

EXPLANATION OF SIGNIFICANT DIFFERENCES
GROUNDWATER EXTRACTION, TREATMENT, AND DISCHARGE
CONTINGENCY REMEDY

For
SHEPLEY'S HILL LANDFILL
FORT DEVENS, MA

Prepared for:

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1.0 Introduction

This document presents an Explanation of Significant Differences (ESD) for the Shepley's Hill Landfill Operable Unit, inclusive of Areas of Contamination (AOC) 4, 5, and 18, at the former Fort Devens. The ESD represents a significant change in remediation approach subsequent to the issuance of the Shepley's Hill Landfill Operable Unit Record of Decision (ROD), dated September, 1995¹.

<i>Site Name and Location</i>	
Site Name:	Shepley's Hill Landfill Operable Unit. The Shepley's Hill Landfill includes three AOCs: AOC 4, the sanitary landfill incinerator, AOC 5, sanitary landfill No. 1, and AOC 18, the asbestos cell.
Location:	Fort Devens is a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) site located in the Towns of Ayer and Shirley (Middlesex County) and Harvard and Lancaster (Worcester County), approximately 35 miles northwest of Boston, Massachusetts.
<i>Lead and Support Agencies</i>	
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Under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and promulgated in 40 CFR Sections 300.435(c)(2)(i) and 300.825(a)(2), if the Army determines that the remedial action at the Shepley's Hill Landfill Operable Unit (site) differs significantly in scope, performance, or cost from the Record of Decision for the site, the Army shall publish an explanation of significant differences between the remedial action being undertaken and the remedial action set forth in the ROD and the reasons such changes are being made. This ESD includes a brief history of the site, a description of the remedy selected in the ROD, and a description of the rationale for the changes to the contingency remedy specified in the ROD.

¹ US Army Environmental Center (USAEC), 1995. Record of Decision, Shepley's Hill Landfill Operable Unit, Fort Devens, Massachusetts. September. Signed by EPA New England (Region 1) on September 26, 1995.

Among other alternatives, the ROD describes two remedial alternatives: Alternative SHL-2, Limited Action, and Alternative SHL-9, Groundwater Pump and Discharge to the Ayer Publicly-Owned Treatment Works (POTW). These alternatives became the primary and contingency elements of the selected remedy for the Shepley's Hill Landfill remedial action, respectively. Alternative SHL-2 generally involves landfill closure with capping and monitoring. Alternative SHL-9, involving active extraction of groundwater, was selected as a contingency element of the selected remedy in order to supplement SHL-2, should SHL-2 not prove to be effective at controlling site risk.

This ESD documents decisions and provides notification relating to 1) implementation of the contingency remedy and 2) needed modifications of the contingency remedy. The needed modifications involve changing the POTW from Ayer to Devens, and providing pretreatment to meet Devens POTW discharge limitations. The change in POTW is a result of a MA DEP consent order issued to the Ayer POTW and subsequent planning, decisions and commitments by the Ayer POTW made to increase the utility's effective capacity, which did not consider a contribution of flow from the Devens SHL Extraction, Treatment and Discharge System. Increases in flow in Ayer will be diverted to the Devens POTW. Therefore, the decision was made to connect directly to the Devens POTW pursuant to the Utility Agreement between the U.S. Army and MassDevelopment.

In addition, the Army has added treatment prior to POTW discharge to ensure that discharge limitations specified in the Devens POTW Industrial Wastewater Discharge Permit #20, dated July, 2003², are met. The ESD has been prepared concurrently with the design of the contingency remedy, in accordance with the *Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (USEPA, July 30, 1999)³.

In accordance with the National Contingency Plan (NCP), Section 300.825(a)(2), the ESD will become part of the Administrative Record for the Shepley's Hill Landfill Operable Unit. The Administrative Record contains the ESD and other supporting documents considered by the Army and the regulatory agencies in developing the ROD for the Shepley's Hill Landfill Operable Unit. The Administrative Record may be viewed at the Ft. Devens BRAC Environmental Office (Building 666, 30 Quebec St., Devens, MA 01432) between the hours of 8:30 AM and 5:00 PM, Monday through Friday. Additional repositories for the Administrative Record are housed in surrounding Town Libraries, including Ayer, Harvard, Lancaster (Executive Summaries only), and Shirley.

² MassDevelopment, 2003. Shepley's Hill Landfill, Industrial Wastewater Discharge Permit #20, July 14.

³ USEPA, 1999. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents, July, EPA 540-R-98-031.

2.0 Summary of Site History and Selected Remedy

The following sections present a brief history relating to the Shepley's Hill Landfill Operable Unit and the selected remedy identified in the 1995 Record of Decision.

2.1 SITE HISTORY

General

The former Fort Devens is located 35 miles west of Boston in north-central Massachusetts within the towns of Ayer and Shirley in Middlesex County, and the towns of Harvard and Lancaster in Worcester County. Prior to realignment and closure in 1996, Fort Devens included 9,280 acres divided into North Post, Main Post, and South Post. Figure 1-1 depicts the location of the various areas of the former base. The North and Main Posts are separated from the South Post by Massachusetts Route 2. The Nashua River runs through the North, Main and South Posts and the area around the former Fort Devens is primarily rural/residential. Currently, the Devens Reserve Forces Training Area (RFTA) consists of 5,196 acres primarily on South Post.

Camp Devens was created as a temporary cantonment in 1917 for training soldiers from the New England area. In 1932, the camp was formerly dedicated as Fort Devens and trained active duty personnel for World War II, the Korean and Vietnam Wars. In July of 1991, the North and Main Posts of Fort Devens were slated for closure and the South Post for realignment, for tactical training of Army Reserves, under the Defense Base Realignment and Closure Act (BRAC) of 1990. The installation ceased to be Fort Devens on March 31, 1996 at which time the remaining Army mission was assimilated by the Devens Reserve Forces Training Area (DRFTA).

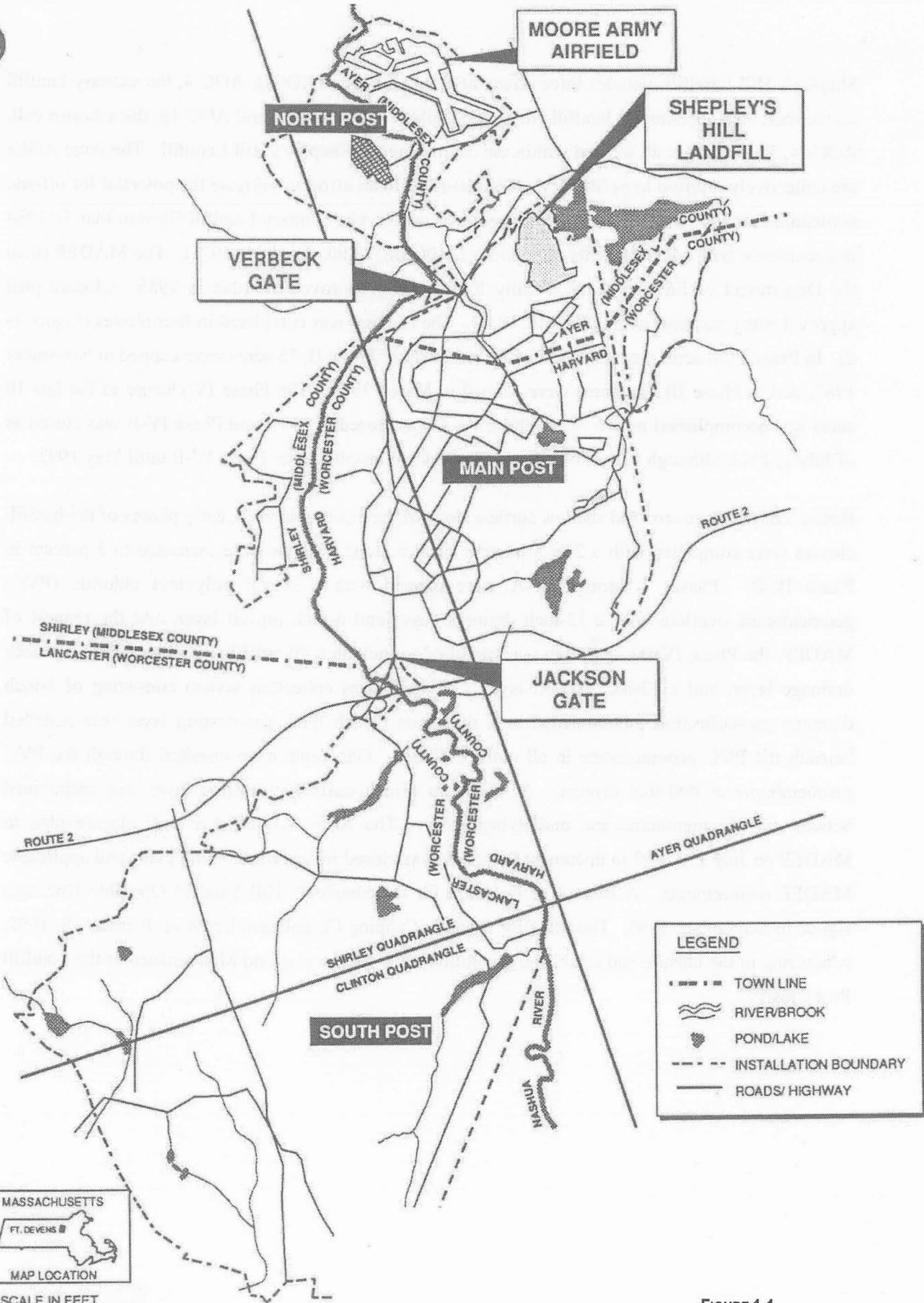
The US Environmental Protection Agency placed the former Fort Devens on its National Priorities List on November 21, 1989. Since listing, investigation and cleanup activities have been occurring to protect human health and the environment and facilitate property redevelopment.

Shepley's Hill Landfill Operable Unit

Shepley's Hill Landfill encompasses approximately 84 acres in the northeast corner of the former Main Post at Fort Devens (see Figure 1-2). It is situated between the bedrock outcrop of Shepley's Hill on the west and Plow Shop Pond on the east. Nonacoicus Brook drains Plow Shop Pond and flows through a low-lying wooded area at the north end of the landfill. The southern end of the landfill borders an area formerly occupied by the Defense Reutilization and Marketing Office (DRMO) yard, motor repair shops, and a warehouse.

Shepley's Hill Landfill includes three Areas of Contamination (AOCs): AOC 4, the sanitary landfill incinerator; AOC 5, sanitary landfill No. 1 or Shepley's Hill Landfill; and AOC 18, the asbestos cell. AOCs 4, 5, and 18 are all located within the capped area at Shepley's Hill Landfill. The three AOCs are collectively referred to as Shepley's Hill Landfill. In an effort to mitigate the potential for off-site contaminant migration, Fort Devens initiated the Fort Devens Sanitary Landfill Closure Plan in 1984 in accordance with Massachusetts regulations (310CMR 19.00, April 21, 1971). The MADEP (then the Department of Environmental Quality Engineering) approved the plan in 1985. Closure plan approval was consistent with 310 CMR 19.00. The capping was completed in four phases (Figure 1-2). In Phase I, 50 acres were capped in October 1986; in Phase II, 15 acres were capped in November 1987; and in Phase III, 9.2 acres were capped in March 1989. The Phase IV closure of the last 10 acres was accomplished in two steps: Phase IV-A was closed in 1991, and Phase IV-B was closed as of July 1, 1992, although the geomembrane cap was not installed over Phase IV-B until May 1993.

Because of the large area and shallow surface slope of the existing landfill, early phases of the landfill closure were completed with a 2 or 3 percent surface slope. Slopes were increased to 5 percent in Phase IV-B. Phases I through IV-A were capped with a 30-mil polyvinyl chloride (PVC) geomembrane overlain with a 12-inch drainage layer and 6-inch topsoil layer. At the request of MADEP, the Phase IV-B cap design was modified to include a 40-mil PVC geomembrane, a 6-inch drainage layer, and a 12-inch topsoil layer. A landfill-gas collection system consisting of 3-inch diameter gas-collection pipes bedded in a minimum 6-inch thick gas-venting layer was installed beneath the PVC geomembrane in all closure phases. Gas vents were installed through the PVC geomembrane at 400-foot centers. A minimum 6-inch cushion/protection layer was maintained between the geomembrane and underlying waste. The Army submitted a draft closure plan to MADEP on July 21, 1995 to document that SHL was closed in accordance with plans and applicable MADEP requirements. A Record of Decision for the Shepley's Hill Landfill Operable Unit was signed in September, 1995. The MADEP issued a Capping Compliance Letter on February 8, 1996, concurring in the closure and establishing conditions for Monitoring and Maintenance of the Landfill Post Closure.



MASSACHUSETTS
FT. DEVENS
MAP LOCATION

SCALE IN FEET

CH2MHILL

FIGURE 1-1
Former Fort Devens Vicinity Map
and Shepley's Hill Landfill
(adapted from Harding ESE, 2003)

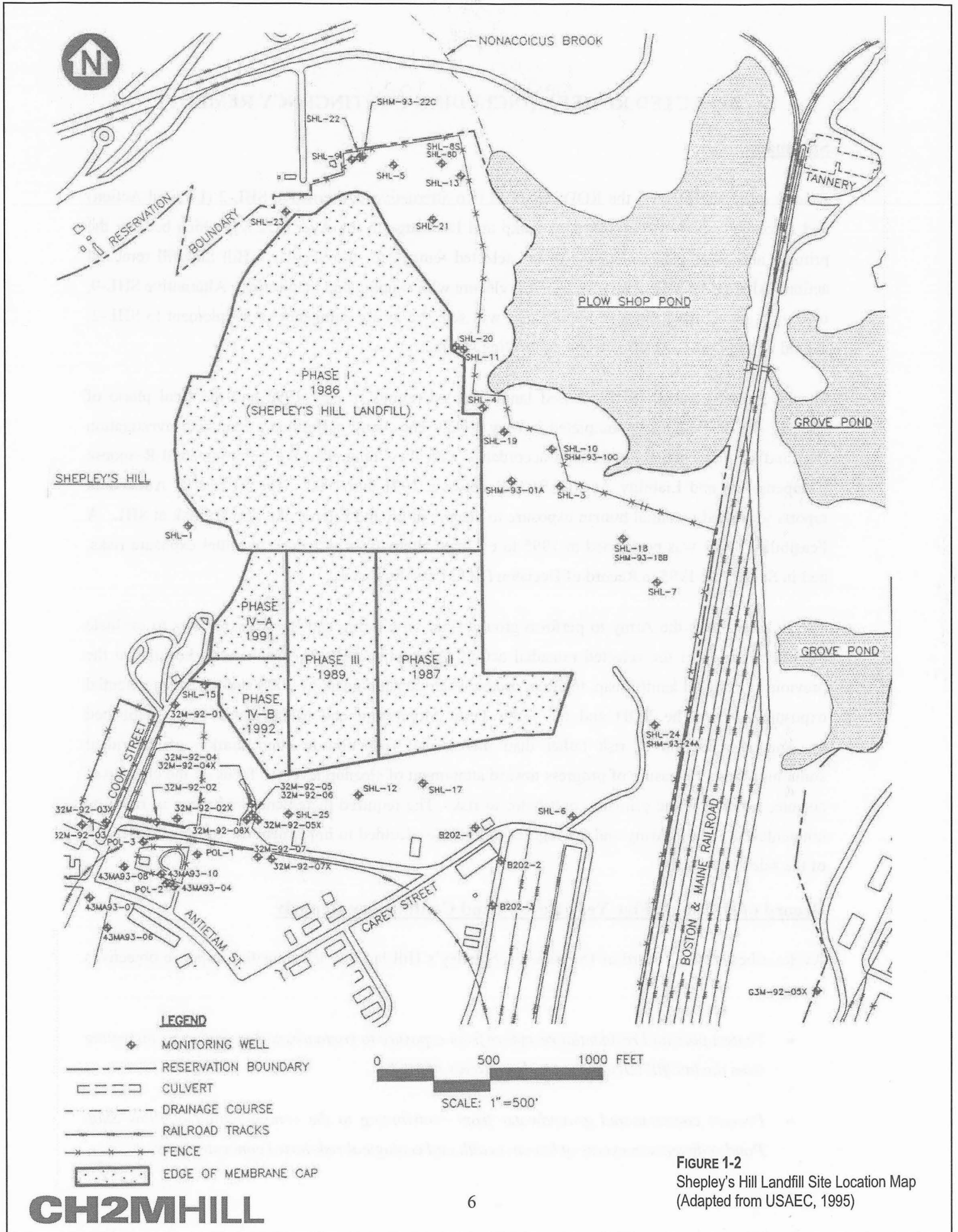


FIGURE 1-2
 Shepley's Hill Landfill Site Location Map
 (Adapted from USAEC, 1995)

Summary

Among other alternatives, the ROD describes two alternatives, Alternative SHL-2 (Limited Action) and Alternative SHL-9 (Groundwater Pump and Discharge to the Ayer POTW), which became the primary and contingency elements of the selected remedy for the Shepley's Hill Landfill remedial action. Alternative SHL-2 involves landfill closure with capping and monitoring. Alternative SHL-9, involving active extraction of groundwater, was selected as a contingency or supplement to SHL-2, should it not prove to be effective at controlling site risk.

Shepley's Hill Landfill (SHL) ceased landfilling operations in July 1992 and the final phase of capping (Phase IV-B) was completed in May 1993. The Army performed a remedial investigation (RI) and supplemental RI at SHL in accordance with the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) between 1991 and 1993. The RI and RI Addendum reports identified potential human exposure to arsenic in groundwater as the primary risk at SHL. A Feasibility Study was performed in 1995 to evaluate alternatives to reduce potential exposure risks, and in September 1995, a Record of Decision (ROD) was finalized.

The ROD requires the Army to perform groundwater monitoring and five-year reviews to evaluate the effectiveness of the selected remedial action (Alternative SHL-2), which relies heavily on the previously installed landfill cap, to attain groundwater cleanup goals by 2008 and to reduce potential exposure risks. The ROD and the Long Term Monitoring and Maintenance Plan established incremental reduction of risk rather than incremental reduction in concentration of individual contaminants as a measure of progress toward attainment of cleanup levels to focus on the cleanup of arsenic, which was the primary contributor to risk. The required incremental reduction in risk was not achieved and the Army and the regulatory agencies decided to implement the contingent element of the selected remedy.

Record of Decision, Five Year Review, and Contingency Remedy

As described in the Record of Decision for Shepley's Hill landfill, the remedial response objectives are to:

- *Protect potential residential receptors from exposure to contaminated groundwater migrating from the landfill having chemicals in excess of MCLs.*
- *Prevent contaminated groundwater from contributing to the contamination of Plow Shop Pond sediments in excess of human health and ecological risk-based concentrations.*

Alternative SHL-2 contains components to maintain and potentially improve the effectiveness of the existing landfill cover systems to satisfy the Landfill Post-Closure Requirement of 310 CMR 19.142 and to reduce potential future exposure to contaminated groundwater. The key components of this Alternative SHL-2 are summarized as follows:

- Landfill closure in accordance with requirements of 310 CMR 19.000;
- Survey of Shepley's Hill Landfill;
- Evaluation/improvement of stormwater diversion and drainage;
- Landfill cover maintenance;
- Landfill gas collection system maintenance;
- Long-term monitoring;
- Long-term landfill gas monitoring;
- Institutional controls;
- Educational programs;
- 60 percent design of a groundwater extraction system;
- Annual reporting to MADEP and USEPA; and
- Five year site reviews.

With the exception of the first two items listed above, activities involving each of these components have been occurring since signing of the ROD in September 1995 and these activities are reported in annual monitoring reports and two separate five year review reports. The original five year review, focused solely on Shepley's Hill Landfill, was completed in August, 1998 (Stone & Webster, 1998)⁴. Another five year review, intended to be comprehensive for all sites at the former Fort Devens undergoing investigation and remediation, was completed in September, 2000 (HLA, 2000)⁵, being triggered by the initiation of soil remediation activities of AOC 44 and 52 on August 11, 1995.

The five year review is intended to evaluate the effectiveness of SHL-2 in reducing potential human health risk from exposure to groundwater and at preventing groundwater from contributing to Plow Shop Pond sediment contamination in excess of human health and ecological risk-based values.

⁴ Stone and Webster Environmental Technology & Services (SWET), 1998. Final Five Year Review, Shepley's Hill Landfill Long Term Monitoring, Devens, Massachusetts. Prepared for the US Army Corps of Engineers, New England District, August.

⁵ Harding Lawson Associates (HLA). 2000. Final First Five-Year Review Report for Devens Reserve Forces Training Area, Devens, Massachusetts. Prepared for the US Army Corps of Engineers, New England District, September.

The following are the specific criteria, as stated in the ROD, for evaluating the effectiveness of Alternative SHL-2 relative to groundwater data from Group 1 and Group 2 wells:

Group 1 Wells. For Group 1 wells where analyte concentrations have historically attained cleanup levels, Alternative SHL-2 will be considered effective if concentrations of individual chemicals within individual wells do not show statistically significant cleanup level exceedances. To determine statistical significance, the Army will apply methods consistent with the regulations at 40 CFR 264.97, 40 CFR 258.53, and 310 CMR 30.663.

Group 2 Wells. For Group 2 wells where chemical concentrations have exceeded cleanup levels in the past, Alternative SHL-2 will be considered effective if a 50 percent reduction in the increment of risk between cleanup levels and baseline concentrations for chemicals of concern within individual wells is achieved by January 1998, if an additional 25 percent (75 percent cumulative) is achieved by January 2003, and if cleanup levels are attained by January 2008.

In general, the ROD states that “Alternative SHL-2 will be considered effective with regard to these wells if five-year reviews show an ongoing reduction of potential human health risk at Group 2 wells and the ultimate attainment of cleanup levels by January 2008.” The ROD further states that “the Army will implement the contingency remedy if the above criteria are not met for any chemical for which cleanup levels were based on MCLs (40 CFR 141) and for manganese. No MCL has been established for manganese. The cleanup level for manganese was based on background concentrations because background concentrations exceed the risk-based concentration derived from the available RfD value (5×10^{-3} milligrams/kilogram/day).” The current cleanup level for manganese was updated in the Long Term Monitoring and Maintenance Plan to 1715 $\mu\text{g/l}$ based on the risk-based concentrations derived from the revised/updated RfD value (4.7×10^{-2} milligrams/kilogram/day).

The data collected over the past several years at Group 1 and 2 wells as part of the long-term groundwater monitoring plan for Shepley’s Hill Landfill, as well as those data collected as part of the *Supplemental Groundwater Investigation* (Harding ESE 2003)⁶ led to the following conclusion in the *Final First Five-Year Review Report* (HLA 2000):

Review of available data suggests that the remedy may have difficulty meeting 2003 interim groundwater cleanup goals. Because of this, the Army should re-evaluate the contingency

⁶ Harding ESE, 2003. Revised Draft Shepley’s Hill Landfill Supplemental Groundwater Investigation, Devens Reserve Forces Training Area, Devens, MA. Volume 1 and 2. Prepared for the US Army Corps of Engineers, New England District, May.

remedy of groundwater extraction with subsequent discharge to the Town of Ayer publicly owned treatment works (POTW). Although groundwater extraction has the potential to contain groundwater contaminants, it will not prevent the release of arsenic from aquifer materials and would need to be performed for an indeterminate length of time. Also, it appears that the POTW would no longer be suitable for receipt of extracted groundwater. These studies should be completed prior to the 2003 assessment of risk at Shepley's Hill Landfill.

During the First Devens Five Year Review four wells; SHL-11, SHL-20, SHM-96-05B and SHM-96-22B had shown little or no reduction in arsenic level between 1997 and 1999 and three of the wells showed an increase. Therefore, it was concluded that these wells may not meet the ROD 2003 incremental goal calling for a 75 % reduction in risk between baseline concentration and the cleanup goals and additional time would be required to determine if the 2008 goal of attaining cleanup goals will be met. These trends continue to be seen in the monitoring data. Subsequent analysis provided in the Supplemental Groundwater Investigation (Harding ESE, 2003) and work of the Army and BRAC Cleanup Team (BCT) have resulted in a recommendation to implement the contingency remedy with changes to further control contamination migration and potential exposure. The Army developed and the BCT reviewed a draft Remedial Action Work Plan in the Spring of 2003 for implementing the contingency remedy identified in the 1995 ROD. The contingency remedy directly addresses the first remedial response objective.

The second remedial response objective involves preventing contaminated groundwater from contributing to the contamination of Plow Shop Pond sediments in excess of human health and ecological risk-based concentrations. The capping of the landfill, associated with Alternative SHL-2, has reduced groundwater flow in the direction of Plow Shop Pond by diverting groundwater flow to the north as indicated by both groundwater monitoring data for a number of wells along the east side of the landfill and groundwater modeling work conducted during the FS for both uncapped and capped landfill scenarios. Groundwater extraction near the north end of the landfill, associated with the contingency remedy is expected to induce additional groundwater flow to the north in the vicinity of Plow Shop Pond, which would further limit or reduce any discharge of landfill-related groundwater to Plow Shop Pond.

The comprehensive *First Five-Year Review Report for Devens Reserve Forces Training Area* (HLA, 2000), identifies the issue of potential changes in the arsenic standard from 50 to 5 ug/l based on the June 22, 2000 USEPA proposed changes. Since that time, a new arsenic standard of 10 ug/l was promulgated (on January 22, 2001) and public water systems must comply with this new standard by

January 23, 2006. Although ROD clean-up goals have not changed, to date, it is anticipated that they will change to be responsive to this new standard while incorporating knowledge of the known ranges of background arsenic concentration in groundwater at the Devens RFTA.

3.0 Significant Differences and the Basis for those Differences

This ESD documents decisions and provides notification relating to:

- 1) Implementation of the contingency remedy;
- 2) Modification of the contingency remedy to
 - a) change the POTW from Ayer to Devens and
 - b) provide pretreatment to meet Devens POTW discharge limitations; and
- 3) The Army's plan to conduct a Comprehensive Site Assessment (CSA) and Corrective Action Alternatives Analysis (CAAA) in accordance with Massachusetts Solid Waste Management Facility regulations (310 CMR 19.000). The CSA/CAA process will provide the technical framework for evaluating all impacts associated with the landfill and shall propose changes to the selected remedy (SHL-2 and SHL-9), if necessary.

Since the signing of the ROD, monitoring work, a groundwater pump test, groundwater modeling, knowledge of capacity constraints of the Ayer POTW, and discharge limitations of the Devens POTW Industrial Wastewater Discharge Permit #20 (MassDevelopment, 2003) have all been factors considered by the Army and the BCT in developing changes to the contingency remedy. Implementation of the contingency remedy, as well as the associated changes, which are considered "significant," require, in accordance with Section 117(c) of CERCLA, that an ESD be developed.

Changes and further definition of the Contingency Remedy may be summarized as follows:

- Receiving POTW Changed from Ayer to Devens: This requires that a discharge pipeline contained within a protective berm will be placed across the Shepley's Hill Landfill to connect with the Devens sewer at a manhole near Antietam and Cook Streets. The Army received an Industrial Wastewater Discharge Permit #20 from MassDevelopment, the owner of the Devens POTW in July 2003. It grants a one year permit term with extensions to the Army for release of up to 50 gallons per minute (gpm) of groundwater with a discharge limitation for arsenic of 150 µg/l and no greater than a maximum daily loading to the plant of 0.07 pounds per day. A one-year renewal Permit was issued in March 2005.

- Addition of Arsenic Treatment Prior to Discharge: This will involve coagulation and microfiltration treatment of extracted groundwater to meet a treatment goal of 10 µg/l. The Army decided to add permanent pretreatment to the Shepley's Hill project with a treatment goal of 10 µg/l to ensure that the concentration and loading discharge limitations for arsenic provided in the Devens POTW permit would be met.

4.0 Support Agency Comments

The United States Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (DEP) have expressed their support for implementation of the contingency remedy as modified by this ESD. Both agencies have provided comments to a draft of this document, they were discussed, and responses have been incorporated.

5.0 Affirmation of the Statutory Determinations

The revised remedy complies with the NCP and the statutory requirements of CERCLA. Considering the decision to implement the contingency remedy (Alternative SHL-9) to supplement the original remedy and new information that has been developed and the changes that have been made to the contingency remedy, the Army, EPA, and DEP believe that the remedy remains protective of human health and the environment, complies with federal and state requirements that were identified in the ROD as applicable or relevant and appropriate to this remedial action at the time the original and this ESD were signed, and is cost-effective. In addition, local POTW pre-treatment system discharge limitations and monitoring requirements will be met. The revised remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable for this site.

6.0 Public Participation Activities

The Army meets regularly with stakeholders through BRAC clean-up team (BCT) meetings and monthly Restoration Advisory Board (RAB) meetings to discuss clean up status at the former Fort Devens and, more specifically, monitoring and other data relating to the Shepley's Hill Landfill Operable Unit. These meetings have involved discussions of monitoring data relating to groundwater compliance monitoring, annual reports, and five year reviews evaluating performance of the selected alternative (SHL-2, Limited Action involving closure capping and monitoring) for Shepley's Hill Landfill. Discussions relating to implementation of the contingency remedy (Alternative SHL-9

involving installation of a groundwater extraction and discharge system), and its modification to involve treatment following groundwater extraction and discharge at a new POTW location (Devens rather than Ayer), have also been presented and discussed. At the RAB meeting on November 13, 2003, the plans to implement the contingency remedy and details about treatment process design and discharge to the Devens POTW were presented and discussed.

In accordance with 40 CFR Section 300.435(c)(2)(i) of the National Contingency Plan, this ESD and other supporting documents are available in the Administrative Record maintained by the Army. The Administrative Record may be viewed at the Ft. Devens BRAC Environmental Office (Building 666, 30 Quebec St., Devens, MA 01434) between the hours of 8:30 AM and 5:00 PM, Monday through Friday, by calling (978) 796-3835. Additional repositories for the Administrative Record are housed in surrounding Town Libraries, including Ayer, Harvard, Lancaster (Executive Summaries only), and Shirley.

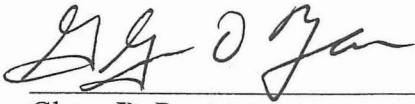
Public notice relating to the availability of the ESD for review was made in the Nashoba Publishing papers, Lowell Sun, and Fitchburg Sentinel on April 22, 2005. A voluntary 30 day public comment period beginning April 29th, 2005 and ending May 31, 2005 will be held by the Army to solicit public comment on this Explanation of Significant Differences.

AUTHORIZING SIGNATURES

The forgoing Explanation of Significant Differences has been prepared to document changes in the contingency remedy from the Record of Decision as required by Section 117(a) of CERCLA. The forgoing represents the selection of a remedial action by the U. S. Department of the Army and U. S. Environmental Protection Agency, with the concurrence of the Massachusetts Department of Environmental Protection.

Concur and recommend for immediate implementation.

U.S. DEPARTMENT OF THE ARMY

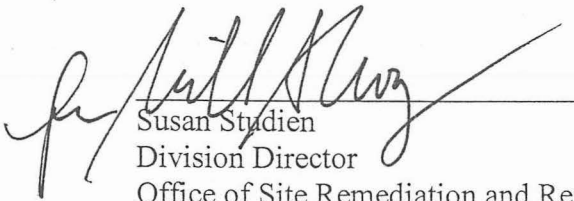


Glynn D. Ryan
Chief, Atlanta Field Office
Department of the Army
Base Realignment and Closure

11-29-05

Date

U.S. ENVIRONMENTAL PROTECTION AGENCY



Susan Studien
Division Director
Office of Site Remediation and Restoration
Region 1

11-2-05

Date