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U.S. Army Environmental Center

Proposed Plan
AOC A7, the Old Gravel Pit Landfill
AOC A9, the POL Burn Area

Fort Devens Sudbury Training Annex
Middlesex County, Massachusetts

June 1995

Prepared for:

U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland 21010-5401

Prepared by:

OHM Remediation Services Corp.
A Subsidiary of OHM Corporation

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The report is a Proposed Plan for remedial action at AOCs A7 and A9 at the Fort Devens Sudbury Training Annex located in Middlesex County, Massachusetts. This Proposed Plan addresses two areas within the Annex which contain both soil and ground water contaminants in excess of both state and federal standards. The Proposed Plan presents the preferred remedial alternative which addresses source control for AOCs A7 and A9 at the Annex. The Proposed Plan also presents an evaluation of remedial alternatives considered for AOCs A7 and A9. A total of three source control remedial alternatives were evaluated for AOC A7. A total of five source control remedial alternatives were evaluated for AOC A9.

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A Subsidiary of OHM Corporation

June 1, 1995

Commander
U.S. Army Environmental Center (USAEC)
Aberdeen Proving Ground, MD 21010-5401

ATTN: SFIM-AEC-IRB (Mr. Ted Ruff)

RE: LETTER OF TRANSMITTAL
DRAFT FINAL PROPOSED PLAN
FORT DEVENS SUDBURY TRAINING ANNEX
CONTRACT NO. DAAA15-90-D-0019; TASK ORDER DA08
OHM PROJECT NO. 14316

Dear Sir:

OHM Remediation Services Corp. (OHM), a wholly owned subsidiary of OHM Corporation, is pleased to submit 12 copies of the Proposed Plan. Additional copies have been submitted to Fort Devens, USEPA, MADEP, and other TRC members as indicated on Attachment I.

If you have any questions or comments, please contact Dr. Suxuan Huang at 412/963-2300 or me at 508/435-9561.

Sincerely,

Suxuan Huang (for)

Stephen R. McGinn
Project Manager

SRM:pjc
Attachment/Enclosures

Letter No. 14316-086

cc: J. Colella
S. McGinn
D. Pringle
Project File

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Fort Devens Sudbury Training Annex
Middlesex County, Massachusetts

PROPOSED PLAN

AOC A7, the Old Gravel Pit Landfill
AOC A9, the POL Burn Area

June 1995

ARMY PROPOSES CLEANUP PLAN FOR AREAS OF CONTAMINATION A7 AND A9 AT THE FORT DEVENS SUDBURY TRAINING ANNEX

The U.S. Army (Army), in coordination with the U.S. Environmental Protection Agency (USEPA), is proposing a cleanup plan to address two areas of contamination (AOCs) at the Fort Devens Sudbury Training Annex **Superfund**[1] site (the Annex) in Middlesex County, Massachusetts. The proposed cleanup plan, referred to as the preferred alternative, combines two cleanup options from among those evaluated during the **Feasibility Study (FS)** performed for these AOCs. In accordance with Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**, the Army is publishing this Proposed Plan to provide an opportunity for the public to review and comment on the cleanup alternatives, known as **remedial alternatives**, under consideration. The Army will consider public comments as part of the final decision-making process for selecting the cleanup alternative for AOCs A7 and A9.

The Army's preferred alternative includes:

- Excavation of laboratory waste and contaminated soil in AOC A7, the Old Gravel Pit Landfill, followed by off-site disposal;
- Excavation of other solid waste and contaminated soil in AOC A7 and consolidation prior to capping;
- Excavation of contaminated soil in AOC A9, the Petroleum, Oil, and Lubricant (POL) Burn Area, for consolidation in AOC A7 prior to capping; and,

[1]Words that appear in **bold** in this document are defined in the glossary.

- Construction of a **Resource Conservation and Recovery Act (RCRA) Subtitle C** multi-layer landfill cap in AOC A7 over the landfill and the consolidated solid waste and contaminated soil.

- Long-term ground water monitoring, operation and maintenance, and 5-year reviews at AOC A7.

The preferred alternative is described in greater detail on Pages 13 through 16 of this document.

This Proposed Plan:

- Explains the opportunities for the public to comment on the remedial alternatives;

- Includes a brief history of the Annex and the principal findings of the **remedial investigations (RIs)**;

- Provides a brief description of the preferred alternative and other alternatives evaluated in the FS;

- Outlines the criteria used by the Army to propose alternatives for use at AOCs A7 and A9, and briefly analyzes whether the alternatives meet each criterion; and

- Presents the Army's rationale for its preliminary selection of the preferred alternative.

To help the public participate in reviewing the cleanup options for AOCs A7 and A9, this document also includes information about where interested citizens can find more detailed descriptions of the remedy process and the alternatives under consideration for AOCs A7 and A9.

THE PUBLIC'S ROLE IN EVALUATING REMEDIAL ALTERNATIVES

Public Information Meeting

Prior to the public hearing, the Army will hold a public information meeting on Wednesday, June 14, 1995, at 7:00 p.m., at Stow Town Building. At this meeting, Army representatives will describe the preferred alternative and other cleanup alternatives evaluated in the FS. The public is encouraged to attend the meeting, to hear the presentations, and to ask questions.

Public Comment Period

The Army will conduct a 30-day public comment period from Monday, June 5 to Wednesday, July 5, 1995, to provide an opportunity for public involvement in the final cleanup decision. During the comment period, the public is invited to review this Proposed Plan, the Draft Final Addendum to the Site Investigation/Remedial Investigation (SI/RI) Report, and the **FS Report**, and to offer comments to the Army. Upon a timely request, the Army will extend the public comment period by a minimum of 30 additional days.

Public Hearing

The Army will hold a public hearing on Wednesday, June 14, 1995, at 7:30 p.m., at Stow Town Building. At this time, oral and written comments will be accepted on the cleanup alternatives under consideration for AOCs A7 and A9. This hearing will allow people to comment on the cleanup plan after they have heard the presentations made at the public information meeting. Comments made at the hearing will be transcribed, and a copy of the transcript will be added to the Annex **Administrative Record**. The Administrative Record is available for review at EPA. Region I, Fort Devens, and the Sudbury Town Hall. Published reports and other documents related to the Sudbury Annex are available at the locations listed on Page 4.

Written Comments

Written comments on the Army's preferred alternative, or any of the other cleanup alternatives under consideration, or other issues relevant to the Annex cleanup, should be delivered to the Army at the Public Hearing, or mailed (postmarked no later than July 5, 1995) to:

Mr. Ron Ostrowski
Environmental Management Office
ATZD-EM, Box 19
Bldg. 689 (Attn: Mr. Tom Strunk)
Fort Devens, MA 01433-5190
Phone: 508-796-3839
Fax: 508-796-3699

Army's Review of Public Comment

The Army will review comments received from the public as part of the process of reaching a final decision on the most appropriate remedial alternative, or combinations of alternatives, for soil cleanup in AOCs A7 and A9. The Army's final choice of a remedy will be issued in a **Record of Decision (ROD)** this fall. A document, called a **Responsiveness Summary**, which summarizes the Army's responses to comments received during the public comment period, will be issued with the ROD. Once the ROD is signed by the Deputy Assistant Secretary of the Army (Environmental Safety and Occupational Health), the Fort Devens Installation

Commander, and the USEPA Regional Administrator, it will become part of the Administrative Record, containing documents used by the Army to choose a remedy for AOCs A7 and A9.

Additional Public Information

Because this Proposed Plan for AOCs A7 and A9 provides only a summary description of the investigation of the two AOCs and the cleanup alternatives considered, the public is encouraged to review the Draft Final Addendum to the SI/RI Report, FS Report, and other site documents, for more detailed information.

Public information is available for review at the following locations:

Goodnow Library	Hours:	Mon., Tues., Wed.	10:00 a.m. - 8:30 p.m.
21 Concord Road		Thurs., Fri., Sat.	10:00 a.m. - 5:00 p.m.
Sudbury, MA 01776		Sun.	2:00 p.m. - 5:00 p.m.
(508) 443-1035			
Contact: Nancy Blair			
Randall Library	Hours:	Tues., Wed., Thurs.	10:00 a.m. - 8:00 p.m.
P.O. Box 263		Fri.	10:00 a.m. - 2:00 p.m.
Common Road		Sat. (Sept. thru June)	10:00 a.m. - 5:00 p.m.
Stow, MA 02775		Sat. (July and August)	Closed
(508) 897-8572		Sun., Mon.	Closed
Contact: Susan Wysk			
Clare Tozeski			
Hudson Public Library	Hours:	Mon., Wed., Fri.	9:00 a.m. - 6:00 p.m.
Wood Square		Mon., Wed. (starting in July)	9:00 a.m. - 8:30 p.m.
Hudson, MA 01749		Sat. (Sept. thru June)	9:00 a.m. - 5:00 p.m.
(508) 568-9644		Sat. (July and August)	9:00 a.m. - 12:00 p.m.
Contact: Phyllis Brooks		Sun.	Closed
Maynard Library	Hours:	Mon., Wed., Fri.	10:00 a.m. - 5:00 p.m.
Town Building		Tues., Thurs.	2:00 p.m. - 9:00 p.m.
Main Street		Sat.	10:00 a.m. - 3:00 p.m.
Maynard, MA 01754		Sun.	Closed
(508) 897-1010			
Contact: Steve Weiner			

Davis Library	Hours:	Mon., Thurs.	12:00 p.m. - 8:00 p.m.
MacArthur Avenue		Tues., Wed.	10:00 a.m. - 6:00 p.m.
Fort Devens, MA 01433		Fri.	Closed
(508) 796-2431		Sat., Sun.	12:00 p.m. - 6:00 p.m.
Contact: Daniel Norum			

SITE HISTORIES

The Annex occupies 4.3 square miles within the towns of Sudbury, Maynard, Hudson, and Stow, in Middlesex County, Massachusetts, and is divided into two irregularly shaped parcels by Hudson Road (see Figure 1). AOCs A7 and A9 are both located on the north boundary of the Annex, adjacent to the Assabet River, and, of the four towns, within the boundaries of the town of Stow.

AOC A7, the Old Gravel Pit Landfill, is approximately 2 acres in extent with a fenced area of 10 acres. It was used as a dumping ground and burial area for general refuse, building demolition debris, and laboratory wastes. Disposal of drums and other chemical containers was reportedly carried out between the late 1950s and 1971. Interviews conducted with Natick employees who participated in chemical disposal activities in the early to mid 1970s indicate that quart- to gallon-sized metal and glass containers of chemicals from the Natick Laboratory were disposed of in this area on a weekly basis. The area where these wastes were discovered is labeled the Laboratory Waste Disposal Area on Figure 2.

General refuse (tentage, cloth, trash, building demolition debris, etc.) has reportedly been buried at shallow depths since 1941. Burning was reportedly conducted to reduce refuse volume. AOC A7 was also used by the general public for unauthorized surface dumping during the 1970s until site access was restricted. Study Area (SA) P8, another surface dump and burial area, is considered a part of AOC A7.

AOC A9, the POL Burn Area, was in use between the late 1950s and the early 1980s (see Figure 2). The area was initially used for product testing, and was made available to local jurisdictions and the Massachusetts Fire Fighters Association for fire prevention training. Natick Laboratory used the area for flame-retardant clothing tests. The Massachusetts State Police used the area for the destruction of confiscated fireworks.

Fire fighting training was conducted using two unlined trenches. During fire fighting training, the trenches were filled with approximately 6 inches of water topped off with fuel oil and ignited. Fuel and other flammable liquids were stored in tanks and drums on site. POL-contaminated soils were excavated and removed from the former fire training pits area between November 1987 and January 1988. Approximately 1,100 cubic yards of soil were transported to a hazardous waste facility. The excavations were then backfilled with soil from an unknown location on the Annex and was not certified as clean. Study Area P12, where an underground storage tank (UST) was removed, is considered a part of AOC A9.

Results of Remedial Investigation of AOCs A7 and A9

RIs were performed to assess the nature and extent of contamination at AOCs A7 and A9. OHM conducted field activities for the RI that included the collection and analysis of **ground water**, soil, **sediment**, **surface soil**, and solid waste samples. Most of the samples collected at AOCs A7 and A9 were analyzed for Target Compound List (TCL) **volatile organic compounds (VOCs)**, **base/neutral/acid extractables (BNAs)**, **polychlorinated biphenyls (PCBs)**, and **pesticides**; Target Analyte List (TAL) metals; **herbicides**; and explosives. For a detailed assessment of the AOCs A7 and A9, refer to the Addendum to the SI/RI Report, which is included in the Administrative Record and Information Repositories at the locations listed on Page 4.

Subsurface Geology and Ground Water Flow

Overburden deposits at the Annex consist primarily of **glacial till** overlain by **outwash** deposits. The outwash forms broad plains of well-stratified sand and gravel locally dissected by streams and pitted by ice-block depressions containing ponds or **wetlands**. Glacial till at the Annex is primarily composed of well compacted silt with clay and sand and has low permeability. In AOC A7, however, the till was found to contain highly oxidized fissures which increases its permeability to water. The overburden deposits rest on **bedrock**.

Both the overburden and bedrock contain ground water. Ground water flow within the outwash is controlled by changes in surficial geology, and by the less-permeable boundary conditions created by glacial till and bedrock. Because glacial till is poorly sorted and has a low hydraulic conductivity, ground water moves through these deposits very slowly. Bedrock is hydraulically connected with the overburden. Although bedrock does transmit water, its configuration and depth has a greater impact on ground water flow than does its water-yielding characteristics. **Surface water** and ground water flow at AOCs A7 and A9 generally flow north and discharge into the Assabet River.

Nature and Extent of Contamination

This section summarizes the nature and extent of contamination at AOCs A7 and A9. The **contaminants** identified in this section have been detected at AOC A7 in excess of either maximum **background** values, State and Federal standards, or other criteria.

Fourteen surface soil samples were analyzed for VOCs, BNAs, PCBs, pesticides, chlorinated herbicides, explosives, and metals. BNAs were detected at two locations, one of which contained 12 BNAs. The pesticides, dieldrin, dichlorodiphenylethane (DDE), and dichlorodiphenyltrichloroethane (DDT) were detected at several sample locations. The PCB, Aroclor 1260, was present in one sample. Two herbicides, silvex and dacthal, were also found. Lead was detected at one sample location at a concentration greater than a standard.

Subsurface soil samples were collected from 19 test pits, 27 borings, and 2 hand auger locations. Many of the pesticides and BNAs found in surface soil samples were also detected in the subsurface. The pesticides detected included dichlorodiphenyldichloroethane (DDD), DDE, DDT, dieldrin, lindane, endrin, heptachlor epoxide, and chlordane.

Thirty ground water samples were collected from ten monitoring wells in AOC A7. Several VOCs, including tetrachloroethylene or perchloroethylene (PCE), 1,1,2,2-tetrachloroethane or perchloroethane (PCA), trichloroethylene (TCE), and chloroform, were detected at concentrations above their drinking water standards. These exceedences were limited to three wells, OHM-A7-8, OHM-A7-51, and OHM-A7-46. Lead was also detected at a concentration above its drinking water standard in one of three samples collected from monitoring well OHM-A7-12.

Surface water and sediment samples were collected from the unnamed stream located adjacent to the landfill to assess whether contaminants from the site had entered the stream. The analytical results show that the site is not contaminating the stream. Arsenic concentrations in surface water were below the freshwater chronic **Ambient Water Quality Criteria (AWQC)**, but exceeded the human health AWQC. Arsenic, barium, nickel, and selenium were detected in sediment samples at concentrations above screening levels.

In AOC A9, the following contaminants were detected in excess of either maximum background levels, State and Federal standards, or other criteria.

Eleven surface soil samples were analyzed for VOCs, BNAs, PCBs, pesticides, explosives, and metals. VOCs, BNAs, and pesticides were all detected at concentrations below screening levels. Arsenic, lead, and thallium concentrations exceeded their standards at several locations.

Forty-six subsurface soil samples were collected from AOC A9 during the RI. Arsenic was the only inorganic contaminant present at concentrations above its standard. Elevated arsenic concentrations were limited to the southwest corner of AOC A9 and were confined to the upper soil layers. However, results from preliminary field screening of SA P9 (which is located apart from and outside the fenced area of AOC A9) indicated that arsenic is present in the soil starting from the southwest corner of AOC A9 (outside the fence) and continuing downgradient to SA P9. This large scope of arsenic contamination may not be directly related to AOC A9 and has been attributed to the basewide application of arsenic-based pesticides along the security perimeter and former railroad beds.

Twenty-five ground water samples were collected from 15 monitoring wells in AOC A9. Ground water data indicate that VOCs, BNAs, and lead are present at concentrations above drinking water standards. Explosive residues were found at one sampling location. There are no drinking water standards for the explosive residues detected.

SUMMARY OF SITE RISKS

A **Human Health Risk Assessment (HHRA)** was prepared in January 1994 for the Annex. An addendum to the HHRA was also prepared and is included as Appendix C to the Draft Final Addendum to the SI/RI Report (April 1995). The primary objectives of the HHRA included the following:

- Examine exposure pathways and contaminant concentrations in soil and ground water at the Annex;
- Estimate the potential for adverse effects associated with the contaminants of concern at the Annex under current and future land use conditions;
- Identify site or land use conditions that present unacceptable risks; and,
- Provide a risk assessment basis on which decisions can be made and from which recommendations for future activities which are protective of human health can be determined.

The HHRA estimated present and future potential risks to human health posed by exposure to contaminated soil, based on conditions as described in the SI/RI Report. The HHRA addressed risks that could occur on AOCs A7 and A9 as they currently exist, and under a scenario that assumes land use may change in the future. Under current conditions, the greatest potential exposure is associated with unauthorized use by school age children. Exposure under current use conditions is most likely to occur via direct contact with, and subsequent ingestion or dermal absorption of, chemicals in site soils.

If sections of the Annex are excessed (sold by the military), future use could include residential housing. Because this scenario posed the highest future use exposure potential, residential use of the facility was evaluated to estimate maximum risks. Under this scenario, exposure could occur through direct contact with soils and sediment (ingestion or dermal absorption), use of on-site ground water or **surface water**, or by consumption of fish.

Risks were assessed using USEPA Region I guidance, which considers both average and maximum concentrations of chemicals in different environmental media at AOCs A7 and A9. The maximum concentrations represent exposure associated with repeated contact with the most contaminated portions of the Annex. The average concentration assumes an individual receives an exposure from a wider distribution of sources. USEPA uses a target excess cancer risk goal of one in one million (10^{-6}) for exposure to **carcinogenic** substances, and typically regulates within a range of one in 10,000 to one in 1,000,000 (10^{-4} to 10^{-6}).

For noncarcinogens, USEPA assumes adverse health effects are unlikely if the estimated exposure dose is lower than the reference **toxicity** criteria [called the **reference dose (RfD)**].

The ratio of exposure dose to RfD is termed the Hazard Quotient (HQ), and the sum of these ratios for multiple chemical exposure is called the Hazard Index or HI. An HI over 1.0 means that adverse non-cancer effects may occur by continuous contact with a particular chemical of concern.

To ensure public health is adequately protected, conservative (unlikely to underestimate risk) assumptions were used in deriving both the exposure estimate and the toxicity values. Because of the use of these conservative assumptions, it is likely that actual risks are considerably lower than risks estimated in this report.

For a complete explanation of risks posed by contamination at the Annex, please refer to the HHRA Addendum presented in the Addendum to the SI/RI Report. The Addendum to the SI/RI Report is part of the Administrative Record and is included in the Information Repositories, available at the locations listed on Page 4.

Risks Associated With AOC A7

Risks associated with current and future use scenarios at AOC A7 are as follows:

- Current Use - Soil Ingestion

	Average	Maximum
Hazard Index	0.09	0.9
Cancer Risk	3×10^{-6}	3×10^{-5}

- Future Use (Residential - Includes Soil and Sediment Ingestion and Ground Water Use)

	Average	Maximum
Hazard Index	0.2	1
Cancer Risk	7×10^{-5}	5×10^{-4}

Exposure to lead at AOC A7 was evaluated separately using USEPA's Uptake/Biokinetic (UBK) Model. Results from the model were compared with an USEPA blood action level of 10 *ug*/dl. Based on the UBK model, lead does not pose a health risk in AOC A7.

Much of the risk estimated for AOC A7 is associated with the presence of **hotspots** (areas of localized contamination). For risks of the magnitude estimated above to occur would require frequent contact with these spots. Because frequent contact is unlikely, and the hotspots will be excavated and removed from AOC A7, actual future risks are probably substantially lower than risk estimates that are based on maximum exposure point concentrations.

Laboratory waste buried in the west-central portion of the site consists of glassware containing unknown chemicals. Hazards posed by this material are undefined but potentially significant, including risks associated with **leaching** of materials from the site to the river and contact with the chemicals if excavation occurs in the area. Consequently, action to address this potential hazard is warranted.

Risks Associated With AOC A9

Risks associated with current and future use scenarios at AOC A9 are as follows:

- Current Use - Soil Ingestion

	Average	Maximum
Hazard Index	0.03	0.1
Cancer Risk	2×10^{-6}	7×10^{-6}

- Future Use (Residential - Includes Soil and Sediment Ingestion and Ground Water Use)

	Average	Maximum
Hazard Index	1	10
Cancer Risk	6×10^{-5}	2×10^{-4}

Much of the risk estimated for AOC A9 is associated with the presence of soil hotspots containing elevated levels of arsenic and thallium. For risks of the magnitude estimated above to occur would require frequent contact with these points. Because frequent contact is unlikely and the hotspots will be excavated and removed from AOC A9, actual future risks are probably substantially lower than risk estimates based on maximum exposure point concentrations.

Exposure to lead at AOC A9 was evaluated separately using USEPA's Uptake/Biokinetic (UBK) Model. Results from the model were compared with an USEPA blood action level of 10 *ug*/dl. Based on the UBK model, lead does not pose a health risk in AOC A9.

Supplemental Ecological Risk Assessment

A supplemental **ecological risk assessment** was conducted as part of the Addendum to the SI/RI Report to determine whether risk estimates from the January 1994 **risk assessment** require modification and to specifically evaluate ecological risk in AOCs A7 and A9. For a complete explanation of these assessments, please refer to Appendix C of the Addendum to the SI/RI Report. A summary of the ecological assessment follows.

Results of investigation at the Annex reveal a complex area containing several interrelated **ecosystems**. In AOCs A7 and A9, chemicals of concern for **ecological receptors** can be separated into three categories:

- Chemicals present in AOCs A7 and A9 ground water that may pose a risk to aquatic organisms in the Assabet River;
- Organochlorine pesticides, metals, and **polynuclear aromatic hydrocarbons (PAHs)** present in soils that may pose a risk to terrestrial wildlife (these chemicals are present in hotspots in both AOCs, and are not widely distributed); and,
- Metals present at elevated concentrations in sediments in the intermittent stream east of AOC A7; these chemicals may pose a risk to aquatic organisms.

AOC A7

Soil contaminants at AOC A7 include lead, DDT, DDE, DDD, and chlordane. These contaminants exist at several hotspots, with most spots concentrated in the central portion of the site. There is no visual evidence of ecological damage at AOC A7. For a complete explanation of risks posed by contamination at AOC A7, please refer to the supplemental ecological risk assessment presented in Appendix C of the Addendum to the SI/RI Report. At AOC A7, contaminants in ground water are associated with a ground water **plume** originating from the laboratory waste disposal area, and possibly migrating to the Assabet River. Elevated levels of lindane and chlorinated **solvents** have been found in ground water. Results of the ecological risk assessment indicate ground water migration to the Assabet River is unlikely to adversely affect aquatic organisms. The assessment also indicates soil hotspots are unlikely to pose an adverse risk to terrestrial wildlife. **Biological assessment** of the stream on the east side of AOC A7 showed no impairment attributable to site contaminants.

AOC A9

At AOC A9, contaminants in ground water are associated with two plumes, one containing chlorinated VOCs and the other containing petroleum-related VOCs. The plumes extend from the AOC toward, and possibly, to the Assabet River. At some monitoring wells, VOCs were found at concentrations above their ground water standards. Concentrations of VOCs in wells closer to the river were much lower. Consequently, these compounds were not considered further in the assessment. Soil contaminants exist at two primary hotspots, with elevated arsenic found in the southwest corner of the AOC, and lead and thallium associated with an old drum in the northwest corner of the AOC.

Results of the screening-level risk assessment indicate ground water migration to the Assabet River is unlikely to adversely affect aquatic organisms. It also suggests the contamination

hotspots are unlikely to pose a risk to terrestrial wildlife. Vegetation in the area represents early-stage successional recovery, which is consistent with removal of topsoil and associated nutrients. Topsoil removal occurred frequently as a consequence of earlier site activities at AOC A9.

Assabet River

Analysis of sediments from the Assabet River indicates that several screening-level criteria are exceeded. However, the distribution of these chemicals laterally and at depth indicates the elevated concentrations are probably the result of past releases to the river from sources other than the Annex. For example, pesticides are concentrated in sediments at the mouth of the small stream that separates AOCs A7 and A9, and might appear to be site related. However, these chemicals are not widespread in AOCs A7 and A9, and are only present in hotspots. In other words, there is no evidence that contamination from AOCs A7 and A9 has migrated to the Assabet River. Lindane, the only pesticide which appears to be slowly migrating in ground water, was not present in river sediment samples. Furthermore, pesticide concentrations were found at depths up to three feet below the sediment surface. It seems likely that pesticides in deep sediments may be the result of upstream use of pesticides in apple orchards. Based on examination of the chemicals found in Assabet river sediments and their relationship to site chemicals, it seems unlikely the Annex is adversely affecting water quality in the Assabet River.

PROPOSED CLEANUP OBJECTIVES AND LEVELS

Based on the potential risks to human health and the environment posed by existing site conditions at the Annex, and the proximity to the Assabet River, stabilization of site conditions at AOCs A7 and A9 was determined to be of high priority. Because AOC A7 contains a landfill for which many remedial alternatives are impracticable due to implementability or cost, a **remedial action** to stabilize existing conditions and provide **source control** was determined to be appropriate.

To implement a source control remedial action that is consistent with the Superfund expectations, a limited number of remedial alternatives that are focused toward achieving containment of the landfill area were developed. A source control action will be consistent with the implementation of a future **management of migration** remedy for AOCs A7 and A9. The management of contaminant migration (i.e. migration of contaminated ground water and **leachate**), as well as any hotspot areas treatment to address principal threats, will be addressed, *in the future after additional data is gathered*, and will be part of the final remedy for AOCs A7 and A9.

Using the information gathered during the RI and FS, the Army identified the following **remedial response** objectives for the source control remedial actions at AOCs A7 and A9. The primary remedial action objectives for AOC A7 are:

- Eliminate potential risk to human health and environment associated with exposure to contaminated wastes;
- Minimize off-site migration of contaminants; and,
- Limit **infiltration** of precipitation to the underlying waste within the landfill area, thereby minimizing leachate generation and ground water degradation.

For AOC A9, the primary remedial action objective is:

- Reduce potential risk to human health associated with exposure to contaminated soil.

To meet these objectives, the Army proposes to conduct an action intended to provide source control and stabilize existing site conditions. This source control remedial action will be consistent with the long-term cleanup goals at the Annex. This approach is supported by the expectations of the Superfund program, as listed in the **National Oil and Hazardous Substances Contingency Plan** (**NCP**, 40 CFR 300.430(a)(1). The NCP indicates that the principal threats posed by a site should be treated wherever practicable (such as in the **remediation** of a hotspot) and that engineering controls, such as containment, are appropriate for waste that poses a relatively low long-term threat or where treatment is impracticable.

For the contaminated soil at AOC A9, the Army has established a cleanup level of 30 parts per million (ppm) for arsenic and 20 ppm for thallium. These cleanup levels are based on risk and will be protective of public health and the environment.

ARMY'S PREFERRED ALTERNATIVE

The Army's selection of the preferred cleanup alternative for AOCs A7 and A9 as described in this Proposed Plan is the result of a comprehensive evaluation and screening process with input from representatives of the USEPA and the Massachusetts Department of Environmental Protection (MADEP). The FS for AOCs A7 and A9 identified and analyzed source control and management of migration alternatives to address soil and ground water contamination, respectively. During the evaluation process it was determined that additional ground water data needed to be collected prior to selecting a management of migration remedy to address the contaminated ground water at both AOCs. Further, it was determined that arsenic contamination at the southwest corner outside the fenced area of AOC A9 may not be related to previous site activities, as discussed above. Therefore, the remedial action for AOC A9 will only address the hotspot contamination within the fenced area of AOC A9. The following sections describe the

preferred source control alternative and the other alternatives the Army retained for detailed analysis.

Preferred Source Control Alternative

The Army's preferred alternative for source control (Alternatives 3 and 4 for AOCs A7 and A9, respectively, as presented in the FS) is summarized below. This alternative involves isolating the landfill area at AOC A7 to minimize direct exposure to landfill materials, and to minimize infiltration of precipitation, thereby limiting production of leachate and the resultant impacts to ground water quality and the Assabet River. The preferred alternative includes removal of hazardous laboratory waste at AOC A7, with off-site disposal, and removal of soil from remaining hotspots within AOCs A7 and A9, and consolidation beneath the landfill cap. Exposures to landfill materials and hotspots would be limited by isolating the waste materials using a RCRA Subtitle C multi-layer cap, and by using institutional controls to limit future site use and to restrict site access. The cap would also direct precipitation runoff away from landfill materials and provide a barrier to infiltration. Following construction of the landfill cap at AOC A7, the Army, as part of the preferred alternative, will conduct ground water monitoring, operation and maintenance, and 5-year reviews.

PREFERRED ALTERNATIVE SUMMARY

- Site Preparation and Grading
- Excavation of Laboratory Waste at AOC A7 followed by Off-Site Disposal
- Consolidation of Contaminated Soil and Disposal Areas at AOC A7 to Within the Extent of the Landfill Cap
- Excavation of Soil from AOC A9 and Consolidation at AOC A7 Prior to Capping
- Construction of RCRA Subtitle C Multi-Layer Cap Over Landfill at AOC A7
- Access and **Institutional Controls**
- Environmental Monitoring, Operation and Maintenance
- Five-Year Reviews at AOC A7

Estimated Cost to Implement:

Estimated Capital Cost:	$1,641,570
Estimated Operations and Maintenance Costs (**present worth**):	$620,380
Estimated Total Cost Including 20% Contingency (present worth)*:	$2,475,270

*Cost for 5-year reviews at AOC A7 only.

AOC A7 - Alternative 3, Laboratory Waste Excavation and Off-Site Disposal, Consolidation, Containment with RCRA Subtitle C Landfill Cap

Prior to construction of the cap, AOC A7 would be regraded to eliminate depressions and steep sidewalls to the extent practicable so that precipitation will run off instead of ponding on the surface or infiltrating into the landfill. This process would require excavating some solid waste along the steep northern slope at AOC A7, and replacing the waste closer to the center of the area to be capped. The proposed areal extent of the cap, subject to change during design, is indicated on Figure 2. During site preparation and grading, contaminated materials within AOC A7 and soil from AOC A9 will be consolidated as part of the necessary subgrade for the proposed cap.

The cap would be designed to meet the requirements applicable to closure of a hazardous waste landfill (RCRA Subtitle C). The cap proposed for the landfill was developed according to RCRA requirements and, as shown on Figure 3, consists of multiple layers, each with a specific purpose. The proposed cap design is consistent with state-of-the-art requirements for hazardous waste landfill caps, providing a high degree of isolation and control. The cap consists of the following layers (described from top of waste to top of finished cap):

- Gas vent layer over existing waste, if necessary, based on site-specific conditions, to vent and/or control landfill gases generated in the landfill;

- Lower very low permeability barrier, consisting of a geosynthetic clay liner, comprised of a layer of bentonite clay sandwiched between an upper and lower geotextile layers;

- Upper **impermeable barrier**, consisting of a **synthetic membrane**, to stop infiltration of percolating water;

- Drainage layer, consisting of a geonet, to divert precipitation that infiltrates through the surficial vegetative and protective layer off of and away from the impermeable barrier layers; and,

- Vegetative and protective layer, approximately 24 inches thick and including 6 inches of topsoil, to protect underlying cap components and control erosion by providing a suitable medium for vegetative growth.

Landfill gas controls, such as gas vents or extraction wells, will be utilized (if necessary) to manage landfill gases generated beneath the cap, thereby preventing accumulation of gas beneath the cap and potential disruption of cap integrity.

The cap and drainage system would be connected to a system of drainage swales around the landfill to control run-on and run-off. Along the north side of the landfill, facing the Assabet

River, additional engineering controls would be utilized to protect landfill materials and the landfill cap from potential damage from erosion. The slope will be regraded and, if necessary, a **revetment** (gabion wall) will be installed along this north slope to provide additional protection against erosion of soil and debris. Access to the area would be further restricted by the existing fence along the perimeter of AOC A7.

Following construction, the cap and associated systems will be inspected periodically and maintained to assure integrity and proper operation. Long-term operations and maintenance will include maintenance of the cap, site fencing, drainage, and landfill gas control systems. Ground water and storm water discharge monitoring programs will also be implemented. Five-year reviews will also be conducted.

A summary of estimated costs, time for design, construction, and operation is presented below.

Estimated Time for Design and Construction: 2 years
Estimated Time of Operation: 30 years
Estimated Capital Cost: $1,614,700
Estimated Operations and Maintenance Costs (present worth): $595,360
Estimated Total Cost Including 20% Contingency (present worth): $2,419,235.

AOC A9 - Alternative 4, Off-Site Disposal at AOC A7

This alternative involves excavation of 50 cubic yards of contaminated soil at AOC A9 within the fenced area. This contaminated soil is assumed to be non-hazardous and will be transported to AOC A7, approximately 1/4 mile away. Soil will be consolidated beneath a 2-acre RCRA Subtitle C multi-layer cap along with contaminated soil excavated from AOC A7. Soil from AOC A9 is not expected to exhibit a hazardous toxicity characteristic [Toxicity Characteristic Leachate Procedure (TCLP) Test] for either lead, arsenic, beryllium, or thallium based on the relatively low levels of these contaminants, and their relatively strong adsorption properties. However, the lack of toxicity has not been confirmed. If, as a result of testing, soil is found to be hazardous, it will be transported off site to a hazardous (RCRA Subtitle C) facility for treatment and disposal. When soil excavation is complete, borrow material from the Annex will be placed within the excavated area. A minimum of 6 inches of soil cover will be placed on top of the **fill** to support vegetation.

Estimated Time for Design and Construction: 3 months
Estimated Time of Operation: 30 years
Estimated Capital Cost: $26,870
Estimated Operations and Maintenance Costs (present worth): $25,020
Estimated Total Cost, Including 20% Contingency (present worth): $56,035.

OTHER ALTERNATIVES EVALUATED IN THE FEASIBILITY STUDY

AOC A7 Remedial Alternatives

The Army considered two other remedial alternatives to address source control at AOC A7. Each of these alternatives is described below. A detailed presentation and analysis of the alternatives can be found in the FS.

Alternative 1 - No Action

This alternative was evaluated in the FS to serve as a **baseline** for comparison to other alternatives under consideration. Under this alternative, no containment, engineering controls, or land use restrictions would be used.

Alternative 2 - Laboratory Waste Excavation and Off-Site Disposal, Containment with RCRA Subtitle C Landfill Cap

Alternative 2 was developed to provide an option similar to the preferred alternative, except that contaminated soils from AOC A9 would not be imported to AOC A7 for consolidation beneath the RCRA Subtitle C cap. (See AOC A9 remedial alternatives). All other aspects of Alternative 2 are similar to the preferred alternative as described above.

Estimated Time for Design and Construction: 2 years
Estimated Time of Operation: 30 years
Estimated Capital Cost: $1,614,350
Estimated Operations and Maintenance Costs (present worth): $595,360
Estimated Total Cost, Including 20% Contingency (present worth): $2,418,860.

AOC A9 Remedial Alternatives

Alternative 1 - No Action

This alternative was evaluated in the FS to serve as a baseline for comparison to other alternatives under consideration. Under this alternative, no containment, engineering controls or land use restrictions would be used.

Alternative 2 - Limited Action

Alternative 2 is a limited action consisting of a fence, warning signs, and deed restrictions. A fence would be installed around each of the two contaminated areas within AOC A9. The fencing would consist of a 6-foot-high, gated, chain-link fence topped with three strands of

barbed wire. Warning signs would be mounted on the fence. Deed restrictions would be imposed, prohibiting residential development or recreational use. Monitoring would be performed at regular intervals for 30 years.

Estimated Time for Design and Construction: 3 months
Estimated Time of Operation: 30 years
Estimated Capital Cost: $15,730
Estimated Operations and Maintenance Costs (present worth): $462,280
Estimated Total Cost, Including 20% Contingency (present worth): $548,620.

Alternative 3 - Off-Site Disposal

Alternative 3 involves the excavation of 50 cubic yards of soil contaminated above the risk-based cleanup levels for arsenic and thallium, and transportation to an off-site facility for final treatment and disposal. Soil from AOC A9 is not expected to exhibit a hazardous toxicity characteristic (TCLP Test) for either lead, arsenic, beryllium, or thallium, based on the relatively low levels of these contaminants in soil, and their relatively strong adsorption properties. Because the lack of toxicity has not been confirmed, this alternative presents disposal costs for both hazardous and non-hazardous soil. If soil is non-hazardous, it is acceptable for disposal at a non-hazardous waste (**RCRA Subtitle D**) facility. If soil exhibits toxicity for any of the aforementioned contaminants, it will require treatment using solidification/stabilization technologies, followed by disposal at a hazardous waste (RCRA Subtitle C) facility. When soil excavation is complete, borrow material from the Annex will be placed within the excavated area. A minimum of 6 inches of soil cover will be placed on top of the fill to support vegetation.

- For soil which is hazardous:

  Estimated Time for Design and Construction: 3 months
  Estimated Time of Operation: 30 years
  Estimated Capital Cost: $61,360
  Estimated Operations and Maintenance Costs (present worth): $25,020
  Estimated Total Cost, Including 20% Contingency (present worth): $125,650.

- For soil which is non-hazardous:

  Estimated Time for Design and Construction: 3 months
  Estimated Time of Operation: 30 years
  Estimated Capital Cost: $41,010
  Estimated Operations and Maintenance Costs (present worth): $25,020
  Estimated Total Cost, Including 20% Contingency (present worth): $103,680.

Alternative 5 - Solidification/Stabilization

Alternative 5 involves the excavation of contaminated soil, consolidation on site, and addition of solidification/stabilization agents. An estimated 50 cubic yards of soil will be excavated from two locations. These two small hotspots of soil containing slightly elevated levels of arsenic, lead, beryllium, and thallium would be transported to the consolidation area prior to the treatment process. Pozzolan/Portland cement would be placed in the mixing area. The Pozzolan/Portland cement and soils would then be mixed using a backhoe. After hardening, the mixture would form a relatively impermeable monolith. Treated soil would be cured within the consolidation area, and solidified material would remain on site. The consolidation and treatment area will be covered with 6 inches of topsoil and seeded. Monitoring would be performed at regular intervals for 30 years.

Estimated Time for Design and Construction: 6 months
Estimated Time of Operation: 30 years
Estimated Capital Cost: $53,925
Estimated Operations and Maintenance Costs (present worth): $347,730
Estimated Total Cost, Including 20% Contingency (present worth): $466,160.

SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Nine criteria are used to select a remedy that meets the national Superfund program goals of protecting human health and the environment, maintaining protection over time, and minimizing untreated waste. Definitions of the nine criteria and a summary of the Army's evaluation of the alternatives using the nine criteria are provided below. The comparative analysis discussion integrates alternatives for AOCs A7 and A9 because the preferred alternative involves moving contaminated soils from AOC A9 into AOC A7.

Overall Protection of Human Health and the Environment

The criterion of overall protection of human health and the environment addresses how an alternative as a whole will protect human health and the environment. This includes an assessment of how public health and environmental risks are properly eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

The preferred alternative (Alternative 3 for AOC A7 combined with Alternative 4 for AOC A9) is most protective of human health and the environment. Protection is provided by removal of laboratory debris which is presumed to be hazardous. It also provides protection against exposures to surficial contaminants through the placement of a physical barrier over them. The preferred alternative utilizes a RCRA Subtitle C multi-layer landfill cap, which stringently controls infiltration of precipitation and subsequent leachate generation. The cap is designed to prevent surficial leachate seeps.

Off-site disposal of contaminated soils (Alternative 2 for AOC A7, and Alternative 3 for AOC A9) is similar to the preferred alternative, except that contaminated soil from AOC A9 is disposed of off site. The off-site disposal alternatives are equally effective as the preferred alternative in both the short- and long-term, since the same technology is employed. Effective containment in both alternatives would provide overall protection by preventing direct contact, ingestion, and inhalation of site contaminants.

The no action alternative (Alternative 1 for both AOCs A7 and A9) would not meet this criterion in its entirety. It is not considered protective because it provides no reduction in potential risks or control of exposure pathways.

Alternative 2 (AOC A9) provides a degree of protection of human health and the environment by utilizing institutional controls to limit site access and future use. However, it would not be as effective in the long term as the capping alternative.

Alternative 5 (AOC A9) involves encapsulation of soil contaminants in a cementitious material which would remain on site. This process is considered equally effective to the preferred alternative in protection of human health and the environment.

Compliance with Applicable or Relevant and Appropriate Requirements

A selected remedial alternative must also comply with all State and Federal environmental and public health laws and requirements that apply, or are relevant and appropriate, to the conditions and cleanup options at a specific site. If **Applicable or Relevant and Appropriate Requirements (ARARs)** cannot be met, the analysis of the alternative must provide the grounds for invoking a statutory waiver.

Compliance with State and Federal ARARs pertaining to hazardous waste and municipal solid waste landfill closure at AOC A7 would be achieved under the preferred alternative only. Material excavated from the laboratory waste disposal areas will comply with action-specific off-site disposal requirements. For AOC A7, a no-action alternative would not meet landfill closure requirements. Alternative 2 at AOC A7 would require a waiver for a state location-specific requirement which requires a 200-foot buffer zone between the edge of a landfill and the property line.

At AOC A9, Alternatives 3 and 4 (the preferred alternative), will comply with action-specific off-site disposal requirements for the material excavated from the hotspots. For Alternative 5, since contaminated materials will remain on site after stabilization, it would have to comply with action-specific requirements of implementing institutional controls, ground water monitoring, and 5-year reviews.

Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to the ability of an alternative to maintain reliable protection of human health and the environment over time, once the cleanup goals have been met. If a remedial action results in hazardous substances or contaminants remaining at the Annex above levels that allow for unlimited use and unrestricted exposure, the action shall be reviewed no less often than every 5 years after initiation of the action.

At AOC A7, the preferred alternative involves excavation and off-site disposal of hazardous laboratory wastes, and placement of a cap over the landfill area and all contaminated soil from both AOCs A7 and A9. The preferred alternative provides an effective method of long-term containment of contaminated soil and debris. However, there is a small risk of contaminant release in the event of cap failure. The preferred alternative is distinct from Alternative 2 because it consolidates contaminated soil from AOC A9 beneath the cap. At both sites, the No Action alternative provides no long-term effectiveness because of the continuous potential for contaminant migration.

At AOC A9, Alternative 2, the Limited Action alternative, provides a moderately effective method of preventing direct contact exposure to contaminated soils. Alternative 3, which involves off-site disposal, is permanent for the site. Alternative 5, solidification, is a proven treatment process for inorganic contaminants; however, long-term monitoring would be required to determine effectiveness.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility or volume of contaminants is a principal measure of the overall performance of an alternative. The 1986 amendments to the Superfund statute emphasize that, wherever possible, a remedy should be selected that uses a treatment process to permanently reduce the levels of toxicity of contaminants, the spread of contaminants away from the source of contamination, and the volume or amount of contamination.

None of the alternatives at AOC A7 involve treatment or destruction. The preferred alternative provides the greatest reduction in potential mobility of site-related contaminants through a multi-layer cap. The cap minimizes infiltration and subsequent leaching of contaminants from wastes in the **unsaturated zone** to the ground water, as well as erosion of surficial contamination and the potential formation of leachate seeps through the side slope of the cap. Alternative 2 at AOC A7 is similar to the preferred alternative except that soil from AOC A9 is not placed beneath the cap. There is no reduction in toxicity, mobility or volume associated with Alternative 1, the No Action alternative, at either AOC A7 or A9.

At AOC A9, Alternatives 1 and 2, the No Action and Limited Action alternatives, provide no reduction in toxicity, mobility, or volume. Alternative 3 does reduce toxicity, mobility, and volume of soil contaminants by removing contaminated soil from the Annex. Alternative 5,

which involves solidification, reduces both the toxicity and mobility of inorganic contaminants, but the volumes of these contaminants remain unchanged.

Short-Term Effectiveness

Short-term effectiveness refers to the likelihood of adverse impacts on human health or the environment during the construction and implementation of an alternative until cleanup goals are achieved.

At AOC A7, the source control alternatives (Alternatives 2 and 3, the preferred alternative) would be effective in the short term. Because of the potential for release of contaminants during the excavation activities, however, special engineering precautions would be taken to lessen the potential for contaminant emissions, to ensure short-term protection of workers and area residents.

At both AOCs A7 and A9, the no-action alternatives (Alternative 1 at both sites) pose no risk to remedial workers or the community because there is no remedial action. At AOC A9, alternatives that involve soil excavation and transport (Alternatives 3 and 4), or excavation and mixing (Alternative 5) would require the same engineering precautions cited above, to prevent or minimize short-term exposure of site workers to soil contaminants. Alternative 5 requires addition of alkaline materials to contaminated soil, which slightly increases the likelihood of injury or dust exposure.

Implementability

Implementability refers to the technical and administrative feasibility of an alternative, including the availability of needed materials and services. At both AOCs A7 and A9, the no-action alternative (Alternative 1) is easiest to implement because no remedial action is required. At AOC A7, Alternatives 2 and 3, which involve construction of a multi-layer cap, are equal in implementability. Although placement of a geomembrane liner is somewhat complex, in all other respects the alternatives are easily implemented.

At AOC A9, Alternative 2 is easily implementable because it only involves limited actions. Alternatives 3 and 4, which involve excavation and disposal either off site or at AOC A7, respectively, are also easily implementable. Alternative 5, soil solidification, is a proven technology which is easily implemented technically and administratively.

Cost

The costs of an alternative include the capital (up-front) cost of implementing an alternative, as well as the operating and maintenance costs over a 30-year period. The total cost of a remedial action is expressed as the present worth of both capital and operation and maintenance costs. The estimated costs of the alternatives increase incrementally with the increasing sophistication

of the remedial action, from the no-action alternative to the preferred alternative, which involves construction of a multi-layer cap.

State Acceptance

State acceptance addresses whether, based on its review of the Addendum to the SI/RI Report, FS Report, and Proposed Plan, the State concurs with, opposes, or has no comment on the alternative the Army is proposing as the remedy for AOCs A7 and A9. The State has reviewed and commented on the Proposed Plan and the Army has taken the State's comments into account.

Community Acceptance

Community acceptance addresses whether the public concurs with the Army's Proposed Plan. Community acceptance of this Proposed Plan will be evaluated based on comments received at the upcoming public meetings and during the public comment period.

Application of the Criteria

Of the nine criteria, overall protection of human health and the environment, and compliance with all ARARs are considered threshold requirements that must be met by all remedies. The Army balances its consideration of alternatives with respect to long-term effectiveness and permanence; reductions of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. State and community concerns are considered as modifying criteria factored into a final balancing of all criteria to select a remedy. Consideration of State and community comments may prompt the Army to modify aspects of the preferred alternative or decide that another alternative provides a more appropriate balance.

ARMY'S RATIONALE FOR PROPOSING THE PREFERRED ALTERNATIVE

Based on current information and analysis of the Addendum to the SI/RI Report and FS Reports, the Army believes the combined preferred alternative for AOCs A7 and A9 at the Annex are consistent with the requirements of the Superfund law and its amendments, specifically Section 121 of CERCLA, and to the extent practicable, the NCP. Except for the No Action alternatives, all the alternatives presented in this Proposed Plan would provide overall protection of human health and the environment. The preferred alternative will provide the greatest overall protection of human health and the environment of the remedial alternatives evaluated. It achieves the best balance among the criteria used to evaluate the alternatives. It will eliminate exposures of human and environmental receptors to the landfill and hotspot areas through selective excavation and replacement, and through engineering and institutional controls. It will also comply with relevant and appropriate hazardous and municipal waste landfill closure requirements, and location-specific requirements. Potential risks from exposure to contaminated

soil and debris will be addressed through placement of an impermeable barrier over the landfill area and through control of future site use through deed restrictions. In the Army's analysis, the preferred alternative is readily implementable, and is not expected to pose unacceptable short-term risks. The remedy meets USEPA expectations regarding Superfund remedial actions, including use of engineering controls such as containment for waste that poses a relatively low long-term threat, or where treatment is impracticable.

For More Information

If you have any questions about the Annex or would like more information, you may call or write to:

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GLOSSARY

Administrative Record: A file which is maintained and contains all information considered and relied upon by the USEPA to make its decision on the selection of a response action under CERCLA. The file is available for public review.

Ambient Water Quality Criteria (AWQC): Concentration values of toxic pollutants in navigable waters that, based on available data, will not result in adverse impacts on important aquatic life or on consumers of such aquatic life.

Applicable or Relevant and Appropriate Requirements (ARARs): ARARs include any state or federal statute or regulation that pertains to protection of public health and the environment in addressing certain site conditions or using a particular cleanup technology at a Superfund site. A state law to preserve wetland areas is an example of an ARAR. USEPA must consider whether a remedial alternative meets ARARs as part of the process for selecting a cleanup alternative at a Superfund site.

Background: In environmental monitoring, the naturally occurring level of a potential contaminant.

Baseline: With respect to the alternatives evaluated, a statement of existing conditions and their relative consequences should no further action be taken.

Base/Neutral/Acid Extractables (BNAs): A large group of chemical compounds characterized by their persistence in the environment. BNAs include compounds contained in petroleum products, plasticizers, pesticides, and explosives. BNAs vary widely with regard to their potential effects on human health and some are known to cause cancer.

Bedrock: The layer of rock located below the glacially deposited soil and rock under the ground surface. Bedrock can be either solid or fractured (cracked); fractured bedrock can support aquifers.

Biological Assessment: The evaluation of the presence of biological organisms in environmental media. Biological assessment is often used to compare the types and numbers of organisms in a potentially chemically impacted environmental medium with the presence of organisms in an unaffected area to evaluate if a potentially pollution-related difference exists.

Carcinogenic: Relating to a chemical's potential to cause or promote cancer in people and/or experimental animals. The USEPA classifies chemicals with regard to their carcinogenic potential and publishes cancer toxicity values for use in estimating human health risks at Superfund sites. These toxicity values are published in the USEPA's Integrated Risk Information System data base and in the Health Effects Assessment Summary Tables.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The act created a special tax that goes into a trust fund, commonly known as Superfund, to investigate and clean up abandoned or uncontrolled hazardous waste sites. Under the program, USEPA can either: 1) pay for site cleanup when parties responsible for the contamination cannot be located or are unwilling or unable to perform the work or 2) take legal action to force parties responsible for site contamination to clean up the site or pay back the federal government for the cost of the cleanup.

Contaminant: Any physical, chemical, biological or radiological substance or matter that has an adverse effect on human health or the environment.

Ecological Receptors: Wildlife or plants that may be exposed to chemicals.

Ecological Risk Assessment: The application of a formal framework, analytical process, or model to estimate the effects of human action(s) on a natural resource, and to interpret the significance of those effects in light of the uncertainties identified in each component of the assessment process. Such analysis includes initial hazard identification, exposure and dose-response assessments, and risk characterization.

Ecosystem: The interacting system of a biological community with its non-living environmental surroundings.

Feasibility Study (FS): Process that investigates the feasibility of remedial technologies and/or process options based on the results gathered during the remedial investigation and risk assessment, and compliance with applicable laws and regulations.

FS Report(s): Report(s) that summarizes the development and analysis of remedial alternatives that USEPA considers for the cleanup of Superfund sites.

Fill: Soil, gravel, or other materials placed in an opening in the ground. "Clean" fill is typically used to replace contaminated soil that has been excavated, or to serve as a cap over soil/waste that is kept in place. Waste (e.g., household garbage) placed into a landfill may also be referred to as fill.

Glacial Till: Non-Sorted, non-stratified sediment and materials originally carried or deposited by a glacier.

Ground Water: Water found beneath the earth's surface that fills pores between materials such as sand, soil, gravel, and cracks in bedrock, and often serves as a principal source of drinking water.

Herbicide: A chemical pesticide designed to control or destroy plants, weeds, or grass.

Hotspot: Area of contamination which differs from the surrounding area by posing a greater level of contamination and/or a significantly increased level of risk to human health and the environment.

Human Health Risk Assessment (HHRA): Evaluation conducted as part of the remedial investigation/feasibility study (RI/FS) process which includes a baseline risk assessment, refinement of preliminary remediation goals, and risk evaluation of remedial alternatives. In conducting a baseline risk assessment, exposure estimates that are based on site data are combined with information on chemical toxicity to characterize potential site-related risks.

Impermeable Barrier: A component of a RCRA Subtitle C cap intended to act as a barrier in preventing the infiltration of water into underlying waste materials. Impermeable barriers typically consist of a low hydraulic conductivity, compacted soil layer, or a synthetic membrane.

Infiltration: The flow of water downward from the land surface into and through the pores in soil, rock, or other subsurface materials.

Institutional Controls: Legal restrictions established to prevent specified activities from occurring in a designated area. Examples include deed restrictions and easement zoning.

Leachate: A liquid product of natural biodegradation, infiltration, and ground water migration through waste materials.

Leaching: The process by which potentially soluble constituents are dissolved in water and percolate through soil or waste materials.

Management of Migration: Action taken to limit or manage the migration of contamination away from source areas.

National Oil and Hazardous Substances Contingency Plan (NCP): The federal regulation that guides the determination of the sites to be corrected under the Superfund program, and the program to prevent or control spills into surface soils or other portions of the environment.

Outwash: Glacial materials which are well-sorted by meltwater, such as sands and gravels.

Overburden: Unconsolidated material (e.g. soil, fill) overlying consolidated material such as **bedrock**.

Pesticide: Substances or mixture thereof intended to prevent, destroy, repel, or mitigate any pest. Also, any substance or mixture intended for use as a plant regulator, defoliant, or desiccant.

Plume: A three dimensional zone within the ground water that contains contaminants and generally moves in the direction of, and with, ground water flow.

Polychlorinated Biphenyls (PCBs): Organic compounds in which two or more chlorine atoms have been substituted for hydrogen atoms on a biphenyl molecule. PCBs are very stable (and, therefore, persistent) and are characterized by a low vapor pressure, low flammability, high heat capacity, and low electrical conductivity. PCBs were used in hydraulic, lubricating, and heat transfer fluids. The USEPA classifies PCBs as Group B2 - probable human carcinogens.

Polynuclear Aromatic Hydrocarbons (PAHs): PAHs are one group of semi-volatile compounds having two or more aromatic rings, and are found naturally in heavy petroleum residues, such as tar, and as products of incomplete combustion of naturally occurring organic materials. Examples of PAHs include naphthalene, which is classified as a non-carcinogen, and benzo(a)pyrene, which is considered a probable human carcinogen.

Present Worth: Expenditures that occur over different time periods discounted to a common base year, usually the current year. This allows the cost of remedial action alternatives to be compared on the basis of a single figure representing the amount of money that, if invested in the base year and discounted as needed, would be sufficient to cover all costs associated with the alternative over its planned life.

RCRA Subtitle C: The portion of the Resource Conservation and Recovery Act (RCRA) which addresses hazardous waste management. This provides the basis for regulation of hazardous waste land disposal facilities.

RCRA Subtitle D: The portion of the Resource Conservation and Recovery Act (RCRA) which addresses state or regional solid waste plans. This provides the basis for the regulation of municipal solid waste landfill facilities.

Record of Decision (ROD): A public document which presents the selected remedial alternative to be used at a National Priorities List (NPL) site. The Decision Summary portion of the ROD provides an overview of the information and technical analysis generated during the site investigation and remedial analysis process. It identifies the selected remedy and explains how the remedy fulfills statutory requirements. The Responsiveness Summary portion of the ROD addresses public comments and community concerns received during the public comment period.

Reference Dose (RfD): The concentration of a chemical known to cause health problems; also referred to as the ADI, or acceptable daily intake.

Remedial Action: The actual construction or implementation phase of a Superfund site cleanup that follows remedial design.

Remedial Alternative: Option evaluated to address the source and/or migration of contaminants at a Superfund site to meet health based cleanup goals. An alternative is developed from one or more remedial technologies.

Remedial Investigation (RI): The remedial investigation assesses the nature and extent of contamination at a hazardous waste site, and forms the basis for the cleanup options developed in the FS.

Remedial Response: Long-term action that stops or substantially reduces a release or threat of a release of hazardous substances that is a serious, but not an immediate, threat to public health.

Remediation: The act or process of remedying a problem such as the cleanup or containment of contamination at a Superfund site.

Resource Conservation and Recovery Act (RCRA): The basic hazardous-waste statute originally enacted in 1976, and amended in 1984. This legislation regulates hazardous-waste management practices, and establishes specific restrictions on land disposal and surface impoundments.

Responsiveness Summary: A report that summarizes the responses to comments received during the upcoming public informational meeting and public comment period. Public comments are taken into account in the final selection of a remedial action for a site.

Revetment: A facing of material such as stone or concrete to sustain an embankment.

Risk Assessment: Qualitative and quantitative evaluation of the risk posed to human health and/or the environment by the actual or potential presence and/or use of specific pollutants.

Sediment: The sand or mud found at the bottom and sides of bodies of water, such as creeks, rivers, streams, lakes, swamps, and ponds. Sediments typically consist of soil, sand, silt, clay, plant matter, and sometimes gravel.

Site Investigation (SI): A means of evaluating suspected hazardous waste sites through preliminary assessments and site inspections to develop a Hazard Ranking Score.

Solvents: Liquids capable of dissolving other liquids or solids to form a solution. The chief uses of industrial solvents are as cleaners and degreasers. Solvents also are used in paints and pharmaceuticals manufacturing. Solvents used in industrial applications are frequently VOCs. Many solvents are flammable and toxic to varying degrees.

Source Control: Action taken to control the source(s) of contamination at a site.

Subsurface Soil: Soils located at depths greater than 1 to 2 feet below the ground surface. These soils are less likely to be subject to wind and water transport than surface soil unless exposed through excavation. Animals and people are also less likely to contact these soils unless by burrowing (animals) or by activities such as landscaping or constructing buildings with foundations.

Superfund: The program operated under the legislative authority of CERCLA and SARA that funds and carries out USEPA solid waste emergency and long-term removal and remedial activities. These activities include establishing the National Priorities List, investigating sites for inclusion on the list, determining their priority, and conducting and/or supervising the cleanup and other remedial actions.

Surface Soil: Soils located at the surface down to a specified depth (typically 1 or 2 feet). These soils are likely to be subject to erosion as a result of wind and surface water runoff. Animals and people may be readily exposed to these soils (e.g., by walking on the soil surface).

Surface Water: Bodies of water on the surface of the earth, such as rivers, lakes, and streams.

Synthetic Membrane: Thin sheet of synthetic material, such as polyethylene or polyvinyl chloride, which is used as a manmade barrier to reduce surface infiltration, prevent direct contact, limit gas emissions, and/or control erosion.

Toxicity: The adverse effect, such as disease, death, or birth defects resulting from exposure to a harmful substance or substances.

Unsaturated Zone: The zone between the ground surface and the water table. The pore spaces contain water at less than atmospheric pressure, as well as air and other gases.

Volatile Organic Compounds (VOCs): A large group of chemical compounds composed primarily of carbon and hydrogen that are characterized by their tendency to evaporate (or volatilize) into the air from water or soil. VOCs include substances that are contained in common solvents, cleaning fluids, and petroleum products. VOCs vary widely in regard to their potential effects on human health; some VOCs are known to cause cancer.

Wetlands: Areas such as marshes, bogs, and swamps that are saturated with water long enough each year to affect the type of soil and vegetation found in the area. Wetlands are protected by federal and state regulations because they purify water, prevent floods, feed and shelter fish and wildlife, and offer recreational opportunities.

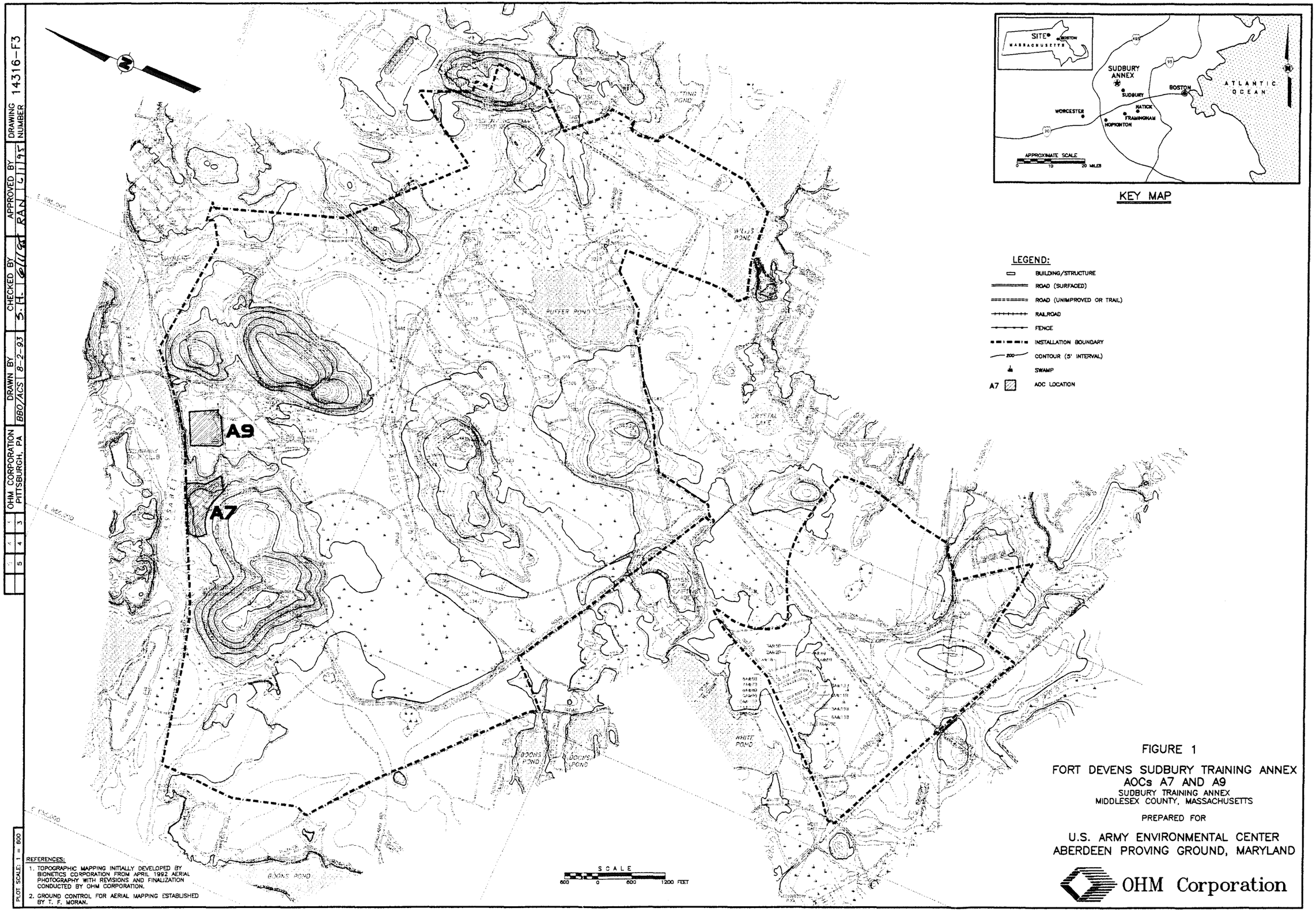

FIGURE 1

FORT DEVENS SUDBURY TRAINING ANNEX
AOCs A7 AND A9
SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

PREPARED FOR

U.S. ARMY ENVIRONMENTAL CENTER
ABERDEEN PROVING GROUND, MARYLAND

OHM Corporation

DRAWING NUMBER 14316-B47

APPROVED BY RAN 6/1/95

CHECKED BY S.H. 6/1/95

DRAWN BY A.C.Smith 4-20-89

OHM CORPORATION
PITTSBURGH, PA

PLOT SCALE: 1" = 1'

STOWAWAY GOLF COURSE

ASSABET RIVER

TRACK ROAD

INSTALLATION BOUNDARY

GABION WALL (OPTIONAL)

OHM-A7-11

OHM-A7-10

OHM-A7-51

OHM-A7-52

OHM-A7-12

OHM-A7-9

EHA2

RCRA-C CAP

SOLID WASTE

LANDFILL

OHM-A7-45

OHM-A7-8

OHM-A7-46

A7

OHM-A7-7A

SURFACE DUMP AND BURIAL AREA

LAB WASTE DISPOSAL AREA

PESTICIDES AND DEBRIS

P8

PESTICIDES SOLID WASTE AND LEAD

TO OFF-SITE DISPOSAL

OHM-A7-13

TO LANDFILL

AREA P9

OHM-BW-5

FORMER UNDERGROUND STORAGE TANK LOCATION

OHM-A9-53

OHM-A9-58

LEAD AND THALLIUM

DM8

OHM-A9-18

DM9A

OHM-A9-17

OHM-A9-57

OHM-A9-56

OHM-A9-54

P12

A9

FIRE RETARDANT CLOTH TESTING FACILITY

DM10

OHM-A9-48

FIRE FIGHTING TRAINING AREA

OHM-A9-47

OHM-A9-55

402

ARSENIC

OHM-A9-16

OHM-A9-49

OHM-A8-14

OHM-A8-15

AREAS A8 AND P10

LEGEND:

- SURFACE DEBRIS REMOVAL
- EXCAVATION AND PLACEMENT UNDER RCRA-C CAP
- EXCAVATION AND OFF-SITE DISPOSAL
- RCRA-C CAP
- TO LANDFILL
- TO OFF-SITE DISPOSAL

NOTE:
EXCAVATION AREAS ARE APPROXIMATE

SCALE
0 160 320 FEET

FIGURE 2

EXCAVATION AND CONSOLIDATION OF CONTAMINATED SOILS
SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

PREPARED FOR

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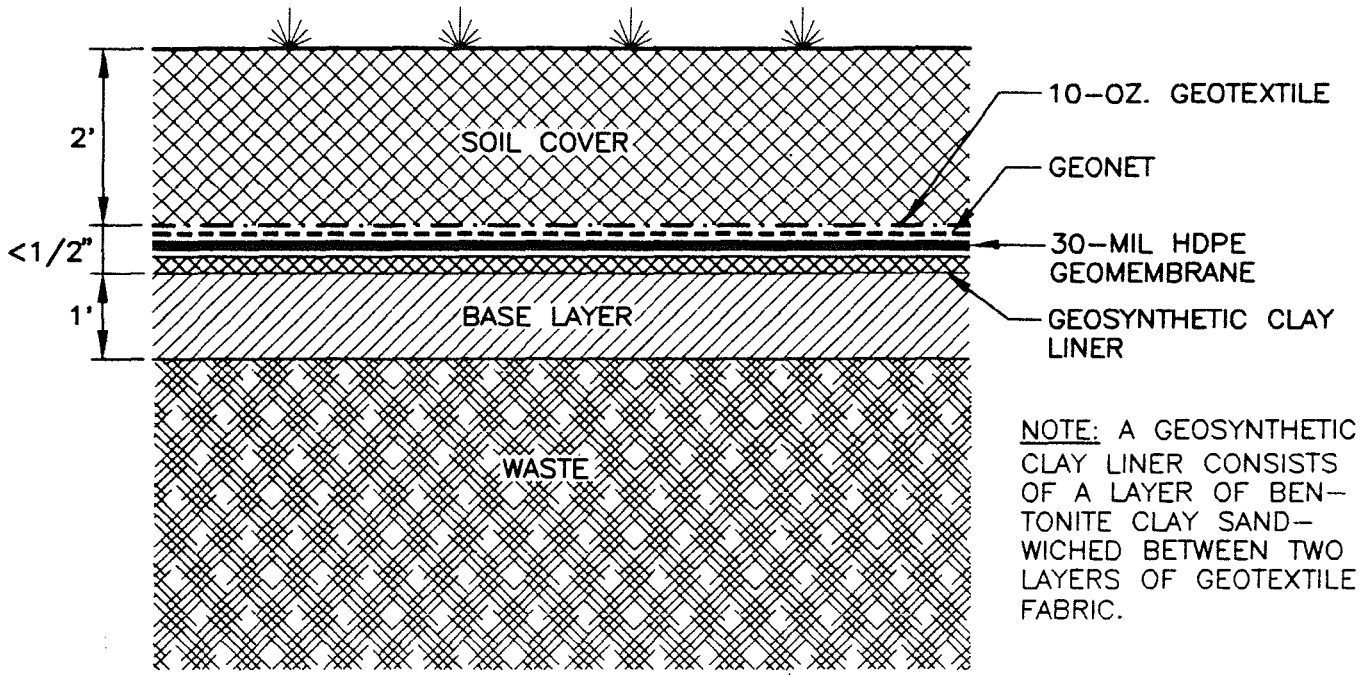

NOTE: A GEOSYNTHETIC CLAY LINER CONSISTS OF A LAYER OF BENTONITE CLAY SANDWICHED BETWEEN TWO LAYERS OF GEOTEXTILE FABRIC.

CAP LAYER FUNCTIONS			
LAYER	FUNCTION	LAYER	FUNCTION
SOIL COVER	TO PROVIDE A PLACE FOR GRASS TO GROW AND TO PROTECT THE LAYERS BELOW FROM DAMAGE.	30-MIL HDPE GEOMEMBRANE	AN IMPERMEABLE BARRIER TO PREVENT INFILTRATION OF RAIN WATER AND SNOW MELT.
GEOTEXTILE	TO KEEP SAND AND SOIL OUT OF THE DRAINAGE LAYER. CAN BE BONDED TO GEONET LAYER BELOW.	GEOSYNTHETIC CLAY LINER	ANOTHER VERY LOW PERMEABILITY BARRIER.
		BASE LAYER	COVERS THE WASTE AND PROVIDES THE FOUNDATION FOR THE CAP ABOVE.
GEONET (LATERAL DRAIN)	A LAYER TO PROVIDE A CONDUIT FOR WATER DRAINAGE.	WASTE	SOLID WASTE AND CONTAMINATED SOIL FROM AOCs A7 AND A9.

FIGURE 3

RCRA SUBTITLE C LANDFILL CAP
SUDBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS

PREPARED FOR

U.S. ARMY ENVIRONMENTAL CENTER
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