5172

RECORD OF DECISION
AREA OF CONTAMINATION A4
AND AREAS OF CONTAMINATION A7 AND A9
MANAGEMENT OF MIGRATION OPERABLE UNITS
U.S. ARMY SUDBURY ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

SEPTEMBER 1997

RECORD OF DECISION
AREA OF CONTAMINATION A4
AND AREAS OF CONTAMINATION A7 AND A9
MANAGEMENT OF MIGRATION OPERABLE UNITS
U.S. ARMY SUDBURY ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

TABLE OF CONTENTS

RECORD OF DECISION
AREA OF CONTAMINATION A4
AND AREAS OF CONTAMINATION A7 AND A9
MANAGEMENT OF MIGRATION OPERABLE UNITS
U.S. ARMY SUDBURY ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

TABLE OF CONTENTS
(continued)

APPENDICES

RECORD OF DECISION
AREA OF CONTAMINATION A4
AND AREAS OF CONTAMINATION A7 AND A9
MANAGEMENT OF MIGRATION OPERABLE UNITS
U.S. ARMY SUDBURY ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

LIST OF FIGURES

RECORD OF DECISION
AREA OF CONTAMINATION A4
AND AREAS OF CONTAMINATION A7 AND A9
MANAGEMENT OF MIGRATION OPERABLE UNITS
U.S. ARMY SUDBURY ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

LIST OF TABLES

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Areas of Contamination A4, A7, and A9
U.S. Army Sudbury Annex
Middlesex County, Massachusetts

STATEMENT OF PURPOSE AND BASIS

This decision document presents the U.S. Army's selected remedial action decision for Area of Contamination (AOC) A4 - Waste Dump and the Management of Migration Operable Units (OUs) at AOCs A7-Old Gravel Pit Landfill and A9-POL Burn Area, at the U.S. Army Sudbury Annex, Middlesex County, Massachusetts. It was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended, 42 USC §§ 9601 et seq. and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as amended, 40 CFR Part 300, to the extent practicable. The Sudbury Annex Base Realignment and Closure (BRAC) Environmental Coordinator; the Devens Reserve Forces Training Area (RFTA) Installation Commander; and the Director of the Office of Site Remediation and Restoration, U.S. Environmental Protection Agency (USEPA) New England have been delegated the authority to approve this Record of Decision.

This decision document is based on the Administrative Record that has been developed in accordance with Section 113(k) of CERCLA. The Administrative Record is available for public review at the Devens BRAC Environmental Office, Building 666, Devens RFTA, Massachusetts, and at the Sudbury, Massachusetts Town Hall. The Administrative Record Index (Appendix D of this Record of Decision) identifies each of the items considered during selection of the remedial action.

DESCRIPTION OF THE SELECTED REMEDY

The U.S. Army and USEPA, with concurrence of the Massachusetts Department of Environmental Protection (MADEP), have determined that no action is necessary to ensure protection of human health and the environment at AOC A4 and the Management of Migration OUs at AOCs A7 and A9. Therefore, the Army's selected remedy is No Action Under CERCLA. At AOCs A7 and A9, previous removal and containment actions have eliminated underground storage tanks and removed or contained contaminated media which would otherwise be a continuing source of groundwater contamination.

DECLARATION

The U.S. Army and the USEPA, with concurrence of the MADEP, have determined that No Action Under CERCLA is necessary for protection of human health and the environment at AOC A4 and the Management of Migration OUs at AOCs A7 and A9. The selected remedy is consistent with CERCLA and to the extent practicable the NCP. Based on previous source area removal and containment actions and the results of the Site Investigation and Remedial Investigation, no action is necessary for AOC A4 and the Management of Migration OUs at AOCs A7 and A9 to ensure protection of human health and the environment.

Because this is a decision for No Action Under CERCLA, the statutory requirements of CERCLA Section 121 for remedial actions are not applicable, and no five-year review will be undertaken as part of this remedy. The Army will conduct long-term groundwater monitoring at AOC A7 as part of the remedy for the AOC A7 Source Control OU and will conduct five-year site reviews as part of that remedy.

The foregoing represents the decision for No Action Under CERCLA by the U.S. Department of the Army and the U. S. Environmental Protection Agency, with the concurrence of the Commonwealth of Massachusetts Department of Environmental Protection.

Concur and recommend for immediate implementation:

U.S. DEPARTMENT OF THE ARMY

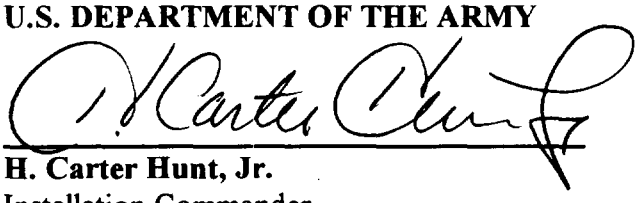
26 Sept. 1997

Thomas Strunk Date
U.S. Army Sudbury Annex, BRAC Environmental Coordinator
Devens Reserve Forces Training Area
Devens, Massachusetts

The foregoing represents the decision for No Action Under CERCLA by the U.S. Department of the Army and the U. S. Environmental Protection Agency, with the concurrence of the Commonwealth of Massachusetts Department of Environmental Protection.

Concur and recommend for immediate implementation:

U.S. DEPARTMENT OF THE ARMY



26 Sep 97

H. Carter Hunt, Jr.
Installation Commander,
Devens Reserve Forces Training Area
Devens, Massachusetts

Date

The foregoing represents the decision for No Action Under CERCLA by the U.S. Department of the Army and the U. S. Environmental Protection Agency, with the concurrence of the Commonwealth of Massachusetts Department of Environmental Protection.

Concur and recommend for immediate implementation:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

9-30-97

Harley F. Laing Date
Director,
Office of Site Remediation and Restoration
U.S. Environmental Protection Agency, Region I

1.0 SITE NAME, LOCATION, AND DESCRIPTION

The U.S. Army Sudbury Annex (the Annex) is a National Priorities List (NPL) site under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). The Annex occupies approximately 4.3 square miles (2,750 acres) in the Massachusetts towns of Hudson, Marlborough, Maynard, Stow, and Sudbury. It is located approximately 20 miles west of Boston and 12 miles northwest of Natick, Massachusetts (Figure 1 in Appendix A). Hudson Road divides the installation into two sections: the larger, northern section, and the smaller, southern section. The Annex became part of Fort Devens, now the Devens Reserve Forces Training Area (RFTA), in 1982.

The Annex historically served as a munitions storage area, ordnance test area, research and development facility, and as a troop training ground. The Annex currently contains military family housing, guest housing, a geophysical radar station operated by the U.S. Air Force, and offices for the Federal Emergency Management Agency (FEMA).

This Record of Decision addresses past releases of contaminants to all media at Area of Contamination (AOC) A4-Waste Dump, and past releases to groundwater at AOC A7-Old Gravel Pit Landfill and AOC A9-Petroleum, Oil, and Lubricant (POL) Burn Area. For the purposes of site remediation, a source control (soil) operable unit (OU) and a management of migration (groundwater) OU was created for AOCs A7 and A9. Source control actions are documented in the Record of Decision for the source control OUs for AOCs A7 and A9. All three AOCs are located within the northern section of the Annex (Figure 2 in Appendix A).

In September 1995, the Annex was identified for cessation of operations and closure under the Defense Base Realignment and Closure (BRAC) Act of September 1990. Closure is tentatively scheduled for November 1997. Except for a small area to be retained for Army housing within the southern section of the installation, the Annex will be transferred to three federal agencies. The majority of the land has been requested by the U.S. Fish and Wildlife Service (USFWS) and will become part of the Great Meadows National Wildlife Refuge. The U.S. Air Force and FEMA have also requested small parcels to continue their existing operations at the Annex.

A more complete description of the Annex can be found in the *Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts,* and the *Addendum Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts* , prepared by OHM Remediation Services, Inc. in 1994 and 1995, respectively). These reports, referred to as the SI/RI and SI/RI addendum reports in this Record

of Decision, are both available for review at the BRAC Environmental Office at Devens RFTA, Devens Massachusetts, and the town libraries in Hudson, Maynard, and Stow.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 LAND USE AND RESPONSE HISTORY

The facility presently known as the Annex was established in the late 1930s as the Maynard Ammunition Sub-depot. The property was acquired by the U.S. Government in 1942 and named the Maynard Ammunition Backup Storage Point. It was used for ammunition storage and as a loading point for ammunition being transported overseas. Following World War II, jurisdiction over the facility was transferred from the Chief of Transportation to the Chief of Ordnance. In 1950, control of the facility was transferred to the First Army, as a subinstallation of Fort Devens, for storage and training.

In 1952, the facility, under control of the Chief of Ordnance, became known as the Maynard Ordnance Test Station. From 1952 to 1957, the primary military activities at the facility involved classified research and development by the Universal Match Corporation and the Arthur D. Little Company that may have included rocket, pyrotechnics, and explosives testing. At the expiration of the Universal Match Corporation contract in 1957, the Ordnance Corps transferred control of the facility to the Quartermaster Corps to help relieve crowded conditions at the nearby Natick Laboratories. In December 1957, the facility was designated the Maynard Quartermaster Test Activity.

From 1957 to 1982, the Annex was used as a field resource by Natick Laboratories. The Natick Laboratories mission was research and development in the physical, behavioral, and biological sciences, and engineering to develop commodities such as clothing and protective equipment. Physical research and development activities included the development of air drop techniques, field shelters and equipment, field organizational equipment, fuel delivery systems, and food and food service systems. Scientific research and development included determination of the stability of various fungicides in materials exposed to outdoor environments, foamed plastics field tests, flame testing of clothing and equipment, toxic fumigant effects on insects, and the study of climatic data in support of various test programs and air drop testing.

In 1982, operational control of the Annex was transferred to Fort Devens. From 1982 through 1994, the Annex was used by Fort Devens to support its mission to train active duty and reserve personnel, and to support the U.S. Army Security Agency Training Center and School, U.S. Army Reserves, National Guard, Reserve Officer Training Corps, and Air Defense sites in New England. By agreement with Fort Devens, Natick Laboratories retained certain use and occupancy rights after property transfer to Fort Devens. This agreement included conditional use

of approximately 8 acres of land known as the POL Burn Area, use of a 30-acre area as an air drop zone, use of specific storage areas, and use of a field evaluation course.

Other agencies and organizations that have used or leased portions of the Annex include the U.S. Air Force and its contractors, Raytheon Corporation, Massachusetts Air National Guard, Massachusetts State Police Academy, Massachusetts Army National Guard, Massachusetts Fire Fighting Academy (MFFA), and FEMA.

2.1.1 AOC A4-Waste Dump

AOC A4 is located near the Eastern Gate and the intersection of Craven Lane and Patrol Road (Figure 3 in Appendix A). It occupies an area of approximately 1,000 by 200 feet along the northwestern side of Craven Lane, from Patrol Road to a wetland on the site's southwestern border. The center of the site consists of a grassy area, whereas trees and low bushes are present along the edges. The land surface slopes gradually from Craven Lane toward the southwest. Groundwater flow is toward the west and the wetland at the western site boundary. The site contains a surface dump near its southwest end and a building foundation dated to the late 1600's at the northeast end. At the time of the SI/RI, the ground surface was littered with plastic bags, empty food and beverage cans, empty paint cans, demolition debris, and glass. The site reportedly was used for the burial of unidentified chemical wastes and drums over a three to four year period from the late 1960s to early 1970s.

The following items summarize the history of AOC A4:

- **Late 1960s to early 1970s.** During this period, AOC A4 was reportedly used for the burial of unidentified chemical wastes and drums.

- **1980.** AOC A4 (then designated Location 15) was identified as a suspected waste disposal site by the Army during a records search.

- **1983.** The Army Environmental Health Agency (AEHA) performed an hydrogeologic and subsurface assessment which included installation of one groundwater monitoring well at AOC A4.

- **1984.** A pre-CERCLA investigation was performed to characterize groundwater quality downgradient of reported dumping areas. Groundwater sampling indicated low concentrations of inorganics, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). Of the detected analytes, iron, manganese and methylene chloride exceeded U.S. Environmental Protection Agency (USEPA) drinking water standards;

however, iron and manganese concentrations were consistent with background concentrations and methylene chloride was concluded to be the result of laboratory contamination. It was concluded that the presence of other analytes not attributable to background conditions or laboratory procedures could be indicative of a low degree of groundwater contamination. Surface water and sediment samples collected from the bordering stream did not show significant contamination.

- **1991-1993.** A two phase RI was performed to assess the nature and extent of contamination in surface soil, groundwater, sediment, and surface water at the site. Investigations included geophysical surveys to locate buried drums and other disposal debris, installation of additional groundwater monitoring wells and several test pits, collection of soil and groundwater samples, and a baseline risk assessment.

  Because of seasonal dry-weather conditions, surface water samples could not be collected, and shallow groundwater samples were substituted. This was subsequently identified as a data gap.

- **1996.** Data gap investigations were performed to assess surface water contamination. The technical memorandum prepared to discuss the findings of the data gap activities concluded that chemicals of potential concern in surface water were present at or below background concentrations and did not pose unacceptable risk to human health or the environment. The technical memorandum recommended that no further action be taken concerning soil and groundwater at AOC A4.

A more detailed description of AOC A4 site history can be found in the *Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts;* the *Addendum Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts; and the Final Technical Memorandum, Remedial (Data Gap) Investigation, Area of Contamination A4, U.S. Army Sudbury Annex.* These three reports are available for review at the BRAC Environmental Office at Fort Devens, and the town libraries in Hudson, Maynard, and Stow.

2.1.2 AOC A7-Old Gravel Pit Landfill

AOC A7 is a 10-acre site located on the north side of Patrol Road along the northern installation boundary (Figure 4). The northern edge of the site is within approximately 100 feet of the Assabet River. The site is generally wooded, but does have a large sandy clearing near its center. The ground surface slopes toward the north and the Assabet River from Patrol Road.

Groundwater flow is also to the north. Aerial photographs indicate the area was first used as a source for gravel during the early 1940s.

Interviews with Natick Laboratories employees identified AOC A7 as the location of laboratory chemical dumping from the late 1950s through 1971. Chemicals were reportedly buried in a shallow trench as well as poured directly onto the ground. General refuse was reported buried at the site as early as 1941; a practice which continued into the 1980s. Refuse including metal pipes, abandoned fuel tanks, drums, and debris was observed during site investigations. Site P8, a reported transformer disposal site, is situated along the eastern edge of AOC A7. Site P8 was identified in 1990 as the possible location of transformer disposal within the A7 site. During the file search, no reference to transformer disposal at the site could be located.

The following items summarize the history of AOC A7:

- **Early 1940s through early 1950's.** Site used as a borrow pit.

- **1940's through 1980s.** AOC A7 used for general refuse dumping, burning, and burial.

- **Late 1950s through 1971.** AOC A7 reportedly used for disposal of waste chemicals.

- **1980.** AOC A7 (then designated Location 12) was identified as a dumping, chemical disposal, and burning ground by the Army during a records search.

- **1983.** AEHA installed one groundwater monitoring well and performed groundwater sampling and analysis for drinking water parameters as part of an investigation to evaluate the hydrogeologic setting and groundwater quality. The only detections were low concentrations of fluoride and nitrate.

- **1984.** A second monitoring well was installed and groundwater samples collected. In addition, surface water and sediment samples were collected from a small unnamed stream at the eastern edge of the site. Analytical results indicated potential groundwater contamination with phthalates and inorganics, including hexavalent chromium. Surface water samples contained low concentrations of iron and acetone, and sediment contained arsenic at concentrations consistent with background and low concentrations of several polynuclear aromatic hydrocarbons (PAHs).

- **1991-1993.** A two phase RI was performed to assess the nature and extent of contamination in surface soil, subsurface soil, groundwater, sediment, and surface water at the site. Investigations included a geophysical study, test pit excavation with subsurface soil sampling,

surface soil sampling, installation of soil borings with soil sampling, installation of additional groundwater monitoring wells with groundwater sampling, surface water and sediment sampling, an hydrogeologic assessment, an ecological assessment, and a baseline risk assessment.

Although groundwater contamination was identified, the SI/RI addendum report was unable to conclude whether it had migrated beyond the installation boundary. This was identified as a data gap requiring additional investigation.

- **1993.** A feasibility study was performed to evaluate potential remedial alternatives for source area (soil) and management of migration (groundwater) OUs at AOC A7.

- **September 1995.** The Record of Decision for the Source Control Operable Unit at AOC A7 was signed. The selected source area remedy included removal of chemical waste debris in the laboratory dump area, considered to be the primary source of groundwater contamination, construction of a double-barrier (RCRA Subtitle C) landfill cap to contain remaining site contaminants, operation and maintenance, institutional controls and land use restrictions to limit future use of the land at AOC A7, long-term groundwater monitoring, and five-year site reviews to assess whether the remedy remains protective of human health and the environment.

- **July-November 1996.** A part of the source area cleanup, chemical waste debris in the laboratory dump area, was excavated for off site disposal, and a double-barrier (RCRA Subtitle C) landfill cap was constructed to contain remaining site contaminants. The two-acre landfill cap was used to contain approximately 6,200 cubic yards of waste material from AOC A7 as well as 5,800 cubic yards of non-hazardous material from other Annex sites needed as fill to meet the design specifications for the cap.

- **1996.** Data gap investigations were performed to assess whether groundwater contamination had migrated beyond the installation boundary. The technical memorandum prepared to discuss the findings of the data gap investigations concluded that although groundwater contamination was present beyond the installation boundary, it did not pose an unacceptable risk to human health or the environment. The technical memorandum recommended that no further action be taken concerning groundwater at AOC A7.

- **February 1997.** The *Final Operations and Maintenance Plan For The Landfill At Area Of Concern A7* outlined the long-term monitoring program for AOC A7. The initial program includes semi-annual sampling of 13 monitoring wells located to enable assessment of contaminant migration from AOC A7. These monitoring wells include wells along the site

perimeter and three wells located near the Assabet River to monitor potential contaminant migration toward the river. Samples will be analyzed, at a minimum, for the following parameters: VOCs, pesticides, metals, phosphate, sulfate, chloride, nitrate, ammonia, total dissolved solids, chemical oxygen demand, dissolved oxygen, and cyanide.

A more detailed description of AOC A7 site history can be found in the *Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts;* the *Addendum Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts; and the Final Technical Memorandum, Remedial (Data Gap) Investigation, Area of Contamination A7, U.S. Army Sudbury Annex.* These three reports are available for review at the BRAC Environmental Office at Fort Devens, and the town libraries in Hudson, Maynard, and Stow.

2.1.3 AOC A9-POL Burn Area

AOC A9 is an eight acre site located on the north side of Patrol Road along the northern installation boundary, approximately 600 feet north of AOC A7 (Figure 5 in Appendix A). The northern edge of the site is within approximately 100 feet of the Assabet River. The site is level and predominately grassy with some pine and oak trees along the western and northern edge. Groundwater in the area flows toward the Assabet River.

AOC A9 was used for flame testing of fire retardent clothing, POL testing and/or storage, MFFA training, and destruction of confiscated fireworks. Testing of fire retardent clothing involved exposing clothing to a JP-4 jet fuel fire in an asphalt lined pit. A 1,000 gallon underground storage tank (UST) (Site P-12) was used to store JP-4 at the site, presumably to supply fuel for this testing. Testing reportedly occurred during a two week period each year from the late 1950s to the 1980s.

Starting around 1970, the MFFA used the area to conduct training on flammable liquid fires. This training reportedly involved extinguishing fires of No. 2 fuel oil and JP-4 tank bottoms floating on water in a shallow concrete pit. Other fire training was conducted in unlined pits and trenches. This training continued until at least 1994 and also included control of flames and smoke associated with the testing of fire retardent clothing by Natick Laboratories. Natick Laboratories also performed some POL testing at the site.

The Massachusetts State Police burned confiscated fireworks at AOC A9 from the early-to-mid 1970s until 1991.

During a 1986 site inspection by representatives by the Massachusetts Department of Environmental Quality Engineering (MADEQE), numerous drums of unidentified material were being stored at the site.

The following items summarize the history of AOC A9:

- **Late 1950s-1986.** Natick Laboratories conducted fire retardent clothing testing at the site.
- **1962.** Natick laboratories began POL testing and continued for an unknown length of time.
- **1970-1984.** MFFA conducted fire training exercises at the site.
- **Mid 1970s-1991.** Massachusetts State Police burned confiscated fireworks at the site.
- **1980.** AOC A9 (then designated Location 4) was identified as a fire test facility by the Army during a records search.
- **1984.** Investigation of the site begins. Samples collected between 1984 and 1987 indicate that surface soil is contaminated with PAHs, phthalates, and hydrocarbons. Groundwater is contaminated with chlorinated VOCs and fuel related hydrocarbons including ethylbenzene, toluene, and xylenes.
- **March 1986.** Representatives of the MADEQE observed standing oil in trenches, oil stained soils, and unmarked drums at the site.
- **June 1986.** All above ground tanks and drums are removed.
- **1987-1988.** Approximately 1,100 cubic yards of contaminated soil are removed up to a depth of approximately 26 feet below ground surface (bgs) and disposed of under manifest.
- **1991-1993.** A two phase RI was performed to assess the nature and extent of contamination in surface soil, subsurface soil, and groundwater at the site. Investigations included a geophysical study, soil-gas study, surface and subsurface soil sampling, installation of additional groundwater monitoring wells with groundwater sampling, an hydrogeologic assessment, an ecological assessment, and a baseline risk assessment.

  The SI/RI addendum report identified both petroleum-related and chlorinated solvent contamination in groundwater. Although free-phase chlorinated solvents were not

encountered during SI/RI activities, the inability to rule out the presence of a dense non-aqueous phase liquid (DNAPL) plume was considered a data gap.

- **1992.** The 1,000 gallon UST (Site P-12) and approximately 31 cubic yards of contaminated soil were removed.

- **1993.** A feasibility study was performed to evaluate potential remedial alternatives for source area (soil) and management of migration (groundwater) OUs at AOC A9.

- **1996.** As part of the source area cleanup, approximately 11 cubic yards of contaminated soil from hot spot locations were excavated and transported to AOC A7 for containment under a landfill cap.

- **1996.** Data gap investigations were performed to assess the presence or absence of DNAPL at AOC A9. The technical memorandum prepared to discuss the findings of the data gap investigations concluded that DNAPL plumes were not present and recommended that no further action be taken concerning groundwater at AOC A9.

A more detailed description of AOC A9 site history can be found in the *Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts;* the *Addendum Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts; and the Final Technical Memorandum, Remedial (Data Gap) Investigation, Area of Contamination A9, U.S. Army Sudbury Annex.* These three reports are available for review at the BRAC Environmental Office at Fort Devens, and the town libraries in Hudson, Maynard, and Stow.

2.2 ENFORCEMENT HISTORY

On January 29, 1987, the Annex was classified as a Federal Facility under the jurisdiction, custody, and control of the U.S. Department of Defense, within the meaning of Executive Order 12580, and within the meaning of the Defense Environmental Restoration Program (DERP), 10 U.S.C., Section 2701 *et seq.*

On February 21, 1990, the Annex was placed on the NPL under CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), to evaluate and implement response actions to cleanup past releases of hazardous substances, pollutants, and contaminants. A Federal Facility Agreement (FFA) to establish a procedural framework for ensuring that appropriate response actions are implemented at the Annex was developed and signed by the U.S.

Army and the USEPA Region I on May 13, 1991, and finalized on November 15, 1991. AOCs A4, A7, and A9 are considered subsites to the entire installation.

In 1991, the U.S. Department of Defense, through the U.S. Army Environmental Center (USAEC), initiated an SI/RI for AOCs A4, A7, and A9, and the final SI/RI report was issued in January 1994. An addendum to the report was issued in September 1995. The purpose of the SI/RI was to determine the nature and extent of contamination, assess human health and ecological risks, and assess whether additional response actions were necessary. A feasibility study to develop and evaluate candidate alternatives to protect human and ecological receptors from unacceptable risks associated with potential exposure to contaminated media at AOCs A7 and A9 was completed in 1995.

The Proposed Plan detailing the Army's plan of No Action Under CERCLA for AOC A4 and the Management of Migration OUs at AOCs A7, and A9 was issued in June 1997 for public comment. Technical comments presented during the public comment period are included in the Administrative Record. The Responsiveness Summary, Appendix C to this Record of Decision, contains a summary of these comments and the Army's responses, and describes how these comments affected the No Action Under CERCLA decision.

3.0 COMMUNITY PARTICIPATION

The Army has held quarterly public Technical Review Committee (TRC) meetings, issued newsletters and press releases, and held a number of public meetings to keep the community and other interested parties informed of activities at the Annex.

In April 1992, the Army released, following public review, a community relations plan that outlined a program to address community concerns and keep citizens informed about and involved in remedial activities at the Annex. As part of this plan, the Army established a TRC, which first met May 13, 1991. The TRC, as required by SARA Section 211 and Army Regulation 200-1, included representatives from USEPA, USAEC, Fort Devens, Massachusetts Department of Environmental Protection (MADEP), U.S. Army Corps of Engineers (USACE), local officials, and the community. The TRC meets quarterly to review and provide technical comments on schedules, work plans, work products, and proposed activities for the study areas at Sudbury Annex. The SI/RI, SI/RI addendum, and feasibility study reports, technical memoranda, Proposed Plan, and other related support documents were submitted to the TRC for their review and comment.

During the week of June 9, 1997, the Army published a public notice announcing the Proposed Plan, public informational meeting, and public hearing in the Sudbury Town Crier, the Middlesex News, the Marlborough-Hudson Enterprise, the Stow Villager, and the Maynard Beacon. The Army also made the Proposed Plan available to the public at the information repositories at the libraries in Stow, Hudson, Sudbury, and Maynard, and at Devens RFTA.

From June 9 through July 8, 1997, the Army held a 30-day public comment period to accept public comments on the Proposed Plan. On June 10, 1997, the Army held an informal public hearing at the Stow Town Building, in Stow, Massachusetts to discuss the Proposed Plan and to accept verbal or written comments from the public. Verbal comments were received from the Four Town Focus and subsequently were elaborated upon in writing. Public comments and the Army's response to comments are included in the Responsiveness Summary (Appendix C of this Record of Decision).

All supporting documentation for the No Action Under CERCLA decision for AOC A4 and the Management of Migration OUs at AOCs A7 and A9 is contained in the Administrative Record. The Administrative Record is a collection of all the documents considered by the Army in making the No Action Under CERCLA decision. On March 20, 1994, the Army made the Administrative Record available for public review at the Sudbury Annex BRAC Environmental Office, and at the Sudbury Town Hall, Sudbury, Massachusetts.

4.0 SCOPE AND ROLE OF RESPONSE ACTION

This No Action decision addresses all media at AOC A4 and the management of migration (i.e., groundwater) OUs at AOCs A7 and A9 at the U.S. Army Sudbury Annex. The risk assessments contained in the SI/RI and SI/RI addendum reports for these AOCs indicate that environmental media at AOC A4 and groundwater contamination at AOCs A7 and A9 does not pose an unacceptable risk to human health or the environment. Technical memoranda for AOCs A4, A7, and A9 completed subsequent to the SI/RI reports provide additional support for this conclusion. Based on this conclusion, the U.S. Army and the USEPA, with the concurrence of the MADEP, have determined that No Action Under CERCLA is required for AOC A4 and the Management of Migration OUs at AOCs A7 and A9.

Potential risks to human health and the environment posed by AOC A4 have not previously been addressed by a Record of Decision. Potential risks to human health and the environment posed by source area OUs (i.e., contaminated soil and waste material) at AOCs A7 and A9 were addressed in the final Record of Decision for source control OUs for A7 and A9 signed in September 1995. No other OUs or known sources of contamination of concern exist at these AOCs.

USEPA has the authority to revisit the No Action Under CERCLA decision if future conditions indicate that an unacceptable risk to human health or the environment would result from exposure to contaminants at AOCs A4, A7, and A9. Such a review could occur even if the Annex is removed from the NPL.

5.0 SUMMARY OF SITE CHARACTERISTICS

The Army performed SI/RI activities in 1992 and 1993 and data gap activities in 1996 to characterize the nature and distribution of contaminants at AOCs A4, A7, and A9. Detailed descriptions of the investigations and available data are presented in the SI/RI and SI/RI addendum reports as well as technical memoranda. The following subsections summarize significant findings of the contamination assessments from those reports.

5.1 AOC A4

Soils. During the Phase I and Phase II RI sampling, eight surface soil and 23 subsurface soil samples were collected for analysis. In general, target analytes included Target Compound List (TCL) VOCs, SVOCs, pesticides, polychlorinated biphenyls (PCBs), chlorinated herbicides, explosives, and Target Analyte List (TAL) metals. Several samples were also analyzed for organophosphorus pesticides and total petroleum hydrocarbons (TPH).

VOCs were detected at low concentration in several Phase I samples; however, all were attributed to laboratory contamination or to naturally occurring turpenes. Only one SVOC, chrysene, was detected above soil screening concentrations. Because it was found in only one sample of 24, it was not considered a chemical of potential concern (COPC).

All pesticide detections were at concentrations less than Massachusetts Contingency Plan (MCP) S-1/GW-1 standards. TPH was detected at a maximum concentration of 35µg/g. PCBs and explosives were not detected. With the exception of lead and zinc, all metals were detected at concentrations less than screening criteria or at concentrations representative of background.

Groundwater. A total of 17 groundwater samples were collected from six monitoring wells during Phases I and II of the SI/RI. In general, target analytes included TCL VOCs, SVOCs, pesticides, PCBs, chlorinated herbicides, explosives, and TAL metals. Several samples were also analyzed for organophosphorus pesticides.

VOCs were not detected above screening criteria in any samples. Toluene was detected at a low concentration in the Phase I sample from one monitoring well; it was not detected in Phase II samples. Only one SVOC was detected; however, its presence was attributed to laboratory contamination. Pesticides were detected in samples from two monitoring wells at concentrations below federal drinking water Maximum Contaminant Levels (MCLs). PCBs and explosives were not detected.

Several inorganics were detected in groundwater. Of these, lead in one unfiltered Phase I sample showed the greatest potential to be a contaminant of concern. Analysis of unfiltered and filtered samples from the same monitoring well in Phase II showed unfiltered concentrations well below the federal drinking water action level of 15 micrograms per liter (µg/L). Lead was not detected in the filtered sample. Aluminum, iron, and manganese were detected in several samples at concentrations greater than federal drinking water Secondary Maximum Contaminant Levels (SMCLs). No other metals were detected at concentrations above screening criteria.

Surface Water. Characterization of surface water during the Phase I and Phase II SI/RI included collection and analysis of seven surface water samples. Most of the samples were analyzed for TCL VOCs, SVOCs, pesticides, PCBs, chlorinated herbicides, explosives, and TAL metals. Several samples were also analyzed for organophosphorus pesticides.

There were no positive identifications of VOCs and SVOCs or confirmations of explosives in the samples. The pesticides endrin aldehyde and 2,2-bis(para-chlorophenyl)-1,1,1-trichloroethane (DDT) and the herbicide dacthal were each reported once. No other pesticides or herbicides were reported.

Concentrations of metals, including lead, aluminum, chromium, copper, and zinc, exceeded aquatic life screening criteria at several locations. With the exception of zinc, exceedances were attributed to the presence of high suspended particulate concentrations in the samples. Elevated concentrations of zinc were attributed to laboratory contamination. Concentrations of arsenic were below screening criteria for aquatic life, but exceeded human health screening criteria.

As part of data gap activities to assess surface water contamination, three surface water samples were collected in 1996 and, based on evaluation of previous data, analyzed for lead. Lead was not detected in two of the samples and was present at a concentration below background in the third.

Sediment. Sediment samples were collected from eleven locations during the Phase I and Phase II SI/RI. Most of the samples were analyzed for TCL VOCs, SVOCs, pesticides, PCBs, chlorinated herbicides, explosives, and TAL metals. Phase II samples were also analyzed for organophosphorus pesticides.

Several VOCs and SVOCs were detected in sediment samples, but all were common laboratory contaminants and were not considered site-related. The pesticides 2,2-bis(para-chlorophenyl)-1,1-dichloroethane (DDD) and 2,2-bis(para-chlorophenyl)-1,1-dichloroethene (DDE) were both detected once at low concentrations. The explosive HMX was detected in one Phase I sample.

Concentrations of several metals, including arsenic, beryllium, barium, copper, lead, nickel, and selenium, were detected at concentrations exceeding screening criteria. However, the SI/RI addendum report concluded that detected concentrations were consistent with concentrations in the Assabet River and that distribution patterns did not suggest that AOC A4 was a significant contributor to sediment metal concentrations.

Summary. Surface and subsurface soil data are consistent with previous dumping of organic chemicals at the site. Elevated concentrations of lead were present at isolated locations. Groundwater data show concentrations of aluminum, iron, and manganese above SMCLs. Although concentrations of metals in SI/RI surface water samples appear high, this is likely the result of high concentrations of suspended matter in the samples. Surface water samples collected during data gap investigations had concentrations of lead which were less than background. AOC A4 does not show widespread contamination and does not appear to be a source of sediment or surface water contamination.

A complete discussion of AOC A4 site characteristics can be found in Section 2.0, of the SI/RI addendum report and the AOC A4 Technical Memorandum.

5.2 AOC A7

Soils. Characterization of soil during the SI/RI included collection of 14 surface soil samples, collection of 53 soil samples from 19 test pit locations, and collection of 27 soil boring and 2 hand-auger subsurface soil samples. In general, these samples were analyzed for TCL VOCs, SVOCs, pesticides, PCBs, chlorinated herbicides, explosives, and TAL metals. A portion of Phase II samples were also analyzed for organophosphorus pesticides.

At the laboratory waste disposal area soil contaminants exceeding screening criteria were primarily pesticides and chlorinated VOCs. The organochlorine pesticides dieldrin, lindane, DDD, and DDT were detected at concentrations greater than screening criteria. Chlordane, heptachlor, heptachlor epoxide, DDE, and PCBs were also detected. The organophosphorus pesticides Demeton-0, Fenthion, and methyl parathion were also detected at concentrations greater than screening criteria. In the VOC analyses, 1,1,2-trichloroethane, 1,2-dichloroethane, chloroform, and tetrachloroethene were detected at concentrations greater than screening criteria. Acetone, chlorobenzene, ethylbenzene, trichloroethene, and xylenes were also detected. Lead was detected in all 10 subsurface soil samples from this area.

At the solid waste landfill, exceedances of screening criteria for were noted for DDT, DDD, and DDE only in the south-central portion of AOC A7. Within this small area, DDT, DDD, and DDE were detected at concentration above screening criteria. The only other compound detected above screening criteria in this area was the SVOC 2-methylnaphthalene.

In the southeastern portion of AOC A7, exceedances of screening criteria for the pesticides endrin, heptachlor epoxide, and total chlordane were noted in samples from test pit A7TPS. An exceedance of total chlordane was also noted in the sample from soil boring A7B12. Lead was detected in test pit A7TPS.

SVOCs were detected at concentrations greater than screening criteria at two closely spaced sampling locations in the north-central portion of AOC A7. Chrysene was detected at a depth of 2.0 to 4.0 feet bgs in test pit A7TPE. 2-Methynaphthalene, benzo(a)anthracene, and benzo(a)pyrene were detected at surface soil sampling location A7SO6.

Groundwater. Groundwater sampling during the SI/RI included collection of 30 samples from 10 monitoring wells. Target analytes generally consisted of TCL VOCs, SVOCs, pesticides, PCBs, chlorinated herbicides, explosives, phosphate, and TAL metals.

Groundwater quality in the vicinity of the laboratory waste disposal area was assessed with data from monitoring wells OHM-A7-8, OHM-A7-45, and OHM-A7-46. The groundwater quality downgradient (north) of this source area was assessed with data from monitoring wells OHM-A7-51 and OHM-A7-52. Exceedances of groundwater screening criteria were primarily noted in source area wells OHM-A7-8 and OHM-A7-46, and in downgradient monitoring well OHM-A7-51. The majority of the contaminants detected in the groundwater were also present at elevated concentrations in area soils.

The pesticides lindane, DDD, and dieldrin and the VOCs 1,1,2-trichloroethane, acetone, carbon tetrachloride, chloroform, and tetrachloroethene, all detected at elevated concentrations in area soils, were also detected in source area groundwater at concentrations exceeding screening criteria. Lead was not detected above screening criteria in any of the monitoring wells.

During the ground water sampling event performed in December 1993, both unfiltered and filtered groundwater samples were submitted for pesticide and PCB analysis for all monitoring wells in, and downgradient of, the laboratory waste disposal area. Pesticides were detected at similar concentrations in both the unfiltered and filtered samples from several monitoring wells.

Groundwater quality downgradient of the solid waste landfill area was assessed with data from ground water samples collected from monitoring wells OHM-A7-9, OHM-A7-10, OHM-A7-11,

and OHM-A7-12. An exceedance of the drinking water action level for lead in one sampling round was not confirmed during two other sampling rounds. Lead is therefore not considered to be a contaminant of concern in groundwater in this area. Methylene chloride was detected a total of 5 times in these monitoring wells at concentrations slightly exceeding the MCL. Four of these detections occurred during the October 3, 1991 sampling event, while the fifth occurred during the June 25, 1992 sampling event. None of the methylene chloride detections were confirmed during other sampling events, and SI/RI report considered the positive detections laboratory artifacts. These analytical results indicate that buried solid waste in the central and eastern portions of AOC A7 is not significantly affecting groundwater quality at this time.

Data gap activities to assess contaminant migration in groundwater included installation of three new monitoring wells and collection and analysis of two rounds of groundwater samples from the three new and six existing monitoring wells. Target analytes consisted of VOCs and pesticides. The analytical results showed that contamination with VOCs and lindane did extend beyond the installation boundary; however, comparison of data from existing monitoring wells with previous data indicated that concentrations were generally lower than in earlier samples collected from those monitoring wells.

Surface Water. Characterization of surface water was based on seven surface water/sediment pair samples collected during the SI/RI and two surface water/sediment pair samples collected during earlier studies. In general, the surface water samples were analyzed for TCL VOCs, SVOCs, pesticides, PCBs, chlorinated herbicides, explosives, and TAL metals. Phase II samples were also analyzed for phosphorus and organophosphorus pesticides.

VOCs and SVOCs were only detected in one sample collected in 1984. The reported organic compounds were all common laboratory contaminants, and the lack of confirmatory results from subsequent sampling led to the SI/RI conclusion that they are not contaminants of concern in the stream.

Arsenic was detected at A7SW2 and E3-BCK-DO3 at concentrations below the freshwater chronic Ambient Water Quality Criteria (AWQC), but above the human health AWQC. Although arsenic, lead, zinc and aluminum were detected in several surface water samples from AOC A7 and Study Area (SA) P9 at concentrations above USEPA Region I Environmental Services Assistance Team (ESAT) surface water and freshwater chronic AWQC criteria, all concentrations were below maximum background values. Elevated zinc concentrations were attributed to laboratory contamination, as the rinseate blank concentrations were comparable to the field sample concentrations. Aluminum exceeded ESAT criteria at A7SW2 and A7SW3. In general, there were no significant differences in metal concentrations between the upstream and downstream sample locations.

Sediment. Sediment characterization was based on seven surface water/sediment pair samples collected during the SI/RI and two surface water/sediment pair samples collected during earlier studies. Sediment samples were analyzed for TCL VOCs, SVOCs, pesticides, PCBs, chlorinated herbicides, explosives, total organic carbon, and TAL metals. Phase II samples were also analyzed for phosphorus and organophosphorus pesticides.

VOCs were only detected in samples collected during the RI. The three detected VOCs (acetone, methyl ethyl ketone, and methylene chloride) are common laboratory contaminants and were not considered site-related contaminants. Several PAHs were detected at one sampling location in 1984. PAHs were not detected in the sediment sample which was collected immediately downstream of that location in 1993.

Pesticides and PCBs were not detected in the sediment samples from AOC A7. DDE and DDT were detected at concentrations above ESAT sediment criteria in one background sample. DDT, DDD, and DDE were also detected at concentrations above screening values in sediment samples collected from upstream locations at SA P9.

Arsenic, barium, nickel, and selenium were all detected at concentrations above ESAT sediment criteria.

Summary. Although several chemicals identified as soil contaminants of concern at AOC A7 were also detected in surface water or sediment samples, there was no significant difference in concentrations between samples collected upstream of the site and those collected downstream of the site. Therefore, the SI/RI concluded that site-related activities have not affected stream quality and that the stream is not acting as a pathway for contaminants to migrate from AOC A7 to the Assabet River. Groundwater data from data gap activities shows that concentrations of groundwater contaminants are decreasing.

A complete discussion of AOC A7 site characteristics can be found in Section 3.0, of the SI/RI addendum report. Supplemental information regarding 1996 groundwater sampling can be found in the AOC A7 Technical Memorandum.

5.3 AOC A9

Soils. A total of 11 surface soil and 46 subsurface soil samples were collected to characterize soil contamination during the SI/RI. In general, these samples were analyzed for TCL VOCs, SVOCs, pesticides, PCBs, explosives, and TAL metals. Soil samples from Phase II borings were also analyzed for organophosphorus pesticides.

Chemicals detected above screening levels in AOC A9 soil samples were primarily metals. Arsenic was detected at concentrations above background at the upstream end of the culvert at the southwest corner of AOC A9; however, additional samples from the vicinity of the culvert indicate that it is not migrating downgradient. Its presence may have been related to past agricultural use. Lead was detected above background in one sample collected near the drum storage area, but not at several nearby locations, suggesting that lead contamination was not widespread. Thallium was also detected above background at one location.

Several VOCs and SVOCs were detected in surface and subsurface soil samples from AOC A9. Of these, acetone, methylene chloride, 2-methyl naphthalene, and di-n-butylphthalate exceeded screening criteria. Acetone and methylene chloride were attributed to laboratory contamination. Detected pesticide and PCB concentrations were less than local background upper confidence limits.

Data gap activities included the drilling of an additional soil boring along the interpreted migration pathway of a chlorinated VOC DNAPL plume and collecting split spoon samples at 5-foot intervals. Field screening of sample container headspace with a photoionization detector did not indicate the presence of any VOCs. In addition, no stains or odors suggesting the presence of DNAPLs were observed. Gas chromatograph screening of four samples and confirmatory analysis of two samples did not detect any VOCs.

Groundwater. Groundwater characterization during the SI/RI included review of data from 25 samples from a total of 15 monitoring wells. Target analytes generally consisted of TCL VOCs, SVOCs, pesticides, PCBs, explosives, phosphate, and TAL metals. The ten groundwater samples analyzed during Phase II investigations were also analyzed for organophosphorus pesticides.

Several chlorinated and petroleum related VOCs were detected in AOC A9 groundwater at concentrations above MCLs. Chlorinated VOCs (1,1,1-trichloroethane, 1,1-dichloroethene, methylene chloride, and trichloroethene) appear limited to an area downgradient of the fire-pit area. The petroleum-related compounds ethylbenzene and toluene were detected in monitoring wells downgradient of the former UST location. The SVOCs naphthalene and 2-

methylnaphthalene and the explosives 3-nitrotoluene and 1,3,5-trinitrobenzene were also detected in monitoring wells in areas downgradient of the former UST location.

The only metal detected above drinking water standards was lead in a sample from downgradient of the former UST location. Its presence was considered consistent with the presence of petroleum compounds at the site.

Data gap activities included the collection and analysis of samples from four monitoring wells located within the area of historic chlorinated VOC groundwater contamination. Analysis was for VOCs only. Analytical results for three of the four wells showed VOC concentrations consistent with or less than previous results. Concentrations were somewhat higher than previously observed at the fourth monitoring well, but provided no indication of a DNAPL plume.

Summary. Primary soil contaminants at AOC A9 include arsenic and lead at isolated locations, but do not appear widespread. Two groundwater plumes exist at the site: one containing chlorinated compounds downgradient of the fire-pit, and one containing petroleum-related compounds downgradient of the former UST location. Concentrations decrease with increasing downgradient distance, suggesting that degradation/attenuation is occurring. Data gap activities did not identify a DNAPL plume at AOC A9.

A complete discussion of AOC A9 site characteristics can be found in Section 4.0, of the SI/RI addendum report. Additional groundwater data can be found in the AOC A9 Technical Memorandum.

6.0 SUMMARY OF SITE RISKS

A Baseline Risk Assessment was completed for AOCs A4, A7, and A9 in 1994 during the Phase I SI/RI. A subsequent addendum to the risk assessment was prepared to evaluate whether data collected during the Phase II SI/RI modified the findings of the 1994 risk assessment. The risk assessments contained in the SI/RI and SI/RI addendum reports evaluate the probability and magnitude of potential adverse human health effects associated with exposure to contaminated media at AOCs A4, A7, and A9. The human health risk assessment followed a four step process: (1) contaminant identification, which identified those hazardous substances that, given the specifics of the site, were of significant concern; (2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; (3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances, and (4) risk characterization, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the site, including carcinogenic and non-carcinogenic risks. A detailed discussion of the human health risk assessment approach and results is presented in *Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts,* and the *Addendum Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts.*

The human health risk assessments prepared in 1994 evaluated current and future exposure pathways which included, respectively, site trespassers and site residents. Since then, the reasonably foreseeable future use scenario of the majority of the Annex has changed from residential development to wildlife refuge, and the anticipated human exposure pathway for AOCs A4, A7, and A9 has changed from a residential pathway to a recreational pathway; however, the risk assessments were not revised and potential future risks under the new future use were qualitatively evaluated in the SI/RI addendum report. Under the base closure process, the Annex property will be transferred to three agencies, with the USFWS receiving approximately 2,000 acres of land. Therefore, the residential future use scenario evaluated in the risk assessments provides a conservative estimate of risk from exposure to site contaminants. Human exposure under a recreational use scenario would be much more limited than exposure under a residential use scenario.

Excess lifetime cancer risks were determined for each exposure pathway by multiplying the exposure level by the chemical-specific cancer slope factor. Cancer slope factors have been developed by USEPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is unlikely to be greater than the predicted risk. The resulting risk estimates are expressed in scientific notation as a probability (e.g., $1x10^{-6}$ for 1/1,000,000) and indicate (using this example) that an

individual has a one-in-a-million chance of developing cancer as a result of site-related exposure over 70 years to the particular compound at the stated concentration. Current USEPA practice considers cancer risks to be additive when assessing exposure to a mixture of hazardous substances.

The hazard index (HI) was also calculated for each exposure pathway as a measure of the potential for non-carcinogenic health effects. The HI is the sum of the hazard quotients (HQs) for individual chemicals with similar exposure pathways and toxic endpoints. A HQ is calculated by dividing the exposure level by the reference dose (RfD) or other suitable benchmark for non-carcinogenic health effects for each individual chemical. RfDs have been developed by USEPA to protect sensitive individuals over the course of a lifetime, and they reflect a daily exposure level that is likely to be without an appreciable risk of an adverse health effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. The HQ is often expressed as a single value (e.g., 0.3) indicating the ratio of the stated exposure to the RfD value (in this example, the exposure as characterized is approximately one third of an acceptable exposure level for the given chemical). The HQ is only considered additive for chemicals that have the same or similar toxic endpoint. (For example: the HQ for a chemical known to produce liver damage should not be added to a second whose toxic endpoint is kidney damage).

Under the current USEPA Superfund policy, acceptable exposures to carcinogens are those that represent an excess upper bound lifetime cancer risk of between $1x10^{-4}$ and $1x10^{-6}$. For noncarcinogenic effects, acceptable exposure levels are those with an HI of 1.0 or less.

A basewide ecological risk assessment that was not specific to individual AOCs was finalized in January 1994 as part of the SI/RI. The SI/RI addendum report supplemented the basewide assessment by including individual ecological risk assessments that focused on AOCs A4, A7, and A9.

The results of the human health risk assessments, followed by a discussion of the ecological risk assessment, are discussed below for AOCs A4, A7, and A9,.

6.1 SUMMARY OF RISKS AT AOC A4

The following subsections summarize the results of the baseline risk assessment and ecological risk assessment for AOC A4.

6.1.1 Human Health Risk Assessment Summary for AOC A4

The COPCs listed in Table 1 in Appendix B of this Record of Decision were selected for evaluation in the AOC A4 baseline human health risk assessment of the SI/RI report. These COPCs were selected to represent potential site-related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment.

Potential human health effects associated with exposure to the COPCs were estimated quantitatively or qualitatively through the development of hypothetical exposure pathways associated with current and anticipated future land use. These pathways, listed below, were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the site. A detailed discussion of the human health risk assessment approach and results is presented in the SI/RI report and the SI/RI addendum report.

Current Land Use

- Soil: Adolescent trespasser exposure to soil contaminants through direct contact and subsequent ingestion or dermal exposure.

Future Land Use

- Soil: Residential exposure through dermal exposure or ingestion
- Sediment: Residential exposure through dermal exposure or ingestion
- Groundwater: Residential exposure through ingestion

Table 2 in Appendix B of this Record of Decision summarizes the human health risks at AOC A4 identified in the baseline risk assessment of the SI/RI report. This table also shows which exposure pathways are most responsible for the estimated risks.

Review of Table 2 shows that for an adolescent under current land use conditions the estimated potential cancer risk for soil exposure is $2x10^{-8}$ for Reasonable Maximum Exposure (RME) conditions and $1x10^{-8}$ for central tendency or average exposure conditions. These values are below the USEPA $1x10^{-4}$ to $1x10^{-6}$ target risk range. The RME case assumes that all of a receptor's exposure is to the maximum contaminant concentrations observed at the site, and is therefore a conservative estimate. HIs for potential RME to noncarcinogenic COPCs in soil are well below USEPA's benchmark value of 1.0. There is no current use or exposure to groundwater.

Under the evaluated future residential scenario, the estimated potential cancer risks for soil are $3x10^{-7}$ under RME conditions and $1x10^{-7}$ under average conditions, both less than the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$. Noncancer HIs associated with residential exposure to soil contaminants are 0.3 and 0.1 under RME and average conditions, respectively.

Under the evaluated future residential scenario, the estimated potential cancer risks for sediment are $3x10^{-5}$ under RME conditions and $1x10^{-5}$ under average conditions, both within the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$. Noncancer HIs associated with residential exposure to sediment contaminants are 0.1 and 0.07 under RME and average conditions, respectively.

The estimated potential cancer risks for groundwater under the evaluated future residential scenario are $6x10^{-5}$ under RME conditions and $2x10^{-5}$ under average conditions, both within the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$. Noncancer HIs associated with residential exposure to groundwater contaminants are 0.5 and 0.1 under RME and average conditions, respectively.

The total estimated potential cancer risks for exposure to soil and groundwater under the evaluated future residential scenario are $6x10^{-5}$ under RME conditions and $2x10^{-5}$ under average conditions, both within the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$. Noncancer HIs associated with residential exposure to soil and groundwater contaminants are 0.8 and 0.2 under RME and average conditions, respectively.

Potential risks from exposure to lead were evaluated using the USEPA Uptake/Biokinetic (UBK) model. Assuming continuous consumption of groundwater with the maximum observed concentration of 190 µg/L, the model predicts that blood lead levels in children would exceed the target level of 10 micrograms per deciliter after two years. Excluding this single value, lead concentrations at AOC A4 do not produce blood lead levels above the USEPA target value.

Chemicals with the greatest contribution to the baseline risk estimates were lead, bis(2-ethylhexyl)phthalate, and arsenic in groundwater and lead and arsenic in soil. Actual risks are likely to be substantially lower than indicated by the baseline risk assessment. Arsenic was present at background concentrations in soil and was detected only once in AOC A4 groundwater; the reported concentration, 3 µg/L, was well below the MCL of 50 µg/L. Lead concentrations were high in the October 1992 sampling round (190 µg/L), but were not detected in other samples.

The SI/RI addendum report reviewed the data obtained during the Phase II SI/RI to evaluate whether modification of the baseline risk assessment was appropriate. The Phase II data were generally consistent with Phase I data. The data confirmed that high concentrations of lead do not appear widespread in soil or groundwater. Lead was not considered a concern in groundwater. Beryllium was detected at greater concentrations in soil, but still at concentrations considered indicative of background. Sediment concentrations of beryllium were also higher

during Phase II sampling. Maximum detected concentrations beryllium resulted in a cancer risk of $1x10^{-5}$, within the USEPA target range.

Using both Phase I and Phase II data, the Army concluded that contaminants at AOC A4, and groundwater contaminants in particular, do not pose an unacceptable risk to human health risk.

Surface water data collected during data gap activities showed that the data evaluated during the SI/RI were not representative of surface water conditions and that lead in surface water at and near AOC A4 poses no human health risk beyond background conditions.

6.1.2 Ecological Risk Assessment Summary for AOC A4

A number of chemicals were detected in samples from AOC A4 during the Phase I and II investigations. The ecological risk assessment of the SI/RI addendum report compared detected concentrations with background concentrations and with screening level toxicity criteria to assess whether the chemicals were COPCs. Tables 3-1 through 3-6 of the ecological risk assessment (Appendix C of the SI/RI addendum report) provide those comparisons. The tabulated chemicals include the following:

Soil
- metals, organochloride pesticides, herbicides, explosives, SVOCs, and chlorinated and non-chlorinated solvents

Groundwater
- chlorinated solvents, organochloride pesticides, and acetone

Surface Water
- iron

Sediment
- metals, solvents, nitrosamine, and an insect repellent

The risk assessment concluded that there is no significant risk to ecological receptors.

Surface water data collected during data gap activities showed that the data evaluated during the SI/RI were not representative of surface water conditions and that lead in surface water at and near AOC A4 poses no ecological risk beyond background conditions.

6.2 SUMMARY OF RISKS AT AOC A7

The following subsections summarize the results of the baseline risk assessment and ecological risk assessment for AOC A7.

6.2.1 Human Health Risk Assessment Summary for AOC A7

The COPCs listed in Table 3 in Appendix B of this Record of Decision were selected for evaluation in the AOC A7 baseline human health risk assessment of the SI/RI report. These COPCs were selected to represent potential site-related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment.

Potential human health effects associated with exposure to the COPCs were estimated quantitatively or qualitatively through the development of hypothetical exposure pathways associated with current and anticipated future land use. These pathways, listed below, were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the site. A detailed discussion of the human health risk assessment approach and results is presented in the SI/RI report and the SI/RI addendum report.

Current Land Use

- Soil: Adolescent trespasser exposure to soil contaminants through direct contact and subsequent ingestion or dermal exposure.

Future Land Use

- Soil: Residential exposure through dermal exposure or ingestion
- Sediment: Residential exposure through dermal exposure or ingestion
- Groundwater: Residential exposure through ingestion

Table 4 in Appendix B of this Record of Decision summarizes the human health risks at AOC A4 identified in the baseline risk assessment of the SI/RI report. This table also shows which exposure pathways are most responsible for the estimated risks.

Review of Table 4 shows that for an adolescent under current land use conditions the estimated potential cancer risk for soil exposure is $3x10^{-5}$ for RME conditions and $3x10^{-6}$ for central tendency or average exposure conditions. These values are within the USEPA $1x10^{-4}$ to $1x10^{-6}$ target risk range. The RME case assumes that all of a receptor's exposure is to the maximum

contaminant concentrations observed at the site, and is therefore a conservative estimate. HIs for potential RME to noncarcinogenic COPCs in soil are well below USEPA's benchmark value of 1.0. There is no current use or exposure to groundwater.

Under the evaluated future residential scenario, the estimated potential cancer risks for soil are $3x10^{-4}$ under RME conditions, slightly greater than the USEPA target range of $1x10^{-4}$ to $1x10^{-6}$, and $4x10^{-5}$ under average conditions, within the USEPA target risk range. Noncancer HIs associated with residential exposure to soil contaminants are 4 and 0.4 under RME and average conditions, respectively.

Under the evaluated future residential scenario, the estimated potential cancer risks for sediment are $2x10^{-5}$ under RME conditions and $1x10^{-5}$ under average conditions, both within the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$. Noncancer HIs associated with residential exposure to sediment contaminants are 0.7 and 0.6 under RME and average conditions, respectively.

The estimated potential cancer risks for groundwater under the evaluated future residential scenario are $2x10^{-4}$ under RME conditions, slightly greater than the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$, and $3x10^{-5}$ under average conditions, within the USEPA target risk range. Noncancer HIs associated with residential exposure to groundwater contaminants are 1 and 0.2 under RME and average conditions, respectively.

The total estimated potential cancer risks for exposure to soil and groundwater under the evaluated future residential scenario are $5x10^{-4}$ under RME conditions, slightly greater than the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$, and $7x10^{-5}$ under average conditions, within the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$. Noncancer HIs associated with residential exposure to soil and groundwater contaminants are 5 and 0.6 under RME and average conditions, respectively.

Potential risks from exposure to lead were evaluated using the USEPA UBK model. Based on the UBK model, lead does not pose a health risk at AOC A7.

Much of the risk estimated for AOC A7 in the baseline risk assessment was associated with areas of localized contamination. As a result, for risks of the estimated magnitude to occur, frequent contact with these hotspots would be required. Such contact would be unlikely, even in the event of residential development. Consequently, actual risks would be lower, quite possibly substantially lower, than the estimated risks based on maximum concentrations.

The SI/RI addendum report reviewed the data obtained during the Phase II SI/RI to evaluate whether modification of the baseline risk assessment was appropriate. The Phase II data were generally consistent with Phase I data, although several chemicals were found at somewhat higher

concentrations in Phase II samples. The SI/RI addendum report concluded that source area controls and incorporation of AOC A7 into the Great Meadows National Wildlife Refuge would lower potential exposure to levels within or below the USEPA target risk range. Source area controls consisting of removal of laboratory waste, construction of a RCRA Subtitle C multi-layer cap, institutional controls, and long-term groundwater monitoring were implemented in 1996. There is no current human health exposure pathway associated with groundwater at AOC A7. In addition, the property downgradient of AOC A7, between the site and the Assabet River, is zoned Recreation-Conservation and is classified as unbuildable by the Town of Stow. Following incorporation of AOC A7 into the Great Meadows National Wildlife Refuge, future residential exposure will not be a realistic exposure scenario.

6.2.2 Ecological Risk Assessment Summary for AOC A7

A number of chemicals were detected in samples from AOC A7 during the Phase I and II investigations. As a preliminary step, the ecological risk assessment of the SI/RI addendum report compared detected concentrations with background concentrations and with screening level toxicity criteria to assess whether the chemicals were COPCs. Only chemicals of potential ecological concern, as identified through screening, were carried through the ecological risk assessment. Tables 4-1 through 4-8 of the ecological risk assessment (Appendix C of the SI/RI addendum report) provide those comparisons. The tabulated chemicals include the following:

Soil
- metals, organochloride pesticides, VOCs, and SVOCs

Groundwater
- trace concentrations of solvents, pesticides, and an insect repellent (probably introduced during sampling)

Surface Water
- one pesticide

Sediment
- solvents and metals

As a result of the screening comparisons, the SI/RI addendum report identified the following chemicals of potential ecological concern at AOC A7:

Soil
- the pesticides DDT, dieldrin, endrin, and chlordane

- PCBs
- the PAHs benzo(a)anthracene, benzo(a)pyrene, and phenanthrene
- lead

Sediment
- the inorganics arsenic, barium, copper, and nickel

Groundwater
- the pesticides DDT, lindane, and heptachlor epoxide
- the chlorinated VOCs chloroform, tetrachloroethene, 1,1,2,2-tetrachloroethane, and trichloroethene

Potential risks to aquatic ecosystem were evaluated by comparing detected groundwater concentrations to Ambient Water Quality Criteria with consideration given to the dilution offered by surface water in the Assabet River and the ability of river sediments to bind contaminants and reduce their mobility. The SI/RI addendum report concluded that chemicals in site affected groundwater were likely to have an insignificant effect on aquatic life.

Potential risks to terrestrial ecosystems were evaluated by comparison of detected soil concentrations to dietary benchmark values for voles, shrews, and robins. With the exception of a very high HQ for exposure of the robin to DDT, all calculated HQs were less than 5. Although the HQ for the robin was high, the benchmark value was inconsistent with other data and considered suspect. The SI/RI addendum report concluded that chemicals in soil affected by the site do not pose a substantial risk to terrestrial receptors.

Although comparison of sediment data to available criteria suggested that potential adverse effects were possible, the results of a Rapid Bioassessment Protocol evaluation showed that conditions in the site's stream were typical of what would expected in the absence of contamination. Therefore, it was concluded that site conditions were not adversely affecting stream organisms.

In summary, the risk assessment concluded that there is no significant risk to ecological receptors at AOC A7.

6.3 SUMMARY OF RISKS AT AOC A9

The following subsections summarize the results of the baseline risk assessment and ecological risk assessment for AOC A9.

6.3.1 Human Health Risk Assessment Summary for AOC A9

The COPCs listed in Table 5 in Appendix B of this Record of Decision were selected for evaluation in the AOC A9 baseline human health risk assessment of the SI/RI report. These COPCs were selected to represent potential site-related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment.

Potential human health effects associated with exposure to the COPCs were estimated quantitatively or qualitatively through the development of hypothetical exposure pathways associated with current and anticipated future land use. These pathways, listed below, were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the site. A detailed discussion of the human health risk assessment approach and results is presented in the SI/RI report and the SI/RI addendum report.

Current Land Use

- Soil: Adolescent trespasser exposure to soil contaminants through direct contact and subsequent ingestion or dermal exposure.

Future Land Use

- Soil: Residential exposure through dermal exposure or ingestion
- Groundwater: Residential exposure through ingestion

Table 6 in Appendix B of this Record of Decision summarizes the human health risks at AOC A9 identified in the baseline risk assessment of the SI/RI report. This table also shows which exposure pathways are most responsible for the estimated risks.

Review of Table 6 shows that for an adolescent under current land use conditions the estimated potential cancer risk for soil exposure is $7x10^{-6}$ for RME conditions and $2x10^{-6}$ for central tendency or average exposure conditions. These values are within the USEPA $1x10^{-4}$ to $1x10^{-6}$ target risk range. The RME case assumes that all of a receptor's exposure is to the maximum contaminant concentrations observed at the site, and is therefore a conservative estimate. HIs for

potential RME to noncarcinogenic COPCs in soil are well below USEPA's benchmark value of 1.0. There is no current use or exposure to groundwater.

Under the evaluated future residential scenario, the estimated potential cancer risks for soil are $1x10^{-4}$ under RME conditions, and $3x10^{-5}$ under average conditions, both within the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$. Noncancer HIs associated with residential exposure to soil contaminants are 0.6 and 0.2 under RME and average conditions, respectively.

The estimated potential cancer risks for groundwater under the evaluated future residential scenario are $2x10^{-4}$ under RME conditions, slightly greater than the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$, and $3x10^{-5}$ under average conditions, within the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$. Noncancer HIs associated with residential exposure to groundwater contaminants are 10 and 1 under RME and average conditions, respectively.

The total estimated potential cancer risks for exposure to soil and groundwater under the evaluated future residential scenario are $2x10^{-4}$ under RME conditions, slightly greater than the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$, and $6x10^{-5}$ under average conditions, within the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$. Noncancer HIs associated with residential exposure to soil and groundwater contaminants are 10 and 1 under RME and average conditions, respectively.

Potential risks from exposure to lead were evaluated using the USEPA UBK Model. Based on the UBK model, lead does not pose a health risk at AOC A9.

It is likely that the baseline risk assessment provided a conservative estimate of the risks at AOC A9. Much of the baseline risk estimate was associated with sporadic detection of single chemicals and frequent repeated contact with these hotspots is unlikely. The chemical posing the greatest risk at AOC A9 was arsenic, which was detected in a single water sample at 4 µg/L, well below the MCL of 50 µg/L. Several other chemicals which contributed to risk were also present in only a single sample.

The SI/RI addendum report reviewed the data obtained during the Phase II SI/RI to evaluate whether modification of the baseline risk assessment was appropriate. Because several VOCs were detected in Phase II groundwater data at concentrations greater than reported in the Phase I data, additional quantitative evaluation was performed under the residential exposure scenario. The re-estimate of cancer risks was somewhat greater (maximum risk of $1x10^{-3}$) than reported in the baseline risk assessment, primarily as a result of higher 1,1-dichloroethene concentrations. However, the SI/RI addendum report stressed that AOC A9 groundwater does not meet MADEP criteria for a domestic water source and that its use as drinking water was unlikely. The potential for domestic use of groundwater is eliminated by incorporation of AOC A9 into the Great

Meadows National Wildlife Refuge. The SI/RI addendum report concluded that natural attenuation processes would likely reduce contaminant concentrations and further reduce the evaluated exposure risks.

6.3.2 Ecological Risk Assessment Summary for AOC A9

A number of chemicals were detected in samples from AOC A9 during the Phase I and II investigations. As a preliminary step, the ecological risk assessment of the SI/RI addendum report compared detected concentrations with background concentrations and with screening level toxicity criteria to assess whether the chemicals were COPCs. Only chemicals of potential ecological concern, as identified through screening, were carried through the ecological risk assessment. Tables 5-1 through 5-6 of the ecological risk assessment (Appendix C of the SI/RI addendum report) provide those comparisons. The tabulated chemicals include the following:

Soil

- metals, organochloride pesticides, VOCs, and SVOCs

Groundwater

- explosives, pesticides, VOCs, SVOCs, chlorinated solvents, and an insect repellent (probably introduced during sampling)

As a result of the screening comparisons, the SI/RI addendum report identified the following chemicals of potential ecological concern at AOC A9:

Soil

- the inorganics arsenic, lead, and thallium

Groundwater

- the VOCs ethylbenzene, toluene, xylene, and 1,1,1-trichloroethane

Potential risks to aquatic ecosystems were evaluated by comparing detected groundwater concentrations to Ambient Water Quality Criteria. The only chemicals exceeding criteria (i.e., ethylbenzene, toluene, and lead) were in samples collected close to the center of the site and not in downgradient monitoring wells closer to the Assebet River; consequently, it appears that the chemicals are not migrating to the river and are not posing a risk to aquatic life. Furthermore, dilution provided by the river would reduce significantly any potential effect. The SI/RI addendum report concluded that chemicals in site-affected groundwater were likely to have an insignificant effect on aquatic life.

Potential risks to terrestrial ecosystems were evaluated by comparison of detected soil concentrations to dietary benchmark values for voles, shrews, and robins. Under the assumptions of the risk assessment, inorganics at AOC A9 may pose risks to small mammals and birds such as voles, shrews, and robins. However, based on the conservative nature of the screening level assessment; the SI/RI addendum report concluded that chemicals in soil affected by the site do not pose a substantial risk to terrestrial receptors.

In summary, the risk assessment concluded that there is no significant risk to ecological receptors at AOC A9.

7.0 DESCRIPTION OF THE NO ACTION ALTERNATIVE

Based on the results of the Baseline Risk Assessments and ecological risk assessments in the SI/RI and SI/RI addendum reports and the technical memoranda, No Action Under CERCLA is necessary to reduce contaminant concentrations or control human health or ecological exposure for AOC A4 and the Management of Migration OUs at AOCs A7 and A9. No five-year site reviews will be performed as part of this remedy.

Although there are no actions associated with the No Action Under CERCLA decision, the Army will continue to monitor groundwater at and conduct five-year site reviews for AOC A7 as part of the remedy for the AOC A7 Source Control OU. *The Final Operations and Maintenance Plan for the Landfill Area of Concern A7* details the groundwater monitoring program. Land use restrictions associated with the source-area remedy will be described in the Environmental Condition of Property report and included in the property transfer documents.

8.0 DOCUMENTATION OF NO SIGNIFICANT CHANGES

The U.S. Army presented a Proposed Plan for AOC A4 and the Management of Migration OUs at AOCs A7 and A9 on June 10, 1997. The Proposed Plan described the Army's plan to pursue No Action Under CERCLA at AOC A4 and the Management of Migration OUs for AOCs A7 and A9. There have been no significant changes made to the No Action Under CERCLA proposal stated in the Proposed Plan.

9.0 STATE ROLE

The Commonwealth of Massachusetts has reviewed the SI/RI, SI/RI addendum, and feasibility study reports, technical memoranda, and Proposed Plan and concurs with the No Action Under CERCLA decision. The Commonwealth has also reviewed these documents to determine if the decision complies with applicable or relevant and appropriate laws and regulations of the Commonwealth. A copy of the Declaration of State Concurrence is attached as Appendix E of this Record of Decision.

FIGURES

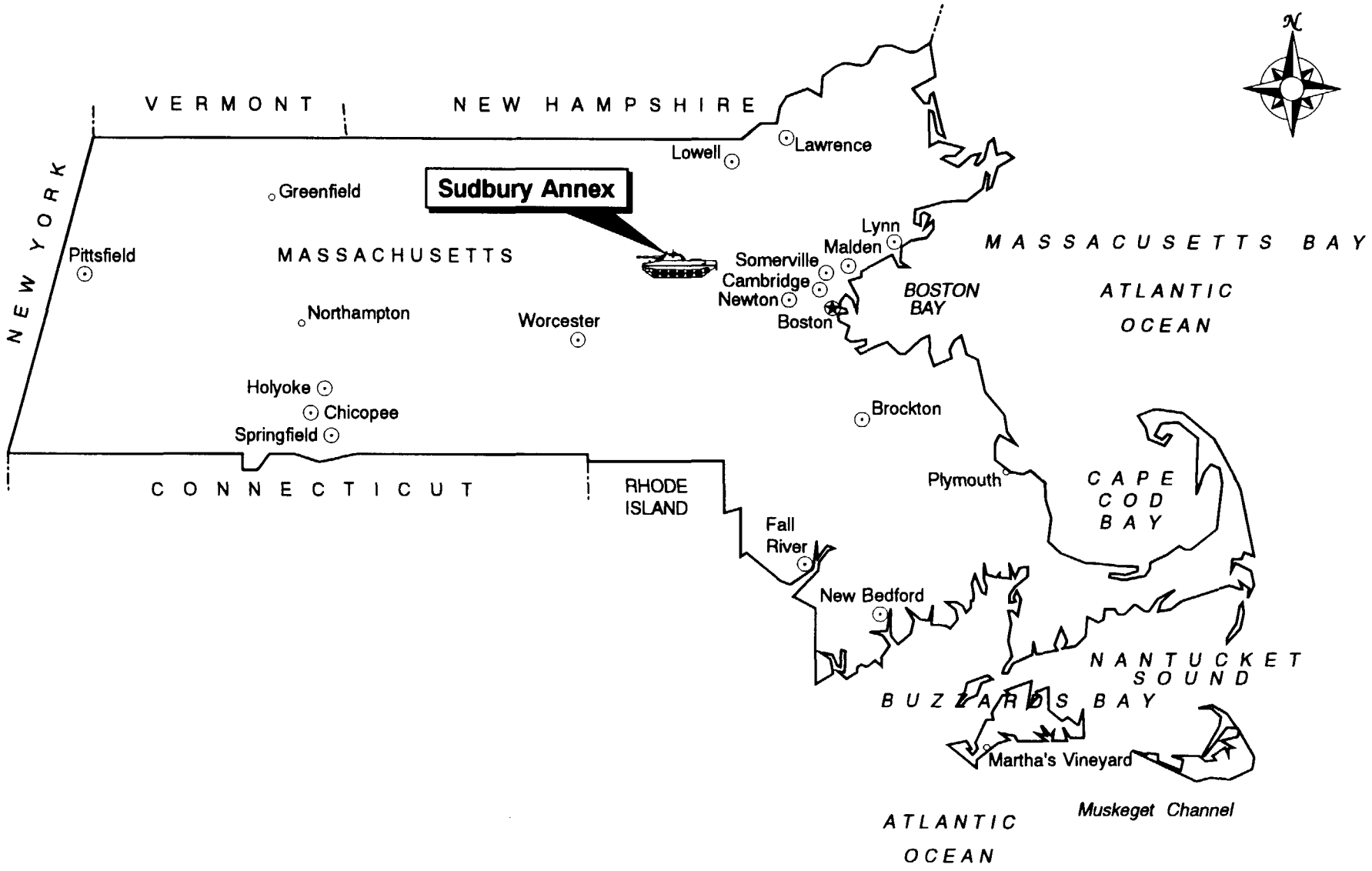
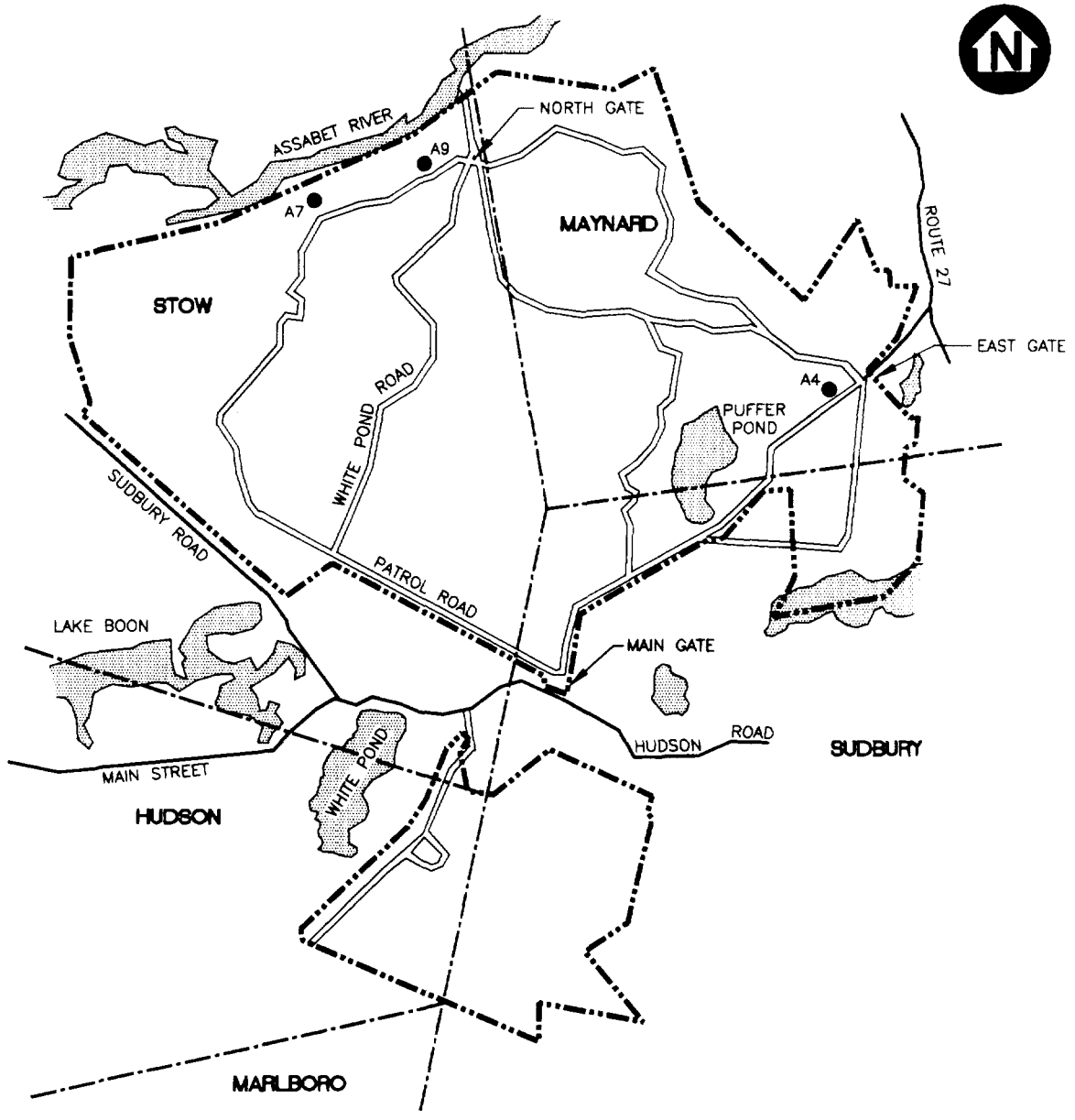


FIGURE 1
U.S. ARMY SUDBURY ANNEX LOCATION MAP

ABB Environmental Services, Inc.

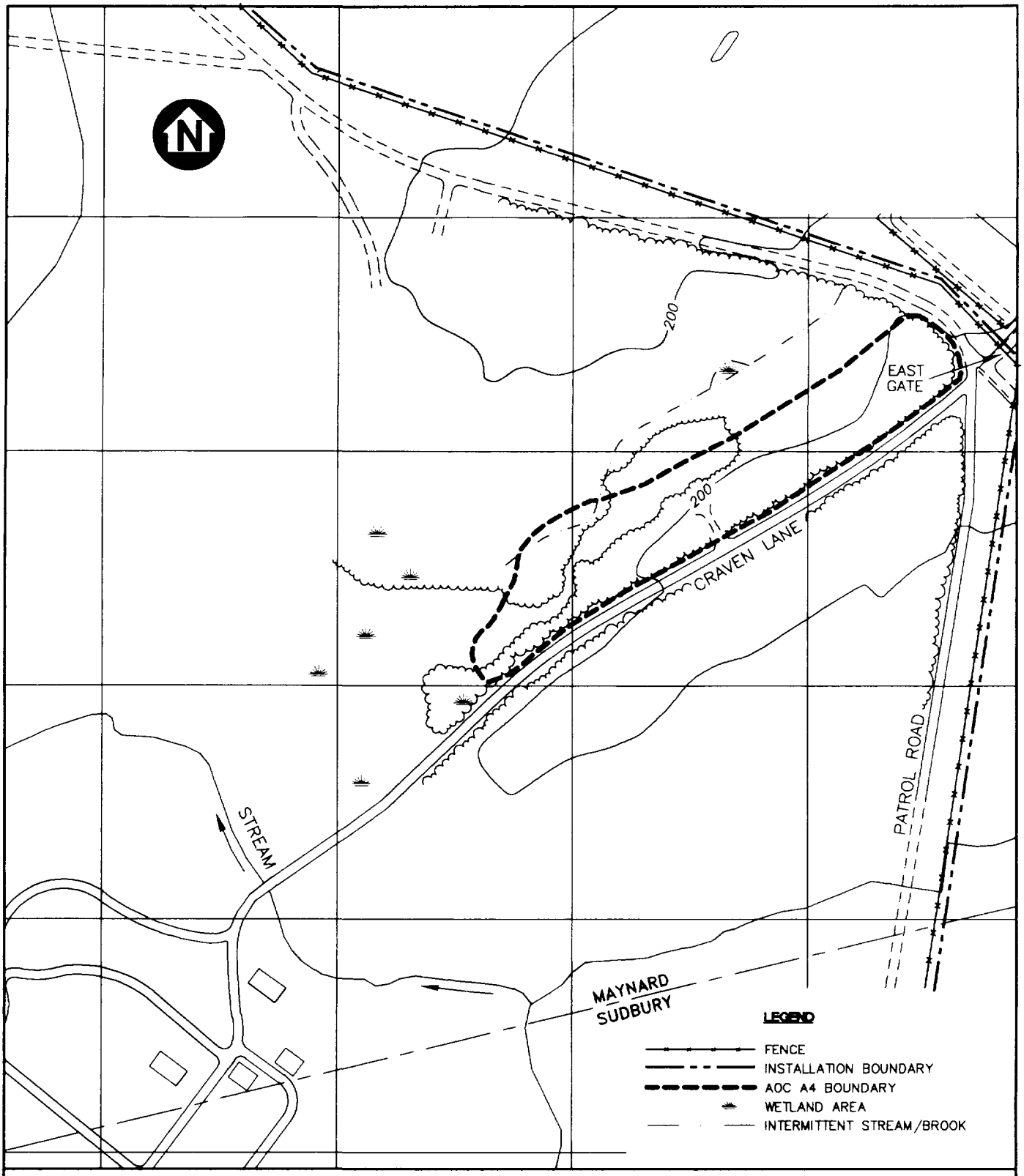
W9708008D



J:\8720-06\8720F052.DWG 8-21-97

FIGURE 2
LOCATION OF AOCs A4, A7, AND A9
U.S. ARMY SUDBURY ANNEX

ABB Environmental Services



J:\8720-01\FIG\8720F054.DWG (1=300) 8/21/97

FIGURE 3
SITE MAP FOR AOC A4
U.S. ARMY SUDBURY ANNEX

ABB Environmental Services

J:\8720-06\8720F053.DWG 8/30/97

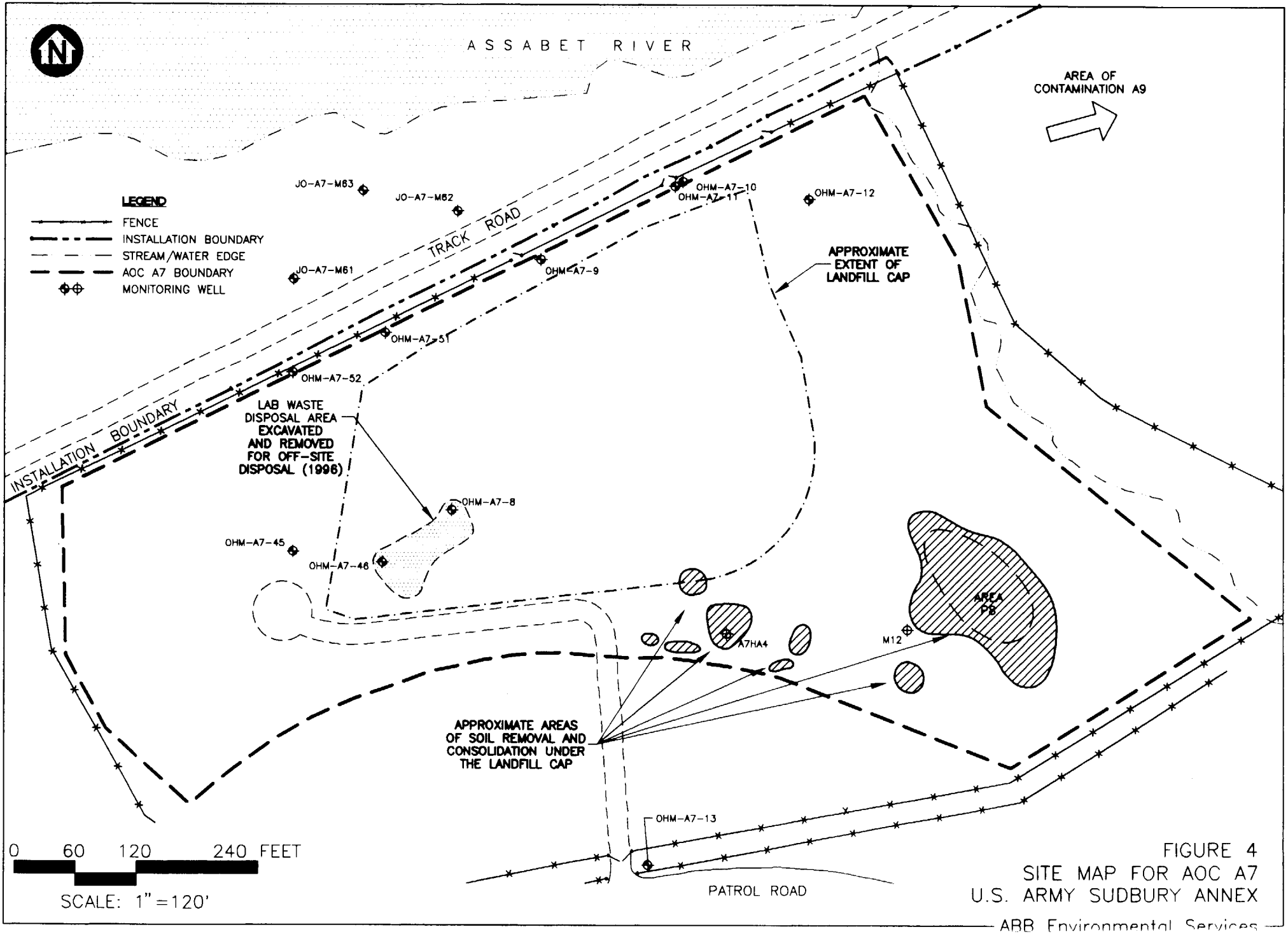
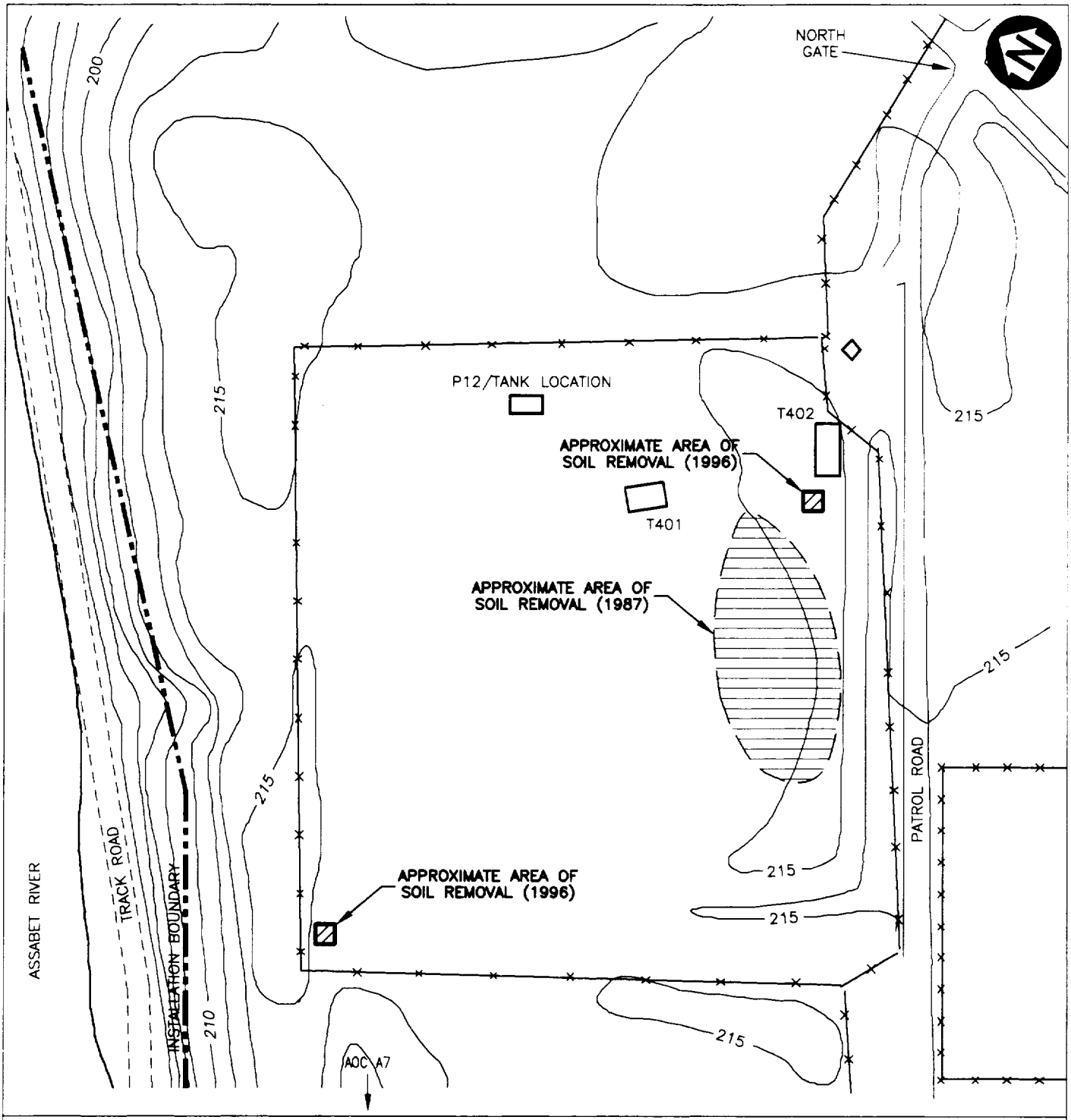


FIGURE 4
SITE MAP FOR AOC A7
U.S. ARMY SUDBURY ANNEX

ABB Environmental Services



FENCE
ELEVATION CONTOUR
INSTALLATION BOUNDARY

0 70 140 280 FEET

Note:

Locations based on review of historical site maps.

FIGURE 5
SITE MAP FOR AOC A9
U.S. ARMY SUDBURY ANNEX

ABB Environmental Services

J:\8720-06\8720F051.DWG 8/24/97

TABLES

TABLE 1
HUMAN HEALTH RISK ASSESSMENT CHEMICALS OF POTENTIAL CONCERN AT AOC A4

U.S. ARMY SUDBURY ANNEX
RECORD OF DECISION AOCs A4, A7, AND A9

	PHASE I			PHASE II		
CHEMICAL	SOIL	SEDIMENT	GROUND-WATER	SOIL	SEDIMENT	GROUND-WATER
VOLATILES						
Acetone	X	X	X		X	
Benzene					X	
Methylene chloride	X	X				
Methyl ethyl ketone					X	
Toluene			X			
alpha-Pinene	X					
SEMIVOLATILES						
Anthracene				X		
Benzo(a)anthracene				X		
Benzo(a)pyrene				X		
Benzo(g,h,i)perylene				X		
bis(2-ethylhexyl)phthalate	X		X	X	X	
Chrysene				X		
Di-n-butylphthalate	X					
Fluoranthene	X			X		
Indeno(1,2,3-c,d)pyrene				X		
Phenanthrene	X			X		
PESTICIDES AND PCB						
DDE	X			X	X	
DDT	X			X		
Heptachlor epoxide			X			
DEET			X			
alpha-Endosulfan	X					
beta-Endosulfan			X			
EXPLOSIVES						
HMX		X				
INORGANICS						
Aluminum	X	X	X	X	X	X
Antimony	X					
Arsenic	X	X	X	X		
Barium	X	X		X	X	
Beryllium	X			X	X	
Cadmium	X			X		
Calcium	X	X	X	X	X	
Chromium	X	X		X		
Cobalt	X	X		X		
Copper	X	X		X	X	
Iron	X	X	X	X		X
Lead	X	X	X	X		X
Magnesium	X	X	X	X		X
Manganese	X	X	X			
Mercury	X		X	X		

TABLE 1
HUMAN HEALTH RISK ASSESSMENT CHEMICALS OF POTENTIAL CONCERN AT AOC A4

U.S. ARMY SUDBURY ANNEX
RECORD OF DECISION AOCs A4, A7, AND A9

	PHASE I			PHASE II		
CHEMICAL	SOIL	SEDIMENT	GROUND-WATER	SOIL	SEDIMENT	GROUND-WATER
Nickel	X	X		X	X	
Potassium	X	X	X	X	X	
Selenium					X	
Sodium			X	X	X	
Vanadium	X	X		X	X	
Zinc	X	X	X	X	X	
MISCELLANEOUS						
TOC	X	X		X	X	
TPH				X		

Notes:

TOC	=	total organic carbon
TPH	=	total petroleum hydrocarbons
DDE	=	2,2-bis(para-chlorophenyl)-1,1-dichloroethene
DDT	=	2,2-bis(para-chlorophenyl)-1,1,1-trichloroethene
DEET	=	N,N-Diethyl-3 methylbenzamide
HMX	=	Cyclotetramethylenetetranitramine

TABLE 2
SUMMARY OF HUMAN HEALTH BASELINE RISK ASSESSMENT FOR AOC A4

U.S. ARMY SUDBURY ANNEX
RECORD OF DECISION FOR AOCS A4, A7, AND A9

Exposure Pathway	Central Tendency		Reasonable Maximum Exposure	
	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
Current Land Use				
Soil				
Adolescent exposure to soil contaminants through ingestion and dermal adsorption	1E-08	0.02	2E-08	0.05
Future Land Use				
Soil				
Residential exposure to soil contaminants through ingestion and dermal adsorption	1E-07	0.1	3E-07	0.3
Sediment				
Residential exposure to soil contaminants through ingestion and dermal adsorption	1E-05	0.07	3E-05	0.1
Groundwater				
Residential exposure to contaminants through groundwater use	2E-05	0.1	6E-05	0.5
Total Future Risk: Soil and Groundwater	2E-05	0.2	6E-05	0.8

TABLE 3
HUMAN HEALTH RISK ASSESSMENT CHEMICALS OF POTENTIAL CONCERN AT AOC A7

U.S. ARMY SUDBURY ANNEX
RECORD OF DECISION AOCS A4, A7, AND A9

	PHASE I			PHASE II		
CHEMICAL	SOIL	SEDIMENT	GROUND-WATER	SOIL	SEDIMENT	GROUND-WATER
VOLATILES						
cis-1,2-Dichlorethylene						X
1,1,1-Trichlorethane						X
1,1,2-Trichloroethane	X					X
1,2-Dichlorethane	X					
Acetone	X	X	X		X	X
Carbon tetrachloride						X
Chlorobenzene	X		X	X		X
Chloroform	X		X	X		X
Chloromethane			X			
Ethylbenzene				X		
Methylene chloride	X	X	X	X		
Methyl ethyl ketone				X	X	
Nonane	X					
Octane	X					
Propylbenzene	X					
Tetrachloroethylene	X		X	X		X
Toluene	X		X			
Trichlorethylene	X					X
Trichlorfluoromethane	X					
Xylenes (total)	X			X		
alpha-Pinene	X					
SEMIVOLATILES						
1,2,3,4-Tetramethylbenzene	X					
1,3,5-Trimethylbenzene	X					
1-Ethyl-2-methylbenzene	X					
2-Methylnaphthalene	X			X		
Anthracene	X					
Benzo(a)anthracene	X					
Benzo(a)pyrene	X					
Benzo(b)fluoranthene	X					
Benzo(g,h,i)perylene	X					
bis (2-ethylhexyl)phthalate	X	X		X		
Chrysene	X					
Di-n-butylphthalate	X	X	X	X		
Fluoranthene	X					
Fluorene	X					
Hexadecanoic acid	X					
Indeno(1,2,3-c,d)pyrene	X					
N,N-bis(2-hydroxyethyl) dodecanamide		X				
N-Nitrosodi-N-propylamine		X				
Naphthalene	X		X			

TABLE 3
HUMAN HEALTH RISK ASSESSMENT CHEMICALS OF POTENTIAL CONCERN AT AOC A7

U.S. ARMY SUDBURY ANNEX
RECORD OF DECISION AOCs A4, A7, AND A9

	PHASE I			PHASE II		
CHEMICAL	SOIL	SEDIMENT	GROUND-WATER	SOIL	SEDIMENT	GROUND-WATER
Octadecanoic acid	X					
Phenanthrene	X			X		
Pyrene	X					
PESTICIDES AND PCB						
DDD	X		X	X		X
DDE	X			X		
DDT	X		X	X		
Dieldrin	X		X	X		
Endrin			X	X		
Endrin aldehyde			X			
Endosulfan sulfate	X					
Heptachlor	X					
Heptachlor epoxide	X		X	X		
Lindane	X		X	X		X
PCB 1242	X					
PCB 1248	X					
PCB 1254	X					
PCB 1260	X			X		
alpha-Benzenehexachloride			X			X
beta-Benzenehexachloride	X					
alpha-Chlordane	X		X	X		
gamma-Chlordane	X			X		
alpha-Endosulfan	X					
beta-Endosulfan	X		X	X		
Demeton-O				X		
Fenthion				X		
Methyl parathion				X		
EXPLOSIVES						
Cyclonite (RDX)	X					
INORGANICS						
Aluminum	X	X	X			
Arsenic	X	X	X	X	X	
Barium	X	X	X	X	X	
Beryllium	X	X		X		
Cadmium	X			X		
Calcium	X	X	X	X	X	
Chromium	X	X	X	X		
Cobalt	X	X		X		
Copper	X	X	X	X		
Iron	X	X	X	X	X	
Lead	X	X	X	X		
Magnesium	X	X	X	X		
Manganese	X	X	X		X	

TABLE 3
HUMAN HEALTH RISK ASSESSMENT CHEMICALS OF POTENTIAL CONCERN AT AOC A7

U.S. ARMY SUDBURY ANNEX
RECORD OF DECISION AOCs A4, A7, AND A9

	PHASE I			PHASE II		
CHEMICAL	SOIL	SEDIMENT	GROUND-WATER	SOIL	SEDIMENT	GROUND-WATER
Mercury	X			X		
Nickel	X	X		X		
Potassium	X	X	X	X		
Selenium					X	
Silver	X			X		
Sodium			X	X		
Vanadium	X	X	X	X		
Zinc	X	X	X	X	X	
MISCELLANEOUS						
Dacthal (DCPA)	X					
Silvex	X					
Phosphate			X	X	X	
Sulfur	X					
TOC	X	X		X	X	

Notes:

DDD = 2,2-bis(para-chlorophenyl)-1,1-dichloroethane
DDE = 2,2-bis(para-chlorophenyl)-1,1-dichloroethene
DDT = 2,2-bis(para-chlorophenyl)-1,1,1-thrichloroethene
TOC = total organic carbon

TABLE 4
SUMMARY OF HUMAN HEALTH BASELINE RISK ASSESSMENT FOR AOC A7

U.S. ARMY SUDBURY ANNEX
RECORD OF DECISION FOR AOCs A4, A7, AND A9

Exposure Pathway	Central Tendency		Reasonable Maximum Exposure	
	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
Current Land Use				
Soil				
Adolescent exposure to soil contaminants through ingestion and dermal adsorption	3E-06	0.09	3E-05	0.9
Future Land Use				
Soil				
Residential exposure to soil contaminants through ingestion and dermal adsorption	4E-05	0.4	3E-04	4
Sediment				
Residential exposure to soil contaminants through ingestion and dermal adsorption	1E-05	0.6	2E-05	0.7
Groundwater				
Residential exposure to contaminants through groundwater use	3E-05	0.2	2E-04	1
Total Future Risk: Soil and Groundwater	7E-05	0.6	5E-04	5

TABLE 5
HUMAN HEALTH RISK ASSESSMENT CHEMICALS OF POTENTIAL CONCERN AT AOC A9

U.S. ARMY SUDBURY ANNEX
RECORD OF DECISION AOCS A4, A7, AND A9

	PHASE I		PHASE II	
CHEMICAL	SOIL	GROUNDWATER	SOIL	GROUNDWATER
VOLATILES				
cis-1,2-Dichlorethylene				
1,1,1-Trichlorethane	X	X	X	X
1,1,2-Trichloroethane				
1,1-Dichlorethylene		X		X
1,2-Dichlorethane				
1,1,3-Trimethylcyclohexane	X			
1,3-Dimethylclohexane	X			
1,4-Dimethycyclohexane	X			
Acetone	X	X		X
Carbon tetrachloride				
Chlorobenzene				
Chloroform				
Chloromethane				
Ethylbenzene	X	X	X	X
Ethylmethyl benzene		X		
Methylene chloride	X	X		
Methyl ethyl ketone	X			
Nonane				
Octane				
Propylbenzene				
Tetrachloroethylene				
Toluene		X	X	X
Trichlorethylene		X		X
Trichlorfluoromethane				
Xylenes (total)	X	X	X	X
alpha-Pinene	X			
SEMIVOLATILES				
1,2,3,4-Tetramethylbenzene		X		
1,2,3-Trimethylbenzene		X		
1,3,5-Trimethylbenzene				
1-Ethyl-2-methylbenzene		X		
1-Methylnaphthalene		X		
2-Methylnaphthalene	X	X	X	X
Anthracene				
Benzo(a)anthracene				
Benzo(a)pyrene	X			
Benzo(b)fluoranthene				
Benzo(g,h,i)perylene				
bis(2-ethylhexyl)phthalate	X	X	X	
Chrysene	X			
Dibenzofuran	X		X	
Di-N-butylphthalate	X	X		

TABLE 5
HUMAN HEALTH RISK ASSESSMENT CHEMICALS OF POTENTIAL CONCERN AT AOC A9

U.S. ARMY SUDBURY ANNEX
RECORD OF DECISION AOCS A4, A7, AND A9

	PHASE I		PHASE II	
CHEMICAL	SOIL	GROUNDWATER	SOIL	GROUNDWATER
Di-N-octylphthalate	X			
Fluoranthene	X		X	
Fluorene	X			
Hexadecanoic acid				
Indeno(1,2,3-c,d)pyrene	X			
N,N-bis(2-hydroxyethyl)dodecanamide				
N-Nitrosodi-N-propylamine				
Naphthalene	X	X	X	X
Octadecanoic acid				
Phenanthrene	X		X	
Pyrene	X			
PESTICIDES AND PCB				
DEET		X		
DDD	X			
DDE	X			
DDT	X			
Endrin aldehyde		X		
Heptachlor epoxide	X	X		
PCB 1254		X		
alpha-Chlordane		X		
beta-Endosulfan		X	X	
EXPLOSIVES				
2,6-Dinitrotoluene	X			
1,3,5-Trinitrobenzene		X		
2,4,6-Trinitrotoluene		X		
3-Nitrotoluene		X		
INORGANICS				
Aluminum	X		X	X
Antimony				
Arsenic	X	X	X	X
Barium	X		X	
Beryllium	X		X	
Cadmium	X			
Calcium	X	X	X	X
Chromium	X	X	X	
Cobalt	X		X	
Copper	X	X	X	
Iron	X	X	X	X
Lead	X	X	X	X
Magnesium	X	X	X	X
Manganese	X	X		X
Mercury	X			

TABLE 5
HUMAN HEALTH RISK ASSESSMENT CHEMICALS OF POTENTIAL CONCERN AT AOC A9

U.S. ARMY SUDBURY ANNEX
RECORD OF DECISION AOCS A4, A7, AND A9

	PHASE I		PHASE II	
CHEMICAL	SOIL	GROUNDWATER	SOIL	GROUNDWATER
Nickel	X		X	
Potassium	X	X	X	X
Selenium			X	
Sodium		X	X	X
Thallium			X	
Vanadium	X		X	
Zinc	X	X	X	X
MISCELLANEOUS				
Phosphate		X		
TOC	X		X	

Notes:

DDD = 2,2-bis(para-chlorophenyl)-1,1-dichloroethane
DDE = 2,2-bis(para-chlorophenyl)-1,1-dichloroethene
DDT = 2,2-bis(para-chlorophenyl)-1,1,1-thrichloroethene
DEET = N,N-Diethyl-3 methylbenzamide
TOC = total organic carbon

TABLE 6
SUMMARY OF HUMAN HEALTH BASELINE RISK ASSESSMENT FOR AOC A9

U.S. ARMY SUDBURY ANNEX
RECORD OF DECISION FOR AOCs A4, A7, AND A9

Exposure Pathway	Central Tendency		Reasonable Maximum Exposure	
	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
Current Land Use				
Soil				
Adolescent exposure to soil contaminants through ingestion and dermal adsorption	2E-06	0.03	7E-06	0.1
Future Land Use				
Soil				
Residential exposure to soil contaminants through ingestion and dermal adsorption	3E-05	0.2	1E-04	0.6
Groundwater				
Residential exposure to contaminants through groundwater use	3E-05	1	2E-04	10
Total Future Risk: Soil and Groundwater	6E-05	1	2E-04	10

RESPONSIVENESS SUMMARY

APPENDIX C

This Responsiveness Summary has been prepared to meet the requirements of Sections 113(k)(2)(B)(iv) and 117(b) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), which requires response to "significant comments, criticisms, and new data submitted in written or oral presentations" on a proposed plan for remedial action. The purpose of this Responsiveness Summary is to document Army responses to questions and comments expressed during the public comment period by the public, potentially responsible parties, and governmental bodies in written and oral comments regarding the Proposed Plan for Area of Contamination (AOC) A4 and the management of migration operable units (OUs) for AOCs A7 and A9 at the U.S. Army Sudbury Annex.

The Army held a 30-day public comment period from June 9 through July 8, 1997, to provide an opportunity for interested parties to comment on the site investigation/remedial investigation (SI/RI) reports, feasibility study, technical memoranda, Proposed Plan, and other documents developed to address contamination at AOCs A4, A7, and A9 at the U.S. Army Sudbury Annex. The SI/RI characterized soil, sediment, groundwater, and surface water contamination at AOCs A4, A7, and A9 and evaluated potential human health and ecological risks. In addition, data gap activities were performed to fill in data gaps identified in the SI/RI and SI/RI addendum reports. Based on the results of the SI/RI, SI/RI addendum, and technical memoranda summarizing data gap activities, the Army concluded that AOC A4 and management of migration OUs at AOCs A7 and A9 did not pose unacceptable risks to human health or the environment. The Army identified its proposal for No Action Under CERCLA in the Proposed Plan issued on June 9, 1997.

All documents considered in arriving at the No Action Under CERCLA decision were placed in the Administrative Record for review. The Administrative Record contains all supporting documentation considered by the Army in choosing the remedy for AOCs A4, A7, and A9. The Administrative Record is available for public review at the U.S. Army Sudbury Annex BRAC Environmental Office, and at the Sudbury Town Hall, Sudbury, Massachusetts. An index to the Administrative Record is available at the U.S. Environmental Protection Agency (USEPA) Records Center, 90 Canal Street, Boston, Massachusetts and is provided as Appendix D to this Record of Decision.

This Responsiveness Summary is organized into the following sections:

I. **Statement of Why the Army Recommended No Further Action**-This section briefly states why the Army recommended No Action Under CERCLA.

II. **Background on Community Involvement**-This section provides a brief history of community involvement and Army initiatives in informing the community of site activities.

III. **Summary of Comments Received During the Public Comment Period and Army Responses**-This section provides Army responses to oral and written comments received from the public during the public comment period. A transcript of the public meeting consisting of all comments received during this meeting and copies of written comments are also provided in Attachment C of this Responsiveness Summary.

****

I. STATEMENT OF WHY THE ARMY RECOMMENDED NO ACTION UNDER CERCLA

The Army recommended No Action Under CERCLA because the risk assessments of the SI/RI indicate no unacceptable risks to human health under the evaluated exposure scenario of future residential development or to the environment. Actual future use of AOCs A4, A7, and A9 will be as part of the Great Meadows National Wildlife Refuge, and future residential exposure will not occur. Because of this potential risks would be lower than those estimated in the risk assessment.

II. BACKGROUND ON COMMUNITY INVOLVEMENT

The Army has held quarterly public Technical Review Committee (TRC) meetings, issued newsletters and press releases, and held a number of public meetings to keep the community and other interested parties informed of activities at the Annex.

In April 1992, the Army released, following public review, a community relations plan that outlined a program to address community concerns and keep citizens informed about and involved in remedial activities at the Annex. As part of this plan, the Army established a TRC, which first met May 13, 1991. The TRC, as required by SARA Section 211 and Army Regulation 200-1, included representatives from USEPA, U.S. Army Environmental Center (USAEC), Fort Devens, Massachusetts Department of Environmental Protection (MADEP), U.S. Army Corps of Engineers (USACE), local officials, and the community. The TRC generally met quarterly to review and provide technical comments on schedules, work plans, work products, and proposed activities for the study areas at the Annex. The SI/RI, SI/RI addendum, and feasibility study reports, technical memoranda, Proposed Plan, and other related support documents were submitted to the TRC for their review and comment.

During the week of June 9, 1997, the Army published a public notice announcing the Proposed Plan, public informational meeting, and public hearing in the Sudbury Town Crier, the Middlesex News, the Marlborough-Hudson Enterprise, the Stow Villager, and the Maynard Beacon. The Army also made the Proposed Plan available to the public at the information repositories at the

libraries in Stow, Hudson, Sudbury, and Maynard, and at Devens Reserve Forces Training Area (RFTA).

From June 9 through July 8, 1976, the Army held a 30-day public comment period to accept public comments on the Proposed Plan. On June 10, 1997, the Army held an informal public hearing at the Stow Town Building, in Stow, Massachusetts to discuss the Proposed Plan and to accept verbal or written comments from the public. Verbal comments were received and subsequently confirmed in writing. Attachment C contains a transcript of the public hearing.

All supporting documentation for the No Action Under CERCLA decision for AOC A4 and Management of Migration OUs at AOCs A7 and A9 is contained in the Administrative Record. The Administrative Record is a collection of all the documents considered by the Army in making the No Action Under CERCLA decision. On March 20, 1994, the Army made the Administrative Record available for public review at the U.S. Army Sudbury Annex BRAC Environmental Office, and at the Sudbury Town Hall, Sudbury, Massachusetts.

III. SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND ARMY RESPONSES

The Army received verbal comments from one citizen representative of the Four Town Focus during the public hearing (see Attachment C). These comments were subsequently confirmed in writing in a letter dated June 23, 1997 from Cambridge Environmental, Inc. (Attachment A). Because of the similarities of the verbal and written comments, the Army has prepared written responses for only the written comments. These responses are contained in Attachment B.

ATTACHMENT A - WRITTEN COMMENTS

Cambridge Environmental Inc
58 Charles Street Cambridge, Massachusetts 02141
617·225·0810 617·225·0813 FAX

June 23, 1997

Thomas Strunk
Sudbury Annex BEC
43 Buena Vista Street
P12 Box 224
Devens, MA 01433

Dear Mr. Strunk:

In response to the public meeting held on June 10, 1997, Four Town Focus (Focus) would like to offer the following additional comments concerning the proposed determination of no further action for site A7. These comments are intended to augment (and not replace) the comments submitted on June 6, 1997. At this time, Focus is not convinced that all necessary steps have been taken to ensure that contamination from this landfill will not cause a threat to human health and/or the environment.

1. The potential risk to the environment from contaminated groundwater at site A7 has not been fully evaluated. The Ambient Water Quality Criteria (AWQC) and/or the Maximum Contaminant Levels (MCLs) for several VOCs, metals, and lindane have been exceeded by concentrations measured in groundwater. In the most recent sampling rounds, the pesticide lindane, for example, has been detected at concentrations 14 times the MCL on site and 1.6 times the MCL down-gradient of the site.

   The Remedial (Data-Gap) Investigation reports that adsorption of chemicals by sediments and dilution of contaminants by the river would reduce contaminant concentrations in the surface water and thus it is unlikely that site A7 may pose a significant ecological risk. As stated in our letter dated June 6, 1997, sampling in the Assabet River would confirm that contaminant migration is not posing a risk to environmental receptors. A quantitative justification of the adsorption and dilution of all contaminants that exceed AWQC should also be provided to further demonstrate your position of no significant risk. Further, if these contaminants are discharging to the Assabet, and have in the past, is there a possibility that these chemicals have accumulated in the sediments? Again, Focus would like a quantitative analysis of this matter.

2. The historical groundwater data presented in Table 1 shows that manganese exceeds the federal MCL in all analyzed samples. Other metals including lead, iron, and aluminum also exceeded the MCLs. Given these exceedences, why were the metals not sampled in

subsequent groundwater testing? The potential risk to human health and the environment from metals in the groundwater have not been fully evaluated.

3. Groundwater was sampled between the Annex and the Assabet River. Who owns this property? What zoning exists on this property? Is residential development feasible? Since the groundwater sampled in this area has been shown to be unfit for human consumption, residential development should be restricted. Are any measures being taken to ensure that residential development will not occur in the future on this property?

4. Impacts to the bedrock aquifer have not been fully investigated. One bedrock well, OHM-A7-11, was sampled in earlier rounds only. Incidently, Figure 3 incorrectly depicts the screen elevation for this well. Dichloromethane and manganese concentrations exceeded the MCLs. Thus, potential off-site migration of these contaminants should be considered, especially if there are homes using private drinking water wells down-gradient of the site (see comment #5). Further, OHM-A7-11 is located northeast of the contaminant plume and would not capture contaminant migration from this disposal area.

Additional bedrock wells should be installed and sampled to determine if contaminated groundwater is reaching the bedrock aquifer that may then migrate off-site. The Data-Gap Investigation report states that a planned well to be screened at the top of bedrock was not installed because bedrock was encountered at 10 feet below ground surface. Please elaborate on this point. Where was this proposed well? Why could it not be installed? Why wasn't a well considered for the bedrock itself? Is there sufficient information to determine flow in the bedrock aquifer? During the public meeting, the ABB consultant noted that the bedrock aquifer could not be influenced by contamination located above this aquifer due to pressure pushing the groundwater up. What data were collected to support this claim?

5. Focus would like more information concerning the homes, if any, located down-gradient of site A7, across the Assabet River. Where does their water come from (groundwater wells or public water)? If private wells are being used, is public water available for these homes and were any of these wells sampled? Is the bedrock aquifer being used as the water source? If no homes currently exist across from A7, is the land zoned for residential development? If so, what measures are being taken to ensure that future private wells will be safe for human consumption? We note that Massachusetts regulations call for the protection of groundwater in areas where a public water supply line is not available (within 500 feet).

Cambridge Environmental Inc
58 Charles Street Cambridge, Massachusetts 02141
617-225-0810 FAX:617-225-0813 E-mail:camenv58@aol.com

Focus opposes the proposed no further action for site A7, the Old Gravel Pit Landfill. Additional sampling both in the bedrock aquifer and the Assabet River and suitable justifications to the questions posed concerning site A7 are requested at this time. Focus awaits your response to these and previously submitted comments either formally or informally, by June 27, 1997. This deadline is requested to provide Focus with ample time prior to the comment submission deadline of July 8, 1997 to elicit additional support if needed. We see no need to involve our Federal and State Senators and Representatives at this time if a reasonable solution can be agreed upon amongst the TRC members.

Thank you for your consideration.

Sincerely,

Kerry L. Bartlett
Associate Scientist

Stephen G. Zemba
Senior Engineer

cc. Stow Board of Health
Robert Lim, U.S. EPA
Scott Greene, MADEP

Cambridge Environmental Inc
58 Charles Street Cambridge, Massachusetts 02141
617-225-0810 FAX 617-225-0813 E-mail: camenv58@aol.com

ATTACHMENT B - RESPONSES TO PUBLIC COMMENTS

RESPONSE TO COMMENTS BY
CAMBRIDGE ENVIRONMENTAL, INC.
PREPARED ON BEHALF OF FOUR TOWN FOCUS
DATED JUNE 23, 1997
CONCERNING THE PROPOSED DETERMINATION OF NO FURTHER ACTION AT AREA OF CONTAMINATION A7

Comment # Comment/Response

1. Comment: The potential risk to the environment from contaminated groundwater at site A7 has not been fully evaluated. The Ambient Water Quality Criteria (AWQC) and/or the Maximum Contaminant Levels (MCLs) for several VOCs, metals, and lindane have been exceeded by concentrations measured in groundwater. In the most recent sampling rounds, the pesticide lindane, for example, has been detected at concentrations 14 times the MCL on site and 1.6 times the MCL down-gradient of the site.

   The remedial (Data-Gap) Investigation reports that adsorption of chemicals by sediments and dilution of contaminants by the river would reduce contaminant concentrations in the surface water and thus it is unlikely that site A7 may pose a significant ecological risk. As stated in our letter dated June 6, 1997, sampling in the Assabet River would confirm that contaminant migration is not posing a risk to environmental receptors. A quantitative justification of the adsorption and dilution of all contaminants that exceed AWQC should also be provided to further demonstrate your position of no significant risk. Further, if these contaminants are discharging to the Assabet, and have in the past, is there a possibility that these chemicals have accumulated in the sediments? Again, Focus would like a quantitative analysis of this matter.

   Response: The RI Data-Gap investigations were conducted in accordance with an approved Work Plan that was specifically intended and designed to address gaps in the RI data-base (ABB-ES, 1996c). The draft Work Plan for the Data-Gap investigations was prepared and distributed for public comment in March 1996 (ABB-ES, 1996b), and recommendations and comments on that document were considered prior to conducting that work.

   Please note that MCLs are standards developed to protect human receptors, and AWQCs are surface-water guidelines for evaluating risks to ecological receptors.

   In downgradient monitoring well JO-A7-M61, the pesticide lindane was detected at a maximum concentration of 0.326 µg/L. However, in monitoring well JO-A7-M63, which is farther downgradient and is the well closest to the river (ABB-ES, 1997, Figures 5 and 6), the maximum detected concentration of lindane was 0.0979 µg/L. Several rounds of sampling in these wells indicate that lindane concentrations are being attenuated significantly between the source area and the Assabet River. The downgradient decrease

in lindane concentrations, as measured in groundwater samples collected in October 1996, is shown on Attachment 1-A. The relationship between lindane concentration and distance from the source area is calculated as

$$y = 3.6014e^{-0.01x}$$

where "y" (µg/L) = concentration of lindane at distance "x" (feet) from the source area.

At the Assabet River (410 feet from the source area), a lindane concentration of approximately 0.06 µg/L would be expected. This is below the AWQC of 0.08 µg/L.

Typically, a dilution/attenuation factor of 10 is conservatively assumed for groundwater discharging to surface water (i.e., the concentration of a contaminant in groundwater is assumed to be 10 times greater than in the surface-water body into which the groundwater discharges.) For example, a factor of 10 was applied to surface-water standards in deriving the GW-3 groundwater standards for the Massachusetts Contingency Plan (310 CMR 40) (refer to MADEP, 1994). The GW-3 groundwater standards are designed to be protective of ecological receptors in downgradient surface-water bodies. For AOC A7, a dilution factor of 10 from the groundwater concentration would represent a lindane concentration of 0.006 µg/L in the Assabet River.

Actual dilution at AOC A7, where the plume of contaminated groundwater is discharging at a rate of 3.78×10^{-3} cubic feet per second (ft^3/sec) (OHM, 1995b, Appendix C) into a river with an average annual flow at the Maynard gauging station, between 1941 and 1996, of 189 ft^3/sec (U.S. Geological Survey, 1996), would be substantially greater and would be expressed as:

$$D = \left[\frac{V_1 + V_2}{V_1}\right]$$

where

D = Dilution factor
V_1 = Flow of groundwater plume
V_2 = Flow of Assabet River

Using the flow rates for groundwater and the Assabet River, the dilution factor is calculated as:

$$D = \left[\frac{3.78 \times 10^{-3}\ ft^3/sec + 189\ ft^3/sec}{\left(3.78 \times 10^{-3}\ ft^3/sec\right)} \right] = 50{,}000$$

This calculated dilution factor is 5,000 times greater than the arbitrary factor of 10 on which the GW-3 standards are based. The concentration of lindane in the Assabet River, based on actual site and local conditions would be:

$$C_2 = \frac{C_1}{D}$$

where

C_1 = Lindane concentration in groundwater
C_2 = Lindane concentration in Assabet River
D = Dilution factor

$$C_2 = \frac{0.06\ \mu g/L}{5 \times 10^4} = 1.2 \times 10^{-6}\ \mu g/L$$

Regardless of which dilution factor is applied, the lindane concentration in the Assabet River would be well below the AWQC.

The VOCs trichloroethylene and tetrachloroethene were detected above MCLs in two of the three monitoring wells located downgradient of the facility (JO-A7-M61 and JO-A7-M63). However, the maximum concentration of trichloroethylene (15 µg/L) is below the Lowest Observed Effects Level (LOEL) (21,900 µg/L) published by the U.S. Environmental Protection Agency (USEPA, 1991) and the GW-3 groundwater standard of the Massachusetts Contingency Plan (20,000 µg/L). The maximum concentration of tetrachloroethene (14 µg/L) is below its LOEL (840 µg/L) and is below the GW-3

standard (5,000 µg/L). Even without allowing for the effects of dilution and volatilization in the river, these concentrations would not be considered a problem for aquatic organisms. No other VOCs were detected above AWQCs in groundwater near the river.

Concentrations of metals in groundwater are addressed in response to Comment #2.

In May 1992 the Army collected nine sediment samples from the Assabet River at locations upstream, downstream, and adjacent to AOC A7. Lindane and trichloroethylene were not detected in any of the samples. Tetrachloroethene was detected only at sampling location FWISD15, at a concentration of 0.016 µg/g. Sediment sampling location FWISD15 was in the Assabet River near the mouth of the unnamed stream at the downstream boundary of AOC A7 (OHM, 1994). That concentration is substantially lower than the applicable apparent effects threshold (AET) for aquatic organisms of >8.1 µg/g. (This specific AET is derived from Barrick and Beller's [1989] reported AET of >22 µg per gram of organic carbon, corrected for the detected organic carbon content of 37% in the Assabet River sediment sample.) These results indicate that partitioning of the chemicals of concern from groundwater into sediments of the Assabet River does not present a potential risk to aquatic organisms.

In 1996, the Army implemented remedial measures at AOC A7 in accordance with the Record of Decision for the "Source-Control" Operable Unit. These measures included removal and off-site disposal of laboratory wastes excavated from the identified source area and design and construction of an extensive landfill cap. The principal objective of these measures has been to reduce the migration of contaminants, and it is expected that contaminant concentrations in groundwater will decline. As part of the operation and maintenance provisions of the Record of Decision, the Army is committed to conduct long-term monitoring of groundwater quality in wells installed at the landfill and between the landfill and the Assabet River.

2. Comment: The historical groundwater data presented in Table 1 shows that manganese exceeds the federal MCL in all analyzed samples. Other metals including lead, iron, and aluminum also exceeded the MCLs. Given these exceedances, why were the metals not sampled in subsequent groundwater testing? The potential risk to human health and the environment from metals in the groundwater have not been fully evaluated.

RESPONSE TO COMMENTS BY
CAMBRIDGE ENVIRONMENTAL, INC.
PREPARED ON BEHALF OF FOUR TOWN FOCUS
DATED JUNE 23, 1997
CONCERNING THE PROPOSED DETERMINATION OF NO FURTHER ACTION AT AREA OF CONTAMINATION A7

Comment # Comment/Response

Response: The Army has developed an extensive analytical data-base for metals in groundwater at AOC A7 (ABB-ES, 1997).

The MCLs for aluminum (200 µg/L), iron (300 µg/L), and manganese (50 µg/L) are actually secondary MCLs (USEPA, 1996). Secondary MCLs are unenforceable federal drinking-water guidelines that are based on factors such as taste, odor, and color. They are not health-related. Furthermore, because there are no current or potential future human groundwater receptors at AOC A7 or on the land located downgradient from the facility (refer to responses to Comments #3, #4, and #5), there are no human-health risks from ingestion of groundwater.

Concentrations of aluminum, iron, and manganese commonly exceed secondary MCLs in groundwater in New England. These metals were also detected above the secondary MCLs upgradient from the site, in well OHM-A7-13. The observed concentrations of these metals at AOC A7 do not represent site-related contamination.

The baseline risk assessment for AOC A7 was prepared before the decision was made to transfer Sudbury Annex to the Department of Interior and manage it as part of the Great Meadows National Wildlife Refuge. Consequently, the risk assessment was based on the earlier assumption that there would be future human ingestion of groundwater at the site. Even with that restrictive assumption, the baseline risk assessment concluded that lead in groundwater at AOC A7 does not pose a risk (OHM, 1994 and 1995a).

The maximum concentration of lead detected in groundwater in wells along the downgradient perimeter fence at AOC A7 was 4.57 µg/L. This is below the MCL of 15 µg/L for groundwater but is slightly greater than the AWQC for surface water (3.2 µg/L, at 100 mg/L hardness as $CaCO_3$). Attenuation between the perimeter fence and the river, plus dilution in the river as calculated in response to Comment #1, would reduce the lead concentrations to levels far below the AWQC.

The maximum concentration of lead detected in the sediment samples collected in 1992 from the Assabet River was 8.2 µg/g, at sampling location FWISD15 (adjacent to AOC A7). The low effects range for lead in sediment is 35 µg/g (Long and Morgan, 1990).

These data indicate that lead in groundwater at AOC A7 does not pose a risk to aquatic organisms in the Assabet River.

Based on the considerations summarized above, groundwater samples from the long-term groundwater monitoring program will not be analyzed for metals.

3. Comment: Groundwater was sampled between the Annex and the Assabet River. Who owns this property? What zoning exists on this property? Is residential development feasible? Since the groundwater sampled in this area has been shown to be unfit for human consumption, residential development should be restricted. Are any measures being taken to ensure that residential development will not occur in the future on this property?

Response: Records of land ownership are available at the Assessors' Office in Stow. The subject property is undevelopable for residential use because of its zoning classification (Conservation-Recreation), wetland restrictions, and proximity to the Assabet River. Further use restrictions are not necessary.

4. Comment: Impacts to the bedrock aquifer have not been fully investigated. One bedrock well, OHM-A7-11, was sampled in earlier rounds only. Incidentally, Figure 3 incorrectly depicts the screen elevation for this well. Dichloromethane and manganese concentrations exceeded the MCLs. Thus, potential off-site migration of these contaminants should be considered, especially if there are homes using private drinking water wells down-gradient of the site (see comment #5). Further, OHM-A7-11 is located northeast of the contaminant plume and would not capture contaminant migration from this disposal area.

Additional bedrock wells should be installed and sampled to determine if contaminated groundwater is reaching the bedrock aquifer that may then migrate off-site. The Data-Gap Investigation report states that a planned well to be screened at the top of bedrock was not installed because bedrock was encountered at 10 feet below ground surface. Please elaborate on this point. Where was this proposed well? Why should it not be installed? Why wasn't a well considered for the bedrock itself? Is there sufficient information to determine flow in the bedrock aquifer? During the public meeting, the ABB consultant noted that the bedrock aquifer could not be influenced by contamination

located above this aquifer due to pressure pushing the groundwater up. What data were collected to support this claim?

Response: The correct elevations of the well screen in monitoring well OHM-A7-11 are 160.7 feet msl (top of screen) and 150.7 feet msl (bottom of screen). Figure 3 of the AOC A7 Technical Memorandum (ABB-ES, 1997) has been revised to correctly depict the screen elevations for this well.

Sudbury Annex is scheduled to be transferred later this year to the U.S. Department of Interior and to become part of the Great Meadows National Wildlife Refuge. In addition, there are no homes located downgradient from AOC A7 (see response to Comment #5), and natural conditions and regulatory restrictions will prevent future residential development (see response to Comment #3). Therefore, there are no current or potential future human receptors of analytes in groundwater, there are no human-health risks from ingestion of groundwater, and groundwater standards designed to protect human health (MCLs) do not apply.

The potential for groundwater contaminant migration from AOC A7 has been considered for all contaminants. Analyte concentrations in groundwater are likely to attenuate between well OHM-A7-11 and the river. However, even if groundwater were to discharge to the Assabet River with dichloromethane at the same concentration as detected in monitoring well OHM-A7-11 (8.4 µg/L), that concentration is far below the LOEL of 11,000 µg/L for halomethanes (USEPA, 1986).

The maximum concentration of manganese detected in monitoring well OHM-A7-11 was 114 µg/L, which is less than the maximum concentration detected in well OHM-A7-13 (270 µg/L), upgradient of AOC A7. The presence of manganese in groundwater is not related to activities or conditions at the site.

Major source-control measures taken by the Army at AOC A7 in 1996, including source removal and capping of the landfill, were designed to further reduce analyte concentrations in groundwater.

RESPONSE TO COMMENTS BY
CAMBRIDGE ENVIRONMENTAL, INC.
PREPARED ON BEHALF OF FOUR TOWN FOCUS
DATED JUNE 23, 1997
CONCERNING THE PROPOSED DETERMINATION OF NO FURTHER ACTION AT AREA OF CONTAMINATION A7

Comment #	Comment/Response

The Army does not concur that additional bedrock wells are necessary at AOC A7. There is a strong upward groundwater flow potential (i.e., an upward vertical hydraulic gradient) near the river, because the Assabet River is a major regional groundwater discharge location. Hydrologically, this manifests itself as higher water levels (heads) in deep wells than in collocated shallow wells. In the downgradient area of AOC A7, the upward gradient is dramatically verified by the well pair OHM-A7-10 / OHM-A7-11. In the shallow well (OHM-A7-10), the head was measured at approximately 2.3 feet below ground surface (bgs), whereas in the deep bedrock well (OHM-A7-11), groundwater flows out of the well under artesian conditions, with a head at least 2 feet above ground.

The Army concurs that well OHM-A7-11 is not directly downgradient of the lab waste disposal area. Installation of the well pair JO-A7-M63 / JO-A7-M64 was proposed as a data-gap activity to address the concern that contaminants potentially being transported by groundwater flowing from bedrock into the surficial aquifer between the perimeter fence and the river had not been characterized. Monitoring well JO-A7-M64 was to be installed within the surficial aquifer, at the top of rock or at a depth of 50 feet bgs, whichever was found to be shallower. It was to be paired with (i.e., to be located within 10 feet of) water-table monitoring well JO-A7-M63. Together, these wells were designed to assess groundwater quality at the water table and deeper within the surficial aquifer. The requirements and rationale are presented in the approved Task Order Work Plan (ABB-ES, 1996c, Section 3.2.3.1, Figure 3-2, and Table 3-2).

In the boring for monitoring well JO-A7-M63, the water table was encountered at 1.5 feet bgs, and bedrock was encountered at 10 feet bgs. A standard 10-foot well-screen could not be used in well JO-A7-M63 under these conditions (ABB-ES, 1996c, p. 3-9; ABB-ES, 1995, pp. 4-18 - 4-21). ABB-ES installed a 5-foot screen from 2 feet bgs to 7 feet bgs and placed the filter pack from 1.5 feet bgs to the bottom of the borehole at 10 feet bgs. Hence, groundwater data obtained from monitoring well JO-A7-M63 are sufficient to represent the entire saturated thickness of the surficial aquifer, and well JO-A7-M64 was not needed.

Downward gradients beneath the landfill at AOC A7 may have introduced contaminants into the underlying bedrock, but as the groundwater flows toward the river it moves upward into the surficial aquifer. Several rounds of groundwater samples in water-table

wells and stratigraphically deeper wells near the perimeter of the facility have adequately characterized the downgradient groundwater quality.

5. Comment: Focus would like more information concerning the homes, if any, located down-gradient of site A7, across the Assabet River. Where does their water come from (groundwater wells or public water)? If private wells are being used, is public water available for these homes and were any of these wells sampled? Is the bedrock aquifer being used as the water source? If no homes currently exist across from A7, is the land zoned for residential development? If so, what measures are being taken to ensure that future private wells will be safe for human consumption? We note that Massachusetts regulations call for the protection of groundwater in areas where a public water supply line is not available (within 500 feet).

   Response: There are no homes located downgradient from AOC A7. Areas that are across the Assabet River from AOC A7 are not downgradient from AOC A7. The Assabet River is a regional hydraulic boundary, with surface water and groundwater discharging into it, from both sides, along its entire length. Natural hydraulic gradients prevent groundwater from flowing beneath the river, from one side of the river to the other. This well-known hydrogeologic principal is shown conceptually in the accompanying illustration (Attachment 5-A) and is discussed, for example, by Freeze and Cherry (1979, pp. 195-196). For discussions of general groundwater flow characteristics at Sudbury Annex, refer to HydroGeoLogic (1994), OHM (1995b, Appendix C), and ABB-ES (1996a, Section 2.2.6).

References:

ABB Environmental Services, Inc. (ABB-ES), 1995. Final Project Operations Plan, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts"; Portland, ME; prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, MD; April.

ABB Environmental Services, Inc. (ABB-ES), 1996a. "Final Supplemental Site Investigation Report for Study Areas A3, A5, A10, A11, P5, P6, P9, P16, P23, P27, P28, P38, P41, P45, and P54, U.S. Army Sudbury Training Annex, Middlesex County, Massachusetts;

Wakefield, MA; prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD; October.

ABB Environmental Services, Inc. (ABB-ES), 1996b. "Draft Task Order Work Plan, Remedial (Data-Gap) Investigations of Area of Contamination A4 and Areas of Contamination A7/A9 (Management-of-Migration Operable Unit) and Supplemental Site Investigations of Selected Study Areas, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts"; Portland, ME; prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD; March.

ABB Environmental Services, Inc. (ABB-ES), 1996c. "Final Task Order Work Plan, Remedial (Data-Gap) Investigations of Area of Contamination A4 and Areas of Contamination A7/A9 (Management-of-Migration Operable Unit) and Supplemental Site Investigations of Selected Study Areas, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts"; Portland, ME; prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD; May.

ABB Environmental Services, Inc. (ABB-ES), 1997. "Technical Memorandum, Remedial (Data-Gap) Investigation, Area of Contamination A7, U.S. Army Sudbury Annex; Wakefield, MA; Wakefield, MA; prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD; March.

Barrick, R.C., and H.R. Beller, 1989. "Reliability of Sediment Quality Assessments in Puget Sound"; *in* Oceans '89, An International Conference Addressing Methods for Understanding The Global Ocean; Seattle, WA; pp. 421 - 426; September.

Freeze, R.A., and J.A. Cherry, 1979. Groundwater; Prentice-Hall, Inc.; Englewood Cliffs, NJ.

HydroGeoLogic, Inc., 1994. "Groundwater Flow Model for Sudbury Training Annex and Vicinity, Massachusetts"; in Final Phase I Site Investigation Report, Appendix H; Herndon, VA; prepared for Ecology & Environment, Inc., Arlington, VA; September.

Long, E.R., and L.G. Morgan, 1990. "The Potential for Biological Effects on Sediment-Sorbed Contaminants Tested in the National Status and Trends Program"; National Oceanic and Atmospheric Administration Technical Memorandum NOS OMA 52.

RESPONSE TO COMMENTS BY
CAMBRIDGE ENVIRONMENTAL, INC.
PREPARED ON BEHALF OF FOUR TOWN FOCUS
DATED JUNE 23, 1997
CONCERNING THE PROPOSED DETERMINATION OF NO FURTHER ACTION AT AREA OF CONTAMINATION A7

Comment # Comment/Response

Massachusetts Department of Environmental Protection (MADEP), 1994. "Background Documentation for the Development of the MCP Numerical Standards"; Bureau of Waste Site Cleanup and Office of Research and Standards; April.

OHM Corporation (OHM), 1994. "Final Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts"; Pittsburgh, PA; prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD; January.

OHM Corporation (OHM), 1995a. "Final Addendum Report, Site/Remedial Investigation, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts"; Pittsburgh, PA; prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD; September.

OHM Corporation (OHM), 1995b. "Final Feasibility Study Report for the Fort Devens Sudbury Training Annex, Areas of Contamination A7 and A9, Middlesex County, Massachusetts"; Pittsburgh, PA; prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD; May.

U.S. Environmental Protection Agency (USEPA); 1986. "Quality Criteria for Groundwater 1986"; EPA 440/5-86-001; Office of Water Regulations and Standards; Washington, D.C.; May.

U.S. Environmental Protection Agency (USEPA), 1991. "Water Quality Criteria Summary"; Office of Science and Technology; Washington, D.C.

U.S. Environmental Protection Agency (USEPA), 1996. "Drinking Water Regulations and Health Advisories"; Office of Water; EPA 822-B-96-002; October.

U.S. Geological Survey, 1996. "Water Resources Data, Massachusetts and Rhode Island, Water Year 1996"; Prepared in cooperation with the States of Massachusetts and Rhode Island and other agencies; MA-RI-96-1.

ATTACHMENT C - PUBLIC HEARING TRANSCRIPT

Volume I
Excerpt

U.S. ARMY

BASE REALIGNMENT AND CLOSURE

FT. DEVENS SUDBURY TRAINING ANNEX

- -x
:
PUBLIC HEARING ON PROPOSED PLAN :
FOR AOC's A4, A7 and A9 :
:
- -x

BEFORE: Thomas Strunk, Environmental Coordinator

-held at-

Stow Town Building
380 Great Road
Stow, Massachusetts
Tuesday, June 10, 1997
7:25 p.m.

(Anne H. Bohan, Registered Diplomate Reporter)

* * * *

I N D E X

PRESENT: Thomas Strunk, Devens Sudbury BEC

Thomas R. Eschner, ABB Environmental Services Inc.

Jeff Waugh, Army Environmental Center

Robert LIM, U.S. EPA

Jim Murphy, U.S. EPA

Scott Greene, Massachusetts DEP

Beverly Lawrence, U.S. Army Corps of Engineers

Deborah Schumann, FOCUS

Lorna Nichols, FOCUS

* * * *

P R O C E E D I N G S

MR. STRUNK: But after listening to ABB's presentation of what the rationale was behind the record of decision that we're talking about, I can open this up for public comments. We'll record your comments, and then we won't answer them tonight, but they will be responded to in the appendix to the ROD, which we have a responsiveness summary section. And also feel free to mail in comments if you have those, and we'll get those out and have those responded to as well.

So if there's anything anyone would like to have addressed any more than we have tonight, this is your opportunity to do it.

MS. SCHUMANN: Well, I think FOCUS's letter pretty much covers the same identical territory that Lorna covered here, and maybe I caused a couple of diversions in possible ways to go after it, but it was the same issue. One way or another, determine what that drinking water risk to a residential housing development on the other side of that river is going to be. Now, I don't know, I'm torn at this point. On the one hand, I'd like you to come back and say, you know, it's horrendous, because it would

be absolutely ideal to stop a development. On the other hand, obviously I don't want to see any contaminants leaving that site at all. But I think we got to know either way, yeah?

MR. GREENE: Again, even if there's -- we're not supposed to respond today. Sorry.

MR. STRUNK: No comments tonight, Scott. Certainly everyone will have a chance to look at the comments as they come in and respond to them.

MS. NICHOLS: There actually are houses like right across the road from the golf course right next to the river. Why would you say there are no existing wells? Are they on some other system?

MR. GREENE: I don't know if there's existing wells or not. They were going to say the golf course was going to be developed.

MS. NICHOLS: Do you know if there are existing wells?

MR. LIM: No.

MS. NICHOLS: Do you know if there are existing wells?

MR. ESCHNER: I do not.

MS. LAWRENCE: I think he was saying the

water on the side. I think that they were just trying to say the wells that they installed were not used in that area.

MS. NICHOLS: Earlier he said to me, I'm not sure if he just repeated it then, that even if contamination was found on the other side of the river, since there are no existing residential wells, the State wouldn't consider that a protected aquifer.

MR. GREENE: I'm saying unless there's a private well there already in existence, and contamination is detected within 500 feet, we wouldn't predict that as a GW1 resource, within 500 feet of that well.

MS. NICHOLS: So whose job would it be to determine whether or not there are residential wells? No volunteers?

MR. WAUGH: The Town of Stow has been provided with all the documents, and they would have notified -- I would hope the Public Health would know of any wells there. I do know there are some wells on the Annex side of the river just east of A9.

MR. STRUNK: Off the record. We'll end the

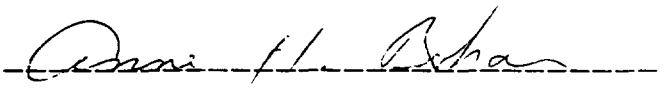
public comment period now so we can take a break.

(Discussion off the record)

(Whereupon, at 8:40 p.m. the hearing was concluded)

C E R T I F I C A T E

I, Anne H. Bohan, Registered Diplomate Reporter, do hereby certify that the foregoing transcript, Volume I, is a true and accurate transcription of my stenographic notes taken on June 10, 1997.



Anne H. Bohan

Registered Diplomate Reporter

- - - -

ADMINISTRATIVE RECORD INDEX

Fort Devens - Sudbury Annex

Administrative Record Index

Record of Decision
Area of Contamination A4 and
Areas of Contamination A7 and A9
Management of Migration Operable Units

Prepared for

New England Division
Corps of Engineers

Prepared by
ABB Environmental Services, Inc
Corporate Place 128, 107 Audubon Road, Wakefield, MA 01880 . (617) 245-6606

Introduction

This document is the Index to the Administrative Record for the Record of Decision, Area of Contamination A4 and Areas of Contamination A7/A9, Management of Migration Operable Units, at the Fort Devens Sudbury Annex. Section I of the Index lists site-specific documents and Section II lists guidance documents used by U.S. Army in selecting response actions at the site. Some documents in this Administrative Record File Index have been cited but are not physically included in the Administrative Record for this Record Of Decision. If a document has been cross-referenced to another Administrative Record File Index, the available corresponding comments and responses have been cross-referenced as well. Efforts were made to include all appropriate comments and responses individually. In come cases, however, comments were only included as part of the response package.

The Administrative Record is available for public review at the office of the BRAC Environmental Coordinator, Fort Devens, Massachusetts, and at the Sudbury Town Hall, Sudbury, Massachusetts. Supplemental/Addendum volumes may be added to this Administrative Record File. Questions concerning the Administrative Record should be addressed to the BRAC Environmental Coordinator.

The Administrative Record is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendment and Reauthorization Act (SARA).

ADMINISTRATIVE RECORD INDEX

for

Record of Decision

Area of Contamination (AOC) A4 and AOCs A7 and 9

Management of Migration Operable Units

Fort Devens - Sudbury Annex Sites

Updated: September 25, 1997

1.0 Pre-Remedial

1.2 Preliminary Assessment

Reports

1. "Analysis of Existing Facilities/Environmental Assessment Report," Natick Research and Development Command (NARADCOM) (November, 1977).
2. "Analysis of Existing Facilities/Environmental Assessment Report," NARADCOM (1978).
3. "Installation Assessment of U.S. Army Natick Research and Development Command (NARADCOM), Report 170," United States Army Toxic and Hazardous Materials Agency (USATHAMA) (1980).
4. "Installation Assessment NARADCOM Research and Development Laboratory, Massachusetts," EPA Environmental Monitoring Systems Laboratory (March 1982).
5. "Burn Pit Remediation - Study Area A9," U.S. Army (November 21, 1986).

1.3 Site Inspection

Reports

1. "Final Site Inspection Report, Sudbury Annex, Sudbury, Massachusetts," NUS (1987).
2. "Draft Expanded Site Inspection (ESI) of Natick Research, Development, and Engineering Center," Dames & Moore (December 1990).
3. "Final Report - Site Investigation - Natick Lab Annex Property," GZA Associates (March 4, 1991).

4. "Final Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts, Vol I-VI," OHM Remediation Services Corp. (January 1994).
5. "Final Site Investigation/ Remedial Investigation Addendum Report for AOCs A4, A7, and A9 and SAs A3/P5, P4, P7, P17, P19, P20, P25, P35, P49, P51, P59, and P60, Ft. Devens Sudbury Training Annex" OHM Remediation Services Corp. (September 22, 1995).
6. "Ft. Devens Sudbury Training Annex Remedial Investigations of AOC A4 and AOCs A7/A9 and Supplemental Site Investigation of Selected SAs Final Work Plan," ABB Environmental Services, Inc. (May 24, 1996).

1.7 Correspondence Related to Proposal of a Site to the NPL

1. Letter from Daniel J. Hannon, Commonwealth of Massachusetts, Department of Environmental Protection to Fort Devens Installation Commander (May 24, 1991), concerning notification that Fort Devens in considered a priority disposal site.

2.0 Removal Response

2.1 Correspondence

1. Memorandum from Timothy Prior, U. S. Army for the Record (August 16, 1991) concerning contaminated soil disposal.
2. Memorandum from Joseph Pierce, U. S. Army to Fort Devens Installation Commander (August 19, 1991) concerning Air Force noncompliance issues at the Sudbury Annex.
3. "Record of Environmental Consideration," (November 9, 1992).
4. Bills of Lading," (May 6, 1993).

2.2 Removal Response Reports

1. "Removal of Underground Storage Tanks," Environmental Application, Inc. (May 1989).

2.6 Work Plans and Progress Reports

Comments

1. Comments dated July 15, 1996 from Robert Lim, USEPA, on "Work Plan for Source Control Remediation SA A7 with Removal Actions at SAs A1, A2, A9, P2, P16, P23, P28, P29, and P41, Ft. Devens Sudbury Training Annex (WESTON).

2.9 Action Memoranda

Reports

1. "Final Technical Memorandum: Consolidation of Soils from SAs P16, P23, and P41 at AOC A7, Ft. Devens Sudbury Training Annex, MA," Stone & Webster (June 1996).

Comments

2. Comments dated March 26, 1996 from Robert Lim, USEPA, on the Draft Technical Memorandum, Consolidation of Soils from Areas P16, P23, and P41 as Subgrade at AOC A7, Ft. Devens Sudbury Training Annex, MA.

3.0 Remedial Investigation (RI)

3.1 Correspondence

1. Memorandum from NUS to Nancy Philigan, EPA (1985), concerning Dames & Moore Technical Plan for Sudbury Annex Site.
2. Meeting Notes, July 8, 1993 meeting at Environmental Office, Fort Devens. OHM Remediation Services Corp. (July 16, 1993).
3. Draft Notes of Site Walk on July 13, 1993, at Sudbury Training Annex. OHM Remediation Services Corp. (July 19, 1993).
4. Meeting Notes, Ecological Assessment Meeting on June 8, 1993, at EPA Region I, Boston, MA. OHM Remediation Services Corp. (July 28, 1993).
5. Meeting Notes, Pre-Drill Site Walk on August 10, 1993 at Sudbury Training Annex, Areas A4, A7, and A9. OHM Remediation Services Corp. (August 20, 1993).
6. Letter from D. Lynne Chappell, MADEP-CERO, to Ron Ostrowski, Fort Devens EMO (August 23, 1993). Concerning Pre-Drill Site Walk on August 10, 1993.
7. Meeting Notes, November 18, 1993 Meeting at Fort Devens to review/respond to comments on Initial Screening of Remedial Technologies and Process Options Report, and Comments on Site/Remedial Investigation Report. OHM Remediation Services Corp. (December 2, 1993).

3.4 Interim Deliverables

1. "Rationale for Not Installing Proposed Monitoring Well OHM-A4-51," OHM Remediation Services Corp. (August 19, 1993).
2. "Initial Screening of Remedial Technologies and Process Options Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts," OHM Remediation Services Corp., (September 23, 1993).
3. "Development and Screening of Remedial Alternatives Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts," OHM Remediation Services Corp., (October 28, 1993).

4. "Technical Memorandum, Remedial (Data-Gap) Investigation, Area of Contamination A7, U.S. Army Sudbury Training Annex," ABB Environmental Services, Inc. (March 1997).
5. "Technical Memorandum, Remedial (Data-Gap) Investigation, Area of Contamination A9, U.S. Army Sudbury Training Annex," ABB Environmental Services, Inc. (March 1997).
6. "Final Technical Memorandum, Remedial (Data-Gap) Investigation, Area of Contamination A4, U.S. Army Sudbury Training Annex," ABB Environmental Services, Inc. (August 13, 1997).
7. "Final Technical Memorandum, Remedial (Data-Gap) Investigation, Area of Contamination A7, U.S. Army Sudbury Training Annex," ABB Environmental Services, Inc. (August 13, 1997).
8. "Final Technical Memorandum, Remedial (Data-Gap) Investigation, Area of Contamination A9, U.S. Army Sudbury Training Annex," ABB Environmental Services, Inc. (August 13, 1997).

Comments

9. Comments Dated October 25, 1993 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the Initial Screening of Remedial Technologies and Process Options, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts, OHM Remediation Corp. (September 23, 1993).
10. Comments Dated October 26, 1993 from Robert Lim, USEPA, on the Initial Screening of Remedial Technologies and Process Options, OHM Remediation Corp. (September 23, 1993).
11. Comments Dated October 27, 1993 from Cindy Svec Ruzich, Four Town Focus on the "Draft Initial Screening of Remedial Technologies and Process Options".
12. Comments Dated December 10, 1993 from Robert Lim, USEPA, on the October 1993 "Draft Development and Screening of Remedial action Alternatives, Fort Devens Sudbury Training Annex," OHM Remediation Services Corp.
13. Comments Dated December 22, 1993 from Jay Naparstek, Commonwealth of Massachusetts Department of Environmental Protection on the October 1993 "Development and Screening of Remedial Alternatives: Fort Devens Sudbury Training Annex, Sudbury Massachusetts," OHM Remediation Services Corp.
14. Comments Dated January 9, 1997, from Robert Lim, USEPA Region I, on the "Draft Technical Memorandum, Remedial (Data-Gap) Investigation, Area of Contamination A4, U.S. Army Sudbury Annex," ABB Environmental Services, Inc.
15. Comments Dated April 17, 1997, from Robert Lim, USEPA Region I, on the March 1997 "Technical Memorandum, Remedial (Data-Gap) Investigation, Area of Contamination A7, U.S. Army Sudbury Annex," ABB Environmental Services, Inc.

Responses to Comments

16. Responses Dated August 11, 1997, from ABB Environmental Services, Inc., to USEPA Region I Comments Dated January 9, 1997, on the December 1996 "Technical Memorandum, Remedial (Data-Gap) Investigation, Area of Contamination A4, U.S. Army Sudbury Annex," ABB Environmental Services, Inc.
17. Responses Dated August 11, 1997, from ABB Environmental Services, Inc., to Comments Dated April 17 and April 23, 1997, on the March 1997 "Technical Memorandum, Remedial (Data-Gap) Investigation, Area of Contamination A7, U.S. Army Sudbury Annex," ABB Environmental Services, Inc.
18. Responses Dated August 12, 1997, from ABB Environmental Services, Inc., to Comments Dated April 2, 1997, on the March 1997 "Technical Memorandum, Remedial (Data-Gap) Investigation, Area of Contamination A9, U.S. Army Sudbury Annex," ABB Environmental Services, Inc.

3.6 Remedial Investigation (RI) Reports

The records cited below as entries number 1 and 2 may be reviewed, by appointment only, at the Fort Devens Environmental Management Office.

1. "Final Remedial Investigations of the Sudbury Annex," Dames & Moore (November 1986).
2. "Final Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts, Vol I-VI," OHM Remediation Services Corp. (January 1994).
3. "Final Site Investigation/ Remedial Investigation Addendum Report for AOCs A4, A7, and A9 and SAs A3/P5, P4, P7, P17, P19, P20, P25, P35, P49, P51, P59, and P60, Ft. Devens Sudbury Training Annex" OHM Remediation Services Corp. (September 22, 1995).

Comments

4. Comments Dated April 12, 1993 from Cindy Svec Ruzich, Four Town FOCUS on the February 1993 "Draft Site/Remedial Investigation - Volumes I-IV," OHM Remediation Services Corp. with the attached Comments Dated March 19, 1993 from Cambridge Environmental, Inc. on the February 1993 "Draft Site/Remedial Investigation - Volumes I-IV," OHM Remediation Services Corp.
5. Comments Dated April 12, 1993 from James P. Byrne, EPA Region I on the February 1993 "Draft Site/Remedial Investigation - Volume I-IV," OHM Remediation Services Corp.
6. Comments Dated April 13, 1993 from Molly J. Elder for D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection on the February 1993 "Draft Site/Remedial Investigation - Volume I-IV,' OHM Remediation Services Corp.
7. Comments Dated May 18, 1993 from Kenneth C. Carr for Gordon E. Beckett, U.S. Department of the Interior Fish and Wildlife Services on the February 1993 "Draft Site/Remedial Investigation - Volume I-IV," OHM Remediation Services Corp.

8. Comments Dated August 6, 1993 from Cindy Svec Ruzich, Four Town Focus, on the Comment Time Extension on the "Draft Final RI/SI Report" and Army Response to FOCUS Comments on 'Draft RI/SI Investigation Report".
9. Comments Dated August 20, 1993 from James P. Byrne, USEPA, on the "Draft Final Site/Remedial Investigation Report," OHM Remediation Services Corp.
10. Comments Dated September 2, 1993 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the July 1993 "Draft Final Site/Remedial Investigation Report," OHM Remediation Services Corp.
11. Update of Comments Dated September 12, 1993 from Cindy Svec Ruzich of Four Town Focus on the Draft SI/RI Investigation Report.
12. Comments Dated September 14, 1993 from Robert Lim, USEPA on the Comment Time Extension on "Draft Final SI/RI Investigation Report and Army Response to Comments on "Draft SI/RI Investigation Report".
13. Comments Dated October 3, 1994 from Jay Naparstek, Commonwealth of Massachusetts Department of Environmental Protection on the August 1994 "Draft Addendum Final Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex," OHM Remediation Services Corp.
14. Comments Dated October 5, 1994 from Robert Lim, USEPA, on the Draft SI/RI Addendum Report, Fort Devens Sudbury Training Annex.
15. Comments Dated October 13, 1993 from Cindy Svec Ruzich of Four Town Focus on the Draft Final RI/SI Phase I Investigation Report, Volume I.
16. Comments Dated October 17, 1994 from Robert Lim, USEPA, on the August 1994 Draft SI/RI Addendum Report, Fort Devens Sudbury Training Annex (OHM Remediation Services Corp.).
17. Comments Dated November 1, 1994 from Jay Naparstek, Commonwealth of Massachusetts Department of Environmental Protection on the August 1994 Draft Addendum Final Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex.
18. Letter Dated November 7, 1994 from Robert Lim, USEPA, to the Ecological Risk Assessment Issues in the Remedial Investigation of Areas of Contamination A4, A7, and A9.
19. Follow-up Letter Dated November 21, 1994 from Robert Lim, USEPA, to the Ecological Risk Assessment Issues in the Remedial Investigation of Areas of Contamination A4, A7, and A9.
20. Comments Dated May 19, 1995 from Robert Lim, USEPA, on the Draft Final Site/Remedial Investigation Addendum Report, Fort Devens Sudbury Training Annex (OHM Remediation).

Responses to Comments

21. Responses Dated July 16, 1993, July 19, 1993 and July 28, 1993 from OHM Remediation Services Corp to the April 12, 1993 Four Town FOCUS, the April 12, 1993 EPA Region I, the April 13, 1993 Commonwealth of Massachusetts Department of Environmental Protection and the May 18, 1993 U.S. Department of Interior Fish and Wildlife Service Comments on the February 1993 "Draft Site/Remedial Investigation - Volumes I-IV," OHM Remediation Services Corp.
22. Responses Dated October 14, 1993 from U.S. Army Environmental Center on the Draft Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex (OHM Remediation Services Corp.).
23. Responses Dated October 28, 1993 from U.S. Army Environmental Center on the Draft Final Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex (OHM Remediation Services Corp.).
24. Responses Dated November 4, 1994 from OHM Remediation Services Corp. on the USEPA Comments on the "Draft SI/RI Addendum Report.
25. Responses Dated June 21, 1995 from OHM Corporation to the U.S. Army Environmental Center on the Draft Final Addendum to the Final Site/Remedial Investigation Report, Fort Devens Sudbury Training Annex.

Responses to Responses to Comments

26. Rebuttals Dated November 15, 1994 from Robert Lim, USEPA, on the Responses to the Army's Responses to Comments on the Draft SI/RI Addendum Report.
27. Correction Letter Dated November 22, 1994 from Robert Lim, USEPA, on November 15, 1994 letter.

3.7 Work Plans and Progress Reports

Reports

1. "Final Work Plan, Fort Devens Sudbury Training Annex," OHM Remediation Services Corp. (April 1992).
2. "Final Field Sampling Plan," OHM Remediation Services Corp. (April 1992).
3. "Final Health and Safety Plan," OHM Remediation Services Corp (April 1992).
4. "Final Quality Assurance Project Plan - Volume I-II," OHM Remediation Services Corp. (April 1992).
5. "Ft. Devens Sudbury Training Annex Remedial Investigations of AOC A4 and AOCs A7/A9 and Supplemental Site Investigation of Selected SAs Final Work Plan," ABB Environmental Services, Inc. (May 24, 1996).
6. Final Draft Project Closeout Report. (Five Vol.) Weston. February 1997.

Comments

7. Comments Dated August 21, 1991 from Todd S. Alving, Organization for the Assabet River on the June/July 1991 "Draft Work Plan, Draft Field Sampling Plan, Draft Health and Safety Plan, Draft Quality Assurance Plan, "OHM Remediation Services Corp.
8. Comments Dated August 21, 1991 from Anne D. Flood, Town of Maynard on the June/July 1991 "Draft Work Plan, Draft Field Sampling Plan, Draft Health and Safety Plan, Draft Quality Assurance Plan," OHM Remediation Services Corp.
9. Comments Dated August 22, 1991 from Gregory M. Ciardi, Maynard Public Schools on the June/July 1991 "Draft Work Plan, Draft Filed Sampling Plan, Draft Health and Safety Plan, Draft Quality Assurance Plan," OHM Remediation Services Corp.
10. Comments Dated February 12, 1992 from Todd S. Alving, Organization for the Assabet River on the December 1991 "Draft Final Work Plan, Draft Final Field Sampling Plan, Draft Final Health and Safety Plan, Draft Final Quality Assurance Plan," OHM Remediation Services Corp.
11. Comments Dated May 13, 1992 from James P. Byrne, EPA Region I on the April 1992 "Final Work Plan, Final Field Sampling Plan, Final Health and Safety Plan, Final Quality Assurance Project Plan," OHM Remediation Services Corp. and the April 1992 "Final Community Relations Plan," Dames & Moore.
12. Comments Dated May 18, 1992 from Ken Raina, Lake Boon Association on the April 1992 "Final Work Plan, Final Field Sampling Plan, Final Health and Safety Plan, Final Quality Assurance Project Plan," OHM Remediation Services Corp.
13. Comments Dated May 19, 1992 from Deborah Schumann and Cindy Svec Ruzich, Four Town FOCUS on the April 192 " Final Work Plan, Final Field Sampling Plan, Final Health and Safety Plan, Final Quality Assurance Project Plan," OHM Remediation Services Corp.
14. Comments dated July 7, 1993 from Jack McKenna, Metcalf & Eddy on the June 1993 "Draft Technical Plan Addenda, Phase II Site Inspections, Remedial Investigations," Ecology and Environment, Inc. and the June 1993 "Draft Final Addendum to the Final Technical Plans - Phase II Feasibility Study," OHM Remediation Services Corp.
15. Comments dated April 16, 1996 from Robert Lim, USEPA, on "Remedial (Data Gap) Investigations of AOC A4 and AOCs A7/A9 and Supplemental Site Investigations of Selected SAs, Draft Task Order Work Plan, Data Item A005."

Responses to Comments

16. Response Dated October 1991 from OHM Remediation Services Corp. to Regulatory Agency Comments on the June/July 1991 "Draft Work Plan, Draft Field Sampling Plan, Draft Health and Safety Plan, Draft Quality Assurance Project Plan," OHM Remediation Services Corp.
17. Response Dated November 19, 1991 from Joseph Pierce, U.S. Army to the August 21, 1991 Comments from Todd S. Alving, Organization for the Assabet River on the June/July 1991 "Draft Work Plan, Draft Field Sampling Plan, Draft Health and Safety Plan, Draft Quality Assurance Project Plan," OHM Remediation Services Corp.

18. Response Dated November 20, 1991 from Dennis R. Dowdy, U.S. Army to the August 22, 1991 Comments from Gregory M. Ciardi, Maynard Public Schools on the June/July 1991 "Draft Work Plan, Draft Field Sampling Plan, Draft Health and Safety Plan, Draft Quality Assurance Project Plan," OHM Remediation Services Corp.
19. Response Dated November 25, 1991 from Ronald J. Ostrowski, U. S. Army to the August 21, 1991 Comments from Anne D. Flood, Town of Maynard on the June/July 1991 "Draft Work Plan, Draft Field Sampling Plan, Draft Health and Safety Plan, Draft Quality Assurance Plan," OHM Remediation Services Corp.
20. Response Dated November 1991 from OHM Remediation Services Corp. to the Four Town FOCUS Comments on the June/July 1991 "Draft Work Plan, Draft Field Sampling Plan, Draft Health and Safety Plan, Draft Quality Assurance Plan," OHM Remediation Services Corp.
21. Responses from OHM Remediation Services Corp. to EPA Region I, Four Town FOCUS, and the U.S. Department of the Interior Fish and Wildlife Service Comments on the December 1991 "Draft Final Work Plan, Draft Final Field Sampling Plan, Draft Final Health and Safety Plan, Draft Final Quality Assurance Plan," OHM Remediation Services Corp.
22. Draft Responses to Four Town FOCUS Comments on the April 1992 "Final Work Plan," OHM Remediation Services Corp.
23. Response dated May 21, 1996 from ABB Environmental Services, Inc. to comments dated April 16 and 26, 1996 on Draft Work Plan for Remedial (Data-Gap) Investigations of AOC A4 and AOCs A7/A9 (Management of Migration Operable Unit) and Supplemental Site Investigations of Selected Study Areas, Ft. Devens Sudbury Training Annex, MA.

Responses to Responses to Comments

24. Response Dated October 21, 1991 from D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection to the Response Dated October 1991 from OHM Remediation Services Corp. to Regulatory Agency Comments on the June/July 1991 "Draft Work Plan, Draft Field Sampling Plan, Draft Health and Safety Plan, Draft Quality Assurance Plan," OHM Remediation Services Corp.
25. Response Dated October 22, 1991 from James P. Byrne, EPA Region I to the Response Dated October 1991 from OHM Remediation Services Corp. to Regulatory Agency Comments on the June/July 1991 "Draft Work Plan, Draft Field Sampling Plan, Draft Health and Safety Plan, Draft Quality Assurance Pan," OHM Remediation Services Corp.
26. Response Dated October 22, 1991 from Steven E. Mierzykowski, U.S. Department of the Interior Fish and Wildlife Service to the Response Dated October 22, 1991 from OHM Remediation Services Corp. to Regulatory Agency Comments on the June/July 1991 "Draft Work Plan, Draft Field Sampling Plan, Draft Health and Safety Plan, Draft Quality Assurance Plan," OHM Remediation Services Corp.
27. Response Dated January 2, 1992 from Four Town FOCUS to the Response Dated November 1991 from OHM Remediation Services Corp. to the FOCUS Comments on

the June/July 1991 "Draft Work Plan, Draft Field Sampling Plan, Draft Quality Assurance Plan," OHM Remediation Services Corp.

3.9 Health Assessments

1. "Final Site-Specific Risk Assessment for the Sudbury Training Annex Facility, Sudbury, Massachusetts," OHM Remediation Services Corp. (January 1994).

4.0 Feasibility Study (FS)

4.1 Correspondence

1. Meeting Notes, November 18, 1993 Meeting at Fort Devens to review/respond to comments on Initial Screening of Remedial Technologies and Process Options Report, and Site/Remedial Investigation Report. OHM Remediation Services Corp., December 2, 1993.
2. Memorandum from Robert Lim, USEPA Region I, to Tom Strunk, Fort Devens (July 27, 1994), regarding issues related to the Feasibility Study for Areas A4, A7, and A9.

4.4 Interim Deliverables

1. "Preliminary Draft Screening of Alternatives," OHM Remediation Services Corp. (May 25, 1993).

4.6 Feasibility Study (FS) Reports

1. "Final Feasibility Study at Fort Devens Sudbury Training Annex Areas A7 and A9, Middlesex County," OHM Remediation Services Corp. (May 1995).

Comments

2. Comments Dated January 30, 1995 from Robert Lim, USEPA, on the Source Control Record of Decision Proposal for Fort Devens Sudbury Training Annex Areas of Contamination - A7 and A9.
3. Comments Dated March 2, 1995 from Robert Lim, USEPA, on the Draft Final Feasibility Study Report at Fort Devens Sudbury Training Annex Area A7 and A9," (OHM Remediation Services Corp.).
4. Comments Dated April 3, 1995 from Robert Lim, USEPA, on the Fort Devens Sudbury Training Annex Feasibility Study for Area A7, 100-Floodplain Location-Specific ARAR," (OHM Remediation Services Corp.).

Responses to Comments

5. Responses Dated September 20, 1994 from U.S. Army Environmental Center on the Draft Final Feasibility Study (OHM Remediation Services Corp.).

6. Responses Dated May 2, 1995 from U.S. Army Environmental Center on the Draft Final Feasibility Study Report, Sudbury Training Annex (OHM Remediation Services Corp.).

Responses to Responses to Comments

7. Rebuttals Dated October 4, 1994 from Robert Lim, USEPA, on the Army's Response to Comments on the Feasibility Study.

4.7 Work Plans and Progress Reports

Reports

1. "Final Addendum to the Final Technical Plans for the Phase II Feasibility Study at the Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts," OHM Remediation Services Corp. (November 10, 1993).

Comments

2. Cross Reference: Preliminary Comments Dated July 7, 1993 from Jack McKenna, Metcalf & Eddy on the June 1993 "Draft Technical Plan Addenda, Phase II Site Inspections, Remedial Investigations," Ecology & Environment, Inc on the June 1993 "Draft Final Addendum to the Final Technical Plans - Phase II Feasibility Study," OHM Remediation Services Corp. [Filed and listed in 3.7 Work Plans and Progress Reports in this Administrative Record Index.
3. Comments Dated July 22, 1993 from D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection on the June 1993 "Draft Final Addendum to the Final Technical Plans - Phase II Feasibility Study," OHM Remediation Services. Corp.
4. Comments Dated July 23, 1993 from D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection on the "Addendum to the Final Technical Plans Phase II Feasibility Study, Fort Devens Sudbury Training Annex, Sudbury, Massachusetts," OHM Remediation Services Corp.
5. Comments Dated August 6, 1993 from James P. Byrne, USEPA, on the June 1993 "Addendum to the Final Technical Plans, Phase II Feasibility Study, Fort Devens Sudbury Training Annex, " OHM Remediation Services Corp.
6. Comments Dated August 6, 1993 from Cindy Svec Ruzich of Four Town Focus on the "Draft Addendum to the Final Technical Plans Phase II Feasibility," OHM Remediation Services Corp.

Responses to Comments

7. Responses Dated September 7, 1993 from OHM Remediation Services Corp. on USEPA Comments on the "Addendum to the Final Technical Plans, Phase II Feasibility Study, Fort Devens Sudbury Training Annex.

Responses to Responses to Comments

8. Rebuttal Dated October 1, 1993 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the June 1993 Army Responses to MADEP's Comments on the Draft Final Addendum to the Final Technical Plans Phase II Feasibility Study, Fort Devens Sudbury Training Annex, Sudbury, Massachusetts (OHM Remediation Corp).

4.8 Cost Reports and Invoices

1. Cost Estimates for Capping Alternatives at Area A7, OHM Remediation Services Corp. (October 18, 1994).

4.9 Proposed Plan for Selected Remedial Action

Reports

1. "Proposed Plan AOC A7, the Old Gravel Pit Landfill, AOC A9, the POL Burn Area, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts," OHM Remediation Services Corp. (June 1995).
2. "Proposed Plan, No Further CERCLA Action at Sites A4, A7, and A9, U.S. Army Sudbury Annex," Sudbury Annex BEC, Devens, MA (June 1997).

Comments

3. Comments Dated April 12, 1995 from Robert Lim, USEPA, on the March 1995 Draft Proposed Plan, Sudbury Training Annex (OHM Remediation Services Corp.).
4. Comments Dated May 18, 1995 from Robert Lim, USEPA on the April 1995 Draft Final Proposed Plan, Fort Devens Sudbury Training Annex (OHM Remediation Services Corp.).
5. Comments Dated April 17, 1997, from Robert Lim, USEPA Region I, on the March 1997 "Draft Proposed Plan, No Further CERCLA Action at Sites A4, A7, and A9, U.S. Army Sudbury Annex," Sudbury Annex BEC.

5.0 Record of Decision (ROD)

5.2 Applicable or Relevant and Appropriate Requirements (ARARs)

1. Letter from D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection to Jeff Waugh, U.S. Army (January 6, 1993). Concerning transmittal of the attached potential ARARs.

2. "Draft Preliminary Applicable or Relevant and Appropriate Requirements for the Fort Devens Sudbury Training Annex," OHM Remediation Services Corp. (January 21, 1993).

5.4 Record of Decision

1. "Final Record of Decision, Source Control Operable Unit, AOC A7, the Old Gravel Pit Landfill, AOC A9, the POL Burn Area, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts," OHM Remediation Services Corp. (September 1995).

Comments

2. Comments Dated July 21, 1995 from Robert Lim, USEPA Region I, on the June 1995 Draft Record of Decision, Source Control Operable Unit AOC A7, the Old Gravel Pit Landfill, AOC 9, the POL Burn Area, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts (OHM Remediation Services Corp.).
3. Comments Dated August 25, 1995 from Robert Lim, USEPA Region I, on the August 1995 Draft Final Record of Decision, Source Control Operable Unit AOC A7, the Old Gravel Pit Landfill, and AOC A9, the POL Burn Area, Fort Devens Sudbury Training Annex, Middlesex County, Massachusetts (OHM Remediation Services Corp.).
4. Comments Dated September 8, 1997, from Robert Lim, USEPA Region I, on the August 1997 "Draft Record of Decision, Area of Contamination A4 and Areas of Contamination A7 and A9 Management of Migration Operable Unit, U.S. Army Sudbury Annex," ABB Environmental Services, Inc.

6.0 Remedial Design (RD)

6.1 Correspondence

1. Approval to Consolidate Soil Piles from Study Area P28 to Area Of Contamination A7, USEPA Region I (June 5, 1995).
2. Letter dated June 20, 1996 from Robert Lim, USEPA, on Ft. Devens Sudbury Training Annex Remedial Design.

6.4 Remedial Design Documents

Reports

1. "Site Safety and Health Plan for Source Control Remedial Design work to be performed at SA A7 and A9, Ft. Devens Sudbury Training Annex, MA," Stone & Webster (August 1995).
2. "Concept Design: Source Control Remediation SA A7 and A9 at Ft. Devens Sudbury Training Annex, MA," Stone & Webster (September 1995).

3. "Draft Final Basis of Design/Design Analysis (BD/DA) Volumes I and II for Source Control Remediation at SA A7 with Removal Actions at SAs A1, A2, A9, P2, P16, P23, P39, and P41 at Ft. Devens Sudbury Training Annex, MA," Stone & Webster (April 11, 1996).
4. "Draft Final Contract Specification and Design Drawings for Source Control Remediation at SA A7 with Removal Actions at SAs A1, A2, A9, P2, P16, P23, P39, and P41 at Ft. Devens Sudbury Training Annex, MA," Stone & Webster (April 11, 1996).
5. Inserts to "Draft Final BD/DA and Contract Specification, Source Control Remedial/Removal Actions, Ft. Devens Sudbury Training Annex, MA, SAs A1, A2, A7, A9, P2, P16, P23, P39, and P41," Stone & Webster (April 29, 1996).
6. Inserts for "Final Basis of Design/Design Analysis (BD/DA) Volumes I and II for Source Control Remedial Design at SAs A7 and A9 with Removal Actions at SAs A1, A2, P2, P16, P23, P39, and P41, Ft. Devens Sudbury Training Annex, MA," Stone & Webster (July 29, 1996).
7. Inserts for "Final Contract Specification and Design Drawings for Source Control Remedial Design at SAs A7 and A9 with Removal Actions at SAs A1, A2, P2, P16, P23, P39, and P41, Ft. Devens Sudbury Training Annex, MA," Stone & Webster (July 29, 1996).

Comments

8. Comments Dated December 20, 1995, from Robert Lim, USEPA Region I, on the November 1995 "65% Remedial Design," Stone & Webster Environmental Technology & Services.
9. Comments Dated March 18, 1996 by Robert Lim, USEPA, on the Pre 95% Remedial Design Package for the landfill design at A7, Ft. Devens Sudbury Training Annex, MA.
10. Comments Dated May 29, 1996 from Robert Lim, USEPA, on Draft Final Basis of Design/Design Analysis and Draft Final Contract Specification and Design Drawings, Sudbury Training Annex, Ft. Devens, MA.

Responses to Comments

11. Response dated January 17, 1996 from Stone & Webster to comments on the 65% Draft BD/DA and Specification for Source Control Remedial Design at SAs A7 and A9, Ft. Devens Sudbury Training Annex, MA.
12. Response dated June 14, 1996 from Stone & Webster to comments on 95% Draft BD/DA and Specification for Source Control Remedial Design, SAs A7/A9, Ft. Devens Sudbury Training Annex, MA.

7.0 Remedial Action (RA)

7.5 Remedial Action Documents

Reports

1. "Final Technical Memorandum: Consolidation of Soils from SAs P16, P23, and P41 at AOC A7, Ft. Devens Sudbury Training Annex, MA," Stone & Webster (June 1996).

Comments

2. Comments Dated March 26, 1996, from Robert Lim, USEPA Region I, on Draft Technical Memorandum, Consolidation of Soils from Areas P16, P23, P41 as Subgrade at AOC A7, Ft. Devens Sudbury Training Annex, MA.
3. Comments Dated March 20, 1997, from Robert Lim, USEPA Region I, on the February 1997 "Draft Project Closure Report, Sudbury Training Annex," Roy F. Weston.

7.6 Work Plans and Progress Reports

Reports

1. "Final Technical Memorandum: Consolidation of Soils from SA A2, P2, and P39 as Subgrade at AOC A7, Ft. Devens Sudbury Training Annex, MA," Stone & Webster (December 1995).

Comments

2. Comments Dated July 15, 1996 from Robert Lim, USEPA, on "Work Plan for Source Control Remediation SA A7 with Removal Actions at SAs A1, A2, A9, P2, P16, P23, P28, P29, and P41, Ft. Devens Sudbury Training Annex, MA."
3. Comments Dated July 31, 1996, from Robert Lim, USEPA Region I, on the following: Letter from Roy F. Weston (July 26, 1996) which summarizes Work Plan to address Lab Waste Staging, Decon Water, Geonet/Geotextile Comments, and Emergency Response Plan.
4. Comments Dated August 12, 1996, from Robert Lim, USEPA Region I, on the August 8, 1996 "Substitution Request for Replacement of the Sand Drainage Layer with a Geonet," Roy F. Weston, Inc.

8.0 Site Closeout

8.1 Correspondence

1. Acceptance Dated April 18, 1997, from Robert Lim, USEPA Region I, of the Responses to USEPA Comments on the "Method Detection Limit Study" prepared as part of the "Final Operation and Maintenance Plan," Roy F. Weston, Inc.

8.3 Operations and Maintenance

1. Comments Dated December 23, 1996, from Robert Lim, USEPA Region I, on the November 1996 "Draft Operations and Maintenance Plan for the Landfill at Area of Contamination A7," Roy F. Weston, Inc.

10.0 Enforcement

10.16 Federal Facility Agreements

Reports

The document cited below as entry number 1 may be reviewed, by appointment only, at Fort Devens.

1. "Final Federal Facility Agreement Under CERCLA Section 120," EPA Region I and U.S. Department of the Army (November 15, 1991).

Comments

2. Comments Dated July 12, 1991 from Edmond G. Benoit, Commonwealth of Massachusetts Department of Environmental Protection on the March 1991 "Draft Federal Facility Agreement Under CERCLA Section 120," EPA Region I and U.S. Department of the Army.

Responses to Comments

3. Response Dated September 5, 1991 from James P. Byrne, EPA Region I to the Comments Dated July 12, 1991 from Edmond G. Benoit, Commonwealth of Massachusetts Department of Environmental Protection on the March 1991 "Draft Federal Facility Agreement Under CERCLA Section 120," EPA Region I and U.S. Department of the Army.

13.0 Community Relations

13.2 Community Relations Plans

Reports

The document cited below as entries 1 and 2 may be reviewed, by appointment only, at Fort Devens.

1. "Final Community Relations Plan," Dames & Moore (April 1992).

Comments

2. Comments Dated September 30, 1991 from Cindy Svec Ruzich and Deborah Schumann, Four Town FOCUS on the August 1991 "Draft Community Relations Plan," Dames & Moore.
3. Comments Dated February 14, 1992 from Cindy Svec Ruzich and Deborah Schumann, Four Town FOCUS on the December 1991 "Draft Final Community Relations Plan," Dames & Moore.
4. Comments Dated March 17, 1992 from D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection on the December 1991 "Draft Final Community Relations Plan," Dames & Moore.
5. Comments from James P. Byrne, EPA Region I on the December 1991 "Draft Final Community Relations Plan," Dames & Moore.
6. Cross Reference: Comments Dated May 13, 1992 from James P. Byrne, EPA Region I on the April 1992 "Final Work Plan, Final Field Sampling Plan, Final Heath and Safety Plan, Final Quality Assurance Project Plan," OHM Remediation Corp. and the April 1992 "Final Community Relations Plan," Dames & Moore. [Filed and listed in 3.7 Work Plans and Progress Reports in this Administrative Record Index.]

Responses to Comments

7. Response to the EPA Comments on the August 1991 "Draft Community Relations Plan," Dames & Moore.
8. Response to the Commonwealth of Massachusetts Department of Environmental Protection Comments on the August 1991 "Draft Community Relations Plan," Dames & Moore.

13.5 Fact Sheets

1. "Installation Restoration Program Fact Sheet: Phase II Work Plan Addendums," U.S. Army, Fort Devens (June 1993).

13.11 Technical Review Committee Documents

1. Technical Review Committee Meeting Summary, List of Attendees, and Handouts (May 14, 1991).
2. Technical Review Committee Meeting Summary and List of Attendees (July 31, 1991).
3. Technical Review Committee Meeting Summary and List of Attendees (October 23, 1991).
4. Technical Review Committee Meeting Summary and List of Attendees (January 15, 1992).
5. Technical Review Committee Meeting Summary, Agenda, Handouts, Overheads, and List of Attendees (April 28, 1992).
6. Technical Review Committee Meeting Summary, Agenda, Handouts, Overheads, and List of Attendees (July 14, 1992).
7. Technical Review Committee Meeting Summary, Agenda, Handouts, Overheads, and List of Attendees (October 27, 1992).
8. Agenda and Attendance List for Sudbury Annex Working Meeting (November 23, 1992).
9. Technical Review Committee Meeting Summary, List of Attendees, and Handouts (February 2, 1993).
10. Letter from Richard D. Dotchin, U.S. Army to James P. Byrne, EPA Region I (March 3, 1993). Concerning follow-up to the February 2, 1993 Technical Review Committee Meeting.
11. Technical Review Committee Meeting Summary, List of Attendees, and Handouts (June 9, 1993).

17.0 Site Management Records

17.6 Site Management Plans

The document cited below as entries number 1 and 2 may be reviewed, by appointment only, at the Fort Devens Environmental Management Office.

Reports

1. "Final Master Environmental Plan," OHM Remediation Services Corp. (January 1992).
2. "Draft Master Environmental Plan, Fort Devens Sudbury Training Annex, Massachusetts," Ecology & Environment, Inc. (May 1994).
3. "Final Project Operations Plan, Fort Devens Sudbury Training Annex, Sudbury, Massachusetts, Volume I & II," ABB Environmental Services, Inc. (April 1995).
4. "Draft Master Environmental Plan, Ft. Devens Sudbury Training Annex, MA," ABB Environmental Services, Inc. (December 1995).

Comments

5. Comments Dated July 11, 1991 from James P. Byrne, EPA Region I on the May 1991 "Draft Master Environmental Plan," OHM Remediation Services Corp.
6. Comments Dated July 15, 1991 from D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection on the May 1991 "Draft Master Environmental Plan," OHM Remediation Services Corp.
7. Comments from James P. Byrne, EPA Region I on the January 1992 "Final Master Environmental Plan," OHM Remediation Services Corp.
8. Comments Dated June 27, 1994 from Robert Lim, USEPA, on the May 1994 "Master Environmental Plan, Update, Fort Devens Sudbury Training Annex, Massachusetts," Ecology and Environment, Inc.
9. Comments Dated January 3, 1997, from Mary Sanderson, USEPA Region I, on the "Draft Final Environmental Baseline Survey and CERFA Letter Reports, Sudbury Training Annex."

Responses to Comments

10. Response Dated August 28, 1991 from OHM Remediation Services Corp. to the Comments Dated July 11, 1991 from James P. Byrne, EPA Region I on the May 1991 "Draft Master Environmental Plan," OHM Remediation Services Corp.
11. Response Dated August 28, 1991 from OHM Remediation Services Corp. to the Comments Dated July 15, 1991 from D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection on the May 1991 "Draft Master Environmental Plan," OHM Remediation Services Corp.

Responses to Responses to Comments

12. Response Dated September 12, 1991 from James P. Byrne, EPA Region I to the Response Dated August 28, 1991 from OHM Remediation Services Corp.

17.7 Reference Documents

1. "Criteria for Evaluating Sites for Hazardous Waste Management," Clark-McGlennon Associates (no date).
2. "Ground-Water Geology and Hydrology of the Maynard Area, Massachusetts," N. M. Perlmutter, U.S. Geological Survey Water-Supply Paper 1539-E (1962).
3. Real Estate File, Survey Inspection and Utilization of Government Property, List of Bunkers (1973).
4. "Report on Water Supply Investigation - Tuttle Hill Area," Dufresne-Henry, Inc. (April 1982).
5. "Element Concentrations in Soils and Other Surficial Materials of the Contemporaneous United States," H. T. Shacklett and J. G. Boergen (1984).
6. "Middlesex County Soil Survey, A Resource Planner's Guide," United States Department of Agriculture (June 1989).
7. "Endangered Species Survey, Phase I. An Environmental Inventory of Wildlife Species and Their Habitats," Anaptek Corporation (1991).
8. Compilation of information on Natick Laboratory and land management obtained through information search, including draft documents and document edits, notes correspondence, etc., OHM Remediation Services Corp. (1990-1991).
9. "Fort Devens Sudbury Annex Inventory Summary Report," Brian O. Butler (1992).

17.8 Federal and Local Technical and Historical Records

The document cited below as entry number 1 may be reviewed, by appointment only, at the office of the Fort Devens BRAC Environmental Coordinator, Fort Devens, Massachusetts.

1. "An Intensive Archeological Survey of the Sudbury Training Annex," The Public Archaeology Laboratory, Inc. (April 1985).
2. "Defense Base Closure and Realignment Commission, Archives Search Report for Ordnance and Explosives, Chemical Warfare Materials, Sudbury Annex," U.S. Army Corps of Engineers, St. Louis District (February 1997).

GUIDANCE DOCUMENTS

The following guidance documents were relied upon during the Fort Devens - Sudbury Annex cleanup. These documents may be reviewed, by appointment only, at the Environmental Management Office at Fort Devens, Massachusetts.

1. Occupational Safety and Health Administration (OSHA). Hazardous Waste Operation and Emergency Response (Final Rule, 29 CFR Part 1910, Federal Register. Volume 54, Number 42) March 6, 1989.
2. USATHAMA. Geotechnical Requirements for Drilling, Monitor Wells, Data Acquisition, and Reports, March 1987.
3. USATHAMA. IRDMIS User's Manual, Version 4.2, April 1991.
4. USATHAMA. USATHAMA Quality Assurance Program: PAM-41, January 1990.
5. USATHAMA. Draft Underground Storage Tank Removal Protocol - Fort Devens, Massachusetts, December 4, 1992.
6. U.S. Environmental Protection Agency. Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring: OWRS QA-1, May 1984.
7. U.S. Environmental Protection Agency. Office of Research and Development. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans: QAMS-005/80, 1983.
8. U.S. Environmental Protection Agency. Test Methods for Evaluating Solid Waste: EPA SW-846 Third Edition, September 1986.
9. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, (OSWER Directive 9355.5-01, EPA/540/3-89/004), 1986.
10. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation manual (Part A), EPA/1-89/002), 1989.
11. U.S. Environmental Protection Agency. Hazardous Waste Management System: Identification and Listing of Hazardous Waste: Toxicity Characteristic Revisions, (Final Rule, 40 CFR Part 261 et al, Federal Register Part V), June 29, 1990.
12. U.S. Army. Environmental Quality - Environmental Protection and Enhancement, (Army Regulation 200-1), April 23, 1990.
13. U.S. Environmental Protection Agency, 1991. Design and Construction of RCRA/CERCLA Final Covers; Office of Research and Development; Washington, DC; EPA/625/4-91/025; May.
14. U.S. Environmental Protection Agency, 1991. Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals) Interim; Office of Emergency and Remedial Response, Washington, DC; Publication 9285.7-01B; October.

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION LETTER OF CONCURRENCE

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ONE WINTER STREET, BOSTON, MA 02108 617-292-5500

ARGEO PAUL CELLUCCI
Governor

TRUDY COXE
Secretary

DAVID B. STRUHS
Commissioner

September 29, 1997

Harley Laing, Director
Office of Site Remediation & Restoration
US. Environmental Protection Agency
JFK Federal Building
Boston, Massachusetts 02203-2211

RE: US Army Sudbury Training Annex; Sudbury, MA
Record of Decision for Operable Units 1, 2, and 3

Dear Mr. Laing:

The Massachusetts Department of Environmental Protection (the Department) has reviewed the September 1997 Record of Decision (ROD) for Operable Units 1, 2, and 3 at the US Army Sudbury Training Annex. The ROD, consistent with the recommendations contained in the Proposed Plan, requires no further remedial actions under CERCLA for Area of Contamination A4 (Operable Unit 1) and Areas of Contamination A7 and A9 (Management of Migration - Operable Units 2 and 3).

The Department has reviewed the Army's proposed no action remedy for its consistency with Massachusetts General Law Chapter 21E and the Massachusetts Contingency Plan. Based upon this review, the Department concurs with the selected remedial action. Conditions at these sites are protective of human health, welfare, and the environment without additional response actions. Groundwater conditions at the landfill site (Area A7) will continue to be monitored in accordance with the Operations and Maintenance Plan. The no further action decision meets state ARARs and helps facilitate the property transfer to the US Fish and Wildlife Service.

The Department looks forward to continuing to work with EPA and the Army in this common endeavor and we are pleased to assist in the transfer of Army property in a manner that is protective of human health, welfare, and the environment. If you have any questions, please feel free to contact me at (617) 292-5801.

Very truly yours,

Robert E. Donovan
Acting Assistant Commissioner

cc: Mr. Bob Lim, US EPA
Mr. Stephen Johnson, DEP, BWSC, NERO
Sudbury BOH, Attn: Bob Leopold, 278 Old Sudbury Road, Sudbury, MA 01776
Stow Selectman's Office, Attn: Thomas Ruggiero, Town Hall, Stow, MA 01775
Hudson BOH, Attn: Robert Steere, Town Hall, Hudson, MA 01749
Maynard BOH, Attn: Jerry Collins, Town Hall, Maynard, MA 01754
FOCUS, Attn: Jane Evers, 37 Howe Street, Hudson, MA 01749

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

AEHA	Army Environmental Health Agency
AOC	area of contamination
AWQC	Ambient Water Quality Criteria
bgs	below ground surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	chemical of potential concern
DDD	2,2-bis(para-chlorophenyl)-1,1-dichloroethane
DDE	2,2-bis(para-chlorophenyl)-1,1-dichloroethene
DDT	2,2-bis(para-chlorophenyl)-1,1,1-trichloroethane
DERP	Defense Environmental Restoration Program
ESAT	USEPA Region I Environmental Services Assistance Team
FEMA	Federal Emergency Management Agency
FFA	Federal Facility Agreement
HI	Hazard Index
HQ	Hazard Quotient
MADEP	Massachusetts Department of Environmental Protection
MADEQE	Massachusetts Department of Environmental Quality Engineering
MCL	Maximum Contaminant Level
MCP	Massachusetts Contingency Plan
MFFA	Massachusetts Fire Fighting Academy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OU	operable unit
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
POL	petroleum, oil, and lubricants

5679

INSTALLATION RESTORATION PROGRAM

RECORD OF DECISION
INTERIM REMEDIAL ACTION
WEST TRUCK ROAD MOTOR POOL (AOC CS-4)
GROUNDWATER OPERABLE UNIT

MASSACHUSETTS MILITARY RESERVATION
CAPE COD, MASSACHUSETTS

FINAL

MAY 1992

HAZWRAP SUPPORT CONTRACTOR OFFICE
Oak Ridge, Tennessee 37831
Managed by MARTIN MARIETTA ENERGY SYSTEMS, INC.
For the U.S. DEPARTMENT OF ENERGY under contract DE-AC05-840R21400

INSTALLATION RESTORATION PROGRAM

RECORD OF DECISION
INTERIM REMEDIAL ACTION
WEST TRUCK ROAD MOTOR POOL (AOC CS-4)
GROUNDWATER OPERABLE UNIT

MASSACHUSETTS MILITARY RESERVATION
CAPE COD, MASSACHUSETTS

FINAL

Prepared for:

HAZWRAP Support Contractor Office
Oak Ridge, Tennessee

Managed by:

Martin Marietta Energy Systems, Inc.
for the
U.S. Department of Energy
Under Contract No. DE-AC05-840R21400

Prepared by:

ABB Environmental Services, Inc.
Portland, Maine
Project No. 7030-04

MAY 1992

AOC CS-4 RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

AOC CS-4 RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

LIST OF FIGURES

AOC CS-4 RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

LIST OF TABLES

1.0 DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

The Massachusetts Military Reservation (MMR) on Cape Cod, Massachusetts, lies within the boundaries of Falmouth, Mashpee, Sandwich, and Bourne. The Area of Contamination (AOC) Chemical Spill Area No. 4 (CS-4) source area is located 1.1 miles from the southern MMR boundary on the northwestern side of West Truck Road. The AOC CS-4 groundwater plume extends approximately 11,000 feet from the source area.

STATEMENT OF BASIS AND PURPOSE

This document presents the selected interim remedial action for MMR AOC CS-4 groundwater chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the administrative record file for this site, which was developed in accordance with Section 113(k) of CERCLA and which is available for public review at the information repositories located at (1) the Falmouth Public Library, Falmouth, Massachusetts; (2) the Air National Guard (ANG) Environmental Management Office at Otis ANG Base, Massachusetts; and (3) the U.S. Environmental Protection Agency (USEPA) Regional Office at 90 Canal Street, Boston, Massachusetts. The attached index identifies the items comprising the Administrative Record upon which the selection of a remedial action is based (see Appendix A). The Commonwealth of Massachusetts statement of concurrence with the selected remedy is presented in Appendix B.

ASSESSMENT OF AOC CS-4 GROUNDWATER

Actual or threatened releases of hazardous substances from this AOC, if not addressed by implementing the response action selected in this Record of Decision (ROD), may pose an imminent and substantial endangerment to human health, welfare, or the environment.

DESCRIPTION OF THE SELECTED INTERIM REMEDY

In summary, the interim remedy consists of the following:

- extracting contaminated groundwater at the leading edge of the plume
- pumping the extracted groundwater to a treatment plant
- removing volatile organic compounds (VOC) by carbon adsorption treatment
- discharging treated groundwater to an infiltration trench located crossgradient at MMR
- installing observation wells to monitor the hydraulic performance of the extraction system
- installing groundwater monitoring wells upgradient of the discharge area
- sampling existing monitoring wells, monitoring wells to be installed upgradient of the discharge area, and some of the proposed observation wells to monitor the plume's flowpath and chemical concentrations
- monitoring the influent and effluent of the carbon adsorption treatment
- reviewing the site after five years of operation

This operable unit interim remedial action will intercept the AOC CS-4 groundwater plume to prevent further downgradient migration of the contaminants. Extraction and treatment will continue until the final remedy for the site is chosen. Selection of a final remedy will depend on the study of the AOC CS-10 groundwater plume that has been identified upgradient from the AOC CS-4 plume. The interim and final remedies must be consistent with the clean-up goals established for the entire MMR site. The National Guard Bureau (NGB) long-term clean-up goals for reducing contamination in the groundwater at MMR are to meet federal Maximum Contaminant Levels (MCLs), federal Maximum Contaminant Level Goals (MCLGs), Massachusetts MCLs, or risk-based guidance levels for compounds for which drinking water standards have not been set.

STATUTORY DETERMINATIONS

The interim action is protective of human health and the environment, complies with federal and state Applicable or Relevant and Appropriate Requirements (ARARs) for this limited scope action, and is cost-effective. Although this interim action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action uses treatment and thus is in furtherance of that statutory mandate. Because this action does not constitute the final remedy for the AOC CS-4 groundwater, the statutory preference for remedies that employ treatment that reduces mobility, toxicity, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action. Subsequent actions are planned to fully address the threats posed by conditions at this operable unit. Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action. Because this is an interim action ROD, review of this site and this remedy will be continuing as the NGB continues to develop final remedial alternatives for the AOC CS-4 groundwater operable unit.

The foregoing represents the selection of an interim remedial action by the Department of Defense, NGB, and USEPA Region I, with concurrence of the Commonwealth of Massachusetts.

Department of Defense, NGB

By: _____ Date: May 20, 1992

Ronald Watson, P.E.
Chief, Environmental Division

U.S. Environmental Protection Agency, Region I

By: _____ Date: May 20, 1992

Julie Belaga
Regional Administrator

2.0 SITE NAME, LOCATION, AND DESCRIPTION

MMR is a National Priorities List (NPL) Superfund site. There are currently 77 areas within MMR that are under investigation. Some of these areas have been grouped into medium-specific operable units for remediation purposes. This ROD relates to the interim remedial action for the AOC CS-4 groundwater plume, which was the result of past contamination from AOC CS-4.

MMR, which lies within the boundaries of Bourne, Falmouth, Mashpee, and Sandwich, Massachusetts, occupies approximately 22,000 acres (Figure 2-1) and consists of several cooperating command units: ANG, Army National Guard, U.S. Air Force (USAF), Veterans Administration, and U.S. Coast Guard. The site is described in more detail in the focused feasibility study (FFS). The USAF managed the base until 1973, when base management was transferred to the ANG.

The U.S. Department of Defense (DOD) initiated a multiphase Installation Restoration Program (IRP) to identify and evaluate problems associated with past hazardous waste disposal and spills at DOD installations, including ANG facilities.

The NGB is proposing an interim remedial plan, referred to as a preferred alternative, to address AOC CS-4 groundwater contamination (Figure 2-2). This ROD recommends a method of addressing contamination associated with AOC CS-4 groundwater from the containment options evaluated during the FFS (ABB Environmental Services, Inc., 1992a).

Property usage surrounding MMR is primarily residential and light industrial in each of the surrounding towns.

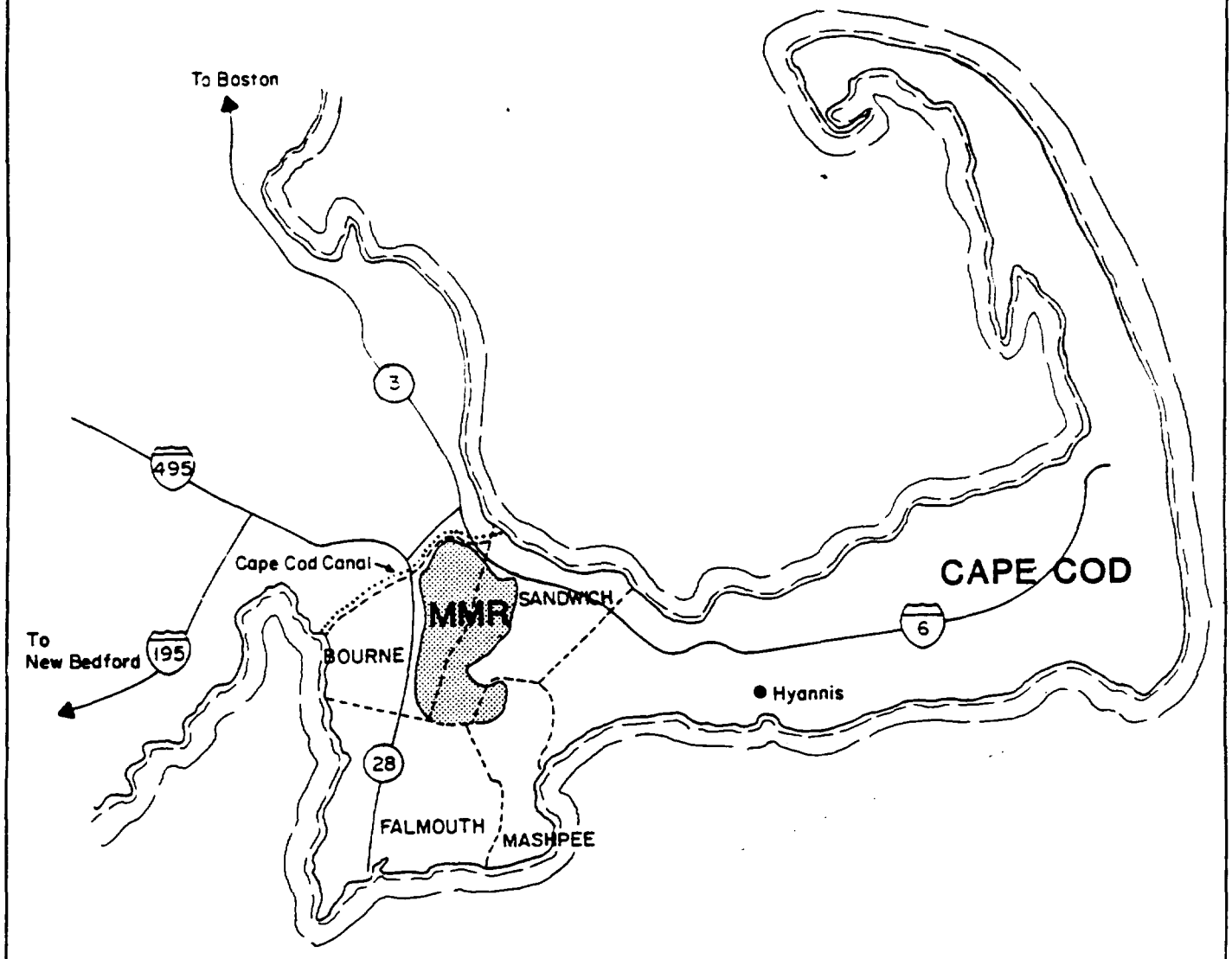
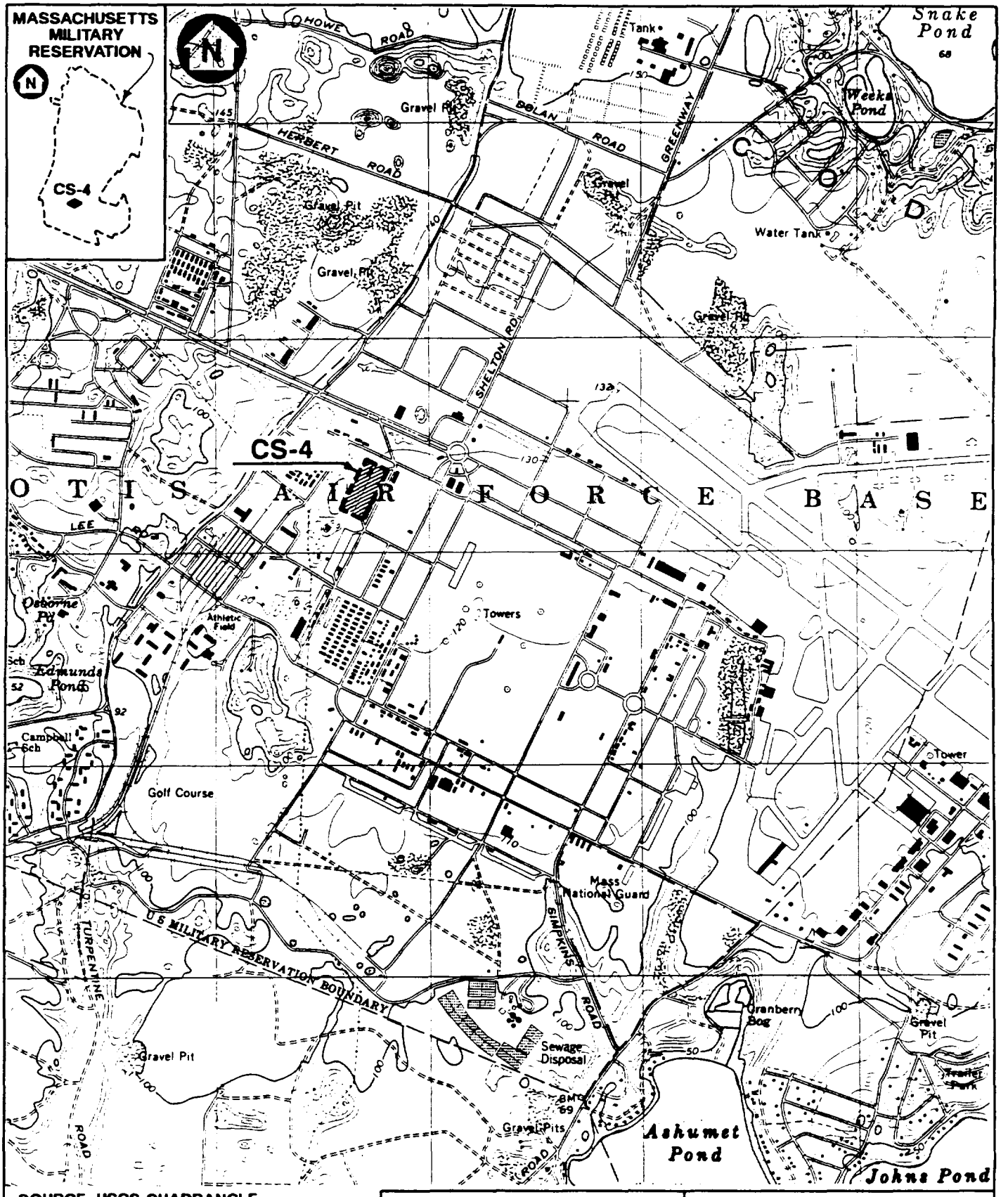


ABB Environmental Services, Inc.	SITE LOCATION MAP	
INSTALLATION RESTORATION PROGRAM MASSACHUSETTS MILITARY RESERVATION	AOC CS-4 ROD	FIGURE 2-1

NOT TO SCALE

7001-05



SOURCE: USGS QUADRANGLE, POCASSET, MA., 7.5 MINUTE SERIES

NOTE: CS = CHEMICAL SPILL

SCALE IN FEET

0 2,000 4,000

ABB Environmental Services Inc.

ASEA BROWN BOVERI

AOC CS-4 SOURCE LOCATION MAP

INSTALLATION RESTORATION PROGRAM
MASSACHUSETTS MILITARY RESERVATION

AOC CS-4 ROD

FIGURE 2-2

7030-04

3.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

In accordance with Section 117(a) of CERCLA, the NGB is publishing this ROD to address public review and comment on the selected interim containment alternative, known as a remedial alternative, considered for AOC CS-4 as the interim remedy. The NGB, in consultation with USEPA, considered public comments as part of the final decision-making process for selecting the remedy for AOC CS-4 groundwater. This ROD summarizes results and conclusions of the FFS and the Proposed Plan.

In response to environmental contamination that has occurred as a result of the use, handling, storage, or disposal of hazardous materials at many military installations across the United States, the DOD initiated investigation and clean-up activities under the IRP. The IRP parallels the Superfund program and is conducted in the following seven stages:

- identification of potential hazardous waste sites
- confirmation of the presence of hazardous materials at the site
- determination of the type and extent of contamination
- evaluation of alternatives for clean up of the site in the FFS
- proposal of a clean-up remedy in the Proposed Plan
- selection of a remedy
- implementation of the remedy for clean up of the site

Both private sector and federal facility sites are eligible for placement on the USEPA NPL, which is used to prioritize investigations and responses at hazardous waste sites. MMR was added to the NPL on November 21, 1989. Private sector sites placed on the NPL are eligible to receive funding from the nation's environmental trust fund (i.e., Superfund), and are often called Superfund sites. Federal military facilities such as MMR receive funding from the DOD Defense Environmental Restoration Account.

3.1 LAND USE AND RESPONSE HISTORY

AOC CS-4 was operated for the maintenance of military vehicles by the U.S. Army from 1940 to 1946 and by the USAF from 1955 to 1973. Wastes generated and

potentially spilled or dumped during this period include oils, solvents, antifreeze, battery electrolytes, paint, and waste fuels.

In addition to motor pool activities, the base Defense Property Disposal Office (DPDO) maintained a storage yard in the northern portion of AOC CS-4 between 1965 and 1983. Wastes were transported to the DPDO from shops and laboratories operating at MMR. Wastes and equipment handled at AOC CS-4 included transformers, electrical equipment, waste oils, solvents, and waste fuels. Liquid wastes were stored in containers or tanks in an unbermed area, or deposited in six 5,000-gallon underground storage tanks (USTs) installed to store motor gasoline when the motor pools were operational. The USTs were used until January 1984; in September 1984, the last USTs used for waste storage were emptied and removed. The area has been inactive since 1986.

Since January 1986, several site investigations have been conducted at MMR as part of the IRP. Initially, AOC CS-4 was studied by the U.S. Army Environmental Hygiene Agency (AEHA) to assess the impact of base DPDO activities on local groundwater quality. Results of that study prompted AEHA to include the remaining motor pool area in the investigation. AOC CS-4 was further investigated in the preliminary assessment of MMR in 1986, and again in 1988 (E.C. Jordan Co., 1986 and 1990a).

In 1987, several multilevel monitoring wells were installed along the MMR boundary, including monitoring well cluster MW-603. Data obtained from these investigations suggest that contaminated groundwater may be migrating off MMR from some of the sites. In particular, groundwater contamination may migrate off MMR in a south-southwesterly direction from AOC CS-4, as indicated by monitoring well cluster MW-603, located along the southern MMR boundary.

The 1989 Phase I MW-603 groundwater study was conducted to determine the extent of groundwater contamination detected in the MW-603 cluster, primarily tetrachloroethylene (PCE), trichloroethylene (TCE), and 1,2-dichloroethylene (DCE), and to provide more data to link AOC CS-4 with contaminants in MW-603. This study concluded that chlorinated solvents were associated with soil contamination found at the AOC CS-4 source area and had migrated off-MMR toward potential groundwater receptors (E.C. Jordan Co., 1990c).

Phase I of the MW-603 groundwater study determined the extent of groundwater contamination and identified the source area. Phase I also identified the need for better hydrogeologic data to assess the feasibility of remediating the groundwater plume. Conducted in the spring of 1990, Phase II of the MW-603 groundwater study was an aquifer pumping test to gather these hydrogeologic data (E.C. Jordan Co., 1990b). Using these hydrogeologic data, the FFS was prepared to evaluate the interim remedial alternatives for containing the AOC CS-4 groundwater plume.

3.2 ENFORCEMENT HISTORY

The NGB has followed USEPA guidelines for most of the IRP investigations conducted at MMR since 1986 and for all investigations completed since 1989. Placement on the NPL has not necessitated substantive changes in the overall technical approach to remediation studies. However, upon formalization of the NPL status, the NGB entered into an Interagency Agreement with USEPA and U.S. Coast Guard on July 17, 1991, to define responsibilities, documentation requirements, and future regulatory interaction regarding remedial activities at MMR under CERCLA authority. The ANG is the NGB component directly responsible for carrying out NGB's responsibilities under the agreement.

4.0 COMMUNITY PARTICIPATION

Throughout MMR's history, community concern and involvement has been high. The NGB and USEPA have kept the community and other interested parties apprised of site activities through informational meetings, fact sheets, press releases, public hearings, and Technical Environmental Affairs Committee (TEAC) meetings. The TEAC was organized in 1986 by NGB to provide a forum for public input on MMR remedial response activities. Membership on the TEAC comprises USEPA, Massachusetts Department of Environmental Protection (MADEP), and representatives from local, regional, and state groups.

During July 1991, the MMR community relations plan was released; this outlined a program to address community concerns and keep citizens informed about and involved in activities during remedial activities. On February 24, 1992, the NGB held an informational meeting at Lawrence Junior High School in Falmouth, Massachusetts, to describe the FFS and Proposed Plan.

On February 24, 1992, the NGB made the administrative record available for public review at NGB's IRP Office, Otis ANG Base, Massachusetts; USEPA's offices in Boston, Massachusetts; and the Falmouth Public Library, Falmouth, Massachusetts. The NGB published a notice and brief analysis of the Proposed Plan in the *Cape Cod Times*, *Bourne Courier*, and *Sandwich Broadsider* on February 20, 1992, and in the *Falmouth Enterprise* and *Mashpee Enterprise* on February 21, 1992. The NGB made the FFS and Proposed Plan available to the public at Falmouth Public Library and the administrative records locations.

On February 24, 1992, the NGB held an informational meeting to discuss the results of the field investigations and the clean-up alternatives presented in the FFS and to present the Proposed Plan. Also during this meeting, the NGB answered questions from the public. From February 25 to March 25, 1992, the NGB held a 30-day public comment period to accept public comments on the alternatives presented in the FFS and the Proposed Plan. On March 18, 1992, the NGB held a public hearing to discuss the Proposed Plan and to accept any oral comments. A transcript of this hearing, the written comments received, and the NGB's responses to the comments are included in the responsiveness summary (see Appendices C, D, and E).

5.0 SCOPE AND ROLE OF RESPONSE ACTION

The selected remedy was developed by combining components of different containment alternatives to obtain a comprehensive approach for remediation of AOC CS-4 groundwater. The selected remedy is an interim remedy. An interim remedy is designed to take action to protect human health and the environment in the short term while additional information is collected to better assess the aquifer's and contaminant's responses to remediation efforts. The interim remedy will operate for a minimum of five years, after which time a final remedial action will be developed. A final ROD for groundwater will be based on the data collected during the design, operation, and monitoring of the interim remedy and the findings of further characterization of the CS-10 plume. Additional interim remedial actions may be proposed if data collected prior to the final ROD warrant it.

In summary, the interim remedy provides for (1) extracting contaminated groundwater at the leading edge of the CS-4 groundwater plume for a minimum of five years; (2) pumping the extracted groundwater to a proposed treatment plant to remove contaminants by carbon adsorption; (3) discharging the treated groundwater to infiltration trenches located crossgradient from the plume at MMR; (4) installing observation wells to monitor the hydraulic performance of the extraction system; (5) sampling existing monitoring wells and some of the proposed observation wells to monitor the plume's flowpath and contaminant concentrations; (6) monitoring the influent and effluent of the carbon adsorption treatment; (7) monitoring proposed monitoring wells upgradient of the discharge area; and (8) reviewing the site after five years of operation. This operable unit interim remedial action will intercept the CS-4 groundwater plume to prevent further downgradient migration of contaminants. An additional contaminated groundwater plume, CS-10, has been identified upgradient of the CS-4 plume. The interim remedial action will allow time for the CS-10 plume to be characterized and a final remedial action to be designed that will be consistent with the interim action and the NGB's long-term clean-up goals for reducing contamination in the groundwater at MMR.

The interim remedial action will address the following objectives:

- Reduce potential risk associated with ingestion of contaminated groundwater to acceptable levels.

- Protect uncontaminated groundwater and surface water for future use by minimizing the migration of contaminants.

- Reduce the time required for aquifer restoration.

6.0 SUMMARY OF SITE CHARACTERISTICS

Section 2.0 of the FFS is an overview of the environmental contamination assessment (ABB Environmental Services, Inc., 1992a). The significant findings of the investigations and environmental contamination assessment are summarized in this section.

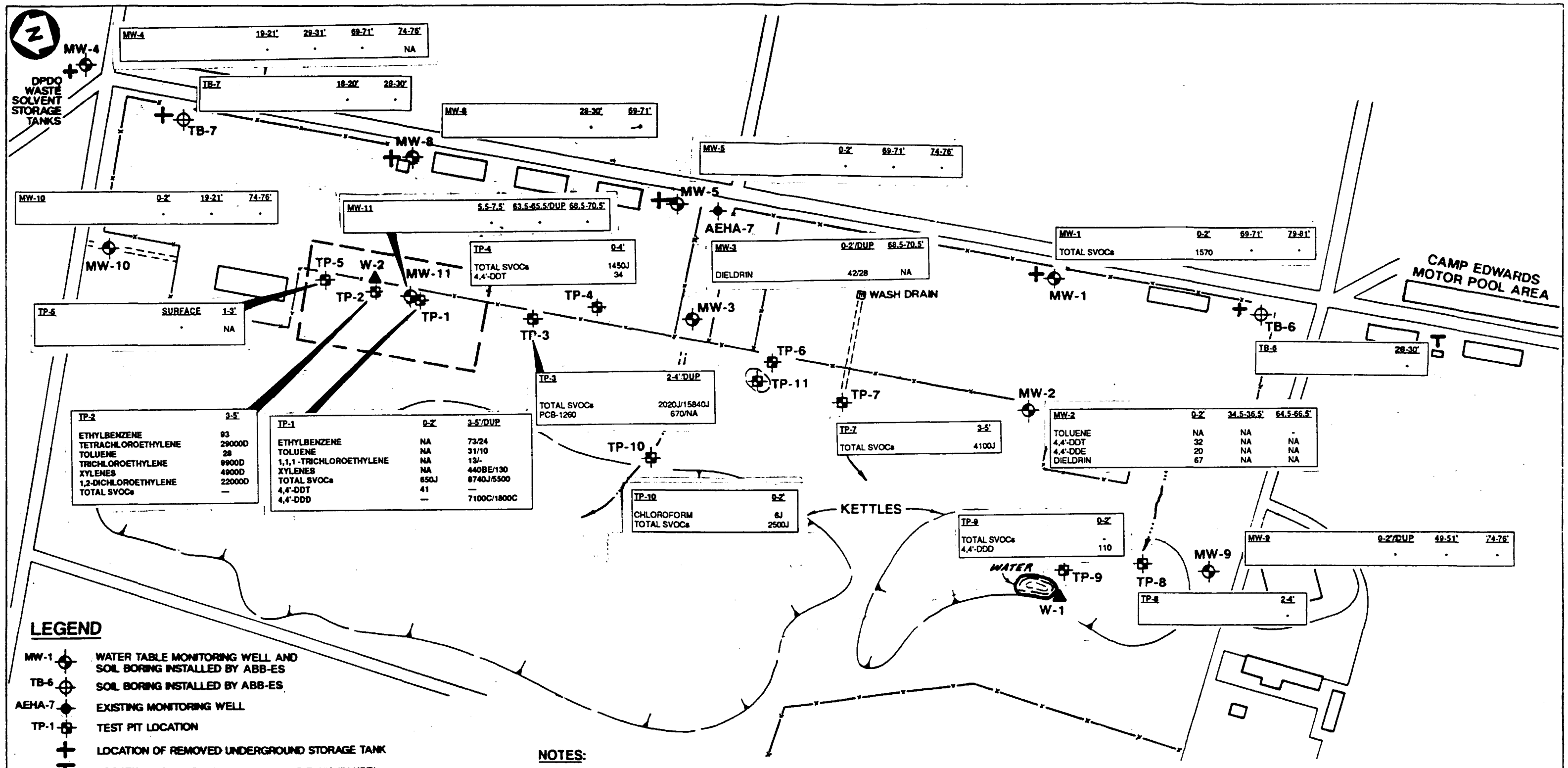
6.1 SOIL CONTAMINATION ASSESSMENT

The primary focus of the environmental contamination assessment is groundwater contamination at AOC CS-4. Because soil contamination has been identified as the source of groundwater contamination, soil contamination is reviewed herein. The soil contamination assessment summarizes the results of field work conducted as Tasks 2-3B and 2-5B during the spring and summer of 1988 and the fall of 1989, respectively (E.C. Jordan Co., 1990a and 1990d).

The primary soil contaminants at AOC CS-4 appear to be PCE, TCE, and 1,2-DCE. Concentrations as high as 130,000 micrograms per kilogram (μg/kg) of PCE and 100,000 μg/kg of TCE were detected in a layer of silty fill soils along the western edge of the site. The greatest concentrations are limited to an area approximately 150 by 6 feet (ABB Environmental Services, Inc., 1991). Figures 6-1 and 6-2 illustrate the spatial distribution and extent of contaminants encountered in AOC CS-4 source area soils.

To understand the potential for AOC CS-4 soil contamination to leach to groundwater, the USEPA Organic Leachate Model (OLM) and modified Summer's model were utilized (USEPA, 1986 and 1989). The AOCs CS-4, FS-25, and FTA-1 engineering evaluation/cost analysis (EE/CA) report discusses the modeling analysis, which indicates that leaching from AOC CS-4 soil would be expected to impact groundwater as observed at the sites (ABB Environmental Services, Inc., 1991).

The source of groundwater contamination appears to be residual chemicals in soils at AOC CS-4. Evaluation of the leaching potential of these soils using the OLM suggests that concentrations in soils at the source area are sufficient to produce the



LEGEND

- MW-1 — WATER TABLE MONITORING WELL AND SOIL BORING INSTALLED BY ABB-ES
- TB-6 — SOIL BORING INSTALLED BY ABB-ES
- AEHA-7 — EXISTING MONITORING WELL
- TP-1 — TEST PIT LOCATION
- LOCATION OF REMOVED UNDERGROUND STORAGE TANK
- LOCATION OF UNDERGROUND STORAGE TANK (IN USE)
- FENCE LINES (EXISTING OR ABANDONED)
- SOIL GAS EXPLORATION PROGRAM
- WATER SAMPLING LOCATION

SCALE IN FEET

0 200 400

NOTES:

ORGANIC RESULTS IN MICROGRAMS PER KILOGRAM
INORGANIC RESULTS IN MILLIGRAMS PER KILOGRAM

- J CONCENTRATIONS LESS THAN CONTRACT REQUIRED DETECTION LIMIT
- E VALUE ESTIMATED DUE TO INTERFERENCE
- – NOT DETECTED
- NA NOT ANALYZED
- C CONFIRMED BY MASS SPECTROMETRY
- B PARAMETERS DETECTED IN BLANK
- • NO PARAMETERS DETECTED IN SAMPLE
- D SAMPLE DILUTED
- X

AREA OF FIGURE 2-2

ABB Environmental Services Inc.
ASEA BROWN BOVERI

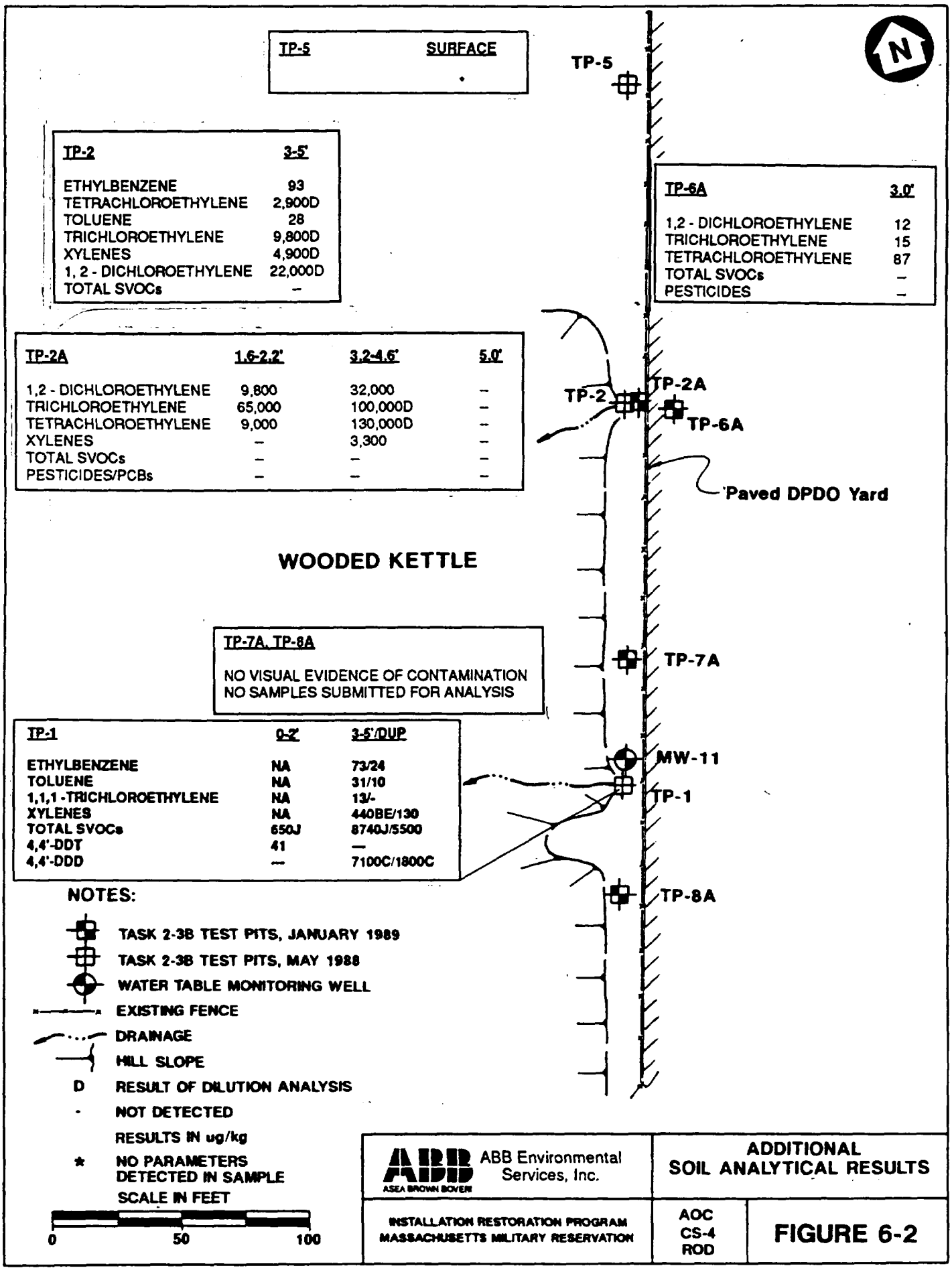
SOIL ORGANIC ANALYTICAL RESULTS

INSTALLATION RESTORATION PROGRAM
MASSACHUSETTS MILITARY RESERVATION

AOC CS-4 ROD

FIGURE 6-1

7001-05


TP-5 SURFACE
TP-5
TP-2 3-5'
ETHYLBENZENE 93
TETRACHLOROETHYLENE 2,900D
TOLUENE 28
TRICHLOROETHYLENE 9,800D
XYLENES 4,900D
1, 2 - DICHLOROETHYLENE 22,000D
TOTAL SVOCs –
TP-6A 3.0'
1,2 - DICHLOROETHYLENE 12
TRICHLOROETHYLENE 15
TETRACHLOROETHYLENE 87
TOTAL SVOCs –
PESTICIDES –
TP-2A 1.6-2.2' 3.2-4.6' 5.0'
1,2 - DICHLOROETHYLENE 9,800 32,000 –
TRICHLOROETHYLENE 65,000 100,000D –
TETRACHLOROETHYLENE 9,000 130,000D –
XYLENES – 3,300 –
TOTAL SVOCs – – –
PESTICIDES/PCBs – – –
TP-2
TP-2A
TP-6A
Paved DPDO Yard
WOODED KETTLE
TP-7A, TP-8A
NO VISUAL EVIDENCE OF CONTAMINATION
NO SAMPLES SUBMITTED FOR ANALYSIS
TP-7A
TP-1 0-2' 3-5'/DUP
ETHYLBENZENE NA 73/24
TOLUENE NA 31/10
1,1,1 -TRICHLOROETHYLENE NA 13/-
XYLENES NA 440BE/130
TOTAL SVOCs 650J 8740J/5500
4,4'-DDT 41 —
4,4'-DDD — 7100C/1800C
MW-11
TP-1
TP-8A
NOTES:
TASK 2-3B TEST PITS, JANUARY 1989
TASK 2-3B TEST PITS, MAY 1988
WATER TABLE MONITORING WELL
EXISTING FENCE
DRAINAGE
HILL SLOPE
D RESULT OF DILUTION ANALYSIS
- NOT DETECTED
RESULTS IN ug/kg
★ NO PARAMETERS DETECTED IN SAMPLE
SCALE IN FEET
0 50 100
ABB Environmental Services, Inc.
ASEA BROWN BOVERI
ADDITIONAL SOIL ANALYTICAL RESULTS
INSTALLATION RESTORATION PROGRAM
MASSACHUSETTS MILITARY RESERVATION
AOC CS-4 ROD
FIGURE 6-2

7001-05

observed groundwater contamination. Remediation of the AOC CS-4 source area is the subject of a separate document (ABB Environmental Services, Inc., 1991).

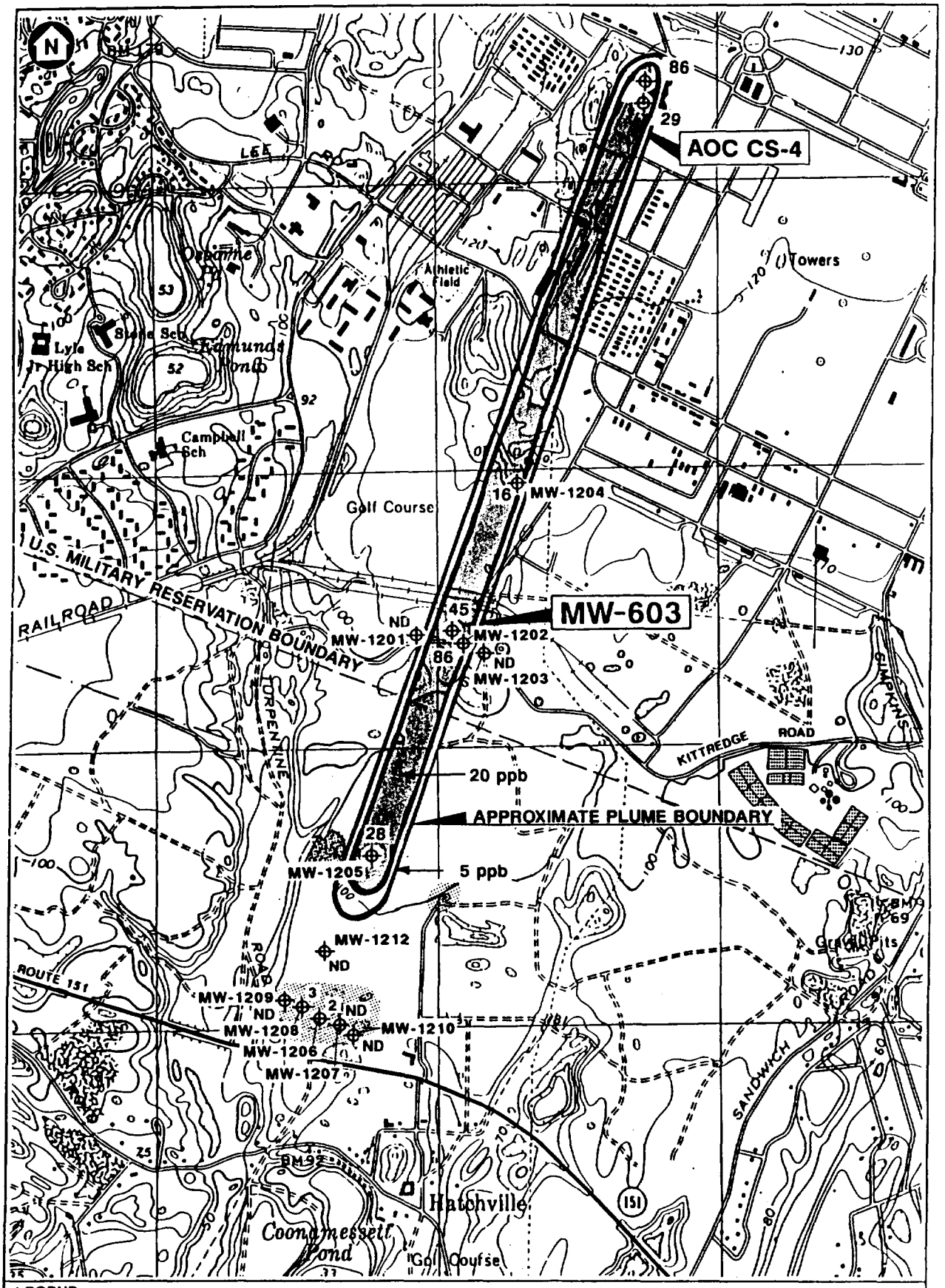
6.2 GROUNDWATER CONTAMINATION ASSESSMENT

The groundwater contamination assessment discusses results of investigations that began in 1985 with the AEHA and continued until 1990 with ABB Environmental Services, Inc. The study of groundwater related to AOC CS-4 evolved from two studies. Groundwater at AOC CS-4 was investigated as part of Tasks 2-3A and 2-3B and Phases I and II of the MW-603 groundwater study (E.C. Jordan Co., 1989a, 1990a, 1990b, and 1990c). The Phase I MW-603 groundwater study provided the link between the downgradient groundwater plume and the AOC CS-4 source area.

A profile of the AOC CS-4 groundwater operable unit plume was generated from data gathered during the investigative studies. Figure 6-3 illustrates the horizontal extent of groundwater contamination. The area where contaminant concentrations exceed 5 micrograms per liter (μg/L) extends from beneath AOC CS-4, 11,000 feet downgradient to within 1,200 feet north of Route 151. The lateral width of the CS-4 groundwater operable unit is approximately 800 feet; its thickness in profile is approximately 40 feet. The estimated plume volume with concentrations equal to or greater than 5 μg/L is 790 million gallons (assuming 30 percent aquifer porosity).

The plume is located near the water table at AOC CS-4. Influenced by rainfall accretion, the plume moves deeper into the aquifer with distance from the source. At MW-603, the plume is approximately 75 feet below the water table. At MW-1206, where only trace concentrations are detectable, the plume is estimated to be 85 feet below the water table.

The primary chemicals detected in the CS-4 groundwater operable unit are PCE (at concentrations up to 62 μg/L) and TCE (at concentrations up to 32 μg/L). DCE has been detected in groundwater at the AOC CS-4 source area at concentrations up to 26 μg/L. 1,1,2,2-Tetrachloroethane has been detected at concentrations as high as 24 μg/L in downgradient monitoring wells. Tables 6-1 through 6-5 summarize results of the groundwater investigations as presented in the FFS.



LEGEND

1.5 SUM OF TRICHLORETHYLENE(TCE) AND TETRACHLOROETHYLENE (PCE) (MICROGRAMS PER LITER)

ESTIMATED LOCATION OF >5 ug/LTCE + PCE CONCENTRATION

BASE MAP SOURCE: USGS MAPS
POCASSET, MASS. DATED 1967 (Photorevised 1979) &
FALMOUTH, MASS. DATED 1972 (Photorevised 1979)

SCALE IN FEET
0 1,000 2,000

ABB Environmental Services Inc.

AOC CS-4
GROUNDWATER PLUME

INSTALLATION RESTORATION PROGRAM
MASSACHUSETTS MILITARY RESERVATION

AOC CS-4 ROD

FIGURE 6-3

7001-05

TABLE 6-1
SUMMARY OF AEHA GROUNDWATER ANALYTICAL DATA

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

MONITORING WELL	ANALYSIS													PHENOL
	ARSENIC	BORON	BARIUM	CALCIUM	CADMIUM	IRON	POTASSIUM	MAGNESIUM	MANGANESE	SODIUM	NICKEL	ZINC	NITRITE - NITRATE	
AEHA-6	–	–	–	2,100	13	142	–	1,870	221	5,100	–	41	180	–
AEHA-7	31*	112*	29*	8,000*	–	2,300	840	3,120*	599*	10,500*	–	42*	1,800*	–
AEHA-8	–	86	12	3,070	–	3,500*	1,120*	2,770	572	7,100	86	21	–	10*
RANGE	ND-31	ND-112	ND-29	ND-8,000	ND-13	142-3,500	ND-1,120	1,870-3,120	221-599	5,100-1,050	ND-86	21-42	ND-1,800	ND-10
MCLs	5	–	1,000	–	10	–	–	–	–	–	–	–	10,000	–

Notes:

All values reported as micrograms per liter (µg/L).
Modified after AEHA (1986)
– = Not Detected
* = Highest Detection
ND = Non-Detect
AEHA = U.S. Army Environmental Hygiene Agency
MCL = Maximum Contaminant Level

Source: AEHA, 1986

W003929.T80/4

TABLE 6-2
TASK 2-3B SOURCE AREA GROUNDWATER ANALYTICAL DATA SUMMARY

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

MONITORING WELL	ANALYSIS			
	TARGET COMPOUND LIST VOLATILE ORGANIC COMPOUNDS			TARGET ANALYTE LIST INORGANICS
	TETRACHLOROETHYLENE	1,2-DICHLOROETHYLENE (TOTAL)	TRICHLOROETHYLENE	SODIUM
AEHA-6	--	--	--	--
AEHA-7	--	--	--	--
AEHA-8	--	--	--	--
MW-1	--	--	--	--
MW-2	--	--	--	6,630E
MW-3	19	4E	6	7,990E
MW-4	5	--	--	9,140E
MW-5	8	--	--	--
MW-8	4E	--	--	8,360E
MW-9	--	--	--	5,240E
MW-10	--	--	--	15,100E*
MW-11	37*	26*	23*	--
RANGE	ND-37	ND-26	ND-23	ND-15,100E

Notes:

All values reported in micrograms per liter (μg/L)
E = Estimated Concentration
-- = Not Detected
ND = Non-Detect
* = Highest Site Detection of Analyte
Sampling Date: 3/90 to 4/90
Semivolatile organic compounds were not detected.

Source: E.C. Jordan Co., 1990a.

TABLE 6-3
TASK 2-5B SOURCE AREA GROUNDWATER ANALYTICAL DATA SUMMARY

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

MONITORING WELL	ANALYSIS				
	TOTAL COMPOUND LIST VOLATILE ORGANIC COMPOUNDS				TOTAL SVOCS
	TETRACHLOROETHYLENE	1,2-DICHLOROETHYLENE (TOTAL)	TRICHLOROETHYLENE	1,1,2,2-TETRACHLOROETHANE	BIS(2-ETHYLHEXYL)PHTHALATE
AEHA-6	–	–	–	–	–
AEHA-7	6J	–	–	–	–
AEHA-8	1J	–	–	–	–
MW-1	–	–	–	–	–
MW-2	–	–	–	–	–
MW-3	9	1	3	–	–
MW-4	4	–	–	–	–
MW-5	6	–	–	–	–
MW-8	3	–	–	–	12
MW-9	–	–	–	–	–
MW-9A	–	–	–	–	–
MW-10	–	–	–	–	–
MW-11	38*	21*	30*	–	15*
MW-12	–	–	1	–	–
MW-13	7	–	1	–	–
MW-603Z	–	–	–	–	–
MW-603A	50*	–	26*	22*	–
MW-603B	–	–	–	10	–
MW-603C	–	–	–	–	–
MW-603D	–	–	–	–	–
MW-603E	–	–	–	–	–
RANGE	ND-50	ND-21	ND-30	ND-22	ND-15

Notes:

All values reported in micrograms per liter (µg/L)
J = Concentration less the Contract Required Detection Limit
- = Not Detected
* = Highest Site Detection of Analyte
ND = Non-Detect
SVOC = Semivolatile Organic Compound

W003929.T80/5

TABLE 6-4
TASK 2-3A DOWNGRADIENT GROUNDWATER ANALYTICAL DATA SUMMARY

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

MONITORING WELL (DATE SAMPLED)		ANALYSIS				
		TARGET COMPOUND LIST VOLATILE ORGANIC COMPOUNDS				
		TRICHLOROETHYLENE	TETRACHLOROETHYLENE	1,1,2,2-TETRACHLOROETHANE	ETHYLBENZENE	XYLENES
MW-603A	10/27/87	31	61*	23	--	--
	1/5/88	32*	57	24*	--	--
MW-603B	10/27/87	7.8	12	12	--	--
	1/5/88	6	11	9	--	--
MW-603C/DUP	10/27/87	--/--	J/J	J/J	--/--	--/--
	1/5/88	--/--	J/--	J/--	--/--	--/--
IRP-9/DUP	10/27/87	--/--	--/J	--/--	--/--	--/J
	1/5/88	--/--	--/--	--/--	--/--	J/--
MW-603E	10/27/87	--	--	--	--	--
	1/5/88	--	--	--	J	7*
RANGE		ND-32	ND-61	ND-24	--	ND-7
MCLs		5	5	--	700	10,000

Notes:

ND = Non-Detect
All values reported in micrograms per liter (μg/L)
* = Highest Detection
J = Concentration less than Contract Required Detection Limit
-- = Not detected
MCL = Maximum Contaminant Level

Source: E.C. Jordan Co., 1989a

TABLE 6-5
MW-603 STUDY GROUNDWATER ANALYTICAL DATA SUMMARY

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

MONITORING WELL	ANALYSIS				
	TARGET COMPOUND LIST VOLATILE ORGANIC COMPOUNDS			TARGET ANALYTE LIST INORGANICS	
	TRICHLOROETHYLENE	TETRACHLOROETHYLENE	1,1,2,2-TETRACHLOROETHANE	SODIUM	CALCIUM
MW-1201A	–	–	–	–	–
MW-1201B	–	–	–	–	–
MW-1202A	24	62*	–	–	–
MW-1202B	5	18	4	–	–
MW-1203A	–	–	–	–	–
MW-1204A/DUP	3/1	13/6	–	11,500*/10,800	–
MW-1204B	–	–	–	–	–
MW-1205B	–	–	–	–	–
MW-1205C	2	2	–	–	–
MW-1205D/DUP	14/13	14/13	5/5	9,270/8,480	5,240*/5,220
MW-1206Z	–	–	–	–	–
MW-1206A	1	2	–	–	–
MW-1206B	–	–	–	–	–
MW-1206C	–	–	–	–	–
MW-1207A	–	–	–	–	–
MW-1208A	2	3	1	–	–
MW-1209A	–	–	–	–	–
MW-1210A	–	–	–	–	–
MW-1212A	–	–	–	–	–
MW-1212B	–	–	–	–	–
MW-603Z	–	–	–	–	–
MW-603A/DUP	30*/14	53D/31	15*/7	9,090	–
MW-603B	5	13	10	–	–
RANGE	ND-30	ND-62	ND-15	ND-11,500	ND-5,240

Notes:

All values reported in micrograms per liter (µg/L)
* Highest Detection of Analyte
– = Not Detected
ND = Non-Detect

Source: E.C. Jordan Co., 1990c

The CS-4 groundwater operable unit will continue to migrate downgradient from its 1989 position at a rate of approximately 370 feet per year (ft/yr). This flow rate is equivalent to approximately 50 gallons per minute (gpm) across the 800-by-40-foot cross-sectional area of the plume. The 790 million gallons of water in the plume would require an estimated 30 years (based on the base plume flux) to pass the current location of the downgradient plume edge.

7.0 SUMMARY OF SITE RISKS

A human health risk assessment was conducted to estimate the probability and magnitude of potential adverse human health effects from exposure to contaminants associated with AOC CS-4. Environmental risk does not currently exist from contaminants in groundwater from AOC CS-4. Environmental risks would only be possible if the contaminated groundwater were allowed to migrate farther south and discharge into Coonamessett Pond. Because groundwater will be remediated before it reaches the pond, there would be no impact by AOC CS-4 groundwater to that surface water body. An ecological risk assessment was not conducted for AOC CS-4. However, once the extent of the AOC CS-10 plume has been characterized, an ecological risk assessment could be conducted for both groundwater plumes. The groundwater risk assessment is described in detail in the FFS (ABB Environmental Services, Inc., 1992a). The human health risk assessment followed a four-step process:

1. Contaminant identification, which identified those hazardous substances that, given the specifics of the site, were of significant concern.

2. Exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure.

3. Toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances.

4. Risk characterization, which integrated the three earlier steps to summarize the potential and actual carcinogenic and noncarcinogenic risks posed by hazardous substances at the site.

Results of the human health risk assessment for the AOC CS-4 are discussed in the following paragraphs, followed by the conclusions of the environmental risk assessment.

Four contaminants of concern were selected for evaluation in the risk assessment. All compounds detected at least once in the groundwater, except for 2-butanone, were retained as contaminants of concern, and are listed in Table 7-1. 2-Butanone was not selected as a contaminant of concern because it was present in laboratory blank samples and is not considered to be site-related. The health effects of each contaminant of concern are summarized in Appendix B of the FFS (ABB Environmental Services, Inc., 1992a).

Potential human health effects associated with exposure to the contaminants of concern were estimated quantitatively through the development of hypothetical exposure pathways. These pathways were developed to reflect the potential for exposure to hazardous substances based on the current and potential future uses and location of AOC CS-4. The following is a brief summary of the exposure pathways evaluated; a more thorough description is in the FFS (ABB Environmental Services, Inc., 1992a). The receptor population exposure pathway was assumed to be future downgradient residents. A lifetime (i.e., 70 years) of consuming 2 liters of groundwater per day for 350 days per year was assumed for an average body weight of 70 kilograms. It was assumed that the same size person would inhale volatilized contaminants at a rate of 0.6 cubic meter per hour during daily 12-minute showers. For each pathway evaluated, an average and a reasonable maximum exposure estimate was generated corresponding to exposure to the average and the maximum concentration detected in that particular medium.

Excess lifetime cancer risks were determined for each exposure pathway by multiplying the exposure level with the chemical-specific cancer potency factor. Cancer potency factors have been developed by USEPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is very unlikely to be greater than the predicted risk. The resulting risk estimates are expressed in scientific notation as a probability (e.g., $1x10^{-6}$ for 1/1,000,000) and indicate (using this example), that an individual is not likely to have greater than a one-in-a-million chance of developing cancer over 70 years as a result of site-related exposure as defined to the compound at the stated concentration. Current USEPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

The Hazard Index (HI) was also calculated for each pathway as USEPA's measure of the potential for noncarcinogenic health effects. The HI is calculated by dividing

TABLE 7-1
CONTAMINANT CONCENTRATIONS DETECTED IN GROUNDWATER

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

CHEMICAL LEVEL	CONCENTRATION[1] RANGE	MEAN[2]	FREQUENCY[3] OF DETECTION	MAXIMUM DETECTED CONCENTRATION
Volatile Organic Compounds (µg/L)				
Tetrachloroethylene	ND-62	18	14/20	62
Trichloroethylene	ND-32	9.1	14/20	32
1,1,2,2-Tetrachloroethane	ND-24	6.8	11/20	24
1,2-Dichloroethylene (total)[4]	ND-21	1.1	1/20	26

Notes:

[1] Duplicate samples were averaged.
[2] Arithmetic means were calculated using one-half the Contract Required Quantitation Limit.
[3] The frequency of detection is the number of samples in which a compound is detected over the number of samples available.
[4] 1,2-Dichloroethylene was selected for evaluation due to its potential to migrate downgradient of the source.

ND = Non-Detect
µg/L = micrograms per liter

the exposure level by the reference dose (RfD) or other suitable benchmark for noncarcinogenic health effects. RfDs have been developed by USEPA to protect sensitive individuals over the course of a lifetime and they reflect a daily exposure level that is likely to be without an appreciable risk of an adverse health effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. The HI is often expressed as a single value (e.g., 0.3) indicating the ratio of the stated exposure as defined to the RfD value (in this example, the exposure is approximately one-third of an acceptable exposure level for the given compound). The HI is only considered additive for compounds that have the same or similar toxic endpoints (for example: the HI for a compound known to produce liver damage should not be added to a second whose toxic endpoint is kidney damage).

Table 7-2 depicts the carcinogenic and noncarcinogenic risk summary for contaminated groundwater ingestion and inhalation of volatilized contaminants in the shower. More detailed tables of the risk assessment are in Appendix B of the AOC CS-4 FFS (ABB Environmental Services, Inc., 1992a).

Carcinogenic risks are compared to the USEPA target carcinogenic risk range of 10^{-4} to 10^{-6}. Noncarcinogenic risks are compared to the USEPA target noncarcinogenic HI of 1.0 (USEPA, 1990).

Future potential carcinogenic risks for downgradient residents ingesting and inhaling groundwater contaminants were estimated to be $3x10^{-5}$ (average case) and $1x10^{-4}$ (reasonable worst case). Noncarcinogenic risks were estimated to be 0.02 (average case) and 0.08 (reasonable worst case). Both carcinogenic and noncarcinogenic risks fall within the USEPA target risk ranges.

Federal MCLs represent the maximum contaminant concentration allowable in public water supplies. Both the mean and maximum concentrations of TCE and PCE exceed their respective MCLs (Table 7-3). The detected concentration of 1,2-DCE (total) is less than the MCL for the cis-isomer. There is no MCL for 1,1,2,2-tetrachloroethane.

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent

TABLE 7-2
SUMMARY OF RISKS RESULTING FROM EXPOSURE TO GROUNDWATER CONTAMINANTS

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

EXPOSURE LOCATION	EXPOSURE MEDIUM	EXPOSURE ROUTE	LIFETIME INCREMENTAL CARCINOGENIC RISK	NONCARCINOGENIC HAZARD INDEX
			AVERAGE	
AOC CS-4	Groundwater	Ingestion	3×10^{-5}	0.02
		Inhalation of Volatilized Contaminants	3×10^{-6}	NA
		TOTAL	3×10^{-5}	0.02
			MAXIMUM	
AOC CS-4	Groundwater	Ingestion	9×10^{-5}	0.08
		Inhalation of Volatilized Contaminants	1×10^{-5}	NA
		TOTAL	1×10^{-4}	0.08

Note:

NA = Appropriate toxicity information is not available to evaluate this route of exposure.

TABLE 7-3
CONTAMINANT CONCENTRATIONS AND FEDERAL MAXIMUM CONTAMINANT LEVELS

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

CHEMICAL	MEAN CONCENTRATION (µg/L)	MAXIMUM CONCENTRATION (µg/L)	FEDERAL MCL (µg/L)
Tetrachloroethylene	18	62	5
Trichloroethylene	9.1	32	5
1,1,2,2-Trichloroethane	6.8	24	NA
1,2-Dichloroethylene (total)	1.1	26	70[1]

Notes:

NA = Not Available
[1] = MCL is for the cis-isomer
µg/L = micrograms per liter

and substantial endangerment to human health, welfare, or the environment. Risks due to groundwater releases are dealt with in this ROD.

8.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

Four alternatives were developed and screened in the FFS. This section describes the response objectives and the development and screening of alternatives.

8.1 STATUTORY REQUIREMENTS/RESPONSE OBJECTIVES

Under its legal authorities, NGB's primary responsibility at this NPL site is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences, including a requirement that the remedial action, when complete, must comply with all federal and more stringent state environmental standards, requirements, criteria, or limitations, unless a waiver is invoked; a requirement that the selected remedial action is cost-effective and utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for remedies in which treatment that permanently and significantly reduces the mobility, toxicity, or volume of the hazardous substances is a principal element over remedies not involving such treatment. Response alternatives were developed to be consistent with these Congressional mandates.

Based on preliminary information relating to types of contaminants, environmental media of concern, and potential exposure pathways, remedial action objectives were developed to aid in the development and screening of alternatives. These interim remedial action objectives were developed to mitigate existing and future potential threats to human health and the environment:

- Reduce the potential risk associated with ingestion of contaminated groundwater to acceptable levels.
- Protect uncontaminated groundwater and surface water for future use by minimizing the migration of contaminants.
- Reduce the time required for aquifer restoration.

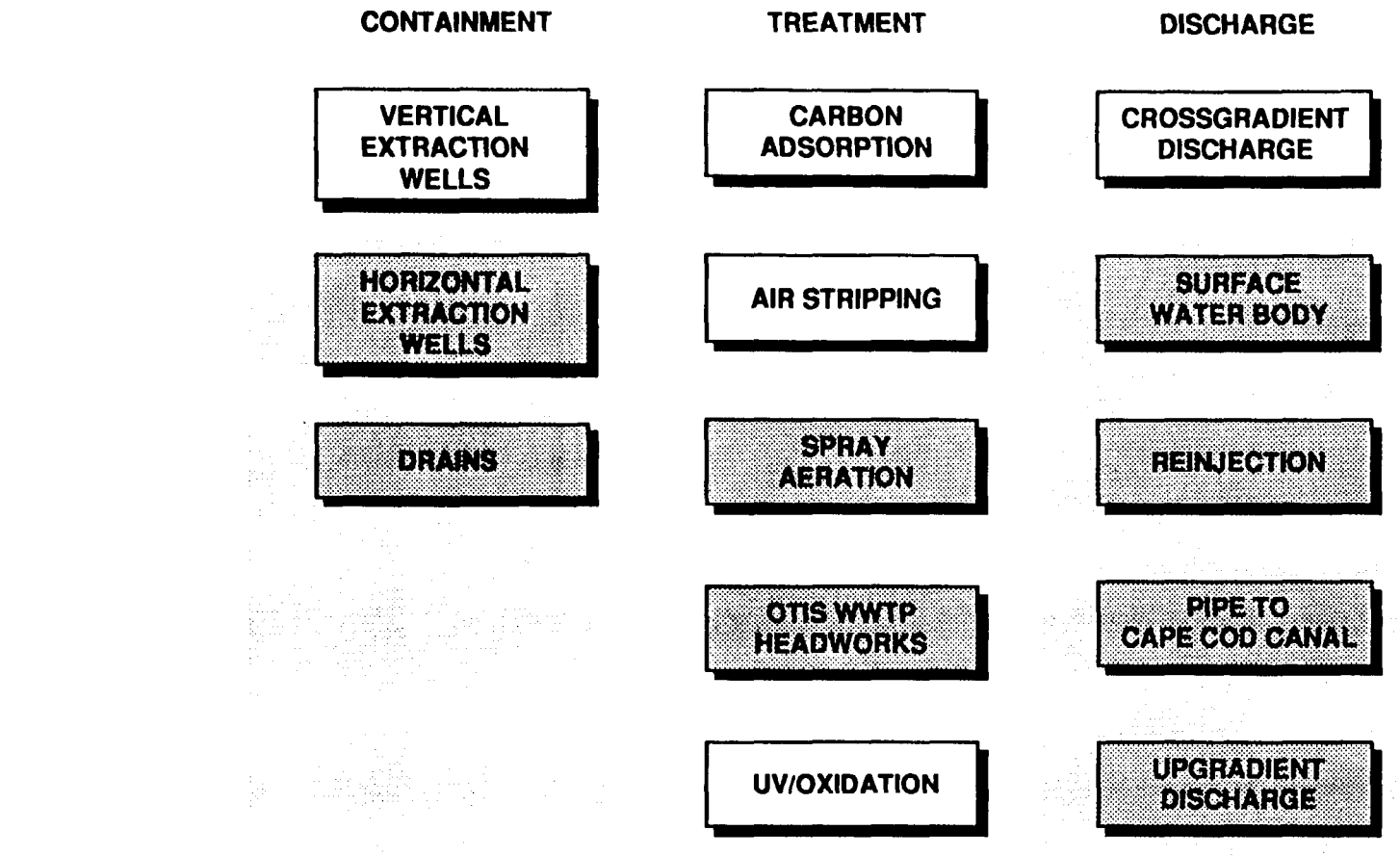
8.2 ALTERNATIVES DEVELOPMENT AND SCREENING

CERCLA and the NCP set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives was developed for AOC CS-4 groundwater plume containment.

With respect to the groundwater response action, the FFS developed a no action alternative and a limited number of interim remedial alternatives that attain site-specific remediation levels using different technologies (ABB Environmental Services, Inc., 1992a).

Section 5.0 of the FFS identified, assessed, and screened technologies based on implementability, effectiveness, and cost. The FFS focused only on groundwater contaminant migration technologies. A separate report addresses source control technologies (ABB Environmental Services, Inc., 1991). Section 6.0 of the FFS presented the interim remedial alternatives developed by combining the technologies identified in the initial screening process per Section 300.430(e)(3) of the NCP. The purpose of the initial screening was to narrow the number of potential remedial actions for further detailed analysis while preserving a range of options. Each alternative was then evaluated and screened in Section 7.0 of the FFS.

Of the 13 remedial technologies screened in the FFS, five were retained for detailed analysis. Figure 8-1 identifies the five technologies retained through the screening process, as well as those eliminated from further consideration.



LEGEND

Technology Eliminated from Further Consideration

ABB Environmental Services, Inc. (ASEA BROWN BOVERI)	SCREENING OF REMEDIAL TECHNOLOGIES	
INSTALLATION RESTORATION PROGRAM MASSACHUSETTS MILITARY RESERVATION	AOC CS-4 ROD	FIGURE 8-1

9201043D

9.0 DESCRIPTION OF ALTERNATIVES

This section provides a narrative summary of each alternative evaluated. A detailed tabular assessment of each alternative is in Table 8-1 of the FFS (ABB Environmental Services, Inc., 1992a).

No source control alternatives were studied in the AOC CS-4 groundwater FFS. Details of the source area removal action are discussed in the AOCs CS-4, FS-25, and FTA-1 source EE/CA (ABB Environmental Services, Inc., 1991).

9.1 CONTAINMENT ALTERNATIVES ANALYZED

Containment alternatives address contaminants that have migrated from the original source of contamination. At AOC CS-4, contaminants have migrated in a south-southwesterly direction from the AOC CS-4 site at an estimated rate of 370 ft/yr. The alternatives evaluated for AOC CS-4 are a minimal no-action alternative (GW-1); a vertical extraction system, activated carbon treatment, and discharge alternative (GW-2); a vertical extraction system, air-stripping treatment, and discharge alternative (GW-3); and a vertical extraction system, ultraviolet (UV)/oxidation treatment, and discharge alternative (GW-4).

9.1.1 Alternative GW-1: Minimal No Action

The minimal no-action alternative provides a baseline against which other alternatives can be compared. This alternative does not involve remedial actions to treat contaminated groundwater. The contaminant plume would not be removed from the aquifer. The minimal no-action alternative would include sampling of existing monitoring wells, and some of the observation wells proposed to be installed for the alternatives involving extraction. Review of the site would also be conducted every five years. The minimal no-action alternative would not reduce risk and would not meet the response objectives described in Subsection 8.1.

Estimated Time for Design and Construction: 6 Months

Estimated Time of Operation: 5 Years

Estimated Capital Cost: None

Estimated Operations and Maintenance Costs (net present worth):* $236,000 to $506,000

Estimated Total Cost (net present worth):* $236,000 to $506,000

*Net present worth costs are based on a 10 percent discount factor and five years of operation.

9.1.2 Alternative GW-2: Extraction, Carbon Adsorption Treatment, and Discharge

The extraction, carbon adsorption treatment, and discharge alternative consists of the environmental monitoring program described for the minimal no-action alternative and a groundwater containment and treatment system. The components of this alternative are as follows:

- groundwater extraction wells
- activated carbon treatment
- discharge of treated water
- environmental monitoring well sampling
- hydraulic performance monitoring

To facilitate containment of contaminated groundwater, an extraction well system would be installed. The volume of AOC CS-4 groundwater is estimated to be approximately 790 million gallons, assuming an aquifer porosity of 30 percent. The area of containment is shown in Figure 6-3. Using data from the AOC CS-4 pumping test, it is estimated that 13 extraction wells yielding approximately 115 gpm total could be installed at the toe of the plume to contain AOC CS-4 groundwater. In addition, observation wells would be installed to evaluate the effectiveness of the extraction system. The exact number and location of wells would be determined during remedial design.

After extraction, carbon adsorption would remove the VOCs found in AOC CS-4 groundwater. Activated carbon, a highly porous substance, selectively adsorbs contaminants by a surface attraction phenomenon in which organic molecules are attracted to the internal pores of the carbon granules. Once the micropore surfaces

are saturated with organics, the carbon is considered spent and must be replaced with virgin carbon, or removed, thermally regenerated, and replaced. Contaminants are permanently destroyed during the regeneration process. The time for the carbon to be considered spent will be assessed by monitoring influent and effluent chemical concentrations.

Treated groundwater would be pumped from the treatment plant to infiltration trenches located crossgradient from the plume, where the water would be allowed to infiltrate below grade and return to the aquifer from which it was removed. The infiltration area would be prepared with sand, gravel, and other materials. Water would be distributed by perforated pipes over the trench area.

Chemical sampling of existing monitoring wells and some of the proposed observation wells would monitor the plume's flowpath and chemical concentrations. Sampling proposed monitoring wells upgradient of the infiltration area will assess groundwater contaminant levels upgradient of the discharge area. The proposed monitoring program is described in the AOC CS-4 groundwater FFS and outlined in Section 5.0 of this ROD (ABB Environmental Services, Inc., 1992a). As an interim remedy, this alternative would provide an increased level of protection to downgradient receptors, compared to baseline conditions. The extraction and treatment system would contain the AOC CS-4 groundwater plume and treat this water to the appropriate discharge requirements (i.e., MCL concentrations). This alternative is expected to provide a permanent reduction in contaminant concentrations in groundwater.

Estimated Time for Design and Construction: 1 Year

Estimated Time of Operation: 5 Years

Estimated Capital Cost: $1,641,000 to $3,516,000

*Estimated Operations and Maintenance Costs (net present worth):** $472,000 to $1,012,000

*Estimated Total Cost (net present worth):** $2,113,000 to $4,528,000

*Net present worth costs are based on a 10 percent discount factor and five years of operation.

9.1.3 Alternative GW-3: Extraction, Air-stripping Treatment, and Discharge

The extraction, air-stripping treatment, and discharge alternative would be similar to the GW-2 alternative, except that VOCs would be removed by air stripping, followed by vapor-phase carbon adsorption. Extraction of groundwater, discharge of treated groundwater, environmental and hydraulic monitoring, and a five-year review would be identical to the GW-2 alternative.

Air stripping removes relatively volatile components from groundwater by passing air through the contaminated water. To accomplish this, groundwater is pumped to the top of an air-stripping tower and allowed to flow down through packing materials to the bottom. At the same time, air is blown upward through the tower and packing materials. Volatile contaminants transfer from water to air. The air is then treated using activated carbon in a manner similar to the preferred alternative. The vapor-phase carbon would be reactivated off-site so that it could be used again at a later date.

As an interim remedy, this alternative would provide an increased level of protection to downgradient receptors, compared to baseline conditions. The extraction and treatment system would contain the AOC CS-4 groundwater plume and treat this water to the appropriate discharge requirements (i.e., MCL concentrations). This alternative is expected to provide a permanent reduction in contaminant concentrations in groundwater.

Estimated Time for Design and Construction: 1 Year

Estimated Time of Operation: 5 Years

Estimated Capital Cost: $1,832,000 to $3,925,000

Estimated Operations and Maintenance Costs (net present worth):* $698,000 to $1,496,000

Estimated Total Cost (net present worth):* $2,530,000 to $5,421,000

*Net present worth costs are based on a 10 percent discount factor and five years of operation.

9.1.4 Alternative GW-4: Extraction, Ultraviolet/Oxidation Treatment, and Discharge

The extraction, UV/oxidation treatment, and discharge alternative would be similar to the GW-2 alternative, except that VOCs would be removed by UV/oxidation treatment in place of carbon adsorption. Extraction of groundwater, discharge of treated groundwater, environmental and hydraulic monitoring, and a five-year review would be identical to the GW-2 alternative.

In place of the carbon adsorption unit described in the GW-2 alternative, a UV/oxidation reactor would be used. The UV/oxidation technology destroys organic compounds in wastewater and groundwater through chemical oxidation enhanced by exposure to the UV light. UV/oxidation occurs in a stainless steel chamber containing vertically or horizontally mounted UV lamps. An oxidant is added to the water in the tank, which breaks down contaminants into less harmful chemicals. The UV light enhances the oxidant's ability to break down contaminants. The oxidant proposed for this alternative is hydrogen peroxide.

As an interim remedy, this alternative would provide an increased level of protection to downgradient receptors, compared to baseline conditions. The extraction and treatment system would contain the AOC CS-4 groundwater plume and treat this water to the appropriate discharge requirements (i.e., MCL concentrations). This alternative is expected to provide a permanent reduction in contaminant concentrations in groundwater.

Estimated Time for Design and Construction: 1 Year

Estimated Time of Operation: 5 Years

Estimated Capital Cost: $2,443,000 to $5,234,000

Estimated Operations and Maintenance Costs (net present worth):* $584,000 to $1,251,000

*Estimated Total Cost (net present worth)**: $3,027,000 to $6,485,000

*Net present worth costs are based on a 10 percent discount factor and five years of operation.

9.2 SOURCE CONTROL ALTERNATIVES ANALYZED

No source control alternatives were evaluated as part of this ROD. AOC CS-4 soils are being addressed separately as part of a removal action for three sites (ABB Environmental Services, Inc., 1991). This separation of the source area soils and the downgradient groundwater is consistent with the operable unit approach outlined in the NCP. If implemented in conjunction with the source control remediation, these groundwater alternatives would provide a sitewide response plan for AOC CS-4.

10.0 SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that, at a minimum, NGB is required to consider in its assessment of alternatives. Building on these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

A detailed analysis was performed on the alternatives using the nine evaluation criteria to select an interim site remedy. The following summary compares each alternative's strength and weakness with respect to the nine evaluation criteria These criteria and their definitions are discussed in the following subsections.

10.1 THRESHOLD CRITERIA

The following two threshold criteria described must be met for alternatives to be eligible for selection in accordance with the NCP:

- **Overall Protection of Human Health and the Environment** addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- **Compliance with ARARS** addresses whether a remedy will meet all of the ARARs of other federal and state environmental laws and/or provide grounds for invoking a waiver.

10.2 PRIMARY BALANCING CRITERIA

The following five criteria are used to compare and evaluate the alternatives that meet the threshold criteria:

- **Long-term Effectiveness and Permanence** assesses alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.

- **Reduction of Mobility, Toxicity, or Volume Through Treatment** addresses the degree to which alternatives employ recycling or treatment that reduces mobility, toxicity, or volume, including how treatment is used to address the principal threats posed by the site.

- **Short-term Effectiveness** addresses the time needed to achieve protection and any adverse impacts on human health and the environment.

- **Implementability** addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

- **Cost** addresses the estimated capital and operations and maintenance costs on a present-worth basis.

10.3 MODIFYING CRITERIA

The modifying criteria are used on the final evaluation of remedial alternatives generally after NGB has received public comment on the FFS and Proposed Plan:

- **State Acceptance** addresses the Commonwealth's position and key concerns related to the preferred alternative and other alternatives including comments on ARARs or the proposed use of waivers.

- **Community Acceptance** addresses the public's general response to the alternatives described in the FFS and Proposed Plan reports.

Following the detailed analysis of each alternative, a comparative analysis, focusing on the relative performance of each alternative against the nine criteria, was conducted. The comparative analysis is presented in the FFS (ABB Environmental Services, Inc., 1992a).

The following subsection presents the nine criteria and a brief narrative summary of the alternatives and their strengths and weaknesses according to the detailed and comparative analysis.

10.4 Overall Protection of Human Health and the Environment

All the remedial alternatives, except the minimal no-action alternative, would provide an increased level of protection to human receptors. The minimal no-action alternative was not designed to achieve remedial action objectives. Alternatives GW-2, GW-3, and GW-4 include containment, treatment, and discharge components that would effectively reduce contaminant concentrations in groundwater. Protection is provided by containment of the plume to prevent the migration of contaminated groundwater to currently uncontaminated areas.

10.5 Compliance with ARARS

The minimal no-action alternative was not designed to achieve remedial action objectives and, therefore, would not comply with chemical-specific ARARs. Groundwater treatment, carbon adsorption, or UV/oxidation is expected to remove VOCs.

The design of the AOC CS-4 groundwater containment option would be based on compliance with location- and action-specific ARARs. The final treatment standards for groundwater would be based on achieving discharge requirements. In addition, all work conducted at AOC CS-4 would be in accordance with Occupational Safety and Health Administration (OSHA) requirements.

10.6 Long-Term Effectiveness and Permanence

The minimal no-action alternative would not meet remedial action objectives. AOC CS-4 groundwater would continue to pose a risk to human health until natural attenuation reduced contaminant levels in the groundwater. Environmental monitoring and site reviews would evaluate the effectiveness of natural attenuation

in reducing contaminant concentrations; future remedial actions may be recommended.

The other three groundwater treatment alternatives (i.e., Alternatives GW-2, GW-3, and GW-4) would meet remedial action objectives for groundwater because the water would be collected and treated before it could migrate farther downgradient. Each treatment option is considered to provide a permanent remedy for removal of contaminants in AOC CS-4 groundwater. Future long-term remedial actions will be evaluated once AOC CS-10 groundwater has been sufficiently characterized.

10.7 Reduction of Mobility, Toxicity, or Volume

This criterion is relevant only for treatment alternatives. The minimal no-action alternative does not reduce the mobility, toxicity, or volume of contaminants or contaminated media. All three of the water treatment alternatives would reduce the mobility, toxicity, and volume of contaminants in groundwater. The reductions for each treatment alternative are evaluated in the FFS (ABB Environmental Services, Inc., 1992a).

10.8 Short-Term Effectiveness

Implementing the minimal no-action alternative would not result in additional adverse impacts on human health or the environment than already exist from AOC CS-4 groundwater. For the other alternatives, impacts on human health would result from increased drilling equipment and construction materials transported to the site.

Impacts on the environment during remedial activities include the removal of trees during site preparation before installing the extraction system, treatment units, and discharge area. However, these components would be designed to have minimal impact on the environment.

Impacts to workers implementing remedial actions as part of Alternative GW-2, GW-3, and GW-4 would be mitigated by the use of appropriate personal protective equipment and clothing and by following safe work practices, as outlined in a Health and Safety Plan. These impacts would be minimal to workers implementing the

environmental monitoring programs as part of Alternative GW-1 because no invasive work would be required.

10.9 IMPLEMENTABILITY

All the remedial alternatives are implementable, although obtaining access to the Crane Wildlife Refuge Area to conduct monitoring or remedial actions would require coordination with personnel responsible for MMR security. Each technology described is well developed and widely available, and has been successfully demonstrated at other Superfund sites. If it is determined that additional remedial actions are necessary in the future, the AOC CS-4 groundwater treatment system may require modification or replacement.

10.10 COST

The alternative cost estimates are a combination of costs estimated for each component. Each remedial alternative includes the cost of the institutional controls and environmental monitoring program given for Alternative GW-1, minimal no action.

The least expensive alternative is the minimal no-action alternative, estimated to cost up to $506,000. For Alternative GW-2, GW-3, and GW-4, the costs of the three different types of treatment processes were compared. The total costs of the three groundwater containment and treatment alternatives are similar and are discussed in Section 9.0 of this ROD.

10.11 STATE ACCEPTANCE

The Commonwealth of Massachusetts has indicated its concurrence with the selected remedy; this concurrence letter is presented in Appendix B.

10.12 COMMUNITY ACCEPTANCE

Based on the written and oral comments received during the recent comment period, there is general acceptance of the selected remedy, although some people commenting requested more information. Responses to community comments are in Appendix E.

11.0 THE SELECTED INTERIM REMEDY

The NGB has chosen Alternative GW-2 as the selected alternative. Alternative GW-2 is an interim remedy, the goals of which are to manage the migration of contaminants, treat the contaminated groundwater to reach the discharge limits, and discharge treated groundwater crossgradient from the groundwater plume, while the AOC CS-10 plume is characterized and final remedial alternatives are studied.

11.1 CLEAN-UP LEVELS

Clean-up levels have been established for the contaminants of concern identified in the risk assessment that are found to pose an unacceptable risk to either human health or the environment. Clean-up levels have been set based on the appropriate ARARs (e.g., drinking water MCLs and MCLGs, if available). In the absence of a chemical-specific ARAR, or other suitable criteria to be considered, a 10^{-5} excess cancer risk level for carcinogenic effects or a concentration corresponding to an HI of 1.0 for compounds with noncarcinogenic effects was used to set clean-up levels. In instances in which the values described were not feasible to quantify, the Practical Quantitation Limit was used as the clean-up level. Periodic assessments of the protection afforded by the remedial action will be made as the interim remedy is implemented. If the interim remedial action is not found to be protective, further action will be required while the final remedy is developed.

Because the aquifer at the compliance boundary of AOC CS-4 is a Class I aquifer, MCLs and non-zero MCLGs established under the Safe Drinking Water Act (SDWA) are ARARs.

Clean-up levels for known and probable carcinogenic compounds have been set at the appropriate MCL. In the absence of an MCL, a proposed drinking water standard, or other suitable criteria (i.e., health advisory or state standard), a clean-up level was derived for carcinogenic effects based on a 10^{-5} excess cancer risk level for groundwater ingestion.

Table 11-1 summarizes the clean-up levels for the VOCs of concern identified in groundwater. The clean-up levels must be met at the completion of the final

TABLE 11-1
PROPOSED TREATMENT LEVELS

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

CARCINOGEN CONTAMINANTS OF CONCERN	TREATMENT LEVEL	BASIS	LEVEL OF RISK	
			INGESTION	INHALATION
Tetrachloroethylene	5 μg/L	MCL	$3x10^{-6}$	$1x10^{-6}$
Trichloroethylene	5 μg/L	MCL	$7x10^{-7}$	$3x10^{-7}$
1,1,2,2-Tetrachloroethane	2 μg/L	*	$1x10^{-5}$	$9x10^{-6}$
		SUM	$2x10^{-5}$	$1x10^{-5}$

NON-CARCINOGEN CONTAMINANTS OF CONCERN	TREATMENT LEVEL	BASIS	HAZARD INDEX	
			INGESTION	INHALATION
1,2-Dichloroethylene	70 μg/L	MCL	$1x10^{-1}$	--
Tetrachloroethylene	5 μg/L	MCL	$1x10^{-2}$	--
Trichloroethylene	5 μg/L	MCL	--	--
1,1,2,2-Tetrachloroethane	2 μg/L	*	--	--
		SUM	$1x10^{-1}$	--

Notes:

* The 1,1,2,2-tetrachloroethane detected in groundwater does not have Federal MCLs, MCLGs, or Massachusetts MCLs, MCLGs; therefore, a risk-based treatment level was proposed. The risk-based treatment level was calculated assuming a $1x10^{-5}$ risk level and using the USEPA risk guidance for human health exposure scenarios.

Per USEPA Region I direction residual risks were calculated on the following assumptions:

ingestion rate:	2 liters/day
average body weight:	70 kg
frequency of exposure:	365 days/year
duration of exposure:	70 years
life expectancy:	70 years

These assumptions differ frorn the assumptions on USEPA 1991 OSWER Directive 9285.6-03 and those used in the baseline risk assessment.

μg/L = micrograms per liter
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
USEPA = U.S. Environmental Protection Agency

W003929.T80/9

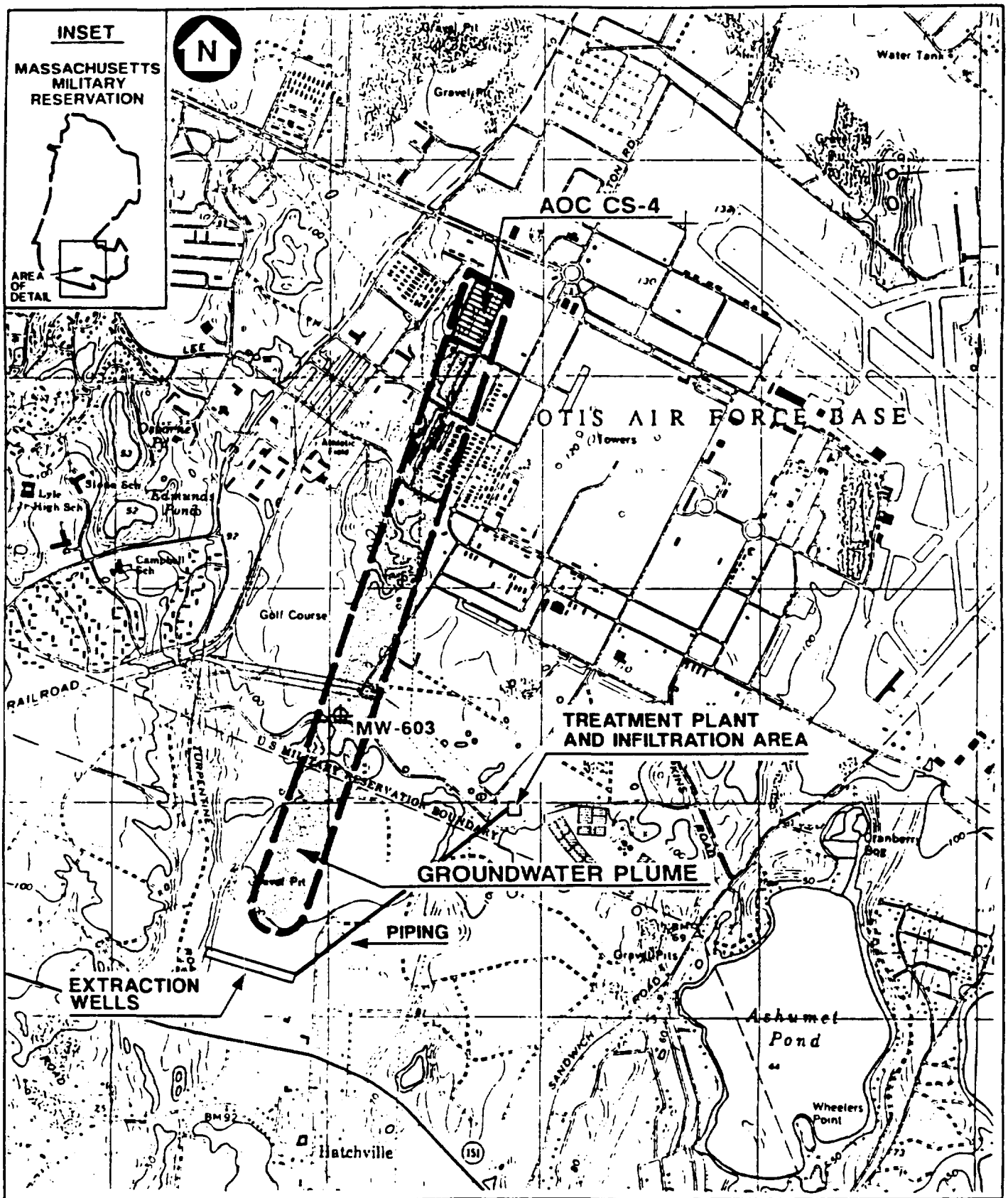
remedial action. The interim remedial action will operate for a minimum of five years. The NGB has estimated that the clean-up level will be attained within 30 years. The clean-up levels are consistent with ARARs for groundwater and attain USEPA's risk management goal for remedial actions.

11.2 DESCRIPTION OF REMEDIAL COMPONENTS

The selected interim remedy, Alternative GW-2, to remediate contaminated groundwater consists of groundwater extraction wells at the leading edge of the AOC CS-4 plume; treatment of the collected groundwater; and discharge of the treated groundwater onto MMR property. Figures 11-1 and 11-2 show the approximate locations of the groundwater extraction wells, piping to the treatment plant, and approximate locations of the treatment plant and treated groundwater infiltration trenches. The selected alternative is expected to operate for a minimum of five years, during which time monitoring and characterization of the CS-10 groundwater plume will be performed. A final remedy will be determined to address the CS-10 and CS-4 groundwater plumes.

Groundwater extraction would be accomplished using a network of approximately 13 vertical extraction wells positioned across the width of the plume and the depth of contamination. The extraction wells would be equidistant from one another, located 60 feet apart, and pumped to provide a combined flow rate of 115 gpm. Observation wells downgradient and to the sides of the extraction wells would be installed to evaluate hydraulic effectiveness of the extraction system.

Pumping extraction wells is effective in containing plumes in groundwater because pumping draws down the local groundwater table, inducing gradients that cause the groundwater to flow toward the well instead of the normal flow direction. Positioning the extraction wells at the toe of the plume would prevent the plume from moving farther downgradient. Extraction wells are simple to install. Wells and pumps can be sized to handle a wide range of flow rates. Locating well screens within the plume would increase the effectiveness of capture. Potential drawbacks of this technology are installation of the wells in the Crane Wildlife Refuge Area and potential for influencing the flowpath of the AOC CS-10 groundwater plume, which has not been fully characterized to date.



SOURCE: USGS QUADRANGLES, POCASSET, FALMOUTH, MA. PHOTOREVISED 1979.

NOTE: PLUME BOUNDARY IS DELINEATED BASED ON 1989 GROUNDWATER DATA.

SCALE IN FEET

0 2.000 4.000

ABB Environmental Services, Inc.

ASEA BROWN BOVERI

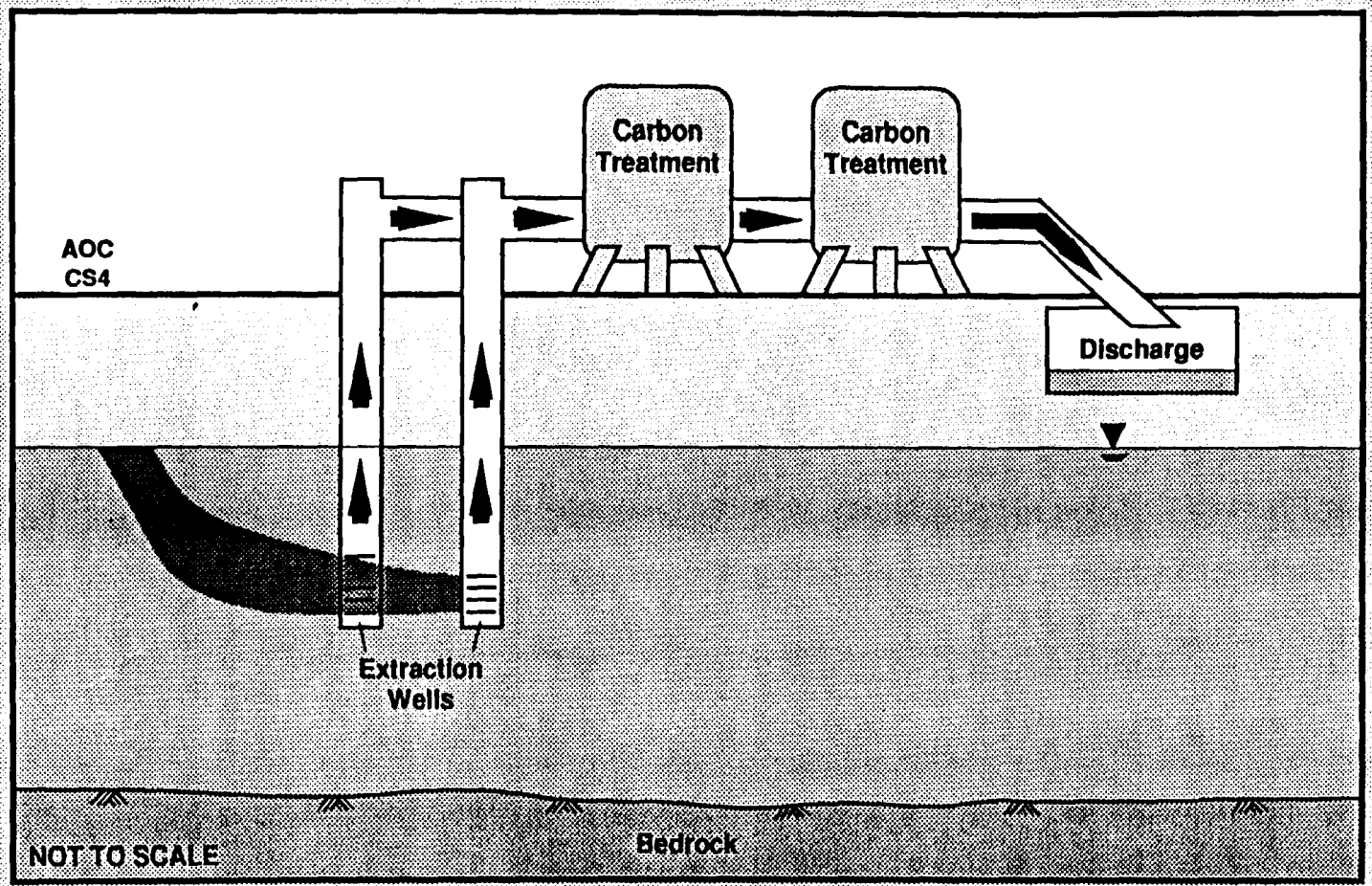
PREFERRED ALTERNATIVE LAYOUT

INSTALLATION RESTORATION PROGRAM
MASSACHUSETTS MILITARY RESERVATION

AOC CS-4 ROD

FIGURE 11-1

7030-02



LEGEND

- GROUND SURFACE
- WATER TABLE
- CONTAMINANT PLUME

ABB Environmental Services Inc.
ASEA BROWN BOVERI

GROUNDWATER EXTRACTION AND CARBON TREATMENT SYSTEM

INSTALLATION RESTORATION PROGRAM
MASSACHUSETTS MILITARY RESERVATION

AOC CS-4 ROD

FIGURE 11-2

The effect of AOC CS-4 extraction on the AOC CS-10 groundwater plume cannot be evaluated until the aquifer is actually pumped; therefore, this interim remedial action would need to be carefully monitored during implementation. Coordination would be required among officials at MMR, the Crane Wildlife Refuge Area, construction contractors, and environmental monitoring personnel to ensure that access can be obtained for both long- and short-term activities associated with the interim remedy.

If iron and manganese were in the groundwater at high enough concentrations, they would interfere with the organic groundwater treatment system (carbon adsorption). Groundwater samples were collected in December 1991 from two monitoring wells. One well was located near the expected location of the extraction wells; the other in the middle of the plume. The samples had low iron and manganese concentrations; therefore, removal of iron and manganese would not be required.

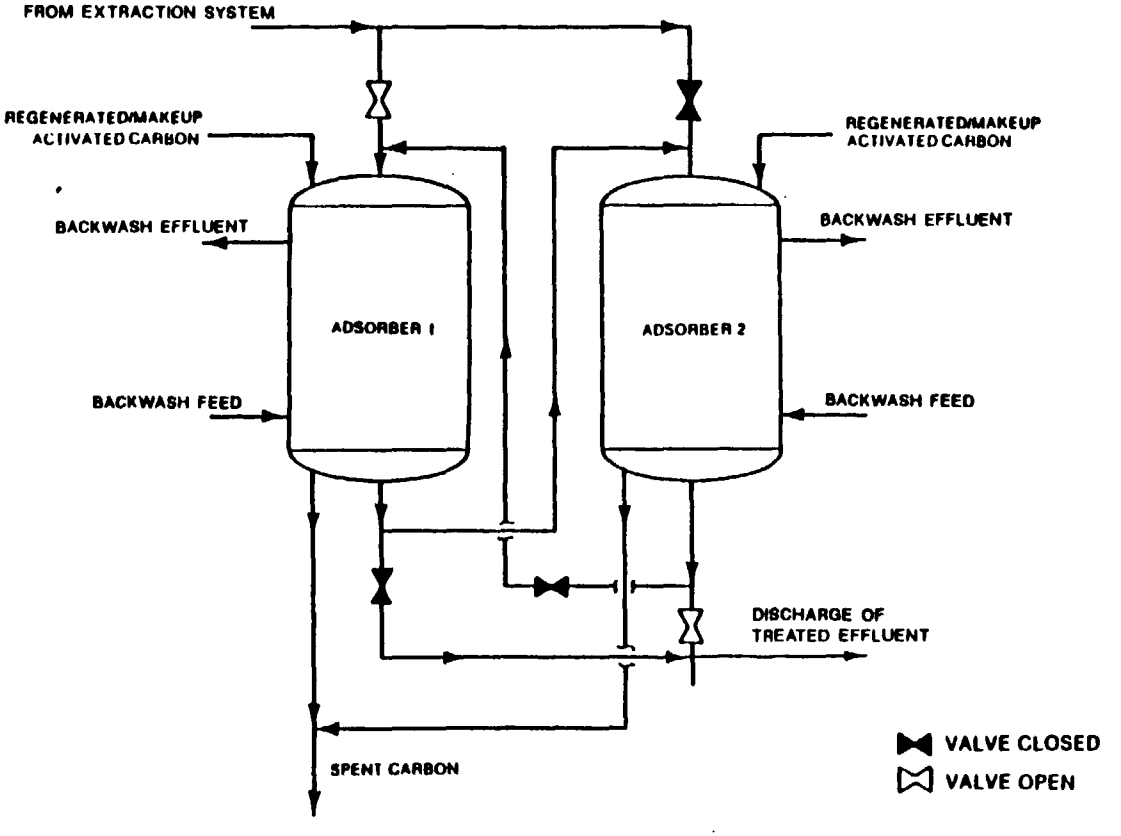
An on-site activated carbon adsorption treatment system would effectively remove organic materials from water by sorption (i.e., the attraction and accumulation of one substance on the surface of another). As water passes through porous granules of carbons, contaminant molecules are attracted to the surface of the pores and held there by weak physical forces.

As activated carbon adsorbs molecules from water, the carbon pores become saturated with contaminants. An activated carbon adsorption system would require units to be connected in series. Figure 11-3 is a schematic of a typical carbon adsorption system. Regular sampling of effluent from the first carbon bed in the series would be required to assess the breakthrough point. Breakthrough occurs when the concentration of the target pollutant in the effluent is higher than the desired level. Once the carbon has been spent, a new charge of carbon would replace the spent carbon. Spent carbon would be reactivated off-site to be used again on-site at a later date. Minimal carbon waste is generated.

Carbon treatment units are readily available and would be implementable for AOC CS-4 groundwater. If the contact time in the carbon units is sufficient, this process will remove up to 99 percent of the absorbable organics in AOC CS-4 groundwater.

Treated groundwater would be pumped from the treatment plant to infiltration trenches located crossgradient from the plume, where the water would be allowed

TWO-VESSEL GRANULAR CARBON ADSORPTION SYSTEM



SOURCE: USEPA, 1985.

ABB Environmental Services, Inc.	TWO-VESSEL GRANULAR CARBON ADSORPTION SYSTEM	
INSTALLATION RESTORATION PROGRAM MASSACHUSETTS MILITARY RESERVATION	AOC CS-4 ROD	FIGURE 11-3

7001-05

to infiltrate below grade and return to the aquifer from which it was removed. The infiltration trenches would be prepared with perforated pipe, sand, gravel, and other materials. Water would be distributed by perforated pipes over the trench area.

The discharge area would be located to (1) not adversely influence the flowpath of other plumes along the southern boundary of MMR (i.e., the FTA-1 and Ashumet Valley plumes); (2) be in an area where no other plumes have been identified to date; and (3) be on MMR property. The proposed location of the crossgradient discharge is approximately 2,000 feet west of the Otis Wastewater Treatment Plant and 600 feet north of the MMR boundary. The area is shown in Figure 11-1.

The objective of the monitoring program would be to evaluate the effectiveness of the groundwater extraction wells to contain the groundwater contaminant plume, to determine the reduction in contaminant concentrations as the treatment progresses, and to determine groundwater quality upgradient of the discharge area. The environmental monitoring plan would involve sampling of groundwater. Samples would be analyzed for Target Compound List VOCs; some wells would be sampled for other compounds. Existing wells and some of the observation wells were proposed for sampling to provide information on contaminant movement attenuation and dispersion in groundwater. Monitoring wells are proposed to be installed upgradient of the infiltration area to monitor upgradient groundwater quality. These wells would provide information on levels of contaminants entering the extraction area and monitor groundwater quality and plume migration.

To the extent required by law, the NGB and USEPA will review the AOC CS-4 site at least once every five years after initiation of the remedial action until no hazardous substances, pollutants, or contaminants remain on the site. The review will ensure that the remedial action continues to protect human health and the environment. The NGB and USEPA will also evaluate the risk posed by AOC CS-4 at the completion of the final remedial action.

12.0 STATUTORY DETERMINATIONS

The interim remedial action selected for implementation at AOC CS-4 is consistent with CERCLA and, to the extent practicable, the NCP. The selected interim remedy protects human health and the environment, attains ARARs, and is cost-effective. The selected remedy, which is not designed or expected to be final, also satisfies the statutory preference for treatment that permanently and significantly reduces the mobility, toxicity, or volume of hazardous substances. Additionally, the selected remedy uses alternate treatment technologies or resource recovery technologies to the maximum extent practicable.

12.1 THE SELECTED INTERIM REMEDY IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT

The remedy at AOC CS-4 will permanently reduce the risks posed to human health by eliminating, reducing, or controlling exposures to human and environmental receptors through treatment, engineering controls, and institutional controls. More specifically, this remedy will provide an increased level of protection to downgradient receptors by containing the AOC CS-4 groundwater plume and treating the contaminated water to the appropriate discharge requirements. Moreover, the selected remedy will result in human exposure levels that are within the 10^{-4} to 10^{-6} incremental cancer risk range and that are within the HI of 1.0 for noncarcinogens. This remedy will result in treated discharge less than the MCLs.

Environmental risks do not currently exist from contaminants in the groundwater from AOC CS-4. Environmental risks would only be possible if the contaminated groundwater were allowed to migrate farther south and discharge into Coonamessett Pond. Because groundwater will be remediated before it reaches the pond, there would be no effect by AOC CS-4 groundwater on that surface water body.

Finally, implementing the selected interim remedy will not pose unacceptable short-term risks or cross-media impacts. Remedial construction activities are not likely to adversely affect the public or MMR personnel. Initial grading of the treatment system location and installation of groundwater monitoring and observation wells are not expected to encounter or expose contaminants. The greatest potential threat to

the public from construction-related activities would be due to fugitive dust created during site preparation. Ambient air monitoring for respirable dust would be conducted during remedial construction activities. Engineering controls for dust suppression are readily available and could be implemented easily if necessary.

12.2 THE SELECTED INTERIM REMEDY ATTAINS ARARS

This remedy will attain all applicable or relevant and appropriate federal and state requirements that apply to this limited scope interim action for AOC CS-4 groundwater. Generally, ARARs for the selected interim remedial action are a subset of those listed in Tables 4-1 through 4-3 of the FFS. The ARARs that do correspond to this interim action are listed in Tables 12-1 through 12-3. A narrative summary of significant ARARs is provided in the following subsections.

12.2.1 *Location-specific ARARs*

Location-specific ARARs for AOC CS-4 groundwater are identified in Table 12-1.

Sole-source Aquifer Regulations. In general, projects that would be subject to review under the sole-source aquifer program include highway or building construction projects, either of which could have potentially detrimental effects on human health and the surrounding environment. The proposed CERCLA activities would not increase current contaminant concentrations in the sole-source aquifer; the proposed interim remedial action would actually decrease the contaminant concentrations of AOC CS-4 groundwater and of the aquifer.

12.2.2 Chemical-specific ARARs

Chemical-specific ARARs are identified in Table 12-2 and are briefly discussed in the following paragraphs.

Groundwater Regulations. The SDWA drinking water standards were used, when available, to develop Target Clean-up Levels for AOC CS-4 groundwater. Massachusetts also has groundwater quality standards that limit the concentrations of certain material allowed in groundwater. The federal standards were relevant and

TABLE 12-1
LOCATION-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE INTERIM ROD
SOLE-SOURCE AQUIFERS				
Federal	SDWA Sole-Source Aquifers (40 CFR 149)	Relevant and Appropriate	USEPA is authorized to designate aquifers as sole source and review federal financially assisted projects in the area to determine the project's potential to contaminate the aquifer. No federal assistance may be made for projects that may contaminate the aquifer. Conversely, federal funds may be used to modify projects to ensure they will not contaminate the aquifer.	The classification of the groundwater beneath Cape Cod as a sole-source aquifer was given consideration in the risk assessment, and therefore in the development of target cleanup levels for AOC CS-4 groundwater.

Notes:

ARAR = Applicable or Relevant and Appropriate Requirements
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
USEPA = U.S. Environmental Protection Agency
SDWA = Safe Drinking Water Act
ROD = Record of Decision

TABLE 12-2
CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE INTERIM ROD
GROUNDWATER/ SURFACE WATER				
Federal	SDWA - MCLs (40 CFR 141.11 - 141.16)	Relevant and Appropriate	MCLs have been promulgated for several common organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered relevant and appropriate for groundwater aquifers used for drinking water.	To assess the potential risks to human health due to consumption of groundwater, contaminant concentrations were compared to their MCLs. When available, the MCLs were used to set clean-up levels for AOC CS-4 groundwater contaminants.
	SDWA - MCLGs (40 CFR 141.50 - 141.51)	Relevant and Appropriate	MCLGs are health-based criteria. As promulgated under SARA, MCLGs are to be considered for drinking water sources. MCLGs are available for several organic and inorganic contaminants.	The 1990 National Contingency Plan states that non-zero MCLGs are to be used as goals. Contaminant concentrations in groundwater were compared to their MCLGs when setting clean-up levels.
	RCRA - Subpart F Groundwater Protection Standards, Alternate Concentration Limits (40 CFR 264.94)	Relevant and Appropriate	This requirement outlines standards, in addition to background concentrations and MCLs, to be used in establishing clean-up levels for remediating groundwater contamination.	These requirements may be relevant and appropriate if certain conditions relating to transport and exposure are met. Because MCLs were available for most compounds, alternate concentration limits were not set.
Federal Guidance and Criteria To Be Considered	USEPA RfDs	To Be Considered	RfDs are considered the levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	USEPA RfDs were used to characterize risks due to noncarcinogens in various media.
	USEPA Carcinogen Assessment Group CPFs	To Be Considered	Carcinogenic effects present the most up-to-date information on cancer risk potency derived from USEPA's Carcinogen Assessment Group.	USEPA CPFs were used to compute the individual incremental cancer risk resulting from exposure to certain compounds.
State	Massachusetts Drinking Water Standards (310 CMR 22.00)	Relevant and Appropriate	Massachusetts Drinking Water Standards with the exception of sodium are equivalent to federal MCLs. When state levels are more stringent than federal levels, the state levels may be used.	Drinking water standards, when available, were used to set clean-up levels.
	Massachusetts Groundwater Quality Standards (314 CMR 6.06)	Applicable	These standards limit the concentration of certain materials allowed in classified Massachusetts waters. The groundwater beneath MMR has been classified as a Class I water or fresh groundwater found in the saturated zone of unconsolidated deposits and is designated as a source of potable water supply.	These standards will be attained because the clean-up levels or potential discharge limits were set using these as guidelines.

continued

TABLE 12-2
CHEMICAL-SPECIFIC ARARs, CRITERIA, ADVISORIES, AND GUIDANCE

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE INTERIM ROD
State	Massachusetts HWMR-Maximum Concentration of Constituents for Groundwater Protection (310 CMR 30.668)	Relevant and Appropriate	This requirement established three categories of groundwater protection standards: background, concentrations, maximum concentrations, and alternate concentrations. The maximum concentrations are identical to federal SDWA MCLs.	Complying with federal MCLs as target clean-up levels will be consistent with state standards.
State Guidance and Criteria to Be Considered	Massachusetts Drinking Water Guidelines	To Be Considered	The Office of Research and Standards uses a methodology similar to the USEPA Office of Drinking Water when setting guidelines. Carcinogens have guidelines set at the lowest practical quantitation limit or a level which would pose an excess cancer risk of 10^{-6}. For noncarcinogens, a percentage (usually 20 percent) is applied to published or derived route-specific, reference doses and standard exposure assumption to derive a drinking water concentration.	In the absence of drinking water standards, these guidelines would have been considered when setting target clean-up levels or discharge limits. However, MCLs or risk-based target clean-up levels were set, for AOC CS-4 groundwater; these guidelines were not necessary to develop cleanup levels.

Notes:

ARAR = Applicable or Relevant and Appropriate Requirement
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CPF = carcinogenic potency factor
HWMR = Hazardous Waste Management Rules
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
MMR = Massachusetts Military Reservation
OSWER = Office of Solid Waste and Emergency Response
RCRA = Resource Conservation and Recovery Act
RfD = reference dose
SARA = Superfund Amendments and Reauthorization Act
SDWA = Safe Drinking Water Act
USEPA = U.S. Environmental Protection Agency
ROD = Record of Decision

TABLE 12-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE INTERIM ROD
Federal			
OSHA - General Industry Standards (29 CFR Part 1910)	Applicable	These regulations specify the 8-hour time-weighted average concentration for various organic compounds. Training requirements for workers at hazardous wastes operations are specified in 29 CFR 1910.120.	Proper respiratory equipment will be worn if it is impossible to maintain the work atmosphere below the concentration. Workers performing remedial activities would be required to have completed specific training requirements.
OSHA - Safety and Health Standards (29 CFR Part 1926)	Applicable	This regulation specifies the type of safety equipment and procedures to be followed during site remediation.	All appropriate safety equipment will be available on site. In addition, safety procedures will be followed during on-site remedial activities.
OSHA - Recordkeeping, Reporting, and Related Regulations (29 CFR 1904)	Applicable	This regulation outlines the recordkeeping and reporting requirements for an employer under OSHA.	These requirements apply to all site contractors and subcontractors, and must be followed during all site work.
RCRA - Standards Applicable to Generators of Hazardous Waste (40 CFR Part 262)	Applicable	This requirement sets standards for generators of hazardous waste that address (1) accumulating waste, (2) preparing hazardous waste for shipment, and (3) preparing the uniform hazardous waste manifest. These requirements are integrated with DOT regulations.	If any alternative proposes shipping wastes off site, the material must be shipped in proper containers that are accurately marked and labeled, and the transporter must display proper placards. All waste shipments would accompanied by an appropriate manifest.
DOT Rules for Transportation of Hazardous Materials (49 CFR Parts 107, 171.1-172.558)	Applicable	This regulation outlines procedures for the packaging, labeling, manifesting, and transporting of hazardous materials.	Hazardous and contaminated materials will be packaged, manifested, and transported to a licensed off-site disposal facility in compliance with these regulations.
Clean Air Act - National Primary and Secondary Ambient Air Quality Standards (40 CFR 50)	Applicable	Primary ambient air quality standards define levels of air quality to protect human health.	The standard for particulate matter of less than 10 microns is 150 $\mu g/m^3$, 24-hour average concentration. These standards would be adhered to for invasive construction activities.
	Applicable	Secondary ambient air quality standards protect public welfare from known or anticipated adverse effects from pollutants.	These standards would be complied with for remedial construction activities.

continued

TABLE 12-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE INTERIM ROD
State			
Massachusetts HWMR - Location Standards for Facilities (310 CMR 30.700 - 30.707)	Relevant and Appropriate	Under these standards, a new facility may not be located in an area subject to flooding; within the watershed of a Class A or Class SA segment of the surface water body unless it is determined that there is no feasible alternative; on land overlying an actual, planned, or potential public or private drinking water source; or in the flow path of groundwater supplying water to an existing well. In addition, there shall be a minimum of 300 feet from the active portion of the facility to the facility property line.	The treatment facility will be located and operated to fulfill these regulations.
Massachusetts HWMR - Requirements for Generators (310 CMR 30.300 - 30.371)	Relevant and Appropriate	These requirements are similar to the federal RCRA regulations for generators. Massachusetts specifies requirements for very small quantity generators, as well as small and large quantity generators.	When a waste or residual waste is moved, the generator requirements would be complied with.
Massachusetts HWMR - Requirements for Transporters (310 CMR 30.400 - 30.416)	Relevant and Appropriate	These regulations are similar to the federal RCRA transportation requirements. In addition, liability insurance must be obtained by all licensed hazardous waste transporters and each vehicle must have a vehicle identification device.	Hazardous materials will be transported by a licensed operator to an off-site disposal facility as specified in these requirements.
Massachusetts Groundwater Discharge Permits (314 CMR 5.00)	Relevant and Appropriate	Permit information, including conditions and variances, are specified in these regulations.	Discharge of treated water to the ground or groundwater would comply with the substantive requirements of these regulations.
Massachusetts Air Pollution Control Regulations (310 CMR 6.00 - 8.00)	Relevant and Appropriate	These regulations outline the standards for air pollution control, including particulate matter, carbon monoxide, nitrogen dioxide, and lead.	Particulate standard is 75 $\mu g/m^3$ annual geometric mean and 150 $\mu g/m^3$ 24-hour average concentration. These standards would be adhered to during construction activities.

continued

TABLE 12-3
ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

AOC CS-4 GROUNDWATER RECORD OF DECISION
MASSACHUSETTS MILITARY RESERVATION

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN THE INTERIM ROD
Implementation of M.G.L. Chapter 111F, Employee and Community Right-to-Know (310 CMR 33.00)	Relevant and Appropriate	The regulations establish rules and requirements for the dissemination of information related to toxic and hazardous substances to the public.	Information applicable to site activities and characteristics will be made available to the public.
Worker Right-to-Know (441 CMR 21.00)	Relevant and Appropriate	These regulations establish requirements for worker right-to-know.	Information applicable to site activities and characteristics will be made available to on-site workers.

Notes:

ARARs = Applicable or Relevant and Appropriate Requirements
CAA = Clean Air Act
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CWA = Clean Water Act
DOT = Department of Transportation (U.S.)
HWMR = Hazardous Waste Management Rules
LDRs = Land Disposal Restrictions
MGL = Massachusetts General Law
MMR = Massachusetts Military Reservation
NESHAP = National Emission Standards for Hazardous Air Pollutants
NPDES = National Pollutant Discharge Elimination System
OSHA = Occupational Safety and Health Administration
POTW = publicly owned treatment works
RCRA = Resource Conservation and Recovery Act
SDWA = Safe Drinking Water Act
$\mu g/m^3$ = micrograms per cubic meter
VOC = volatile organic compound
ROD = Record of Decision

appropriate and the state standards were applicable as chemical-specific requirements in determining effluent discharge limits, although the discharge will be occurring from an on-site treatment facility to the groundwater. The criteria would be met by setting effluent discharge limits, designing and constructing a treatment process to meet those levels, and by monitoring the process for compliance with the criteria.

The other requirements listed in Table 12-2 were used in the risk assessment and development of Target Clean-up Levels for those compounds that did not have promulgated drinking water standards.

12.2.3 Action-specific ARARs

Action-specific ARARs for the selected remedy are presented in Table 12-3. A summary of requirements that must be attained are discussed in the following brief descriptions.

Air Regulations. Federal and state air quality standards exist for particulate matter and would be used in assessing excavation and construction emission controls. These standards are relevant and appropriate, rather than applicable, because they were originally developed to control stack and automobile emissions. Threshold Limit Values established by OSHA regulations provide an extensive list of control levels applicable to on-site remediation activities such as installation of the extraction wells and collection network, and the treatment system. Air-related ARARs would be met through the use of engineering controls and monitoring during construction of the remedy.

Water Regulations. Substantive requirements of the Massachusetts Groundwater Discharge Permits would be relevant and appropriate to the on-site discharge of treated groundwater. The effluent from the treatment process would be monitored to evaluate compliance with these regulations.

Hazardous Waste Regulations. The off-site shipment of hazardous materials would be subject to U.S. Department of Transportation rules. If the spent carbon or other residuals are determined to be hazardous wastes, the treatment facility would have to comply with the substantive Resource Conservation and Recovery Act requirements for generators and transporters.

Other Action-specific Regulations. Federal OSHA requirements that regulate worker and employee records should be followed during all on-site work. These regulations include safety and health standards for federal service contracts and recordkeeping, reporting, and related regulations. Because these regulations govern general working conditions within industry and provide minimum protection standards for workers involved in remedial actions, these regulations are applicable.

Massachusetts has hazardous substance right-to-know regulations that establish requirements to protect the health and safety of employees and community residents through the communication of information regarding toxic and hazardous substances. These regulations are relevant and appropriate to on-site workers during the interim remedial action.

12.3 THE SELECTED INTERIM REMEDIAL ACTION IS COST-EFFECTIVE

In the NGB's judgment, the selected remedy affords overall effectiveness proportional to its costs. Once the NGB identified alternatives that are protective of human health and the environment and that attain ARARs, the NGB evaluated the overall effectiveness of each alternative by assessing the three relevant criteria:

- reduction in mobility, toxicity, and volume through treatment
- short-term effectiveness
- long-term effectiveness and permanence

The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs. The costs of this interim remedial alternative are as follows:

Estimated Capital Cost: $1,641,000 to $3,516,000

Estimated Operations and Maintenance Cost (net present worth):* $472,000 to $1,012,000

Estimated Total Cost (net present worth):* $2,112,000 to $4,528,000

*Net present worth costs are based on a 10 percent discount factor and five years of operation.

12.4 THE SELECTED INTERIM REMEDY UTILIZES PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The NGB identified which alternative uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by identifying an alternative that provides the best balance of trade-offs in terms of the following criteria:

- long-term effectiveness and permanence
- reduction of mobility, toxicity, or volume through treatment
- short-term effectiveness
- implementability
- cost

The balancing test emphasized long-term effectiveness, permanence, and the reduction of mobility, toxicity, and volume through treatment. This interim test also considered the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste, and community and state acceptance. The selected remedy provides the best balance of trade-offs among the alternatives, given the limited scope of the interim action selected. Consideration of long-term effectiveness does not apply due to the short-term nature of the selected remedy. The selected remedy will achieve reduction of mobility, toxicity, or volume through treatment of extracted groundwater, thereby reducing migration of contaminants. The selected interim remedy would have no implementation difficulties. Carbon adsorption technology is well demonstrated and the equipment is readily available. The selected remedy will achieve the goals of the interim action; that is, reduction of contaminant migration and collection of further data to characterize the AOC CS-10 groundwater plume for use in selecting the final remedy, while costing the least of the active interim options.

12.5 THE SELECTED INTERIM REMEDY SATISFIES THE PREFERENCE FOR TREATMENT WHICH PERMANENTLY AND SIGNIFICANTLY REDUCES THE MOBILITY, TOXICITY, OR VOLUME OF THE HAZARDOUS SUBSTANCES AS A PRINCIPAL ELEMENT

The principal element of the selected remedy is the extraction and treatment of groundwater at the leading edge of the AOC CS-4 contaminated groundwater plume and its subsequent discharge to on-site infiltration trenches. This element addresses the primary exposure pathway at the site for this operable unit: contamination of groundwater. The selected remedy satisfies the statutory preference for reduction in the mobility, toxicity, or volume to the extent possible in light of its limited scope by extracting and treating contaminated groundwater and preventing its further migration to downgradient areas. This interim ROD will be followed by a final ROD that will determine what further actions, if any, will be necessary to meet the preference for treatment that will permanently and significantly reduce the mobility, toxicity, or volume of hazardous substances.

13.0 DOCUMENTATION OF NO SIGNIFICANT CHANGES

The NGB presented a Proposed Plan for remediation of AOC CS-4 in February 1992. The management of migration portion of the preferred alternative included extraction of contaminated groundwater, treatment of the collected groundwater, and discharge of the treated groundwater to an infiltration basin on MMR property. There have been no significant changes made to the plan as stated in the Proposed Plan of February 1992 (ABB Environmental Services, Inc., 1992b).

14.0 STATE ROLE

MADEP, on behalf of the Commonwealth of Massachusetts, reviewed the various alternatives and indicated its support for the selected interim remedy. MADEP also reviewed the FFS to determine if the selected remedy is in compliance with applicable or relevant and appropriate state environmental regulations. MADEP concurs with the selected remedy for AOC CS-4 groundwater. A copy of the declaration of concurrence is in Appendix B.

AEHA	Army Environmental Hygiene Agency
ANG	Air National Guard
AOC	Area of Contamination
ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWA	Clean Water Act
DCE	dichloroethylene
DOD	Department of Defense (U.S.)
DPDO	Defense Property Disposal Office
EE/CA	engineering evaluation/cost analysis
FFS	focused feasibility study
ft/yr	feet per year
gpm	gallons per minute
HI	Hazard Index
IRP	Installation Restoration Program
MADEP	Massachusetts Department of Environmental Protection
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MMR	Massachusetts Military Reservation
NCP	National Contingency Plan
NGB	National Guard Bureau
NPL	National Priorities List
OLM	Organic Leachate Model
OSHA	Occupational Safety and Health Administration
PCE	tetrachloroethylene

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

RfD	reference dose
ROD	Record of Decision
SDWA	Safe Drinking Water Act
TCE	trichloroethylene
TEAC	Technical Environmental Affairs Committee
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
USAF	U.S. Air Force
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
UV	ultraviolet
VOC	volatile organic compound

ABB Environmental Services, Inc., 1991. "Study Areas CS-4, FS-25, and FTA-1 Engineering Evaluation/Cost Analysis Report"; Installation Restoration Program; Massachusetts Military Reservation; prepared for HAZWRAP; Portland, Maine; June 1991.

ABB Environmental Services, Inc., 1992a. "Groundwater Focused Feasibility Study, West Truck Road Motor Pool (AOC CS-4)"; Installation Restoration Program; Massachusetts Military Reservation; prepared for HAZWRAP; Portland, Maine; February 1992.

ABB Environmental Services, Inc., 1992b. "Groundwater Proposed Plan, West Truck Road Motor Pool (AOC CS-4)"; Installation Restoration Program; Massachusetts Military Reservation; prepared for HAZWRAP; Portland, Maine; February 1992.

Army Environmental Hygiene Agency (AEHA), 1986. "U.S. Army Environmental Hygiene Agency Geohydraulic Study No. 38-26-0500-86; Camp Edwards, Massachusetts; July 8-10 and September 9-17, 1985"; April 1986.

E.C. Jordan Co., 1986. 'Task 6, Phase I Records Search: Air National Guard, Camp Edwards, U.S. Air Force, and Veterans Administration Facilities at Massachusetts Military Reservation"; prepared for Oak Ridge National Laboratory; Oak Ridge, Tennessee; December 11, 1986.

E.C. Jordan Co., 1989a. "Site Inspection Report, Field Investigation Work Conducted Fall 1987, Task 2-3A"; Installation Restoration Program; Massachusetts Military Reservation; prepared for HAZWRAP; Portland, Maine; March 1989.

E.C. Jordan Co., 1989b. "Hydrogeologic Summary Report, Task 1-8"; Installation Restoration Program; Massachusetts Military Reservation; prepared for HAZWRAP; Portland, Maine; April 1989.

E.C. Jordan Co., 1990a. "Site Inspection Report, Field Investigation Work Conducted Spring-Summer 1988, Task 2-3B"; Installation Restoration Program; Massachusetts Military Reservation; prepared for HAZWRAP; Portland, Maine; February 1990.

REFERENCES

E.C. Jordan Co., 1990b. "Technical Memorandum, Phase II Investigations of the MW-603 Groundwater Study"; Installation Restoration Program; Massachusetts Military Reservation; prepared for HAZWRAP; Portland, Maine; February 1990.

E.C. Jordan Co., 1990c. "Technical Report, Phase I of the MW-603 Groundwater Study (Study Area CS-4, West Truck Motor Pool, Groundwater Operable Unit)"; Installation Restoration Program; Massachusetts Military Reservation; prepared for HAZWRAP; Portland, Maine; March 1990.

E.C. Jordan Co., 1990d. "Focused Feasibility Study, West Truck Road Motor Pool Site: Study Area CS-4, Source Control Operable Unit"; Installation Restoration Program; Massachusetts Military Reservation; prepared for HAZWRAP; Portland, Maine; June 1990.

U.S. Environmental Protection Agency (USEPA), 1986. "Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Final Exclusion and Final Organic Leachate Model (OLM)"; Code of Federal Regulations, Title 40, Part 261; Final Rule; *Federal Register;* Vol. 51, No. 219; November 13, 1986.

U.S. Environmental Protection Agency (USEPA), 1989. "Determining Soil Response Action Levels Based on Potential Contaminant Migration to Ground Water: A Compendium of Examples"; USEPA 540/2-89/057.

U.S. Environmental Protection Agency (USEPA), 1990. "National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan)"; Code of Federal Regulations, Title 40, Part 300; March 8, 1990; Final Rule; *Federal Register;* Vol. 55, No. 46; pp. 8666 *et seq.*

ADMINISTRATIVE RECORD INDEX

INTRODUCTION

This document is the index to the Administrative Record for the Chemical Spill 4 (CS-4) Groundwater Interim Remedial Action at the Otis Air National Guard Base/Camp Edwards National Priorities List (NPL) Site. Section I of the index cites site-specific documents, and Section II cites guidance documents used by the National Guard Bureau and the EPA in selecting a response action at the site.

The Administrative Record is available for public review at: the Installation Restoration Program office, Bldg. 868, Otis ANG Base, MA 02542;EPA Region I headquarters, 90 Canal Street, Boston, MA 02203 and; the Falmouth Public Library, 123 Katherine L. Bates Road, Falmouth, MA 02540. Questions concerning the Administrative Record should be addressed to the National Guard Bureau Project Manager.

The Administrative Record is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

SECTION I

SITE-SPECIFIC DOCUMENTS

MASSACHUSETTS MILITARY RESERVATION
Administrative Record
For Site CS-4

1.0 Pre-Remedial

1.1 "Final Report: Task 6", Volume 1 and Appendices December 11, 1986.

1.2 "Phase II/IVA, Task 2-3B, Site Inspection Report for Work Conducted Spring-Fall 1988 Installation Restoration Program, Volume II" February 1989.

1.3 "Final Site Inspection Report Field Investigation Work Conducted Fall 1987 Task 2-3A Volume I - Text" March 1989.

1.4 "Site Inspection Report, Field Investigation Work Conducted Spring-Summer 1988, Installation Restoration Program Task 2-3B, Volume I - Text" March 1989.

1.5 Correspondence

1. Letter from Christopher Tilden, DEQE (DEP), to John Conaway, NGB; Commandant, USCG; Veterans Administration, Washington D.C.; Secretary of the Air Force, Pentagon; Secretary of the Army, Pentagon; Air National Guard, NGB; and Army National Guard, NGB, regarding 2-3A SI Comments November 22, 1988.

2. Letter from Robert McGirr, E.C. Jordan, to Larry Janssen, HAZWRAP, regarding MMR Task 2-3A SI Report - DEQE (DEP) Comments, December 29, 1988.

3. Letter from Robert McGirr, E.C. Jordan to Larry Janssen, HAZWRAP, regarding DEQE (DEP) comments on Task 2-3A SI Report, February 6, 1989.

4. Letter from Paul Marchessault, USEPA, to Ronald Watson, NGB, regarding receipt of report "Final Site Inspection Report- Field Investigation Work Conducted Fall, 1987 - Installation Restoration Program, Task 2-3A, Volumes I and II, March 1989". November 5, 1990.

1.6 Federal Register Notices

1. Proposed NPL update including Otis Air National Guard Base/Camp Edwards, July 14, 1989.

2. Final NPL update including Otis Air National Guard Base/Camp Edwards, November 21,1989.

1.7 Inter-Agency Agreement

1. IAG dated July 17, 1991 including revisions dated May 4, 1992.

2. IAG public comments including joint EPA/DOD/USCG responses dated December 13, 1991.

2.0 Remedial Investigation (RI)

2.1 "Final Report: Technical Report Phase I of the MW-603 Groundwater Study (Site CS-4, West Truck Motor Pool, Groundwater Operable Unit)" March 1990.

2.2 Correspondence

1. Letter from Joseph Sczurko, C-E Environmental, Inc., to Larry Janssen, HAZWRAP, regarding MW-603 Pump Test Program DEQE Permit Application- June 8, 1989.

2. Letter from Joe Sczurko, C-E Environmental, Inc. to Larry Janssen, HAZWRAP, regarding MMR, CS-4 GW Operable Unit, Pump Test Water Disposal, December 13, 1989.

3. Letter from Ron Watson, NGB, to Paul Marchessault, USEPA, regarding MMR, Site CS-4 Groundwater Operable Unit Pump Test Water Disposal- January 26, 1990.

4. Letter from Robert Donovan, DEQE (DEP), to Ron Watson NGB, regarding receipt of RIFSAP, remaining Priority I Sites, Task 2-5B, IRP, MMR dated October 1989, Draft October 26, 1989.

5. Letter from Robert Donovan, DEQE (DEP), to Ron Watson, NGB, regarding review of document Technical Memorandum Phase II Investigations of the MW-603 Groundwater Study IRP, MMR, October 1989 Draft November 10, 1989.

6. Letter from Robert Donovan, DEQE (DEP), to Ron Watson, NGB, regarding review of documents RIFSAP, remaining Priority I Sites, Task 2-5B IRP, MMR, October 1989 Draft November 27, 1989.

7. Letter from Ron Watson, NGB, to Robert Donovan, DEQE (DEP), regarding addresses to comments of November 27, 1989 regarding the October draft copy of the RIFSAP, remaining Priority I Sites, Task 2-5B, MMR December 20, 1989.

8. Letter from Paul Marchessault, USEPA, to Henry Lowman, NGB, regarding Receipt of Reports August 15, 1990.

9. Letter from Paul Marchessault, USEPA, to Henry Lowman, ANG, regarding receipt of reports, "Final Report: Technical Report, Phase I of the MW-603 Groundwater

Study, March 1990" and "Final Report: Technical Memorandum, Phase II Investigations of the MW-603 Groundwater Study, March 1990" August 15, 1990.

2.3 Sampling and Analysis

1. Fax from Larry Janssen, HAZWRAP, to Henry Lowman, NGB, regarding MMR 603 Groundwater Study Comparison of Screening vs CLP Analysis May 17, 1989.

3.0 Feasibility Study

3.1 "Groundwater Focused Feasibility Study West Truck Road Motor Pool (AOC CS-4)" February 1992.

3.2 "Final Groundwater Proposed Plan West Truck Road Motor Pool (AOC CS-4)" February 1992.

3.3 Correspondence

1. Letter from Daniel Santos, ANG, to Paul Marchessault, USEPA, regarding EPA Comments on CS-4 Groundwater Feasibility Study, January 8, 1992.

2. Letter from Paul Marchessault, USEPA, to Daniel Santos, NGB, regarding extension of CS-4 Feasibility Study Comments January 16, 1992.

4.0 Record of Decision

4.1 Record of Decision, May 20, 1992.

4.2 "Technical Memorandum, Phase II Investigation of the MW-603 Groundwater Study" October, 1989.

4.3 Correspondence

1. Letter from Paul Marchessault, USEPA, to Daniel Santos, NGB, regarding CS-4 Groundwater Containment, June 13, 1991.

2. Letter from Paul Marchessault, USEPA, to Ron Watson, NGB, regarding NCP revisions impact on the proposed removal actions March 8, 1990.

3. Letter from Robert Donovan, DEP, to Paul Marchessault, USEPA, regarding MMR Removal Actions, December 4, 1990.

4. Letter from Daniel S. Greenbaum, MADEP to Julie Belaga, EPA and Ronald Watson, NGB regarding CS-4 Groundwater Interim Record of Decision concurrence, May 18, 1992.

5.0 Public Relations

5.1 Public Affairs News Release concerning "Proposed Plan, CS-4 Groundwater Operable Unit" February 11, 1992.

5.2 Fact Sheet "Guard Bureau Proposes Groundwater Cleanup From Former Motor Pool and Disposal Office (CS-4)" February 1992.

5.3 Public Affairs News Release concerning "Public Hearing on the CS-4 Groundwater Proposed Plan" March 9, 1992.

SECTION II

GUIDANCE DOCUMENTS

GUIDANCE DOCUMENTS

EPA Guidance Documents may be reviewed at EPA Region I, Boston, Massachusetts.

General Guidance Documents

1. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, amended October 17, 1986.

2. Memorandum from J. Winston Porter, HQ EPA to Addressees ("Regional Administrators, Regions I-X et al.), (OSWER Directive 9234.0-05), July 9, 1987 (discussing interim guidance on compliance with applicable or relevant and appropriate requirements).

3. Memorandum from Jonathan Z. Cannon, HQ EPA to Addressees ("Waste Management Division Directors, Regions I, et al., October 18, 1989 (discussing considerations in Ground Water Remediation at Superfund Sites with attached: U.S. Environmental Protection Agency. Office of Environmental and Remedial Response. Evaluation of Ground-Water Extraction Remedies, Volume 1, Summary Report (EPA/540/2-89/054), September 1989.)

4. "National Oil and Hazardous Substances Pollution Contingency Plan," (40 CFR Part 300), March 8, 1990.

5. U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health, and Occupational Safety and Health Administration. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985.

6. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Community Relations in Superfund: A Handbook (Interim Version) (EPA/HW-6, OSWER Directive 9230.0-3B), June 1988.

7. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Compendium of Superfund Field Operations Methods (EPA/540/P-87/001, OSWER Directive 9355.0-14), December 1987.

8. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites (OSWER Directive 9283.1-2), December 1988.

9. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund Federal-Lead Remedial Project Management Handbook (EPA/540/G-87/001, OSWER

Directive 9355.1-1), December 1986.

10. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund State-Lead Remedial Project Management Handbook (EPA/540/G-87/002), December 1986.

11. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund Public Health Evaluation Manual (OSWER Directive 9285.4-01), October 1986.

12. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Handbook of Remedial Action at Waste Disposal Sites (EPA/625/6-85/006), October 1985.

13. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act), (EPA/540/G-89/004), October 1988.

14. U.S. Environmental Protection Agency. Office of Health and Environmental Assessment. A Compendium of Technologies Used in the Treatment of Hazardous Waste (EPA/625/8-87/014), September 1987.

15. U.S. Environmental Protection Agency. Office of Research and Development. Hazardous Waste Engineering Research Laboratory. Technology Briefs: Data Requirements for Selecting Remedial Action Technology (EPA/600/2-87/001), January 1987.

16. U.S. Environmental Protection Agency. Office of Research and Development. Hazardous Waste Engineering Research Laboratory. Treatment Technology Briefs: Alternatives to Hazardous Waste Landfills (EPA/600/8-86/017), July 1986.

17. U.S. Environmental Protection Agency. Office of Research and Development. Hazardous Waste Engineering Research Laboratory. Handbook: Remedial Action at Waste Disposal Sites (Revised) (EPA/625/6-85/006), October 1985.

18. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Data Quality Objectives for Remedial Response Activities: Development Process (EPA/540/G-87/003), March 1987.

19. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Interim Guidance on Superfund Selection of Remedy (OSWER Directive 9355.0-19), December

24, 1986.

20. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Draft Guidance on CERCLA Compliance with Other Laws Manual (OSWER Directive 9234.1-01), August 8, 1988.

21. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Alternate Concentration Limits Guidance (OSWER Directive 9481.00-6C, EPA/530-SW-87-017), July 1987.

22. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response and Office of Emergency and Remedial Response. Mobile Treatment Technologies for Superfund Wastes (EPA 540/2-86/003F), September 1986.

23. U.S. Environmental Protection Agency. Region I Risk Assessment Work Group. Supplemental Risk Assessment Guidance for the Superfund Program (EPA 901/5-89-001), June 1989.

STATE CONCURRENCE LETTER

Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Protection

William F. Weld
Governor
Daniel S. Greenbaum
Commissioner

Ms. Julie Belaga
Regional Administrator
U.S. EPA Region 1
JFK Federal Building
Boston, Massachusetts 02103

and

Mr. Ronald Watson
Chief, Environmental Division
ANGRC/CER
National Guard Bureau
Building 3500
Andrews AFB, Maryland 20331-6008

RE: BOURNE--BWSC SA4-0037
Massachusetts Military Reservation (MMR) Area of Contamination Chemical Spill-4 (CS-4) Groundwater Interim Record of Decision Concurrence

May 18, 1992

Dear Ms. Belaga and Mr. Watson:

The Department of Environmental Protection (DEP) has reviewed the preferred remedial action alternative recommended by the National Guard Bureau and the U.S. EPA for an interim cleanup of the CS-4 groundwater contaminant plume at the MMR National Priorities List Site.

The DEP has evaluated the preferred alternative for consistency with M.G.L. Chapter 21E and the Massachusetts Contingency Plan. The proposed alternative is a groundwater containment action that addresses the continued downgradient migration of contaminated groundwater originating at CS-4. The interim remedy consists of approximately 13 extraction wells positioned across the width and depth of the plume. The extraction wells will be equidistant from one another, located 60 feet apart, and will pump a combined flow rate of 115 gpm. The extracted groundwater will be treated with granular activated carbon to remove volatile organic compounds and clean water will be discharged through infiltration trenches.

The interim remedy will be operated for a minimum of five years, during which time the CS-10 groundwater contaminant plume, known to be located upgradient from the CS-4 plume, will be fully characterized and options for remediation evaluated. A final remedy will be determined to address the CS-4 and CS-10 groundwater plumes.

The DEP has determined that the interim remedy is a remedial action on a portion of the disposal site which would be consistent with a future permanent solution for the entire disposal site. However, a permanent solution determination cannot be made until it has been demonstrated that the remedial response action or combination of actions will meet the Total Site Risk Limits as defined in the Massachusetts Contingency Plan (MCP) 310 CMR 40.00 for the site.

The DEP has identified the MCP and M.G.L. Chapter 21E as applicable requirements, within the meaning of CERCLA, for the CS-4 Groundwater Operable Unit of the MMR National Priorities List Site. The selected remedy appears to meet all Massachusetts state Applicable or Relevant and Appropriate Requirements (ARARs). The DEP will continue to evaluate compliance with ARARs as remedial design progresses and during implementation and operation.

The DEP looks forward to working with you in implementing the preferred alternative and facilitating an expeditious cleanup of the MMR site. If you have any questions please contact James F. Begley at (508) 946-2871.

Very truly yours,

Daniel S. Greenbaum, Commissioner
Department of Environmental Protection

cc: BWSC Boston
TEAC Distribution

PUBLIC HEARING TRANSCRIPT

RE: CS-4 GROUNDWATER PROPOSED PLAN PUBLIC HEARING
(Word for Word Version)

BEFORE: Douglas Gutro, USEPA, Chairperson
Paul Marchessault, USEPA
James Begley, MDEP
Dan Santos, NGB
Douglas Karson, NGB

Lawrence Junior High School
Falmouth, Massachusetts
Wednesday, March 18, 1992
7:16 p.m.

MR. GUTRO: If I can have your attention. My name is Douglas Gutro. I'm with the United States Environmental Protection Agency. I'm in the office of external programs, and I will be the hearing officer here this evening.

Introductions this evening, to my right we have Dan Santos. He's the National Guard Bureau's project manager for the Installation Restoration Program here at Otis Air National Guard base. To Dan's right is Jim Begley. He's with the Massachusetts Department of Environmental Protection, and he's their remedial project manager, and to Jim's right is Paul Marchessault. He's with the United States Environmental Protection Agency, and he's EPA's remedial project manager. The purpose of tonight's hearing is to accept oral comments, oral testimony, on the CS-4 ground water proposed interim remedial action. It was made available by the National Guard Bureau in mid-February, approximately February 14th, for your review, and this evening we're accepting oral testimony to get your comments on that plan.

On February 24th, the National Guard Bureau hosted a public meeting right here in this room and conducted presentations to discuss the proposed plan as well as other feasible alternatives that were looked at while evaluating which action to propose. On the 25th of February, public comment period, 30-day public comment period began, and today, the 18th of March, we're hosting a public hearing here, which is being transcribed tonight. We have a court reporter. And any other comments that we receive will be on the record, and the National Guard Bureau will be responsible for addressing each and every one of those comments in what's called a Responsiveness Summary.

A Responsiveness Summary categorizes and summarizes all of you comments that we receive, both orally this evening and in writing, throughout the duration of the public comment period. The Responsiveness Summary will accompany a Record of Decision, in this case an interim Record of Decision, on which action will be taken at this site, Cs-4 ground water. The anticipated announcement of Record of Decision is early spring of this year on March 25th. The public comment period, the 30-day public comment period, will come to a close. The administrative record, which contains all of the documents that the National Guard Bureau has used to -- as the bases for selecting this proposed remedy are available in a number of places. They're available at Falmouth Town Library, they're available on base, they're available at the EPA records center at 90 Canal Street in Boston, Massachusetts. Indexes to the administrative records for this proposed plan are available at all of the information repositories in each of the towns, Bourne, Mashpee, and Sandwich, as well as Falmouth. We encourage you to consult any of information in the administrative record that will assist you in providing comments on the proposed plan.

I'd like to talk a little bit about how this hearing will be

conducted this evening. To some degree it's different that typical public meeting that we hold. Public meetings generally are an interactive sort. A public hearing is exclusively an opportunity for the National Guard Bureau, EPA to receive your oral comments. We will not be responding to your comments. You may come up and submit comments at the microphone. We will have a court reporter transcribe those, but we will not be formally responding to those verbally this evening. Those comments, as I mentioned earlier, will be taken and put into a document called a Responsiveness Summary, and they'll be formally responded to in writing at the end of the comment period, and that document, as I said, will accompany a Record of Decision this spring.

This evening Dan Santos will follow me and he'll give a brief description of the Preferred Alternative, the same presentation to some degree that was explained here a few short weeks ago, and just to refresh your memory, if you need any copies of the proposed plan itself, Doug Karson has additional copies available. We encourage you to take copies, and since we have such a small crowd, I want to ask you to limit any of your oral comments. If you do have extensive comments to make orally this evening, I encourage you to submit them in writing if you do in fact have them and once again remind you that all written comments are due to Douglas Karson at the Otis Air National Guard base by close of business on 3-25, March 25th. I also thank you to keep your comments exclusively to the CS-4 groundwater operable unit in the proposed plan this evening. If you have any questions or comments regarding any of the other sites on the military installation, we encourage you afterwards either to approach us and ask questions about those or to contact us. Our numbers are available. We've got a list of numbers. Many of you have them, I'm sure, but you can get them from Doug Karson, who's at the back of the room at the table.

Also, what we're planning on doing this evening, since many of you may have some additional follow-up questions after you submit your comments, when all formal comments to be made orally, we're going to officially close the record and have an availability session of sorts so that if you do have questions that you feel you need to have answered as you prepare your written statements to submit, we will be available afterwards for any comments or questions you have on the CS-4 proposed plan, but at the beginning part, the formal part of the hearing, as I said, we will not be responding to your comments. They're just exclusively to be placed into the administrative record.

During any of the comments that you submit, we may in fact ask for some clarifications if we really don't understand what your comment or your question is. That's the only interactions we'll have during the formal part, but again, as I said, afterwards the three gentlemen to my right would be happy to answer any questions you have on CS-4 and the proposed plan, and without further ado, I'd like to introduce Dan Santos, who will give a brief presentation of

the Preferred Alternative.

MR. SANTOS: Thank you, Doug. Is this on? As you mentioned, I've just prepared a short summary briefing to talk about our proposal and the proposed plan, and the slides are taken from the meeting that we had on February 24th for presenting this proposed plan. Okay, the proposed plan basically is the presentation of the National Guard Bureau's Preferred Alternative for conducting remedial action, which provides for public review and comment, and that's the purpose of the public commentary, the commentary which we're in right now obviously and this hearing.

Just very quickly, I'll show you how we -- this is the process I'm following, the CERCLA, or the process to get from a site and educated you about the remedial action, and you can see here we have outlined in red the feasibility study stage. We have conducted all the site investigation work at this site to bring us to the point where we can look at alternatives for remediation, and in this case that documents all the feasibility study, which is the sister document to the proposed plan, and it's also available and you can see here.

The proposed plan is in the process right here. Once the proposed plan has gone through the public comment period and the Record of Decision is signed by the EPA, then we will go through the rest of the process here, which is the remedial design and the actual remedial action or construction, I guess. Okay. What this proposed plan, the proposed remedial action is, in this instance, is containing or stopping a plume of contaminated groundwater from area of contamination called chemical spill four or CS-4 which is currently beyond the base boundardy and southern portion of the base located in the Crane Wildlife Management area. What that proposal includes is removing contaminated groundwater from the plum, which is currently about 140 feet below the ground surface, pumping it back onto the base property into a treatment plant, which consists of running the water through a granular-activated carbon which removes the contaminates from the water and then discharging the treated water back to the ground.

This is a map of the base showing the contamination plumes contaminated from a number of areas of contamination. The one we're here concerned with tonight is this long one here. That is the area of contamination, or AOC, CS-4 plume. The colors on that map represent the type of contamination and in this case the EPA's chlorinated solvent contamination.

Okay. How we found this contamination plume was by doing groundwater investigations, and very quickly, back in 1987 we installed monitoring wells along the southern base boundary to identify contamination that may be in the groundwater from known possible sites on the base, and MW 603, which stands for monitoring well 603, identified contamination and we launched basically an in

depth study of the underground water surrounding this well, which allowed us to trace the contamination back to this area of contamination, CS-4.

Okay, that plume, once we fully identified it, is about 11,000 feet long from the source down to its leading edge or toe in the Crane Wildlife Management area, is about 800 feet wide and 40 feet thick, and that volume of water is about 800 million gallons within that plume.

Okay. We come up with treatment levels, or the requirements of treatment. What do you have to do to treat this groundwater, and that comes from a couple of things, one being standards that are set by the federal and state governments for the amounts of contaminant that are allowed in groundwater and the second being conducting a risk assessment, which is a calculation of the risks to public health and/or the environment from these contaminants being in the groundwater.

After conducting those calculations, which are detailed in the feasibility study, the numbers that result are shown here. This is the maximum concentration of these contaminants that are listed on the left here, and these, by the way, are all chlorinated solvents or volatile organic compounds, those chemicals which are easily evaporated. These are the current concentrations and these are the treatment levels. These are the levels which we will have to get below to be in accordance with the state and federal laws, or in one case up here in particular with risk assessment, the other ones are maximum contamination levels allowed in groundwater. That doesn't mean that's what the water will look like coming out of the treatment system. The water that will come out of this system will probably have much less contaminants in them than this. This is the maximum that's allowed.

These systems are very effective for removing these types of chemicals from groundwater and will probably result in 99.99 or as close to a hundred percent as we could get of removal of the contaminants and water would be considered very, very clean that would be discharged back to the ground. That would be insured during the whole process through continuous groundwater monitoring, monitoring of the extraction system to make sure we're extracting the entire plume and not allowing anything to go by and monitoring of the actual discharge water from the treatment system.

To arrive at the Preferred Alternative work we're proposing, which is the granular-activated carbon treatment, there are a number of criteria which we evaluate into the feasibility study, and again I refer you to that document for the details -- detailed analysis of the various alternatives to look at, and I just have them listed here. Basically some of the key points are, number one, obviously, overall protection of human health and the environment and effectiveness of the system for removing these type of contaminants

in this type of environment, cost, and the ease of implementability which obviously means the treatment systems that we're proposing are available to us and the ease at which they can be implemented on the site. The last two, state acceptance and community acceptance, aren't addressed in the feasibility study, they are addressed during the public comment period, which we're doing right now, and this oral testimony is part of that accepting the community comment and re-evaluating our proposal based on the comments that are accepted from the community and the state.

Once we work through all those criteria on the alternatives that were proposed, we result in this final Preferred Alternative, which consists of three parts, the containment, the treatment, and the discharge, which would be a vertical well extraction system, and all that really needs is similar to you get water here for residents and for municipalities on the Cape. It's just a well and we pump the groundwater out. We will treat it on the base with the granular-activated carbon and then discharge it back to the groundwater. It says crossgradient here, and what that means is the site, we wouldn't put the water back in right in the area that the plume is actually moving. We don't want to alter that. By adding the water we could alter the path, which possibly could move the plume off location and our extraction wells would naturally capture it, and we've also modeled the best location to put the groundwater back so it wouldn't influence other plumes that are in the area as well.

And what that look like is -- again, here's the plume, the AOC, AOC CS-4 about this location in the middle of the base. This here shows the location of the extraction wells which will be placed downward from the known location of the plume to make sure that during construction the plume would not pass by, again to make sure that we capture all the contaminants, and that simply would show the piping back up on the base, the treatment system here. This is the base boundary and waste water treatment plant and shoot up on here for reference, and this is 151.

And just to give you a bird's eye view, this is the old Coonamessett Airport, which is commonly Crane Wildlife Management, the Nickelodeon Theatre, and this is the base here, the CS-4 site over here, and the plume comes down in this direction.

And this, graphically this is what is going to happen in the three-step process, the extraction, the treatment plant and discharge. See the plume traveling down here. It's captured by the well. It's pumped to the surface. These would be located again on base. This is the carbon treatment units, which basically are canisters full of this granular-activated carbon, and then piping discharge for the groundwater below ground surface to allow the infiltration back to the groundwater. Just so you're not confused, for ease of showing it here on the diagram, it looks like it is down from where we're extracting the plumes. This actually would be located beside

the plume. In one respect it's a little inaccurate.

And in a nutshell, that's what we're proposing in this proposed plan, and now Doug will accept the comments.

MR. GUTRO: Thank you, Dan. As many of you walked in this evening, Doug Karson hopefully asked you if you would be interested in providing any oral testimony this evening on this proposed plan or any of the other physical alternatives that were evaluated. I have before me a list of those of you who have indicated that you wished to give oral testimony. I will be calling you up individually, one at a time, in the order with which you gave your name to Mr. Karson. I'm going to ask each of you if you could -- to come up, state your name and affiliation into the microphone and then give your oral testimony. I want to remind you one more time that we will not be responding verbally during the testimony today. The testimony that you give us, we will be doing that in Responsiveness Summary when the final decision is made this April.

For those of you that did not indicated that you wanted to give testimony, we will have time at the end in case you did change your mind after hearing the presentation, and we'll allow you to give any oral comments that you're interested in giving at that time. After that point, we'll close the formal part of the hearing and allow for any questions and answers that you might have that will assist you in developing written comments that you wish to submit before the close of the comment period.

I'd like to ask Virginia Valiela, Falmouth selectman, to come up to the mike.

MS. VALIELA: I'm Virginia Valiela, and I'm a member of the Board of Selectmen. The board will be submitting written testimony as the official record of the board, but I'm speaking tonight as a citizen and as a layman who's been concerned about groundwater pollution for more that a decade in Falmouth.

I'd like to say first and foremost that I welcome the day that we begin to clean up the polluted water in Falmouth. We have waited a long time. I concur with the Preferred Alternative of vertical wells to extract the contaminated water contributed by carbon adsorption and then discharged with the crossgradient site. I have four comments I would like to make regarding the proposal that I have read, both in the summary form and as well as at gradient site.

The first comment has to do with the crossgradient site itself. It's stated in the report that there is no known plume in that area and that it was selected so that it would not affect either the plume farms or the sewage treatment plant or the fire training area or those two plumes that were close. I believe before you actually discharge there that you should check there is no plume and that

the area of discharge should be bracketed with monitoring wells to make sure that you're indeed dealing with clean groundwater.

Second, the discharge point is listed in the report as being point one acres, a tenth of an acre. That seems to me to be a very small area in which to discharge more that 110,000 gallons a day, and so I would encourage you to make that area somewhat -- make the discharge somewhat more diffuse, not to concentrate it all into one little pocket.

Thirdly, the identifying compounds in the plume are all volatiles, PCE, TCE, DCE, and tetrachloroethylene. There are no fuel-related compounds reported in this plume, but we're aware that in the path of this plume, south of the source of the CS-4 plume, there is the potential for significant discharge of fuel-related compounds over time, and I think that you should be monitoring for those compounds, including EDB, when you are in the process of extracting the water from the CS-4 plume. I think this should be looked into to see if any fuel-related compounds appear in the water that has been brought for treatment, and I think that that monitoring should be done on a very frequent basis. There is no indication in the feasibility study as to how often you look at the water as you treat it. I don't know whether it's daily, weekly, monthly, but it seems to me you should be looking for fuel-related compounds on a frequent basis, by that I mean weekly, monthly.

Fourthly, the extraction wells are located between the toe of the plume and the current fence of wells, which are numbers 1206 through 1210. Two of those wells already show low levels, trace levels, of volatiles, and I think it's going to be hard for you to assure the Falmouth public that this treatment system is really working. If you have downstreaming of wells, that actually shows it has evolved already, and I believe to address that you need to put in at least a pair of additional monitoring wells south of that fence, and whether those wells are on the north side of 151 or the south side of 151, I can't really make an engineering decision, but I think you should put some monitoring wells where there is clearly no contamination where you have background groundwater constituents so that it would be clear in time as the treatment proceeds that there is indeed no travel of volatiles into the area of Falmouth which as been most known to have some wells and private wells. Thank you for the opportunity to come up.

MR. GUTRO: Thank you, Ms. Valiela. I would like to invite David Down to comment on any oral testimony he may have.

MR. DOW: I'm Dave Dow. I'm representing the Cape Group Sierra Club. The National Guard Bureau is to be congratulated for coming forward with a plan to contain the CS-4 groundwater plume, or the CS-4 groundwater operating--operating--groundwater operable unit, as it's referred to in the document before the plume crosses Route 151, thereby threatening the drinking water of private wells in the

Hatchville area and ultimately the safety of the Falmouth Town well at Coonamessett Pond. The preferred unit containment strategy of a series of pumping wells at the toe of the CS-4 plume followed by treatment via carbon adsorption to remove the volatile organic carbon contaminants seems like a sound approach. The treated water will be released in an infiltration area near the treatment unit. Hopefully the National Guard Bureau will undertake a cleanup of the CS-4 and the CS-10 groundwater plumes in a period of less than a projected five year time span of the pump and treat containment plan for CS-4. Since the extent of the CS-10 plume has not been defined, it is important to characterize it as soon as possible to make sure that the CS-4 containment plume will not affect the flow of the CS-10 groundwater plume.

There has been much discussion in the media regarding a potential FS-2 groundwater plume which may have penetrated further south than the line of 13 pumping wells designed to contain CS-4. Some local activists feel that the FS-2 may have actually moved south of Route 151. Given the different assessments of the likelihood of the existence of an FS-2 groundwater plume between the National Guard Bureau and the state Department of Environmental Protection, coupled with the possibility that because of the volatilization and in situ biodegradation of the BTEX contaminants, the FS-2 plume could be detached from its source area, therefore it would be a prudent and proactive policy for the National Guard Bureau to sample private wells off Base looking for indications of BTEX contamination int eh groundwater. If a consistent pattern appeared that could not be explained by the leaking fuel tanks from the individual homesites, then the National Guard Bureau could establish their own test wells moving out beyond the Base border in order to characterize the position of the potential FS-2 plume. The testing of off-Base private wells would not be that costly and it would save the National Guard Bureau the embarrassment that accompanied the discovery of the Forestdale plume by the Town of Sandwich. Our group has long advocated a more proactive strategy to detect potential new sources of groundwater pollution.

Regarding the compliance of the proposed interim remediation scheme with Applicable or Relevant and Appropriate Requirements, or ARARs, it would be useful if the state's position on the proposed, preferred option were made known prior to the close of the public comment period. It appears under Section 8.8 that the stat's position will not be addressed until the interim Record of Decision is prepared for the CS-4 plume. It would be useful to have additional details on such items as the procedures to be employed in order to determine whether the activated carbon has become spent or exhausted so that the VOC adsorption capacity will not be exceeded. VOCs vary in their adsorption capacity on activated carbon with poorer adsorbers requiring greater carbon use rates and competitive adsorption interactions between weak and strong adsorbers can also impact the carbon use rate. Single solute VOC bedlives range from 7 to 12 days for vinyl chloride, to 158 to 245

days for DCE, 340 to 529 days for TCE, and 441 to 693 days for benzene. Since the CS-4 plume has a mixture of these VOC components, it is not a trivial problem to estimate when the carbon adsorption capacity has been spent, unless one has a continuous on-line organic monitoring system. It would be useful to know the state DEP's response to these issues in the National Guard Bureau's Proposed Plan.

One final point is that the interim remedial plans for removal--for removing VOC's from the contaminated sediments in the CS-4 source area is not independent of the plan to pump and treat the CS-4 groundwater plume, CS-4 groundwater plume. For example, following the soil roasting and incineration of the off gases and CS-4, the sediment will be returned to the original site and will still be contaminated by lead, aluminum, cadmium, chromium, zinc, PCBs, dieldrin, and DDt. Unless some type of impervious layer separates the partial remediated soil from the groundwater, then continued low level pollution of the groundwater will occur. This will complicate the eventual cleanup of the CS-4 plume which os to take place after the containment phase. The dominant contaminants in the CS-4 groundwater plume include TCE, PCE, DCE, cadmium, manganese, and sodium. Interim remediation of the contaminated soil at the CS-4 source area will leave a big hole, roughly 3,000 cubic yards, in the ground for a period of time which could fill in with water and thus increase the recharge rate of the groundwater. This could change the flow rate of the contamination zone in the groundwater, thereby complicating the plume containment strategy. Thus full remediation of the CS-4 source area and the CS-4 groundwater plume need to go hand in hand.

I want to thank you for allowing us to submit comments.

MR. GUTRO: Thank you, Mr. Dow. thank you, next, James Kinney, Mashpee Association for Base Cleanup, you're welcome to provide us with any oral testimony you have.

MR. KINNEY: Thank you. My name's James Kinney from the Mashpee Association for Base Cleanup. I have several comments about the Proposed Plan. First, I'd like to say that we are relieved that the National Guard Bureau's finally doing any containment strategy on anything at all, and we hope that they will try to do this faster as we go onto the other 43 or 77 sites, depending on who's doing the counting.

One of my comments has to do with the Proposed Plan itself. If I understand this right, the statement in the plan that says that the CS-4 plume is 1,200 feet north of Route 151 is based on well sampling that was taken in 1989. The report also states that the plume is moving at the rate of about 370 feet per year, so that means that in the last two and a half or so years, this plume could well be south of Route 151. And I wonder what effect that would have on the cleanup strategy in terms of pumping the effluent from

that area back onto the Base and if that would complicate things to be dealing now with a major highway.

That also brings up the point of trying to speed up this action given the fact that in the document it says that the estimated time for design and construction is one year, in which case the plume will move another 370 feet and perhaps make it even harder to pump back the water over a highway.

We also have a concern about what the effect of this interim remediation of the CS-4 plume will have on two other plumes that are in the area, the FS-2 plume, which is the result of the railroad site area where 110,000 plus gallons of fuel has been spilled, and also on the CS-10 or BOMARC plume, which has not been fully delineated. It seems possible that doing any kind of pumping reaction on the CS-4 plume could pull the other plumes faster toward that area, and hopefully strict and continuous monitoring will be done to make sure that those eventualities don't occur or that they're dealt with quickly if they do.

On page 6-1 of the plan it states that the interim containment is expected to continue for five years. The corollary of that statement seems to be that the final cleanup action wouldn't happen for a minimum of five years. I'd just like to know if that really is true and if we are now doing this interim containment and then will be waiting for rive or more years for CS-4 plume to actually finally be cleaned up or all of the plume that may be in that area, CS-4 and CS-10, would be cleaned up, and hopefully this plan will not slow up any other cleanup action in that area.

Another concern is the discharge or infiltration area. The influx of thousands of gallons of water a day presumably in an area where there are no other plumes, I agree with Ms. Valiela that monitoring has to be done in that area to make sure that all this water being put there is not going to push the Ashumet Valley plume or the fire training area plume any further or any faster. It's already moving into the Ashumet POnd and that we need some sort of assurances that in fact won't make things worse on that part of the Base.

Finally, I would just like to mention that the Mashpee Association For Base Cleanup, the Alliance for Base Cleanup, and other concerned residents in the area generated hundreds of comments, some of them very detailed, about the proposed thermal treatment incineration plan that was proposed for three sites on the Base last year. Even though we generated somewhere in the vicinity of 800 or 900 comments, the result of making those public comments in the time allowed was that the National Guard Bureau agreed to let the contractor decide on the actual final thermal treatment process and incineration process. I think that has raised--raises a serious question about the effectiveness of our public comments since we went to great expense and time and energy to generate all those comments informing people in the area about what was going on

and then the National Guard Bureau essentially ignores those comments by passing the buck to the contractor and allowing them to make the final decision. I'm concerned that the same thing will not happen in this case, otherwise I will say that this public comment period is merely a sham to follow the law and has really no integrity as a process that's trying to solicit and really address the concerns of the public. Thank you.

MR. GUTRO: Thank you, Mr. Kinney, for those comments. Next is Ed DeWitt from Falmouth.

MR. DEWITT: My name is Ed DeWitt. I'm a Hatchville homeowner, and I also have a private well. I am in favor of the Preferred Alternative. I guess I'm another one who's going to applaud the National Guard Bureau for doing something. I guess the analogy is for an abused child to thank the parent for stopping slapping them in the face, but I think it is progress and I'm all for it.

The CS-4 plume is a dynamic plume. Not only is it moving on toward the Coonamessett Pond area, it's also sinking, and although there's engineering considerations to keep up with the toe of the plume, the failure of that directly impacts upon my private well and the wells of my neighbors and the public well operated by the Town of Falmouth at Coonamessett. I think you have to incorporate into this plan a monitoring system of private wells in the Hatchville area of Falmouth, particularly since the FS-2, the CS-10 plumes have not been clearly mapped out and to assure the public that your plan to clean up CS-4 is in fact working.

I believe that all of the wells that are in this area should be tested by the National Guard Bureau through the use of an independent laboratory, and this will not only insure the safety, but it may provide some additional information to the National Guard Bureau in assessing the location and severity of other plumes at Otis. Thank you.

MR. GUTRO: Thank you for those comments, Mr. DeWitt. Next is Richard Hugus, Falmouth Association for Base Cleanup.

MR. HUGUS: My name is Richard Hugus, Falmouth Association for Base Cleanup. The comments that I planned to make tonight have all been made. All I can do is back them up with my own testimony. First of all, I think that the treatment here, since it's been names as an interim treatment or remediation of the CS-4 groundwater plume, it's defined as interim because of the need to document and treat the CS-10 plume ultimately. I think that FS-2, site FS-2, should be included in the interim setup. That is FS-2 and CS-10 should be what makes this an interim treatment. I agree with the other who have spoken tonight that we need to know what happened with that 110,000 gallons of fuel spilled at the railroad fuel pumping station.

I don't want any of my comments to lead to a delay in the treatment. Falmouth Association for Base Cleanup is for it so that these are only additions and not meant to hold anything up. We believe that you should go right ahead with it. Another criticism, however, has to do with the fact that the water, once treated, will be sent back up pretty much next to the Base sewage treatment plan, which everyone knows is the source of the Ashumet Valley plume. Now, if that water is going to be treated down to five parts per billion and then put back into the ground, it's going to be part of a hundred parts per billion plume in the Ashumet Valley, so it's more or less if the Ashumet Valley Plume is going to be now only five parts per billion plume, and also it's more--it's sort of like the Ashumet Valley Plume becomes the sewer for the treatment, and we don't know if that's going to be treated yet either. We'd like to know.

I agree that free testing of private wells in the Hatchville area should be done. It shouldn't be something that the residents there should have to pay for. In most cases--well, it's always expensive and hard to afford for people to get their water tested. This isn't something that they're responsible for.

Finally, I'd like to back up what James Kinney said from Mashpee. The number I was given by the Guard Bureau for how many comments were opposed to the soil treatment plan was 978. That's 978 people who took the trouble to make the public comments. Opposing the thermal treatment plan was the afterburn, which we call the incineration, and three were--three people were in favor of that treatment. I realize that wasn't a vote, but the score, it was 978 to 3, and we feel that if you're serious about soliciting public comment and getting the public involved in decision making on the treatments coming up at the Base, that you should listen to what the public says, and in this case I doubt if there will be any problem because everyone's in agreement, but down the road there may be disagreements, and we'd appreciate being listened to. Thank you.

MR. GUTRO: Thank you, Mr. Hugus, for those comments. Next, Kathy Engles, Falmouth.

MS. ENGLES: Hi. My name's Kathy Engles. I'm a Falmouth resident, and this cleanup is taking place in my old neighborhood. I had a house right in that area and several of my friends live in that area. Their property value has gone down. They're concerned about their well water, especially Cloverfield Drive, which is right there behind, right on the border. These people want their well--they want their wells tested on a regular basis, if possible. they'd like monitoring wells right along the border, which I assume is in the -- it was in the treatment plan recitation notes here. Excuse me a minute. But the wells range from between 50 to 80 to 130 feet deep. Their land is not just sand, it's sand, clay, rock, and there's a lot of clay in that area. Everybody is happy that

the carbofied treatment plan will begin soon, the sooner the better, but we feel in the short term it will probably be a short term answer to the problem and a long one, and basing this information on some research that we read that says that, "Researchers find that levels of groundwater contamination at 19 spill sites improved initially but gains leveled off long before the water reached drinkable purity. You can't find a single aquifer restored to drinking water standards with the standard pump and treatment methods used at most Superfund," and that's a quote from Curtis Travis, who is from Oak Ridge Lab.

The CS-4 plume needs to be addressed, but if this will stop the plume, then everybody's thrilled. Meanwhile across 151 Sam Turner road, Coonamessett, across that way, those neighborhoods, their wells also range from 50 to 130, you know. The well levels are all different. We feel that you need monitoring wells at all the different levels all the way down to Coonamessett right to Coonamessett, and if you will not put the monitoring wells, then at least test the residents' water at all different levels, not just at one level, but especially at the level of the wells that are 130 to 140 feet because that's the level of the plume in that area, and that's it. Thank you.

MR. GUTRO: Thank you, Ms. Engles. those are all of the individuals at this time which came in that asked to give formal testimony on the record. Are there any other individuals in the audience tonight that care to make some formal oral comments on the record?

Would Jim Begley of the DEP care to stand up?

MR. BEGLEY: Hi. I'm Jim Begley. I'm the remedial project manager with the Department of Environmental Protection for the Commonwealth of Massachusetts. I'd like to respond in part to a statement Richard made about the state's position on this. I had been planning to send a letter detailing al of our comments. We will be doing that this week. But I'd like to say that the state does concur with this action. We feel that, number one, this action will be protective of public health. The system that's been outlined in the Proposed Plan seems to be a well thought out system that uses effective technology, and we're confident that it will do the necessary job of containing the CS-4 plume.

I'd like to back up to some things I heard earlier about monitoring. The actual design of a monitoring system to go along with this containment system will be part of the remedial design, so we don't have specific details on that monitoring system yet. The state will be reviewing those designs as they come out. I feel that it's important that in the meantime, before those designs are ready, before the system is constructed, that we have regular monitoring of most downgradient wells to insure that contamination is not passing that leading edge, as we know it now, before the

system becomes operation.

There has been some more recent monitoring since 1989 just during this past year which showed no detectable concentrations in those leading edge wells. That gives us some confidence that we haven't had a situation of the plume migrating beyond the monitoring area, so that's all I'd like to say, and thank you.

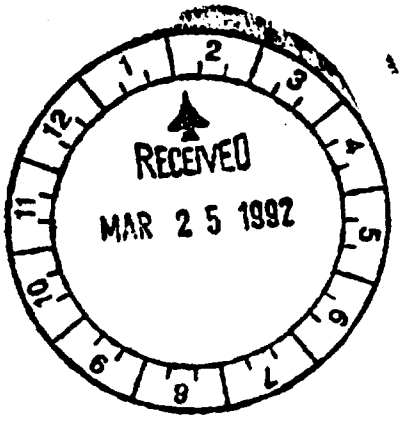
MR. GUTRO: Thank you, Mr. Begley. I would like to note that anyone that does have written comments with them this evening is welcome to submit them to me, and I will personally put them into the record. I'd also like to note in closing that the comment period, as I've stated already, ends on the 25th of March and that all comments, written comments, need to be submitted postmarked no later than that day, March 25th, and sent to Douglas Karson at the Otis Air National Guard Base, public affairs office. His address is in the Proposed Plan, if you don't have it, and in closing, I'd like to thank you all for your thoughtful testimony. We certainly appreciate it and it will be carefully considered as we approach the Record of Decision, and with that I'd like to conclude the formal part of the hearing and close the record, and those of you that wish to stay around and have any questions or clarifications regarding the Proposed Plan, we encourage you to ask any questions.

(Whereupon the hearing concluded at 8:05 p.m.)

COMMENT LETTERS RECEIVED DURING PUBLIC COMMENT PERIOD

CAPE COD COMMISSION

3225 MAIN STREET
P.O. Box 226
BARNSTABLE, MA 02630
508-362-3828
FAX: 508-362-3136



March 24, 1992

Doug Karson
102nd FIW/PA
Otis ANG Base, MA 02542-5001

Dear Mr. Karson:

I have received the document "Groundwater Focused Feasibility Study for Area of Contamination (AOC) CS-4 and the "Proposed Plan" for the same, both dated February 1992. The Water Resources Staff at the Cape Cod Commission is in full support of the ANG's proposed plan for an interim remedial action to contain the CS-4 plume. Because this is the Base's first groundwater remedial action and to some extent is setting precedent for further remedial actions on more complex AOCs that occur the on the Base, the selection of the proposed plan bears some further clarification and support.

The plan compares the use of activated carbon and air stripping to treat the contaminated groundwater. The plan's preferred alternative is activated carbon. I was surprised that the amount of activated carbon to treat the water (51,300 pounds over a 30 year period) was the same as the amount of vapor phase carbon to treat the air emissions from the air stripper.

The air emissions from the air stripper were proposed to be treated by vapor phase carbon, why wasn't the use of a CATOX system to treat the air emissions also evaluated?

The remedial action was selected based upon the low concentrations of iron and manganese from two groundwater samples. Are these grab samples representative of the general plume area? Does the plume occur in a low dissolved oxygen zone of the aquifer? Subsequent aquifer tests for feasibility studies should include inorganic water quality tests.

The emissions from the air stripper were calculated as 37 pounds per year. There was no quantification of the significance of this amount other than a reference to an EPA guidance document on Superfund sites. The Remedial Technology Evaluation and ARARs Handbook prepared by E.C. Jordan (1989) reported that air stripping

without emission treatment was the most cost-efficient method for treating contaminated groundwater. Given that the Draft Final Groundwater Remediation Strategy Report (1991) estimates that over 6 million gallons per day could possibly be pumped and treated, it behooves the ANG, and the regulators to make optimal decisions regarding remedial alternatives. For this reason, an informed and objective risk assessment of the discharge of 37 pounds of volatile organics per year into the atmosphere should be conducted to support the selected alternative.

Monitoring the extraction area to confirm complete capture of the plume will be a difficult task. Would the ANG consider using an innocuous tracer to supplement that effort?

The focused feasibility plan is based upon the previous remedial investigations in which the plume is interpreted and presented as a continuous contaminant source. Chemical spill plumes are actually discontinuous chronic sources of contamination where slugs of contaminant are intermittently released. As such the plume's interior definition may change from one sampling round to another. The first remedial action alternative is for no action and continual quarterly sampling. Due to the slug-like nature of these plumes, it would be prudent for the ANG to mobilize a regular sampling program of selected wells within each of the AOCs. Review of regular sampling data will allow feasibility studies to be prepared with the best and most up-to-date characterization of the plume's condition. The last time the CS-4 monitoring wells were comprehensively sampled was 1989.

On a technical note, the transmissivity calculated from the pump test analysis of the recovery well data was used to derive a hydraulic conductivity (K) of 160 feet/day by dividing transmissivity by the entire aquifer thickness of 127 feet. If the test well was not pumped at an appropriate rate to stress the entire aquifer thickness, the K may be too low. I also noted that the K of 160 feet/day was used for the entire aquifer thickness in the groundwater flow model, whereas the text on the pump test indicates that there is a gradation of K from the shallower to deeper portions of the aquifer.

Thank you for the opportunity to comment.

Sincerely,

Tom Cambareri

Thomas C. Cambareri
Water Resource Coordinator
Hydrogeologist, CGWP

cc: TEAC Distribution
Susan Walker, Assembly of Delegates
Cape Cod Commission MMR Sub-Committee

TOWN OF FALMOUTH
59 TOWN HALL SQUARE
FALMOUTH, MA 02540

March 24, 1992

Doug Karson, Public Affairs Officer
102nd FIW/PA
Otis ANG Base, MA 02542-5001

RE: Public Comment on Proposed Plan for CS-4

Dear Mr. Karson:

The Board of Selectmen voted unanimously on March 23, 1992, to endorse the National Guard Bureau's Proposed Plan to remediate the plume from the West Truck Road Motor Pool, known as CS-4.

Given the potential of this plume to contaminate both public and private wells in the Hatchville area of Falmouth, it is very important that migration of the CS-4 be stopped. The density of monitoring wells downstream of this plume should be sufficient to guarantee that the entire plume has been captured by the extraction wells.

We are also concerned about the potential for a plume from the railroad yard pumping station, FS-2, and whether fuel-related compounds from that area might appear in the monitoring wells or treated water of the CS-4 plume. A close watch should be kept on the quality of the extracted water.

In remediating CS-4, every effort should be made to bring about a total clean-up of this portion of Falmouth's aquifer.

Sincerely,

Raymond R. Labossiere

Nathan S. Ellis

Edward Marks

Virginia Valiela

John S. Elliott

BOARD OF SELECTMEN

The Commonwealth of Massachusetts

Senate

State House · Boston

March 25, 1992

Mr. Daniel Santos
Installation Restoration Program
Otis Air National Guard Base
Massachusetts 02542-5001

Dear Mr. Santos:

We have reviewed the Proposed Plan for the containment of CS-4, as well as the potential remedial alternatives suggested by the feasibility study. It is our feeling that the interim remedial action proposal to contain the plume is a positive step that will protect the groundwater down-gradient of the plume.

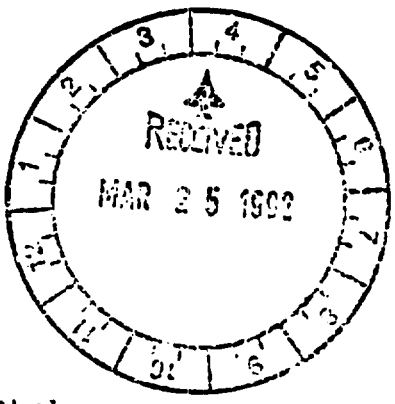
We understand that this containment project will be closely monitored, and would support extension of this containment action to many of the other plumes of contamination emanating from the Base as soon as possible, especially in the area of John's Pond once those plumes have been more clearly defined.

We are supportive of this action, and hopeful it will commence in the fall as scheduled.

Sincerely,

HENRI S. RAUSCHENBACH
State Senator
Cape & Islands District

THOMAS S. CAHIR
3rd Barnstable District



HSR\cb

Winnifred Woods
Attorney at Law
(508) 540-1269

Post Office Box 266-E
East Falmouth
Massachusetts 02536-0266

received 25 MAR 92
7:05 P.M.
KK

March 23, 1992

Doug Karson, Public Affairs Officer
102nd FIW/PA
Otis ANG Base, Massachusetts 02542-5001

Re: Groundwater Proposed Plan, West Truck Road Motor Pool (AOC CS-4)

Sir:

By way of background, I have been a resident of the Town of Falmouth (East Falmouth) since 1955. I have been a Town Meeting Member (Precinct 7) since 1983, and I am a former member of the Falmouth Planning Board (1983-1987), among other local offices held. I've been a member of the Massachusetts Bar since 1975, and my undergraduate degree is in the field of mathematics.

During the past decade, I've become acutely aware of and concerned about the need for high-quality water supplies for the exploding population of the Falmouth area, and the various threats to our "sole source" aquifer. One of the most serious is that of the pollution originating from the Massachusetts Military Reservation (MMR). Where Falmouth is surrounded on three sides by the ocean and has experienced intense development along its entire shore, its well sites are limited to those areas which are inland and tending to be on the north side of the town. Unfortunately, those same sites are relatively closer to the MMR and therefore, more immediately threatened by pollution stemming from the MMR.

Besides the Long Pond reservoir (which has a limited safe pumping rate), the Town has constructed three wells: the Ashumet Well, the Fresh Pond Well and the Coonamessett Well. The Ashumet Well was closed long ago due to pollution from the MMR; the Fresh Pond Well closed last year and the cause has not yet been determined, but the MMR hasn't been ruled out; and the Coonamessett Well is directly in the path of (and less than a half mile from) the toe of the CS-4 plume. The Town, which is growing rapidly, has very few sites left for future water needs, and recently, was forced to delay construction of a new well because of severe budget restraints.

Obviously, the Town cannot afford to lose any additional water supply sites (existing or contemplated), nor can the Town

ignore further threats to private wells, which would force additional households onto the already strained public water system.

With all of the above in mind, I applaud the long-awaited start of actual cleanup of the contamination flowing from the MMR to the surrounding towns. I generally concur with the ANG's choice of the preferred alternative, known as Alternative GW-2. However, I am frustrated by several factors, namely:

1. I find it difficult to adequately review proposals that are merely conceptual and lacking specific details;
2. I do not believe the ANG's approach to the public participation in the CERCLA is particularly fair or calculated to harvest the best response, where the ANG artificially isolates individual plumes for review and thereby essentially ignores probably interaction between individual plumes;
3. The ANG has acknowledged that there may be many sources of contamination not yet known, and that known plumes of contamination have not been adequately studied to map with certainty, yet the ANG spokesman, Mr. Daniel Santos has made statements that testing of private and municipal wells is a county and local responsibility. He has also admitted that the ANG's monitoring wells are not comprehensive, but rather, south of developed, industrial areas of the Base.

At various times, I have been told by a number of men who worked at the Base in the 1940's and 1950's that the standard operating procedure for the Base was to accept regular monthly allocations of various fuels and other supplies whether needed or not. I was repeated told by these different sources that if new supplies arrived with inadequate storage availability, tanker trucks would be directed to dump the excess at various and unrecorded locations throughout the MMR. Given that (1) these various men had no reason to lie to me, (2) these incidents probably occurred over many years, and groundwater travels one-to-two feet per day, it is logical to assume that testing on or near the base may not reveal pollution that has in fact migrated into neighboring towns and public and private water supplies.

Recently, Mr. Santos said: "We find contamination at the source and then we follow it to its end." Contaminants released at or near the Base border ten, twenty, thirty or forty years ago, may have migrated, leaving the origination point at the Base testing site relatively "clean", but that doesn't mean that the

surrounding towns and their public and private wells are without serious risk of pollution.

Given the severity of the human health risk posed by the chemical pollution originating on the MMR and the unacceptable expense to individual homeowners and the municipalities to test for the sophisticated chemical compounds found in groundwater contamination from Base, it is not reasonable for the ANG to simply monitor a portion of its boundary (and an average distance between those monitoring wells of 1800 feet is REALLY INADEQUATE) and known plumes of contamination. It is not reasonable for the ANG to pass remaining (and expensive) monitoring responsibilities on to the financially constrained municipalities and individual homeowners. The towns and their inhabitants are not responsible for the pollution, and they should not have to live in fear of all that is still unknown because they cannot afford the required testing to insure safety.

Figure 1-2, the map of the CS-4 groundwater plume, indicated "Note: Plumeboundary is delineated based on 1989 groundwater data". Given the rate of groundwater movement in the area and the scale of the map, the toe of the plume would be approaching Route 151 (with Coonamessett Pond close at hand). However, this has been disputed by the ANG spokesman, who indicated that there is no evidence of pollution is recent monitoring wells' samples. The following questions need to be addressed:

(1) Where are these monitoring wells?
(2) Do they adequately monitor all three dimensions of the plume, including depth?
(3) What about surrounding sources of pollution (eg. the FS-2 plume); how are they possibly affecting the subject plume from CS-4, both before and after the planned pumping and treating?
(4) How will further delay for design and construction affect the location of the toe of CS-4 plume in relation to Route 151 and the Coonamessett well?
(5) What are the contingency plans if the monitoring wells suddenly indicate the advance of the CS-4 plume?
(6) How often are the monitoring wells sampled?
(7) What happens to the plans for construction if the pollution advances to a point south of Route 151?

I also question the plan to discharge the treated water "cross-gradient". I realize that we're not talking about the huge amounts of water that would be involved with respect to a public well site, but I cannot believe that removing the

groundwater contained in the CS-4 plume and discharging it to a small point in adjacent groundwater will not artificially affect the natural movement of groundwater, both at the point of removal (and down-gradient) and at the point of discharge (and down gradient. If the treated water is of drinking water quality, why is it not being returned to its natural point of origin to continue its natural course toward Coonamessett Pond? Is the discharge of the treated water on top of existing groundwater flow meant to dilute any pollution in the in situ groundwater?

Given that the rate of pumping of the CS-4 plume has to conform fairly closely to the actual rate of groundwater flow (otherwise, if too slow, the pollution will by-pass the extraction wells, and if too fast, the CS-10 plume will be prematurely drawn south toward the public well (Coonamessett)), there should be close monitoring of the actual rate of the natural flow of groundwater (at various depths conforming to depths of pollution) to account for and react to seasonal and rainfall variations that may affect rate of flow.

Thank you for your consideration.

Sincerely,

Winnifred Woods

Winnifred Woods

cc: Paul Marchessault, U.S.E.P.A
James Begley, Mass. D.E.P.
Representative Gerry Studds
Senator Edward M. Kennedy
Senator John Kerry
Governor William F. Weld
State Senator Henri Rauschenbach
State Representative Thomas S. Cahir
State Representative Eric T. Turkington
Falmouth Town Administrator Peter Boyer
Cape Cod Commission
Falmouth Enterprise

3/25/92

Received 3/25/92
8:45 P.M.
DJC

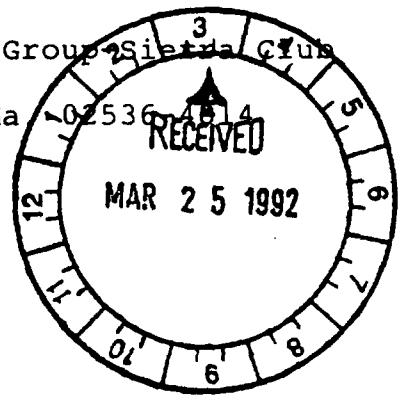
Comments

Otis Model Aircraft Club

comments regarding CS-4 Groundwater containment. Request relocation of pipeline path so as not to obstruct ~~[redacted]~~ grassy area used by our organization. Will work around at your convenience.

William J Henry
16 Rochelle Ct.
Mashpee, MA. 02649
508-539-0147
club President

David Dow
Chair, Cape Cod Group-Sierra Club
18 Treetop Lane
East Falmouth, Ma. 02536-4814
March 23, 1992



Doug Karson, Public Affairs
Officer
102 nd. FIW/PA
Otis ANG Base, Ma. 02542-5001

Dear Doug Karson:

The following written comments are submitted by the Cape Cod Group-Sierra Club on the Proposed Plan for Interim Remedial Action Regarding the CS-4 Groundwater Operable Unit (CS-4 GOU). This represents a follow-on to our oral testimony submitted at the Public Hearing held by the U.S. Environmental Protection Agency (USEPA) on March 18, 1992 at the Lawrence School in Falmouth, Ma. Our group is supportive of the proposed plan to contain the CS-4 groundwater plume north of route 151 with a pump and treatment operation.

We feel that the Proposed Plan that the National Guard Bureau (NGB) submitted for public comment is inadequate in the level of detail included on the preferred option and in its failure to discuss the potential impact of the CS-4 pump and treatment operation on the CS-10 plume and the possible FS-2 plume. In addition the interim remedial action plan to remove VOCs from the CS-4 source area is not functionally independent of the interim remedial action to contain the CS-4 groundwater plume north of route 151. The two remedial action plans and the final cleanup plans for the CS-4 source area and plume need to be co-ordinated to maximize the expenditure of government funds and to protect the public health. The Interagency Agreement and its accompanying target dates for producing documents related to either the source area or plume cleanup may suggest that these are independent activities, but this ignores the practical reality of the situation.

On page 6-3 of the Proposed Plan for the CS-4 Groundwater Plume Containment it states that the time for the carbon to be considered spent or exhausted will be monitored for each unit. As we pointed out in our oral testimony VOCs vary greatly in their bedload residence times and there are competitive interactions between poor adsorbers and good adsorbers (Clark and Adams. 1991. Jour. Environ. Engineer. 117(2):247-268)). The omission of the discussion of these technical ambuguities in the Proposed Plan suggests that either the authors are intellectually lazy or not aware of the technical problems. The proposed plan is riddled with this type of vagueness and in reality what is presented is an outline of a proposed plan. It is hard to have worthwhile public comment on a document which is this vague regarding what will be done, how it will be accomplished, and what the technical and public health tradeoffs are.

The final point is that it appears that the public comment on the documents produced by the EPA (IAG) and NGB (EA/CA for CS-4, FS-25, and FTA-1) is a public relations ploy. Many of the comments from local groups and the State Attorney General were not addressed by EPA in a substantive fashion. The NGB has ignored the overwhelming public opposition of the local citizens to incineration of the off-gases

and has decided to leave it up to the contractor to decide what type of cleanup technology should be employed. We are given the lame excuse that federal procurement regulations require this course of action. This is a bunch of bull. The military often uses sole source contracting and even when items are put out for bid for competitive procurements the military procurement requirements are often so specific as to rule out many potential vendors. If the technical results of carbon adsorption of the off-gases is equivalent to incineration, then it would enhance public confidence in the comment process to go with the latter option. Community acceptance is one of the ARARs. The NGB has expressed a desire to reduce the adverserial relationship with the local community/environmental groups concerned about the cleanup of pollution at the MMR Superfund site, but it proceeds in a fashion which sometimes suggests that it has a hidden agenda which differs from that of the concerned public. We would all benefit from more trust and goodwill on both sides.

Yours truly,

David Dow

David Dow

210 Nottingham Drive
Centerville, MA 02632
March 24, 1992

Douglas Karson
102FIW/PA
Otis ANGB, MA 02542

Mr Karson,

Following comment/recommendation is submitted regarding the National Guard's proposal to treat the CS-4 groundwater plume:

- I note the concern being raised lately about the possibility of a detached plume from the FS-2 site on the base and some folks asking for additional well drilling and testing south of it.

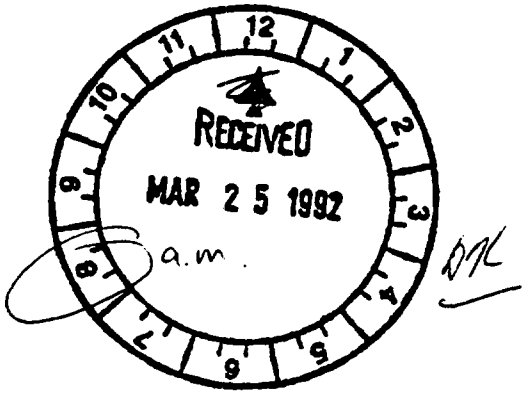
- The proposal for treating the CS-4 plume calls for pumping the extracted water back up on to the base and discharging it to the east of the CS-4 plume.

- At the March 18th public hearing at the Morse Pond school in Falmouth, Virginia Valiela asked the Guard to put some wells in the area where the water was to be discharged to ensure that that particular area was not contaminated.

- Why not place the discharge area just west of the CS-4 plume? This way, wells which will/should be drilled for monitoring purposes will also be in the general area of the FS-2 site and the wells could possibly serve two purposes?

Respectfully,

William G. Sullivan



Ashumet Valley Property Owners, Incorporated
of East Falmouth, MA
(508) 420-2030
P.O. BOX 122, MASHPEE, MA 02649

March 21 1992

Mr. Douglas Karson
102FIW/PA
Otis ANGB, MA 02542-5028

Dear Mr. Karson,

This letter is in response to the Groundwater Proposed Plan for the West Truck Road Motor Pool (AOC CS-4). We have reviewed the public documents which outline the NGB's Preferred Alternative for this site. Ashumet Valley Property Owners, Inc. is in support of the proposed remedial action as an interim solution to prevent further migration of contaminated groundwater plumes into Falmouth from AOC CS-4.

We do however have the following concerns and requests:

1) Pump and treat actions are executed in accordance with all appropriate state and federal guidelines to minimize any further environmental contamination.

2) Plans for removal of source soils from AOC CS-4 as outlined in the EE/CA for sites CS-4, FTA-1, and FS-25 are not impeded.

3) Periodic site visits by representatives of AVPOI to review procedures and progress.

4) Monitoring of wells in the down gradient area from the operable unit site to confirm the effectiveness of the remedial action and to protect the health of individuals on private wells.

5) That the cross gradient discharge site be chosen to prevent the possibility of increasing intrusion of the sewage treatment plume into Ashumet Pond.

6) That remedial actions for CS-4 do not impede the delineation and definition of the CS-10 plume and any subsequent remedial actions.

Given these concerns AVPOI fully endorses the interim remedial action for AOC CS-4.

Sincerely,

James F. Remillard
Chair - Environmental Committee

Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Protection
Southeast Regional Office

William F. Weld
Governor
Daniel S. Greenbaum
Commissioner

March 23, 1992

Daniel Santos, Project Manager
NBG/DEVR/OLO
Building 868
Otis ANG Base, MA 02542

RE: BOURNE--BWSC 4-0037
Massachusetts Military
Reservation, AOC CS-4
Groundwater Proposed Plan

Dear Mr. Santos:

The Department of Environmental Protection has reviewed the document titled "Groundwater Proposed Plan West Truck Road Motor Pool (AOC CS-4)" dated February 1992 and prepared by ABB Environmental Services, Inc.

The document outlines the National Guard Bureau's (NGB) proposed interim remedial action for the Area of Contamination (AOC) CS-4 Groundwater Operable Unit. The preferred alternative includes extracting contaminated groundwater at the leading edge of the CS-4 plume, pumping it to a treatment plant for removal of volatile organic contaminants by carbon adsorption and discharging the treated groundwater to an infiltration area located at Massachusetts Military Reservation. The preferred alternative will intercept and contain the CS-4 groundwater plume, preventing further migration of contaminants downgradient.

This action is proposed as an interim remedial action. Selection of a final remedy will depend on the study of the AOC CS-10 groundwater plume that is following the path of the CS-4 plume. The CS-10 plume has not been fully defined.

The Department of Environmental Protection approves of the NGB's proposed interim remedial action. This action will stop the continued migration of contaminants in groundwater thereby eliminating risk of harm to health, safety, public welfare and the environment at locations downgradient of the plume.

Please be advised that the Department of Environmental Protection considers it essential that definitive steps toward and including the production of a final Record of Decision for CS-4 and CS-10 Groundwater Operable Units are included in the fiscal year 1993/1994 schedule now being formulated for the Federal Facility Agreement.

The Department appreciates your efforts in reaching this significant milestone in the cleanup of MMR. If you have any questions regarding this matter please contact James Begley of this office.

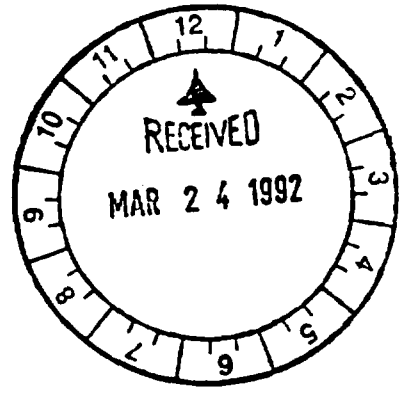
Very truly yours,

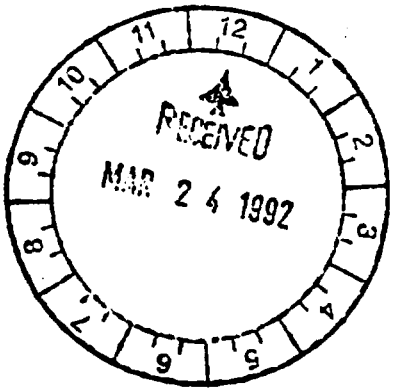
Robert E. Donovan, Regional Engineer for Waste Site Cleanup

D/JB/re

cc: TEAC Distribution

SERO - Data Entry





Subject: Comments on the CS 4 Groundwater Containment Plan.

March 20,1992

17 Salt River Road
E.Falmouth, Mass. 02540

Mr. D.Karson
102nd FIW / PA
Otis ANGB, Ma 02542-5028

Dear Sir,

I have the following questions on the CS-4 Containment Plan:

1. Why was remedial alternative GW-2 (carbon adsorption) chosen over GW-3 (air stripping) ?

2. What happens to the "off gases" from treatment GW-2 ?

3. Will treatment GW-2 work ? How efficient ? How will the hot / cold weather affect this efficiency ?

4. Is there a plan / procedure to dispose of the "used" activated carbon, which becomes hazardous waste ?

5. Is there a contingency plan in case of a contractor "bid protest" and if this does occur, how will this delay the start of this project ? From experience, what impact will any delay have on the overall length of treatment ?

6. How many years will this treatment be required ?

7. Have all improper hazardous waste disposal practices in the CS-4 Area and on the Massachusetts Military Reservation been eliminated ?

Robert G. Harrold, Jr.
(508) 624-1494

cc: V. Valiela
(TEAC Member

As Treasurer of the Coronaville Pond Assn., I am fortunate to be updated on your progress with these plumes by our President, Ron Swoboda, who is on the T.E.A.K Committee. We feel comfortable with your decision for treatment of this plume.

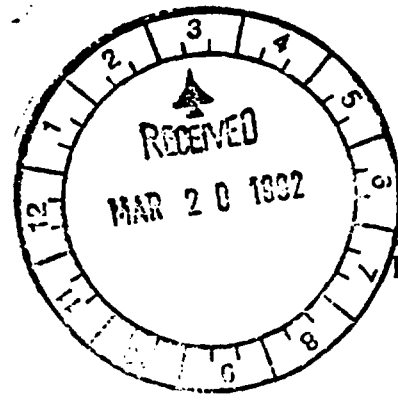
I look forward to hearing that my well on Ranch Road will be a test site for your groundwater cleanup program.

Sincerely, Laurie Hoole

3/21/92

Dear Mr. Karson,

As the homeowner with a private well closest to Rte 61 and the CS-4 plume, I would greatly appreciate having my well tested for the volatile solvent and fuel-related compounds comprising that plume. It is a precarious feeling to be sitting out here in my peaceful rustic setting only to find out that the enemy is below my vision.



197 Farmersville Rd.
Sandwich, MA 02563
March 12, 1992

Douglas C. Karson
Public Affairs Officer
Hdq. 102D FIW
Mass. ANG
Otis ANGB, MA 02542-5001

Dear Mr. Karson:

The Feb. 1992 Groundwater Proposed Plan West Truck Rd. Motor Pool (AOC CS-4) is a well written document. It is very easy to understand except for the following two places:

a) 5-1 The sentence on the ANG long term clean-up goals should be followed by a simpler sentence restating the goal of meeting federal and state drinking water standards.

b) 9-1 It is never clearly stated why GW2 was chosen over GW3. A further explanation is needed beyond "more readily implementable".

At the public information meeting a graphic was handed out that illustrated the relationship of the pump - to the treatment - to the discharge. This would have been good to include in the document.

Finally on p. 4-3 it states an ecological risk assessment "could be conducted". We need stronger wording reading "will be conducted".

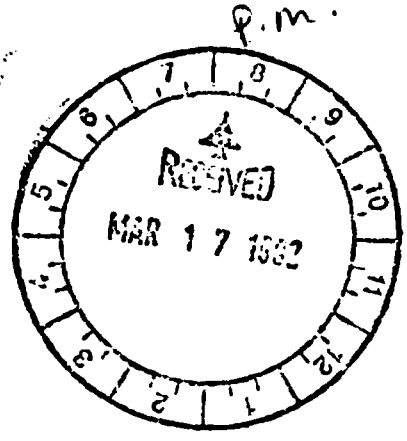
Responsible Environmental Protection for Sandwich (REPS) supports the interim method chosen and hopes it can begin as soon as possible with no delay.

Thank you for the opportunity to learn more at the public information meeting. I have a conflict on March 18th, so I would appreciate these comments being made part of the official record.

Sincerely,

Susan V. Walker

Susan V. Walker
Member of REPS Steering Com.



P.O Box 3407
Waquoit, MA 02536

March 14, 1992

Mr. Douglas C. Karson
102FIW/PA
Otis ANGB
MA 02542-5028

Mr. Karson:

The plan to address the CS-4 plume by pumping and treating the effluent by carbon filtration is most welcome. Having talked to William Kerfoot about the need to conduct the treatment on base should any problems occur, I realize why you are not proposing to return water to the zone of contribution of Falmouth's Coonamesset well. However, the location of the return site should be carefully chosen to avoid any other plumes such as one from the undetermined FS-2 site which would result in recontamination of the treated water.

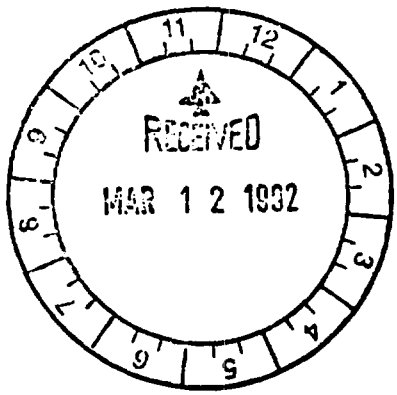
Regarding soil treatment at FTA-1, CS-4, and FS-25, please heed the public's concern and require carbon filtration after soils undergo thermal aeration rather than incineration which may lead to air pollution from dioxin.

Finally, please develop more interim plans to treat the many plumes since "interim" translates to a shorter time frame.

Sincerely,

Jayne B. Abbott

Jayne B. Abbott



Wendy F. Bone and Josef S. Idoine
14 Cutter Drive
East Falmouth, MA 02536

March 7, 1992

Doug Karson, Public Affairs Officer
102nd FIW/PA
Otis ANG Base, MA 02542-5001

Dear Mr. Karson,

We are writing to comment on the proposed clean-up plan addressing the contaminated groundwater emanating from AOC CS-4. We feel that is important to go ahead with an interim action because of the imminent danger to private and public wells and we are pleased that this plan is "in the works". We also urge those studying the CS-10 plume to move with haste, since it threatens to contaminate an even larger number of wells when it moves off the base.

We wondered why the pipe leading from the extraction wells to the treatment area was to be put underground. It seems that putting it just above ground would allow for easier monitoring for leakage and repair, if necessary. It would also involve less disturbance of the area, much of which is a wildlife sanctuary. We understand that freezing could be a potential problem if the pipe were above ground, but if there is constant flow through the pipe, isn't it unlikely to freeze?

Have the planners considered the impact of the plan's implementation on the affected area's biological systems, to keep the impact at a minimum?

Finally, we feel that it is the obligation of the ANG base, where the contamination originated, to monitor the water in the private wells off the base closest to the plume (perhaps the 5 or so closest wells). Surely the Nickelodeon Theatre's wells are still in existence. In addition, there are homes in the direct path of the plume right across Route 151. We feel the base should cover the cost of testing the water from these individuals' wells at the Barnstable County lab. This would add extra evidence that the treatment has been successful, in addition to the testing of water from the planned test wells downgrade from the extraction wells. The expense involved would be a mere drop in the bucket compared to the millions of dollars to be spent on the treatment, but it would certainly help improve the base's relations with those individuals whose health might soon be threatened.

Sincerely,

Wendy F. Bone
Josef S. Idoine

Dick Prince
P. O. Box 594
Monument Beach, MA 02553

March 11, 1992

Mr. Douglas Karson
102nd FIW/PA
Otis ANGB, MA 02542-5028

Subject: AOC CS-4 Groundwater Containment

Dear Mr. Karson:

After attending the public meeting February 24, 1992, on the subject plan, I have the following comments and questions.

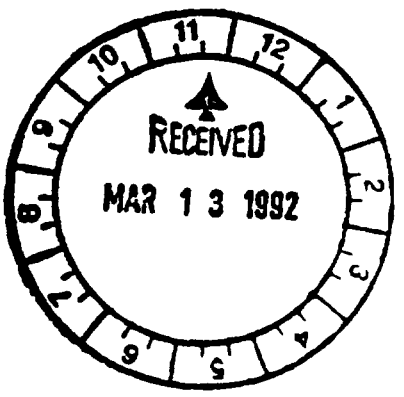
The plan proposes to pump and treat and discharge back into the aquifer the contaminated water from the CS-4 plume without the use of holding tanks. Although I have not had the opportunity to read the full report, I understand that monitoring will take place both to ensure that no part of the plume will penetrate beyond the wells and also to evaluate the treated water being discharged back into the aquifer. I understand that if the plume is detected beyond the wells then additional wells will be drilled to correct this situation.

My question is really: what is the contingency plan if, through mechanical failure or otherwise, monitoring detects untreated or only partially treated water being discharged into the aquifer? If the operation, as I understand it, can not be shut down and there are no holding tanks, what action can be taken immediately to prevent creation of a new plume at the discharge site? I understand the functioning of the dual carbon treatment vessels but these will not handle an accident, for instance, which could break the piping between the wells and the treatment vessels.

In my opinion, with all the clamor for an action plan should monitoring detect a discharge problem with the MWRA Outfall Pipe, the public has every right to demand an action plan should monitoring detect a problem with the CS-4 remedial action.

Thank you for your attention to this question.

Sincerely,



Copy to: Tom Cambareri, CCC

March 7, 1992

Douglas Karson

Here are my comments regarding the AOC CS-4 Groundwater Containment.

I support the proposed interim remedial action as recommended at the public presentation.

I am pleased that the Carbon absorbtion system was selected - responding to REAL concerns about the effects on public health and safety from other alternatives.

I have a few minor concerns which need answers

- In the public meeting it was said that when it was time to change the carbon in a filter, only one would be used during the swapout - each month Half of the filtering off line! how can the water be clean then - polluted water will be returned to the water supply! What are the alternatives to avoid this - like - not pumping for an hour or two while filters are changed.
- WHAT CAN BE DONE - ONE MORE Yet Before pumping begins is FAR TOO LONG - You asked for no 30 day extend and I support that - How about you take a goal to pump by the end of 1992 - IT CAN BE DONE!!!

Herb Luther
40 Everett St

RESPONSIVENESS SUMMARY

APPENDIX E

RESPONSIVENESS SUMMARY
AOC CS-4 GROUNDWATER INTERIM ACTION

MASSACHUSETTS MILITARY RESERVATION
CAPE COD, MASSACHUSETTS

Prepared for:

HAZWRAP Support Contractor Office
Oak Ridge, Tennessee

Managed by:

Martin Marietta Energy Systems, Inc.
for the
U.S. Department of Energy
Under Contract No. DE-AC05-85OR21400

Prepared by:

ABB Environmental Services, Inc.
Portland, Maine
Project No. 7030-04

MAY 1992

AOC CS-4 GROUNDWATER RESPONSIVENESS SUMMARY
MASSACHUSETTS MILITARY RESERVATION

TABLE OF CONTENTS

The U.S. National Guard Bureau (NGB) held a 30-day comment period from February 25 to March 25, 1992, to provide an opportunity for the public to comment on the Proposed Plan and other documents developed for Area of Contamination (AOC) Chemical Spill Number 4 (CS-4) groundwater at the Otis Air National Guard Base Superfund site at the Massachusetts Military Reservation (MMR) on Cape Cod, Massachusetts. The Proposed Plan is the document that identifies remedial action objectives, evaluates interim remedial alternatives, and recommends the alternative that best meets the evaluation criteria. The NGB made a preliminary recommendation of its preferred alternative for interim remedial action in Proposed Plan Section 6.0, which was issued on February 14, 1992, before the start of the public comment period. All documents on which the preferred alternative was based were placed in the administrative record for review. The administrative record is a collection of the documents considered by the NGB while choosing the interim remedial action for AOC CS-4 groundwater. It is available to the public at the following locations:

Environmental Management Office - IRP
Building 868
Otis ANG Base, Massachusetts 02542-5001

Falmouth Public Library
123 Katherine L. Bates Road
Falmouth, Massachusetts 02540

U.S. Environmental Protection Agency Records Center
90 Canal Street, 1st Floor
Boston, Massachusetts 02114

The NGB will maintain an index of the contents of the administrative record at the following four locations:

Jonathan Bourne Library
19 Sandwich Road
Bourne, Massachusetts 02532

Sandwich Public Library
142 Main Street
Sandwich, Massachusetts 02563

Mashpee Public Library
Steeple Street
Mashpee, Massachusetts 02649

U.S. Coast Guard Base Library
Building 5202
Otis ANG Base, Massachusetts 02542

The purpose of this Responsiveness Summary is to document NGB responses to the questions and comments raised during the public comment period regarding the proposed containment of AOC CS-4 groundwater. NGB considered all comments in this document before selecting a final removal alternative to address groundwater contamination from AOC CS-4.

This Responsiveness Summary is organized into the following sections:

1.0 **Overview of Remedial Alternatives Considered in Proposed Plan, including the Selected Remedy.** This section briefly outlines the interim remedial alternatives evaluated in the Proposed Plan, including NGB's selected remedy.

2.0 **Background on Community Involvement and Concerns.** This section provides a brief history of community interest in the three AOCs and concerns regarding these areas.

3.0 **Summary of Comments Received During the Public Comment Period and NGB Responses.** This section summarizes and provides NGB's responses to the written comments received from the public during the public comment period.

A.1.0 OVERVIEW OF REMEDIAL ALTERNATIVES CONSIDERED IN THE PROPOSED PLAN INCLUDING THE SELECTED REMEDY

Using information gathered during field investigations, NGB identified remedial and response objectives for the interim containment actions:

- Reduce potential risk associated with ingestion of contaminated groundwater to acceptable levels
- Protect uncontaminated groundwater and surface water for future use by minimizing the migration of contaminants
- Reduce the time for aquifer restoration

Target Clean-up Levels for groundwater are set at levels that the U.S. Environmental Protection Agency (USEPA) and NGB considered to be protective of human health and the environment. After identifying the remedial action objectives, the NGB developed and evaluated potential interim remedial alternatives. The Proposed Plan describes the interim remedial alternatives considered to address the contaminants of concern and the media in which they pose a threat. The Proposed Plan also describes the criteria NGB used to narrow the range of alternatives to one alternative. These criteria are the same nine criteria USEPA uses to evaluate clean-up alternatives.

The interim remedial action selected by the NGB to address remedial objectives includes extraction of the contaminated groundwater, carbon adsorption treatment, and crossgradient discharge of the treated groundwater. The remedial alternatives identified for implementation for AOC CS-4 groundwater are described in the Focused Feasibility Study and the Proposed Plan.

A.2.0 BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Community concerns relating to hazardous waste contamination problems at MMR first surfaced in 1978 when contamination was found in a Town of Falmouth municipal water well. The contamination was later traced to the Ashumet Valley Plume emanating from the MMR wastewater treatment plant and a former fire-training area (FTA-1). Other concerns were raised over the possibility of additional contamination problems that may exist.

As a result, the NGB instituted the Installation Restoration Program (IRP) at Otis ANG Base in 1982. Local municipal officials and the Otis Task Force, which was appointed by the governor in 1973, began to monitor the IRP in 1983. In 1985, the IRP was expanded to include the entire MMR. In 1986, the Technical Environmental Affairs Committee (TEAC) was formed to formally address local concerns. In May 1991, the Joint Public Involvement/Community Relations Plan was finalized. In July 1991, the Interagency Agreement was signed, outlining duties, responsibilities, and time frames for cleanup of hazardous waste sites at MMR.

Community concerns expressed over the years involve various issues including threats to human health, threats to the environment, quality of air and water, economic concerns, the pace of cleanup, and public participation in the clean-up process.

During the past two years, various programs have been instituted and upgraded at MMR to better facilitate the flow of information to the public. Several avenues are now in place for effective communication, many of which are outlined in the Joint Public Involvement/Community Relations Plan.

With respect to comments received on the Proposed Plan for AOC CS-4 groundwater, specific concerns involved public involvement in the remedy selection, the rationale for the selected remedy, the proposed monitoring plan, the sampling of downgradient private wells, and contractual concerns.

A.3.0 SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND NGB RESPONSES

This Responsiveness Summary addresses comments received by the NGB and USEPA during the public comment period from February 25 to March 25, 1992. Comments include numerous letters written by individuals; letters from citizen groups including the Falmouth Association for Base Cleanup, Upper Cape Concerned Citizens, Ashumet Valley Property Owners, Inc. (AVPOI), and Responsible Environmental Protection for Sandwich; letters from environmental groups including the Cape Cod Group - Sierra Club, and the Association for the Preservation of Cape Cod, Inc.; comments from local governments bodies including the Cape Cod Commission, and the Town of Falmouth Board of Selectmen; and comments from the Massachusetts Department of Environmental Protection (MADEP).

The comments received by the NGB were categorized and summarized into the following groups: (1) Public Involvement in Remedy Selection; (2) Rationale for Selected Remedy; (3) Monitoring Plan for Selected Remedy; (4) Sampling of Downgradient Wells; and (5) Contractual Concerns. Responses for each group of comments are presented in the following subsections.

A.3.1 PUBLIC INVOLVEMENT IN REMEDY SELECTION

During the public comment period, requests were received for more information about the Remedial Investigation/Feasibility Study (RI/FS) process and the public's involvement throughout that process.

> Comment: One commenter recommended that periodic site visits by representatives of AVPOI should be held to review procedures and progress.
>
> NGB Response: The NGB plans to conduct regular site visits to the treatment system upon the request of an individual or group. Visits can be arranged through the MMR Environmental Coordinating Office at telephone (508) 968-4092.
>
> Comment: One commenter noted that many concerned citizens generated comments during the public comment period on the source removal action.

This commenter wanted to know the effectiveness of the public's comments in the NGB's decision for this groundwater interim action.

NGB Response: Public comment is considered a modifying criterion in selecting the remedy for a site cleanup. It is considered along with State acceptance once the seven threshold and balancing criteria are met by a proposed remedy in accordance with the National Contingency Plan (NCP). Public comment is addressed in the form of a Responsiveness Summary which is issued with the Record of Decision that is signed by the USEPA's Regional Administrator and the NGB. The Responsiveness Summary addresses all comments by either answering the question, providing further explanation, or detailing any changes that will be made as a result of the comment. There are many examples all across the nation where public comments have changed or modified a proposed remedy. The public's concerns are being addressed by the NGB in the Record of Decision, the remedial design, or separately from this interim action.

A.3.2 RATIONALE FOR SELECTED REMEDY

Comment: One commenter stated that it was never clearly stated why GW-2 was chosen over GW-3. A further explanation is needed beyond "more readily implementable".

NGB Response: Alternative GW-2 removes the volatile organic compounds (VOCs) using activated carbon. Alternative GW-3 would use air stripping in combination with activated carbon. Alternative GW-2 provides effective treatment for the relatively lower cost.

Comment: One commenter suggested that the crossgradient discharge site be chosen to prevent the possibility of increasing intrusion of the sewage treatment plume into Ashumet Pond.

NGB Response: The crossgradient discharge site was chosen because its location is between the CS-4 groundwater plume and the Ashumet Valley groundwater plume. Therefore the clean water discharge will not adversely affect the sewage treatment plume.

Comment: Another commenter said that remedial actions for CS-4 should not impede the delineation and definition of the CS-10 plume and any subsequent remedial actions.

NGB Response: The remedial action at CS-4 plume will have no known effect upon the CS-10 plume nor will such action impede future remedial action in the CS-10 plume. The CS-10 plume is located much deeper in the aquifer than the CS-4 plume. The final remedial action for CS-4 plume will be evaluated once the CS-10 plume has been further characterized.

Comment: One commenter asked why was remedial alternative GW-2 (carbon adsorption) chosen over GW-3 (air stripping).

NGB Response: Refer to the first response under this Subsection which discusses the reasons for selecting alternative GW-2.

Comment: Another commenter queried, "What happens to the "off-gases" from treatment GW-2?"

NGB Response: This liquid phase carbon treatment produces no "off-gases."

Comment: One commenter asked if treatment GW-2 will work. How efficiently? How will the hot/cold weather affect this efficiency? Another commenter questioned if half the carbon filter is off-line, how can the water be clean?

NGB Response: The granulated activated carbon (GAC) has millions of pores on its surface waiting to trap or adsorb organic compounds. The GAC removes practically all the VOCs as the contaminated water moves through the packed GAC column from top to bottom. As the top section loses its ability to trap the VOCs, more of the bottom section begins to trap VOCs. When all the GAC pores have been used, the second GAC column begins removing VOCs. At this point, the initial column is replaced with new GAC and the second GAC becomes the lead column treating the VOCs. Groundwater is fairly uniform in temperature so VOC removal efficiency will remain at 99+ percent throughout the year.

Comment: A commenter questioned if there was a plan/procedure to dispose of the used activated carbon, which becomes hazardous waste.

NGB Response: The GAC supplier will extract spent GAC from the contractor using a double compartmented trailer and will refill the contactor with new GAC. The spent or used GAC will be trucked to the supplier's furnace to burn off the VOC's. The GAC will then be recycled.

Comment: One commenter asked how many years will this treatment be required.

NGB Response: The treatment system, as proposed in the Proposed Plan, will operate for up to five years. The final treatment of CS-4 plume could take up to 30 years. The final treatment for CS-4 plume will be evaluated once CS-10 plume has been more completely characterized.

Comment: One commenter questioned what was the contingency plan if, through mechanical failure or otherwise, monitoring detects untreated or only partially treated water being discharged into the aquifer?

NGB Response: If the failure occurred in one GAC contactor, then the other GAC contactor can easily handle the contaminants until the first is repaired. If the failure disrupts both contactors, then the discharge will likely meet drinking water standards by localized dilution within the aquifer. The well pumps will also draw clean water through the well screen, thus somewhat diluting contaminants in the CS-4 plume. If the repairs cannot be made for several weeks, then a mobile carbon adsorption unit can be rented to further minimize contaminant concentrations.

Comment: One commenter understood the functioning of the dual carbon treatment vessels but would these handle an accident, for instance, which could break the piping between the wells and the treatment vessels.

NGB Response: The piping system from the extraction wells to the treatment system consists of an inner carrier pipe and an outer casement pipe. If the carrier pipe ruptures, the casement pipe will stay intact. A pressure gauge at each manhole along the pipeline route monitors pressure between the pipes. If a break occurs, the pressure will increase to indicate a break. Once repair materials are on site, the pipe can be pulled and repaired in a matter of hours.

Comment: One commenter stated that putting it (the pipe) just aboveground would allow for easier monitoring for leakage and repair. It would also involve less disturbance of the area, much of which is a wildlife sanctuary. If there is constant flow through the pipe, isn't it unlikely to freeze?

NGB Response: The pipe is buried so that it does not receive a puncture from a sharp object or a hunter's bullet. The disturbance will be temporary and will be seeded to help its recovery. Wildlife will be impacted only during construction.

Comment: One commenter noted that at the March 18th public hearing at the Morse Pond School in Falmouth, another commenter asked the Guard to put some wells in the area where water was to be discharged to ensure that the particular area was not contaminated.

NGB Response: Monitoring wells will be placed upgradient from the proposed discharge area to define groundwater characteristics. Monitoring the effluent from the treatment system on a biweekly basis will establish its characteristics.

Comment: One commenter said the discharge point is listed as being a tenth of an acre. That seems to be a very small area in which to discharge 110,00 gallons a day, etc.

NGB Response: A point discharge was selected so as to limit the effect upon existing plumes.

Comment: One commenter suggested that it would be useful to have additional details on such items as the procedures to be employed in order to determine whether the activated carbon has become spent or exhausted so that the VOC adsorption capacity will not be exceeded.

NGB Response: These requirements will be detailed in the operations and maintenance plan as part of the system design details. Generally, VOCs will be measured weekly on the influent, the lead contactor effluent, and the lag contactor effluent. When breakthrough occurs in the lead contactor, we will measure pounds of VOCs removed per pound of GAC. Thereafter samples will be taken every two weeks to establish breakthrough, coating removal rate

per pound of GAC, so that by calculating the amounts of VOCs treated, one can estimate when the breakthrough should occur.

Comment: One commenter noted that on page 6-1 of the plan it states that the interim containment is expected to continue for five years. The corollary of that statement seems to be that the final clean-up action wouldn't happen for a minimum of five years. Is that true?

NGB Response: The proposed interim action for the CS-4 plume is expected to operate for up to five years. At the end of five years, a complete reevaluation of the plume and its contents will occur. This evaluation will establish treatment effectiveness and its clean-up effectiveness. Also, once the CS-10 plume has been further characterized, the final remedial alternatives for CS-4 and CS-10 plumes can be evaluated.

Comment: One commenter asked if the water is going to be treated down to 5 parts per billion and put back into the ground, was it going to be part of the Ashumet Valley plume. Another commenter advised that the location of the return site should be carefully chosen to avoid any other plumes... which would result in recontamination of the treated water.

NGB Response: The discharge point was chosen so that it will not become part of or affect any known plumes in the area. This area is approximately 1,000 feet crossgradient of plumes identified to date. The treated water will be discharged at or below drinking water standards (i.e., ARARs).

Comment: One commenter asked why the use of CATOX system to treat the air emissions (from an air stripper) also wasn't evaluated?

NGB Response: Catalytic oxidation of VOCs in the vapor phase could have been evaluated. However, such destruction of organics sends pollutants into the exit gases. Scrubbing the exit gas to remove chlorine and hydrochloric acid (both by-products of the chlorinated compounds PCE, TCE, and DCE) will not remove 100 percent, thereby violating new source emissions for Cape Cod. Also the scrubber water needs to be dechlorinated, neutralized, and treated at the base wastewater treatment facility.

Comment: The commenter stated that the remedial action was selected based upon low concentrations of iron and manganese from two groundwater

samples. Are these grab samples representative of the general plume area? Does the plume occur in a low dissolved oxygen zone in the aquifer?

NGB Response: Additional samples were collected throughout the plume area and analyzed for iron and manganese prior to final design. The sample results show low concentrations of iron and manganese within the plume area. Groundwater in this area of the Cape has low concentrations of iron and manganese. All alternatives included preliminary treatment for metals removal and the selected alternative was based on VOC removal, not metals removal. Dissolved oxygen profiles were not taken within the plume.

Comment: Another commenter calculated that the air-stripping technology without emission treatment was the most cost-efficient method for treating contaminated groundwater. An informed and objective risk assessment of the discharge of 37 pounds of volatile organics per year into the atmosphere should be conducted to support the selected alternative.

NGB Response: Such a risk assessment was not conducted because the Cape Cod area is within an air quality "non-attainment" area. The Massachusetts Department of Environmental Protection will not allow any new sources of pollution.

Comment: One commenter noted that a hydraulic conductivity (K) of 160 feet per day was calculated from pump test analysis using the entire aquifer thickness of 127 feet. If the pumped flow was not sufficient to stress the entire aquifer thickness, the K may be too low.

NGB Response: Drawdown data collected from observation wells screened at various aquifer depths above and below the screened interval of the test well indicate that a representative thickness of the aquifer was adequately stressed by pumping at a rate of 147 gallons per minute for approximately 72 hours. In order to address the potential effect of variability in hydraulic conductivity, the extraction system is overdesigned by approximately 30 percent to handle higher capacity.

The three-dimensional finite-difference model (MODFLOW) was discretized into eight layers. The top layer is 50 feet thick and is interpreted to represent medium- to coarse-grained aquifer sediments. Results of captive zone analysis

(MODPATH) indicate that the top layer of the model is not affected by pumping from the extraction wells.

Comment: One commenter added that since proper functioning of the treatment facility is essential to the success of the remedial action, they would like NGB to issue a detailed operation and maintenance plan for the extraction and treatment system, particularly for the carbon adsorption unit.

NGB Response: An operations and maintenance plan will be prepared as part of the design. This plan will be supplemented by operating and maintenance manuals supplied by the specific equipment manufacturer.

Comment: One commenter asked if NGB had projected possible failures of the extraction and/or treatment process, and does a contingency plan exist.

NGB Response: A contingency plan is outlined in the remedial design's operations and maintenance plan, covering such items as electrical failures, pipe failure, well pump failure, backwash outage, infiltration trench failure, etc. Also see responses in paragraphs A.3.2.3, 6th comment, and A.3.2.4, 1st and 2nd comments.

Comment: Another commenter questioned what was the contingency plan if the monitoring wells suddenly indicate the advance of the CS-4 plume?

NGB Response: The extraction wells will be moved to a point to intercept the plume.

Comment: The commenter also queried, "What happens to the plans for construction if the pollution advances to a point south of Route 151?"

NGB Response: If this unlikely event occurs, then a new strategy must be planned and implemented.

Comment: One commenter requested relocation of pipeline path so as not to disturb grassy area used by the local model aircraft club.

NGB Response: During construction, some disruption is inevitable regardless of pipeline location. The area will be reseeded, reverting to its original

condition. The selected route is the most direct, therefore disturbing the least area.

Comment: One commenter could not understand that removing the groundwater contained in the CS-4 plume and discharging it to a small point in adjacent groundwater will not artificially affect the natural movement of groundwater, both at the point of removal (and downgradient) and at the point of discharge (and downgradient).

NGB Response: The effect of withdrawing or injecting 115 gallons per minute into a large aquifer is negligible. The volume being extracted for CS-4 plume is very small compared to the total volume of groundwater underlying Cape Cod; the effect on the aquifer will be barely noticed.

Comment: One commenter asked if the treated water is of drinking water quality, why was it not being returned to its natural point of origin to continue its natural course toward Coonamessett Pond?

NGB Response: The treated water should be discharged on the base. Discharging off-base will only create another concern among downgradient water users.

Comment: Another commenter questioned if the discharge of the treated water on top of existing groundwater flow meant to dilute any pollution in the in situ groundwater?

NGB Response: No. The discharge of treated water is not meant to dilute any plumes in the aquifer.

Comment: One commenter stated that the rate of pumping to the CS-4 plume has to conform fairly closely to the actual rate of groundwater flow (otherwise, if too slow, the pollution will by-pass the extraction wells, and if too fast, the CS-10 plume will be prematurely drawn south toward the public well [Coonamessett]), there should be close monitoring of the actual rate of the natural flow of groundwater (at various depths conforming to depths of pollution) to account for and react to seasonal and rainfall variations that may affect rate of flow.

NGB Response: The extraction well pumping rate will exceed the estimated flow rate in the plume to aid in its capture. No physical changes in groundwater flow outside of each well's sphere of influence is expected.

Comment: One commenter asked if all improper hazardous waste disposal practices in the CS-4 Area and on Massachusetts Military Reservation have been eliminated?

NGB Response: Yes. Hazardous waste disposal for the MMR occurs entirely off-site and is conducted in accordance with all applicable federal, state, and local laws.

A.3.3 MONITORING PLAN FOR SELECTED REMEDY

Comment: One commenter requested monitoring of wells in the downgradient area from the operable unit site to confirm the effectiveness of the remedial action and to protect the health of individuals on private wells.

ANG Response: A two-phase monitoring program is proposed. Phase 1 is designed to collect groundwater data and establish baseline conditions for the CS-4 plume, prior to installing and start-up of the pump and treat systems. Phase 2 is designed to collect groundwater data for assessing the effectiveness of the groundwater extraction system in containing the plume. The ANG is proposing to sample existing and proposed monitoring wells as part of the environmental sampling program. The analyses for the wells would include volatile organic compounds, semivolatile organic compounds, inorganic analytes, and ethylene dibromide (EDB).

Comment: One commenter stated that the NGB should be monitoring for fuel-related compounds, including ethylene dibromide (EDB), when you are in the process of extracting water for the CS-4 plume.

NGB Response: The proposed monitoring plan discussed previously will define the CS-4 plume's characteristics.

Comment: One commenter noted that if you have (contamination) downstream of wells, the NGB needs to put in at least a pair of additional monitoring wells south of the fences...so that it would be clear in time that

there is not travel of volatiles into the area of Falmouth which has some wells and private wells.

NGB Response: The proposed monitoring program discussed previously intends to establish both background and future data to answer these concerns.

Comment: One commenter remarked that the report also states that the plume is moving at the rate of about 370 feet per year, so that means that in the last two-and-a-half or so years this plume could well be south of Route 151.

NGB Response: The monitoring plan as proposed in a previous paragraph will establish the plume's boundary and the extraction wells will be modified if necessary. That part of the plume that is outside of drinking water standards is located between the Kittredge Road and 1,200 feet north of Route 151.

Comment: Another commenter added that doing any kind of pumping action on the CS-4 plume could pull the other plumes faster toward that area, and hopefully strict and continuous monitoring will be done to make sure that those eventualities don't occur or that they are dealt with quickly if they do.

NGB Response: The monitoring plan discussed in a previous paragraph is intended to answer these concerns.

Comment: One commenter stated that the influx of thousands of gallons of water a day will be done presumably in an area where there are no other plumes. The commenter agreed with the Town of Falmouth selectmen that monitoring has to be done in that area to make sure this water being put there is not going to push the Ashumet Valley plume or the Fire Training Area plume any further or any faster.

NGB Response: The monitoring plan discussed in Paragraph A.3.3 will address this concern.

Comment: One commenter felt that before those designs are ready, before the system is constructed that regular monitoring of the most downgradient

wells be initiated to ensure that contamination is not passing that leading edge, as we know it now, before the system becomes operational.

NGB Response: The Phase 1 monitoring plan to begin before the start-up of the extraction system addresses this concern.

Comment: Another commenter stated that due to the slug-like nature of these plumes, the NGB should mobilize a regular sampling program of selected wells within each of the AOCs.

NGB Response: The NGB has no plans to implement a basewide groundwater monitoring plan at this time.

Comment: One commenter noted that test dates and results of additional rounds of sampling of the monitoring wells downgradient of the leading edge of the CS-4 plume should be publicized to assure citizens (a) that the necessary sampling has been performed prior to placement and operation of the recovery wells, and (b) the results do in fact verify that the plume has not moved beyond monitoring wells MW-1206 through 1210 (if this is the area where the recovery wells are to be located).

NGB Response: The monitoring plan referred described in previous paragraphs proposes such evaluation in Phase 1.

Comment: One commenter asked what was the environmental monitoring program referred to on Page 6-1 (Paragraph 3) of the Proposed Plan which the NGB will implement during the five years of the CS-4 containment.

NGB Response: The monitoring program is outlined in the first response under Paragraph A.3.3. The program gathers data from which the effectiveness of the cleanup can be assessed statistically. At the end of five years, the samples may be modified after data assessment.

Comment: One commenter remarked that the density of monitoring wells downstream of this (CS-4) plume should be sufficient to guarantee that the entire plume has been captured by the extraction wells.

NGB Response: Both existing wells and new monitoring wells will be used to monitor the plume.

to hasten the process. All documents are being reviewed concurrently by the regulatory agencies and the NGB. Additionally, at our own risks, pending the final Record of Decision, we have done as much of the design work as is possible. Once the Record of Decision is signed and we begin the contracting process, we are subject to the Federal Acquisition Regulations. Under these regulations, it takes four months at a minimum to advertise and award a contract. Once a contract is awarded, we must allow the contractor a reasonable amount of time to obtain, install, and test the specified system. In this instance, that time period will be four to six months.

Comment: One commenter requested that plans for removal of source soils from AOC CS-4 as outlined in the Engineering Evaluation and Cost Analysis (EE/CA) for sites CS-4, FS-25, and FTA-1 are not impeded.

NGB Response: The NGB is proceeding with the plans for conducting a removal action of soils from sites CS-4, FTA-1, and FS-25. The current schedule calls for awarding that contract later this year and have treatment activities soon thereafter. This work will be conducted in conjunction with the groundwater contaminant action.

Comment: One commenter asked if there was a contingency plan in case of a contractor "bid protest" and, if this does occur, how will this delay the start of this project.

NGB Response: Contractor bid protests are a possibility. Under contracting regulations, the bid protest must be resolved in order to award the contract and proceed with the remediation work. Any delays due to a bid protest will result in corresponding delays in the start of the work.

Comment: Another commenter queried where these monitoring wells were.

NGB Response: In the Crane Wildlife Management Area and within the base boundary along the plume's length. Most are located south of the proposed extraction wells, so that the extraction wells effects may be monitored.

Comment: The same commenter asked if they (the monitoring wells) adequately monitor all three dimensions of the plume.

NGB Response: Yes, but the five-year Phase 2 monitoring program to be initiated after the extraction system begins pumping will help determine monitoring adequacy.

A.3.4 SAMPLING OF DOWNGRADIENT WELLS

Comment: One commenter stated that because the plume could come precariously close to private wells in the residential area south of Route 151 before it is immobilized, it is extremely important that these wells be monitored by NGB before, during, and after the containment action. Another commenter thought that the NGB has to incorporate into this plan a monitoring system of private wells in the Hatchville area of Falmouth, particularly since the FS-2, and the CS-10 plumes have not been clearly mapped out, and to assure the public that your plan to clean-up CS-4 is, in fact, working. A third commenter agreed that free testing of private wells in the Hatchville area should be done.

NGB Response: The NGB is working with the Town of Falmouth and the Falmouth Board of Health to determine which residential wells downgradient of the projected path of the CS-4 plume should be sampled to provide assurance that (1) the plume has not traveled further than we have estimated, and (2) that the residents are not using contaminated water. During the design process, we will work with the regulatory agencies to develop a monitoring system that will enable us to accurately determine whether the full extent of the plume is being captured.

Comment: One commenter noted that the NGB has acknowledged that there may be sources of contamination not yet known, and that known plumes of

contamination have not been adequately studied to map with certainty. The NGB spokesman has made statements that testing of private and municipal wells is a county and local responsibility. He also admitted that the NGB's monitoring wells are not comprehensive, but rather south of developed industrial areas of the base. Another commenter believed that it is the obligation of the NGB base, where the contamination originated, to monitor the water in the private wells off-base, closest to the plume.

NGB Response: The testing of residential wells is normally a responsibility of the local municipality and/or the county. In certain circumstances, when a known plume of contamination is in the area where residential wells exist and it is felt that there does not exist an adequate monitoring well network, then the NGB will undertake the sampling and analysis of residential wells. A comprehensive program designed to intercept groundwater contamination that may be headed off-base was implemented in 1987 on the MMR southern boundary. That program had regulatory concurrence and resulted in identifying the CS-4 plume, which is the subject of this Proposed Plan.

Comment: One commenter stated that it would be prudent and proactive for the NGB to sample private wells off-base looking for indications of benzene, toluene, ethylbenzene, and xylene (BTEX) contamination in the groundwater.

NGB Response: Area of Contamination FS-2 is located above the path of the CS-4 plume. As we are currently working with the Town of Falmouth and the Falmouth Board of Health to identify residential wells to be sampled downgradient of the known leading edge of the CS-4 plume, analysis would also be provided for groundwater that originated at the FS-2 site.

A.3.5 CONTRACTUAL CONCERNS

Comment: One commenter asked what can be done - one more year before pumping begins is far too long. The NGB asked for no 30-day extensions and this commenter support that. The commenter asked that the NGB take a goal to pump by the end of 1992 - it can be done!

NGB Response: The schedule that has the NGB pumping and treating water from the CS-4 plume in early spring 1993 has been optimized to get us into the field in the least amount of time. We have initiated a number of actions

Association for the Preservation of Cape Cod, Inc.

P. O. Box 636
Orleans, Massachusetts 02653 **508-255-4142**

March 24, 1992

Mr. Doug Karson
National Guard Bureau
Building 158
Otis ANG, MA 02542

Dear Mr. Karson:

Following are the comments of the Association for the Preservation of Cape Cod (APCC) on the document entitled "Groundwater Proposed Plan, West Truck Motor Pool (AOC CS-4)."

In general, APCC supports the proposed interim action of extracting contaminated water from the CS-4 plume, treating it by carbon adsorption, and discharging clean groundwater at a removed site crossgradient to the CS-4 plume. We do, however, have several comments/concerns, and these are as follows:

1. While of the plumes investigated to date CS-4 may be the furthest off base, the underlying CS-10 plume is by far the more significant plume in terms of its size and composition. Rapid progress must be made on characterizing the full extent of CS-10, and taking remedial action. APCC strongly urges the National Guard Bureau to give CS-10 priority attention. We would like to see a schedule of the time frame planned for characterization and remedial action on CS-10.

2. Test dates and results of additional rounds of sampling of the monitoring wells downgradient of the leading edge of the CS-4 plume should be publicized to assure citizens (a) that the necessary sampling has been performed prior to placement and operation of the recovery wells, and (b) the results do in fact verify that the plume has not moved beyond wells 1206-1210 (if this is the area where the recovery wells are to be located). This assurance is important because the typical groundwater flow rate in the area of 370 feet per year would suggest that by 1993, when the actual extraction is scheduled to begin, the plume will have travelled 1110 to 1480 feet beyond its 1989 location (depending on when in 1989 the samples were actually collected). However, the existing downgradient well screen is only 1000 feet south of the location of the leading edge in 1989. Not only would the potential distance travelled by 1993 put the toe of the plume past the extraction wells, the plume would be extremely close to or at the private wells noted to be 1500 feet downgradient of the known location of the plume in 1989 (pp 4-3).

3. Because the plume could come precariously close to private wells in the residential area south of Route 151 before it is immobilized, it is extremely important that these wells be monitored by NGB before, during, and after the containment action.

4. Where questions about how FS-2 may relate to the CS-4 remedial action are presently unresolved, the proposed plan should be amenable to modification should information from FS-2 field work indicate modification is necessary.

5. What is the environmental monitoring program referred to on page 6-1 (paragraph 3) which the NGB will implement during the five years of the CS-4 containment?

6. Since proper functioning of the treatment facility is essential to the success of this remedial action, APCC would like NGB to issue a detailed operation and maintenance plan for the extraction and treatment system, particularly for the carbon adsorption unit.

7. Has NGB projected possible failures of the extraction and/or treatment process, and does a contingency plan exist?

In conclusion, APCC congratulates the NGB on concrete progress toward the cleanup of the CS-4 Area of Contamination. We anticipate that this action is the starting point for a progression of rapid and effective measures to characterize, contain, and clean up all the Areas of Contamination at the Massachusetts Military Reservation.

Thank you for your attention to these comments.

Sincerely,

Susan L. Nickerson

Susan L. Nickerson
Executive Director

SLN:ep
cc: Dan Santos, NGB Project Manager
Paul Marchesseault, EPA Project Manager
Jim Begley, DEP Project Manager
Ron Watson, National Guard Bureau
Doug Gutro, Superfund Community Relations Coordinator
Senator Edward M. Kennedy
Senator John F. Kerry
Congressman Gerry E. Studds
Senator Henri Rauschenbach
Senator Edward Kirby
Representative Thomas S. Cahir
Representative John Klimm
Representative Robert Lawless
Representative Edward B. Teague
Representative Eric Turkington
Susan Walker, Assembly of Delegates
Rick Armstrong, Cape Cod Commission
TEAC distribution
Community Relations Plan distribution