 samples, are shown on Figure 4. Notes on the figure describe the types of samples (grab or composite,) and identify the symbols used. It can be observed from Figure 4 that several locations originally represented by confirmation samples from the 2002 removal have been expanded in 2003 beyond the 2002 limits. Therefore the final extent of excavation at these locations is represented by the 2003 confirmatory samples. Table 6 shows the confirmatory sample results from the 2003 removal, including a comparison to cleanup goals.

Although the work plan identified approximately 50 ppm as an approximate PID screening level where the COCs were not expected to exceed action levels, the PID readings of jar headspace samples taken from the final extent of excavation, after meeting the three criteria previously described, were on the order of 10 ppm or less in most cases. In addition, a visible change in materials, typically abrupt transition from grey stained sand to light brown sand, was noted at the majority of the final extent of excavation on the bottoms and sidewalls. Samples for PID screening, and subsequent confirmatory sample analysis were taken from the lighter brown materials in many cases.

In 2003, a total of 2,361 tons (approximately 1,500 cubic yards) of contaminated soils were removed for recycling at the ESMI facility in Loudon, NH, and a total of 94,000 gallons of contaminated groundwater were pumped, stored, and discharged to the Devens Sewer system under a temporary discharge permit. Transportation and disposal of wastes from the 2002 and 2003 removal work is summarized in Section 5.8. The 2003 soil removal successfully achieved the revised Cleanup Goals for soil at AOC57 Area 2. De-minimus remaining contamination (as evidenced by sheening on infiltrating groundwater observed at the completion of excavation in 2003 at Area 2), is consistent with, and will be addressed by, the planned remediation approach for groundwater contamination in the Long Term Monitoring Plan.

5.6 *Installation of Interceptor/Monitoring Trench*

The remedial contractor designed and installed an interceptor/monitoring trench at a location in Area 2 between the 2003 soil excavation area and the wetlands. Figure 3 shows the location of this interceptor/monitoring trench, and shows as-built elevations. The approximate depth of the trench is 4 feet below ground surface, which spans the expected vertical fluctuation of the water table at this location. The purpose of the interceptor/monitoring trench is to observe for evidence of floating petroleum waste/sheens following the completion of the source removal work. The trench can be incorporated into the Long-Term Monitoring Plan, and can also serve as a collection point for future skimming or pumping if required. Test pits excavated at the beginning of the soil removal work, and observations made during the soil removal work, served to support field decisions regarding the final trench design.

5.7 *Final Site Restoration*

The Army's contractors completed final site restoration at AOC57 Areas 2 and 3 in October, 2003. Restoration was completed according to the Work Plan and 2003 Work Plan Amendment for Additional Soil removal, including the following activities:

Uplands/Slope Area Restoration

- Grading of backfill to produce slopes consistent with surrounding, and pre-excavation grades;
- Placement of topsoil over disturbed areas on the slopes and base of slopes;
- Seeding with seed consistent with the mix specified in the Work Plan (New England Erosion Control/Restoration Mix)
- Planting of White Oak trees at approximately 20 feet on center in Areas 2 and 3;
- Placement of rip rap stone on an eroded channel on the east side of the slope at Area 2;
- Placement of stumps at the perimeter of the Area 3 restoration area;
- Placement of tree trunks from clearing activities at the top of slope at Areas 2 and 3;
- Excavation of a diversion ditch above the Area 2 slope to protect the slope from erosion;
- Re-building of protective casings on monitoring wells disturbed during remediation (57M-03-01X, and 57M-03-06X);
- Placement of boulders to protect monitoring well 57M-03-01X, at the top of the Area 2 slope; and
- Placement of hay mulch, and wood chips generated during site clearing over seeded slope areas and stockpile areas to control erosion.

Restoration within the Area 2 Wetlands Boundary

- Placement of a topsoil/peat mix rich in organic materials to a depth of approximately one foot within and up to approximately 10 feet north of the staked wetland boundary;
- Site visit by a wetland scientist retained by the remediation contractor to observe planting materials, planting areas extent and elevations, and provide guidance on the restoration work;
- Planting of 7 (seven) red maple trees;
- Seeding with the wetlands seed mix specified in the Work Plan (New England Wetmix); and,
- Installation of three staff gauges at designated locations corresponding to the surface water sampling stations previously used by USACE and regulatory agencies.

Silt fence surrounding the work areas was left in place, and should be removed following acceptable establishment of permanent vegetation in the restored wetlands and slope areas. Observations made during November 2003 showed that some of the components of the seed mixes had germinated, and that the trees planted had dropped their leaves and were dormant for the winter months.

5.8 *Waste Transportation and Disposal and Final Demobilization*

The following wastes were generated during the two phases of excavation work at Devens AOC57 Areas 2 and 3:

Wastes Generated during 2002 Removal – Areas 2 and 3

- Contaminated Soil shipped to ESMI. Loudon, NH, total of 2,197 tons, including approximately 2,000 tons from Area 2 and 197 tons from Area 3. Waste characterization testing data is contained in Appendix D. Recycling documentation is contained in appendix F.
- Fourteen (14) drums containing contaminated absorbent materials and PPE, transported to Onyx facility, TX for thermal destruction. Waste characterization testing data is contained in Appendix E. Transportation and disposal documentation is contained in Appendix G.
- One 20-cy container of contaminated plastic liner material, mixed with contaminated soil, transported for final landfill disposal at Allied Waste disposal facility, Buffalo, NY. Documentation contained in Appendix G. The contaminated soil waste characterization data was used for the waste profile for this container of solid waste.
- Solid waste container of construction wastes, hauled for disposal at a solid waste landfill in Fitchburg, MA by Waste Management, Inc.

Wastes Generated during 2003 Removal – Area 2

- Contaminated Soil shipped to ESMI. Loudon, NH, total of 2,361 tons from Area 2. Waste characterization testing data is contained in Appendix D. Recycling documentation is contained in appendix F.
- Ten (10) drums containing petroleum-contaminated absorbent materials and PPE, transported to Onyx facility, TX for thermal destruction.
- Two (2) drums containing collected petroleum-contaminated liquids (petroleum waste/water mixture) from skimming operations, partially full, estimated total of 80 gallons, transported to Onyx facility, TX for thermal destruction. Waste characterization testing data is contained in Appendix E. Transportation and disposal documentation is contained in Appendix G.
- Wastewater from excavation pumping in the 2003 soil removal, a quantity of 94,000 gallons hauled for discharge into the Devens Sewer System under a temporary discharge permit. The permit and supporting characterization data and other documentation is contained in Appendix H. Bills of Lading are contained in Appendix I.
- Solid waste container of construction wastes, including decontaminated stockpile liner and cover materials, hauled for disposal at a solid waste landfill in Fitchburg, MA by Waste Management, Inc.

Summary of Waste Quantities

Contaminated Soil Recycled at ESMI facility, Loudon, NH:

Area 2 – 4,361 tons, or approximately 2,800 cubic yards
Area 3 – 197 tons, or approximately 120 cubic yards

Drums containing contaminated absorbent materials and PPE, transported to Onyx facility, TX for thermal destruction: Total of twenty four (24) 55-gallon drums.

Drums containing collected petroleum-contaminated liquids (petroleum waste/water mixture) from skimming operations, two 55-gallon partially full drums, estimated total of 80 gallons.

One 20-cy container of plastic liner co-mingled with contaminated soils.

Two 30-cy trash containers of construction wastes and decontaminated liner/cover materials.

Contaminated Excavation Water, total volume of 94,000 gallons, was hauled from the frac tanks for discharge to the Devens Sewer System.under a temporary discharge permit. An additional approximately 200 gallons of solids/liquids from the tank bottoms was removed and disposed during final tank cleanout.

Final Equipment Decontamination/Demobilization

The remedial contractor performed final decontamination and removal of equipment and supplies from the AOC57 site during December 2003. Final punch list items were addressed as described in Section 7.0. The on-site storage container was cleaned out and demobilized, along with temporary sanitary facilities. The five 20,000 gallon capacity fractionation storage tanks were decontaminated and PCB wipe samples were obtained and tested to document the successful decontamination effort (Appendix J). The supplier removed these tanks on January 14, 2004. Remaining wastes and materials were removed, including a final load of drummed materials during February 2004.

6.0 Summary of Documents Generated

Below is a list of documents generated during the completion of remedial action for contaminated soils at AOC57 Areas 2 and 3, after the signing of the ROD:

- Statement of Work, prepared by US Army Corps of Engineers, New England District, October 2001;
- Remedial Action Work Plan, prepared by Conti Environmental, Inc., January 2002
- Remedial Action Work Plan – Response Summary to Regulatory Comments, prepared by Conti Environmental, Inc., January 2002
- Technical Memorandum – "Oil Seepage Area", Area of Contamination 57, prepared by Conti Environmental, Inc., 10 April 2002
- Work Plan Amendment, Supplemental Soil Sampling, prepared by Conti Environmental, Inc., August 2002
- Technical Memorandum, "Supplemental Soil Sampling and Source Delineation", prepared by Conti Environmental, Inc.,15 October 2002

- Responses to Regulatory Comments, Draft Technical Memorandum, Supplemental Soil Sampling and Source Delineation, prepared by Conti Environmental, Inc.,15 January 2003.
- Work Plan Amendment for Monitoring Well Installation and Soil Sampling at Area 2, prepared by Conti Environmental, Inc., January 2003
- Responses to Regulatory Comments, Draft Work Plan Amendment, Monitoring Well Installation and Soil Sampling at Area 2, Area of Contamination 57, prepared by Conti Environmental, Inc.,15 January 2003
- Technical Memorandum "Summary of Soil Sampling and Testing Data, and Recommendations for Further Removal Action", prepared by Conti Environmental, Inc., dated April 14, 2003.
- Technical Memorandum, "Summary of Groundwater Sampling and Testing Data", prepared by Conti Environmental, Inc., 13 May 2003
- EPA Conditional Approval letter for Explanation of Significant Differences, 4 March 2004
- Final Explanation of Significant Differences, 10 March 2004
- Responses to Regulatory Comments, Draft Work Plan Amendment, Additional Soil Removal, prepared by Conti Environmental, Inc., 29 August 2003
- Work Plan Amendment for Additional Soil Removal, prepared by Conti Environmental, Inc., draft in May 2003 and finalized in September 2003

7.0 Final Inspection

As part of the CQC process, the remedial contractor, together with the Corps of Engineers, prepared a punch list for completion of the soil remediation and site restoration work in November 2003. Punch list items were completed by January 23, 2004, with the final removal of the drummed wastes.

Punch list items addressed in December 2004 included:

- Installation of three staff gauges.
- Post-excavation recovery test of well 57M-03-06X (Appendix A contains results).
- Repairs to well protective casings on well 57M-03-06X, and 57M-03-01X.
- Installation of covers on the CMP sumps.
- Installation of barricades to protect well 57M-03-01X.
- Spreading of hay mulch on disturbed stockpile areas.
- Placement of rip-rap stone on the Area 2 slope to provide additional erosion control.
- Final removal of wastes, including a trash container and drummed materials.
- Decontamination and demobilization of five fractionation tanks.
- Demobilization of remaining equipment.

A final walk-through inspection was conducted at AOC57 Areas 2 and 3 on July 8, 2004. The following individuals were present at the walk-through inspection:

Takashi Taka – Devens BRAC
Carol Keating – USEPA
Jim Murphy – USEPA
David Salvadore – MADEP
Brian Duval - MADEP
Ron Ostrowski – Mass Development
Ellen Iorio – USACE
John McDowell - USACE
Stan Reed – MACTEC

No deficiencies were noted during the site inspection, and no follow-up actions were required.

8.0 Summary of Project Costs

As documented in the ROD, the original remedy for soils remediation at AOC 57 Areas 2 and 3 had an estimated total capital construction cost of $ 429,344, including $ 80,699 for Area 3, and $ 348,645 for Area 2.

The final remedy for soils remediation, at Areas 2 and 3 combined, completed following execution of the ROD, has a projected at-completion total cost of $ 1,074,213. This cost includes costs of the soil and removal work, disposal of all liquid and solid wastes generated, closeout reports, and also some groundwater well installations, which may become part of the long-term monitoring network.

The increase in costs can be attributed to the increased total volume of soil to be remediated, related additional delineation work, and the need for increased recovery of floating petroleum waste.

9.0 Contact Information

The following individuals are contacts for the remediation work at AOC57

Benjamin Goff, BRAC Environmental Coordinator, 978-796-2205
BRAC Environmental Office
Building 666
30 Quebec Street
Devens, MA 01432

Carol Keating, USEPA Remedial Project Manager, 617-918-1393
United States Environmental Protection Agency
One Congress Street, Suite 1100
Boston, MA 02114-2023

Lynne Welsh, MADEP Representative, 978-792-7653
MADEP Central Regional Office
627 Main Street
Worcester, MA 01605

The Site Administrative Record is available to the public at the EPA Records Center and at the following additional locations.

US Environmental Protection Agency	Hours: M-F	10:00 am - 1:00 pm
Records Center	and	2:00 pm - 5:00 pm
One Congress Street		
Boston, MA 02114		
(617) 918-1440		

BRAC Environmental Office
Building 666
30 Quebec Street
Devens, MA 01432

Hazen Memorial Library
3 Perimeter Road
Shirley, MA 01464

Harvard Public Library
Fairbanks Street
Harvard, MA 01461

Ayer Public Library
26 E. Main Street
Ayer, MA 01432

Lancaster Public Library
Main Street
Lancaster, MA 01523

TABLES

DEVENS AOC 57 - 2002 Removal Confirmatory Samples - Area 3

SAMPLE	EPH C11-C22 Aromatics
	mg/kg dry weight
Cleanup Goal (ROD)	980
Excavation Bottom	
A3-SE-EB001-3-0	19
A3-SE-EB002-4-0	25
A3-SE-EB003-3-0	20
Sidewall Samples	
A3-SE-SW001-2-0	20
A3-SE-SW002-2-0	17
A3-SE-SW003-3-0	80
A3-SE-SW004-3-0	35
A3-SE-SW005-2-0	23
A3-SE-SW005-2-1	22
A3-SE-SW006-2-0	17

NOTE: In all samples, the following nomenclature applies:

A2 = Area 2 Sample
SE = Excavation Confirmatory Soil Sample
EB001 = Excavation Bottom Sample and number for location
SW008 = Sidewall Sample and number for location
the last two numbers refer to the sample depth to the nearest foot, and the subsample number as applicable (the last number was used for duplicate samples)

A2-SE- EB-011-3-0 would be an Excavation Bottom Soil Sample from Area 2, location # 011, depth of 3 feet

TABLE 1

DEVENS AOC 57 - 2002 Removal Confirmatory Samples - Area 2

SAMPLE	Total Lead	PCB-1260	COMMENTS
	mg/kg dry weight	ug/kg dry weight	
Cleanup Goal (ROD)	600	3500	
Excavation Bottom			
A2-SE-EB001-6-0	6.3	–	
A2-SE-EB002-4-0	21	330	
A2-SE-EB003-5-0	23	<23	
A2-SE-EB004-4-0	20	<20	
A2-SE-EB005-4-0	22	<22	
A2-SE-EB006-4-0	23	<23	
A2-SE-EB006-4-1	22	<22	
A2-SE-EB007-4-0	21	110	
A2-SE-EB008-4-0	22	280	
A2-SE-EB009-4-0	21	48	
A2-SE-EB010-8-0	22	<22	
A2-SE-EB011-3-0	20	**4300**	Exceeded cleanup goal, and therefore this area was re-excavated.
A2-SE-EB012-4-0	22	2500	
A2-SE-EB013-3-0	20	1900	
A2-SE-EB013-3-1	20	2400	
A2-SE-EB014-3-0	21	1200	
A2-SE-EB015-5-0	21	2000	Sample taken after additional 2' excavation at EB011 sample location.
Sidewall Samples			
A2-SE-SW001-5-0	5	–	
A2-SE-SW002-5-0	6.4	–	
A2-SE-SW003-5-0	4.6	–	
A2-SE-SW004-5-0	3.7	–	
A2-SE-SW004-5-1	4.1	–	
A2-SE-SW005-3-0	20	1600	
A2-SE-SW005-3-1	20	1200	
A2-SE-SW006-3-0	21	<21	
A2-SE-SW007-4-0	20	2700	
A2-SE-SW008-3-0	21	<21	
A2-SE-SW009-3-0	21	590	
A2-SE-SW010-3-0	21	38	
A2-SE-SW011-3-0	20	2100	
A2-SE-SW012-3-0	22	970	
A2-SE-SW013-3-0	22	<22	
A2-SE-SW014-7-0	21	320	
A2-SE-SW015-3-0	25	1500	
A2-SE-SW016-2-0	20	550	

NOTE: In all samples, the following nomenclature applies:

A2 = Area 2 Sample
SE = Excavation Confirmatory Soil Sample
EB001 = Excavation Bottom Sample and number for location
SW008 = Sidewall Sample and number for location
the last two numbers refer to the sample depth to the nearest foot, and the subsample number as applicable
(the last number was used for duplicate samples)

A2-SE- EB-011-3-0 would be an Excavation Bottom Soil Sample from Area 2, location # 011, depth of 3 feet

– indicates sample not tested for this parameter
bold indicates sample exceeded cleanup level

TABLE 2

Summary of Groundwater Elevations

Former Fort Devens AOC 57

Devens, Massachusetts

Well ID	Wellhead Elevation	Date Gauged	Depth to Product	Product Thickness	Depth to Water	Water Elevation
57M-03-01X	237.9	3/11/2003	NP	--	14.69	223.21
Overburden well		4/2/2003	NP	--	14.32	223.58
Screenlength = 10'		7/29/2003	NP	--	14.79	223.11
Total Depth = 20'						
57M-03-02X	227.1	3/11/2003	NP	--	5.26	221.84
		4/2/2003	NP	--	5.03	222.07
Overburden well		7/29/2003	NP	--	5.51	221.59
Screenlength = 10'						
Total Depth = 12'						
57M-03-03X	223.64	3/11/2003	NP	--	2.51	221.13
		4/2/2003	NP	--	2.34	221.30
Overburden well		7/29/2003	NP	--	0.27	223.37
Screenlength = 10'						
Total Depth = 12'						
57M-03-04X	224.02	3/11/2003	NP	--	2.91	221.11
		4/2/2003	NP	--	2.71	221.31
Overburden well		7/29/2003	NP	--	2.5	221.52
Screenlength = 10'						
Total Depth = 12'						
57M-03-05X	224.33	3/11/2003	NP	--	2.74	221.59
		4/2/2003	NP	--	2.59	221.74
Overburden well		7/29/2003	NP	--	2.8	221.53
Screenlength = 10'						
Total Depth = 12'						
57M-03-06X	224.56	3/11/2003	NP	--	2.91	221.65
		4/2/2003	NP	--	2.76	221.80
Overburden well		7/29/2003	NP	--	2.99	221.57
Screenlength = 10'						
Total Depth = 12'						

Well ID	Wellhead Elevation	Date Gauged	Depth to Product	Product Thickness	Depth to Water	Water Elevation
North Sump	225.07	7/29/2003	NP	--	3.01	222.06
Overburden recovery well						
Screenlength =						
Total Depth =						
Far West Sump	225.10	7/29/2003	Sheen Noted	--	3.92	221.18
Overburden recovery well						
Screenlength =						
Total Depth =						
West Sump	224.18	7/29/2003	2.51	0.04	2.55	221.63
Overburden recovery well						
Screenlength =						
Total Depth =						
East Sump	223.33	7/29/2003	2.6	0.02	2.62	220.71
Overburden recovery well						
Screenlength =						
Total Depth =						

Notes:
Groundwater depths are recorded in feet below wellhead or top of sump
Groundwater elevations are recorded in feet MSL.
Reference Elevation: Top PVC Casing, well 57M-95-06X, Harding-Lawson Assoc. RI Report 2000
NP = No product detected
-- = Not able to be calculated

TABLE 3

Summary of Surface Water Elevations
Devens AOC 57

Monitoring Location	Date Gauged	Water Elevation
Wetland West	3/11/2003	223.50
SW-1 Sample Station	4/2/2003	220.04
	7/29/2003	220.02
New Staff Gauge Installed -->	12/12/2003	221.11
Wetland Middle	3/11/2003	223.47
SW-2 Sample Station	4/2/2003	220.01
	7/29/2003	220.04
New Staff Gauge Installed -->	12/12/2003	221.20
Wetland East	3/11/2003	223.31
SW-3 Sample Station	4/2/2003	219.74
	7/29/2003	220.12
New Staff Gauge Installed -->	12/12/2003	220.67
Open Excavation	3/11/2003	225.33 (top of ice)
	4/2/2003	221.70
	7/29/2003	221.61
Surface Water by 57M-03-03X	7/29/2003	221.43

Elevations are in Ft. MSL
Reference Elevation: Top PVC Casing, well 57M-95-06X, Harding-Lawson Assoc. RI Report 2000

All Staff Gauges calibrated to zero reading on gauge = 220 ft. MSL

Summary of Groundwater Sample Results
Samples Collected on April 2, 3, 2003

AOC57 AREA 2
Barnum Road, Devens, Ma

Sample ID	57M-03-01X	57M-03-02X	57M-03-03X	57M-03-04X	57M-03-05X	57M-03-06X	Duplicate	PRELIMINARY REMEDIATION GOALS[1]	MAXIMUM CONTAMINANT LEVELS
Date	4/2/2003	4/2/2003	4/3/2003	4/3/2003	4/3/2003	4/3/2003	4/3/2003	Groundwater (ug/L)	Groundwater (ug/L)
VOCs (ug/L)									
Toluene	0.2 JB	4J	1J	15	10	0.2J	0.2JB	NL	1,000
Trichlorofluoromethane	<10	<10	<10	<10	<10	2J	2J	NL	NL
Benzene	<5	<5	<5	1J	<5	<5	<5	NL	5
Tetrachloroethene	3J	**6**	**8**	3J	2J	2J	<5	5	5
Chlorobenzene	<5	<5	<5	3J	<5	<5	<5	NL	100
Ethylbenzene	0.2J	0.4JB	1JB	4JB	12B	0.3JB	0.1J	NL	700
Xylenes	0.3JB	1JB	7J	2J	6JB	0.4JB	0.2JB	NL	10,000
Chloromethane	<10	0.3JB	<10	<10	<10	<10	<10	NL	NL
cis-1,2-Dichloroethene	<5	3J	35	4J	**140**	<5	<5	NL	70
trans-1,2-Dichloroethene	<5	<5	0.9J	<5	1J	<5	<5	NL	100
Trichloroethene	<5	**6**	3J	3J	2J	<5	<5	NL	5
1,2,4-Trimethylbenzene	<5	0.3J	12	20	35	0.6J	<5	NL	NL
1,3,5-Trimethylbenzene	<5	<5	2J	6	3J	0.2J	<5	NL	NL
sec-Butylbenzene	<5	<5	1J	<5	2J	<5	<5	NL	NL
N-Propylbenzene	<5	<5	<5	2JB	4JB	0.2JB	0.1J	NL	NL
P-Isopropyltoluene	<5	<5	1J	<5	4J	<5	<5	NL	NL
N-Butylbenzene	<5	<5	0.6J	<5	2J	<5	<5	NL	NL
tert-Butylbenzene	<5	<5	<5	1J	1J	<5	<5	NL	NL
Naphthalene	<5	0.9JB	0.6JB	2JB	3JB	2JB	<5	NL	NL
1,2,4-Trichlorobenzene	<5	<5	<5	3J	3J	3J	<5	NL	70
1,2,3-Tichlorobenzene	<5	<5	<5	4J	4J	4J	<5	NL	NL
1,3,5-Trichlorobenzene	<5	<5	<5	<5	0.4J	<5	<5	NL	NL
1,4-Dichlorobenzene	<5	<5	<5	6	<5	<5	<5	NL	75
Vinyl chloride	<10	<10	**10**	<5	**15**	<5	<5	NL	2
Bromobenzene	<5	<5	<5	<5	<5	0.3JB	<5	NL	NL
2-Chlorotoluene	<5	<5	<5	<5	<5	0.2JB	<5	NL	NL
4-Chlorotoluene	<5	<5	<5	<5	<5	0.3JB	<5	NL	NL
Isopropylbenzene	<5	<5	0.8J	2J	2J	<5	<5	NL	NL
Acetone	<10	<10	<5	<10	4J	<10	<10	NL	NL
EPH (ug/L)								NL	NL
C11-C22 Aromatics	<160	<160	<160	<160	170*	<160	<160	NL	NL
Arsenic (ug/L)	<5	<5	<5	**57**	14	<5	<5	50	50

Notes:
1 = Record of Decision Table 8, September 2001.
* indicates that the sample result was obtained on a re-extraction of the sample. The initial extraction recorded low surrogate recovery, and required re-extraction. That sample recorded a result of <160 ug/L.
All results reported in micrograms per liter (ug/L).
Bold indicates an exceedance of the PRG or MCL values.
J indicates an estimated value. The analyte was detected in the sample at a concentration less than the laboratory Practical Quantitation Limit, but above the Method Detection Limit.
JB indicates that the analyte was detected in the laboratory method blank analyzed concurrently with the sample.
< X.X is laboratory detection limit.
VOC is volatile organic compound
EPH is extractable petroleum hydrocarbon

TABLE 5

DEVENS AOC 57 - 2003 Removal Confirmatory Samples - Area 2

Conti Environmental, Inc.

SAMPLE	EPH C11-C22 Aromatics	Total Lead	PCB-1260
	mg/kg dry weight	mg/kg dry weight	ug/kg dry weight
Cleanup Goal (ROD/ESD)	200	600	3500 (= 3.5 mg/kg)
Excavation Bottom			
A2-SE-EB020-3-0	BQL (19)	4.3	BQL (20)
A2-SE-EB021-13-0	BQL (21)	2.5	BQL (74)
A2-SE-EB024-13-0	BQL (22)	2.6	BQL (23)
A2-SE-EB026-13-0	BQL (20)	2.2	BQL (22)
A2-SE-EB028-8-0	BQL (21)	3.1	BQL (22)
A2-SE-EB031-8-0	BQL (21)	2.7	BQL (23)
A2-SE-EB034-6-0	BQL (20)	4.2	J 16 (estimated)
A2-SE-EB035-5-0	79	3.3	BQL (22)
A2-SE-EB037-6-0	BQL (21)	2.5	BQL (23)
A2-SE-EB039-8-0	BQL (20)	2.8	BQL (21)
Sidewall Samples			
A2-SE-SW017-1-0	BQL (22)	8.5	BQL (24)
A2-SE-SW017-1-1	BQL (23)	9.3	BQL (24)
A2-SE-SW018-1-0	BQL (24)	9.5	BQL (25)
A2-SE-SW019-1-0	BQL (21)	4.2	BQL (23)
A2-SE-SW022-12-0	BQL (20)	3.0	BQL (84)
A2-SE-SW023-10-0	BQL (20)	2.8	BQL (86)
A2-SE-SW025-13-0	BQL (21)	2.4	BQL (67)
A2-SE-SW027-8-0	BQL (20)	2.4	BQL (21)
A2-SE-SW029-5-0	BQL (19)	3.5	BQL (21)
A2-SE-SW030-6-0	BQL (20)	3.8	BQL (21)
A2-SE-SW032-4-0	BQL (19)	3.9	BQL (21)
A2-SE-SW032-4-1	BQL (20)	5.2	BQL (21)
A2-SE-SW033-5-0	100	4.8	110
A2-SE-SW036-4-0	BQL (20)	3.4	BQL (21)
A2-SE-SW038-5-0	120	3.4	BQL (21)

NOTE: In all samples, the following nomenclature applies:

A2 = Area 2 Sample
SE = Excavation Confirmatory Soil Sample
EB001 = Excavation Bottom Sample and number for location
SW008 = Sidewall Sample and number for location
the last two numbers refer to the sample depth to the nearest foot, and the subsample number as applicable
(the last number was used for duplicate samples)

A2-SE- EB-011-3-0 would be an Excavation Bottom Soil Sample from Area 2, location # 011, depth of 3 feet

BQL indicates that the compound was detected at or below the Practical Quantitation Limit (PQL), and this number is equal to the PQL for that sample and run.

TABLE 6

FIGURES

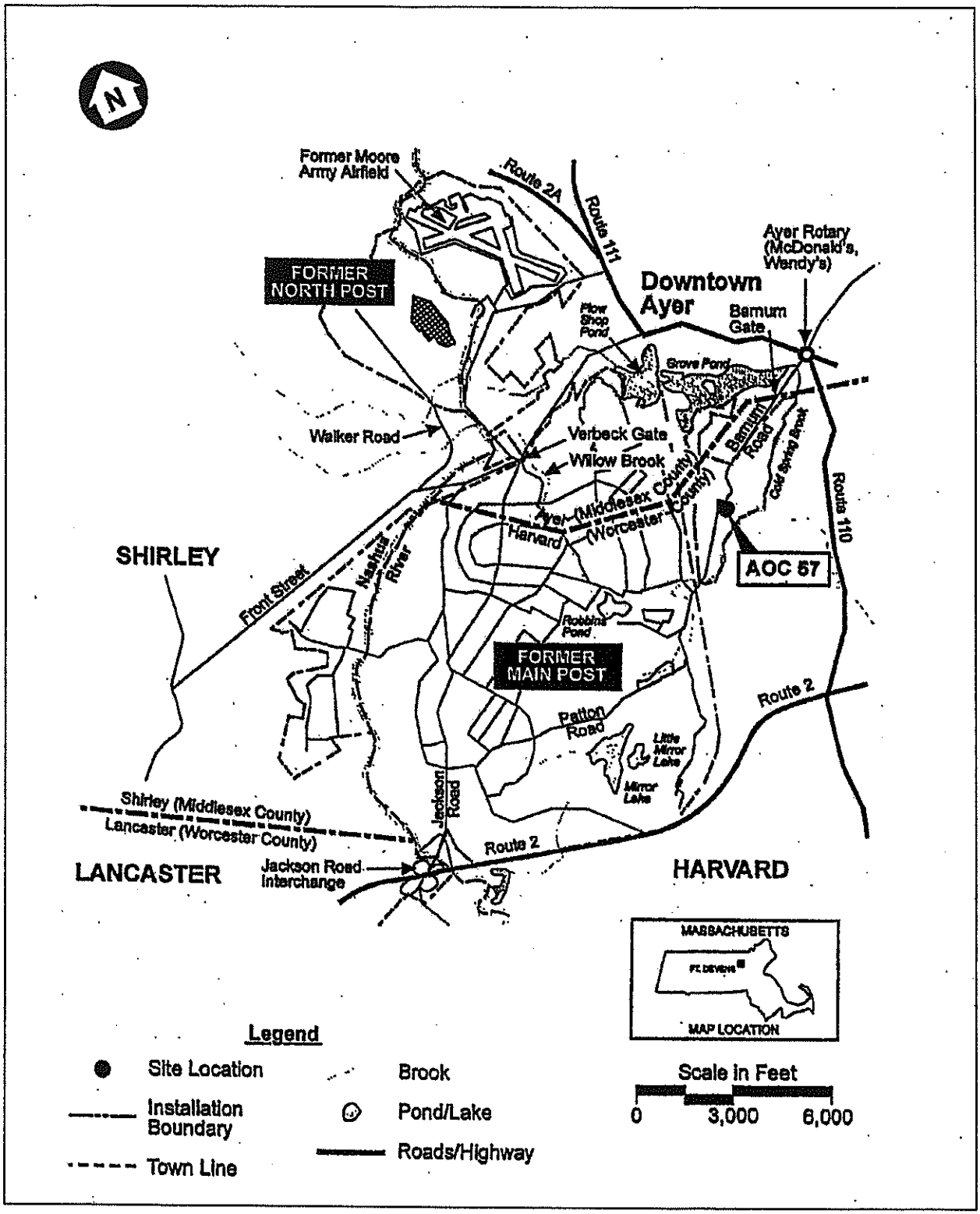
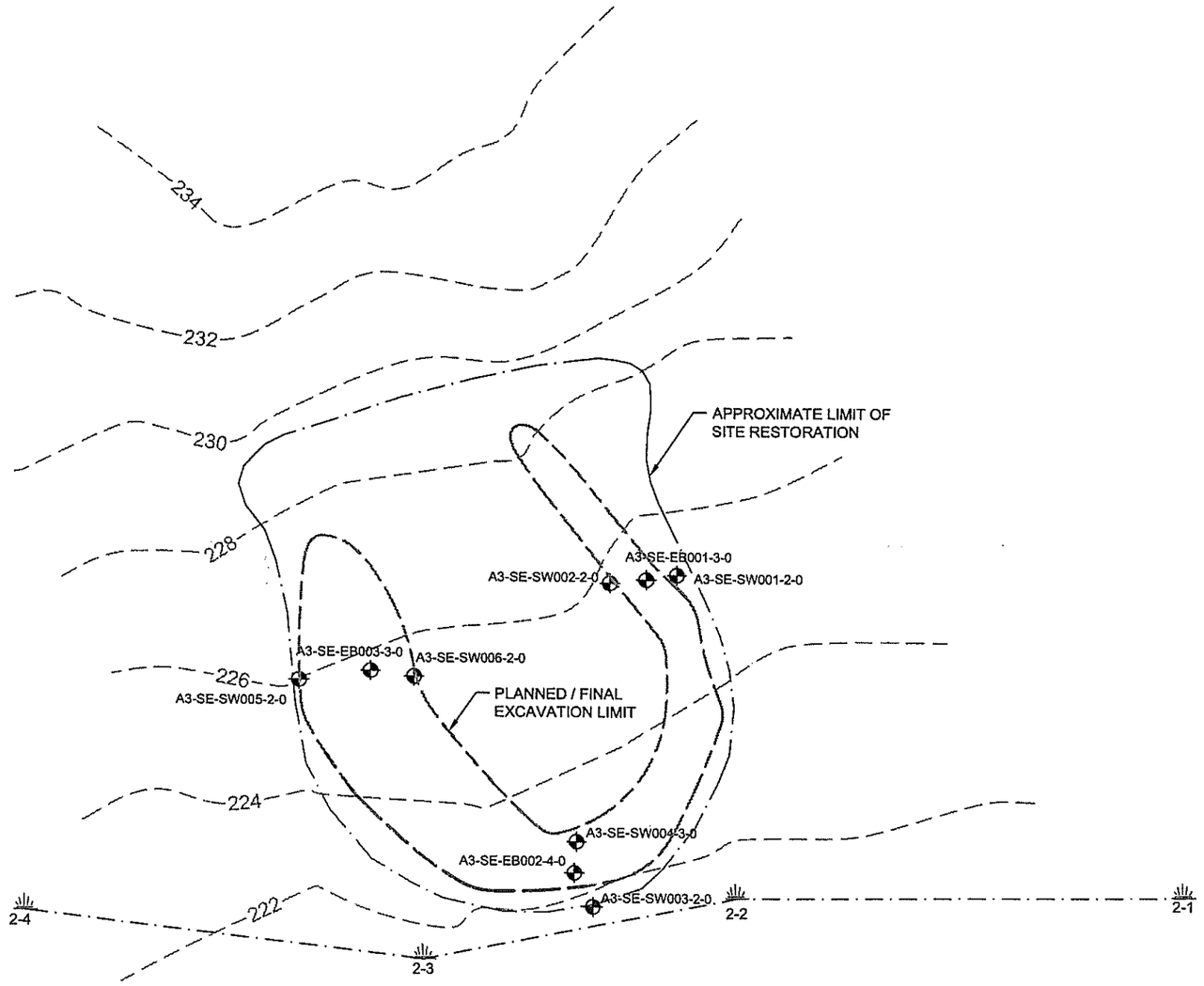


FIGURE 1
AOC57 Site Location

Interim Remedial Action Completion Report
DACW33-01-D-0003 TO 0002



LEGEND

	APPROXIMATE DEPTH OF EXCAVATION FROM ORIGINAL GRADE (FT) (2002 & 2003)
1-1	WETLAND FLAG ID
228	SURFACE CONTOURS (PRE-EXCAVATION)
	LIMIT OF FLAGGED WETLANDS
A3-SE-SW001-2-0	CONFIRMATION SAMPLE LOCATION

APPROXIMATE SCALE

20' 10' 0' 10' 20' 40'

NOTES

1. THIS DRAWING WAS DEVELOPED FROM A SITE PLAN COMPLETED BY HOWE SURVEYING ASSOCIATES, Inc. AND FIELD MEASUREMENTS PERFORMED BY CONTI ENVIRONMENTAL, Inc.

Prepared for:

US Army Corps of Engineers New England
696 Virginia Road
Concord, MA 01742

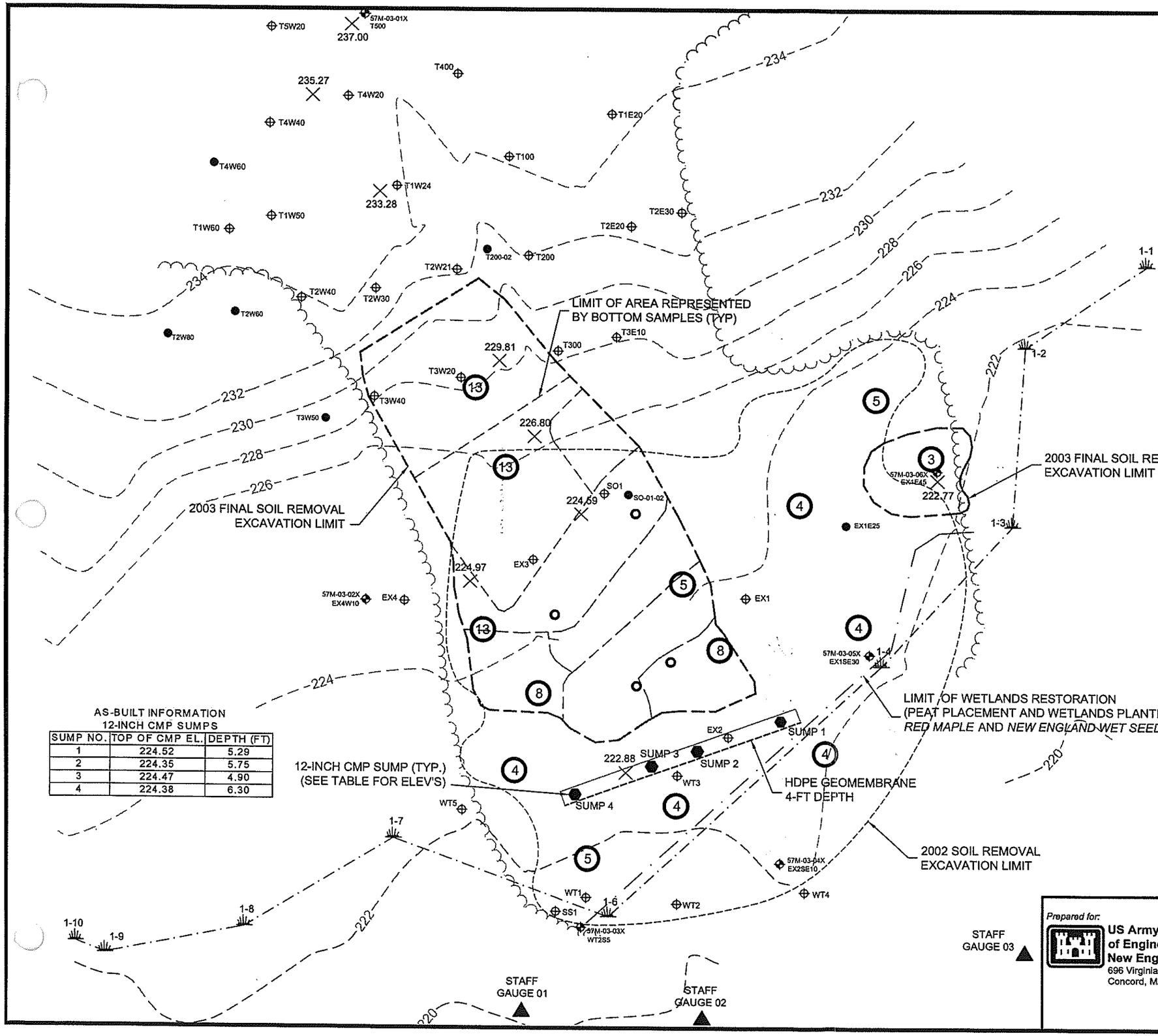
Prepared by:

Conti Environmental & Infrastructure
One Concord Farms
490 Virginia Road
Concord, MA 01742
978.318.9095
Fax: 978.318.9055

FIGURE 2

FINAL EXCAVATION LIMITS AND LOCATIONS OF CONFIRMATORY SAMPLES
A.O.C. #57 AREA 3
BARNUM ROAD
DEVENS, MASSACHUSETTS

PROJECT NO. 01029 | JANUARY 2004



LEGEND

- 235.27 — SPOT ELEVATION (FINAL GRADE DEC 2003)
- FINAL EXCAVATION LIMIT (2003)
- 13 — APPROXIMATE DEPTH OF EXCAVATION FROM ORIGINAL GRADE (FT) (2002 & 2003)
- WETLAND STAFF GAUGE INSTALLED DEC. 2003 (ZERO=220 FT. MSL)
- 12-INCH CMP SUMP INSTALLED DEC 2003
- TREE LINE
- WT3 — GEOPROBE BORING LOCATION
- 12-In. CORRUGATED METAL PIPE SUMP
- 1-1 — WETLAND FLAG ID
- 228 — SURFACE CONTOURS (PRE-EXCAVATION)
- SO-01-02 — GEOPROBE/HOLLOW STEM AUGER SOIL BORING
- 57M-03-06X EX1E45 — NEW MONITORING WELL
  MONITORING WELL No. IS 57M-XX-XXX
  SOIL BORING No. EX1E45
- LIMIT OF CONTI EXCAVATION (2002)
- LIMIT OF FLAGGED WETLANDS

APPROXIMATE SCALE

20' 10' 0' 10' 20' 40'

NOTES

1. THIS SITE PLAN WAS DEVELOPED FROM A SITE PLAN COMPLETED BY HOWE SURVEYING ASSOCIATES, Inc. AND A SURVEY PERFORMED BY CONTI ENVIRONMENTAL, Inc.
2. CONTI ENVIRONMENTAL Inc. TAPE-MEASURED THE GEOPROBE EXPLORATION LOCATIONS, SUMP LOCATIONS, AND APPROXIMATE EXISTING OPEN EXCAVATION, USING ESTABLISHED WETLAND FLAG LOCATIONS 1-7 AND 1-2 AS BASE POINTS.
3. SPOT AS-BUILT ELEVATIONS AND STAFF GAUGES SURVEYED BY CONTI DECEMBER 2003 (ELEVATIONS IN FT MSL).

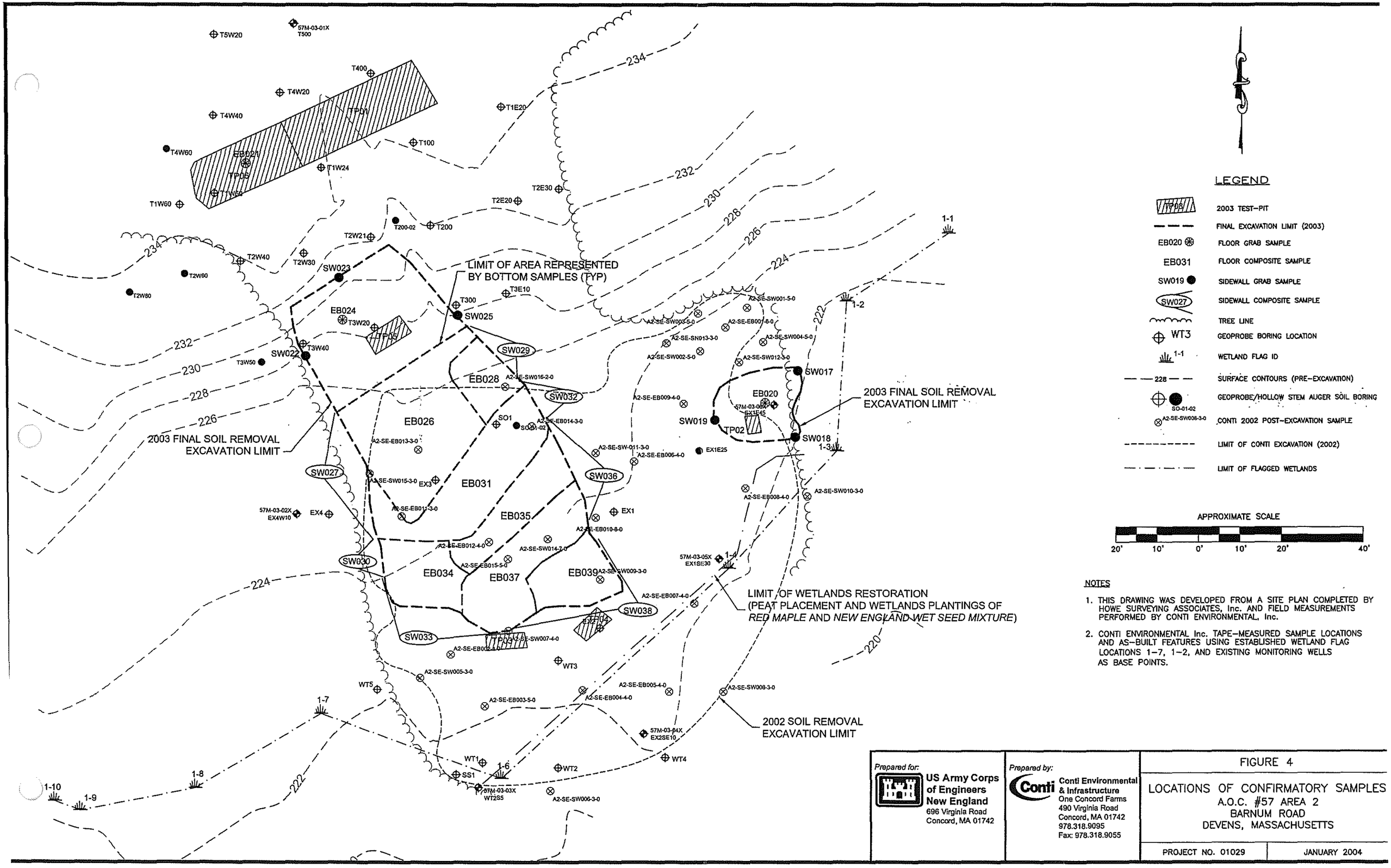
Prepared for:
US Army Corps of Engineers
New England
696 Virginia Road
Concord, MA 01742

Prepared by:
Conti Environmental & Infrastructure
One Concord Farms
490 Virginia Road
Concord, MA 01742
978.318.9095
Fax: 978.318.9055

FIGURE 3

FINAL EXCAVATION LIMITS AND SITE RESTORATION
A.O.C. #57 AREA 2
BARNUM ROAD
DEVENS, MASSACHUSETTS

PROJECT NO. 01029 | JANUARY 2004



LEGEND

- 2003 TEST–PIT
- FINAL EXCAVATION LIMIT (2003)
- EB020 — FLOOR GRAB SAMPLE
- EB031 — FLOOR COMPOSITE SAMPLE
- SW019 — SIDEWALL GRAB SAMPLE
- SW027 — SIDEWALL COMPOSITE SAMPLE
- TREE LINE
- WT3 — GEOPROBE BORING LOCATION
- 1-1 — WETLAND FLAG ID
- 228 — SURFACE CONTOURS (PRE–EXCAVATION)
- SO-01-02 — GEOPROBE/HOLLOW STEM AUGER SOIL BORING
- A2-SE-SW008-3-0 — CONTI 2002 POST–EXCAVATION SAMPLE
- LIMIT OF CONTI EXCAVATION (2002)
- LIMIT OF FLAGGED WETLANDS

APPROXIMATE SCALE

20' 10' 0' 10' 20' 40'

NOTES

1. THIS DRAWING WAS DEVELOPED FROM A SITE PLAN COMPLETED BY HOWE SURVEYING ASSOCIATES, Inc. AND FIELD MEASUREMENTS PERFORMED BY CONTI ENVIRONMENTAL, Inc.
2. CONTI ENVIRONMENTAL Inc. TAPE–MEASURED SAMPLE LOCATIONS AND AS–BUILT FEATURES USING ESTABLISHED WETLAND FLAG LOCATIONS 1–7, 1–2, AND EXISTING MONITORING WELLS AS BASE POINTS.

Prepared for:
US Army Corps of Engineers New England
696 Virginia Road
Concord, MA 01742

Prepared by:
Conti Environmental & Infrastructure
One Concord Farms
490 Virginia Road
Concord, MA 01742
978.318.9095
Fax: 978.318.9055

FIGURE 4

LOCATIONS OF CONFIRMATORY SAMPLES
A.O.C. #57 AREA 2
BARNUM ROAD
DEVENS, MASSACHUSETTS

PROJECT NO. 01029 | JANUARY 2004