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U.S. Army Corps of Engineers
New England District

LANDFILL REMEDIATION
FEASIBILITY STUDY ADDENDUM REPORT

DEVENS RESERVE FORCES TRAINING AREA
FORMERLY FORT DEVENS,
DEVENS, MASSACHUSETTS

CONTRACT DACA31-94-D-0061
TASK ORDER NO. 0002

U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
CONCORD, MASSACHUSETTS

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HLA Harding Lawson Associates

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Prepared for:

U.S. Army Corps of Engineers
New England District
Concord, Massachusetts

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November 1998

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EXECUTIVE SUMMARY

Harding Lawson Associates, formerly ABB Environmental Services, Inc., prepared this Feasibility Study Addendum Report for seven debris disposal areas at the Devens Reserve Forces Training Area, Devens, Massachusetts. This Addendum Report presents information collected and evaluations performed since completion of the Landfill Remediation FS Report in January 1997. The purpose of this report is to provide documentation for the expanded consolidation landfill site search, and for the evaluation of transporting debris by rail to an offsite landfill.

The Landfill Remediation Feasibility Study Report evaluated nine alternatives for managing these disposal areas:

- Study Area 6
- Area of Contamination 9
- AOC 11
- SA 12
- SA 13
- AOC 40
- AOC 41

In December 1997, the U.S. Department of the Army issued a Proposed Plan that described the preferred alternative (Alternative 4a). Alternative 4a consisted of excavating debris from AOCs 9 and 40, and from SA 13, and consolidating the debris into a new, lined landfill to be constructed near the existing Shepley's Hill Landfill. Surface debris collected from AOC 11 (as a Comprehensive Environmental Response, Compensation, and Liability Act action), and from SA 13 and AOC 41 (non-CERCLA actions) would also be relocated to the consolidation landfill. No action under CERCLA would be taken at SA 6.

Residents and public officials voiced strong opposition to the proposed consolidation landfill location near Shepley's Hill, and asked the Army to evaluate other sites that were not located over an area identified as a potentially productive aquifer. The community favored debris excavation and disposal in an offsite landfill. Citing concerns over environmental impact posed by site wastes, the community asked the Army to excavate and remove the entire debris area at AOC 11.

The Army has: (1) conducted an expanded site search for a consolidation landfill location, (2) evaluated the option of transporting debris by rail to an offsite landfill, and (3)

evaluated the option to remove AOC 11 debris in its entirety. During the course of these assessments, two additional remedial alternatives (Alternatives 4b and 4c) were developed, for a total of twelve alternatives. Alternatives 4a, 4b and 4c are described in detail in this report.

The Army has determined that the former Golf Course Driving Range best meets both regulatory criteria for siting landfills, and "non-regulatory" criteria derived from public comment.

Evaluation of disposing debris offsite via rail was undertaken using information obtained from contacts with waste disposal contractors. After careful review, the Army concluded that debris cleanup with offsite disposal would be significantly more costly than cleanup with onsite consolidation. Evaluations conducted for the expanded consolidation location site search and for offsite debris disposal are described in this report.

Alternative 4a consists of:

- No further action under CERCLA: SAs 6 and 12, and AOC 41
- Limited debris removal: AOC 11
- Debris excavation and consolidation at a new landfill near Shepley's Hill: SA13, AOCs 9 and 40

Alternative 4b consists of:

- No further action under CERCLA: SAs 6 and 12, and AOC 41
- Limited debris removal: AOC 11
- Debris excavation and either consolidation at a new onsite landfill, or disposal offsite: SA13, AOCs 9 and 40

Alternative 4c consists of:

- No further action under CERCLA: SAs 6 and 12, and AOC 41
- Debris excavation and consolidation at a new onsite landfill, or disposal offsite: SA13, AOCs 9, 11, and 40

Alternative 4c has been selected as the Army's preferred alternative. As a component of the alternative, formal contractor bids will be solicited for both onsite landfill consolidation and, alternately, for offsite disposal. A debris disposal option will be selected after evaluating the formal bids. Bid evaluation will consider the following criteria:

- Overall protection of human health and the environment
- Cost
- Ability to satisfy health and safety concerns identified by area residents and public officials
- Contractor's past performance

The selection of Alternative 4c is documented in a Proposed Plan being released concurrently with this Feasibility Study Addendum Report.

1.0 INTRODUCTION

Harding Lawson Associates, formerly ABB Environmental Services, Inc. (ABB-ES), prepared this Feasibility Study (FS) Addendum Report for seven debris disposal areas at the Devens Reserve Forces Training Area (RFTA, formerly Fort Devens), Devens, Massachusetts. This Addendum Report presents information collected and evaluations performed since completion of the Landfill Remediation FS Report (ABB-ES, 1997a).

The Landfill Remediation FS Report evaluated nine alternatives for managing these disposal areas:

- Study Area (SA) 6
- Area of Contamination (AOC) 9
- AOC 11
- SA 12
- SA 13
- AOC 40
- AOC 41

In December 1997, the U.S. Department of the Army (Army) issued a Proposed Plan (ABB-ES, 1997b) that described the preferred alternative (Alternative 4a). Though it was not one of the nine remedial alternatives evaluated in the FS Report, Alternative 4a was a combination of individual actions that made up the nine alternatives. The Army's preferred alternative consisted of excavating debris from AOCs 9 and 40, and from SA 13, and consolidating the debris into a new, lined landfill to be constructed near the existing Shepley's Hill Landfill. Surface debris collected from AOC 11 (as a Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] action), and from SA 13 and AOC 41 (non-CERCLA actions) would also be relocated to the consolidation landfill. No action under CERCLA would be taken at SA 6.

Residents and public officials voiced strong opposition to the proposed consolidation landfill location near Shepley's Hill, and asked the Army to evaluate other sites that were not located over an area identified as a potentially productive aquifer (PPA). The community favored debris excavation and disposal in an offsite landfill. Citing concerns over environmental impact posed by site wastes, the community asked the Army to excavate and remove the entire debris area at AOC 11.

After evaluating Proposed Plan comments submitted by the Massachusetts Department of Environmental Protection (MADEP), the U.S. Environmental Protection Agency (USEPA), and the public, the Army: (1) conducted an expanded site search for a

consolidation landfill location, (2) evaluated the option of transporting debris by rail to an offsite landfill, and (3) evaluated the option to remove AOC 11 debris in its entirety.

1.1 PURPOSE

The purpose of this FS Addendum is to provide documentation for the expanded consolidation landfill site search, and for the evaluation of transporting debris by rail to an offsite landfill. During the course of these assessments, two additional remedial alternatives (Alternatives 4b and 4c) were developed, for a total of twelve alternatives. Alternatives 4a, 4b, and 4c are described in detail in Section 3.0 of this report.

1.2 BASIS FOR ADDITIONAL EVALUATIONS

Comments received from area residents and public officials indicated strong opposition to the proposed consolidation landfill location near Shepley's Hill. The Army was asked to evaluate other sites that were not located over a PPA. The Army conducted an expanded site search for an appropriate consolidation location, using criteria derived from public comment. The site search was performed using information from the Army Geographic Information Systems (GIS) database, combined with site reconnaissance and limited subsurface investigations. As a result of the search, the Army has determined that the former Golf Course Driving Range best meets both regulatory criteria for siting landfills, and "non-regulatory" criteria derived from public comment.

Evaluation of disposing debris offsite via rail was undertaken using information obtained from contacts with waste disposal contractors. After careful review, the Army concluded that debris cleanup with offsite disposal would be significantly more costly than cleanup with onsite consolidation. Evaluations conducted for the expanded consolidation location site search and for offsite debris disposal are described in Section 2.0 of this report.

In Section 3.0, new Alternatives 4a, 4b, and 4c, developed after the Landfill Remediation FS Report, are evaluated in detail using the evaluation criteria recommended in USEPA's Remedial Investigation/Feasibility Study guidance (USEPA, 1988). Complete debris removal at AOC 11 is included in Alternative 4c.

Alternative 4a consists of:

- No further action under CERCLA: SAs 6 and 12, and AOC 41
- Limited debris removal: AOC 11

- Debris excavation and consolidation at a new landfill near Shepley's Hill: SA13, AOCs 9 and 40

Alternative 4b consists of:

- No further action under CERCLA: SAs 6 and 12, and AOC 41
- Limited debris removal: AOC 11
- Debris excavation and either consolidation at a new onsite landfill, or disposal offsite: SA13, AOCs 9 and 40

Alternative 4c consists of:

- No further action under CERCLA: SAs 6 and 12, and AOC 41
- Debris excavation and consolidation at a new onsite landfill, or disposal offsite: SA13, AOCs 9, 11, and 40

2.0 EVALUATION OF DEBRIS DISPOSAL OPTIONS

This section presents the expanded site search for the consolidation landfill location, and provides a description of the offsite debris disposal evaluation.

2.1 EXPANDED SEARCH FOR CONSOLIDATION LANDFILL SITE

To address public concern regarding selection of the consolidation landfill site presented in the Feasibility Study Report (i.e., the area near Shepley's Hill Landfill), an expanded consolidation site search was conducted. At the outset of the search, all areas within the former Fort Devens facility boundary were considered as potential sites. The Devens Base Closure Team (BCT) agreed to use the MADEP solid waste landfill siting regulations (310 CMR 16.40) as the initial screening criteria for the expanded site search. Because the area near Shepley's Hill Landfill meets the siting criteria, it remained a potential site. A summary of the MADEP landfill siting criteria is summarized in Appendix A.

The Army GIS was used to help determine which areas at Devens met the criteria, and thus could be considered as a consolidation site. Using siting criteria information in the GIS database, a Devens area map was generated. The map showed conforming parcels of land within the former Fort Devens that could be used to site the landfill (Figure 2-1). Within the conforming land area, thirteen potential landfill sites were identified. These sites met the initial screening criteria. The sites (Figures 2-2 through 2-11) were:

- 2500-2600 Wooded Area
- Shepley's Hill Landfill Area
- DRMO (Defense Reutilization and Marketing Office)Yard Area
- Former Amphitheater near Davao Housing
- Former Golf Course Driving Range
- Former Moore Army Airfield
- Locust Housing Area
- North Post - North of AOC 9
- Northwest Lake George Street Area
- Patch Road Gravel Pit
- Soccer Fields adjacent to Sherman Road
- Shirley Housing Area
- Southwest 3400 Area

The thirteen sites were assessed for compliance with a list of non-regulatory criteria. The criteria were developed from the comments received on the Proposed Plan. Methods of criteria measurement (see Table 2-1) were developed to assist in evaluating the criteria. The non-regulatory criteria and associated measurement methods were discussed with Town Administrators from Ayer, Harvard, and Shirley at an April 8, 1998 meeting held at the Devens Base Realignment and Closure (BRAC) office. The measurement methods were evaluated at a series of weekly status meetings held at the BRAC office from April 29, 1998 to July 8, 1998. In attendance at the status meetings were representatives of the Army, MADEP, USEPA, the Devens Commerce Center (DCC), and the Ayer Town Administrator.

Summaries of site conformance to non-regulatory criteria are presented in Appendix B. The one-page summaries are based on information contained in the Army GIS System, supplemented by field observations conducted by Army personnel.

The DCC, tasked with civilian redevelopment of the former Fort Devens, evaluated the thirteen sites in terms of existing development plans. As requested by the DCC, the Northwest Lake George Street Area and the Shirley Housing Area were eliminated from consideration by the BCT because of impending development. A third site, the 2500-2600 Wooded Area, was eliminated because of physical characteristics not conducive to landfill development. The site is heavily wooded, has a year-round groundwater table at or near the ground surface, and is in an area of shallow bedrock.

Using the site characteristic summaries presented in Appendix B, evaluation of the ten remaining potential consolidation landfill sites was conducted by the BCT. A matrix summarizing the evaluation of the ten sites is presented in Appendix C. As a result of the evaluation, the BCT reached a consensus regarding the five sites that best presented a favorable balance of the non-regulatory criteria. These sites were:

- Former Golf Course Driving Range
- Shepley's Hill Landfill Area
- Former Amphitheater near Davao Housing
- Patch Road Gravel Pit
- DRMO Yard Area

The BCT concurred that the five sites were viable locations for the consolidation landfill. Public comments received on the Proposed Plan strongly urged the proposed landfill not overlie a mapped PPA. Therefore, the BCT focused its evaluation on the Former Golf Course Driving Range and the Patch Road Gravel Pit. Of the five remaining sites, these are the only sites that do not overlie a PPA.

To further determine the suitability of the two sites to support construction and operation of a landfill, subsurface soil borings were advanced at the Driving Range and Gravel Pit. Soil types and estimated depths to groundwater and bedrock were determined from three borings at the Driving Range, and two at the Gravel Pit. The results of the investigations suggest that both sites qualify as viable, potential landfill sites. Soil boring locations and drilling logs are presented in Appendix D.

Following the soil boring investigations, the DCC informed the Army that the Patch Road Gravel Pit site was critical to its plan to develop a new recreational area at Devens. The DCC suggested the site no longer be considered for a landfill. The DCC is a division of MassDevelopment, current owner of the property containing the Driving Range and the Gravel Pit. Both parcels were transferred from the Army to MassDevelopment in 1996.

Although it does not overlie a PPA, portions of the Patch Road Gravel Pit are within approximately two hundred feet of the nearest PPA boundary. The site is in a relatively remote area, and would not be as accessible by truck during new landfill construction as would the other four sites being considered. For these reasons, the Patch Road Gravel Pit site was eliminated from further consideration as a potential landfill site.

Of the ten potential sites evaluated, the Former Golf Course Driving Range was selected by the BCT as the site that most favorably meets the evaluation criteria. A debris landfill at the Driving Range site would possess the following attributes:

- Would not create detrimental visual impact, nor negatively impact surrounding property value
- Would not overlie a PPA
- Would not be located within a Zone II of a water supply well
- Would not negatively impact development or other constructive uses in the immediate area
- Would not interfere with planned uses at adjacent properties
- Would not be close to populated areas or schools
- Would not be close to areas designated as Conservation Land
- Has adequate size for landfill development
- Would require a relatively low amount of site preparation
- Has adequate roadway access for trucks and construction equipment
- Debris haul routes would have minimal impact on the surrounding communities
- Would not impact the Army mission at Devens

2.2 OFFSITE DEBRIS DISPOSAL EVALUATION

This subsection describes the offsite disposal option developed in Alternative 4c, concluding with Spring 1998 Army presentations to the public. A CERCLA evaluation of remedial Alternative 4c is presented in Subsection 3.4. Alternative 4c consists of full debris removal at AOCs 9, 11, and 40, and at SA 13. As an option, excavated debris would be transported by rail and disposed in an offsite landfill.

A remedial alternative that featured offsite debris disposal was originally presented in the Consolidation Landfill Feasibility Study Report (ABB-ES, 1995). The cost estimate for offsite disposal of debris from all seven landfills was estimated to be $31.6 million, assuming offsite debris transport to a commercial landfill via truck. The comparable cost to consolidate debris from all seven landfills onsite was estimated to be $17.6 million. Because of its significantly higher cost compared to onsite consolidation, the offsite debris disposal option was eliminated from further consideration in the FS Report. For this reason, offsite debris disposal was not considered in the Landfill Remediation FS Report (ABB-ES, 1997). To address public concern that offsite debris disposal via rail had not been assessed, a comprehensive evaluation of that option was undertaken.

On April 1, 1998, the Army placed a notice in the Commerce Business Daily. The notice requested that interested waste disposal contractors submit a preliminary approach and cost estimate for disposing landfill debris at an offsite, commercial landfill using rail transport. A list of contractor survey questions was developed for use in evaluating responses to the inquiry. By the end of April 1998, written responses had been submitted by five contractors. To clarify information in the responses and to obtain further information, the Army continued discussions with the contractors and their references.

During a series of meetings with the USEPA, MADEP, the DCC, and community officials and residents, the Army presented updates of the inquiry responses as they were being received. Contractor survey questions and a response summary spreadsheet are presented in Appendix E. After careful review of contractor responses, a cost estimate for landfill remediation with offsite debris disposal (i.e., Alternative 4b) was prepared. The estimate is presented in Subsection 3.3.2.7 of this report. Costs were estimated for four phases of the work: (1) Site work, (2) Onsite handling and loading, (3) Rail Transportation, and (4) Offsite disposal. The total cost for debris excavation with offsite disposal by rail is estimated to be $29.3 million. Of the total estimated cost, direct costs are $24.3 million. Direct costs include expenditures for the equipment, labor, and materials necessary to perform remedial actions. Indirect costs include expenditures for engineering, construction oversight, and other services that are not part of actual performance activities but are required to complete the performance of remedial alternatives. Estimated direct costs for the Alternative 4b option that includes onsite debris consolidation are $13.0 million.

The offsite debris disposal evaluation was presented to the public at the June 11, 1998 meeting of the Restoration Advisory Board. At the meeting, public comments suggested that offsite disposal costs could be reduced if formal contractor bids were solicited.

3.0 LANDFILL REMEDIATION ALTERNATIVES

This section provides a summary of the remedial alternatives evaluated in detail in the Landfill Remediation FS Report. Alternatives 4a, 4b, and 4c, developed after preparation of the FS Report, are described and assessed using USEPA's FS evaluation criteria.

3.1 FEASIBILITY STUDY ALTERNATIVES REVIEW

This subsection provides summary descriptions of the nine remedial alternatives evaluated in detail in the Landfill Remediation FS Report. For more detailed descriptions and assessments of the nine alternatives using USEPA's FS evaluation criteria, refer to Section 8.0 of the FS Report.

3.1.1 Description of Alternative 1

The No Further Action (NFA) Alternative serves as a baseline alternative with which to compare other alternatives per CERCLA regulations. No action will be taken at any of the landfills to meet the response objectives stated in Section 5 of the Landfill Remediation FS Report.

3.1.2 Description of Alternative 2: No Further Action at AOC 41, and SAs 6, 12, and 13; Limited Removal at AOC 11 (Disposal at AOC 9); and Cap-in-Place at AOCs 9 and 40

This alternative includes different types of management at the seven disposal sites. At AOC 41, and SAs 6, 12, and 13 no further action would be taken. At AOC 11 surface debris would be removed for disposal at AOC 9. At AOCs 9 and 40 a cap would be placed over the debris. AOC 9 will have some consolidation of debris, which will minimize both the area to be capped, and associated costs. The debris collected from AOC 11 would be placed under this cap. Alternative 2 includes removing exposed drums at AOC 40 to remove a potential source of contamination, and excavation of sediment from two hot spots in Cold Spring Brook Pond to reduce ecological risk from exposure to contaminated sediments.

Key components of Alternative 2 include:

No Further Action at AOC 41, SAs 6, 12, 13

- No action.

Limited Removal at AOC 11

- Mobilization/demobilization;
- Excavation of debris and transportation to AOC 9;
- Backfilling site; and
- Site restoration.

Cap-in-Place AOCs 9 and 40

- Mobilization/demobilization;
- Site preparation;
- AOC 40 sediment removal with disposal at AOC 9;
- AOC 40 drum removal with disposal at AOC 9;
- Consolidate debris at AOC 9;
- Cap construction;
- Site restoration;
- Wetland restoration;
- Institutional controls;
- Cover system monitoring and maintenance; and
- Five-year site reviews.

3.1.3 Description of Alternative 3: No Further Action at AOC 41, and SAs 6, 12, and 13; and Cap-in-Place at AOCs 9, 11, and 40

This alternative includes different types of management at the seven disposal sites. At AOC 41, and SAs 6, 12, and 13 no further action is taken. At AOCs 9, 11, and 40 a cap is placed over the debris. AOC 9 will have some consolidation of debris to minimize the size of the cap. Alternative 3 includes removing exposed drums at AOC 40 to remove a potential source of contamination, and excavation of sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments.

Key components of Alternative 3 include:

No Further Action at AOC 41, SAs 6, 12, 13

- No action

Cap-in-Place AOCs 9, 11, 40

- Mobilization/demobilization;
- Site preparation;
- AOC 40 sediment removal with disposal at AOC 9;
- AOC 40 drum removal with disposal at AOC 9;
- Consolidate debris areas at AOC 9;
- Cap construction;
- Site restoration;
- Wetland restoration;
- Institutional controls;
- Cover system monitoring and maintenance; and
- Five-year site reviews.

3.1.4 Description of Alternative 4: No Further Action at AOC 41, and SAs 6, 12, and 13; limited removal at AOC 11 (disposal in Consolidation Landfill); and excavation and consolidation of AOCs 9 and 40

Alternative 4 proposes removal of surface debris from AOC 11, excavating construction/demolition debris from AOC 9 and AOC 40, and consolidating the debris in a proposed secure landfill near Shepley's Hill Landfill. At AOC 41, and SAs 6, 12, and 13, no further action would be taken. Alternative 4 includes removing exposed drums at Cold Spring Brook Landfill (AOC 40) to remove a potential source of contamination, and excavating sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments.

The key components of Alternative 4 include:

No Further Action at AOC 41, SAs 6, 12, 13

- No action

Limited Removal at AOC 11

- Mobilization/demobilization;
- Excavation of debris and transportation to the Consolidation Landfill;
- Backfilling site; and
- Site restoration.

Excavation and Consolidation of AOCs 9 and 40

- Mobilization/demobilization;
- AOC 40 sediment removal with disposal at AOC 9;
- AOC 40 drum removal with disposal at AOC 9;
- Debris excavation and backfill at AOCs 9 and 40;
- Wetlands restoration;
- Consolidation of excavated debris at Consolidation Landfill;
- Institutional controls;
- Cover system monitoring and maintenance at Consolidation Landfill; and
- Five-year site reviews;

3.1.5 Description of Alternative 5: Limited removal at AOC 11 (disposal in Consolidation Landfill); Cap-in-Place at AOC 41 and SAs 6, 12, and 13; and excavation and consolidation of AOCs 9 and 40

Alternative 5 proposes limited removal of debris from AOC 11; capping AOC 41, SAs 6, 12, 13; excavating construction/demolition debris from AOCs 9 and 40; and consolidating excavated debris in a proposed secure landfill near Shepley's Hill Landfill. Alternative 5 includes removing exposed drums at Cold Spring Brook Landfill (AOC 40) to remove a potential source of contamination, and excavating sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments.

Key components of Alternative 5 include:

Limited Removal at AOC 11

- Mobilization/demobilization;
- Excavation of debris and transportation to the Consolidation Landfill;
- Backfilling site; and
- Site restoration.

Cap-in-Place AOC 41, SAs 6, 12, 13

- Mobilization/demobilization;

- Site preparation;
- Unexploded Ordnance (UXO) Monitoring at SAs 6, 12, and AOC 41;
- Cap construction;
- Site restoration;
- Wetland restoration;
- Institutional controls;
- Cover system monitoring and maintenance; and
- Five-year site reviews.

Excavation and Consolidation at AOC 9 and AOC 40

- Mobilization/demobilization;
- AOC 40 sediment removal with disposal at AOC 9;
- AOC 40 drum removal with disposal at AOC 9;
- Debris excavation with backfill at AOCs 9 and 40;
- Wetlands restoration;
- Consolidation of excavated debris at Consolidation Landfill;
- Institutional controls;
- Cover system monitoring and maintenance at Consolidation Landfill; and
- Five-year site reviews;

3.1.6 Description of Alternative 6: Cap-In-Place at AOC 41 and SAs 6, 12, and 13; and Excavation and Consolidation of AOCs 9, 11, and 40

Alternative 6 proposes capping at AOC 41 and SAs 6, 12, 13; excavating debris from AOCs 9, 11, and 40; and consolidating excavated debris in a proposed secure landfill near Shepley's Hill Landfill. Alternative 6 includes removing exposed drums at Cold Spring Brook Landfill (AOC 40) to remove a potential source of contamination, and excavating sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments.

Key components of Alternative 6 include:

Cap-in-Place AOC 41, SAs 6, 12, 13

- Mobilization/demobilization;
- Site preparation;
- UXO monitoring at SAs 6, 12 and AOC 41;
- Cap construction;
- Site restoration;

- Wetland restoration;
- Institutional controls;
- Cover system monitoring and maintenance; and
- Five-year site reviews.

Excavation and Consolidation at AOCs 9, 11 and 40

- Mobilization/demobilization;
- AOC 40 sediment removal with disposal at AOC 9;
- AOC 40 drum removal with disposal at AOC 9;
- Debris excavation and backfill at AOCs 9, 11 and 40;
- Wetlands restoration;
- Consolidation of excavated debris at Consolidation Landfill;
- Institutional controls;
- Cover system monitoring and maintenance at Consolidation Landfill; and
- Five-year Site Reviews;

3.1.7 Description of Alternative 7

This alternative includes construction of a cap over each of the seven disposal sites. Alternative 7 includes removing exposed drums at AOC 40 to remove a potential source of contamination, and excavation of sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments.

Key components of Alternative 7 include:

Cap-in-Place AOCs 9, 11, 40, 41 and SAs 6, 12, 13

- Mobilization/demobilization;
- Site preparation;
- AOC 40 sediment removal with disposal at AOC 9;
- AOC 40 drum removal with disposal at AOC 9;
- UXO monitoring at SAs 6, 12, and AOC 41;
- Cap construction;
- Site restoration;
- Wetland restoration;
- Institutional controls;
- Cover system monitoring and maintenance; and
- Five-year site reviews.

3.1.8 Description of Alternative 8: Limited removal at AOC 11 (disposal in Consolidation Landfill); and excavation and consolidation of AOCs 9, 40, and 41, and SAs 6, 12, and 13

Alternative 8 proposes limited removal of debris from AOC 11; excavating debris from AOCs 9, 40, 41 and SAs 6, 12, 13; and consolidating excavated debris in a proposed secure landfill near Shepley's Hill Landfill.

Based on archeological monitoring conducted during predesign investigations at SA 6, further study is assumed to be warranted prior to disturbance of waste at this site. Work at this site would need to comply with the requirements of the National Historical Preservation Act which establishes procedures to provide for preservation of historical and archeological data which might be destroyed through alteration of terrain as a result of a Federal construction project. Archeological monitoring at the remaining six SA/AOCs is not anticipated.

Alternative 8 includes removing exposed drums at Cold Spring Brook Landfill (AOC 40) to remove a potential source of contamination, and excavating sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments.

The key components of Alternative 8 include:

Limited Removal at AOC 11

- Mobilization/demobilization;
- Excavation of debris and transportation to the Consolidation Landfill;
- Backfilling site; and
- Site restoration.

Excavation and Consolidation at AOCs 9, 40, 41 and SAs 6, 12, 13

- Mobilization/demobilization;
- AOC 40 sediment removal with disposal at AOC 9;
- AOC 40 drum removal with disposal at AOC 9;
- UXO monitoring at SAs 6, 12 and AOC 41;
- Debris excavation and backfill;
- Wetlands restoration;
- Consolidation of excavated debris at Consolidation Landfill;

- Institutional controls;
- Cover system monitoring and maintenance at Consolidation Landfill; and
- Five-year site reviews;

3.1.9 Description of Alternative 9: Excavation and consolidation of all seven disposal areas

Alternative 9 proposes excavating construction/demolition debris from SAs 6, 12, 13, AOCs 9, 11, 40 and 41, and consolidating excavated debris in a proposed secure landfill near Shepley's Hill Landfill.

Based on archeological monitoring conducted during the predesign investigations at SA 6, further study is assumed to be warranted prior to disturbance of waste at this site. Work at this site would need to comply with the requirements of the National Historical Preservation Act which establishes procedures to provide for preservation of historical and archeological data which might be destroyed through alteration of terrain as a result of a federal construction project. Archeological monitoring at the remaining six SA/AOCs is not anticipated.

Alternative 9 includes removing exposed drums at Cold Spring Brook Landfill (AOC 40) to remove a potential source of contamination, and excavating sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments.

Key components of Alternative 9 include:

Excavation and Consolidation at AOCs 9,11, 40, 41 and SAs 6, 12, 13

- Mobilization/demobilization;
- AOC 40 sediment removal with disposal at AOC 9;
- AOC 40 drum removal with disposal at AOC 9;
- UXO monitoring at SAs 6, 12 and AOC 41;
- Debris excavation and backfill;
- Wetlands restoration;
- Consolidation of excavated debris at Consolidation Landfill;
- Institutional controls;
- Cover system monitoring and maintenance at Consolidation Landfill; and
- Five-year site reviews;

3.2 DESCRIPTION AND DETAILED EVALUATION OF ALTERNATIVE 4a

This subsection describes Alternative 4a, evaluates the alternative using USEPA evaluation criteria, and provides a cost estimate.

3.2.1 Description of Alternative 4a: No Further Action under CERCLA at AOC 41, and SAs 6 and 12; limited removal at AOC 11 (disposal in Consolidation Landfill); and excavation and consolidation of AOCs 9 and 40 and SA 13

Alternative 4a proposes removal of surface debris from AOC 11, excavating construction/demolition debris from AOC 9, AOC 40, and from SA 13, and consolidating the debris in a proposed secure landfill near Shepley's Hill Landfill. At AOC 11, known surface soil "hot spots" will be removed as a CERCLA action. At AOC 41, and at SAs 6 and 12, no further action under CERCLA would be taken. Non-CERCLA actions at SA 12 and AOC 41 would include removal of visible man-made surface debris and removal of known surface soil "hot spots".

Alternative 4a includes removing exposed drums at Cold Spring Brook Landfill (AOC 40) to remove a potential source of contamination, and excavating sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments.

Key components of Alternative 4a include:

<u>No Further Action under CERCLA at AOC 41, SAs 6 and 12</u>

- No action under CERCLA
- Non-CERCLA surface debris and known surface soil "hot spot" removal

<u>Limited Removal at AOC 11</u>

- Mobilization/demobilization;
- Excavation of debris and transportation to the Consolidation Landfill;
- Removal of known surface soil "hot spots"
- Backfilling site; and
- Site restoration.

Excavation and Consolidation of AOCs 9 and 40, and SA 13

- Mobilization/demobilization;
- AOC 40 sediment removal with disposal in the Consolidation Landfill;
- AOC 40 drum removal with disposal in the Consolidation Landfill;
- Debris excavation, backfill, and regrading at AOCs 9 and 40, and at SA 13;
- Wetlands restoration;
- Consolidation of excavated debris at Consolidation Landfill;
- Institutional controls;
- Cover system monitoring and maintenance at Consolidation Landfill; and
- Five-year site reviews;

3.2.1.1 Description of No Further Action Components for Alternative 4a. No Further Action serves as a baseline with which to compare other alternatives per CERCLA regulations. No action will be taken to meet the response objectives stated in Section 5 of the FS Report.

3.2.1.2 Description of Limited Removal Components for Alternative 4a.

Mobilization/demobilization. Excavation and backfill equipment including backhoes, frontend loaders, and dump trucks would be mobilized to AOC 11 to remove surface debris and transport it to the Consolidation Landfill. There would be minimal disruption to AOC 11. Clearing is not anticipated and no roads would be constructed.

Excavation of debris and transportation to AOC 9. Excavation at AOC 11 would be limited to surface debris and refuse, and know surface soil "hot spots". The 2+ acres of level area and the 10-foot banking along the south wetlands have exposed refuse including large pieces of metal, wood, bricks, and other construction debris. Clearing the landfill surfaces of trees and brush would be minimal. Individual protruding debris items would be removed by excavators of appropriate size, and hauled by truck to the Consolidation Landfill. Silt fences may be installed along the wetlands, to be removed after construction. No change in the wetlands footprint would result after the landfill banking was regraded and revegetated. Disturbed wetlands would be cleared of construction materials and left for natural revegetation.

Backfilling site. The excavated/disturbed areas of AOC 11 would be backfilled with vegetative soil and graded.

Site restoration. The site would then be restored by seeding, mulching, and fertilizing the disturbed areas. Wetlands would be left for natural revegetation.

3.2.1.3 Description of Excavate and Consolidate AOCs 9 and 40, and SA 13 Components for Alternative 4a.

Mobilization/demobilization. Excavation and backfill equipment including backhoes, bulldozers, and rollers would be mobilized at AOC 9, AOC 40, and SA 13. Additional sediment removal equipment requiring mobilization at AOC 40 includes an excavator or a clamshell crane, watertight dump trucks, and water storage tanks.

Site Preparation. Initial activities at AOC 9, AOC 40, and SA 13 would be some clearing of trees, constructing temporary access roads, and installing silt fences and erosion control measures. Contractor trailers with utilities would be established, and parking and staging areas prepared.

At AOC 40, Cold Spring Brook Landfill, drum removal would be attempted by hydraulic excavator or backhoe from the landfill surface. Some tree removal and minor regrading of the landfill surface may be needed to accomplish this task. Sediment removal from sediment Area I would also be attempted from the landfill surface. The most direct access to sediment Area I from Patton Road would be to cross the landfill east of well CSM-93-01A. However, the landfill surface is relatively high in this area and it may not be possible to reach the entire sediment removal area. As an alternative, approaching the sediment removal area via a more easterly route may make sense. The pond bank is lower and the debris/rubble would provide a relatively firm foundation for excavation equipment. Even with this approach, construction of up to 200 feet of temporary road along the edge of the pond/landfill may be necessary. A third alternative would be to construct approximately 500 feet of temporary access road along the northwestern side of the landfill. Construction of either access road would likely require placement of a geotextile mat and significant quantities of gravel over the naturally occurring peat to support heavy equipment. Construction of the longer road would also require removal of a number of trees. As indicated in Figure 8-3 of the FS Report, it may be possible to construct the road along the northwest edge of the landfill without crossing wetland areas. However, this would need to be confirmed. The cost estimates for sediment removal at Area I are based on construction and subsequent removal of 200 feet of temporary access road.

Prior to excavation at sediment Area II near the outlet of Cold Spring Brook Pond, some fill material may need to be placed along the bank of the pond to provide a level platform for equipment. Access would be from Patton Road east of the pond. For cost estimating purposes, it is assumed that gravel would be obtained onsite from the southern side of Patton Road to construct the work platforms and access roads. If this gravel cannot be used, material costs would increase. These access roads would be temporary, and would

be removed following completion of remedial activities at the landfill. The cost estimate includes removal of temporary roads or work platforms at Area II.

Construction of a lined basin for dewatering sediment, a lined drum storage area for staging drums, small decontamination pads, a stockpile area approximately 1 acre in size for cover system materials, and a small parking area would be required.

Partial dewatering of Cold Spring Brook Pond may be required prior to debris excavation.

Sediment removal and disposal at AOC 40 Sediment removal is proposed at AOC 40 for two hot spot locations producing elevated ecological risks due to arsenic and lead contamination in Cold Spring Brook Pond. The first location (Area I) is a small inlet east of monitoring well CSB-2 (see Figure 8-3 of the FS Report). The second location (Area II) is at the pond outlet. For cost estimating purposes, the volume of sediment to be removed has been estimated to be 1,200 cy.

A silt fence or a floating boom weighted at its bottom would be placed around the two excavation areas to prevent sediment suspended during excavation from migrating to other locations in the pond. Sediment removal would be attempted by a long-stick hydraulic excavator or a crane with a watertight clamshell bucket to minimize the quantity of water and sediment spilling adjacent to the excavation. If access from the top of the landfill is not successful, a temporary access road would be constructed along the northern side of the landfill, and sediment would be removed with an excavator. Sediment would be placed in watertight dump trucks and transported to a lined dewatering basin constructed as close to the landfill area as practicable. For cost estimating purposes, the lined dewatering basin is proposed to be 100 x 100 feet with a 4-foot depth, constructed with an impervious liner to temporarily store sediment and water.

As the sediment settles out, the supernatant water would be pumped into tanks and sampled. If analysis shows that the water will not cause Cold Spring Brook Pond to exceed Ambient Water Quality Criteria (AWQC), it would be discharged back to the pond. If water quality does not meet acceptable criteria, it would be treated onsite in a mobile clarifier before discharge to the pond. Sediments would be disposed at the Consolidation Landfill. The addition of a sorbent or solidifying agent may be necessary to eliminate free water prior to transport and disposal. For cost estimating purposes, treatment of supernatant water is assumed.

Drum removal and disposal at AOC 40. At AOC 40, 14 55-gallon drums along the northern edge of Cold Spring Brook Landfill would be removed. Drums are located on the landfill bank, as well as partially submerged in the pond (see Figure 8-3 of the FS

Report). Drum removal would be attempted with a backhoe or hydraulic excavator working from cleared areas on top of the landfill.

Drums with contents would be lifted manually or by means of a sling, and overpacked into 85-gallon drums. These drums would then be removed and staged on a lined, bermed, onsite staging area approximately 400 square feet in size. Drum contents would be sampled and analyzed for toxicity Characteristic Leaching Procedure (TCLP) constituents following drum staging. After TCLP results are obtained, the drums would be disposed at the Consolidation Landfill or an offsite RCRA Treatment, Storage, or Disposal (TSD) facility. Empty drums would be placed in polybags and taken to the Consolidation Landfill.

Debris Excavation, Backfill, and Regrading at AOCs 9 and 40, and at SA 13. A total debris volume of approximately 232,000 cy will be generated by excavation from AOC 9 (112,000 cy), AOC 40 (110,000 cy), and SA 13 (10,000 cy). The basis of the debris volumes is presented in Appendix B of the FS Report. The estimated volumes are founded on observations made during test pit/trench excavations.

Debris will be removed with excavators with the possible necessity of specialized equipment for AOC 40, due to the steep slopes at these areas. Erosion control measures will be used at all excavations, especially those adjacent to wetlands, to prevent impacts to surrounding areas. These measures may include silt fences, hay bales, and polystyrene covers for soil piles left onsite during excavation.

During excavations, debris will be screened to identify and segregate material that is potentially hazardous. First, an experienced professional would visually scan excavated debris, and arrange separation of materials that appear potentially hazardous. Potentially hazardous materials could include containers, drums, and stained or odorous soil. Segregation would also be determined using readings from field instruments such as a photoionization detector. Following segregation, samples would be collected from the soil that is mixed with the debris. An onsite laboratory would be used to measure volatile and semi-volatile organic compounds, inorganics, polychlorinated biphenyls, pesticides, and total petroleum hydrocarbons. An offsite laboratory analysis would be used to confirm onsite laboratory results. The TCLP will be used to determine whether segregated materials are hazardous. Onsite laboratory results will be compared to theoretical TCLP criteria. If onsite results are greater than TCLP criteria, samples will be sent offsite for analysis. If offsite TCLP results exceed regulatory limits, the associated materials will be disposed offsite in a licensed, hazardous waste disposal facility. The screening process is summarized in Figure 3-1.

Subsequent to debris removal, the excavations at AOC 9 and SA 13 will be backfilled and regraded to blend with surrounding topography. AOC 40 will be backfilled to match a 2:1 slope from Patton Road down to Cold Spring Brook Pond. The required backfill will be from an offsite borrow source.

Wetlands Restoration. Remedial activities at AOC 9 and AOC 40 will disturb bordering wetland areas. The areas would be restored in accordance with a Wetland Restoration Specification (WRS) prepared prior to wetland restoration.

At AOC 40, the northern edge of the low-permeability cover system, and the additional length of access road proposed for this alternative would extend beyond the limits of the landfill into Cold Spring Brook Pond. Areas of sediment excavation, temporary access road construction, and ditch excavation at the toe of the cover system would be backfilled and graded, and some areas potentially revegetated. For cost estimating purposes, the extent of wetland restoration associated with landfill capping and sediment removal is assumed to be approximately 1.5 acres. This area would increase to an estimated 2.5 acres of the landfill was excavated for subsequent disposal/consolidation. The WRS would incorporate guidelines from the Massachusetts Wetland Protection Act and Regulations, specifically 310 CMR 10.55. The primary goal of wetland restoration activities at Cold Spring Brook Pond and the surrounding wetland area would be to restore self-sustaining freshwater wetlands in situ (i.e., in the same "footprint" as the altered wetlands).

Restoration of wetlands at Cold Spring Brook Pond would:

- reduce the long-term impacts of activities in and adjacent to the wetlands;
- compensate for losses of wetland habitats;
- restore or replace degraded wetlands; and
- meet state and federal permitting and regulatory guidelines and requirements.

At Cold Spring Brook Pond and the surrounding wetland area, it is anticipated that required wetland restoration would be relatively minor. The areas of sediment excavation within the pond would require backfilling to pre-remediation grade. Restoration in the wetland area on the northwest side of Cold Spring Brook Landfill, where an access road may be placed, would require removal of road materials, backfilling and grading to match the pre-remediation grade, and potentially revegetating the disturbed area.

Based on regulatory guidelines, including 310 CMR 10.55 and wetlands regulations regarding restoration, the WRS should include: careful consideration of Cold Spring Brook Pond hydrology, topography, vegetation, and soil characteristics; evaluation of wetlands functional assessment; examination of regional wetlands replacement literature; consultation with regulatory and technical authorities; and experience with similar wetland restoration projects. This WRS would be prepared in accordance with state and federal technical requirements for wetland alteration. Development of the WRS may depend on terms described in the Interagency Agreement (IAG) between the Army and USEPA (USEPA, 1991). The WRS would include a detailed description of all proposed activities, a discussion of goals based on wetland functional attributes, and a long-term monitoring plan (which would be combined with the proposed biomonitoring).

The goal of wetlands restoration would be to restore the wetland within the same footprint to achieve at a minimum, the same values and functions as determined by the evaluation used to assess the functions and values of the Cold Spring Brook wetland.

It is difficult to estimate the costs of implementing the WRS until it has been developed and approved, and state and federal regulatory requirements are better defined. For cost-estimating purposes of this FS, a cost of $50,000 per acre is assumed for wetland restoration activities, including soil replacement, revegetation, monitoring, and maintenance.

Consolidation of Excavated Debris at Consolidation Landfill. The preferred site for the Consolidation Landfill is an open, sandy borrow area east of Shepley's Hill Landfill (see Figure 8-8 of the FS Report). The site covers approximately 12 acres, bounded on the north by Plow Shop Pond, on the west and south by Shepley's Hill Landfill, and on the east by the Army reservation boundary.

This area was selected because of its large size and favorable location in an area that would have minimal impact on human health. The area is not visible from main roads or public areas, so it would not adversely impact the aesthetic value of the surrounding property. The Shepley's Hill Landfill site is accessible off Carey Street on the former Main Post. However, access to the site would need to be significantly improved for truck traffic, because the current access road is narrow and unpaved. Utilities are not available on site. A drainage swale from the existing landfill crosses the site and would require rerouting and culvert installations to permit facility construction.

Hydrogeology at the Shepley's Hill area has been studied extensively, and much information has been documented in previous reports. A compilation of this data is provided in Appendix E of the FS Report. The data compilation is consistent with the

requirements for a Hydrogeological Study derived in the Massachusetts Solid Waste Regulation (310 CMR 19.104.(3)).

The Consolidation Landfill would be constructed near Shepley's Hill Landfill to accommodate debris from the disposal areas at Devens. Design for construction, operation, and closure of the landfill would be carried out in accordance with the Massachusetts Solid Waste Management Facility Regulations 310 CMR 19.000 Parts I and II. This alternative assumes that the Consolidation Landfill would be constructed prior to excavation at the debris areas.

The conceptual design for the Consolidation Landfill complies with the requirements of 310 CMR 19.110 and 19.112. If this alternative is selected, alternative design components and methodologies to improve performance and/or reduce costs should be evaluated during the design phase.

The cost estimate for this alternative is based on construction of an approximately 7-acre landfill with enough capacity for the estimated 232,000 cy of debris from AOCs 9, 40, and SA 13. For estimating purposes, the daily cover was estimated to be 10 percent of the total volume to be landfilled and the final cover would be 5 feet thick. The total estimated volume, including debris, daily cover, and final cover, would be approximately 315,000 cy.

The conceptual Consolidation Landfill used for cost estimating is, approximately 550 x 550 feet, and has three-horizontal to one-vertical side slopes maximum, 5 percent top slope minimum, and 2 percent bottom slope. The landfill would rise up to approximately 52 feet above existing grade. Figures 8-9 and 8-10 of the FS Report show the plan and cross-sectional views of the Consolidation Landfill, respectively. The basis for the Consolidation Landfill footprint and elevations is presented in Appendix B of the FS Report. A geotechnical evaluation was made for settlement, slope stability under static and seismic conditions, and for geosynthetic-soil interface stability. The geotechnical evaluation is presented in Appendix F of the FS Report.

The conceptual Consolidation Landfill includes a groundwater protection system to: (1) provide an effective hydraulic barrier preventing leachate from reaching groundwater, and (2) to collect landfill leachate for disposal. The groundwater protection system would consist of a composite hydraulic barrier layer (low permeable soil layer and geomembrane), a drainage layer with leachate collection pipes, a buffer soil layer, and a geotextile fabric. The purpose of the fabric is to prevent clogging of the leachate collection soil layers caused by potential migration of fine particles contained within the landfilled debris. The composite hydraulic barrier would consist of 24 inches of compacted soil with a maximum in-place saturated hydraulic conductivity of $1x10^{-7}$ cm/sec, overlain by a 60-mil geomembrane. A 12-inch sand drainage layer is

proposed above the geomembrane. The drainage layer would have a minimum hydraulic conductivity of $1x10^{-2}$ cm/sec with leachate collection pipes spaced 50 feet on center. The sand drainage layer and the leachate collection pipes would provide a high permeability pathway for leachate collection. The 12-inch buffer soil layer above the sand layer would have a minimum hydraulic conductivity of $1x10^{-3}$ cm/sec. Leachate collected in the landfill could be removed by pumping the leachate directly from the leachate collection system into tanker trucks for transport to an approved wastewater treatment facility for disposal.

When debris disposal is complete, the landfill will be closed and a low-permeability cover system constructed. Figure 8-11 of the FS Report shows the groundwater protection and cover system build-up used for cost estimating. A 12-inch minimum subgrade buffer soil will be placed over the debris to prevent penetration of the overlying geomembrane. A 12-inch sand drainage layer with a minimum hydraulic conductivity of $1x10^{-3}$ cm/sec would overlay the geomembrane. An 18-inch common borrow soil with 15-35 percent fines would overlay the drainage soil for moisture retention and protection of the geomembrane against heaving from frost. A geotextile fabric would separate the moisture retention soil layer from the drainage soil layer. The vegetative topsoil layer would be approximately 6 inches cover thick and the moisture retention soil.

Institutional Controls. Institutional controls for the proposed Consolidation Landfill are in the form of land use restrictions for property released by the Army during Fort Devens base closure activities. By preempting residential use, these controls will help limit human exposure. In addition, land use restrictions at AOC 11 would be placed in conformance with 310 CMR 19.141. This would protect potential human receptors from potential future releases to groundwater. These controls would be drafted, implemented and enforced in cooperation with state and local government.

Cover System Monitoring and Maintenance at Consolidation Landfill. Massachusetts Solid Waste Management Regulations (310 CMR 19.142) require the post-closure monitoring period to extend a minimum of 30 years. Proposed cover system monitoring and maintenance at the Consolidation Landfill would consist of conducting annual site inspections, performing needed cover system repairs, and mowing.

Inspections would be conducted to ensure the integrity of the landfill cover system layers, surface water diversion trenches, monitoring wells, access roads, and the general site conditions. Required maintenance activities would be proposed and conducted based on information from site inspections.

Groundwater monitoring is proposed to confirm that groundwater quality will remain acceptable over time. One upgradient and three downgradient monitoring wells are assumed for cost estimating. All monitoring wells would be sampled and analyzed semi-

annually consistent with the monitoring requirements of 310 CMR 19.132 for a minimum of 30 years. Assumptions made for this monitoring plan are for cost estimating purposes only. A final detailed monitoring plan would be developed in conjunction with regulatory agency review and comment.

Five-year Site Reviews. Under CERCLA 121c, any remedial action (or lack thereof) that results in contaminants remaining onsite must be reviewed at least every five years. Data collected during the groundwater monitoring program would provide information for these reviews. The reviews would evaluate whether Alternative 4a is protective of human health and the environment and whether additional remedial actions should be initiated.

3.2.2 Detailed Evaluation of Alternative 4a

The following subsections present an assessment of Alternative 4a according to USEPA's evaluation criteria.

3.2.2.1 Overall Protection of Human Health and the Environment The following paragraphs assess how the proposed actions of this alternative would provide protection of human health and the environment.

SA 6. Potential human health and environmental risks have not been evaluated in a Preliminary Risk Evaluation (PRE) or baseline risk assessment. However, there is no reason to expect unacceptable risk to human health and the environment at SA 6. Therefore, this alternative is considered to provide protection of human health and the environment at SA 6.

AOC 9. This alternative would provide protection of human health and the environment by excavating landfill materials and then disposing of them at the consolidation facility. This would prevent potential future exposure to surface soil and sediment and would prevent potential future releases from landfill debris to groundwater. However, moving the landfill debris to a consolidation facility would transfer the risk of potential release to another location. However, it is the Army's interpretation that there is no significant risk to human health and the environment posed by environmental contamination at AOC 9. Therefore, the risk reduction benefit from excavating and consolidating AOC 9 is considered low.

AOC 11. Removal and disposal of surface debris would remove potential physical hazards to occasional site visitors. Removed surface debris would be disposed of at the consolidation facility. Because the consolidation facility would be lined, disposal at the consolidation facility is protective. However, because potential human health risks at AOC 11 were within or below the USEPA target values, the human health risk reduction

benefit is considered low. Surface soil ecological risks will be addressed by removal of known surface soil "hot spots".

SA 12. This alternative would enhance protection of human health. However, interpreted environmental risks would not be addressed.

SA 13. This alternative would provide protection of human health and the environment by excavating landfill materials and disposing of them at the consolidation facility. This would prevent potential future exposure to surface soil and sediment and would prevent potential future release from landfill debris to groundwater. However, moving the landfill debris to a separate consolidation facility would transfer the risk of potential releases to another location.

AOC 40. This alternative achieves an acceptable level of risk for human and ecological receptors. The drum and sediment removal components of this alternative would provide the same protectiveness as those alternatives, which include capping AOC 40. This alternative would prevent potential future release from landfill debris to groundwater and Cold Spring Brook Pond sediment by excavating soil and debris from the Cold Spring Brook Landfill, and disposing them in the Consolidation Landfill. However, relocating landfill debris to a separate consolidation facility would transfer the risk of potential releases to another location.

AOC 41. This alternative would enhance protection of human health and the environment.

3.2.2.2 Compliance with ARARs. Tables 3-1, 3-2, and 3-3 summarize how Alternative 4a will attain Applicable or Relevant and Appropriate Requirements (ARARs).

3.2.2.3 Long-term Effectiveness and Permanence. The following paragraphs assess the long-term effectiveness and permanence of the proposed actions of this alternative.

SA 6. Because there is no reason to expect risks to human health, this alternative provides long-term effectiveness for protecting human health and environment at SA 6.

AOC 9. Excavation of landfill debris would effectively prevent human and ecological exposure and would prevent the landfill from being a potential source of future groundwater contamination. The effectiveness of the consolidation facility at isolating landfill debris would depend on the quality of construction and proper maintenance of cover and leachate collection systems. Landfills that include groundwater protection systems with leachate collection, cover systems, and long-term monitoring and maintenance have a history of effectively isolating wastes from the environment.

AOC 11. Removal of surface debris would provide long-term and effective protection from existing physical hazards. The proposed action would not limit infiltration of precipitation with the potential benefit of reducing contaminant leaching. Portions of the landfill are subject to periodic flooding by the Nashua River which could expose currently buried debris, possibly transport it to new locations, and present new exposure hazards or pathways. USEPA would be responsible for future long-term monitoring at AOC 11.

SA 12. This alternative would enhance long-term effectiveness at protecting human health. However, long-term environmental protection would not be addressed.

SA 13. Excavation of landfill debris would effectively prevent human and ecological exposure and would prevent the landfill from being a potential source of future groundwater contamination. The effectiveness of the consolidation facility at isolating landfill debris would depend on the quality of construction and proper maintenance of cover and leachate collection systems. Landfills that include groundwater protection systems with leachate collection, cover systems, and long-term monitoring and maintenance have a history of effectively isolating wastes from the environment.

AOC 40. Removal of the landfill as a potential source of future groundwater contamination, and removal of hot spot sediments and drums would effectively prevent human and ecological exposure. The effectiveness of the consolidation facility at isolating Cold Spring Brook Landfill debris would depend on the quality of construction and proper maintenance of cover and leachate collection systems. Landfills that include groundwater protection systems with leachate collection, cover systems, and long-term monitoring and maintenance have a history of effectively isolating wastes from the environment.

AOC 41. This alternative would enhance long-term effectiveness at protecting human health and the environment.

3.2.2.4 Reduction of Toxicity, Mobility, and Volume Through Treatment. The following paragraphs assess the reduction of toxicity, mobility, and volume of contaminants through treatment offered by the proposed actions of this alternative.

SAs 6, 12, and AOC 41. This alternative would not use removal, containment, or treatment processes to address contamination at this site. No reduction of toxicity, mobility, or volume of contaminants through treatment would occur. This alternative would not satisfy the statutory preference for treatment as a component of remedial actions.

AOC 9. Reduction of toxicity, mobility, or volume of landfill contaminants through treatment would not be achieved. By removing landfill debris, the potential for leaching of landfill materials and contamination of groundwater would be reduced. No reduction of toxicity, mobility, or volume of groundwater contaminants would be achieved. Disposal of excavated landfill debris at a consolidation facility with low permeability liner, leachate collection, and low permeability cover would reduce contaminant mobility.

AOC 11. . Reduction of toxicity, mobility, or volume of contaminants through treatment would not be achieved. Removal of surface debris would reduce waste volume at AOC 11; this volume would be transferred to another disposal site.

SA 13. Reduction of toxicity, mobility, or volume of landfill contaminants through treatment would not be achieved. By removing landfill debris, the potential for leaching of landfill materials and contamination of groundwater would be reduced. No reduction of toxicity, mobility, or volume of groundwater contaminants would be achieved. Disposal of excavated landfill debris at a consolidation facility with low permeability liner, leachate collection, and low permeability cover would reduce contaminant mobility.

AOC 40. Reduction of toxicity, mobility, or volume of landfill contaminants through treatment would not be achieved. By removing landfill debris, the potential for leaching of landfill materials and contamination of groundwater would be reduced. No reduction of toxicity, mobility, or volume of groundwater contaminants would be achieved. Sediment and drum removal would not reduce the toxicity or volume of associated contaminants. Disposal of excavated landfill debris, drums, and dewatered sediments at a consolidation facility with low permeability liner, leachate collection, and low permeability cover would reduce contaminant mobility.

3.2.2.5 Short-term Effectiveness. The following paragraphs assess the short-term effectiveness of the actions proposed at each of the landfills.

SAs 6, 12, and AOC 41. This alternative would not provide any remedial actions. Therefore, no short-term risks to the community or environment would result from implementation.

AOC 9. This alternative is expected to present minimal risks to workers, the community, and the environment. Transportation of excavated materials would be planned to avoid creating traffic congestion and hazards to the community.

Available information does not suggest the presence of hazardous substances, which would present a risk to workers during excavation. Worker adherence to general health and safety practices, and use of personnel monitoring would reduce potential exposure to

potentially hazardous substances to a safe level. Excavation of landfilled debris and construction of the consolidation facility could generate dust. Dust suppression techniques would reduce potential risk to workers and the community.

AOC 11. This alternative would be expected to present minimal short-term risks to workers, the community, and the environment. Risk to the community would be minimal because residences are not close enough to the site to be impacted by noise or dust potentially generated from debris removal activities. It is anticipated that debris removal activities can be planned to avoid creating traffic congestion and hazards. Exposure to potentially contaminated soil and debris could be reduced to a safe level by worker adherence to general health and safety practices, and use of personnel monitoring during any intrusive activities at the landfill.

SA 13. This alternative is expected to present minimal risks to workers, the community, and the environment. Transportation of excavated materials would be planned to avoid creating traffic congestion and hazards to the community.

Available information does not suggest the presence of hazardous substances, which would present a risk to workers during excavation. Worker adherence to general health and safety practices, and use of personnel monitoring would reduce potential exposure to potentially hazardous substances to a safe level. Excavation of landfilled debris and construction of the consolidation facility could generate dust. Dust suppression techniques would reduce potential risk to workers and the community.

AOC 40. This alternative is expected to present minimal risks to workers, the community, and the environment. Transportation of excavated materials would be planned to avoid creating traffic congestion and hazards to the community. To further protect the community, traffic on Patton Road could be rerouted during removal of soil and debris from the Cold Spring Brook Landfill. Handling and transportation of any hazardous materials would be conducted according to Resource Conservation and Recovery Act (RCRA) and Department of Transportation (DOT) regulations to protect workers and the community.

Available information does not suggest the presence of hazardous substances that would present a risk to workers during excavation. Worker adherence to general health and safety practices, and use of personnel monitoring would reduce potential exposure to potentially hazardous substances to a safe level. Excavation of landfilled debris and construction of the consolidation facility could generate dust. Dust suppression techniques would reduce potential risk to workers and the community.

Excavation activities at the Cold Spring Brook Landfill would be conducted to minimize adverse affects on the environment. Excavation would be conducted to minimize pond water entering the excavation. In addition, stormwater runoff and groundwater flow into the excavation would be controlled to minimize the quantity of sediment and contaminants entering the pond. Construction of the temporary access road along the northwest toe of the landfill may adversely affect the environment, but wetland restoration activities would minimize any permanent effect. The consolidation facility would be located and constructed according to regulations to minimize adverse affects on the environment.

3.2.2.6 Implementability. The following paragraphs assess the implementability of the actions proposed at each of the landfills.

SAs 6, 12, and AOCs 11, 41. This alternative would be easy to implement and would not limit or interfere with the ability to perform future remedial actions.

AOC 9. Debris excavation, landfill construction, and offsite disposal can be accomplished using standard construction procedures and conventional earthmoving equipment, and many engineering and construction companies are qualified and available. Successful implementation of this alternative is contingent on the approval and construction of a consolidation facility to accept the excavated debris. The consolidation facility would be constructed and maintained to effectively isolate debris excavated from AOC 9. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions at AOC 9.

All activities to excavate AOC 9 would be conducted onsite, and permits would not be required. Design, construction, operation, closure, and post-closure monitoring and maintenance of the consolidation facility would be conducted according to the technical requirements of Massachusetts 310 CMR 19.000.

Consolidation of this disposal area with others reduces the administrative burden and complexity of implementing the long-term monitoring and maintenance requirements of 310 CMR 19.000 at separate disposal areas.

SA 13. Debris excavation, landfill construction, and offsite disposal can be accomplished using standard construction procedures and conventional earthmoving equipment, and many engineering and construction companies are qualified and available. Successful implementation of this alternative is contingent on the approval and construction of a consolidation facility to accept the excavated debris. The consolidation facility would be constructed and maintained to effectively isolate debris excavated from SA 13. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions at SA 13.

All activities to excavate SA 13 would be conducted onsite, and permits would not be required. Design, construction, operation, closure, and post-closure monitoring and maintenance of the consolidation facility would be conducted according to the technical requirements of Massachusetts 310 CMR 19.000.

Consolidation of this disposal area with others reduces the administrative burden and complexity of implementing the long-term monitoring and maintenance requirements of 310 CMR 19.000 at separate disposal areas.

AOC 40. Equipment required to excavate and handle sediment, remove and handle 55-gallon drums and potentially construct a temporary access road at the Cold Spring Brook Landfill is conventional in nature, and contractors are readily available. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions.

Discarded 55-gallon drums would be disposed of at the Consolidation Landfill or at an offsite TSD facility if drum contents displayed hazardous characteristics. Sediment would require dewatering to eliminate free water prior to disposal at the Consolidation Landfill. Some sediments may exhibit hazardous characteristics, and would require disposal at a licensed landfill or incinerator. Offsite services should have sufficient capacity for the relatively small volume of sediments requiring disposal.

According to the National Contingency Plan (NCP), no federal, state, or local permits are required for onsite response actions conducted pursuant to CERCLA, although coordination with review agencies is recommended. Because remedial actions for this alternative will be conducted onsite, permits would not be required for sediment dredging or discharge of water from dewatered sediment to Cold Spring Brook Pond. However, consultation with the local conservation commission in accordance with Massachusetts Wetlands Protection Regulations (310 CMR 10.000) may be required prior to constructing an access road at the northwestern toe of the landfill. In addition, dredging of sediment in Cold Spring Brook Pond will have to be done in accordance with the technical requirements of the Massachusetts Water Quality Certification for Dredging (314 CMR 9.00).

Debris excavation, landfill construction, and offsite disposal can be accomplished using standard construction procedures and conventional earthmoving equipment, and many engineering and construction companies are qualified and available. Successful implementation of this alternative is contingent on the approval and construction of a consolidation facility to accept the excavated debris. The consolidation facility would be constructed and maintained to effectively isolate Cold Spring Brook Landfill debris.

Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions at Cold Spring Brook Landfill.

All activities to excavate Cold Spring Brook Landfill for this alternative would be conducted onsite, and permits would not be required. At the Cold Spring Brook Landfill, stormwater runoff would be controlled to minimize the quantity of sediments and contaminants entering the pond. Design, construction, operation, closure, and post-closure monitoring and maintenance of the consolidation facility would be conducted according to the technical requirements of Massachusetts 310 CMR 19.000.

Consolidation of this disposal area with others reduces the administrative burden and complexity of implementing the long-term monitoring and maintenance requirements of 310 CMR 19.000 at separate disposal areas.

3.2.2.7 Cost. The cost estimate for Alternative 4a includes estimates of direct and indirect capital costs and operation and maintenance (O&M) costs. Direct capital costs included for this alternative include site preparation, sediment and debris excavation, drum removal, and site restoration. A contingency is included in direct cost items to account for unforeseen project complexities (e.g., adverse weather conditions and inadequate site characterization).

O&M costs include environmental monitoring of groundwater, wetlands, and sediment.

Table 3-4 summarizes the cost estimate for Alternative 4a. The total capital cost (direct plus indirect costs) is estimated to be $16,888,000. O&M costs are estimated to be $56,000 per year.

To enable evaluation costs that would occur over different time periods, the table also includes a present worth analysis. Present worth represents the amount of money that, if invested now and disbursed as needed, would be sufficient to cover all costs associated with the remedial action over its planned life. A discount rate of 7 percent before taxes and after inflation is used as recommended in OSWER Directive 9355.3-20. Unless noted otherwise, costs are based on a 30-year time frame. The estimated total present worth is $17,299,000.

Cost calculations are included in Appendix D of the FS Report. To determine the estimated cost for Alternative 4a, the estimated cost to excavate and consolidate debris from SA 13 was added to the estimated cost for Alternative 4.

3.3 DESCRIPTION AND DETAILED EVALUATION OF ALTERNATIVE 4b

This subsection describes Alternative 4b, evaluates the alternative using USEPA evaluation criteria, and provides a cost estimate.

3.3.1 Description of Alternative 4b: No Further Action under CERCLA at AOC 41, and SAs 6 and 12; limited removal at AOC 11; and excavation of AOCs 9 and 40 and SA 13, with onsite consolidation or offsite disposal

Alternative 4b proposes removal of surface debris from AOC 11, excavating construction/demolition debris from AOC 9, AOC 40, and from SA 13, and either consolidating the debris in a proposed secure landfill at the former Golf Course Driving Range, or disposing the debris in an offsite landfill. At AOC 11, known surface soil "hot spots" will be removed as a CERCLA action. At AOC 41, and at SAs 6 and 12, no further action under CERCLA would be taken. Non-CERCLA actions at SA 12 and AOC 41 would include removal of visible man-made surface debris and removal of known surface soil "hot spots".

Alternative 4b includes removing exposed drums at Cold Spring Brook Landfill (AOC 40) to remove a potential source of contamination, and excavating sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments.

Key components of Alternative 4b include:

<u>No Further Action under CERCLA at AOC 41, SAs 6 and 12</u>

- No action under CERCLA
- Non-CERCLA surface debris and known surface soil "hot spot" removal

<u>Limited Removal at AOC 11</u>

- Mobilization/demobilization;
- Excavation of debris and transportation to either the Consolidation Landfill or an offsite landfill;
- Removal of known surface soil "hot spots"
- Backfilling site; and
- Site restoration.

Excavation and Either Onsite Consolidation or Offsite Disposal of Debris from AOCs 9 and 40, and SA 13

- Mobilization/demobilization;
- AOC 40 sediment removal with disposal either in the Consolidation Landfill or offsite;
- AOC 40 drum removal with disposal either in the Consolidation Landfill or offsite;
- Debris excavation, backfill, and regrading at AOCs 9 and 40, and at SA 13;
- Wetlands restoration;
- Consolidation of excavated debris at Consolidation Landfill or transport to an offsite landfill;
- Institutional controls;
- If required, cover system monitoring and maintenance at Consolidation Landfill; and
- Five-year site reviews;

3.3.1.1 Description of No Further Action Components for Alternative 4b. No Further Action serves as a baseline with which to compare other alternatives per CERCLA regulations. No action will be taken to meet the response objectives stated in Section 5 of the FS Report.

3.3.1.2 Description of Limited Removal Components for Alternative 4b.

Mobilization/demobilization. Excavation and backfill equipment including backhoes, frontend loaders, and dump trucks would be mobilized to AOC 11 to remove and transport surface debris. There would be minimal disruption to AOC 11. Clearing is not anticipated and no roads would be constructed.

Excavation of debris. Excavation at AOC 11 would be limited to surface debris and refuse, and know surface soil "hot spots". The 2+ acres of level area and the 10-foot banking along the south wetlands have exposed refuse including large pieces of metal, wood, bricks, and other construction debris. Clearing the landfill surfaces of trees and brush would be minimal. Individual protruding debris items would be removed by excavators of appropriate size, and hauled by truck to the disposal location. Silt fences may be installed along the wetlands, to be removed after construction. No change in the wetlands footprint would result after the landfill banking was regraded and revegetated. Disturbed wetlands would be cleared of construction materials and left for natural revegetation.

Backfilling site. The excavated/disturbed areas of AOC 11 would be backfilled with vegetative soil and graded.

Site restoration. The site would then be restored by seeding, mulching, and fertilizing the disturbed areas. Wetlands would be left for natural revegetation.

3.3.1.3 Description of Excavate and Dispose AOCs 9 and 40, and SA 13 Components for Alternative 4b.

Mobilization/demobilization. Excavation and backfill equipment including backhoes, bulldozers, and dump trucks would be mobilized at AOC 9, AOC 40, and SA 13. Additional sediment removal equipment requiring mobilization at AOC 40 includes an excavator or a clamshell crane, watertight dump trucks, and water storage tanks.

Site Preparation. Initial activities at AOC 9, AOC 40, and SA 13 would be some clearing of trees, constructing temporary access roads, and installing silt fences and erosion control measures. Contractor trailers with utilities would be established, and parking and staging areas prepared.

At AOC 40, Cold Spring Brook Landfill, drum removal would be attempted by hydraulic excavator or backhoe from the landfill surface. Some tree removal and minor regrading of the landfill surface may be needed to accomplish this task. Sediment removal from sediment Area I would also be attempted from the landfill surface. The most direct access to sediment Area I from Patton Road would be to cross the landfill east of well CSM-93-01A. However, the landfill surface is relatively high in this area and it may not be possible to reach the entire sediment removal area. As an alternative, approaching the sediment removal area via a more easterly route may make sense. The pond bank is lower and the debris/rubble would provide a relatively firm foundation for excavation equipment. Even with this approach, construction of up to 200 feet of temporary road along the edge of the pond/landfill may be necessary. A third alternative would be to construct approximately 500 feet of temporary access road along the northwestern side of the landfill. Construction of either access road would likely require placement of a geotextile mat and significant quantities of gravel over the naturally occurring peat to support heavy equipment. Construction of the longer road would also require removal of a number of trees. As indicated in Figure 8-3 of the FS Report, it may be possible to construct the road along the northwest edge of the landfill without crossing wetland areas. However, this would need to be confirmed. The cost estimates for sediment removal at Area I are based on construction and subsequent removal of 200 feet of temporary access road.

Prior to excavation at sediment Area II near the outlet of Cold Spring Brook Pond, some fill material may need to be placed along the bank of the pond to provide a level platform for equipment. Access would be from Patton Road east of the pond. For cost estimating purposes, it is assumed that gravel would be obtained onsite from the southern side of Patton Road to construct the work platforms and access roads. If this gravel cannot be

used, material costs would increase. These access roads would be temporary, and would be removed following completion of remedial activities at the landfill. The cost estimate includes removal of temporary roads or work platforms at Area II.

Construction of a lined basin for dewatering sediment, a lined drum storage area for staging drums, small decontamination pads, a stockpile area approximately 1 acre in size for cover system materials, and a small parking area would be required.

Partial dewatering of Cold Spring Brook Pond may be required prior to debris excavation.

Sediment removal and disposal at AOC 40 Sediment removal is proposed at AOC 40 for two hot spot locations producing elevated ecological risks due to arsenic and lead contamination in Cold Spring Brook Pond. The first location (Area I) is a small inlet east of monitoring well CSB-2 (see Figure 8-3 of the FS Report). The second location (Area II) is at the pond outlet. For cost estimating purposes, the volume of sediment to be removed has been estimated to be 1,200 cy.

A silt fence or a floating boom weighted at its bottom would be placed around the two excavation areas to prevent sediment suspended during excavation from migrating to other locations in the pond. Sediment removal would be attempted by a long-stick hydraulic excavator or a crane with a watertight clamshell bucket to minimize the quantity of water and sediment spilling adjacent to the excavation. If access from the top of the landfill is not successful, a temporary access road would be constructed along the northern side of the landfill, and sediment would be removed with an excavator. Sediment would be placed in watertight dump trucks and transported to a lined dewatering basin constructed as close to the landfill area as practicable. For cost estimating purposes, the lined dewatering basin is proposed to be 100 x 100 feet with a 4-foot depth, constructed with an impervious liner to temporarily store sediment and water.

As the sediment settles out, the supernatant water would be pumped into tanks and sampled. If analysis shows that the water will not cause Cold Spring Brook Pond to exceed AWQC, it would be discharged back to the pond. If water quality does not meet acceptable criteria, it would be treated onsite in a mobile clarifier before discharge to the pond. Sediments would be disposed either at the Consolidation Landfill or offsite. The addition of a sorbent or solidifying agent may be necessary to eliminate free water prior to transport and disposal. For cost estimating purposes, treatment of supernatant water is assumed.

Drum removal and disposal at AOC 40. At AOC 40, 14 55-gallon drums along the northern edge of Cold Spring Brook Landfill would be removed. Drums are located on the landfill bank, as well as partially submerged in the pond (see Figure 8-3 of the FS

Report). Drum removal would be attempted with a backhoe or hydraulic excavator working from cleared areas on top of the landfill.

Drums with contents would be lifted manually or by means of a sling, and overpacked into 85-gallon drums. These drums would then be removed and staged on a lined, bermed, onsite staging area approximately 400 square feet in size. Drum contents would be sampled and analyzed for TCLP constituents following drum staging. After TCLP results are obtained, the drums would be disposed either at the Consolidation Landfill, or offsite, possibly at a RCRA TSD facility. Empty drums would be placed in polybags and taken either to the Consolidation Landfill, or offiste.

Debris Excavation, Backfill, and Regrading at AOCs 9 and 40, and at SA 13. A total debris volume of approximately 232,000 cy will be generated by excavation from AOC 9 (112,000 cy), AOC 40 (110,000 cy), and SA 13 (10,000 cy). The basis of the debris volumes is presented in Appendix B of the FS Report. The estimated volumes are founded on observations made during test pit/trench excavations.

Debris will be removed with excavators with the possible necessity of specialized equipment for AOC 40, due to the steep slopes at these areas. Erosion control measures will be used at all excavations, especially those adjacent to wetlands, to prevent impacts to surrounding areas. These measures may include silt fences, hay bales, and polystyrene covers for soil piles left onsite during excavation.

During excavations, debris will be screened to identify and segregate material that is potentially hazardous. First, an experienced professional would visually scan excavated debris, and arrange separation of materials that appear potentially hazardous. Potentially hazardous materials could include containers, drums, and stained or odorous soil. Segregation would also be determined using readings from field instruments such as a photoionization detector. Following segregation, samples would be collected from the soil that is mixed with the debris. An onsite laboratory would be used to measure volatile and semi-volatile organic compounds, inorganics, polychlorinated biphenyls, pesticides, and total petroleum hydrocarbons. An offsite laboratory analysis would be used to confirm onsite laboratory results. The TCLP will be used to determine whether segregated materials are hazardous. Onsite laboratory results will be compared to theoretical TCLP criteria. If onsite results are greater than TCLP criteria, samples will be sent offsite for analysis. If offsite TCLP results exceed regulatory limits, the associated materials will be disposed offsite in a licensed, hazardous waste disposal facility. The screening process is summarized in Figure 3-1.

Subsequent to debris removal, the excavations at AOC 9 and SA 13 will be backfilled and regraded to blend with surrounding topography. AOC 40 will be backfilled to match a 2:1

slope from Patton Road down to Cold Spring Brook Pond. The required backfill will be from an offsite borrow source.

Wetlands Restoration. Remedial activities at AOC 9 and AOC 40 will disturb bordering wetland areas. The areas would be restored in accordance with WRS prepared prior to wetland restoration.

At AOC 40, the northern edge of the low-permeability cover system, and the additional length of access road proposed for this alternative would extend beyond the limits of the landfill into Cold Spring Brook Pond. Areas of sediment excavation, temporary access road construction, and ditch excavation at the toe of the cover system would be backfilled and graded, and some areas potentially revegetated. For cost estimating purposes, the extent of wetland restoration associated with landfill capping and sediment removal is assumed to be approximately 1.5 acres. This area would increase to an estimated 2.5 acres if the landfill was excavated for subsequent disposal/consolidation. The WRS would incorporate guidelines from the Massachusetts Wetland Protection Act and Regulations, specifically 310 CMR 10.55. The primary goal of wetland restoration activities at Cold Spring Brook Pond and the surrounding wetland area would be to restore self-sustaining freshwater wetlands in situ (i.e., in the same "footprint" as the altered wetlands).

Restoration of wetlands at Cold Spring Brook Pond would:

- reduce the long-term impacts of activities in and adjacent to the wetlands;
- compensate for losses of wetland habitats;
- restore or replace degraded wetlands; and
- meet state and federal permitting and regulatory guidelines and requirements.

At Cold Spring Brook Pond and the surrounding wetland area, it is anticipated that required wetland restoration would be relatively minor. The areas of sediment excavation within the pond would require backfilling to pre-remediation grade. Restoration in the wetland area on the northwest side of Cold Spring Brook Landfill, where an access road may be placed, would require removal of road materials, backfilling, and grading to match the pre-remediation grade, and potentially revegetating the disturbed area.

Based on regulatory guidelines, including 310 CMR 10.55 and wetlands regulations regarding restoration, the WRS should include: careful consideration of Cold Spring Brook Pond hydrology, topography, vegetation, and soil characteristics; evaluation of wetlands functional assessment; examination of regional wetlands replacement literature; consultation with regulatory and technical authorities; and experience with similar wetland restoration projects. This WRS would be prepared in accordance with state and federal technical requirements for wetland alteration. Development of the WRS may depend on terms described in the IAG between the Army and USEPA (USEPA, 1991). The WRS would include a detailed description of all proposed activities, a discussion of goals based on wetland functional attributes, and a long-term monitoring plan (which would be combined with the proposed biomonitoring).

The goal of wetlands restoration would be to restore the wetland within the same footprint to achieve at a minimum, the same values and functions as determined by the evaluation used to assess the functions and values of the Cold Spring Brook wetland.

It is difficult to estimate the costs of implementing the WRS until it has been developed and approved, and state and federal regulatory requirements are better defined. For cost-estimating purposes of this FS, a cost of $50,000 per acre is assumed for wetland restoration activities, including soil replacement, revegetation, monitoring, and maintenance.

Disposal Option One: Consolidation of Excavated Debris at Consolidation Landfill. The Consolidation Landfill would be constructed at the Former Golf Course Driving Range. The site is described in Subsection 2.1 and Appendix B of this report. Design for construction, operation, and closure of the landfill would be carried out in accordance with the Massachusetts Solid Waste Management Facility Regulations 310 CMR 19.000 Parts I and II. This alternative assumes that the Consolidation Landfill would be constructed prior to excavation at the debris areas.

The conceptual design for the Consolidation Landfill complies with the requirements of 310 CMR 19.110 and 19.112. If this alternative is selected, alternative design components and methodologies to improve performance and/or reduce costs should be evaluated during the design phase.

The cost estimate for this alternative is based on construction of an approximately 11-acre landfill with enough capacity for the estimated 232,000 cy of debris from AOCs 9, 40, and SA 13. For estimating purposes, the daily cover was estimated to be 10 percent of the total volume to be landfilled and the final cover would be 5 feet thick. The total estimated volume, including debris, daily cover, and final cover, would be approximately 344,000 cy.

The conceptual Consolidation Landfill used for cost estimating has three-horizontal to one-vertical side slopes maximum, 5 percent top slope minimum, and 2 percent bottom slope. The landfill would rise up to approximately 32 feet above existing grade. Figure 2-1 shows a cross-sectional view of the Consolidation Landfill

A preliminary geotechnical evaluation concluded that subsurface settlement after construction of the proposed landfill at the Former Golf Course Driving Range would be two inches or less. The settlement evaluation, similar to that performed for the area near Shepley's Hill Landfill (see Appendix F to the FS Report), used information from the site subsurface boring investigation conducted in June 1998. A conceptual, elevation view of the proposed landfill design is shown in Figure 3-2.

The conceptual Consolidation Landfill includes a groundwater protection system to: (1) provide an effective hydraulic barrier preventing leachate from reaching groundwater and (2) to collect landfill leachate for disposal. The groundwater protection system would consist of a composite hydraulic barrier layer (low permeable soil layer and geomembrane), a drainage layer with leachate collection pipes, a buffer soil layer, and a geotextile fabric. The purpose of the fabric is to prevent clogging of the leachate collection soil layers caused by potential migration of fine particles contained within the landfilled debris. The composite hydraulic barrier would consist of 24 inches of compacted soil with a maximum in-place saturated hydraulic conductivity of $1x10^{-7}$ cm/sec, overlain by a 60-mil geomembrane. A 12-inch sand drainage layer is proposed above the geomembrane. The drainage layer would have a minimum hydraulic conductivity of $1x10^{-2}$ cm/sec with leachate collection pipes spaced 50 feet on center. The sand drainage layer and the leachate collection pipes would provide a high permeability pathway for leachate collection. The 12-inch buffer soil layer above the sand layer would have a minimum hydraulic conductivity of $1x10^{-3}$ cm/sec. Leachate collected in the landfill could be removed by pumping the leachate directly from the leachate collection system into tanker trucks for transport to an approved wastewater treatment facility for disposal.

When debris disposal is complete, the landfill will be closed and a low-permeability cover system constructed. Figure 8-11 of the FS Report shows the groundwater protection and cover system build-up used for cost estimating. A 12-inch minimum subgrade buffer soil will be placed over the debris to prevent penetration of the overlying geomembrane. A 12-inch sand drainage layer with a minimum hydraulic conductivity of $1x10^{-3}$ cm/sec would overlay the geomembrane. An 18-inch common borrow soil with 15-35 percent fines would overlay the drainage soil for moisture retention and protection of the geomembrane against heaving from frost. A geotextile fabric would separate the moisture retention soil layer from the drainage soil layer. The vegetative topsoil layer would be approximately 6 inches cover thick and the moisture retention soil.

Disposal Option Two: Disposal of Excavated Debris at an Offsite Landfill. Excavated debris that has been screened for hazardous materials will be loaded into trucks or intermodal boxes for transport. For purposes of FS evaluation, it is assumed that dump trucks will be used. Covered debris will be transported via truck to a rail siding. For purposes of FS evaluation, it is assumed that the existing rail siding at Devens will be used. The remedial action contractor could elect to transport debris to a rail siding located offsite, if it was determined to be a more cost-effective option.

At the rail siding, debris would be transferred to rail cars. For purposes of FS evaluation, it is assumed that a ramp will be constructed at the siding, allowing direct-loading of debris from trucks into waiting rail (gondola) cars. Alternately, debris could be placed from the transport trucks onto a paved area adjacent to the rail, then transferred into gondola cars using a front-end loader.

Debris would be transported via rail to the offsite landfill. Debris disposal could be at one or multiple solid waste disposal facilities. Travel route and distance would be determined by the rail service provider, and would be largely dependent on disposal facility location. The frequency of rail traffic would be dependent on availability of rail cars and number of rail cars in the train.

Because of the numerous options available for debris transport and disposal via rail, several waste disposal contractors were contacted for information. Contractor responses contained descriptions of general approaches to each element of the work, and associated cost ranges. For purposes of FS evaluation, costs for offsite debris transport and disposal were determined from these responses.

Institutional Controls. Institutional controls for the proposed Consolidation Landfill are in the form of land use restrictions for property released by the Army during Fort Devens base closure activities. By preempting residential use, these controls will help limit human exposure. In addition, land use restrictions at AOC 11 would be placed in conformance with 310 CMR 19.141. This would protect potential human receptors from potential future releases to groundwater. These controls would be drafted, implemented, and enforced in cooperation with state and local government.

Cover System Monitoring and Maintenance at Consolidation Landfill. Massachusetts Solid Waste Management Regulations (310 CMR 19.142) require the post-closure monitoring period to extend a minimum of 30 years. Proposed cover system monitoring and maintenance at the Consolidation Landfill would consist of conducting annual site inspections, performing needed cover system repairs, and mowing.

Inspections would be conducted to ensure the integrity of the landfill cover system layers, surface water diversion trenches, monitoring wells, access roads, and the general site conditions. Required maintenance activities would be proposed and conducted based on information from site inspections.

Groundwater monitoring is proposed to confirm that groundwater quality will remain acceptable over time. One upgradient and three downgradient monitoring wells are assumed for cost estimating. All monitoring wells would be sampled and analyzed semi-annually consistent with the monitoring requirements of 310 CMR 19.132 for a minimum of 30 years. Assumptions made for this monitoring plan are for cost estimating purposes only. A final detailed monitoring plan would be developed in conjunction with regulatory agency review and comment.

Five-year Site Reviews. Under CERCLA 121c, any remedial action (or lack thereof) that results in contaminants remaining onsite must be reviewed at least every five years. Data collected during the groundwater monitoring program would provide information for these reviews. The reviews would evaluate whether onsite consolidation is protective of human health and the environment and whether additional remedial actions should be initiated.

3.3.2 Detailed Evaluation of Alternative 4b

The following subsections present an assessment of Alternative 4b according to USEPA's evaluation criteria.

3.3.2.1 Overall Protection of Human Health and the Environment. The following paragraphs assess how the proposed actions of this alternative would provide protection of human health and the environment.

SA 6. Potential human health and environmental risks have not been evaluated in a PRE or baseline risk assessment. However, there is no reason to expect unacceptable risk to human health and the environment at SA 6. Therefore, this alternative is considered to provide protection of human health and the environment at SA 6.

AOC 9 This alternative would provide protection of human health and the environment by excavating landfill materials and then disposing of them at the consolidation facility or offsite. This would prevent potential future exposure to surface soil and sediment and would prevent potential future releases from landfill debris to groundwater. However, moving the landfill debris would transfer the risk of potential release to another location. However, it is the Army's interpretation that there is no significant risk to human health

and the environment posed by environmental contamination at AOC 9. Therefore, the risk reduction benefit from excavating and consolidating AOC 9 is considered low.

AOC 11. Removal and disposal of surface debris would remove potential physical hazards to occasional site visitors. Removed surface debris would be disposed of at the consolidation facility or offsite. Because the consolidation facility or offsite landfill would be lined, disposal at the consolidation facility or offsite landfill is protective. However, because potential human health risks at AOC 11 were within or below the USEPA target values, the human health risk reduction benefit is considered low. Surface soil ecological risks will be addressed by removal of known surface soil "hot spots".

SA 12. This alternative would enhance protection of human health. However, interpreted environmental risks would not be addressed.

SA 13. This alternative would provide protection of human health and the environment by excavating landfill materials and disposing them at the consolidation facility or offsite. This would prevent potential future exposure to surface soil and sediment and would prevent potential future release from landfill debris to groundwater. However, moving the landfill debris would transfer the risk of potential release to another location.

AOC 40. This alternative achieves an acceptable level of risk for human and ecological receptors. The drum and sediment removal components of this alternative would provide the same protectiveness as those alternatives, which include capping AOC 40. This alternative would prevent potential future release from landfill debris to groundwater and Cold Spring Brook Pond sediment by excavating soil and debris from the Cold Spring Brook Landfill, and disposing them in the Consolidation Landfill or offsite. However, relocating landfill debris would transfer the risk of potential release to another location.

AOC 41. This alternative would enhance protection of human health and the environment.

3.3.2.2 Compliance with ARARs. Tables 3-1, 3-2, and 3-3 summarize how Alternative 4b will attain ARARs.

3.3.2.3 Long-term Effectiveness and Permanence. The following paragraphs assess the long-term effectiveness and permanence of the proposed actions of this alternative.

SA 6. Because there is no reason to expect risks to human health, this alternative provides long-term effectiveness for protecting human health and environment at SA 6.

AOC 9. Excavation of landfill debris would effectively prevent human and ecological exposure and would prevent the landfill from being a potential source of future groundwater contamination. The effectiveness of the consolidation facility or the offsite landfill at isolating landfill debris would depend on the quality of construction and proper maintenance of cover and leachate collection systems. Landfills that include groundwater protection systems with leachate collection, cover systems, and long-term monitoring and maintenance have a history of effectively isolating wastes from the environment.

AOC 11. Removal of surface debris would provide long-term and effective protection from existing physical hazards. The proposed action would not limit infiltration of precipitation with the potential benefit of reducing contaminant leaching. Portions of the landfill are subject to periodic flooding by the Nashua River which could expose currently buried debris, possibly transport it to new locations, and present new exposure hazards or pathways. USEPA would be responsible for future long-term monitoring at AOC 11.

SA 12. This alternative would enhance long-term effectiveness at protecting human health. However, long-term environmental protection would not be addressed.

SA 13. Excavation of landfill debris would effectively prevent human and ecological exposure and would prevent the landfill from being a potential source of future groundwater contamination. The effectiveness of the consolidation facility or the offsite landfill at isolating landfill debris would depend on the quality of construction and proper maintenance of cover and leachate collection systems. Landfills that include groundwater protection systems with leachate collection, cover systems, and long-term monitoring and maintenance have a history of effectively isolating wastes from the environment.

AOC 40. Removal of the landfill as a potential source of future groundwater contamination, and removal of hot spot sediments and drums would effectively prevent human and ecological exposure. The effectiveness of the consolidation facility or the offsite landfill at isolating Cold Spring Brook Landfill debris would depend on the quality of construction and proper maintenance of cover and leachate collection systems. Landfills that include groundwater protection systems with leachate collection, cover systems, and long-term monitoring and maintenance have a history of effectively isolating wastes from the environment.

AOC 41. This alternative would enhance long-term effectiveness at protecting human health and the environment.

3.3.2.4 Reduction of Toxicity, Mobility, and Volume Through Treatment. The following paragraphs assess the reduction of toxicity, mobility, and volume of contaminants through treatment offered by the proposed actions of this alternative.

SAs 6, 12, and AOC 41. This alternative would not use removal, containment, or treatment processes to address contamination at this site. No reduction of toxicity, mobility, or volume of contaminants through treatment would occur. This alternative would not satisfy the statutory preference for treatment as a component of remedial actions.

AOC 9. Reduction of toxicity, mobility, or volume of landfill contaminants through treatment would not be achieved. By removing landfill debris, the potential for leaching of landfill materials and contamination of groundwater would be reduced. No reduction of toxicity, mobility, or volume of groundwater contaminants would be achieved. Disposal of excavated landfill debris at a consolidation facility or offsite landfill with low permeability liner, leachate collection, and low permeability cover would reduce contaminant mobility.

AOC 11. . Reduction of toxicity, mobility, or volume of contaminants through treatment would not be achieved. Removal of surface debris would reduce waste volume at AOC 11; this volume would be transferred to another disposal site.

SA 13. Reduction of toxicity, mobility, or volume of landfill contaminants through treatment would not be achieved. By removing landfill debris, the potential for leaching of landfill materials and contamination of groundwater would be reduced. No reduction of toxicity, mobility, or volume of groundwater contaminants would be achieved. Disposal of excavated landfill debris at a consolidation facility or offsite landfill with low permeability liner, leachate collection, and low permeability cover would reduce contaminant mobility.

AOC 40. Reduction of toxicity, mobility, or volume of landfill contaminants through treatment would not be achieved. By removing landfill debris, the potential for leaching of landfill materials and contamination of groundwater would be reduced. No reduction of toxicity, mobility, or volume of groundwater contaminants would be achieved. Sediment and drum removal would not reduce the toxicity or volume of associated contaminants. Disposal of excavated landfill debris, drums, and dewatered sediments at a consolidation facility or offsite landfill with low permeability liner, leachate collection, and low permeability cover would reduce contaminant mobility.

3.3.2.5 Short-term Effectiveness. The following paragraphs assess the short-term effectiveness of the actions proposed at each of the landfills.

SAs 6, 12, and AOC 41. This alternative would not provide any remedial actions. Therefore, no short-term risks to the community or environment would result from implementation.

AOC 9. This alternative is expected to present minimal risks to workers, the community, and the environment. Transportation of excavated materials would be planned to avoid creating traffic congestion and hazards to the community.

Available information does not suggest the presence of hazardous substances, which would present a risk to workers during excavation. Worker adherence to general health and safety practices, and use of personnel monitoring would reduce potential exposure to potentially hazardous substances to a safe level. Excavation of landfilled debris and construction of the consolidation facility could generate dust. Dust suppression techniques would reduce potential risk to workers and the community.

AOC 11. This alternative would be expected to present minimal short-term risks to workers, the community, and the environment. Risk to the community would be minimal because residences are not close enough to the site to be impacted by noise or dust potentially generated from debris removal activities. It is anticipated that debris removal activities can be planned to avoid creating traffic congestion and hazards. Exposure to potentially contaminated soil and debris could be reduced to a safe level by worker adherence to general health and safety practices, and use of personnel monitoring during any intrusive activities at the landfill.

SA 13. This alternative is expected to present minimal risks to workers, the community, and the environment. Transportation of excavated materials would be planned to avoid creating traffic congestion and hazards to the community.

Available information does not suggest the presence of hazardous substances, which would present a risk to workers during excavation. Worker adherence to general health and safety practices, and use of personnel monitoring would reduce potential exposure to potentially hazardous substances to a safe level. Excavation of landfilled debris and construction of the consolidation facility could generate dust. Dust suppression techniques would reduce potential risk to workers and the community.

AOC 40. This alternative is expected to present minimal risks to workers, the community, and the environment. Transportation of excavated materials would be planned to avoid creating traffic congestion and hazards to the community. To further protect the community, traffic on Patton Road could be rerouted during removal of soil and debris from the Cold Spring Brook Landfill. Handling and transportation of any hazardous

materials would be conducted according to RCRA and DOT regulations to protect workers and the community.

Available information does not suggest the presence of hazardous substances that would present a risk to workers during excavation. Worker adherence to general health and safety practices, and use of personnel monitoring would reduce potential exposure to potentially hazardous substances to a safe level. Excavation of landfilled debris and construction of the consolidation facility could generate dust. Dust suppression techniques would reduce potential risk to workers and the community.

Excavation activities at the Cold Spring Brook Landfill would be conducted to minimize adverse affects on the environment. Excavation would be conducted to minimize pond water entering the excavation. In addition, stormwater runoff and groundwater flow into the excavation would be controlled to minimize the quantity of sediment and contaminants entering the pond. Construction of the temporary access road along the northwest toe of the landfill may adversely affect the environment, but wetland restoration activities would minimize any permanent effect. A consolidation facility would be located and constructed according to regulations to minimize adverse affects on the environment.

3.3.2.6 Implementability. The following paragraphs assess the implementability of the actions proposed at each of the landfills.

SAs 6, 12, and AOCs 11, 41. This alternative would be easy to implement and would not limit or interfere with the ability to perform future remedial actions.

AOC 9. Debris excavation, landfill construction, and offsite disposal can be accomplished using standard construction procedures and conventional earthmoving equipment, and many engineering and construction companies are qualified and available. Successful implementation of this alternative may be contingent on the approval and construction of a consolidation facility to accept the excavated debris. The consolidation facility would be constructed and maintained to effectively isolate debris excavated from AOC 9. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions at AOC 9.

All activities to excavate AOC 9 debris would be conducted onsite, and permits would not be required. Design, construction, operation, closure, and post-closure monitoring and maintenance of the consolidation facility would be conducted according to the technical requirements of Massachusetts 310 CMR 19.000.

If needed, rail transportation is available near the debris areas, and several permitted offsite landfills exist for debris disposal.

Consolidation of this disposal area with others reduces the administrative burden and complexity of implementing the long-term monitoring and maintenance requirements of 310 CMR 19.000 at separate disposal areas.

SA 13. Debris excavation, landfill construction, and offsite disposal can be accomplished using standard construction procedures and conventional earthmoving equipment, and many engineering and construction companies are qualified and available. Successful implementation of this alternative is contingent on the approval and construction of a consolidation facility to accept the excavated debris. The consolidation facility would be constructed and maintained to effectively isolate debris excavated from SA 13. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions at SA 13.

All activities to excavate SA 13 would be conducted onsite, and permits would not be required. Design, construction, operation, closure, and post-closure monitoring and maintenance of the consolidation facility would be conducted according to the technical requirements of Massachusetts 310 CMR 19.000.

Consolidation of this disposal area with others reduces the administrative burden and complexity of implementing the long-term monitoring and maintenance requirements of 310 CMR 19.000 at separate disposal areas.

AOC 40. Equipment required to excavate and handle sediment, remove and handle 55-gallon drums and potentially construct a temporary access road at the Cold Spring Brook Landfill is conventional in nature, and contractors are readily available. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions.

Discarded 55-gallon drums would be disposed of at the Consolidation Landfill or at an offsite TSD facility if drum contents displayed hazardous characteristics. Sediment would require dewatering to eliminate free water prior to disposal at the Consolidation Landfill. Some sediments may exhibit hazardous characteristics, and would require disposal at a licensed landfill or incinerator. Offsite services should have sufficient capacity for the relatively small volume of sediments requiring disposal.

According to the NCP, no federal, state, or local permits are required for onsite response actions conducted pursuant to CERCLA, although coordination with review agencies is recommended. Because remedial actions for this alternative will be conducted onsite, permits would not be required for sediment dredging or discharge of water from dewatered sediment to Cold Spring Brook Pond. However, consultation with the local

conservation commission in accordance with Massachusetts Wetlands Protection Regulations (310 CMR 10.000) may be required prior to constructing an access road at the northwestern toe of the landfill. In addition, dredging of sediment in Cold Spring Brook Pond will have to be done in accordance with the technical requirements of the Massachusetts Water Quality Certification for Dredging (314 CMR 9.00).

Debris excavation, landfill construction, and offsite disposal can be accomplished using standard construction procedures and conventional earthmoving equipment, and many engineering and construction companies are qualified and available. Successful implementation of this alternative is contingent on the approval and construction of a consolidation facility to accept the excavated debris. The consolidation facility would be constructed and maintained to effectively isolate Cold Spring Brook Landfill debris. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions at Cold Spring Brook Landfill.

All activities to excavate Cold Spring Brook Landfill for this alternative would be conducted onsite, and permits would not be required. At the Cold Spring Brook Landfill, stormwater runoff would be controlled to minimize the quantity of sediments and contaminants entering the pond. Design, construction, operation, closure, and post-closure monitoring and maintenance of the consolidation facility would be conducted according to the technical requirements of Massachusetts 310 CMR 19.000.

Consolidation of this disposal area with others reduces the administrative burden and complexity of implementing the long-term monitoring and maintenance requirements of 310 CMR 19.000 at separate disposal areas.

3.3.2.7 Cost. The cost estimate for Alternative 4b includes estimates of direct and indirect capital costs and O&M costs. Direct capital costs included for this alternative include site preparation, sediment and debris excavation, drum removal, and site restoration. A contingency is included in direct cost items to account for unforeseen project complexities (e.g., adverse weather conditions and inadequate site characterization).

O&M costs include environmental monitoring of groundwater, wetlands, and sediment at AOCs 11 and 40, and at the Consolidation Landfill.

Tables 3-5a and 3-5b summarize the cost estimate for Alternative 4b. Estimated costs in Table 3-5a assume debris would be consolidated onsite. Estimated costs in Table 3-5b assume debris would be disposed offsite. Estimated debris excavation and site restoration costs for AOCs 9 and 40, and SA 13 are the same, regardless of assumed disposal method.

Selection of the debris disposal option will have a significant impact on the total cost for the alternative. Estimated direct costs for offsite debris disposal, including handling, rail transport, and tipping fees, are nearly twice those for onsite debris consolidation.

To enable evaluation costs that would occur over different time periods, the estimates include a present worth analysis. Present worth represents the amount of money that, if invested now and disbursed as needed, would be sufficient to cover all costs associated with the remedial action over its planned life. A discount rate of 7 percent before taxes and after inflation is used as recommended in OSWER Directive 9355.3-20. Unless noted otherwise, costs are based on a 30-year time frame. The estimated total present worth cost for Alternative 4b is $17,299,000 assuming onsite debris consolidation and $29,289,000 assuming offsite debris disposal.

3.4 DESCRIPTION AND DETAILED EVALUATION OF ALTERNATIVE 4c

This subsection describes Alternative 4c, evaluates the alternative using USEPA evaluation criteria, and provides a cost estimate.

Alternative 4c: No Further Action under CERCLA at AOC 41, and SAs 6 and 12 and excavation of AOCs 9, 11, and 40, and SA 13, with onsite consolidation or offsite disposal.

3.4.1 Description of Alternative 4c:

Alternative 4c proposes excavating construction/demolition debris from AOCs 9, 11, and 40, and from SA 13, and either consolidating the debris in a proposed secure landfill at the former Golf Course Driving Range, or disposing the debris in an offsite landfill. At AOC 41, and at SAs 6 and 12, no further action under CERCLA would be taken. Non-CERCLA actions at SA 12 and AOC 41 would include removal of visible man-made surface debris, and removal of known surface soil "hot spots".

Alternative 4c includes removing exposed drums at Cold Spring Brook Landfill (AOC 40) to remove a potential source of contamination, and excavating sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments.

Key components of Alternative 4c include:

No Further Action under CERCLA at AOC 41, SAs 6 and 12.

- No action under CERCLA
- Non-CERCLA surface debris and known surface soil "hot spot" removal

Excavation and Either Onsite Consolidation or Offsite Disposal of Debris from AOCs 9, 11, and 40, and SA 13.

- Mobilization/demobilization;
- AOC 40 sediment removal with disposal either in the Consolidation Landfill or offsite;
- AOC 40 drum removal with disposal either in the Consolidation Landfill or offsite;
- Debris excavation, backfill, and regrading at AOCs 9, 11, and 40, and at SA 13;
- Wetlands restoration;
- Consolidation of excavated debris at Consolidation Landfill, or transport to an offsite landfill;
- Institutional controls;
- If required, cover system monitoring and maintenance at Consolidation Landfill; and
- Five-year site reviews;

3.4.1.1 Description of No Further Action Components for Alternative 4c. No further action is similar to that discussed for Alternative 4b, Subsection 3.3.1.1.

3.4.1.2 Description of Excavate and Dispose AOCs 9, 11, and 40, and SA 13 Components for Alternative 4c.

Mobilization/demobilization. This component is similar to that discussed in Alternative 4c, Subsection 3.3.1.3.

Site preparation. This component is similar to that discussed in Alternative 4b, Subsection 3.3.1.3.

Sediment removal and disposal at AOC 40. This component is similar to that discussed in Alternative 4b, Subsection 3.3.1.3.

Drum removal and disposal at AOC 40. This component is similar to that discussed in Alternative 4b, Subsection 3.3.1.3.

Debris Excavation, Backfill, and Regrading at AOCs 9, 11, and 40, and at SA 13. This component is similar to that discussed in Alternative 4b, Subsection 3.3.1.3.

At AOC 11, excavation of debris would be accomplished in phases because some debris is buried below the groundwater table. The site is between wetlands to the north and south, and adjacent to the Nashua River to the east. A natural 40 foot-wide berm along the Nashua River separates the debris from the river water. This berm is 8 to 10 feet above normal river elevations, but still below flood stage. It is recommended that debris excavation be scheduled for low-flow summer months. The first phase would be to excavate all of the debris above the watertable utilizing a backhoe, bulldozer, and trucks. The estimated volume of debris above groundwater is about 90 percent of the total amount of AOC 11. The second phase, removing the debris (about 10 percent) from below groundwater, would require dewatering of one limited area at a time, then excavating and immediately backfilling. Dewatering would consist of two rows of individual sumps on either side of the debris section to be excavated. The sumps would intercept groundwater from the river and from the upland hill. The length of the dewatered excavation section would vary from approximately 50 to 100 feet. After one section is excavated and backfilled, the operation would move along until all of the 500-foot length of debris is removed. Additional soils investigation would be necessary during design to determine soil properties and limits of debris.

Wetlands Restoration. This component is similar to that discussed in Alternative 4b, Subsection 3.3.1.3.

Disposal Option One: Consolidation of Excavated Debris at Consolidation Landfill. This is similar to that discussed for Alternative 4b, Subsection 3.3.1.3. The estimated volume of debris to be disposed is 267,000 cy. The total estimated volume, including debris, daily cover, and final cover, is 382,000 cy. The landfill would rise up to approximately 34 feet above existing grade.

Disposal Option Two: Disposal of Excavated Debris at Offsite Landfill. This component is similar to that discussed for Alternative 4b, Subsection 3.3.1.3.

Institutional Controls. This component is similar to that discussed in Alternative 4b, Subsection 3.3.1.3.

Five-year Site Reviews. This component is similar to that discussed in Alternative 4b, Subsection 3.3.1.3.

3.4.2 Detailed Evaluation of Alternative 4c

The following subsections present an assessment of Alternative 4c according to the seven evaluation criteria.

3.4.2.1 Overall Protection of Human Health and the Environment. The following paragraphs assess how the proposed actions of this alternative would provide protection of human health and the environment.

SA 6. Overall protection of human health and the environment is similar to that discussed for the No Further Action Alternative in Subsection 3.3.3.1.

AOC 9. This alternative would provide protection of human health and the environment by excavating landfill materials and then disposing of them at the Consolidation Landfill or offsite. This would prevent potential future exposure to surface soil and sediment and would prevent potential future releases from landfill debris to groundwater. However, relocating landfill debris would transfer risk of potential release to another location. However, it is the Army's interpretation that there is no significant risk to human health and the environment posed by environmental contamination at AOC 9. Therefore, risk reduction benefit from excavating and disposing AOC 9 debris is considered low.

AOC 11. This alternative would provide protection of human health and the environment by excavating landfill materials and then disposing of them at the Consolidation Landfill or offsite. This would prevent potential future exposure to surface soil and sediment and would prevent potential future releases from landfill debris to groundwater. However, relocating landfill debris would transfer risk of potential release to another location. Because potential human health risks at AOC 11 were within or below the USEPA target values, the human health risk reduction benefit from excavating and disposing AOC 11 debris is considered low.

SA 12. This alternative would enhance protection of human health. However, interpreted environmental risks would not be addressed.

SA 13. This alternative would provide protection of human health and the environment by excavating landfill materials and disposing them at the consolidation facility or offsite. This would prevent potential future exposure to surface soil and sediment and would prevent potential future release from landfill debris to groundwater. However, relocating landfill debris would transfer risk of potential release to another location.

AOC 40. This alternative achieves an acceptable level of risk for human and ecological receptors. The drum and sediment removal components of this alternative would provide the same protectiveness as those alternatives that include capping AOC 40. This alternative would prevent potential future release from landfill debris to groundwater and Cold Spring Brook Pond sediment by excavating soil and debris from Cold Spring Brook Landfill, and disposing them in the consolidation facility or offsite. However, relocating landfill debris would transfer risk of potential release to another location.

AOC 41. This alternative would enhance protection of human health and the environment.

3.4.2.2 Compliance with ARARs. Tables 3-1, 3-2, and 3-3 summarize how Alternative 4c will attain ARARs.

3.4.2.3 Long-term Effectiveness and Permanence. The following paragraphs assess the long-term effectiveness and permanence of the proposed actions of this alternative.

SA 6. The long-term effectiveness of this alternative is similar to that discussed for the No Further Action Alternative in Subsection 3.3.2.3.

AOC 9. Excavation of landfill debris would effectively prevent human and ecological exposure and would prevent the landfill from being a potential source of future groundwater contamination. The effectiveness of the consolidation facility or the offsite landfill at isolating landfill debris would depend on the quality of construction and proper maintenance of cover and leachate collection systems. Landfills that include groundwater protection systems with leachate collection, cover systems, and long-term monitoring and maintenance have a history of effectively isolating wastes from the environment.

AOC 11. Excavation of landfill debris would effectively prevent human and ecological exposure and would prevent the landfill from being a potential source of future groundwater contamination. The effectiveness of the consolidation facility or the offsite landfill at isolating landfill debris would depend on the quality of construction and proper maintenance of cover and leachate collection systems. Landfills that include groundwater protection systems with leachate collection, cover systems, and long-term monitoring and maintenance have a history of effectively isolating wastes from the environment.

SA 12. This alternative would enhance long-term effectiveness at protecting human health. However, long-term environmental protection would not be addressed.

SA 13. Excavation of landfill debris would effectively prevent human and ecological exposure and would prevent the landfill from being a potential source of future groundwater contamination. The effectiveness of the consolidation facility or the offsite landfill at isolating landfill debris would depend on the quality of construction and proper maintenance of cover and leachate collection systems. Landfills that include groundwater protection systems with leachate collection, cover systems, and long-term monitoring and maintenance have a history of effectively isolating wastes from the environment.

AOC 40. Removal of the landfill as a potential source of future groundwater contamination, and removal of hot spot sediments and drums would effectively prevent human and ecological exposure. The effectiveness of the consolidation facility or the offsite landfill at isolating Cold Spring Brook Landfill debris would depend on the quality of construction and proper maintenance of cover and leachate collection systems. Landfills that include groundwater protection systems with leachate collection, cover systems, and long-term monitoring and maintenance have a history of effectively isolating wastes from the environment.

AOC 41. This alternative would enhance long-term effectiveness at protecting human health and the environment.

3.4.2.4 Reduction of Toxicity, Mobility, and Volume Through Treatment. The following paragraphs assess the reduction of toxicity, mobility, and volume of contaminants through treatment offered by the proposed actions of this alternative.

SAs 6, 12, and AOC 41. The reduction in toxicity, mobility, and volume would be similar to that discussed in Subsection 3.3.2.4.

AOC 9. Reduction of toxicity, mobility, or volume of landfill contaminants through treatment would not be achieved. By removing landfill debris, the potential for leaching of landfill materials and contamination of groundwater would be reduced. No reduction of toxicity, mobility, or volume of groundwater contaminants would be achieved. Disposal of excavated landfill debris at a consolidation facility or an offsite landfill with low permeability liner, leachate collection, and low permeability cover would reduce contaminant mobility.

AOC 11. . Reduction of toxicity, mobility, or volume of landfill contaminants through treatment would not be achieved. By removing landfill debris, the potential for leaching of landfill materials and contamination of groundwater would be reduced. No reduction of toxicity, mobility, or volume of groundwater contaminants would be achieved. Disposal of excavated landfill debris at a consolidation facility or an offsite landfill with low permeability liner, leachate collection, and low permeability cover would reduce contaminant mobility.

SA 13. Reduction of toxicity, mobility, or volume of landfill contaminants through treatment would not be achieved. By removing landfill debris, the potential for leaching of landfill materials and contamination of groundwater would be reduced. No reduction of toxicity, mobility, or volume of groundwater contaminants would be achieved. Disposal of excavated landfill debris at a consolidation facility or an offsite landfill with low

permeability liner, leachate collection, and low permeability cover would reduce contaminant mobility.

AOC 40. Reduction of toxicity, mobility, or volume of landfill contaminants through treatment would not be achieved. By removing landfill debris, the potential for leaching of landfill materials and contamination of groundwater would be reduced. No reduction of toxicity, mobility, or volume of groundwater contaminants would be achieved. Sediment and drum removal would not reduce the toxicity or volume of associated contaminants. Disposal of excavated landfill debris, drums, and dewatered sediments at a consolidation facility or an offsite landfill with low permeability liner, leachate collection, and low permeability cover would reduce contaminant mobility.

3.4.2.5 Short-term Effectiveness. The following paragraphs assess the short-term effectiveness of the actions proposed at each of the landfills.

SAs 6, 12, and AOC 41. Short-term effectiveness would be similar to that discussed in Subsection 3.3.2.5.

AOC 9. This alternative is expected to present minimal risks to workers, the community, and the environment. Transportation of excavated materials would be planned to avoid creating traffic congestion and hazards to the community.

Available information does not suggest the presence of hazardous substances, which would present a risk to workers during excavation. Worker adherence to general health and safety practices, and use of personnel monitoring would reduce potential exposure to potentially hazardous substances to a safe level. Excavation of landfilled debris could generate dust. Dust suppression techniques would reduce potential risk to workers and the community.

AOC 11. This alternative is expected to present minimal risks to workers, the community, and the environment. Transportation of excavated materials would be planned to avoid creating traffic congestion and hazards to the community.

Available information does not suggest the presence of hazardous substances, which would present a risk to workers during excavation. Worker adherence to general health and safety practices, and use of personnel monitoring would reduce potential exposure to potentially hazardous substances to a safe level. Excavation of landfilled debris could generate dust. Dust suppression techniques would reduce potential risk to workers and the community.

SA 13. This alternative is expected to present minimal risks to workers, the community, and the environment. Transportation of excavated materials would be planned to avoid creating traffic congestion and hazards to the community.

Available information does not suggest the presence of hazardous substances, which would present a risk to workers during excavation. Worker adherence to general health and safety practices, and use of personnel monitoring would reduce potential exposure to potentially hazardous substances to a safe level. Excavation of landfilled could generate dust. Dust suppression techniques would reduce potential risk to workers and the community.

AOC 40. This alternative is expected to present minimal risks to workers, the community, and the environment. Transportation of excavated materials would be planned to avoid creating traffic congestion and hazards to the community. To further protect the community, traffic on Patton Road could be rerouted during removal of soil and debris from the Cold Spring Brook Landfill. Handling and transportation of any hazardous materials would be conducted according to RCRA and DOT regulations to protect workers and the community.

Available information does not suggest the presence of hazardous substances that would present a risk to workers during excavation. Worker adherence to general health and safety practices, and use of personnel monitoring would reduce potential exposure to potentially hazardous substances to a safe level. Excavation of landfilled debris could generate dust. Dust suppression techniques would reduce potential risk to workers and the community.

Excavation activities at the Cold Spring Brook Landfill would be conducted to minimize adverse affects on the environment. Excavation would be conducted to minimize pond water entering the excavation. In addition, stormwater runoff and groundwater flow into the excavation would be controlled to minimize the quantity of sediment and contaminants entering the pond. Construction of the temporary access road along the northwest toe of the landfill may adversely affect the environment, but wetland restoration activities would minimize any permanent effect. A consolidation facility would be located and constructed according to regulations to minimize adverse affects on the environment.

3.4.2.6 Implementability. The following paragraphs assess the implementability of the actions proposed at each of the landfills.

SAs 6, 12, and AOCs 11, 41. Implementability would be similar to that discussed in Subsection 3.3.2.6.

AOC 9. Debris excavation, landfill construction, and offsite disposal can be accomplished using standard construction procedures and conventional earthmoving equipment, and many engineering and construction companies are qualified and available. Successful implementation of this alternative is contingent on the approval and construction of a consolidation facility to accept the excavated debris. The consolidation facility would be constructed and maintained to effectively isolate debris excavated from AOC 9. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions at AOC 9.

All activities to excavate AOC 9 would be conducted onsite, and permits would not be required. Design, construction, operation, closure, and post-closure monitoring and maintenance of the consolidation facility would be conducted according to the technical requirements of Massachusetts 310 CMR 19.000.

Consolidation of this disposal area with others reduces the administrative burden and complexity of implementing the long-term monitoring and maintenance requirements of 310 CMR 19.000 at separate disposal areas.

AOC11. Debris excavation, landfill construction, and offsite disposal can be accomplished using standard construction procedures and conventional earthmoving equipment, and many engineering and construction companies are qualified and available. Successful implementation of this alternative is contingent on the approval and construction of a consolidation facility to accept the excavated debris. The consolidation facility would be constructed and maintained to effectively isolate debris excavated from AOC 11. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions at AOC 11.

All activities to excavate AOC 11 would be conducted onsite, and permits would not be required. Design, construction, operation, closure, and post-closure monitoring and maintenance of the consolidation facility would be conducted according to the technical requirements of Massachusetts 310 CMR 19.000.

Consolidation of this disposal area with others reduces the administrative burden and complexity of implementing the long-term monitoring and maintenance requirements of 310 CMR 19.000 at separate disposal areas.

SA 13. Debris excavation, landfill construction, and offsite disposal can be accomplished using standard construction procedures and conventional earthmoving equipment, and many engineering and construction companies are qualified and available. Successful implementation of this alternative is contingent on the approval and construction of a consolidation facility to accept the excavated debris. The consolidation facility would be

constructed and maintained to effectively isolate debris excavated from SA 13. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions at SA 13.

All activities to excavate SA 13 would be conducted onsite, and permits would not be required. Design, construction, operation, closure, and post-closure monitoring and maintenance of the consolidation facility would be conducted according to the technical requirements of Massachusetts 310 CMR 19.000.

Consolidation of this disposal area with others reduces the administrative burden and complexity of implementing the long-term monitoring and maintenance requirements of 310 CMR 19.000 at separate disposal areas.

AOC 40. Equipment required to excavate and handle sediment, remove and handle 55-gallon drums and potentially construct a temporary access road at the Cold Spring Brook Landfill is conventional in nature, and contractors are readily available. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions.

Discarded 55-gallon drums would be disposed of an offsite TSD facility if drum contents displayed hazardous characteristics. Sediment would require dewatering to eliminate free water prior to offsite disposal. Some sediments may exhibit hazardous characteristics, and would require disposal at a licensed landfill or incinerator. Offsite services should have sufficient capacity for the relatively small volume of sediments requiring disposal.

According to the NCP, no federal, state, or local permits are required for onsite response actions conducted pursuant to CERCLA, although coordination with review agencies is recommended. Because remedial actions for this alternative will be conducted onsite, permits would not be required for sediment dredging or discharge of water from dewatered sediment to Cold Spring Brook Pond. However, consultation with the local conservation commission in accordance with Massachusetts Wetlands Protection Regulations (310 CMR 10.000) may be required prior to constructing an access road at the northwestern toe of the landfill. In addition, dredging of sediment in Cold Spring Brook Pond will have to be done in accordance with the technical requirements of the Massachusetts Water Quality Certification for Dredging (314 CMR 9.00).

Debris excavation, landfill construction, and offsite disposal can be accomplished using standard construction procedures and conventional earthmoving equipment, and many engineering and construction companies are qualified and available. Successful implementation of this alternative is contingent on the approval and construction of a consolidation facility to accept the excavated debris. The consolidation facility would be

constructed and maintained to effectively isolate debris excavated from AOC 40. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions at AOC 40.

All activities to excavate AOC 40 would be conducted onsite, and permits would not be required. Design, construction, operation, closure, and post-closure monitoring and maintenance of the consolidation facility would be conducted according to the technical requirements of Massachusetts 310 CMR 19.000.

Consolidation of this disposal area with others reduces the administrative burden and complexity of implementing the long-term monitoring and maintenance requirements of 310 CMR 19.000 at separate disposal areas.

3.4.2.7 Cost. The cost estimate for Alternative 4c includes estimates of direct and indirect capital costs and O&M costs. Direct capital costs included for this alternative include site preparation, sediment and debris excavation, drum removal, and site restoration. A contingency is included in direct cost items to account for unforeseen project complexities (e.g., adverse weather conditions and inadequate site characterization).

O&M costs include environmental monitoring of groundwater, wetlands, and sediment at AOC 40 and at the Consolidation Landfill.

Tables 3-6a and 3-6b summarize the cost estimate for Alternative 4c. Estimated costs in Table 3-6a assume debris would be consolidated onsite. Estimated costs in Table 3-6b assume debris would be disposed offsite. Estimated debris excavation and site restoration costs for AOCs 9, 11, and 40, and SA 13 are the same, regardless of assumed disposal method.

Selection of the debris disposal option will have a significant impact on the total cost for the alternative. Estimated direct costs for offsite debris disposal, including handling, rail transport, and tipping fees, are nearly twice those for onsite debris consolidation.

To enable evaluation costs that would occur over different time periods, the estimates include a present worth analysis. Present worth represents the amount of money that, if invested now and disbursed as needed, would be sufficient to cover all costs associated with the remedial action over its planned life. A discount rate of 7 percent before taxes and after inflation is used as recommended in OSWER Directive 9355.3-20. Unless noted otherwise, costs are based on a 30-year time frame. The estimated total present worth cost for Alternative 4c is $20,200,000 assuming onsite debris consolidation, and $34,760,000 assuming offsite debris disposal.

4.0 CONCLUSIONS

Evaluation of onsite debris consolidation and offsite debris disposal indicate that each option offers similar protection of human health and the environment, and a similar degree of conformance to ARARs. Estimated direct costs for offsite debris disposal, however, are nearly twice those for onsite consolidation. In recent comments, area residents and public officials indicated they are in favor of providing waste disposal contractors an opportunity to submit a formal bid to dispose debris offsite. By doing so, a final determination could be made as to whether the offsite disposal option can be as cost-effective as onsite consolidation.

Alternative 4c has been selected as the Army's preferred alternative. Formal contractor bids will be solicited for onsite landfill consolidation and, alternately, for offsite disposal. A debris disposal option will be selected after evaluating the formal bids. Bid evaluation will consider the following criteria:

- Overall protection of human health and the environment
- Cost
- Ability to satisfy health and safety concerns identified by area residents and public officials
- Contractor's past performance

The selection of Alternative 4c is documented in a Proposed Plan being released concurrently with this Feasibility Study Addendum Report.

ABB-ES	ABB Environmental Services, Inc.
AOC	Area of Contamination
ARARs	Applicable or Relevant and Appropriate Requirements
Army	U.S. Department of the Army
AWQC	Ambient Water Quality Criteria
BCT	Base Closure Team
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Cy	cubic yard
DCC	Devens Commerce Center
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
FS	Feasibility Study
GIS	Geographic Information Systems
IAG	Interagency Agreement
MADEP	Massachusetts Department of Environmental Protection
NCP	National Contingency Plan
NFA	no further action
O&M	operations and maintenance
PPA	potentially productive aquifer
PRE	Preliminary Risk Evaluation
RCRA	Resource Conservation and Recovery Act
RFTA	Reserve Forces Training Area
SA	Study Area
TCLP	toxicity Characteristic Leaching Procedure
TSD	treatment storage, or disposal
USEPA	U.S. Environmental Protection Agency
UXO	Unexploded Ordnance
WRS	Wetland Restoration Specification

ABB Environmental Services, Inc., (ABB-ES), 1997a. "Landfill Remediation Feasibility Study Report"; Devens, Massachusetts; prepared for the U.S. Army Environmental Center; prepared by ABB Environmental Services, Inc., Portland, ME, January, 1997.

ABB Environmental Services, Inc. (ABB-ES), 1997b. "Proposed Plan for SAs 6, 12, and 13, and AOCs 9, 11, 40 and 41"; U.S. Army, Reserve Forces Training Area, Devens, Massachusetts; prepared for the U.S. Army Corps of Engineers, New England District; prepared by ABB Environmental Services, Inc., Portland, ME, December, 1997.

ABB Environmental Services, Inc., (ABB-ES), 1995. "Draft Consolidation Landfill Feasibility Study Report"; Fort Devens, Massachusetts; prepared for the U.S. Army Environmental Center; prepared by ABB Environmental Services, Inc., Portland, ME, September, 1995.

U.S. Environmental Protection Agency (USEPA), 1991. "Federal Facility Agreement Under CERCLA 120 between the USEPA Region I and the U.S. Department of the Army, in the matter of the Fort Devens Army Installation, Fort Devens, Massachusetts"; May, 1991.

U.S. Environmental Protection Agency (USEPA), 1988. "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA"; EPA/540/G-89/004; October, 1988.

FIGURE 2-1
LOCATION MAP
POTENTIAL CONSOLIDATION LANDFILL SITES
LANDFILL REMEDIATION FEASIBILITY STUDY
ADDENDUM REPORT
DEVENS, MA

Harding Lawson Associates

\3712-05\B712F019.DWG 10/20/98

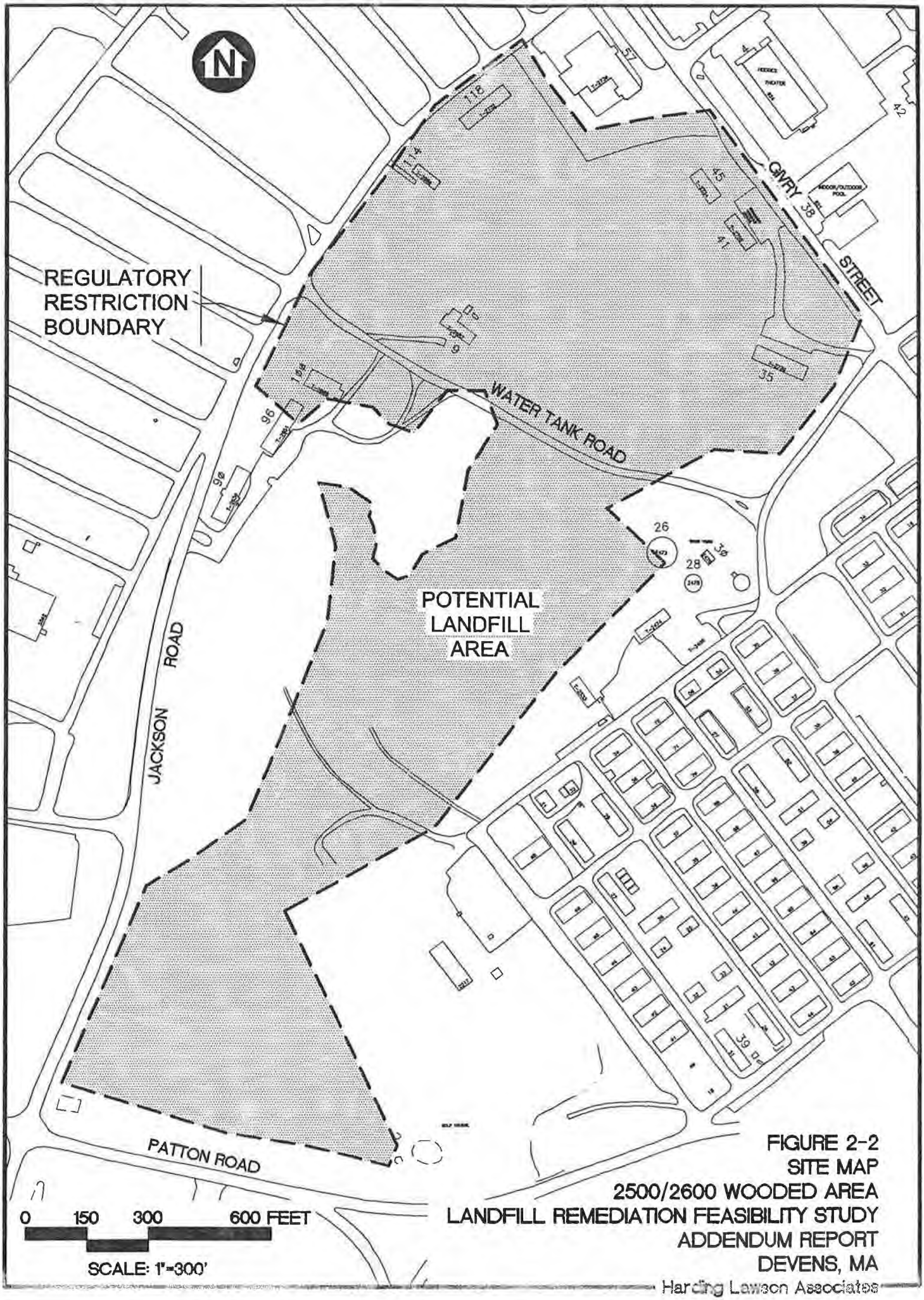

FIGURE 2-2
SITE MAP
2500/2600 WOODED AREA
LANDFILL REMEDIATION FEASIBILITY STUDY
ADDENDUM REPORT
DEVENS, MA

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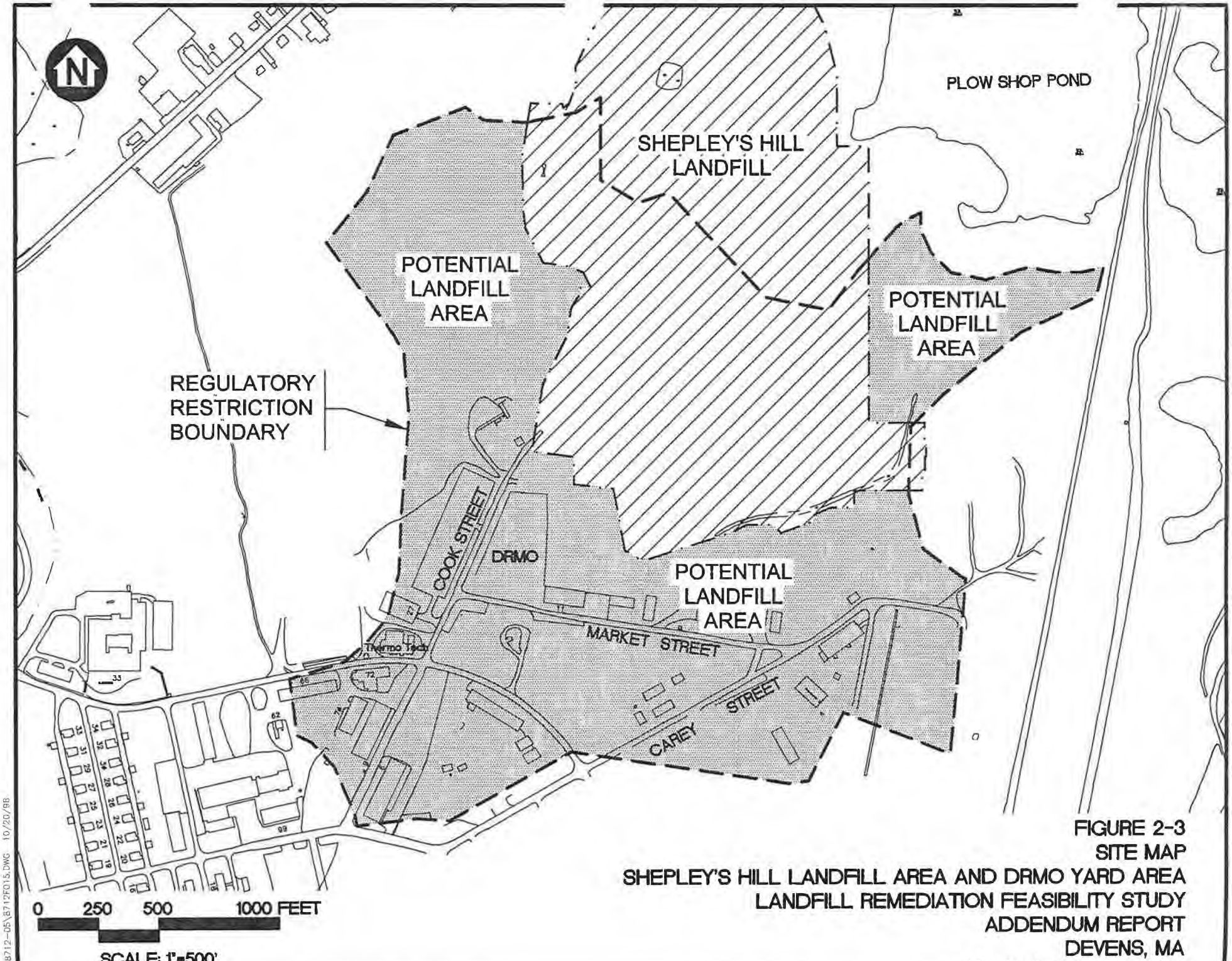

FIGURE 2-3
SITE MAP
SHEPLEY'S HILL LANDFILL AREA AND DRMO YARD AREA
LANDFILL REMEDIATION FEASIBILITY STUDY
ADDENDUM REPORT
DEVENS, MA
Harding Lawson Associates

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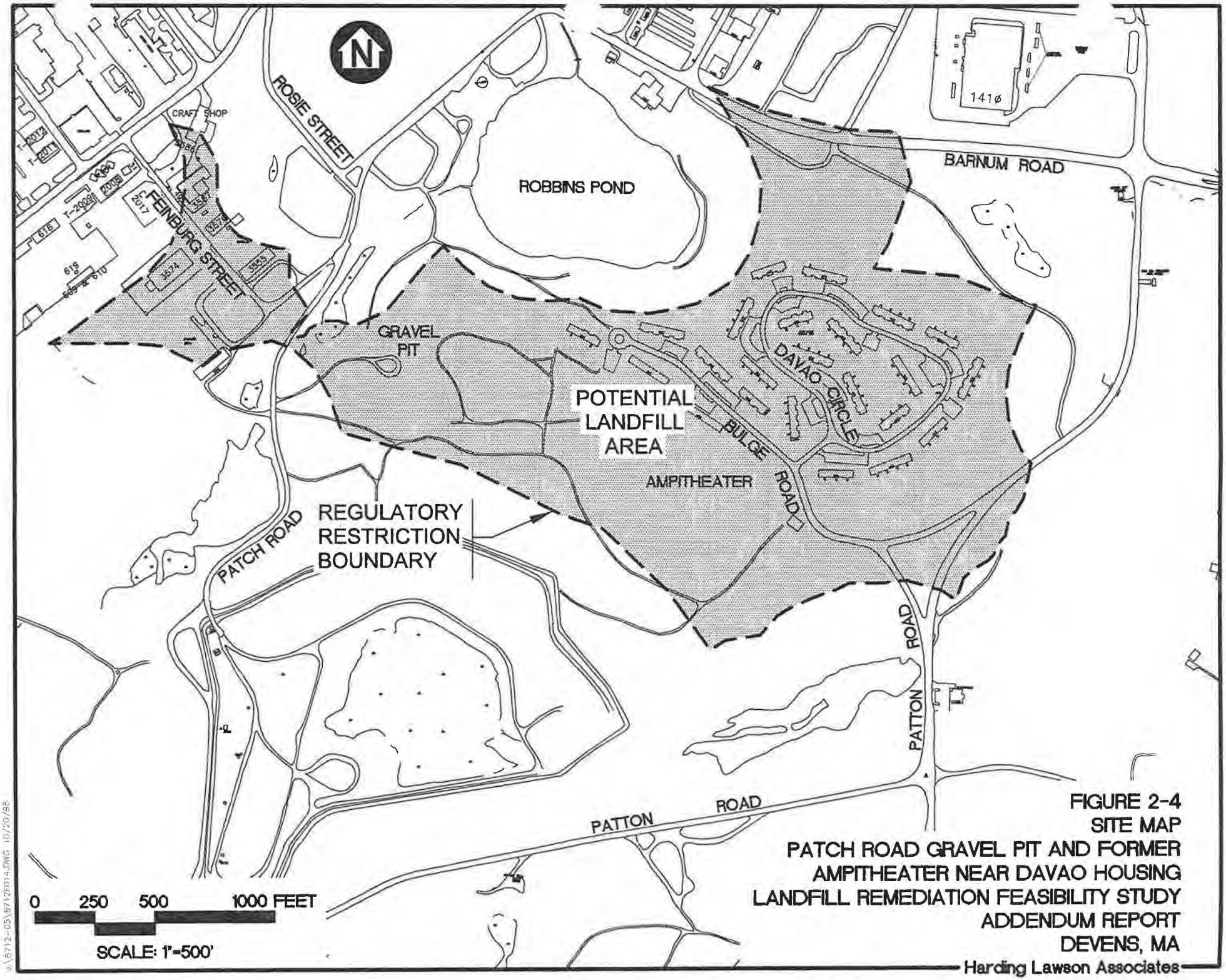

FIGURE 2-4
SITE MAP
PATCH ROAD GRAVEL PIT AND FORMER AMPITHEATER NEAR DAVAO HOUSING
LANDFILL REMEDIATION FEASIBILITY STUDY
ADDENDUM REPORT
DEVENS, MA

Harding Lawson Associates

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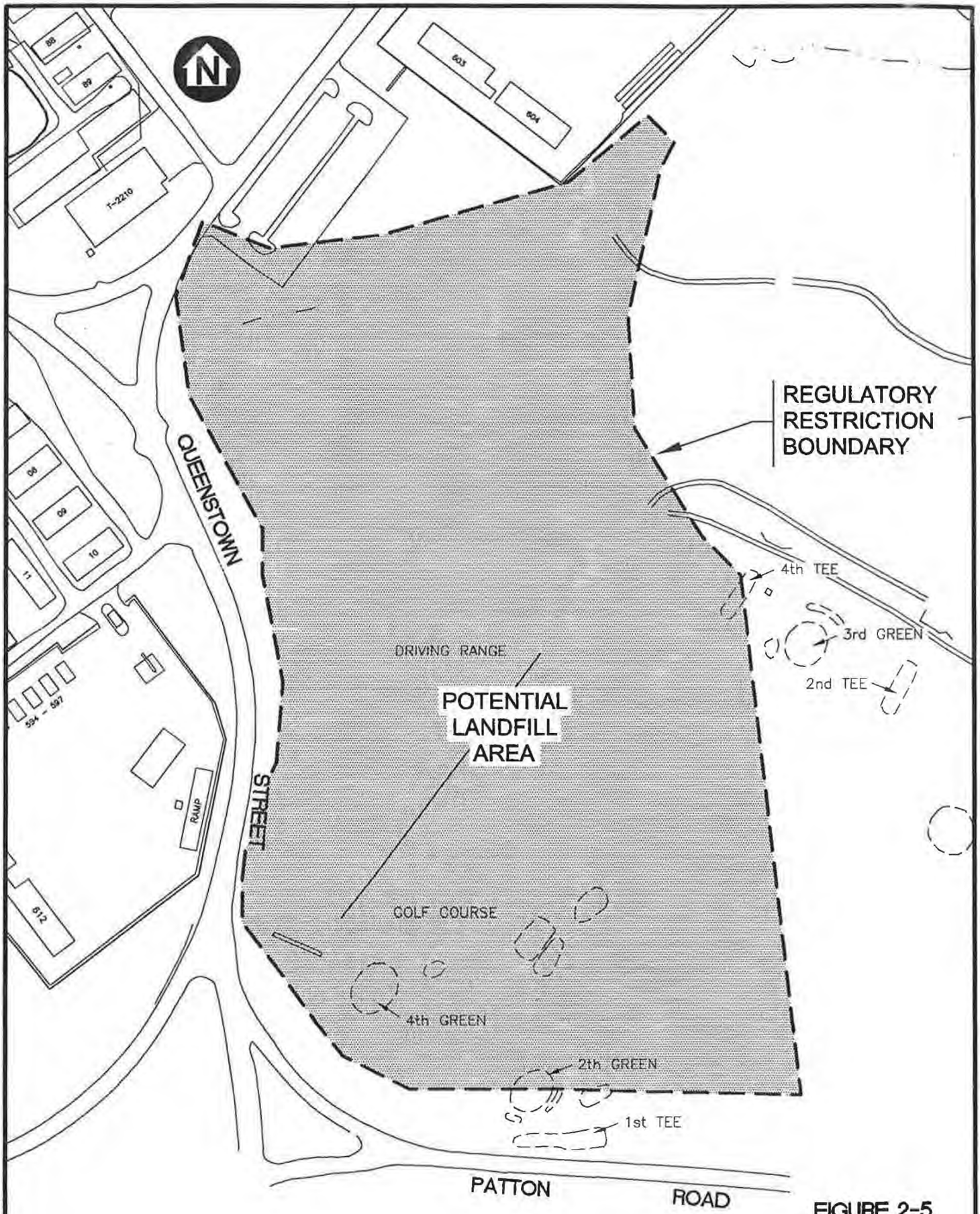

FIGURE 2-5
SITE MAP
FORMER GOLF COURSE DRIVING RANGE
LANDFILL REMEDIATION FEASIBILTY STUDY
ADDENDUM REPORT
DEVENS, MA

Harding Lawson Associates

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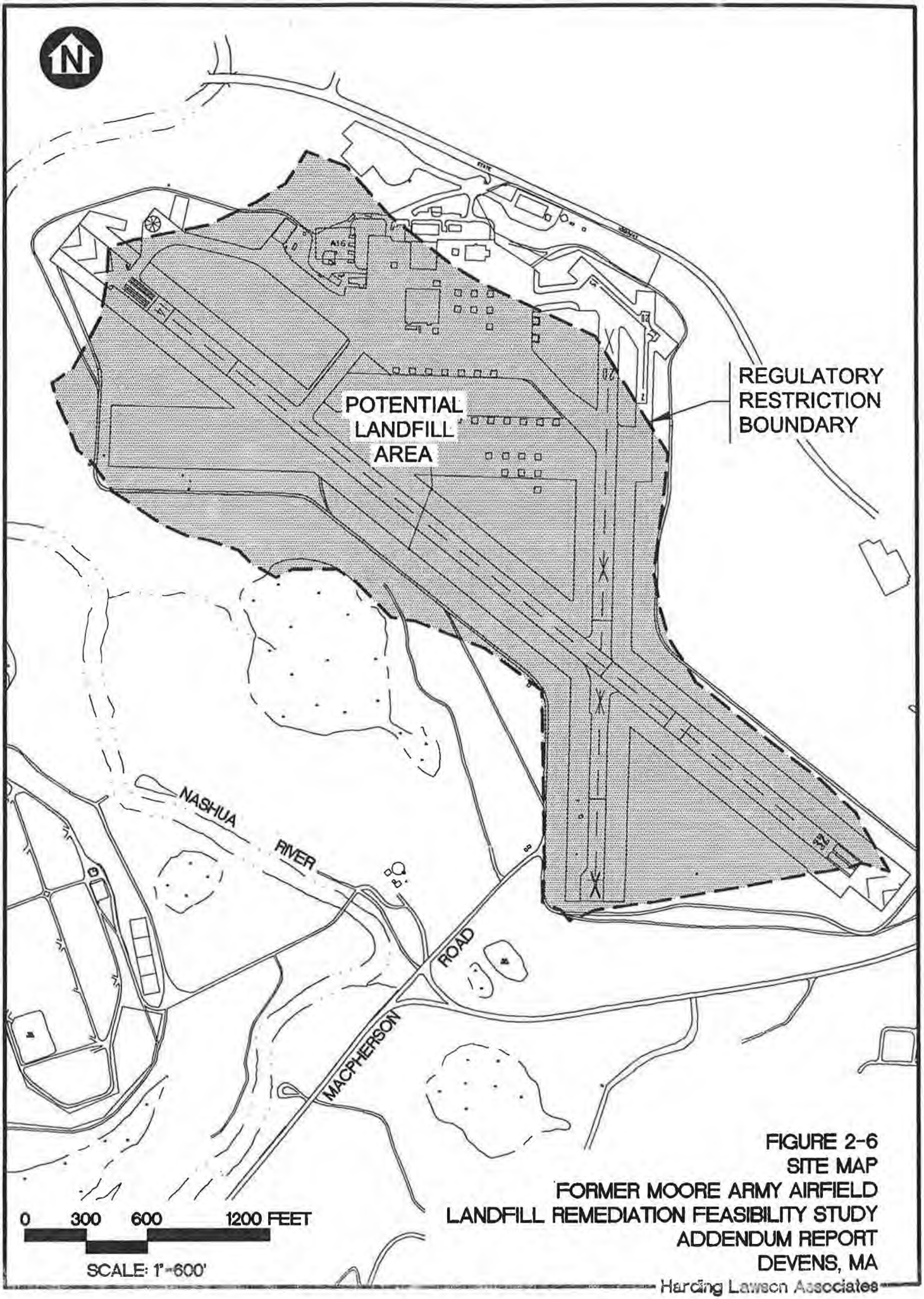

FIGURE 2-6
SITE MAP
FORMER MOORE ARMY AIRFIELD
LANDFILL REMEDIATION FEASIBILITY STUDY
ADDENDUM REPORT
DEVENS, MA
Harding Lawson Associates

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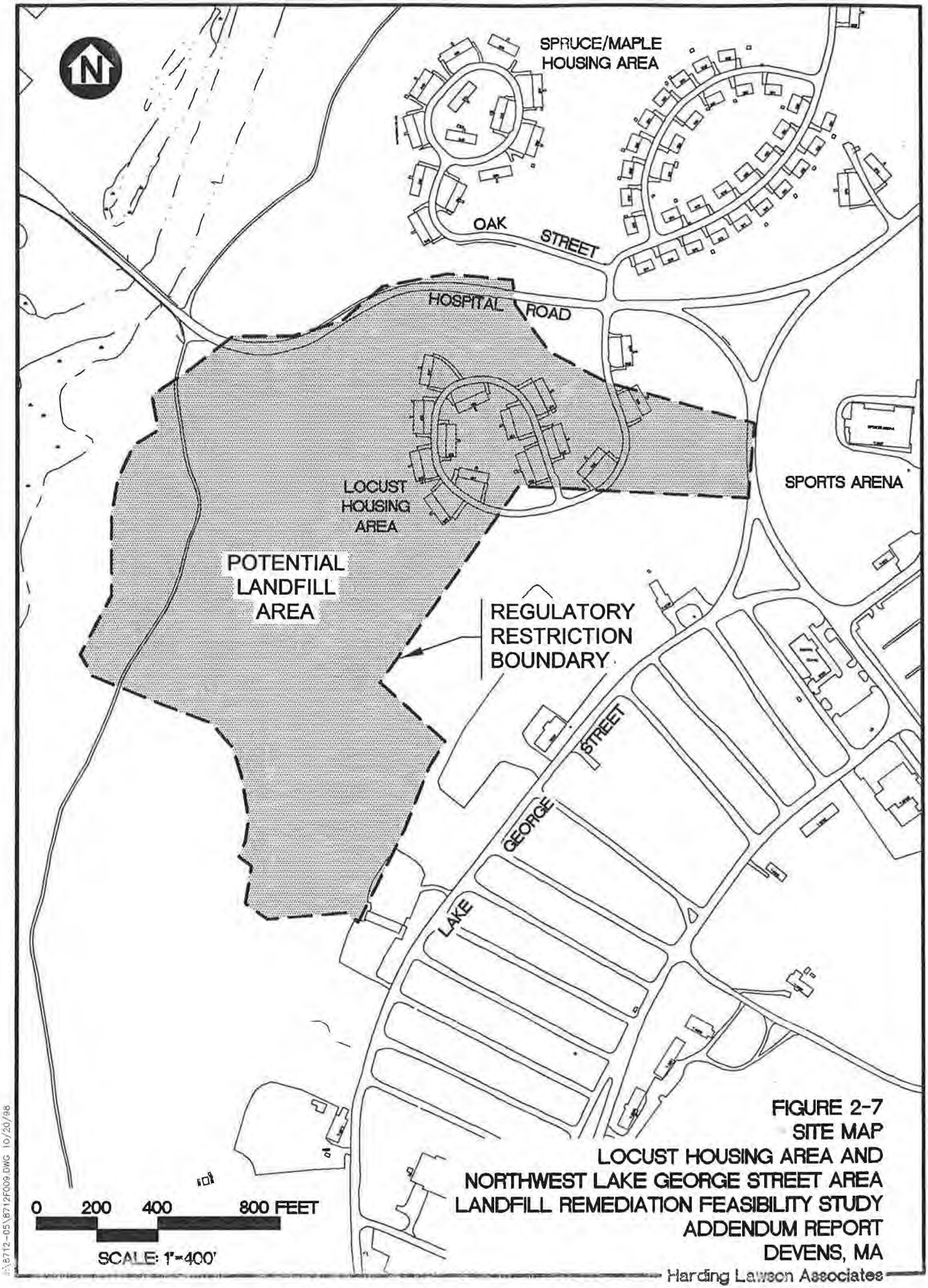

FIGURE 2-7
SITE MAP
LOCUST HOUSING AREA AND
NORTHWEST LAKE GEORGE STREET AREA
LANDFILL REMEDIATION FEASIBILITY STUDY
ADDENDUM REPORT
DEVENS, MA

Harding Lawson Associates

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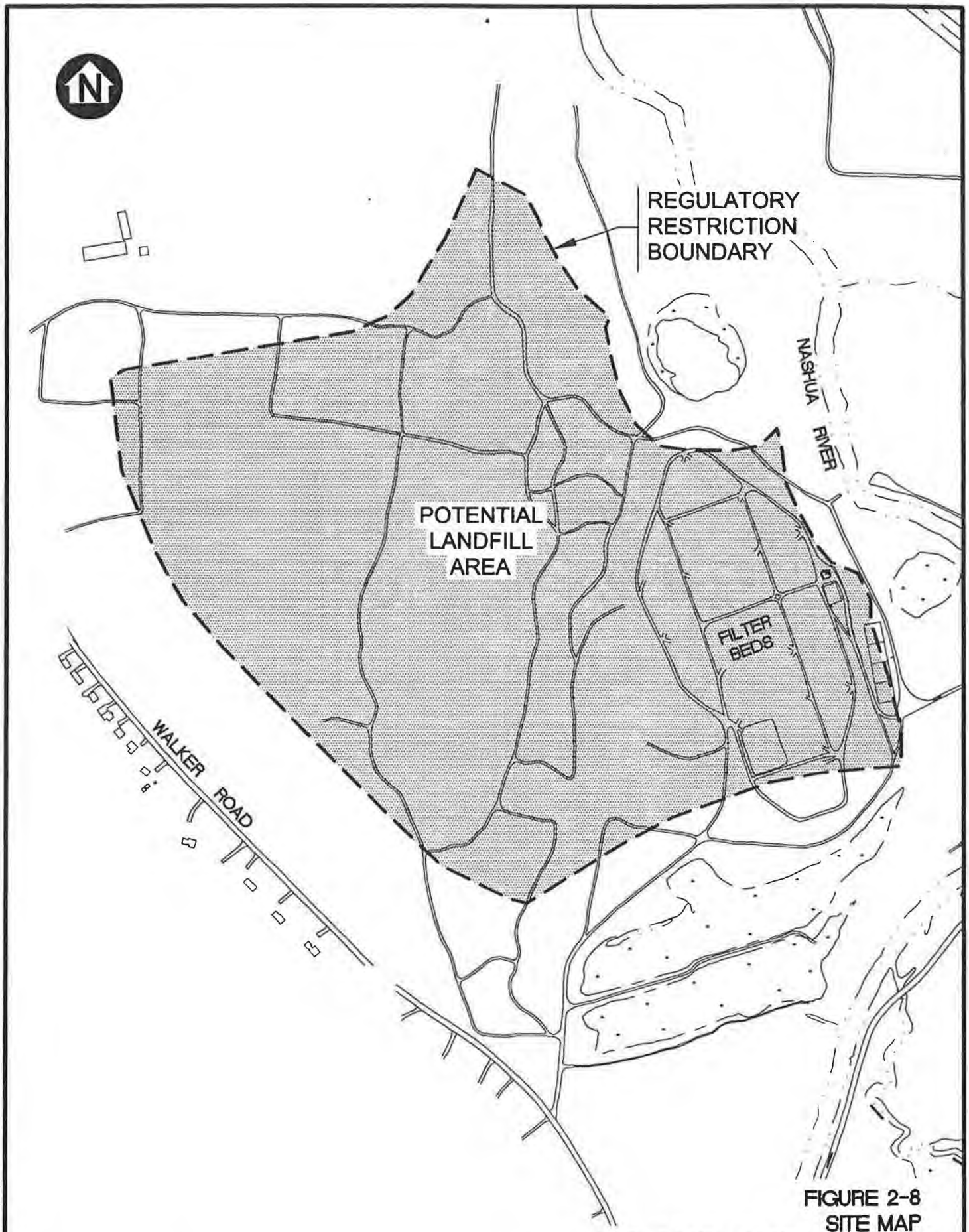

FIGURE 2-8
SITE MAP
NORTH POST - NORTH OF AOC 9
LANDFILL REMEDIATION FEASIBILITY STUDY
ADDENDUM REPORT
DEVENS, MA
Harding Lawson Associates

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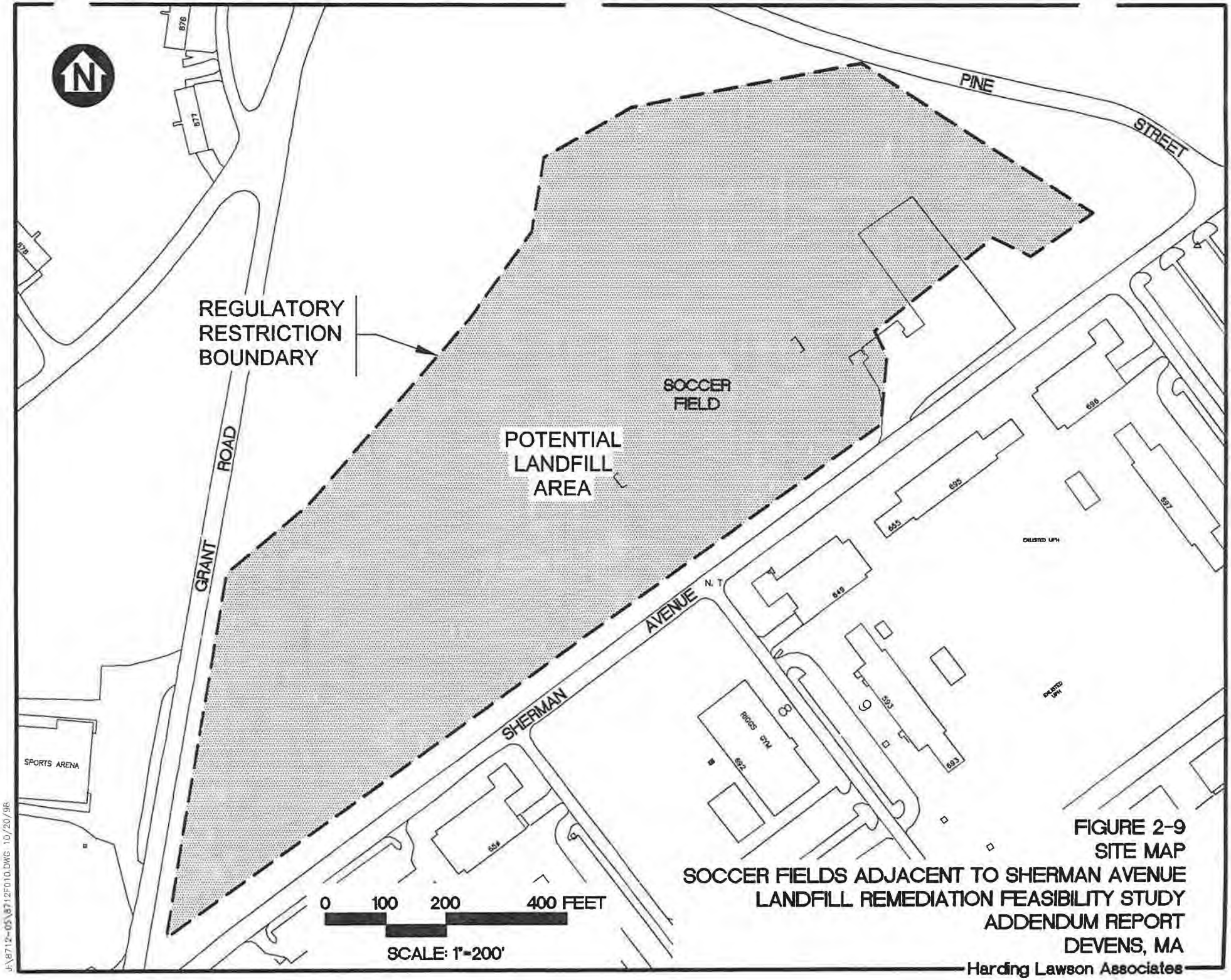

FIGURE 2-9
SITE MAP
SOCCER FIELDS ADJACENT TO SHERMAN AVENUE
LANDFILL REMEDIATION FEASIBILITY STUDY
ADDENDUM REPORT
DEVENS, MA
Harding Lawson Associates

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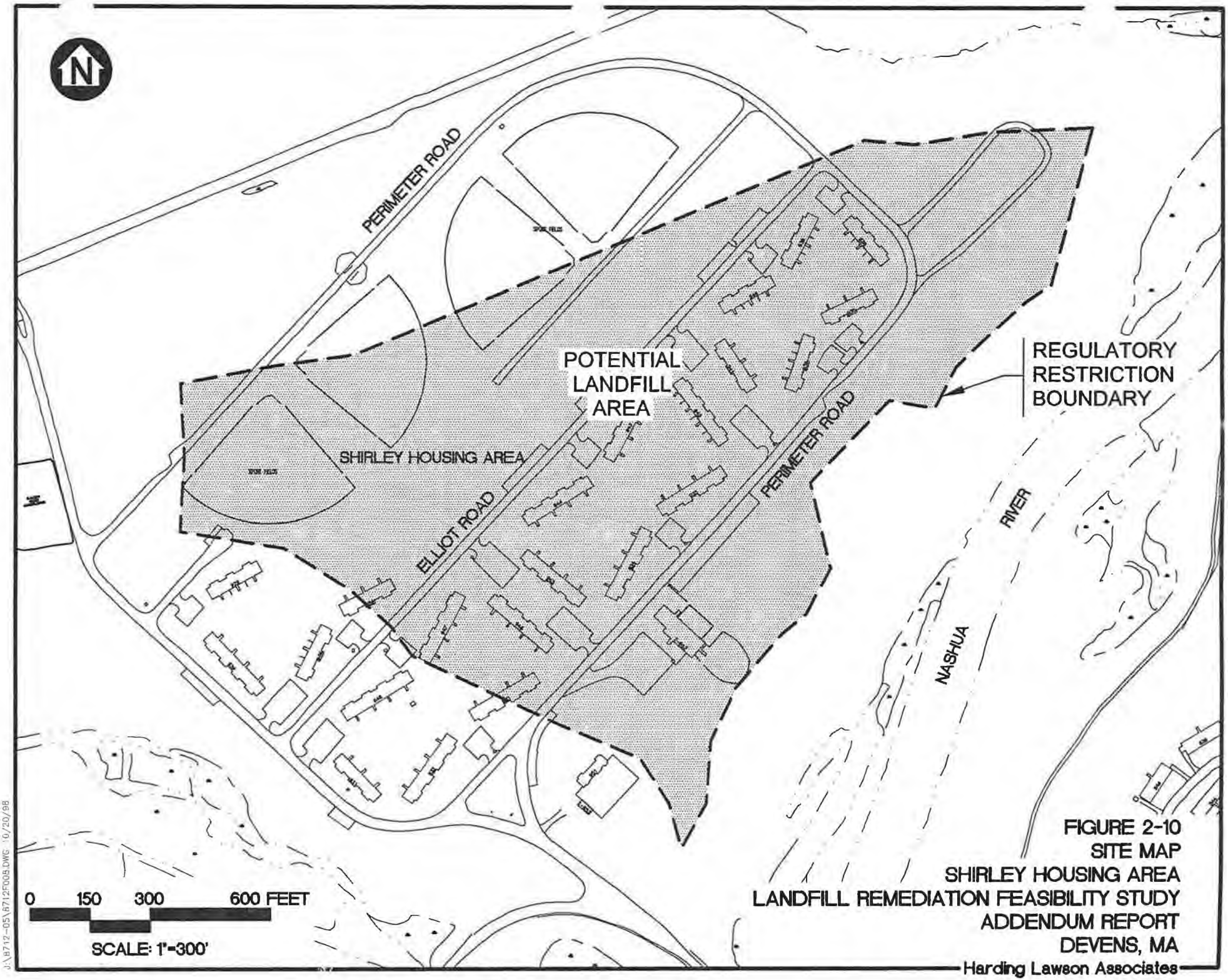

FIGURE 2-10
SITE MAP
SHIRLEY HOUSING AREA
LANDFILL REMEDIATION FEASIBILITY STUDY
ADDENDUM REPORT
DEVENS, MA

Harding Lawson Associates

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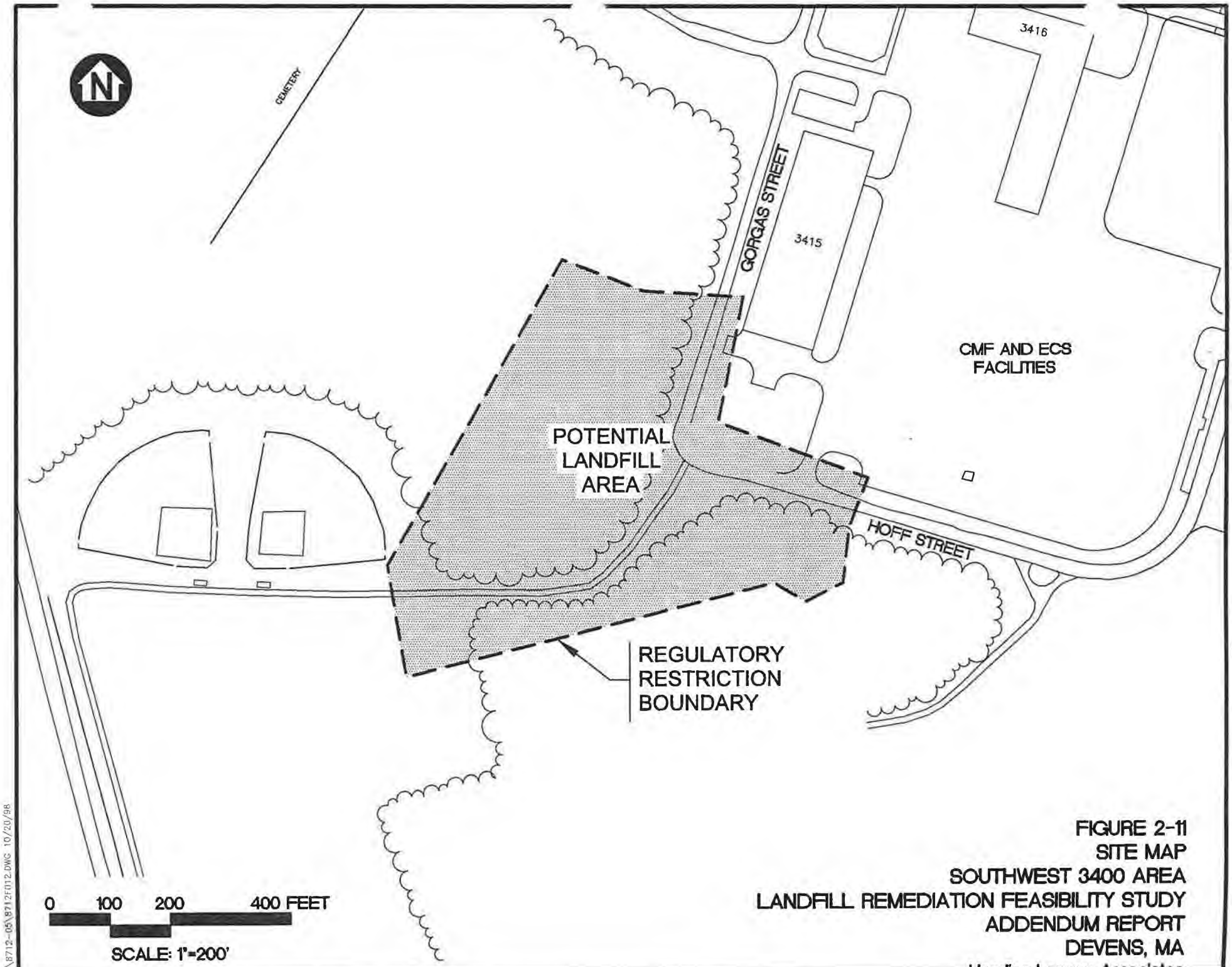

FIGURE 2-11
SITE MAP
SOUTHWEST 3400 AREA
LANDFILL REMEDIATION FEASIBILITY STUDY
ADDENDUM REPORT
DEVENS, MA
Harding Lawson Associates

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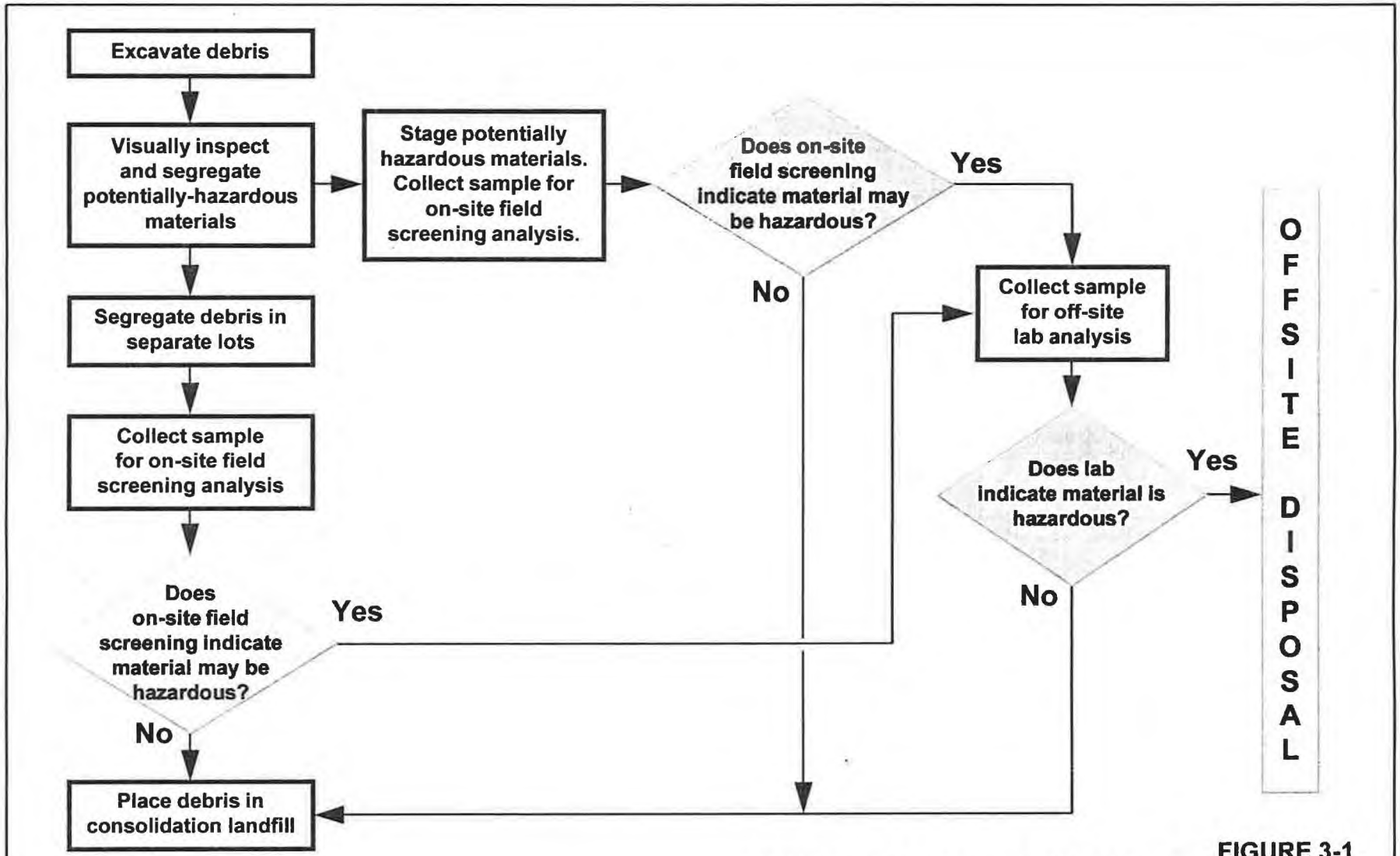

FIGURE 3-1
CONCEPTUAL DEBRIS SCREENING FLOW CHART
LANDFILL REMEDIATION FEASIBILITY STUDY
ADDENDUM REPORT
DEVENS, MA

Harding Lawson Associates

W9802010(a)

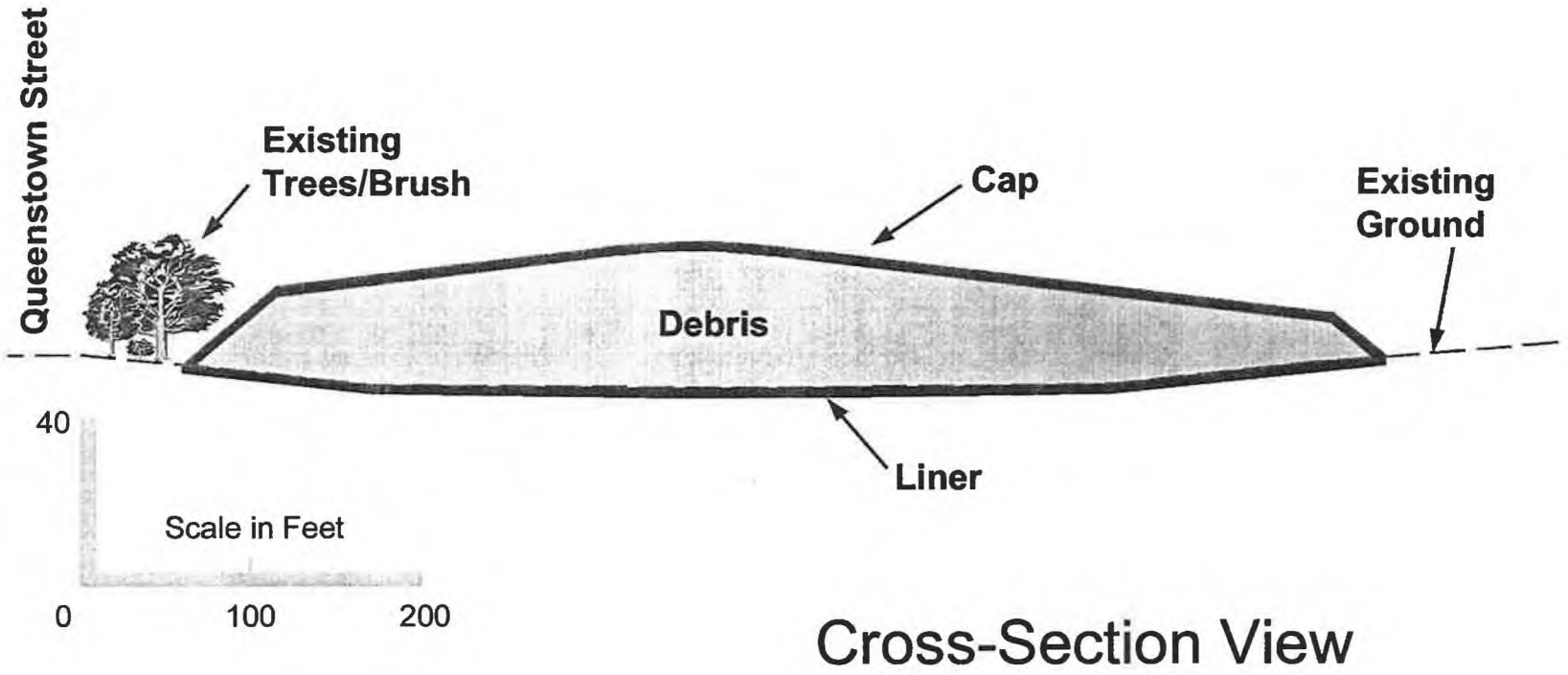

FIGURE 3-2
CONCEPTUAL DEBRIS LANDFILL
FORMER GOLF COURSE DRIVING RANGE
LANDFILL REMEDIATION FEASIBILITY STUDY
ADDENDUM REPORT
DEVENS, MA

Harding Lawson Associates

W9802010(a)

TABLE 2-1

LANDFILL REMEDIATION
NON-REGULATORY SITING CRITERIA
DEVENS RESERVE FORCES TRAINING AREA

LANDFILL REMEDIATION FEASIBILITY STUDY ADDENDUM
DEVENS, MA

CRITERIA	MEASUREMENT METHOD
1. Visual and Property Value Impact	Proximity to residential and public areas Further away is better Landfill visible from adjacent property Buffers present (Trees, topography, other)
2. Mapped Potentially Productive Aquifers	Further away is better Discharge area better than Recharge area
3. Proximity to Zone II Boundary	Further away is better Down-gradient better than cross-gradient better than Up-gradient
4. Underlying soil types	Lower permeability is better
5. Impact on Development or other constructive uses	Conflicts with Reuse Plan Known development areas Potential to impact nearby development areas
6. Adjacent Property Uses	Contaminated vs. Uncontaminated Areas Regulatory preference for similar adjacent site uses Fits in with surrounding property use
7. Proximity to popula: .. areas/Schools	Further away is better
8. Proximity to Conservation Land	Further away is better
9. Parcel Size	Minimum of 12 Acres
10. Site Preparation Requirements	Availability of Utilities (Electric, Sewer) Clearing and grading requirements Existing Building Demolition
11. Roadway Access and Hauling Impacts	Avoid Populated areas/Schools Existing road width and construction Bridge and road weight limits
12. Impact on Army Mission	Site specific

TABLE 3-1
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARs FOR ALTERNATIVES 4a, 4b, and 4c

LANDFILL REMEDIATION FEASIBILITY STUDY ADDENDUM
DEVENS, MA

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Floodplains	Floodplain Management Executive Order 11988 [40 CFR Part 6, Appendix A]	Applicable AOC 9 AOC 11 AOC 40	Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.	Drum removal and hot-spot sediment removal will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary.
	Wetlands	Protection of Wetlands Executive Order 11990 [40 CFR Part 6, Appendix A]	Applicable AOC 9 AOC 11 AOC 40	Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.	Drum removal and hot-spot sediment removal will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary.
	Wetlands, Aquatic Ecosystem	Clean Water Act, Dredge or Fill Requirements Section 404 [40 CFR Part 230]	Relevant and Appropriate AOC 9 AOC 11 AOC 40	Section 404 of the Clean Water Act regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a discharge of fill materials. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under Clean Water Act Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands.	The removal of drums/sediments will be designed to minimize placement of fill in wetland areas. If this alternative is chosen, the affected areas will be restored to the extent necessary.
Federal	Surface Waters, Endangered Species, Migratory Species	Fish and Wildlife Coordination Act [16 USC 661 et. seq.]	Relevant and Appropriate AOC 9 AOC 11 AOC 40 SA 13	Actions that affect species/habitat require consultation with U.S. Department of Interior, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions. Under 40 CFR Part 300.38, these requirements apply to all response activities under the National Contingency Plan.	To the extent necessary, actions will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The U.S. Fish and Wildlife Service, acting as a review agency for the USEPA, will be kept informed of proposed remedial actions.

Table 3-1 continued

TABLE 3-1
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARs FOR ALTERNATIVES 4a, 4b, and 4c

LANDFILL REMEDIATION FEASIBILITY STUDY ADDENDUM
DEVENS, MA

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Endangered Species	Endangered Species Act [50 CFR Parts 17.11-17.12]	Applicable AOC 9 AOC 11 AOC 40 SA 13 Consolidation Facility	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	The protection of endangered species and their habitat will be considered during excavation activities and cover installation.
	Atlantic Flyway, Wetlands, Surface Waters	Migratory Bird Treaty Act [16 USC 703 et seq.]	Relevant and Appropriate AOC 11	The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.	Remedial actions will be performed to protect migratory birds, their nests, and eggs.
State	Floodplains, Wetlands, Surface Waters	Massachusetts Wetland Protection Act and regulations [MGL c. 131 s. 40; 310 CMR 10.00]	Applicable AOC 9 AOC 11 AOC 40 SA 13	These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year floodplain). A Notice of Intent (NOI) must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons.	All work to be performed within wetlands and the 100 foot buffer zone will be in accordance with the substantive requirements of these regulations.
	Endangered Species	Massachusetts Endangered Species Regulations [321 CMR 8.00]	Applicable AOC 9 AOC 11 AOC 40 SA 13 Consolidation Facility	Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	The protection of state listed endangered species (in particular the Grasshopper Sparrow at the Consolidation Facility) will be considered during the design and implementation of this alternative.

Notes:

CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CWA = Clean Water Act
DOI = Department of the Interior
FWS = Fish and Wildlife Service
MEPA = Massachusetts Environmental Policy Act
MGL = Massachusetts General Laws
NMFS = National Maine Fisheries Service
USC = United States Code

TABLE 3-2
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs FOR ALTERNATIVES 4a, 4b, and 4c

LANDFILL REMEDIATION FEASIBILITY STUDY ADDENDUM
DEVENS, MA

REGULATORY AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Surface water	Clean Water Act, Ambient Water Quality Criteria [40 CFR 131; Quality Criteria for Water 1986]	Relevant and Appropriate AOC 11 AOC 40	Federal Ambient Water Quality Criteria (AWQC) include (1) health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and (2) acute and chronic toxicity values for the protection of aquatic life. AWQC for the protection of human health provide protective concentrations for exposure from ingesting contaminated water and contaminated aquatic organisms, and from ingesting contaminated aquatic organisms alone. Remedial actions involving contaminated surface water or discharge of contaminants to surface water must consider the uses of the water and the circumstances of the release or threatened release.	Remedial actions will be performed in a manner to prevent AWQC exceedances in surface water. Activities at AOC 11 will be performed to prevent AWQC exceedances in the Nashua River. Removal of sediment at AOC 40 will be performed in a manner to prevent AWQC exceedances in Cold Spring Brook Pond. Supernatant from dredged spoil will be monitored to prevent AWQC exceedances in Cold Spring Brook Pond.
	Groundwater	Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs and MCLGs [40 CFR Parts 141.60 - 141.63 and 141.50 - 141.52]	Relevant and Appropriate AOC 40	The National Primary Drinking Water Regulations establish Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health based goals set equal to or lower than MCLs.	At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average scenario, and the MCL for arsenic will be met under average and maximum scenario. MCLs are not exceeded at Patton Well.
State	Surface water	Massachusetts Surface Water Quality Standards [314 CMR 4.00]	Relevant and Appropriate AOC 11 AOC 40	Massachusetts Surface Water Quality Standards designate the most sensitive uses for which surface waters of the Commonwealth are to be enhanced, maintained, and protected, and designate minimum water quality criteria for sustaining the designated uses. Surface waters at Fort Devens are classified as Class B. Surface waters assigned to this class are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. These criteria supersede federal AWQC only when they are more stringent (more protective) than the AWQC.	At AOC 11 activities will be performed in a manner to prevent exceedances of surface water quality in the Nashua River. At AOC 40 sediment removal will be performed in a manner to prevent exceedances of Surface Water Quality Standards in Cold Spring Brook Pond. Supernatant from dredged spoil dewatering will be monitored to prevent exceedances in the pond. To the extent necessary, Surface Water Quality Standards will be used to develop discharge limitations.

TABLE 3-2
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs FOR ALTERNATIVES 4a, 4b, and 4c

LANDFILL REMEDIATION FEASIBILITY STUDY ADDENDUM
DEVENS, MA

REGULATORY AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Relevant and Appropriate AOC 40	These standards designate and assign uses for which groundwaters of the Commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class I, fresh groundwaters designated as a source of potable water supply.	At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average scenario, and the MCL for arsenic will be met under average and maximum scenario. MCLs are not exceeded at Patton Well.
	Groundwater	Massachusetts Drinking Water Regulations [310 CMR 22.00]	Relevant and Appropriate AOC 40	These regulations list Massachusetts MCLs which apply to drinking water distributed through a public water system.	At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average scenario, and the MCL for arsenic will be met under average and maximum scenario. MCLs are not exceeded at Patton Well.

Notes:

AWQC = Ambient Water Quality Criteria
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Rules
CWA = Clean Water Act
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
MMCL = Massachusetts Maximum Contaminant Level
NPDWR = National Primary Drinking Water Regulations
SDWA = Safe Drinking Water Act
SMCL = Secondary Maximum Contaminant Level

TABLE 3-3
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVES 4a, 4b, and 4c

LANDFILL REMEDIATION FEASIBILITY STUDY ADDENDUM
DEVENS, MA

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Construction over/in navigable waters	Rivers and Harbors Act of 1899 [33 USC 401 et seq.]	Relevant and Appropriate AOC 40 AOC 11	Section 10 of the Rivers and Harbors Act of 1899 requires an authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers (USACE), for the construction of any structure in or over any "navigable water of the U.S."; the excavation from or deposition of material in such waters, or any obstruction of alteration in such waters.	Excavating, filling, and disposal activities will be conducted to meet the substantive criteria and standards of these regulations.
	Control of surface water runoff, Direct discharge to surface water	Clean Water Act NPDES Permit Program [40 CFR 122,125]	Relevant and Appropriate AOC 9 AOC 11 AOC 40 SA 13 Consolidation Facility	The National Pollutant Discharge Elimination System (NPDES) permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to waters of the United States.	Construction activities will be controlled to meet USEPA discharge requirements. On-site discharges will meet the substantive requirements of these regulations.
	Land Disposal of Hazardous Wastes	Resource Conservation and Recovery Act (RCRA), Land Disposal Restrictions (LDRs); (40 CFR Part 268)	Applicable AOC 9 AOC 11 AOC 40 SA 13	Land disposal of RCRA hazardous wastes without specified treatment is restricted. Remedial actions must be evaluated to determine if they constitute "placement" and if LDRs are applicable. The LDRs require that wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility.	If it is determined that materials excavated from AOCs 9, 11, 40, or SA 13 are hazardous materials subject to LDRs, the materials will be handled and disposed of in compliance with these regulations.
State	Solid Waste Landfill Siting	Massachusetts Solid Waste Facilities Site Regulations [310 CMR 16.00]	Applicable Consolidation Facility	These regulations outline the requirements for selecting the site of a new solid waste landfill for the Commonwealth of Massachusetts.	The consolidation facility will be sited in accordance with these regulations.
	Solid Waste Landfill Construction, Operation, Closure, and Post-Closure Care	Massachusetts Solid Waste Management Regulations [310 CMR 19.000]	Relevant and Appropriate AOC 9 AOC 11 SA 12 SA 13 Consolidation Facility	These regulations outline the requirements for construction, operation, closure, and post closure at solid waste management facilities in the Commonwealth of Massachusetts.	Final closure and post-closure plans will be prepared and submitted to satisfy the requirements of 310 CMR 19.021 for AOCs 9, 11, and 40, and SA 13. The requirements of 310 CMR 19.021 will not be satisfied for SA 12. The consolidation landfill will be constructed, operated, and closed in conformance with the regulations at 310 CMR 19.000. A Record Notice of Landfill Operation will be filed for AOC 11 in accordance with 310 CMR 19.141.

Note: A Record Notice of Landfill Operation for AOC 11 is not necessary with Alternative 4c.

TABLE 3-3
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVES 4a, 4b, and 4c

LANDFILL REMEDIATION FEASIBILITY STUDY ADDENDUM
DEVENS, MA

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State	Activities that potentially affect surface water quality	Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00]	Relevant and Appropriate AOC 40	For activities that require a MADEP Wetlands Order of Conditions to dredge or fill navigable waters or wetlands, a Chapter 91 Waterways License, a USACE permit or any major permit issued by USEPA (e.g., Clean Water Act NPDES permit), a Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00.	Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to attain and maintain Massachusetts Water Quality Standards in affected waters.
	Activities that affect ambient air quality	Massachusetts Air Pollution Control Regulations [310 CMR 7.00]	Applicable AOC 9 AOC 11 AOC 40 SA 13 Consolidation Facility	These regulations pertain to the prevention of emissions in excess of Massachusetts ambient air quality standards.	Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18).

Notes:

CFR = Code of Federal Regulations
CMR = Code of Massachusetts Rules
CWA = Clean Water Act
MADEP = Massachusetts Department of Environmental Protection
MGL = Massachusetts General Laws
NPDES = National Pollutant Discharge Elimination System
USACE = U.S. Army Corps of Engineers
USC = United States Code

TABLE 3-4
COST SUMMARY TABLE
ALTERNATIVE 4a: NO FURTHER ACTION AT SAS 6, 12, AOC 41;
LIMITED REMOVAL AT AOC 11;
EXCAVATE AND CONSOLIDATE AOCS 9 & 40, SA 13 NEAR SHEPLEY'S HILL

LANDFILL REMEDIATION FEASIBILITY STUDY ADDENDUM
DEVENS, MA

ITEM	TOTAL COST
Direct Costs	
No Further Action	
SA 6	0
SA 12	0
AOC 41	0
Limited Removal at AOC 11	44,000
Excavate Debris/Restore Site	
AOC 9	2,206,000
AOC 40	1,770,000
SA 13	337,000
Transport to Consolidation Landfill	2,262,000
Consolidation Landfill Construction	6,373,000
Total Direct Costs	**12,992,000**
Indirect Costs	
Health and Safety	649,000
Legal, Admin, Permitting	649,000
Engineering	1,299,000
Services During Construction	1,299,000
Total Indirect Costs	**3,896,000**
Total Capital (Direct + Indirect) Costs	16,888,000
Operation and Maintenance Costs	
Total Annual O&M Costs for AOC 11 – 2 years	4,000
Total Annual O&M Costs Consolidation Landfill – 30 years	23,000
Total Additional Annual O&M Costs for AOC 40 – 5 years	29,000
Total Present Worth of O&M Costs	**411,000**
TOTAL COSTS ALTERNATIVE 4a	**17,299,000**

TABLE 3-5a
COST SUMMARY TABLE
ALTERNATIVE 4b: NO FURTHER ACTION AT SAs 6, 12, AOC 41;
LIMITED REMOVAL AT AOC 11;
EXCAVATE AND CONSOLIDATE AOCs 9 & 40, SA 13 AT THE FORMER GOLF COURSE DRIVING RANGE
(DISPOSAL OPTION ONE)

LANDFILL REMEDIATION FEASIBILITY STUDY ADDENDUM
DEVENS, MA

ITEM	TOTAL COST
Direct Costs	
No Further Action	
SA 6	0
SA 12	0
AOC 41	0
Limited Removal at AOC 11	44,000
Excavate Debris/Restore Site	
AOC 9	2,206,000
AOC 40	1,770,000
SA 13	337,000
Transport to Consolidation Landfill	2,262,000
Consolidation Landfill Construction	6,373,000
Total Direct Costs	**12,992,000**
Indirect Costs	
Health and Safety	649,000
Legal, Admin, Permitting	649,000
Engineering	1,299,000
Services During Construction	1,299,000
Total Indirect Costs	**3,896,000**
Total Capital (Direct + Indirect) Costs	16,888,000
Operation and Maintenance Costs	
Total Annual O&M Costs for AOC 11 – 2 years	4,000
Total Annual O&M Costs Consolidation Landfill – 30 years	23,000
Total Additional Annual O&M Costs for AOC 40 – 5 years	29,000
Total Present Worth of O&M Costs	**411,000**
TOTAL COSTS ALTERNATIVE 4b WITH DISPOSAL OPTION ONE	**17,299,000**

TABLE 3-5b
COST SUMMARY TABLE
ALTERNATIVE 4b: NO FURTHER ACTION AT SAS 6, 12, AOC 41;
LIMITED REMOVAL AT AOC 11;
EXCAVATE AND DISPOSE OFFSITE: AOCS 9 & 40, SA 13
(DISPOSAL OPTION TWO)

LANDFILL REMEDIATION FEASIBILITY STUDY ADDENDUM
DEVENS, MA

ITEM	TOTAL COST
Direct Costs	
No Further Action	
SA 6	0
SA 12	0
AOC 41	0
Limited Removal at AOC 11	44,000
Excavate Debris/Restore Site	
AOC 9	2,206,000
AOC 40	1,770,000
SA 13	337,000
Handle and Load Debris	2,283,000
Rail Transport	9,632,000
Offsite Disposal	8,026,000
Total Direct Costs	**24,298,000**
Indirect Costs	
Health and Safety	1,215,000
Legal, Admin, Permitting	1,215,000
Engineering	1,215,000
Services During Construction	1,215,000
Total Indirect Costs	**4,860,000**
Total Capital (Direct + Indirect) Costs	29,158,000
Operation and Maintenance Costs	
Total Annual O&M Costs for AOC 11 – 2 years	4,000
Total Additional Annual O&M Costs for AOC 40 – 5 years	29,000
Total Present Worth of O&M Costs	**131,000**
TOTAL COSTS ALTERNATIVE 4b WITH DISPOSAL OPTION TWO	**29,289,000**

TABLE 3-6a
COST SUMMARY TABLE
ALTERNATIVE 4c: NO FURTHER ACTION AT SAS 6, 12, AOC 41;
EXCAVATE AND CONSOLIDATE AOCS 9, 11, & 40, SA 13
AT THE FORMER GOLF COURSE DRIVING RANGE
(DISPOSAL OPTION ONE)

LANDFILL REMEDIATION FEASIBILITY STUDY ADDENDUM
DEVENS, MA

ITEM	TOTAL COST
Direct Costs	
No Further Action	
SA 6	0
SA 12	0
AOC 41	0
Excavate Debris/Restore Site	
AOC 9	2,206,000
AOC 11	1,757,000
AOC 40	1,770,000
SA 13	337,000
Transport to Consolidation Landfill	2,609,000
Consolidation Landfill Construction	6,549,000
Total Direct Costs	**15,228,000**
Indirect Costs	
Health and Safety	761,000
Legal, Admin, Permitting	761,000
Engineering	1,523,000
Services During Construction	1,523,000
Total Indirect Costs	**4,568,000**
Total Capital (Direct + Indirect) Costs	19,796,000
Operation and Maintenance Costs	
Total Annual O&M Costs Consolidation Landfill – 30 years	23,000
Total Additional Annual O&M Costs for AOC 40 – 5 years	29,000
Total Present Worth of O&M Costs	**404,000**
TOTAL COSTS ALTERNATIVE 4c WITH DISPOSAL OPTION ONE	**20,200,000**

TABLE 3-6b
COST SUMMARY TABLE
ALTERNATIVE 4c: NO FURTHER ACTION AT SAS 6, 12, AOC 41;
EXCAVATE AND DISPOSE OFFSITE: AOCS 9, 11, & 40, SA 13
(DISPOSAL OPTION TWO)

LANDFILL REMEDIATION FEASIBILITY STUDY ADDENDUM
DEVENS, MA

ITEM	TOTAL COST
Direct Costs	
No Further Action	
SA 6	0
SA 12	0
AOC 41	0
Excavate Debris/Restore Site	
AOC 9	2,206,000
AOC 11	1,757,000
AOC 40	1,770,000
SA 13	337,000
Handle and Load Debris	2,611,000
Rail Transport	11,011,000
Offsite Disposal	9,171,000
Total Direct Costs	**28,863,000**
Indirect Costs	
Health and Safety	1,443,000
Legal, Admin, Permitting	1,443,000
Engineering	1,443,000
Services During Construction	1,444,000
Total Indirect Costs	**5,773,000**
Total Capital (Direct + Indirect) Costs	34,636,000
Operation and Maintenance Costs	
Total Additional Annual O&M Costs for AOC 40 – 5 years	29,000
Total Present Worth of O&M Costs	**124,000**
TOTAL COSTS ALTERNATIVE 4c WITH DISPOSAL OPTION TWO	**34,760,000**

MADEP SOLID WASTE LANDFILL SITING CRITERIA

SOLID WASTE LANDFILL SITING CRITERIA

A. MADEP Criteria (from 310 CMR 16.40)

1. FACILITY-SPECIFIC CRITERIA

A proposed landfill:

1. Shall not be within a Zone II of an existing water supply well.
2. Shall not be within an Interim Wellhead Protection Area.
3. Shall not be within 15,000 feet upgradient of a well for which Zone II has not been calculated.
4. Shall not be within Zone II of a potential groundwater supply.
5. Shall not be in an area where leachate release would endanger a potential public groundwater supply for which Zone II has not been determined.
6. Shall not be over a recharge area of a Sole Source Aquifer (some exceptions)
7. Shall not be less than one-half mile upgradient of a surface drinking water supply.
8. Shall not be less than 250 feet upgradient of a perennial watercourse draining to a surface drinking water supply within one mile of the landfill.
9. Shall not be less than 500 feet downgradient of a surface drinking water supply.
10. Shall not be within 500 feet of a private drinking water supply unless restricted area and well are purchased.
11. Shall be able to attain four feet from the maximum high groundwater table to the lowermost liner.
12. Shall not be within an area protected by the Wetlands Protection Act (including 100-year floodplain).
13. Shall not be less than 250 feet from a lake or river other than a drinking water supply.
14. Shall not be less than 500 feet from an occupied residential dwelling, health care facility, prison, lower educational institution, or pre-school.
15. Shall not be located where leachate would result in an adverse impact to groundwater, unless a groundwater protection system is incorporated.
16. Shall not be less than 100 feet from an active farmland.
17. Shall not be in an area where traffic impacts would endanger public health, safety, or the environment.
18. Shall not adversely impact wildlife and wildlife habitat.
19. Shall not be in an Area of Critical Environmental Concern (ACEC).
20. Will meet federal and state air quality standards and not edanger public health, safety, or the environment.
21. Will not create nuisance conditions endangering public health, safety, or the environment with regard to: noise, litter, rodents/insects, odors, and bird hazards to traffic.
22. Shall be of sufficient size to properly operate and maintain.

A. MADEP Criteria (from 310 CMR 16.40)

B. General Criteria:

Where an area adjacent to the site of a proposed facility has been previously used for solid waste disposal:

1. Prior solid waste activities on the adjacent site shall not adversely impact the proposed site.
2. Use of the proposed site should not adversely impact the site previously used for solid waste disposal.
3. The combined impacts of the proposed site and the previously-used adjacent site shall not adversely impact public health, safety, and the environment relative to:

- whether the proposed site is an expansion of or constitutes beneficial integration of the solid waste activities with the adjacent site
- whether the proposed site is related tothe closure and/or remedial activities at the adjacent site
- extent to which design and operation of the proposed site will mitigate existing or potential impacts from the adajent site.

SITE CONFORMANCE TO NON-REGULATORY CRITERIA

Evaluation of the 2500-2600 Wooded Area

Consolidation Landfill Site Selection
Devens, Massachusetts

Non-Regulatory Criteria	Technical Site Information	Comments
Visual and Property Value Impact	Landfill may be visible from prison and Army Reserve Area. Existing trees would provide natural visual screen.	Not visible from residential areas. Site is located within Jackson Road Gateway Corridor.
Proximity to Mapped Potentially Productive Aquifers	Site overlies discharge area of a potentially productive aquifer. Groundwater table is at or just a few feet below ground surface.	MADEP regulations do not prohibit landfills in mapped aquifer areas. Four-foot separation between waste and groundwater table would require significant engineering modifications.
Proximity to Zone II Boundary	Site is approximately 2,500 feet from the Zone II boundaries of both the Patton and Sheboken water supply wells. Site is approximately 1,300 feet from the MCI Shirley well IWPA.	Site is upgradient from the IWPA boundary.
Underlying Soil Types	Underlying soil is till, with bedrock outcrops at ground surface.	
Impact on Development or other Constructive Uses	Plans for commercial development of this site are underway.	Proposed landfill would conflict with site development plans.
Adjacent Property Uses	Site is located in area designated as Innovation and Technology Business. The site borders the prison and an area designated for Army Reserve.	Use of the site as a landfill would appear to moderately conflict with adjacent property uses.
Proximity to Populated Areas / Schools	Site is approximately 500 feet from the Parker Charter School.	Site is separated from populated areas by developed and undeveloped parcels.
Proximity to Conservation Land	Not located in land identified for conservation.	Nearest conservation land is approximately 700 feet away.
Parcel Size	Parcel is approximately 45 acres in size.	Use of the subsurface for debris disposal not likely anywhere within the parcel.
Site Preparation Requirements	Sewer and electric utilities available nearby. The site is flat and heavily wooded; extensive clearing necessary. No existing buildings to demolish.	Electric and sewer service can be extended to the site. Extensive clearing required. No building demolition required. No preliminary cut/fill requirements.
Roadway Access and Hauling Impacts	Site is accessible from debris disposal areas. Debris hauling through heavily populated areas is not anticipated. Haul road widths, bridge and road weight limits appear to be adequate for dump truck hauling.	New access/maintenance roadway would need to be constructed at the site.
Impact on Army Mission	No adverse impact on Army mission.	Adjacent Army Reserve area may be used to house landfill monitoring and maintenance equipment

Evaluation of the Area Adjacent to Shepley's Hill

Consolidation Landfill Site Selection
Devens, Massachusetts

Non-Regulatory Criteria	Technical Site Information	Comments
Visual and Property Value Impact	Proposed landfill is expected to be no higher than Shepley's Hill Landfill. Existing trees provide natural visual screen.	The public perceives proposed landfill to be visually unattractive, with a potential to lower property values.
Proximity to Mapped Potentially Productive Aquifers	Site overlies discharge area of a potentially productive aquifer. Depth to groundwater is approximately 15 feet.	MADEP regulations do not prohibit landfills in mapped aquifer areas.
Proximity to Zone II Boundary	Site is approximately 1,300 feet away from nearest Zone II boundary (Grove Pond wellfield).	Site is cross-gradient to the Zone II boundary.
Underlying Soil Types	Underlying soil is highly permeable sands.	Geotechnical evaluation concluded that site soils are capable of supporting consolidation landfill.
Impact on Development or other Constructive Uses	There are currently no plans for development at this site. Development plans in adjacent property include industrial development to the south.	Proposed landfill would have no adverse impact on development plans either at the site or on adjacent property.
Adjacent Property Uses	Site is located in area designated as Open Space. The site borders Plow Shop Pond to the north, a rail yard and Grove Pond to the east, a planned industrial area to the south, and Shepley's Hill Landfill to the west.	Public perceives the consolidation landfill as compounding environmental problem at an existing 84-acre Shepley's Hill Landfill. Site meets regulatory preference for similar adjacent site uses, i.e., approved Landfill Expansion Area.
Proximity to Populated Areas / Schools	Site is over 2,800 ft. from nearest school, 1,600 feet from nearest residence, and 2,100 ft. from populated areas.	Plow Shop and Grove Ponds separate the site from the nearest populated area in Ayer.
Proximity to Conservation Land	Not located in land identified for conservation.	Nearest conservation land is approximately 3,700 feet away.
Parcel Size	Required minimum of 12 acres is available.	Expandability limited by Shepley's Hill Landfill and proximity to installation boundary.
Site Preparation Requirements	Sewer and electric utilities available nearby. The site is flat with no existing buildings.	Electric and sewer service can be extended to the site. No clearing or building demolition required. No preliminary cut/fill requirements.
Roadway Access and Hauling Impacts	Site is accessible from debris disposal areas. Debris hauling through heavily populated areas is not anticipated. Haul road widths, bridge and road weight limits appear to be adequate for dump truck hauling.	Approximately 1,000 feet of access dirt roadway at the site may need to be improved.
Impact on Army Mission	Existing landfill is presently closed.	Long-term monitoring and maintenance can be conducted in conjunction with existing SHL monitoring.

Evaluation of the DRMO Yard Area

Consolidation Landfill Site Selection
Devens, Massachusetts

Non-Regulatory Criteria	Technical Site Information	Comments
Visual and Property Value Impact	Site is surrounded by commercial and other non-residential activities.	Not visible from residential areas.
Proximity to Mapped Potentially Productive Aquifers	Site overlies recharge area of a potentially productive aquifer. Groundwater table is approximately 20 feet below ground surface.	MADEP regulations do not prohibit landfills in mapped aquifers.
Proximity to Zone II Boundary	Site is approximately 1,100 feet from nearest Zone II boundary (MacPherson well).	Site is upgradient of the MacPherson Zone II.
Underlying Soil Types	Underlying soil is sand and gravel.	Geotechnical evaluation of subsurface soil has not been conducted.
Impact on Development or other Constructive Uses	Future rail-served commercial/industrial development is planned for the area.	Moderate to high impact on future development.
Adjacent Property Uses	Site is located in an area designated as Rail, Industrial, and Trade-Related. The site borders Shepley's Hill Landfill to the northeast and a planned industrial area to the south.	Site meets regulatory preference for similar adjacent site uses. Use of the site as a landfill would not significantly conflict with adjacent property uses.
Proximity to Populated Areas / Schools	Site is approximately 1,200 feet from the future Parker Charter School and Job Corps facility.	Site is separated from populated areas by developed and undeveloped parcels.
Proximity to Conservation Land	Not located in land identified for conservation.	Nearest conservation land is approximately 2,300 feet away.
Parcel Size	Required minimum of 12 acres is available.	
Site Preparation Requirements	Sewer and electric utilities available nearby. Site surface is irregular. There are some buildings and pavement; no trees.	Electric and sewer service can be extended to the site. No clearing required. Preliminary cut/fill activities required. Some building and pavement demolition required.
Roadway Access and Hauling Impacts	Site is accessible from debris disposal areas. Debris hauling through heavily populated areas is not anticipated. Haul road widths, bridge and road weight limits appear to be adequate for dump truck hauling.	
Impact on Army Mission	No adverse impact on Army mission is anticipated.	

Evaluation of the Former Amphitheater Near Davao Housing

Consolidation Landfill Site Selection
Devens, Massachusetts

Non-Regulatory Criteria	Technical Site Information	Comments
Visual and Property Value Impact	Site is in a relatively remote area near Robbins Pond.	Not visible from residential areas.
Proximity to Mapped Potentially Productive Aquifers	Site overlies recharge area of a potentially productive aquifer. Groundwater table is approximately 20 feet below the ground surface at the bottom of the amphitheater.	MADEP regulations do not prohibit landfills in mapped aquifers.
Proximity to Zone II Boundary	Site is approximately 400 feet from nearest Zone II boundary (Patton well).	Site is crossgradient of the Patton well Zone II boundary.
Underlying Soil Types	Underlying soil is sand and gravel.	Geotechnical evaluation of subsurface soil has not been conducted.
Impact on Development or other Constructive Uses	Golf Course planned for the site.	Proposed landfill would have limited impact on development plans at the site. Design of LF would have to be coordinated with Golf Course.
Adjacent Property Uses	Site is located in an area designated as Open space and Recreation.	Use of the site as a landfill would not conflict with adjacent property uses.
Proximity to Populated Areas / Schools	Site is approximately 2,700 feet from the Shirley Elementary School.	Site is separated from populated areas by developed and undeveloped parcels.
Proximity to Conservation Land	Not located in land identified for conservation.	Nearest conservation land is approximately 400 feet away.
Parcel Size	Required minimum of 12 acres is available.	
Site Preparation Requirements	Sewer and electric utilities are available in the nearby Davao Housing complex. The site has a moderate growth of trees.	Electric and sewer service can be extended the site. Tree clearing required.
Roadway Access and Hauling Impacts	Site located close to AOC 40. Haul road widths, bridge and road weight limits appear to be adequate for dump truck hauling.	New access/maintenance roadway would need to be constructed at the site.
Impact on Army Mission	No adverse impact on Army mission is anticipated.	

Evaluation of the Former Golf Course Driving Range

Consolidation Landfill Site Selection
Devens, Massachusetts

Non-Regulatory Criteria	Technical Site Information	Comments
Visual and Property Value Impact	Site is surrounded by commercial and other non-residential activities.	Not visible from residential areas.
Proximity to Mapped Potentially Productive Aquifers	Site is not located in an area designated as a potentially productive aquifer. Groundwater table is approximately 50 feet below the ground surface.	Meets public preference for avoiding landfill siting over a mapped aquifer.
Proximity to Zone II Boundary	Site is approximately 100 feet from nearest Zone II boundary (Patton well).	Site is upgradient of the Patton well Zone II boundary.
Underlying Soil Types	Underlying soil is sand and gravel.	Geotechnical evaluation of subsurface soil has not been conducted.
Impact on Development or other Constructive Uses	Golf Course planned for the site.	Proposed landfill would have limited impact on development plans at the site. Design of LF would have to be coordinated with Golf Course.
Adjacent Property Uses	Site is located in an area designated as Innovative and Technology Business. Adjacent property uses include Open Space and Recreation, and Army Reserve.	Use of the site as a landfill would not conflict with adjacent property uses.
Proximity to Populated Areas / Schools	Site is approximately 3,000 feet from the existing Parker Charter School.	Site is separated from populated areas by developed and undeveloped parcels.
Proximity to Conservation Land	Site is adjacent to Conservation Restriction Land.	
Parcel Size	Parcel is approximately 23 acres in size.	Because of the significant depth to groundwater table, use of the subsurface for debris disposal is possible. Result would be a reduction in landfill height.
Site Preparation Requirements	Sewer and electric utilities are available nearby. The site has an overall light growth of trees. No existing buildings.	Electric and sewer service can be extended to the site. Some tree clearing required. No building demolition required.
Roadway Access and Hauling Impacts	Site is accessible from debris disposal areas. Debris hauling through heavily populated areas is not anticipated. Haul road widths, bridge and road weight limits appear to be adequate for dump truck hauling.	New access/maintenance roadway would need to be constructed at the site.
Impact on Army Mission	No adverse impact on Army mission is anticipated.	

Evaluation of the Former Moore Army Airfield

Consolidation Landfill Site Selection
Devens, Massachusetts

Non-Regulatory Criteria	Technical Site Information	Comments
Visual and Property Value Impact	Site is in a remote location, surrounded by wooded areas.	Landfill would not be visible from residential areas.
Proximity to Mapped Potentially Productive Aquifers	Site is partly within recharge area of a potentially productive aquifer. However, a landfill could be located outside PPA. Groundwater table is approximately 56 feet below the ground surface.	MADEP regulations do not prohibit landfills in mapped aquifer areas.
Proximity to Zone II Boundary	Site is approximately 1,500 feet from nearest Zone II boundary (MacPherson well).	Site is crossgradient from the MacPherson well Zone II boundary.
Underlying Soil Types	Underlying soil is sand and gravel.	Geotechnical evaluation of subsurface soil has not been conducted.
Impact on Development or other Constructive Uses	Site zoning allows light industrial use. Site could accommodate large manufacturing facilities attracted by potential rail service.	Moderate to high potential future impacts.
Adjacent Property Uses	Site is located in an area designated as Special Use. The Nashua River and its wetlands lie to the west. The installation boundary is close by to the north, east, and south.	Use of the site as a landfill would not conflict with adjacent property uses. Property has been industrial for over 50 years.
Proximity to Populated Areas / Schools	Site is over a mile from the Parker Charter School.	Site is in a remote area, separated from populated areas by developed and undeveloped parcels.
Proximity to Conservation Land	Not located in land identified for conservation. Adjacent to Nashua River USFWS Greenway.	Nearest conservation land is approximately 1,000 feet away.
Parcel Size	Parcel is approximately 144 acres in size. LF would be located outside of PPA.	Because of the significant depth to groundwater table, use of the subsurface for debris disposal is possible. Result would be a reduction in landfill height.
Site Preparation Requirements	Sewer and electric utilities are available at the site. Reinforced concrete runways would likely require demolition. The site has no tree growth or existing buildings.	Electric and sewer service can be extended to the site. No tree clearing or building demolition required.
Roadway Access and Hauling Impacts	Site is accessible from debris disposal areas. Debris hauling through downtown Ayer or Walker Rd. to Rt. 2A would be required.	New access/maintenance roadway would need to be constructed at the site.
Impact on Army Mission	No adverse impact on Army mission is anticipated.	

Evaluation of the Locust Housing Area

Consolidation Landfill Site Selection
Devens, Massachusetts

Non-Regulatory Criteria	Technical Site Information	Comments
Visual and Property Value Impact	Site is in a remote location, surrounded by wooded, unoccupied areas. Existing trees provide natural visual screen.	Landfill would not be visible from residential areas.
Proximity to Mapped Potentially Productive Aquifers	Site is not located in a area mapped as a potentially productive aquifer. Groundwater table is up to approximately 25 feet below the ground surface.	Meets public preference for avoiding landfill siting over a mapped aquifer.
Proximity to Zone II Boundary	Site is approximately 4,000 feet from nearest Zone II boundary (Patton well).	Site is cross-gradient from the Patton well Zone II boundary.
Underlying Soil Types	Underlying soil is sand and gravel.	Geotechnical evaluation of subsurface soil has not been conducted.
Impact on Development or other Constructive Uses	Plans for commercial development of this site are underway.	Proposed landfill would significantly conflict with site development plans.
Adjacent Property Uses	Site is located in an area designated as Innovative and Technology Business use. Adjacent property use is Open Space and Recreation.	Use of the site as a landfill would moderately conflict with adjacent property uses.
Proximity to Populated Areas / Schools	Site is 2,000 feet from the existing Parker Charter School.	Site is separated from populated areas by developed and undeveloped parcels.
Proximity to Conservation Land	Not located in land identified for conservation.	Nearest conservation land is approximately 900 feet away.
Parcel Size	Required minimum of 12 acres is available.	Because of the significant depth to groundwater table, use of the subsurface for debris disposal is possible. Result would be a reduction in landfill height.
Site Preparation Requirements	Sewer and electric utilities are available in the former housing area nearby. The site has moderate tree growth. Vacant housing units remain onsite.	Electric and sewer service can be extended to the site. Tree clearing would be required. Building demolition would be required.
Roadway Access and Hauling Impacts	Site is accessible from debris disposal areas. Debris hauling through heavily populated areas is not anticipated. Haul road widths, bridge and road weight limits appear to be adequate for dump truck hauling.	
Impact on Army Mission	No adverse impact on Army mission is anticipated.	

Evaluation of the North Post - North of AOC 9

Consolidation Landfill Site Selection
Devens, Massachusetts

Non-Regulatory Criteria	Technical Site Information	Comments
Visual and Property Value Impact	Site is in a relatively remote location. However, residences are present along a 700-foot length of nearby Walker Road. Existing trees provide natural visual screen.	Landfill would not likely be visible from residential areas.
Proximity to Mapped Potentially Productive Aquifers	Site is partly within an area mapped as a potentially productive aquifer. Groundwater table is approximately 60 feet below the ground surface.	Meets public preference for avoiding landfill siting over a mapped aquifer.
Proximity to Zone II Boundary	Site is approximately 200 feet from both the nearest Zone II boundary (MacPherson well), and the nearest IWPA (Town of Shirley well).	Site is cross- and downgradient from the MacPherson well Zone II and IWPA boundaries.
Underlying Soil Types	Underlying soil is sand and gravel.	Geotechnical evaluation of subsurface soil has not been conducted.
Impact on Development or other Constructive Uses	There are currently no plans for development at this site.	Proposed landfill would have moderate impact on development plans at the site.
Adjacent Property Uses	Site is located in an area designated as Environmental Business. Residences on Walker Road lie approximately 700 feet to the west. The Devens wastewater treatment filter beds are located east of the site.	Use of the site as a landfill may not be compatible with residential use on Walker Road.
Proximity to Populated Areas / Schools	Site is over one mile from any school.	Site is in a remote area, separated from populated areas by developed and undeveloped parcels.
Proximity to Conservation Land	Not located in land identified for conservation.	Nearest conservation land is approximately 1,300 feet away.
Parcel Size	Parcel is approximately 160 acres in size. Landfill to be located outside PPA.	Because of the significant depth to groundwater table, use of the subsurface for debris disposal is possible. Result would be a reduction in landfill height.
Site Preparation Requirements	Sewer and electric must be obtained from Mass Development. Utilities nearby but sewer is difficult due to elevation differences. The site is heavily wooded. There are no existing buildings onsite.	Electric service can be extended to the site. Landfill leachate may have to be collected in a tank and transported off-site via truck. Tree clearing would be required. Building demolition would not be required.
Roadway Access and Hauling Impacts	Slightly more hauling on Walker Road than for other locations. Haul road widths, bridge and road weight limits appear to be adequate for dump truck hauling.	Debris can be hauled directly from AOC 9 without traversing public roads. New access/maintenance roadway would need to be constructed at the site.
Impact on Army Mission	No adverse impact on Army mission is anticipated.	

Evaluation of the Northwest Lake George Street Area

Consolidation Landfill Site Selection
Devens, Massachusetts

Non-Regulatory Criteria	Technical Site Information	Comments
Visual and Property Value Impact	Site is in a relatively remote location, south of the Locust Housing Area. Existing trees provide natural visual screen.	Landfill would not be visible from residential areas.
Proximity to Mapped Potentially Productive Aquifers	Site is not located in a area mapped as a potentially productive aquifer. Groundwater table is approximately 20 feet below the ground surface.	Meets public preference for avoiding landfill siting over a mapped aquifer.
Proximity to Zone II Boundary	Site is approximately 4,500 feet upgradient from nearest Zone II boundary (MacPherson well), and 4,500 feet upgradient from the Town of Shirley well IWPA.	
Underlying Soil Types	Underlying soil is sand and gravel.	Geotechnical evaluation of subsurface soil has not been conducted.
Impact on Development or other Constructive Uses	Plans for commercial development of this site are underway.	Proposed landfill would conflict with site development plans.
Adjacent Property Uses	Site is located in an area designated as Innovative and Technology Business. Adjacent area is designated as Open Space and Recreation.	Use of the site as a landfill would not significantly conflict with adjacent property uses.
Proximity to Populated Areas / Schools	Site is less than 500 feet from the existing Parker Charter School.	Site is separated from populated areas by developed and undeveloped parcels.
Proximity to Conservation Land	Site is adjacent to Conservation Restriction Land.	
Parcel Size	Required minimum of 12 acres is available.	
Site Preparation Requirements	Sewer and electric utilities are available nearby. The site is heavily wooded. There are no existing buildings onsite.	Electric service can be extended to the site from Lake George Street. Tree clearing would be required. Building demolition would nof be required.
Roadway Access and Hauling Impacts	Site is accessible from debris disposal areas. Debris hauling through heavily populated areas is not anticipated. Haul road widths, bridge and road weight limits appear to be adequate for dump truck hauling.	New access/maintenance roadway would need to be constructed at the site.
Impact on Army Mission	No adverse impact on Army mission is anticipated.	

Evaluation of the Patch Road Gravel Pit

Consolidation Landfill Site Selection
Devens, Massachusetts

Non-Regulatory Criteria	Technical Site Information	Comments
Visual and Property Value Impact	Site is in a relatively remote area near Robbins Pond.	Not visible from residential areas.
Proximity to Mapped Potentially Productive Aquifers	Site is not located in an area designated as a potentially productive aquifer. Groundwater table ranges from 15 to 35 feet below the ground surface.	Meets public preference for avoiding landfill siting over a mapped aquifer.
Proximity to Zone II Boundary	Site is approximately 250 feet from nearest Zone II boundary (Patton well).	Site is downgradient to cross-gradient of the Patton well Zone II boundary.
Underlying Soil Types	Underlying soil is sand and gravel.	Geotechnical evaluation of subsurface soil has not been conducted.
Impact on Development or other Constructive Uses	There are currently no plans for development at this site.	Proposed landfill would have no adverse impact on development plans at the site.
Adjacent Property Uses	Site is located in and adjacent to an area designated as Open Space and Recreation. An Army enclave borders the site to the west.	Use of the site as a landfill would moderately conflict with adjacent property uses.
Proximity to Populated Areas / Schools	Site is approximately 1,700 feet from the Shirley Elementary School.	Site is separated from populated areas by developed and undeveloped parcels.
Proximity to Conservation Land	Not located in land identified for conservation.	Nearest conservation land is approximately 400 feet away.
Parcel Size	Required minimum of 12 acres is available.	
Site Preparation Requirements	Sewer and electric utilities are not readily available at the site. The site is moderately wooded. No existing buildings.	Electric service can be extended to the site. Landfill leachate may have to be collected in a tank and transported offsite via truck. Tree clearing would be required. Building demolition would not be required.
Roadway Access and Hauling Impacts	Site is accessible from debris disposal areas. Debris hauling through heavily populated areas is not anticipated. Haul road widths, bridge and road weight limits appear to be adequate for dump truck hauling.	New access/maintenance roadway would need to be constructed at the site.
Impact on Army Mission	No adverse impact on Army mission is anticipated.	

Evaluation of the Soccer Fields Adjacent to Sherman Road

Consolidation Landfill Site Selection
Devens, Massachusetts

Non-Regulatory Criteria	Technical Site Information	Comments
Visual and Property Value Impact	Site is in an open, highly-visible area.	The site would not be visible from existing residential areas. However, new residential development is planned for the immediate area
Proximity to Mapped Potentially Productive Aquifers	Site is not located in an area designated as a potentially productive aquifer. Groundwater table is approximately 60 feet below the ground surface.	Meets public preference for avoiding landfill siting over a mapped aquifer.
Proximity to Zone II Boundary	Site is approximately 2,000 feet from nearest Zone II boundary (MacPherson well).	Site is upgradient of the MacPherson well Zone II boundary.
Underlying Soil Types	Underlying soil is sand and gravel.	Geotechnical evaluation of subsurface soil has not been conducted.
Impact on Development or other Constructive Uses	There are currently no plans for development at this site.	Proposed landfill would have moderate to high impact on future development plans at the site.
Adjacent Property Uses	Site is located in an area designated as Innovative and Technology Business. Adjacent property is designated as Army Reserve and as Residential use.	Use of the site as a landfill would conflict with adjacent residential property uses.
Proximity to Populated Areas / Schools	Site is approximately 2,600 feet from both the Shirley Elementary School and the Parker Charter School.	Site is separated from existing populated areas by developed and undeveloped parcels.
Proximity to Conservation Land	Not located in land identified for conservation.	Nearest conservation land is approximately 2,500 feet away.
Parcel Size	Site size is approximately 19 acres.	Use of the subsurface for debris disposal is possible. Result would be a reduction in landfill height.
Site Preparation Requirements	Sewer and electric utilities are available nearby. The site is lightly wooded overall.	Electric and sewer service can be extended to the site. Tree clearing would be required.
Roadway Access and Hauling Impacts	Site is accessible from debris disposal areas. Debris hauling through heavily populated areas is not anticipated. Haul road widths, bridge and road weight limits appear to be adequate for dump truck hauling.	New access/maintenance roadway would need to be constructed at the site.
Impact on Army Mission	No adverse impact on Army mission is anticipated.	

Evaluation of the Shirley Housing Area

Consolidation Landfill Site Selection
Devens, Massachusetts

Non-Regulatory Criteria	Technical Site Information	Comments
Visual and Property Value Impact	Site is within view of existing private homes and main road.	Landfill would be visible from existing residential areas.
Proximity to Mapped Potentially Productive Aquifers	Site overlies recharge area of a potentially productive aquifer. Groundwater table is approximately 46 feet below the ground surface.	MADEP regulations do not prohibit landfills in mapped aquifer areas.
Proximity to Zone II Boundary	Site is approximately 4,000 feet from nearest Zone II boundary (MacPherson well), and 1,600 feet from the nearest IWPA boundary (Town of Shirley well)..	Site is upgradient from the MacPherson well Zone II boundary.
Underlying Soil Types	Underlying soil is sand and gravel.	Geotechnical evaluation of subsurface soil has not been conducted.
Impact on Development or other Constructive Uses	Plans for development of this site are proposed.	Proposed landfill would conflict with site development plans.
Adjacent Property Uses	Site is located in an area designated as Village Growth. Adjacent property use is Open Space and Recreation.	Use of the site as a landfill differs from existing use.
Proximity to Populated Areas / Schools	Site is approximately 3,500 feet from the existing Parker Charter School, and 6,000 feet from the Shirley Elementary School.	Site is approximately 400 feet from populated areas
Proximity to Conservation Land	Site is adjacent to Conservation Restriction Land.	
Parcel Size	Parcel size is approximately 42 acres.	Because of the significant depth to groundwater table, use of the subsurface for debris disposal is possible. Result would be a reduction in landfill height.
Site Preparation Requirements	Sewer and electric utilities areavailable in the former housing area nearby. The site has no significant tree growth. Vacant housing units remain onsite.	Electric and sewer service can be extended to the site. Building demolition would be required.
Roadway Access and Hauling Impacts	Site is accessible from debris disposal areas. Debris hauling through heavily populated areas is not anticipated. Haul road widths, bridge and road weight limits appear to be adequate for dump truck hauling.	
Impact on Army Mission	No adverse impact on Army mission is anticipated	

Evaluation of the Southwest 3400 Area

Consolidation Landfill Site Selection
Devens, Massachusetts

Non-Regulatory Criteria	Technical Site Information	Comments
Visual and Property Value Impact	Site is located in remote area near the Nashua River. Existing trees provide natural visual screening.	Landfill may be visible from existing residential areas, depending on exact location.
Proximity to Mapped Potentially Productive Aquifers	Site overlies recharge area of a potentially productive aquifer. Groundwater table is approximately 36 feet below the ground surface.	MADEP regulations do not prohibit landfills in mapped aquifer areas.
Proximity to Zone II Boundary	Site is approximately 2,400 feet from nearest IWPA boundary (MCI Shirley well).	Site is cross-gradient from IWPA boundary.
Underlying Soil Types	Underlying soil is sand and gravel.	Geotechnical evaluation of subsurface soil has not been conducted.
Impact on Development or other Constructive Uses	Army Property - No plans for development.	
Adjacent Property Uses	Site is located in an area designated as Army Reserve Enclave. Adjacent property use is Open Space and Recreation.	Use of the site as a landfill may conflict with residential zoning nearby.
Proximity to Populated Areas / Schools	Site is approximately 3,200 feet from both the Parker Charter School and the Shirley Elementary School.	Site is separated from populated areas by developed and undeveloped parcels.
Proximity to Conservation Land	Not located in land identified for conservation.	Nearest conservation land is approximately 1,700 feet away.
Parcel Size	Identified parcel size is approximately 7 acres.	Parcel would need to be expanded into the 500 foot residential boundary to obtain the required 12-acre minimum. Because of the significant depth to groundwater table, use of the subsurface for debris disposal is possible. Result would be a reduction in landfill height.
Site Preparation Requirements	Sewer and electric utilities are available in the Reserve Enclave. The site is heavily wooded. No buildings exist on the identified parcel.	Electric and sewer service can be extended to the site. Tree clearing would be required. Building demolition would not be required.
Roadway Access and Hauling Impacts	Site is accessible from debris disposal areas. Debris hauling through heavily populated areas is not anticipated. Bridge weight limits would likely impact hauling.	New access/maintenance roadway would need to be constructed at the site.
Impact on Army Mission	Moderate impact on Army mission is anticipated.	

BCT CONSENSUS EVALUATION

CONSOLIDATION I FILL SITE SCREENING BCT CONSENSI LUATION

NON-REGULATORY CRITERIA	FORMER MOORE ARMY AIRFIELD	FORMER AMPHITHEATER NEAR DAVAO HOUSING	FORMER GOLF COURSE DRIVING RANGE	NORTH POST NORTH OF AOC 9	ADJACENT TO SHEPLEY'S HILL LANDFILL	SOCCER FIELDS ADJACENT TO SHERMAN ROAD	LOCUST HOUSING AREA	SOUTHWEST 3400 AREA	DRMO YARD AREA	PATCH ROAD GRAVEL PIT
Visual and Property Value Impact	+	+	+	+	+	-	0	0	+	+
Mapped Potentially Productive Aquifers	0	-	+	+	0	+	+	-	-	+
Proximity to Zone II Boundary	+	+	+	+	+	+	+	+	+	+
Underlying Soil Types	-	-	-	-	-	-	-	-	-	-
Impact on Development or Other Constructive Uses	0	+	+	0	+	0	-	+	0	+
Adjacent Property Uses	+	+	+	0	+	-	0	0	+	+
Proximity to Populated Areas/ Schools	+	+	+	0	+	-	+	0	+	+
Proximity to Conservation Land	+	+	+	+	+	+	+	+	+	0
Parcel Size	+	+	+	+	+	+	+	-	+	+
Site Preparation Requirements	0	+	+	-	+	+	-	-	+	-
Roadway Access and Hauling Impacts	-	+	+	-	+	+	+	-	+	+
Impact on Army Mission	+	+	+	+	+	+	+	0	+	+

Evaluation Legend: + Positive - Negative 0 Neutral

SOIL BORING LOGS
FORMER GOLF COURSE DRIVING RANGE
PATCH ROAD GRAVEL PIT

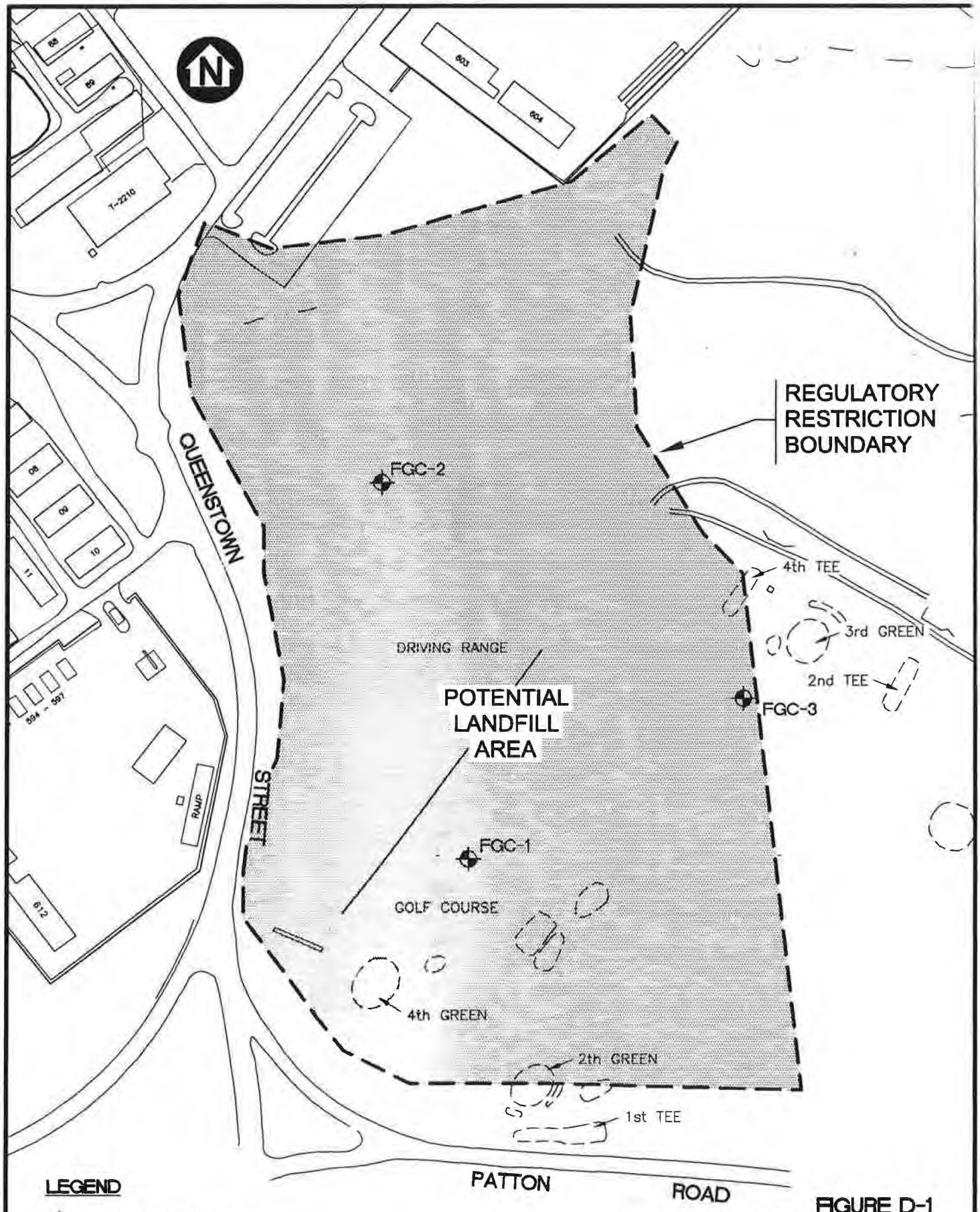

FIGURE D-1
SOIL BORING LOCATIONS
FORMER GOLF COURSE DRIVING RANGE
LANDFILL REMEDIATION FEASIBILTY STUDY
ADDENDUM REPORT
DEVENS, MA

Harding Lawson Associates

SOIL BORING LOG

Client: USAEC	Project No. 8712.02	Study Area: FORMAL GOLF COURSE	
Contractor: GA. LOANS	Date Started: 6-1-98	Boring No.: FG-1	
Method: D+W	Casing Size: 3" ID	Protection: ACC D	
Ground Elev.:	Soil Drilled:	Completed: 6-1-98	
Logged by: HRW	Checked by:	PI Meter:	
Screen: (ft.) Riser: (ft.) Diam: (ID) Material:		Total Depth: 20'	
		Below Ground: ~9'	
		Page 1 of: 2	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm) NO PID	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	NO WELL DATA
2	S-1	0-2		1.3		TOP 1.0 TOPSOIL SILTY SAND W/ ROOTS, GRASS, ETC. DK. BRN, OCCASS. GRAVEL LOOSE BOT. 0.4 TAN-BRN V. FINE - COARSE SAND W/ SILT & GRAVEL MOIST, SL. PLAST. FINES, ~20 GRAV (UP TO 1/2")	SM SW	2 2 4 6
4	S-2	2-4		1.1		TOP 0.4 SAME AS ABOVE V.F-C. SAND W/ SILT + GRAVEL ~15% SL. PLAST. SILTS BOT. 0.7' TAN-BRN F-C SAND W/ GRAVEL, WELL GRADED ~35% GRAVEL (SUBANG. TO 1")	(SW) (SW)	14 29 14 18
6	S-3	4-5.5/6		0.7'		BRN F-C SAND W/ SILT & GRAVEL ~15% NON PLAST FINES, ~45% GRAVEL UP TO 1.5" SUBANGULAR V. LOOSE PASSED REFUSAL TIP	SW	82 41 ICE/6"
8	S-4	6/8		N/12		CUTTINGS SAMPLE ROCK PIECES FROM WASH NO SPOON SAMPLE COLLECTED	GW	
10 1134 HRS	S-5	8-10		1.0		BRN F-C SAND W/ SILT & GRAVEL ~15% SLIGHTLY PLASTIC TO NON PL. FINES ~45% GRAVEL (IRON-STAINED UP TO 1½" SUBANGULAR) VERY LOOSE	SW	24 42 36 29

ABB Environmental Services, Inc.

9312005S L7

SOIL BORING LOG

Client: USACE	Project No. 0712.02	Study Area: GOLF COURSE	
Contractor: GR. LEAKS	Date Started: 6-4-98	Boring No.: RI FGC-1	
Method:	Casing Size: 3" ID	Protection: MW D	
Ground Elev.:	Soil Drilled:	Completed: 6-4-98	
Logged by: HKW	Checked by:	PI Meter:	
Screen: (ft.)	Riser: (ft.) Diam: (ID) Material:	Total Depth: 20'	
		Below Ground: ~9'	
		Page 2 of: 2	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	TOPOG. SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	WELL DATA
10								
1115 HRS	S-6	10-12		1.3		GR-BRN - TILL LIKE SILTY F-C SAND W/GRAVEL ~ 25% SL. PLAST. FINES ~ 35% SUBANG. GRAVEL TO 3/4" (Qm)	SM	21 32 78 85
						BOTT. 0.5' BROKEN ROCK, VERY LGTH. BOULDER? POLISHED ROCK AT TIP OF SPOON V. DENSE		
12							GW	
	S-7	12-14				CUTTINGS SAMPLE BROKEN ROCK (FROM ROLLERBIT) REVEALED BLACK PHYLLITE? & WHITE ROCK (LOOKS LIKE SMOKY QUARTZ		
1200 HRS 14								
	S-8	14-16				ROLLERBIT AHEAD MOSTLY BLACK ROCK MIXED W/ WHITE QUARTZ? SCHIST-LIKE		
16								
18								
	S-9	19-20						

BORING TERMINATED AT 20'

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9312005S L7

Client: USAEC	Project No. 671[illegible]	Protection: MOD D
Contractor: GREAT WORKS	Date Started: 6/2/98	Completed: 6/2/98
Method: DAW	Casing Size: 3" ID	PI Meter: —
Ground Elev.:	Soil Drilled:	Total Depth: 35
Logged by: HKW	Checked by:	Below Ground: ~ 20 FT
Screen: (ft.)	Riser: (ft.) Diam: (ID) Material:	Page 1 of: 4

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm) A/C PID	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	A/C WELL DATA
0910 HKW		0-2		0.7		TOP 0.2' TOPSOIL SILTY SAND (~15% SILT NON PLASTIC), ~5% GRAVEL (< 1/2"), ~5% ROOTS) DARK BRN loose BOTTOM 0.5' MOSTLY FINE SAND, <5% SILT, LIGHT BRN-TAN, DRY TO DAMP	SM	2 5 5 6
2	S-1	2-4		1.0		TOP 0.5' MOSTLY FINE SAND, TAN <5% SILT (NON-PLAST.), DAMP (SP) M. loose BOT 0.5' LT. BRN FINE TO MED. SAND W/ GRAVEL (WELL GRADED) <5% SILT, ~25% GRAVEL SUBANGULAR UP TO 1" (ELONGATED)	SP GW	7 7 10 15
4	S-2	HKW 4-4½"		0		WASH CUTTINGS PHYLLITE ROCK WASH? COBBLY V. loose	GW	75/3"
1000 HKW 6	S-3	N/A HKW		0		V. loose	GW	100/0"
8	S-4	N/A 8-10 HKW		0		ROLLER BIT CUTTINGS REVEALED BLACK GRANITE/PHYLLITE COBBLY V. loose	GW	100/1"
10								

SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

9312005S L7

Client: USAEC	Project No. 9712.025	Protection: MOD D	
Contractor: GREAT WORKS	Date Started: 6/3/98	Completed: 6/3/98	
Method: DHW	Casing Size: 3" ID	PI Meter: —	
Ground Elev.:	Soil Drilled:	Total Depth: 35'	
Logged by: HKW	Checked by:	Below Ground: ~20'	
Screen: (ft.)	Riser: (ft.)	Diam: (ID)	Material:

Page 2 of: 4

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	WELL DATA
10 (1015 HNU)	S-5	10-12		0.8'		BRN SILTY F-C SAND + GRAVEL ~60% GRAVEL (WEATH. ROCK + COBBLE) BLACK PHYLLITE? ~20% SL. PLAST. SILT DAMP V. DENSE	GM	21 34 47 31
12 (1025 HNU)	S-6	12-13		1.0		BRN F-C SAND W/SILT + GRAVEL ~10% SL. PLAST SILT, ~40% GRAVEL (SUBANGULAR UP TO 1"), SOME WEATH. ROCK V. DENSE	SW	41 100/6"
14	S-7	14-16		0.6'		BRN F-C SAND W/SILT + GRAVEL ~60% SUBANGULAR GRAVEL (IRON-STAINED UP TO 1") ~15% SILT (SL. PLASTIC) VERY MOIST V. DENSE	SW	60 A. 55 65
16 (1100 HNU)	S-8	16-18'				WASH CUTTINGS COBBLY ROCK V. DENSE	GW	100 RX/6"
18	S-9	18-20		N/A		REDRILL IT WASH CUTTINGS COBBLY ROCK - SAME AS ABOVE	GW	
20								

SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

9312005S L7

Client: USAEC	Project No. 87[illegible]	Boring No.: FGT-2	Protection: Lev. D
Contractor: Gr. Works	Date Started: 6/3/92		Completed: 6/3/92
Method: D+W	Casing Size: 3" ID		PI Meter:
Ground Elev.:	Soil Drilled:		Total Depth: 35'
Logged by: HKW	Checked by:		▽ Below Ground: ~20'
Screen: (ft.)	Riser: (ft.)	Diam: (ID)	Material:	Page 3 of: 4

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	WELL DATA
1145 20	S-10	20-22		0.5		TILL-LIKE TAN F-C SILTY SAND W/ GRAVEL ~25%. SL. PLAST. FINES ~35% SUBANGULAR GRAVEL, WET V. Dense	SM	3A 60 76 47
22	S-11	22-24		1.2		TAN F-C SILTY SAND W/ GRAVEL TILL-LIKE ~40%. SUBANG. GRAVEL IRON-STAINED ~20%. NON-PLAST FINE SAND LENS OF MOSTLY F-C SILTY SAND (~1" LENS 23.5-23.6') VERY MOIST NO GRAVEL V. Dense	SM	1S 4C 39 17
24	S-12	24-26		0.9		TAN F-M SAND W/ SILT & GRAVEL ~35%. IRON-STAINED SUBANGULAR GRAVEL UP TO 1" ~15% SILT NON-PLASTIC, WET Dense	SP	3C 72 15 10
1215 HMI 26	S-13	26-28		0.9		TOP 0.3' TAN-BRN MOIST MED. SAND W/ OCCASIONAL GRAVEL (60), SUBROUNDED GRAVEL SL. PLAST. SILTY SAND Dense BOTTOM 0.3' GREEN-BRN SILTY F-C SAND W/ GRAVEL (TILL-LIKE) ~30% PLASTIC FINES ~35% GRAVEL (SUBANG. UP TO 1") SAT	SP	2A 27 20 3C
28	S-14	28-29' 11"				TILL, GR-TAN SILTY F-C SAND W/ GRAVEL ~30% PLASTIC FINES, ~35% ANGULAR & SUBANGULAR GRAVELS, CALCAREOUS, CLASSIC TILL V. Dense	SM	6S 15 6? VOID/S"
1175 HMS 30								

SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

SOIL BORING LOG

Client: USACE	Project No. 8712.02	Study Area: FGC-2	
Contractor: GR. WORKS	Date Started: 6/7/95	Boring No.: MW-D	
Method: DRL	Casing Size: 3" ID	Protection: 6/7/95	
Ground Elev.:	Soil Drilled:	Completed:	
Logged by: HILL	Checked by:	PI Meter:	
Screen: (ft.) Riser: (ft.) Diam: (ID) Material:		Total Depth: 35'	
		Below Ground: ~20'	
		Page 4 of: 4	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	WELL DATA
30						ROLLER BIT THROUGH TO 33' CUTTINGS SAME AS S-14 TILL SILTY F-C SAND W/ GRAVEL - DENSE (SM)	SM	
32								
1320 HRS 34	S-15	33' 35'		N/A		SOLID ROCK (COMPETENT) BLACK PHYLLITE TRY TO SPOON AT 35' - NO RECOVERY		
36						BORING TERMINATED AT 35' BGS HOLE BACKFILLED W/ CUTTINGS		

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9312005S L7

SOIL BORING LOG

Client: USACE	Project No. 8712.02	Study Area: GOLF COURSE	
Contractor: CAT. WORKS	Date Started: 6-4-98	Boring No.: FGC-3	
Method: D + W	Casing Size: 3" ID	Protection: MW: D	
Ground Elev.:	Soil Drilled:	Completed: C-4-98	
Logged by: HKL	Checked by:	PI Meter:	
Screen: (ft.)	Riser: (ft.) Diam: (ID) Material:	Total Depth: 25'	
		Below Ground: ~9'	
		Page 1 of: 3	

0805 NRS

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm) N.R.	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	N/O WELL DATA
0	S-1	0.2		1.3		TOP 0.4' DK. BRN SILTY SAND W/ ROOTS, GRASS, + GRAVEL ~20%. NON PLAST. FINES MOSTLY FINE SAND - TOPSOIL (SM) BELT 0.5' BRN F-M SAND W/ SILTY GRAVEL ~15% SILT (NON-PLAST.) ~20% ANGULAR GRAV (MPT: 1") M. DENSE (SP)	SM SP	7 12 15 20
2	S-2	2-4		1.1		BRN F-C SILTY SAND W/ GRAV. ~20% PLASTIC SILT, ~30% SUBANGULAR SL. DAMP. M. DENSE	SM	16 14 19 7
4	S-3	4-6		1.1		BRN F-C SILTY SAND W/ GRAV ~20% PL. PLAST. SILT ~35% SUBANG GRAVEL WELL GRADED (SM) M. DENSE MOIST	SM	27 17 11 9
6	S-4	6-8		1.1		SAME AS S-3 BRN F-C SILTY SAND W/ GRAV. SAME AS ABOVE WET WELL GRADED (SM) DENSE	SM	17 18 17 19
8	S-5	8-10		6.6		BRN MOSTLY FINE SAND ~5% SILT RUSTED ROCK AT 5' (SP) 5" COBBLE GRAVEL SATURATED (SM) DENSE ▽	SM	18 26 27 30
10								

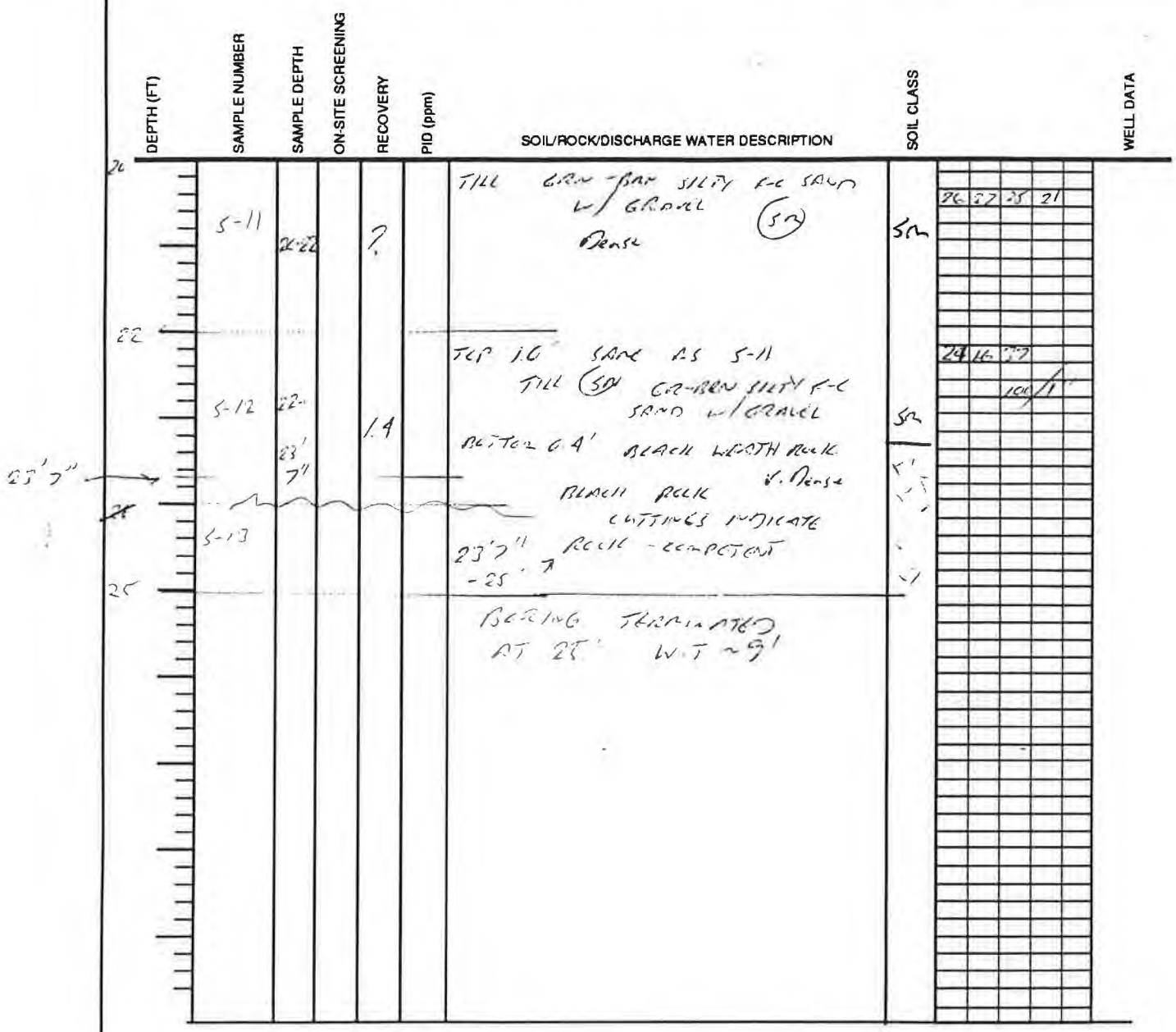
SOIL BORING LOG

Client: USACE	Project No. 8712.02	Study Area: GOLF COURSE	
Contractor: ORT. WORKS	Date Started: 6-4-96	Boring No.: GC-3	
Method: HSA	Casing Size: 7" ID	Protection: MW 6	
Ground Elev.:	Soil Drilled:	Completed: 6-4-96	
Logged by: HKW	Checked by:	PI Meter:	
Screen: (ft.)	Riser: (ft.) Diam: (ID) Material:	Total Depth: 25'	
		▽ Below Ground: -5'	
		Page 2 of: 3	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	WELL DATA
10	SG	10-12		0.3		BRN SILTY F-C SAND W/GRAVEL SATURATED ~25% SL. PLASTIC FINES ~30% GRAVEL (SUBANGULAR UP TO 3/4") (SM)	SM	13 17 17 9
12	S-7	12-14		1.2		BRN MOSTLY FINE SAND 10% NON-PLASTIC FINES (SP) NO GRAVEL SATURATED	SP	8 8 9 10
CL 40 14	S-9	14-16		1.0		BRN F-M SAND 5% NON-PL. FINES NO GRAVEL SAT	SP	22 12 11 12
16	S-9	16-18		1.4		TOP 0.9' SAME AS S-8 (SP) BRN F-M SAND BOTTOM 1.0' GRN-BRN SILTY F-C SAND W/ GRAVEL ~30% SL. PLASTIC FINES TILL-LIKE	SP / SM	16 27 30 31
18	S-10	18-20		1.1		GR-BRN SILTY F-C SAND W/ GRAVEL TILL-LIKE (SM) SAME AS BOTTOM OF S-9 (17-18') SATURATED	SM	54 32 24 37
20								

SOIL BORING LOG

Client: USACE	Project No. 8712.02	Study Area: Golf course	
Contractor:	Date Started: 6/1/92	Boring No.: FGC-1	
Method:	Casing Size: 7" ID	Protection: Road.	
Ground Elev.:	Soil Drilled:	Completed: 6/1/92	
Logged by: HKW	Checked by:	PI Meter:	
Screen: (ft.)	Riser: (ft.)	Diam: (ID)	Material:
		Total Depth: 25'	
		Below Ground: ~~4'~~ ~5'	
		Page 3 of: 3	



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9312005S L7

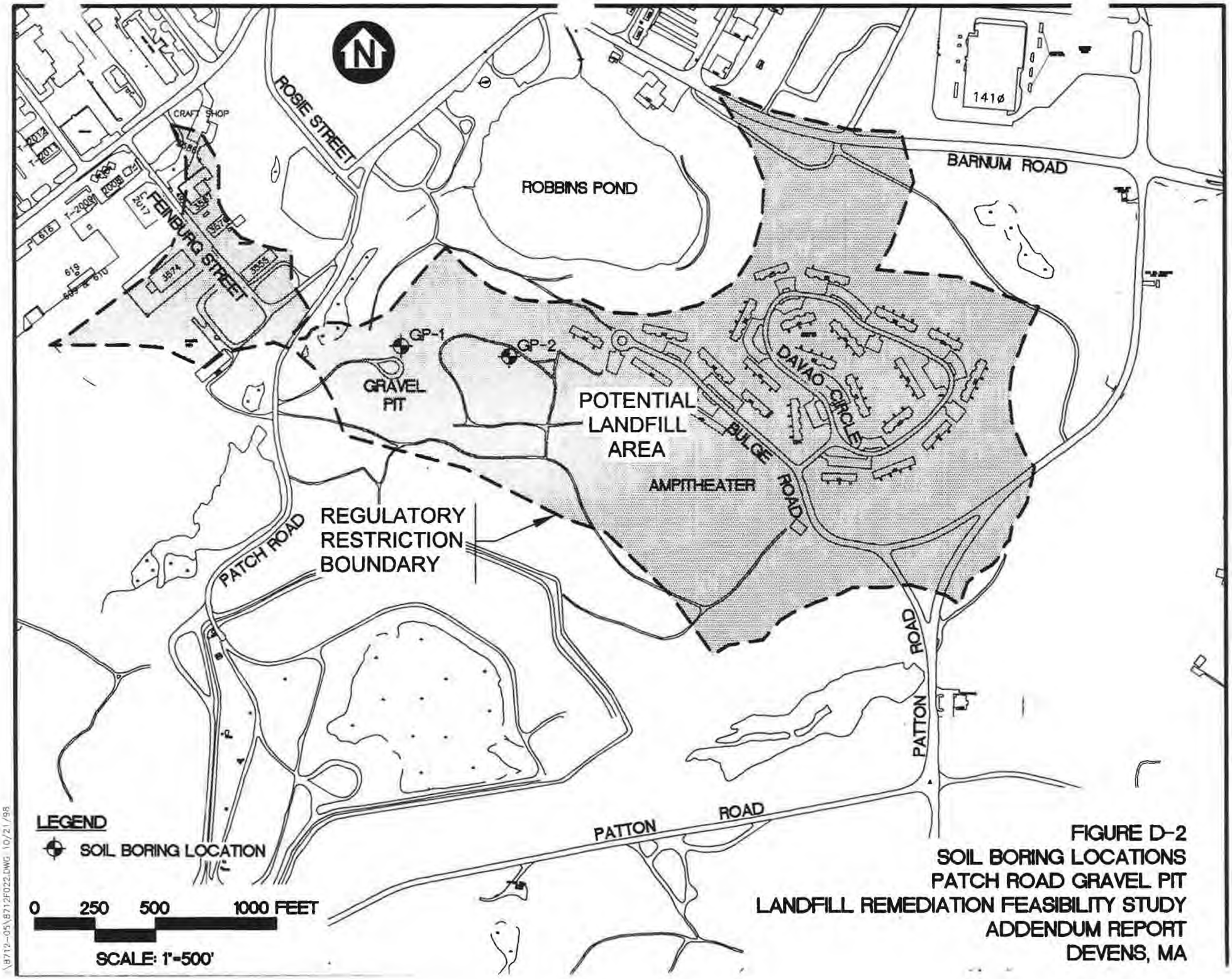

FIGURE D-2
SOIL BORING LOCATIONS
PATCH ROAD GRAVEL PIT
LANDFILL REMEDIATION FEASIBILITY STUDY
ADDENDUM REPORT
DEVENS, MA

SOIL BORING LOG

Client: USACE	Project No. 8712.02	Study Area: GAA Pit	
Contractor: GR. WORK	Date Started: 6/1/98	Boring No.: GC-1	
Method: DRIVE + WASH	Casing Size: 3" ID	Protection: Mod D	
Ground Elev.:	Soil Drilled: 50'	Completed: 6/5/98	
Logged by: HLW	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.) Diam: NA (ID) Material: NA	Total Depth: ~~50~~ (casing) / 52 (spar	
		Below Ground: ~37.5'	
		Page 1 of: 6	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	2" OD spoon 150 lb. hammer blow counts	WELL DATA
1310 HRS									
	S-1	0-2		1.5		BRN SAND W/ SILT OCCASIONAL GRAVEL GRADING TO – NO. NON-PLAS SILT BRN SAND W/ SILTY GRAV. (UP TO 1" PIECES) DRY ~15% SILT		2 2 8 24	Soft to firm (MED) v. loose to loose ~~med. dense~~ (MED)
2	S-2	2-4		1.2		LT BRN F-M SAND OCCASS. GRAVEL (< ½") (SP) DRY	SP	35 31 24 18	dense to med. dense
4	S-3	4-6		1.1		GREY-BRN F-C SAND W/SILT OCCASIONAL GRAVEL (UP TO ½' SUBANGULAR) 25% NP SILT ~5% GRAVEL DRY	SW	10 12 12 13	med. dens
6	S-4	6-8		1.2		GRY BRN F-C SAND W/SILT OCCAS. GRAVEL SAME AS S-3 DRY	SW	14 17 14 16	med. dens
8	S-5	8-10		1.1		TAN-GRAY F-M SAND W/ OCCASS. SILT & GRAV. DRY	SP	13 12 15 12	med. dens
10									

SOIL BORING LOG

Client: USNEC	Project No. 8712.02	Study Area: GRAY PIT	
Contractor: GRT 4-12/45	Date Started: 6/4/98	Boring No.: GP-1	
Method: Drive + Wash	Casing Size: 3" ID	Protection: non. D	
Ground Elev.:	Soil Drilled: 50'	Completed: 6/5/98	
Logged by: HKW	Checked by:	PI Meter: NA	
Screen: Nf (ft.) Riser: NA (ft.) Diam: NA (ID) Material: NA		Total Depth: 50' (casing) / 52	
		Below Ground: ~37.5'	
		Page 2 of: 6	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS		WELL DATA
10	S-6	10-12		1.1'		BRN-BLK F-C SAND w/ SILT CLASS GRAVEL DRY (SW) ~5% NON PLAST. FINES ~45% GRAVEL (SUBANGULAR UP TO 3/4"		10 11 12 14	med. dens
1750 HNU 12	S-7	12-14		1.4		LT. BRN F-C SAND w/ GRAVEL ~25% (SUBANGULAR GRAVEL UP TO 1") (SW) ~5% SILT		12 14 46 44	med. dens to dense
14	S-8			1.0		LT BRN F-C SAND w/ SILT + GRAVEL ~10% NON-PL FINES DRY (SW) ~20% GRAVEL (SUBANG UP TO 1")		37 39 79 26	dens
1425 HNU 16	S-9			1.5		LT. BRN F-C SAND w/ GRAVEL, ~5% SILT ~25% GRAVEL (SUBANG. UP TO 1") (SW)		23 28 27 21	med. dens
18	S-10			1.0		Lt. Brown F-M sand w/ ~10% coarse, 20% gravel, ~5% silt, sub-round to sub-angular up to 1.5 inch Moist throughout except ~~in sand area~~ at 0.5'	(SP) ~~SM~~ (SW)	28 24 28 21	med. dens
20									

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1/11/99

SOIL BORING LOG

Client: USAEC	Project No. 8712.02	Study Area: Gravel Pit	
Contractor: Grt. Works.	Date Started: 6/4/98	Boring No.: GP-1	
Method: Drive + Wash	Casing Size: 3" ID	Protection: Mod. D *	
Ground Elev.:	Soil Drilled: 50'	Completed: 6/5/98	
Logged by: HKW/NER	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.) Diam: NA (ID) Material: NA	Total Depth: 50' (casing)/52' (Spoon	
		▽ Below Ground: ~37.5'	
		Page 3 of: 6	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS		WELL DATA
20									
	S-11			0.9	NA	lt. Brown mostly F sand w/ ~30% M. ± 5% silt ~10% gravel - moist to wet	SP	19 17 17 23	med. dens
22									
	S-12			1.0	NA	0-0.4 F sand ~30% M. Tan 0.4-0.7 Grading to F-C sand (tan) w/ ~10% gravel (black) 0.7-1 F-C sand w/ silt and gravel - dark (M) brown DRY	SP SW SW-SM	17 27 30 31	med. dens to dense
24									
	S-13			0.7	NA	0-0.4 Gravelly (black) F + M sand (brown) w/ ~15% C sand - wet - subangular gravel (1" to #4) ~5% silt 0.4-0.7 F-C Sand (lt. brown) - ~5% silt, ~10% gravel ≤ 0.5" - subangular, dry - well graded	SW	51 37 51 42	dense to v. dense
26						Same as 0.4-0.7 above except wet to sat. in tip + spary. Some is just above wet sat.	SW	54 54 50 43	very dens
	S-14			1.5	NA				
28						Moist grading to dry wet sat at 1.3' Med brown F+M sand - ±10% C sand - ~15% Gravel (fine to med gr) - wet - subangular - V. ~~most~~ dense (M)	SW	49 75 56 71	very dens
	S-15			0.7	NA				
30									

1515 Quit for day

6/5/98 0800

FIGURE 4-8A
SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

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* Mod. D = hard hats, hearing protection, + steel toed ~~boots~~

SOIL BORING LOG

Client: USAEC	Project No. 08712.02	Study Area: Gravel Pit	
Contractor: Grt. Works	Date Started: 6/4/98	Boring No.: GP-1	
Method: Drive & Wash	Casing Size: 3" ID	Protection: Mod. D*	
Ground Elev.:	Soil Drilled: 50'	Completed: 6/5/98	
Logged by: HKW/NER	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.)	Diam: NA (ID)	Material: NA
		Total Depth: 50' (casing)/52'	
		Below Ground: ~37.5'	
		Page 4 of: 6	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	WELL DATA
30						Rollerbit from 30 - 35' bgs		
32								
34								
35								
36	S-16			0.6	NA	Med Brown F+M sand - ~10% C sand - ~5% subang. to Sub. round gravel - ~3% silt. Saturated - mod. ~~dense~~. Grading down to poorly graded F+M sand.	SW	18:22 18:24
37						Roller bit down to 40' bgs		
38								
40								

med. den

0900

0915 NRaka offsite w/ A. Fillip & R. Ostrowski to located GP-2

SOIL BORING LOG

Client: USAEC	Project No. 08712.02	Study Area: Gravel Pit	
Contractor: Grt. Works	Date Started: 6/4/98	Boring No.: GP-1	
Method: Drive + Wash	Casing Size: 3" ID	Protection: Mod. D *	
Ground Elev.:	Soil Drilled: 50'	Completed: 6/5/98	
Logged by: HKW/NER	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.) Diam: NA (ID) Material: NA	Total Depth: 50' (casing)/52' (SP	
		Below Ground: ~37.5'	
		Page 5 of: 6	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	WELL DATA
40								
	S-17			~~0.8~~ 1.0	NA	Lt. brown F-M sand - poorly graded - Mod ~~dense~~ loose - Fine gravel (Fe concretions?) at 40.2'. Fe-stained lens from 40.3-40.4. Mostly med sand from 40.4-40.8. Sat. F-M sand from 40.8-41	SP	20 23 24 25 med. den
42						Roller bit to 45'		
44								
45						∅ recovery		17 22 26 28 med. dense
46	S-18			0	NA			
47						Roller bit to 50'		
48								
50								

0940. NRaKa Konsite

0950

FIGURE 4-8A
SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

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SOIL BORING LOG

Client: USAEC	Project No. 08712.02	Study Area: Gravel Pit	
Contractor: Grt. Works	Date Started: 6/4/98	Boring No.: GP-1	
Method: Drive + Wash	Casing Size: 3" ID	Protection: Mod D*	
Ground Elev.:	Soil Drilled: 50' bgs	Completed: 6/5/98	
Logged by: HKW/NER	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.)	Diam: NA (ID)	Material: NA
		Total Depth: 50' (casing)/52' (spoon)	
		Below Ground: ~37.5'	
		Page 6 of: 6	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS		WELL DATA
50					0-0.2	Med. br. F sand w/ <5% M sand 20% C sand (drk br.) - mod. dense (MD) wet to sat - ~5% silt.	SP	23 28 25 28	med. den.
52	S-19			1.0	NA	0.2-0.5 F-C sand, <5% silt - well graded - wet to sat.	SM SP		
						0.5-1 tan F sand and silt - mod. plastic grading down to dk. brown F-M sand and silt - sat.	SP SM		
54						B.O.E. casing = 50' spoon = 52' 6/5/98 1040 backfill w/ cuttings ∇ 37.5			
55									
56									
57									
58									
60									

FIGURE 4-8A
SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

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SOIL BORING LOG

Client: USAEC	Project No. 8712.02	Study Area: Gravel Pit	
Contractor: Grt. Wrks.	Date Started: 6/5/98	Boring No.: GP-2	
Method: Drive + Wash	Casing Size: 3" ID	Protection: Mod. D *	
Ground Elev.:	Soil Drilled: 100'	Completed: 6/8/98	
Logged by: NER	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.) / Diam: NA (ID) / Material: NA	Total Depth: 100' (casing) / 102' (spo	
		Below Ground: 77-80' bgs	
		Page 1 of: 11	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	2" OD Spoon 150 lb. hammer blow counts	WELL DATA
1210 0	S-1 (MP) STET			0.8	NA	0-0.4 Loam and ~10% silt 0.4-0.8 yellow-brn. F+M sand w/ ~30% (MP) fine gravel, - rootlets - damp - poorly graded. Gravel is subangular - F to M (up to 1").	SP	2 3 4 6	very loose
2						Rollerbit down to 10' bgs			
4									
6									
8									
10									

FIGURE 4-8A
SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

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* Mod D = hard hat, eye protection, & steel toed boots

SOIL BORING LOG

Client: USAEC	Project No. 8712.02	Study Area: Gravel Pit	
Contractor: GA Wrks	Date Started: 6/5/98	Boring No.: GP-2	
Method: Drive + Wash	Casing Size: 3" ID	Protection: Mod. D *	
Ground Elev.:	Soil Drilled: 100'	Completed: 6/9/98	
Logged by: NER	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.)	Diam: NA (ID)	Material: NA
		Total Depth: 100' (casing)/102' (	
		Below Ground: 77-80'	
		Page 2 of: 11	

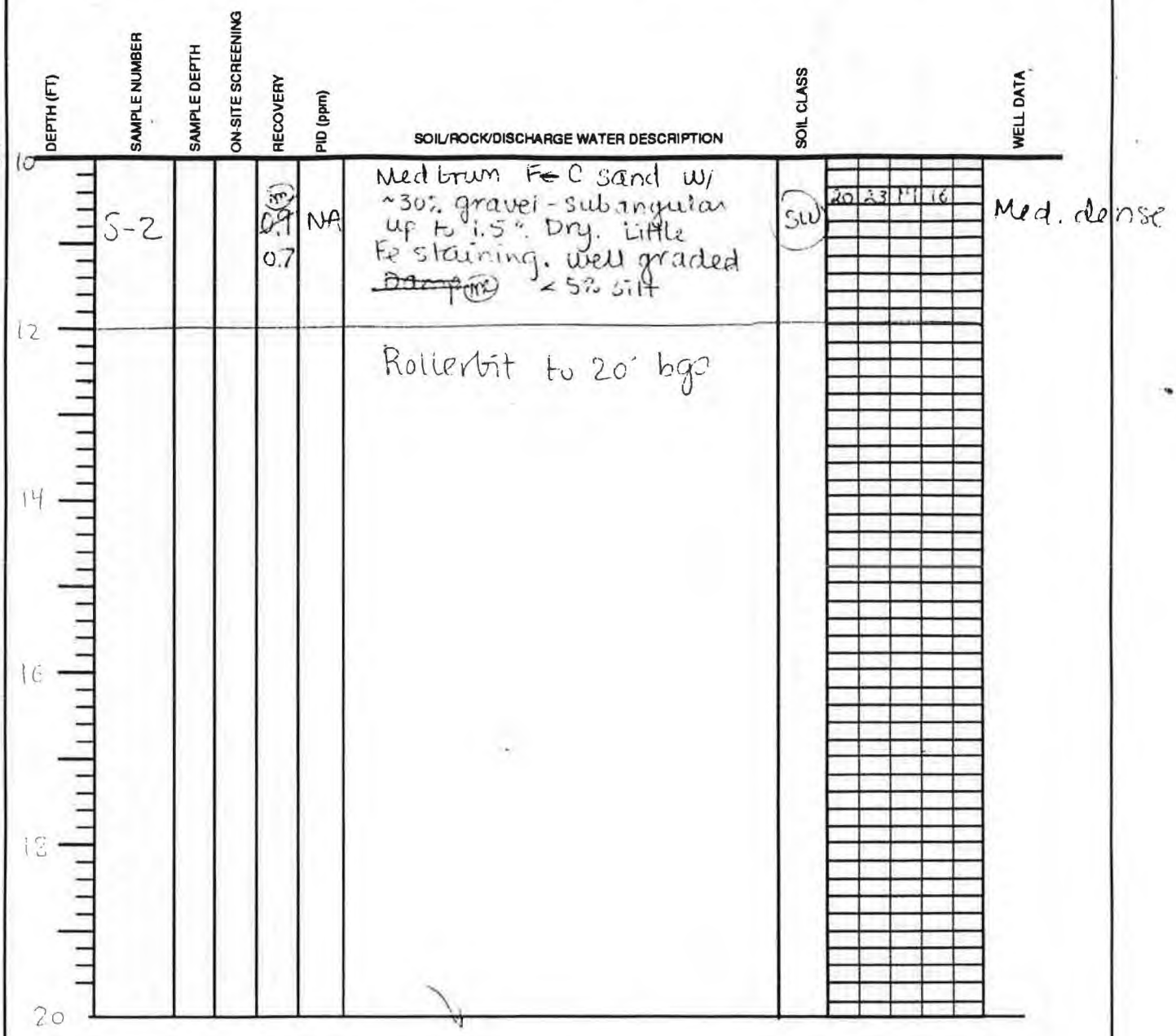

FIGURE 4-8A
SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

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SOIL BORING LOG

Client: USACE	Project No. 08712.02	Study Area: Gravel Pit	
Contractor: Grt. Wrks.	Date Started: 6/5/98	Boring No.: GP-2	
Method: Dr + Wash	Casing Size: 3" ID	Protection: Mod. D *	
Ground Elev.:	Soil Drilled: 100'	Completed: 6/9/98	
Logged by: NER	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.)	Diam: NA (ID)	Material: NA
		Total Depth: 100'(casing)/102'(spoon)	
		▽ Below Ground: 77-80'	
		Page 3 of: 11	

1325

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	WELL DATA
20	S-3			0.6	NA	Same as 2' to 12' except gravel up to 1". Wet. Quartz/biotite (?) in top of spoon. (see sample)	(SW) 37 15 16 35	Med. dens
22						Roller bit to 30' bgs.		
24								
26								
28								
30								

1410 Grnd. Sp. Lvl.

FIGURE 4-8A
SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

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SOIL BORING LOG

Client: USACE	Project No. 08712.02	Study Area: Gravel Pit	
Contractor: GA Works	Date Started: 6/5/98	Boring No.: GP-2	
Method: Dr + Wash	Casing Size: 3" ID	Protection: Mod. D *	
Ground Elev.:	Soil Drilled: 100'	Completed: 6/9/98	
Logged by: NER	Checked by:	PI Meter: NA	
Screen: NA (ft.) / Riser: NA (ft.) / Diam: NA (ID) / Material: NA		Total Depth: 100'(casing)/102'	
		Below Ground: 77-80	
		Page 4 of: 11	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	wf ≤ 5% silt	SOIL CLASS	WELL DATA
6/8/98 0815 30	S-4			1.0	NA	Med brown grading down to it. brown F-C sand and gravel. Gravel is subangular t. angular ~~up~~ up to 1.5", from 0.3 to 0.7" M+C fractions ~~absent~~ ~~wf up to~~ ≤10% DRY and >50% gravel, ~5% silt		SW / GP-GM / SW	13 25 29 23 Med. dense
32						Roller bit to 40' bgs			
34									
36									
38									
40									

FIGURE 4-8A
SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

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SOIL BORING LOG

Client: USAEC	Project No. 0872.02	Study Area: Gravel Pit	
Contractor: Grt. Wrks.	Date Started: 6/5/98	Boring No.: GP-2	
Method: DC + Wash	Casing Size: 3" ID	Protection: Mod. D *	
Ground Elev.:	Soil Drilled: 100'	Completed: 6/9/98	
Logged by: NER	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.)	Diam: NA (ID)	Material: NA
		Total Depth: 100' (casing) / 102' (open)	
		Below Ground: 77-80'	
		Page 5 of: 11	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS		WELL DATA
40									
	S-5			0.7	NA	Lt. brown F+M sand, ±5% C sand, ~5% silt. Poorly graded. Moist	SP	21 18 19 23	Med. dense
42									
						Rollerbit down to 50' bgs			
44									
46									
48									
50									

FIGURE 4-8A
SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

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SOIL BORING LOG

Client: USAEC	Project No. 08712.02	Study Area: Gravel Pit	
Contractor: Grt. Works	Date Started: 6/8/98	Boring No.: GP-2	
Method: Drv + Wash	Casing Size: 3" ID	Protection: Mod. D *	
Ground Elev.:	Soil Drilled: 100'	Completed: 6/9/98	
Logged by: NER	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.)	Diam: NA (ID)	Material: NA
		Total Depth: 100 (casing)/102'(S)	
		Below Ground: 77-80'	
		Page 6 of: 11	

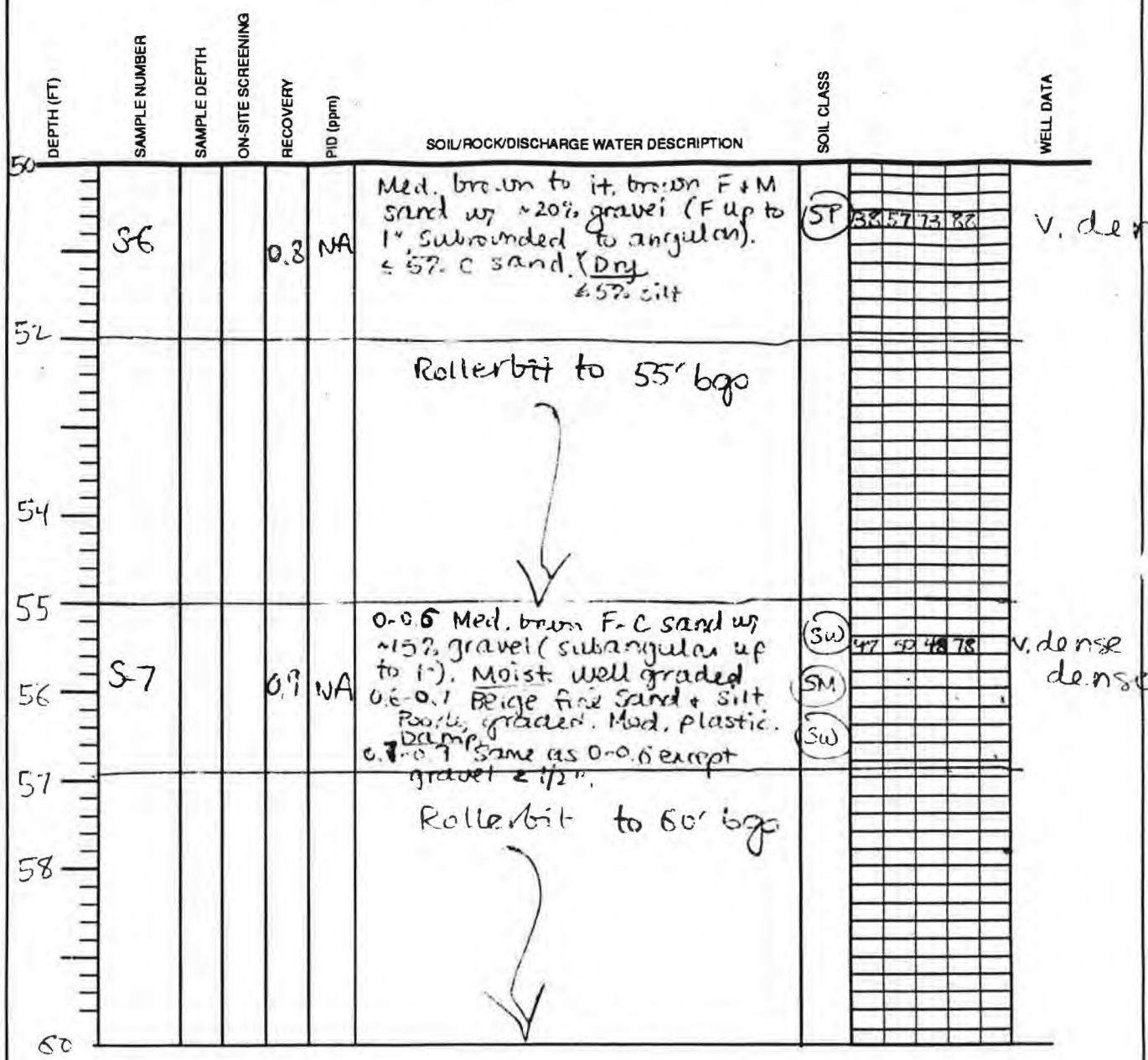

FIGURE 4-8A
SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

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SOIL BORING LOG

Client: USAEC	Project No. 08712.02	Study Area: Gravel Pit	
Contractor: GA, Wrigs.	Date Started: 6/5/98	Boring No.: GP-2	
Method: Dr. & Wash	Casing Size: 3" ID	Protection: Mod. D *	
Ground Elev.:	Soil Drilled: 100	Completed: 6/9/98	
Logged by: NER	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.)	Diam: NA (ID)	Material: NA
		Total Depth: 100' (casing)/102' (spoon	
		▽ Below Ground: 77-80	
		Page 7 of: 11	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS		WELL DATA
60									
	S-8			0.9	NA	Same as above except gravel up to 1" + subrounded to subangular. wet in bottom of spoon - moist above.	SW	31 34 38 51	dense
62						Rollerbit to 65' bgs			
64									
65									
66	S-9			0.8	NA	0-0.6 Tan, med. brown, + drk brown; F+M sand and silt w/ ~15%. subangular to angular gravel Fe staining - dry ~ mod. plastic 0.6-0.8 Gravel (angular) w/ ~10% F sand + silt and ~15% C sand - wet. * lost wash H2O at 65' bgs	SW-SM	34 23 16 17	Med. dense
67									
68						Rollerbit to 70' bgs			
70									

FIGURE 4-8A
SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

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SOIL BORING LOG

Client: USAEC	Project No. 08712.02	Study Area: Gravel Pit	
Contractor: GT. WRKS.	Date Started: 6/5/98	Boring No.: GP-2	
Method: Dr. & Wash	Casing Size: 3" ID	Protection: Mod. D *	
Ground Elev.:	Soil Drilled: 100'	Completed: 6/9/98	
Logged by: NER	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.)	Diam: NA (ID)	Material: NA
		Total Depth: 100' (casing)/102' (c	
		Below Ground: 77-80'	
		Page 8 of: 11	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	WELL DATA
70	S-10			0.6	NA	lt. brown F + M poorly graded sand grading to lt. brown orange M + C sand and gravel (subrounded to subangular), up to 10% F sand. Grading down to charcoal-grey, C sand + gravel (angular, up to ¾") and lt. bro in F sand.	SP	Med. dense dense
72						Moist to wet. * Lost wash fluid at 70' bgs. Rollerbit down to 75' bgs.		
74								
75	S-11			0.9	NA	lt. brown F + M sand w/ trace C sand and ~10% F gravel (≤ 0.5"). subrounded to subangular. Lens of all F sand at 0.4'. Moist to wet. Poorly graded. ≤ 5% silt.	SP	Med. dense to dense
76								
77						Rollerbit down to 80 bgs		
78								
80								

FIGURE 4-8A
SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

SOIL BORING LOG

Client: USAEC	Project No. 08712.02	Study Area: Gravel Pit	
Contractor: Grt. Wrks.	Date Started: 8/5/98	Boring No.: GP-2	
Method: Dr. + Wash	Casing Size: 3" ID	Protection: Mod. D*	
Ground Elev.:	Soil Drilled: 100'	Completed: 6/9/98	
Logged by: NER	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.)	Diam: NA (ID)	Material: NA
		Total Depth: 100' (casing)/102' (spo	
		Below Ground: b/tw 77 and 80' w	
		Page 9 of: 11	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	WELL DATA
80	S-12			0.8	NA	Lt. brwn F+M sand-trace silt. Poorly graded-~~wet~~ sat. Fe staining at 0.3 ft.	SP	25 30 35 36 — Med. dens to dens
82						Rollerbit to 85' bgs		
84								
85	S-13			0.8	NA	Same as above except no Fe staining-sat.	SP	21 18 23 26 — Med. der
87						Rollerbit to 90' bgs		
88								
90								

FIGURE 4-8A
SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

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SOIL BORING LOG

Client: USAEC	Project No. 08712.02	Study Area: Gravel Pit	
Contractor: Grt. Works	Date Started: 6/5/98	Boring No.: GP-2	
Method: Dr. & Wash	Casing Size: 3" ID	Protection: Mod. D *	
Ground Elev.:	Soil Drilled: 100'	Completed: 6/9/98	
Logged by: NER	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.)	Diam: NA (ID)	Material: NA
		Total Depth: 100' (casing)/102'	
		Below Ground: 77-80'	
		Page 10 of: 11	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	WELL DATA
90						6/9/98 0805		
	S-14			0.9	NA	Lt. brown ~~clayey~~ Silty SAND - F+M - Sat. - poorly graded - Mod. Plastic. - Sat. * Top of spoon contains ~0.8' of material that has settled out of H_2O from previous day - clayey/silty + plastic in nature (See extra jar)	SM w/H	14 31 35 39 dense
92						Rollerbit to 95 ~~ft~~ bgs.		
94								
95								
96	S-15			0	NA	Ø recovery		21 28 27 35
97								
98						Rollerbit to 100' bgs		
100								

FIGURE 4-8A
SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

9312005S L7

SOIL BORING LOG

Client: USAEC	Project No. 08712.02	Study Area: Gravel Pit	
Contractor: GA. Wrks	Date Started: 6/5/98	Boring No.: GP-2	
Method: Dr. & Wash	Casing Size: 3" ID	Protection: Mod. D #	
Ground Elev.:	Soil Drilled: 100'	Completed: 6/9/98	
Logged by: NER	Checked by:	PI Meter: NA	
Screen: NA (ft.)	Riser: NA (ft.)	Diam: NA (ID)	Material: NA
		Total Depth: 100'(casing)/102'(Spoon)	
		Below Ground: 77-80'	
		Page 11 of: 11	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE DEPTH	ON-SITE SCREENING	RECOVERY	PID (ppm)	SOIL/ROCK/DISCHARGE WATER DESCRIPTION	SOIL CLASS	WELL DATA
100								
(33) ~~102~~	S-16			1.0	NA	Lt. brwn F+M Sand - trace C sand - trace subrounded gravel < 1/2" d - sat. - ± 5% silt poorly graded.	SP	30 51 44 51 dense
102						B.O.E. casing @ 100' Spoon 102' 6/9/98 Grouted using (2) 50 lbs. bags Volclay to ~ 55 gal H_2O. Filled to surface with drill cuttings.		
104								
105								
106								
107								
108								
110								

FIGURE 4-8A
SOIL BORING LOG
PROJECT OPERATIONS PLAN
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

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CONTRACTOR SURVEY QUESTIONS AND RESPONSE SUMMARY SPREADSHEET

SURVEY QUESTIONS

Sequence of Activities for Debris Loading, Rail Transport, and Off-Site Disposal

Note: For purposes of the survey, it is assumed that access to the waste loading areas is provided. Landfill materials are assumed to have already been excavated, dewatered (where needed), stockpiled at each landfill site, and ready for loading. The rail spur behind the Maintenance Building is assumed to be the rail loading and departure area [need to confirm with Colin Pease of Guilford Industries].

Regular Text = Questions to ask Contractors

Italic Text = Questions Army will Answer/Provide

A. Before Loading Debris at each Disposal Site:

Sort debris for recycling? for separate disposal destinations - based on type of material? How - equipment, handling etc.?

What are waste characterization requirements for disposal?
Will characterization efforts impact loading schedule?

B. Loading Debris at each Disposal Site:

Will loading occur one site at a time or on multiple sites simultaneously?

What equipment will be used to load debris?

Rate of loading?

How much space needed at each site for stockpiling, handling and loading debris based on loading rate?

C. Local Transport to Rail Loading Area:

What are the haul routes and associated load and/or other restrictions?

Type and size of transport vehicles? Loaded capacity (weight and volume)?

Rate of loaded vehicle trips to rail loading site? Cycle time? *(May not matter if large stockpile areas are set up at rail loading area, then bring in rail cars and load)*

Would improvements/modifications to the proposed site access routes be needed prior to transport?

What is likelihood that physical damage to access routes from transport vehicles will require maintenance and repair? What is the estimated repair cost? (Note: this may be the same for hauling to consolidation location)

D. Debris Handling at Rail Loading Site:

Are there alternatives to the assumed rail loading site behind the Maintenance Building - outside of Devens? *(On-site options will be coordinated with Colin Pease - Guilford Transportation)*

Would material be stockpiled at the rail loading site in large (5,000-10,000 cy) stockpiles prior to rail cars being brought to the site?

What is the anticipated rate of debris loading?

Will debris be loaded directly into waiting rail cars? How? Will a temporary ramp or ramps need to be constructed? How?

How many rail cars would be used per train?

Will the cars leave immediately after being loaded, or will there be a delay?

Who provides the rail cars?

What type of rail cars will be used?

Will the waste need to be sealed within each car?

How will free liquids be handled - precipitation, etc.?

Total length of rail siding required?

What area is required for handling and stockpiling materials adjacent to the rail siding?

E. Debris Transport

What is the rate at which loaded debris will be moved out of the proposed rail siding?

What is the intended disposal site(s)?

What routes will the trains take? Who are the points of contact with the rail companies?

How are costs allocated for transportation? per car/train/weight?

What are typical costs for rail transport per unit?

Are there potential bottlenecks in the proposed route that could affect the schedule?

Who is responsible should an accident such as a train derailment occur? What are the contingency plans for such an event?

F. Debris Disposal

If more than one disposal site, how much debris is going to which site?

Describe the disposal facility(s) - waste volume capacity; waste volume received to-date; hydraulic containment components, i.e., liner, cap; proximity to populated areas; how long has it been operating; when is it intended to be closed.

How will debris be unloaded from the rail cars?

Under which permits is the facility operating?

Have there been any permit violations within the last five years? If so, what were the violations? How were they resolved?

Will the debris be further processed or separated at the facility? If so, will any of the processed/separated debris be diverted to another facility?

What is the tipping fee range at the facility for projects of this size?

Company	$/ton	Est. Weight	Density	Est. Cost	Basis of Costs	Before Loading					Loading at Debris Site			
						Sorting/ Recycling	If yes, separate disposal destinations	If yes, seperate which materials?	Characterize requirements	Will characterize impact loading schedule?	Area Req.	One or Mult sites	pieces equip	# operators
USA Waste of Virginia	$68 to $78 per ton	1500 lbs/cy in place. 1000 to 1250 lbs/cy as loaded	0.75 tons/cy in place. 0.5 to 0.63 tons/cy loaded	$7.88 mil. to $11.4 mil.	85 tons per railcar, with each rail car supporting 4 containers. TAT for rail equip. is 12 days. Production estimated at 54 cars/wk, 6 days/wk for a period of 6 to 12 mo.	No	N/A	N/A	Reqs certs from owner stating clean	Unable to answer	5Ac.	One site at a time	loader, excavator with grapple unit, bulldozer	1
									Requires analysis for known contam. to facility					
Environmental Waste Technology, Inc. (EWT)	$79 per ton	8 to 1.1 yds to tons	equivalent of 1.25 to .9 tons/cy	$22.91 mil. to $16.5		Done at the off-site landfill.	no	unknown	requires TCLP analysis			2 sites at a time	2 to 5 loaders	2 operators /loading
ECDC Environmental	$26 to $47/ton		1.1 to 1.4 tons/cy	$6.64 mil to $15.27 mil.		no	N/A	N/A	None specific to C&D. Questionaire					
Waste Management Inc.	$120/ton		.7 tons/cy	$19.49 mil.										

Company	$/ton		Transport to Rail													
		Rate of Loading	Type and Size	Loaded capacity (weight and volume)	Travel Route known?	Trip rate to rail site	Cycle time	Physical Restrictions ARMY	Imprvmnts req'd ARMY	Maint. or Repair ARMY	Est. Cost ARMY	Alternatives to rail loading siting	Stockpiles at rail site prior to loading cars?	Rate of loading debris at rail site	Loaded directly?	Ramps req'd?
USA Waste of Virginia	$68 to $78 per ton	---	100 cy trailers	20 to 23 tons/trailer	No	Unknown	12 days	Unknown	Unknown	Unknown	Unknown	Unknown	No. Containers loaded at debris site	Unknown	intermodal containers at waste site. 100 cy trailers	maybe
Environmental Waste Technology, Inc. (EWT)	$79 per ton	estimate at 500 tons/day	25 cy-intermodal boxes	Approximately 80,000 lbs per rolloff truck	assumed to be yes. not disclosed	2 trips per day to Allston Brighton Railyard						Onsite not reqd. deliver to Allston Brighton	No	500 tons/day	Yes	no
ECDC Environmental	$26 to $47/ton		10 wheelers or other "shuttle" trucks		on base only								Yes	2,000 to 2,500 tons/day up to 8,000 tons/day	No	No
Waste Management Inc.	$120/ton															

Company	$/ton	Handling at Rail Site														
		If ramps constructed, how?	If ramps, what size?	Is ramp cost included in rate?	No. of rail cars per train.	Will train leave immediately or delayed (unit trains)	Car provider	Type of car	Type of Car Seal	How are free liquids handled?	Length of siding req'd	Siding area req'd ARMY	Rate of loaded debris leaving rail siting?	Intended disposal sites	Routes	Railroad point of contact
USA Waste of Virginia	$68 to $78 per ton	Unknown	Unknown	Unknown	Unknown	Not unit trains. Trains will leave based on rail schedule	USA and subs	Intermodal rail containers	leakproof with covered tops		Unknown	5 Ac	based on predet. schedules with rail co.	Maplewood Landfill or Charles City Landfill or both	Unknown	Maplewood is serviced by Norfolk Southern
																Charles City is serviced by CSX
Environmental Waste Technology, Inc. (EWT)	$79 per ton	N/A	N/A	N/A	Unknown	suspect non unit trains	Minerva	intermodal or gondolas	intermodals with lids, gondolas trapped and taped		Long enough to accomodate (6) 100 ton gondolas	50 yds or more	hourly for intermodal, 2 hrs for gond.	Minerva Landfill.	known, but not disclosed	Conrail
ECDC Environmental	$26 to $47/ton	N/A	N/A	N/A		either. Unit trains are cheaper	Conrail/CSX	90 to 100 ton gondolas	unknown. Top covered				2,000 to 2,500 tons/day	Taylor County Landfill, GA	known	
Waste Management Inc.	$120/ton				40	unit trains							3200 tons/train	VA		

Company	$/ton	Transport					Disposal									
		Transp costs allocated? $per car/train/weight	Typical transport costs/unit	Bottlenecks	Resp. party (in case of accident)	Contingency plan known	Disposal Site	Volume of debris per disposal site	Hydraulic Containment Components	Proximity to populated areas	Current volume at each Facility	Facility Capacity	Available capacity (future permits)	Years of operation	Closing date, if known	Off-loading at facility
USA Waste of Virginia	$68 to $78 per ton	included with disposal	see disposal costs	Unknown			Maplewood Landfill	Unknown	Subtitle D; double liner. Leachate collect and treat	37 mi. west of Richmond, VA/ 5 mi. west of Amelia	Not discussed	404 Ac. permitted	804 Ac.	6 yrs.	20 yrs. @ 5000 tpd/ 50 yrs. @ 1500 tpd	Off loaded at siding, transported to working face
							Charles City County Landfill	Unknown	Subtitle D; double liner. Leachate collect and treat	20 mi. southeast of Richmond, VA	80 Ac. as of Nov. 96 (5.5 mil. tons)	289 Ac. permitted	934 Ac.	8 yrs.	33 to 38 yrs. @ 3000 tpd	Off loaded at siding, transported to working face
Environmental Waste Technology, Inc. (EWT)	$79 per ton			none anticipated	in contract	in contract	Minerva Landfill, OH				between 1 and 2 mil. cy. currently occupying landfill	55 mil. cy of airspace				
ECDC Environmental	$26 to $47/ton	$ per ton	$18 to $29 per ton				Taylor County Landfill, GA	N/A	Subtitle D; double liner. Leachate collect and treat	all land w/in .5 mi. is agri., woodland, or forest	7 mil. cy	50 mil. cy	43 mil. cy	9 yrs.	Sometime after 2020	
Waste Management Inc.	$120/ton	$ per ton	$81/ton				VA									

Company	$/ton	Which permits does the facility operate under	# violations in 5 yrs.	Violation desc.	Violations resolved	Further facility processing?	If separation, will debris go to another facility?	Facility daily limits	Facility tipping fee range	Transport etc. fee
USA Waste of Virginia	$68 to $78 per ton	Virginia Department of Waste Management #540	1	minor	yes, no fines	commingled with waste	N/A	5000 tons/day	$38/ton	$30 to $40/ton
		Virginia Department of Waste Management #531	0	---	---	commingled with waste	N/A	6000 tons/day	$38/ton	$30 to $40/ton
Environmental Waste Technology, Inc. (EWT)	$79 per ton									
ECDC Environmental	$26 to $47/ton	Federal Sub-title D and State							$8 to $18/ton	$18 to $29/ton
Waste Management Inc.	$120/ton							2,000 tons/day	$39/ton	$81/ton