U.S. Army Corps of Engineers
New England Division

FINAL ACTION MEMORANDUM
STUDY AREA 39, SYLVANIA BUILDING SITE

FORT DEVENS, MASSACHUSETTS

CONTRACT NO DACA33-91-D-0006
DELIVERY ORDER NO. 21

SEPTEMBER 1995

ABB Environmental Services, Inc.

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Prepared for:

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EXECUTIVE SUMMARY

This Action Memorandum documents the decision to perform a time-critical removal action for the Sylvania Building Site, Study Area 39, within the Oxbow National Wildlife Refuge. The Sylvania Building Site is located south of Route 2 in Harvard, Massachusetts. This area was part of the South Post of Fort Devens until 1973. Sylvania leased at least one of the buildings formerly located at the site from before 1956 until the early 1960s. Sylvania was reportedly under contract with the Army to test laser siting systems on Army tanks, and possibly tank communications systems. The site was later used by the Army Reserves.

During development of the Master Environmental Plan and the Enhanced Preliminary Assessment, Study Area 39 was identified as a potential area of contamination because of a polychlorinated biphenyl spill from an overturned transformer near Building 4250 that occurred in 1984. Contaminated soil was excavated and removed from the site in December 1984. The Master Environmental Plan recommended that the results of confirmation sampling be presented to the Massachusetts Department of Environmental Protection for approval, and the site be recommended for no further action. The Enhanced Preliminary Assessment noted that an underground storage tank was removed from the site, and recommended a review of Army records for documentation of tank removal, and sampling based on the findings of the records review.

A site investigation was conducted for Groups 4, 8, and 9 which addressed Study Area 39. The site investigation involved records review and geophysical surveys to attempt to locate former or abandoned underground storage tanks or leach fields, confirmatory sampling at the remediated transformer spill, and sampling in the wetland to evaluate potential impacts. The Main Post Site Investigation Report recommended a phased supplemental site investigation to include additional soil, groundwater, surface water, and sediment sampling to further investigate contamination detected during the site investigation.

Human health risks associated with exposure to soils at Study Area 39 were evaluated in the preliminary risk evaluation conducted during the site investigation, which was revised following the Phase I supplemental site investigation. Polychlorinated biphenyls slightly exceeded the residential human health criterion in surface soil, but the average concentration in soils remaining at the former spill location was below the criterion. Petroleum hydrocarbon compounds and arsenic were detected in soils at concentrations that may pose a potential human health risk if this study area is developed for residential

use in the future. The residential exposure assumption may overestimate risk, because the area will likely remain a wildlife refuge in the future. The ecological soil criteria were exceeded for aluminum, lead, and vanadium in surface soils at the site, but the metal concentrations did not exceed background levels for these analytes in Fort Devens soils. The residual concentrations of polychlorinated biphenyls are not believed to pose a significant risk to the local Blandings Turtle population.

Semivolatile organic compounds, polychlorinated biphenyls, and total petroleum hydrocarbon compounds were not detected in groundwater. One volatile organic compound, 1,2,4-trimethylbenzene, was detected in one sample slightly above the regulatory criterion for this compound in groundwater. Several metals were detected in filtered and unfiltered groundwater samples; however, concentrations were fairly consistent across the site and may be representative of local background conditions. Therefore, it was determined that groundwater had not been adversely affected by soil contamination and that the second phase of the supplemental site investigation was not warranted.

Several analytes were detected in wetland sediments above ecological protective contaminant levels; however, they are believed to be representative of natural conditions rather than a contaminant source at the site. Pesticide compounds detected in sediment were below background values calculated for Fort Devens.

The proposed removal action includes excavation of soil contaminated with petroleum hydrocarbons on the southeast side of the Building 4250 foundation. Additionally, any remaining polychlorinated biphenyl-contaminated soil identified during the removal action will be excavated. Portions of the building 4250 foundation will be demolished, if necessary, in order to access the contaminated soil. Soil will be sampled during excavation and field screened for total petroleum hydrocarbons by infrared spectroscopy. Polychlorinated biphenyl screening will be conducted off-site by a U.S. Army Environmental Center - approved analytical laboratory. Screening results will be used to define the limits of excavation: soil with total petroleum hydrocarbon concentrations greater than 500 micrograms per gram or polychlorinated biphenyl concentrations greater than 2 micrograms per gram will be considered contaminated and will be removed from the site. An estimated 90 cubic yards of contaminated soil will be removed from the vicinity of former Building 4250.

When removal action objectives have been met, the excavation will be lined with polyethylene and backfilled with clean fill. Soil containing petroleum hydrocarbons and

soil containing polychlorinated biphenyls will be stockpiled separately in discrete storage cells. The soil will later be used during the construction of a consolidation landfill adjacent to the Shepley's Hill Landfill, which will be constructed following the requirements of the Massachusetts Solid Waste Management Regulations.

The removal action, from initial site preparation activities to site restoration, is expected to be completed in one month. The removal action will be funded entirely by the Army, and is estimated to cost $40,000.

The removal of contaminated soil from Study Area 39 will reduce potential future risks to human health from petroleum and/or polychlorinated biphenyl contamination in soil. Confirmation sampling results will be compared to risk-based concentrations and regulatory standards and guidelines to evaluate residual risks and to determine if further action is required. No further action is anticipated for Study Area 39 following the removal action. No other removal or remedial actions have been recommended for Study Area 39.

I. PURPOSE

This Action Memorandum documents the decision to perform a removal action described herein for the Sylvania Building Site, Study Area (SA) 39 within the Oxbow National Wildlife Refuge, formerly part of Fort Devens in Massachusetts. The U. S. Department of the Army (Army) intends to pursue a time-critical removal action for petroleum-contaminated soils at this area. This Action Memorandum identifies the proposed removal action to address contaminated soil near former Building 4250. This Action Memorandum was prepared using current U.S. Environmental Protection Agency (USEPA) guidance (USEPA, 1990b), and was prepared concurrently with the design and contract documents, which were executed under the authority of the U. S. Army Corps of Engineers.

II. SITE CONDITIONS AND BACKGROUND

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) states that a removal action may be conducted at a site where a threat to human health and welfare or the environment is established. An appropriate removal action is taken to abate, minimize, stabilize, mitigate, or eliminate the release or threat of release at a site (USEPA, 1990a). The following paragraphs describe Fort Devens and the conditions at the Sylvania Building Site that support the need for a time-critical removal action.

A. SITE DESCRIPTION

1. Removal Site Evaluation

Fort Devens is located in the Commonwealth of Massachusetts approximately 35 miles northwest of the city of Boston. Fort Devens is located within the towns of Ayer and Shirley (Middlesex County) and Harvard and Lancaster (Worcester County), and occupies approximately 9,280 acres of land area (Figure 1). Since 1917, Fort Devens has been used for a variety of training missions. The current mission of Fort Devens is to command and train its assigned units and support various tenant activities.

Fort Devens was placed on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) on December 21, 1989. In addition, under Public Law 101-510, the Defense Base Realignment and Closure Act of 1990, Fort Devens was selected for cessation of operations and closure.

During development of the Master Environmental Plan (MEP) (Biang, et al., 1992) and the Enhanced Preliminary Assessment (PA) (Roy F. Weston, 1992), 59 study areas were identified. SA 39 was identified as a potential area of contamination because of a polychlorinated biphenyl (PCB) spill from an overturned transformer near Building 4250 that occurred in 1984. Contaminated soil was excavated and removed from the site in December 1984. The MEP recommended that the results of confirmation sampling be presented to the Massachusetts Department of Environmental Protection (MADEP) for approval, and that the site be recommended for no further action. The Enhanced PA noted that an underground storage tank (UST) was removed from the site, and recommended a review of Army records for documentation of tank removal, and sampling based on the findings of the records review.

A site investigation (SI) was conducted for Groups 4, 8, and 9 which addressed SA 39. This study involved records review and geophysical surveys to attempt to locate former or abandoned USTs or leach fields, confirmatory sampling at the remediated transformer spill, and sampling in the wetland to evaluate potential impacts. The SI report recommended a phased supplemental SI to include additional soil, groundwater, surface water, and sediment sampling to further investigate contamination detected during the SI (Arthur D. Little, Inc., 1993).

The Phase I Supplemental SI included excavating soil and removing the concrete transformer pad in the area of the historical PCB spill, completing eight Geoprobe borings around Building 4250, and sampling soil and groundwater from these borings. Based on the lack of significant groundwater contamination identified during the Phase I investigation, it was determined that the Phase II investigation was not warranted. If petroleum-related contamination had been detected, the Phase II investigation would have included installation of groundwater monitoring wells, groundwater sampling, and additional surface water and sediment sampling (Arthur D. Little, Inc., 1995).

2. Physical location

The Sylvania Building Site is located south of Route 2 in Lancaster, Massachusetts. Sylvania leased at least one of the two buildings (4249 and 4250), formerly located at the site, from before 1956 until the early 1960s (Figure 2). Sylvania was reportedly under contract with the Army to test laser siting systems on Army tanks, and possibly tank communications systems. The site was later used by the Army Reserves. SA 39, formerly part of the South Post of Fort Devens, is currently within the Oxbow National Wildlife Refuge, which was deeded by Fort Devens to the U. S. Department of the Interior in 1973 (Arthur D. Little, Inc., 1993).

3. Site characteristics

The site is at an elevation of 225 feet above mean sea level and is surrounded by wetlands. Soil borings have been completed to a depth of 14 feet at the site. Subsurface deposits are generally poorly sorted yellowish-brown sands with varying amounts of silt and gravel. Groundwater was encountered in the borings at depths ranging from 4.5 to 12.5 feet. Groundwater is expected to discharge to the wetlands (Arthur D. Little, Inc., 1993).

According to the MEP and Enhanced PA, a spill of PCB oil was discovered in September 1984 near Building 4250, adjacent to a transformer (found empty) (Biang, et al., 1992). The oil stain was approximately 288 square feet (ft^2) in size (Directorate of Engineering and Housing, 1985). The spill was divided into four quadrants:

- Quadrant I - visibly stained area
- Quadrant II - transformer and concrete slab
- Quadrants III and IV - areas believed to be contaminated with oil leaked from the transformer

The location of these quadrants is shown in Figure 3. Samples were collected from each of the four quadrants in September, November, and December 1984, and were analyzed for PCBs. Contaminated soil containing PCBs at concentrations above 50 parts per million (ppm) was excavated. Eight 85-gallon drums of soil and the transformer were removed and taken to the Hazardous Waste Storage Area at Building 1650 (Biang, et al., 1992). Confirmation samples collected in December 1984, following the removal, indicated that residual concentrations were below 50 ppm, the selected cleanup level.

A former UST was identified in the Enhanced PA as having been removed from the site (Roy F. Weston, 1992). Real property records indicated that two buildings located on the site were demolished in December 1985. Building 4250 was 6,780 ft^2 in size and contained a water pump and a 75-gallon water storage tank, a 1,000-gallon UST containing fuel oil, and one bathroom. Building 4249 was a 4,365 ft^2 structure containing a 75-gallon water storage tank, two 1,000-gallon USTs containing fuel, and one bathroom. A 144 ft^2 storage shed and two 10-ton air conditioners were also associated with Building 4249 (Arthur D. Little, Inc., 1993).

4. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant

Historical information and sampling results indicate that there was a release of PCB-containing oil from a transformer into the environment and petroleum contamination in soils that may be associated with former activities at the study area. This section summarizes results of available analytical data for soil, surface water, and sediment near Buildings 4249 and 4250. Sampling locations are shown in Figures 4 through 9. Analytical data are summarized in Tables 1 through 11.

After the transformer spill was discovered, samples were collected from four quadrants in the vicinity of the transformer pad at Building 4250, at locations described in Table 1. Results of analysis for PCBs ranged from 5.2 to 60 ppm. The highest concentration was in the visibly stained area, Quadrant 1. Based on these results, soil was excavated in December 1984 and taken, with the empty transformer, off site. Confirmation sample results, shown in Table 2, indicate that PCB-contaminated soil above the 50 ppm cleanup level was removed.

The SI field program at SA 39 was conducted in 1993 by Arthur D. Little, Inc. The objectives of the program, as stated in the Main Post SI Report, were to investigate the presence of environmental contamination associated with the historical PCB spill, reported USTs formerly used at the site, and reported leach fields associated with the former buildings. The investigation included sampling of concrete and surface soils near the former PCB spill, sampling of surface and subsurface soils collected from eight exploratory borings, and sampling of surface water and sediment in the wetlands near the study area (Arthur D. Little, Inc., 1993).

Eight exploratory borings were completed, with soil sampling at 0 to 6 inches, 2 to 4 feet, and at the depth of first encountered groundwater (4.5 to 12.5 feet). These soil borings

were completed in locations judged most likely to represent UST or leach field locations based on historical site information, geophysical anomalies, and observations of site conditions (see Figures 4 and 5) (Arthur D. Little, Inc., 1993). Each of the soil boring samples was analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides/PCBs, total petroleum hydrocarbon compounds (TPHC), explosives, and metals (see Table 3). Eight confirmatory surface soil samples at the former PCB spill area near former Building 4250 were analyzed for PCBs only (see Figure 6 and Table 4).

No VOCs were detected in soil samples. The only SVOC detected was bis(2-ethylhexyl)phthalate at a single location. TPHC was detected at all three depth intervals in soil boring 39B-93-08X, at concentrations ranging from 140 micrograms per gram (μg/g) to 5,500 μg/g. TPHC was also detected in the surface samples at 39B-93-01X, 39B-93-02X, and 39B-93-03X, in the sample from 8 to 10 feet in boring 39B-93-03X, and in all three sample depths in 39B-93-06X. TPHC concentrations in these samples did not exceed the 500 μg/g Massachusetts Contingency Plan (MCP) S-1 soil standard. Pesticides were detected at low concentrations in several surface and subsurface soil samples. Aroclor 1260 was detected in shallow samples from boring 39B-93-06X and in all eight surface soil samples, at concentrations ranging from 0.052 μg/g to 5.8 μg/g. Metals detected above Fort Devens background concentrations included arsenic, barium, calcium, chromium, cobalt, copper, iron, magnesium, nickel, potassium, and zinc.

Three confirmatory concrete chip samples were collected from the transformer pad and analyzed for PCBs (see Figure 6 and Table 5). Aroclor 1260 was detected in the three samples and in a duplicate sample, at concentrations ranging from 2.8 μg/g to 8.1 μg/g (Arthur D. Little, Inc., 1993).

Three pairs of surface water and sediment samples were collected west of former Building 4250 to evaluate potential impacts to the adjacent wetland (see Figure 5). Each surface water sample was analyzed for VOCs, SVOCs, pesticides/PCBs, TPHC, explosives, water quality parameters, and metals (see Table 6). Each sediment sample was analyzed for VOCs, SVOCs, pesticides/PCBs, TPHC, explosives, total organic carbon, grain size, and metals (see Table 7) (Arthur D. Little, Inc., 1993).

No organic compounds were detected in surface water samples. Metals detected in surface water included arsenic, barium, calcium, iron, magnesium, manganese, nickel, sodium, and zinc. Only zinc in surface water was detected above the range of

concentrations typical in the Nashua River. No VOCs or SVOCs were detected in sediment samples. TPHC was detected at concentrations ranging from 230 μg/g to 510 μg/g. The pesticides DDE and DDT were detected in one of three sediment samples below background values calculated for Fort Devens. Several inorganic analytes were detected in sediments; however, only arsenic was detected in one sample at concentrations in excess of the concentration range typically detected in the Nashua River (Arthur D. Little, Inc., 1993). However, because background concentrations of metals in wetland environments are likely to be higher than in moving water environments (such as those upon which background data for Fort Devens are based), metals detected in the surface water and sediment in the SA 39 wetland may be representative of natural conditions rather than a contaminant source at the site (Arthur D. Little, Inc, 1995).

The Main Post SI Report recommended a phased supplemental SI at SA 39, to include additional soil, groundwater, surface water, and sediment sampling to further investigate contamination detected during the SI. The first phase of the program included soil and groundwater sampling. If TPHC-contaminated groundwater had been identified or if soil contamination that was likely to impact adjacent wetlands had been identified, the second phase of the Supplemental SI program would have been implemented. This Phase II investigation would have included installation of groundwater monitoring wells, groundwater sampling, and collection of additional surface water and sediment samples (Arthur D. Little, Inc, 1995).

The Phase I Supplemental SI included excavating soil and the concrete transformer pad in the area of the historical PCB spill, completing eight Geoprobe borings around Building 4250, and sampling soil and groundwater from these borings (see Figures 7 and 8). Excavation soil samples were screened in the field for PCBs using an immunoassay method, and five samples were sent to a U.S. Army Environmental Center (USAEC)-approved laboratory for PCB analysis (see Table 8). Soil samples from the Geoprobe borings were screened in the field for TPHC and were confirmed by analysis at a USAEC-approved laboratory (see Tables 9 and 10). Groundwater samples from the Geoprobe borings were analyzed at an off-site laboratory for VOCs, SVOCs, PCBs, TPHC, and metals (see Table 11).

Approximately 20 cubic yards of soil from the historical PCB spill area and the entire concrete transformer pad were excavated during the Supplemental SI. The area of excavation was approximately 780 ft^2 and 0.5 to 1 foot deep (see Figure 7). During excavation, 13 soil samples were collected for field screening (see Figure 7). Split

samples from five locations were analyzed by a USAEC-approved laboratory. PCBs were detected by field screening in six of the 13 samples at concentrations ranging from 0.5 to 1.0 parts per million (ppm). Laboratory analytical results indicated residual Aroclor 1260 concentrations ranging from 0.22 to 5.3 μg/g (Arthur D. Little, Inc, 1995).

PCB concentrations in soils on the northern and eastern edges of the excavation were below 0.5 ppm. Additional soil on the western and southern sides was not excavated at the time due to the presence of the building foundation and a large tree (Arthur D. Little, Inc, 1995).

Eight Geoprobe borings were advanced to determine whether subsurface soil contamination was affecting groundwater at the site. Field screening results for TPHC indicated that TPHC was detected above 500 μg/g in two soil samples from Geoprobe boring 39G-02: the 0- to 2-foot sample and the 4- to 6-foot sample at 1,900 μg/g and 3,900 μg/g, respectively. Samples analyzed by the USAEC-approved laboratory confirmed these results. Boring 39G-02 is located near 39B-93-08X, the boring completed during the SI that contained elevated concentrations of TPHC (see Figure 9). TPHC was detected below the 500 μg/g MCP S-1 soil standard in 13 other samples. Although the source of TPHC in this area has not been determined, the limited areal and vertical extent of TPHC indicates that it is related to a small release (Arthur D. Little, Inc., 1995).

SVOCs, PCBs, and TPHC were not detected in groundwater. One VOC, 1,2,4-trimethylbenzene, was detected in one sample slightly above the regulatory criterion for this compound in groundwater. Several metals were detected in filtered and unfiltered groundwater samples; however, concentrations were fairly consistent across the site and may be representative of local background conditions. Based on the results of the Phase I investigation, it was determined that the Phase II investigation was not warranted.

The Army has estimated the amount of petroleum-contaminated soil near the former Building 4250 is 90 cubic yards, based on an assumed maximum depth of contamination of 6 feet. TPHC contamination above risk-based levels has been identified in soil boring 39B-93-08X and Geoprobe boring 39G-02 near the building foundation (see Figure 9). Additionally, PCBs at concentrations above the site cleanup level of 2 μg/g may remain in soil under the Building 4250 foundation. Because TPHC and possibly PCBs in the soil may pose a risk to human health, petroleum-contaminated soil and any remaining PCB-contaminated soil identified during the excavation is recommended for removal.

5. National Priorities List status

On December 21, 1989, Fort Devens was placed on the NPL under CERCLA as amended by SARA. Although no longer part of Fort Devens, SA 39 is part of the NPL site.

B. OTHER ACTIONS TO DATE

1. Previous actions

Actions have been undertaken at SA 39 to abate, minimize, stabilize, or eliminate the release of contamination. Soil contaminated with PCB oil from a transformer spill was removed from the site by the Directorate of Engineering and Housing in 1984. The concrete transformer pad and approximately 20 cubic yards of PCB-contaminated soil were removed during the Supplemental SI.

2. Current actions

The Army is not currently conducting other remedial actions or removal actions at this site.

C. STATE AND LOCAL AUTHORITIES' ROLE

1. State and local actions to date

The U. S. Army Corps of Engineers is undertaking this removal action for the Army. The Army is the lead agency for Fort Devens. To date, no emergency response actions or requests for State or USEPA assistance have been made.

2. Potential for continued State/local response

The proposed removal action for the Sylvania Building Site and corresponding documents will be reviewed by USEPA Region I and the MADEP.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Section 300.415 of the NCP outlines factors to be considered in establishing the appropriateness of a removal action. This section evaluates factors for the Sylvania Building Site.

A. THREATS TO PUBLIC HEALTH OR WELFARE

1. Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations or the food chain

Human health risks associated with exposure to soils at SA 39 were evaluated in the preliminary risk evaluation (PRE) conducted during the SI (Arthur D. Little, 1993), which was revised in the Supplemental SI Data Package (Arthur D. Little, Inc., 1995). The PRE compared detected concentrations of each analyte to published risk-based concentrations, regulatory standards and guidelines, or Fort Devens background concentrations. Only TPHC in two soil samples from boring 39B-93-08X and arsenic in the 6- to 10-foot sample in boring 39B-93-01X were detected above human health criteria for a future residential exposure scenario during the SI. TPHC results for soil samples collected from Geoprobe borings during the Supplemental SI indicated that only samples from boring 39G-02 exceeded the MCP S-1 standard of 500 μg/g.

Three of the six post-excavation surface soil samples collected from the historical spill area had Aroclor 1260 concentrations exceeding the residential soil criterion of 2.0 μg/g. Concentrations of 2.5 μg/g (1.83 μg/g in the duplicate sample from the same location), 4.6 μg/g, and 5.3 μg/g were detected in samples 39E-94-01X, 39E-94-04X, and 39E-94-05X, respectively. PCBs were either not detected or detected below 2 μg/g in other samples. The average concentration of residual PCBs in eight surface soil samples (collected during both the SI and Supplemental SI) remaining in and adjacent to the excavation is 1.89 μg/g, which is below the risk-based screening level.

The screening level PRE identified contaminants that may pose a potential human health concern if this study area is developed for residential use in the future. This area is currently part of the Oxbow National Wildlife Refuge and land use is expected to remain the same in the future.

The proposed cleanup objective for TPHC of 500 μg/g will address the potential human health risks associated with TPHC. Excavation of surface soil in the area of samples 39B-93-08X and 39G-02 will reduce or eliminate potential human health risks associated with SA 39.

2. Actual or potential contamination of drinking water supplies

Neither groundwater nor surface water in the vicinity of SA 39 is currently used as a drinking water supply. The site is currently a wildlife refuge, and future use is expected to remain the same.

Groundwater monitoring wells have not been installed at SA 39; however, groundwater was sampled in each of the eight Geoprobe borings during the Supplemental SI. Groundwater was encountered at depths ranging from 4.5 to 14 feet below grade in Geoprobe borings. Only one VOC, 1,2,4-trimethylbenzene, was detected in one sample slightly above the regulatory criterion for this compound in groundwater. Several metals were detected in filtered and unfiltered groundwater samples; however, concentrations were fairly consistent across the site and may be representative of local background conditions. The lack of significant contamination in groundwater collected from the Geoprobe borings suggests that vertical migration of contaminants to the water table has not occurred. Groundwater at the site is expected to discharge to the surrounding wetland (Arthur D. Little, Inc., 1993). Therefore, groundwater at the site will not have an adverse effect on a public drinking water supply.

3. Hazardous substances, pollutants, or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release

A review of records and interviews conducted during the Main Post SI indicated that three USTs and two leach fields were potentially associated with the former buildings at the site. Magnetic surveys conducted during the SI identified several anomalies and anomalous areas near the building foundations, including some that were interpreted to potentially indicate buried metal objects. Ground penetrating radar surveys were conducted to further examine the magnetic anomalies. Three large buried metal objects were identified near the Building 4249 foundation and six near the Building 4250 foundation. The Hager-Richter Geoscience, Inc. geophysical survey report (Appendix G of the Main Post SI Report) concluded that none of the buried metal objects appeared to be a UST or reinforced concrete septic tank (Arthur D. Little, Inc., 1993). Exploratory soil borings were completed at eight locations judged most likely to

represent former UST and leach field locations. Although no physical evidence of leach fields or USTs were found during drilling, a large mass of buried wire was found at a depth of approximately 2 feet at 39B-93-04X, and loosely compacted soil was noted at 39B-93-06X from 0 to 9 feet that may indicate the former location of a UST. No additional evidence to explain the other anomalies was identified (Arthur D. Little, Inc., 1993).

4. High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate

While low levels of Aroclor 1260 and other analytes have been detected in near-surface soils at SA 39, migration of these contaminants by erosion and infiltration is not likely. PCBs and TPHC were not detected in groundwater samples, indicating that significant vertical migration of soil contaminants has not occurred. High concentrations of contaminants were not detected in wetland surface water and sediment samples, suggesting that erosion of contaminants into the wetland has not occurred.

5. Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released

None identified.

6. Threat of fire or explosion

None identified.

B. THREATS TO THE ENVIRONMENT

1. Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations or the food chain

Metals detected above Fort Devens background concentrations in surface soils (0 to 2 feet) included arsenic, calcium, chromium, cobalt, copper, iron, magnesium, and nickel. Concentrations of these analytes were below the corresponding ecological soil protective contaminant levels (PCLs). Although PCLs were exceeded for aluminum, lead, and vanadium in surface soils, the concentrations of these analytes are lower than background concentrations for Fort Devens soils. This suggests that the detected

concentrations of these analytes do not add significantly to the pre-existing, baseline risk for soil receptors at Fort Devens (Arthur D. Little, Inc. 1993).

PCBs were detected in three surface soil samples collected from Quadrant I in excess of the ecological soil criterion of 3.1 μg/g during the SI. However, soil at these sampling locations was excavated during the Supplemental SI. PCB concentrations in two of the six post-excavation surface soil samples exceeded the PCL, but the average concentration (1.89 μg/g) did not (Arthur D. Little, Inc., 1995).

Soil contamination at this study area is unlikely to pose significant ecological risk to most species of fauna, since the area has dry, sandy soils that probably do not support significant soil invertebrates fed on by birds and mammals. The Blandings Turtle, which is listed as a threatened species by the Massachusetts Natural Heritage and Endangered Species Program, reportedly inhabits the area and lays its eggs in sandy areas. However, the residual concentrations of PCBs are not believed to pose a significant risk to the local Blandings Turtle population (Arthur D. Little, Inc., 1995).

During the SI, several analytes were detected in wetland sediments above ecological PCLs; however, concentrations of lead, mercury, manganese, and TPHC were within the range of concentrations detected in Nashua River sediment samples, indicating that these analytes may not be related to site contamination. Arsenic was detected in sediment at a concentration slightly higher than the typical range of arsenic concentrations in the Nashua River, and zinc slightly exceeded the surface water criteria and Nashua River concentration range. Pesticide compounds detected in sediment were below background values calculated for Fort Devens (Arthur D. Little, Inc., 1993).

2. Actual or potential contamination of sensitive ecosystems

As discussed in Section III.B.1, it is unlikely that concentrations of soil contaminants pose a significant risk to the Blandings Turtle. Analytes detected in wetland surface water and sediment samples are not believed to be related to SA 39, and may be representative of natural conditions (Arthur D. Little, Inc., 1995).

3. Hazardous substances, pollutants, or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release

As discussed in Section III.A.3, several anomalies were detected by the geophysical surveys conducted during the SI, but were not interpreted to represent USTs or septic tanks reportedly associated with Buildings 4249 and 4250.

4. High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate

As discussed in Section III.A.4, contaminants in surface soils are not believed to have migrated.

5. Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released

None identified.

6. Threat of fire or explosion

None identified.

IV. ENDANGERMENT DETERMINATION

A time-critical removal action to facilitate the rapid cleanup of contaminated soil has been identified for the Sylvania Building Site. Actual or threatened releases of pollutants or contaminants from this site, if not addressed by implementing the response actions described in this Action Memorandum, may endanger human health and welfare.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

This section describes the proposed removal action and associated costs.

A. PROPOSED ACTIONS

1. Proposed action description

The proposed removal action includes excavation and reuse of petroleum-contaminated soils on the southeast side of the Building 4250 foundation, and site restoration. Additionally, any remaining PCB-contaminated soil identified during the removal action will be excavated. Portions of the building foundation will be demolished, if necessary, in order to access areas of PCB contamination.

Soil will be sampled during excavation and field screened for TPHC by infrared spectroscopy. PCB screening will be conducted off-site by a USAEC-approved laboratory. Screening results will be used to define the limits of excavation: soil with total petroleum hydrocarbon concentrations greater than 500 μg/g or PCB concentrations greater than 2 μg/g will be considered contaminated and will be removed from the site. An estimated 90 cubic yards of contaminated soil will be removed from the vicinity of former Building 4250.

Composite confirmation samples will be collected from the bottom and sides of the excavation for off-site laboratory analysis for TPHC, SVOCs, and PCBs. Excavated soil will be characterized by collecting composite samples of excavated soil and analyzing for TPHC, SVOCs, PCBs, Toxicity Characteristic Leaching Procedure analytes, and ignitability, reactivity, and corrosivity.

When removal action objectives have been met, the excavation will be lined with polyethylene and backfilled with clean fill. Soil containing petroleum hydrocarbons and soil containing PCBs will be stockpiled separately in discrete storage cells. The soil will later be used during the construction of a consolidation landfill adjacent to the Shepley's Hill Landfill, which will be constructed following the requirements of the Massachusetts Solid Waste Management Regulations.

2. Contribution to remedial performance

The removal of contaminated soil from SA 39 will remove potential future risks to human health from contaminants in soil. The removal action will contribute to the reduction of overall site risks. Confirmation sampling results will be compared to risk-based concentrations and regulatory standards and guidelines to evaluate residual risks and to determine if further action is required. No further action under CERCLA is

anticipated for the Sylvania Building Site following the removal action. No other removal or remedial actions have been recommended for SA 39.

3. Description of alternative technologies

Because the removal action described in this Action Memorandum will be conducted as a time-critical action, alternative technologies were not considered.

4. Engineering Evaluation/Cost Analysis

Because a time-critical removal action was selected as the appropriate response for the Sylvania Building Site, an Engineering Evaluation/Cost Analysis was not prepared.

5. Applicable or Relevant and Appropriate Requirements

Applicable or Relevant and Appropriate Requirements (ARARs) are federal and state public health and environmental requirements used to (1) evaluate the appropriate extent of site cleanup, (2) scope and formulate removal action alternatives, and (3) govern the implementation and operation of a selected removal action. CERCLA and the NCP require that removal actions attain ARARs to the greatest extent practicable. To determine practicability, factors such as the urgency and scope of the remedial action should be considered.

ARARs have not been identified for SA 39. However, the removal action will follow appropriate state and federal guidelines. Because of the site's location in the Oxbow National Wildlife Refuge and because the Blandings Turtle reportedly inhabits the area, removal activities will be coordinated through the appropriate federal and state agencies to ensure that impacts on wildlife, including the Blandings Turtle, are minimized.

6. Project schedule

The removal action, from initial site preparation activities to site restoration, is expected to be completed in one month.

B. ESTIMATED COSTS

The removal action at the Sylvania Building Site will be funded entirely by the Army. This removal action is estimated to cost $40,000.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If the proposed action is delayed or not implemented, contaminated soil could potentially pose a risk to human health or the environment.

VII. OUTSTANDING POLICY ISSUES

None identified.

VIII. ENFORCEMENT

The Army is the lead agency for Fort Devens. This removal action will not be financed through Superfund; all funding will be provided by the Department of Defense through the Army and Fort Devens. Therefore, enforcement strategies do not apply to this removal action.

IX. RECOMMENDATION

This document presents the proposed removal action for contaminated soil at the Sylvania Building Site in Harvard, Massachusetts, developed in accordance with CERCLA, as amended, and not inconsistent with the NCP.

Conditions at the Sylvania Building Site meet the NCP Section 300.416(b)(2) criteria for a removal action and therefore a removal action is recommended for this site.

JAMES C. CHAMBERS
BRAC Environmental Coordinator

31 Aug 95
Date

ABB-ES	ABB Environmental Services, Inc.
ARARs	Applicable or Relevant and Appropriate Requirements
ARMY	U.S. Department of the Army
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
ft^2	square feet
MADEP	Massachusetts Department of Environmental Protection
MCP	Massachusetts Contingency Plan
MEP	Master Environmental Plan
$\mu g/g$	microgram per gram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
PA	Preliminary Assessment
PCB	polychlorinated biphenyl
PCLs	protective contaminant levels
ppm	parts per million
PRE	preliminary risk evaluation
SA	Study Area
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
SVOCs	semivolatile organic compounds
TPHC	total petroleum hydrocarbon compounds
USAEC	U.S. Army Environmental Center
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
VOCs	volatile organic compounds

Arthur D. Little, Inc., 1993. Final Site Investigation Report, Fort Devens Main Post Site Investigation, Fort Devens, Massachusetts; prepared for the U. S. Army Environmental Center, Aberdeen Proving Ground, Maryland; Cambridge, Massachusetts; December 15.

Arthur D. Little, Inc., 1995. Supplemental Site Investigation Data Package, Study Area 39 - Sylvania Building Site, Fort Devens Main Post Site Investigation, Fort Devens, Massachusetts; prepared for the U. S. Army Environmental Center, Aberdeen Proving Ground, Maryland; Cambridge, Massachusetts; Revision 1; March.

Biang, C.A., R.W. Peters, R.H. Pearl, and S.Y. Tsai, 1992. "Master Environmental Plan for Fort Devens, Massachusetts"; prepared for U.S. Army Toxic and Hazardous Materials Agency; prepared by Argonne National Laboratory, Environmental Assessment and Information Sciences Division; Argonne, IL; Final, April.

Directorate of Engineering and Housing, 1985. PCB Spill Report, Sylvania Building 4250, Fort Devens, Massachusetts; submitted to Massachusetts Department of Environmental Quality Engineering by Directorate of Engineering and Housing Environmental Management Office, Fort Devens.

Roy F. Weston, Inc., 1992. "Delivery Order 9 Enhanced Preliminary Assessment, Fort Devens, Massachusetts"; prepared for the U. S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland; West Chester, PA; February.

U. S. Environmental Protection Agency (USEPA), 1990a. National Oil and Hazardous Substances Pollution Contingency Plan, Final Rule; 40 CFR Part 300; March 8.

U. S. Environmental Protection Agency (USEPA), 1990b. Superfund Removal Procedures: Action Memorandum Guidance; Office of Solid Waste and Emergency Response; Washington, DC; December.

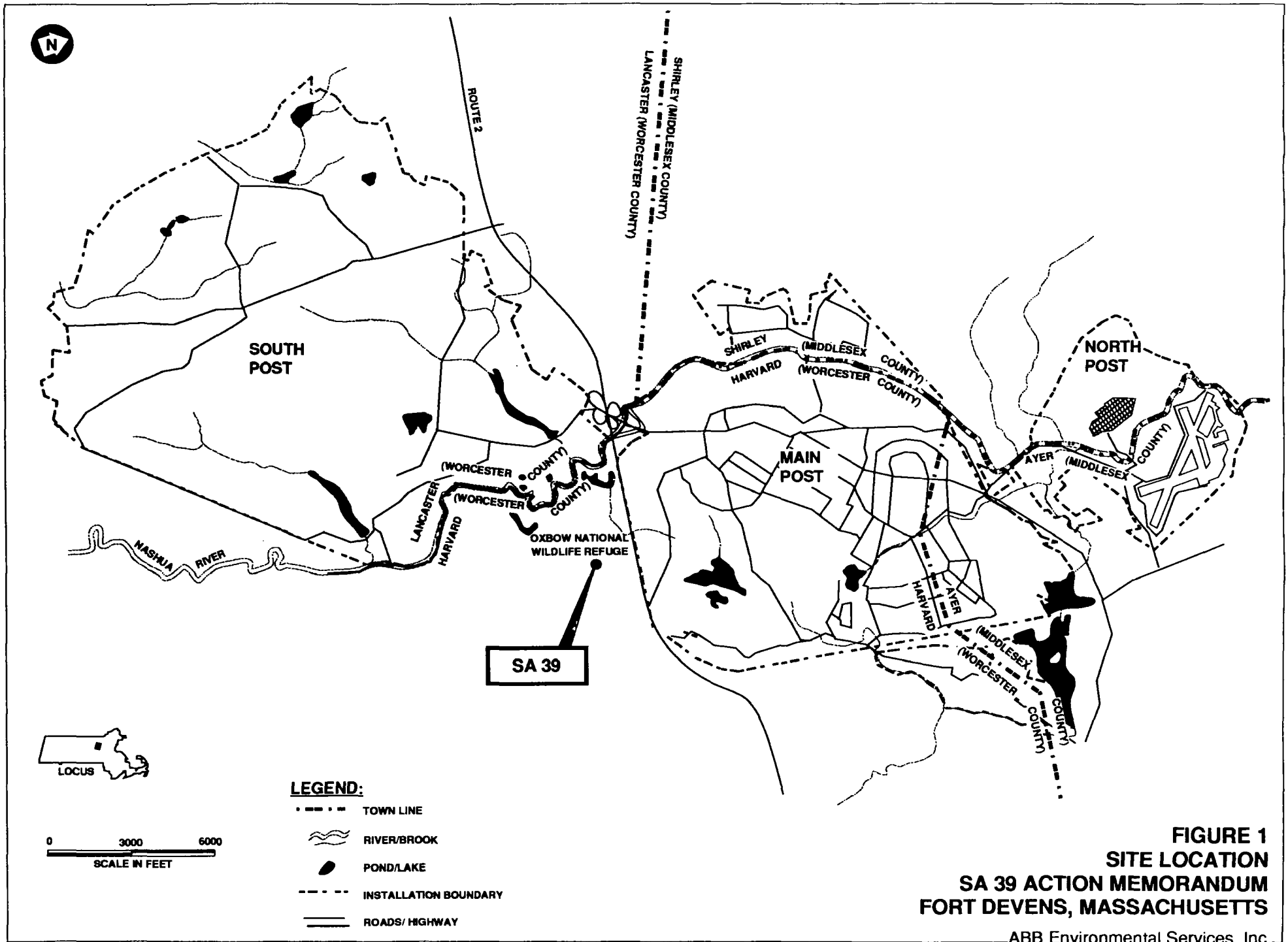
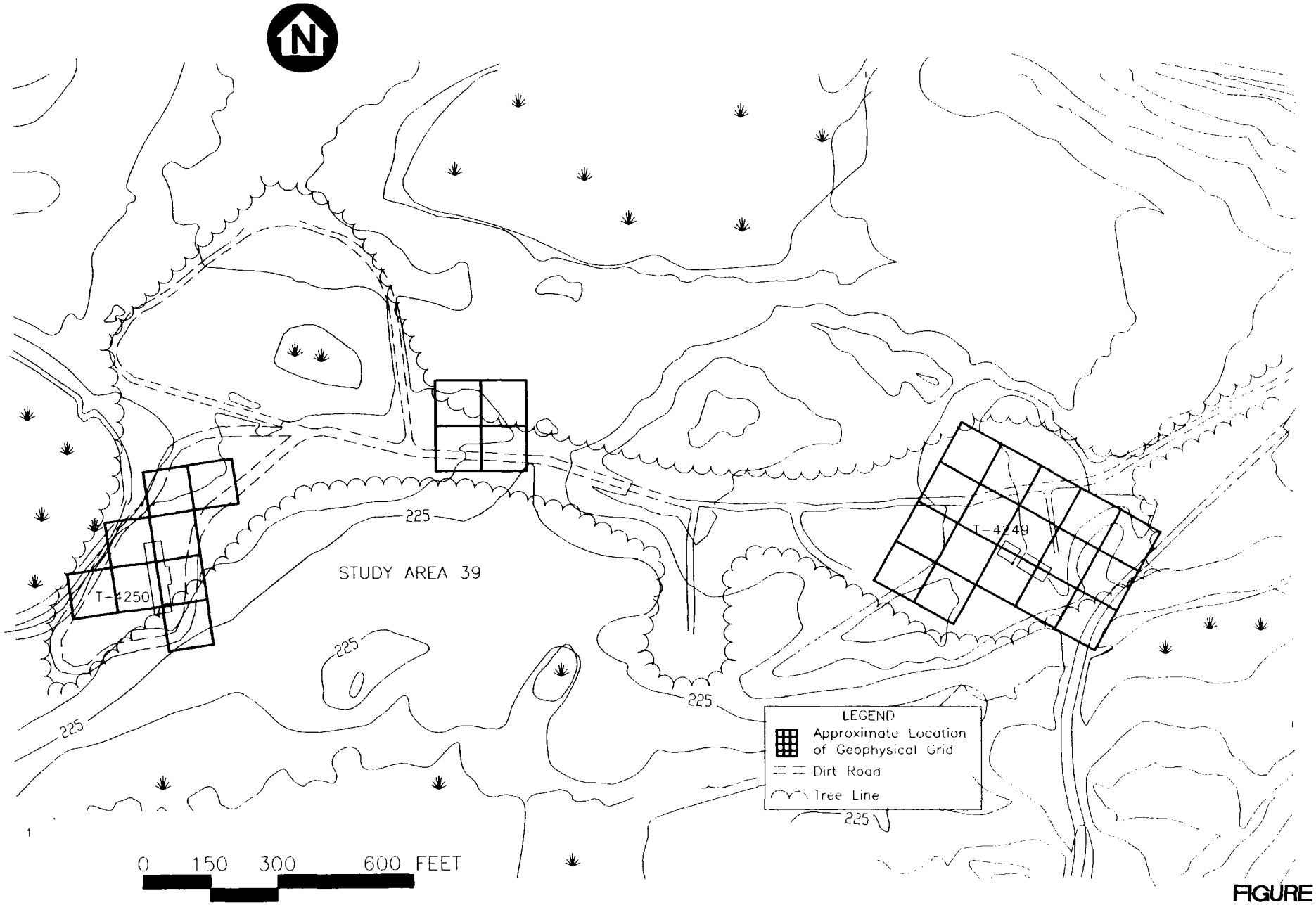


FIGURE 1
SITE LOCATION
SA 39 ACTION MEMORANDUM
FORT DEVENS, MASSACHUSETTS

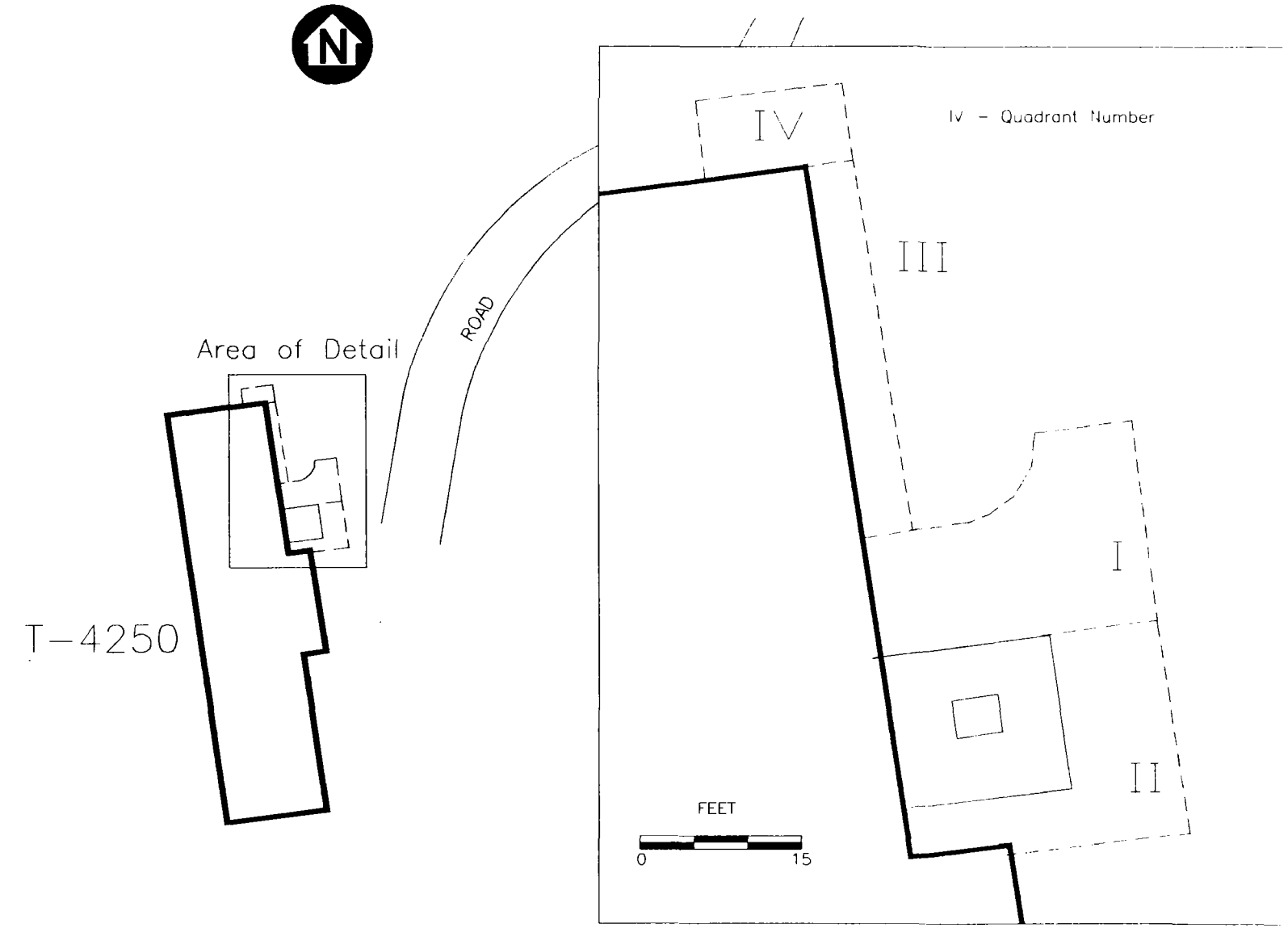
ABB Environmental Services, Inc.

7053-07 AA



BASE MAP SOURCE: ARTHUR D LITTLE

FIGURE 2
LOCATIONS OF BUILDINGS 4249 AND 4250
SA 39 ACTION MEMORANDUM
FORT DEVENS, MASSACHUSETTS
ABB Environmental Services, Inc.



0 30 60 120 FEET

SCALE: 1"=60'

BASE MAP SOURCE: ARTHUR D. LITTLE

FIGURE 3
PCB SPILL QUADRANTS
SA 39 ACTION MEMORANDUM
FORT DEVENS, MASSACHUSETTS
ABB Environmental Services, Inc.

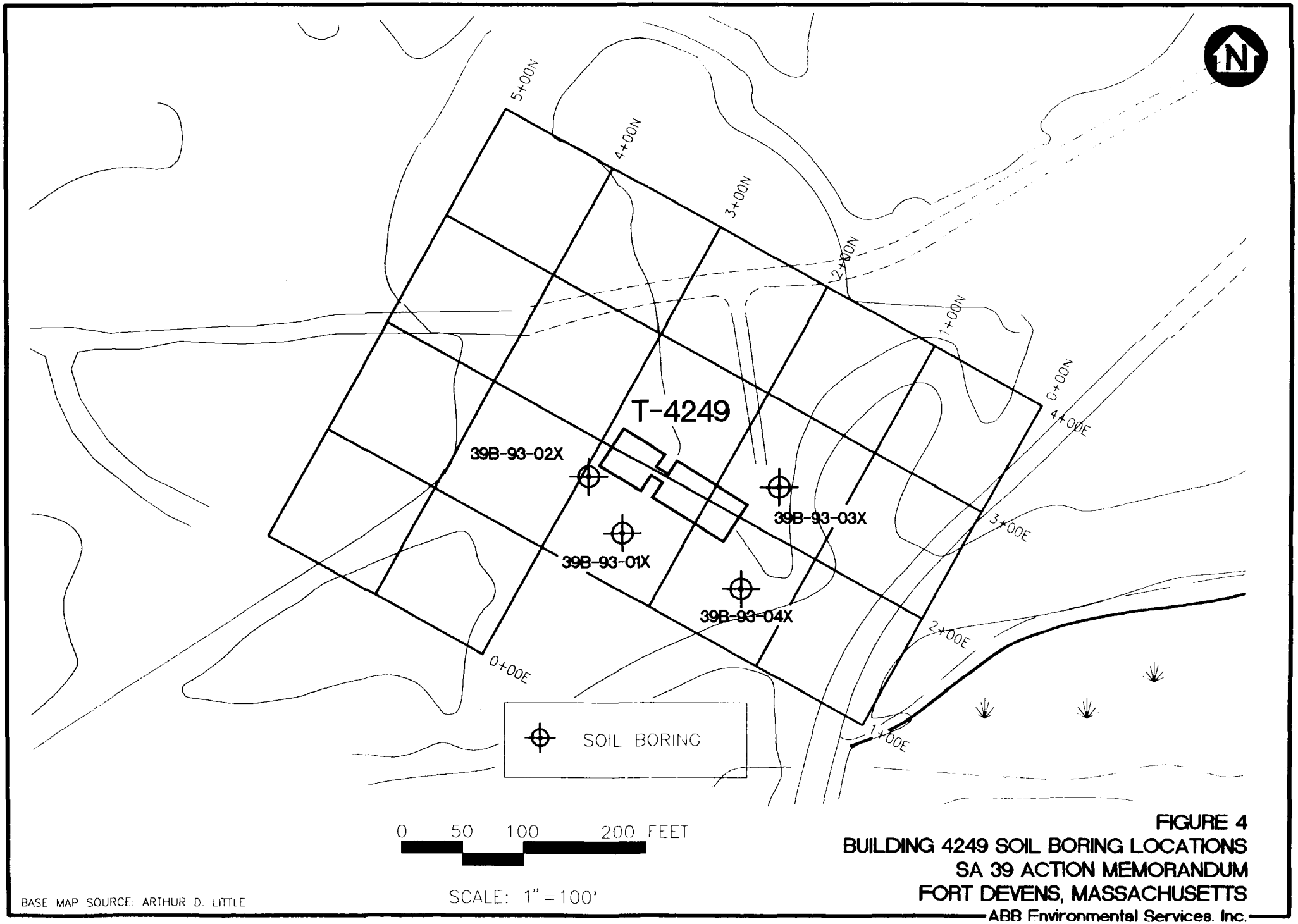
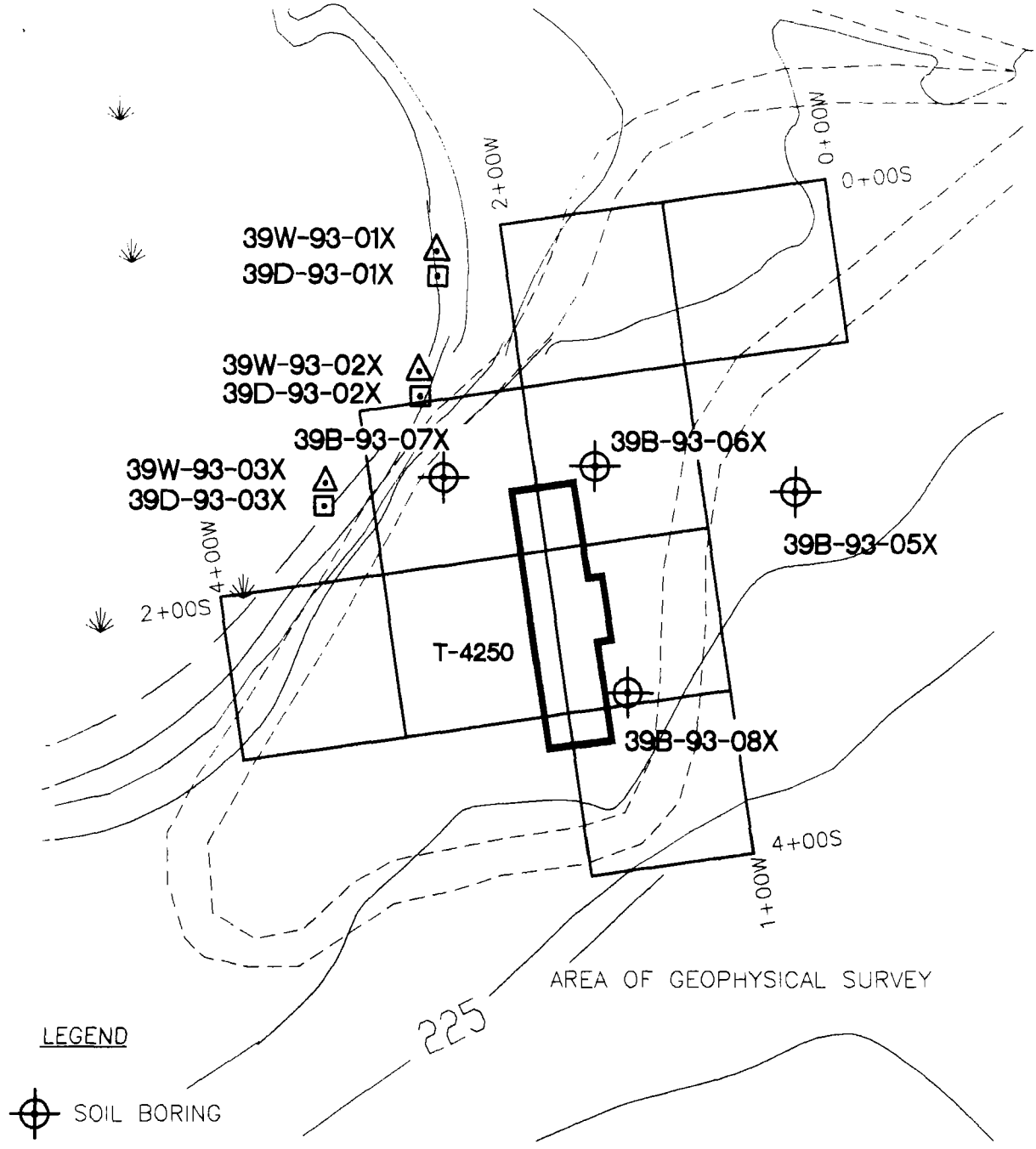


FIGURE 4
BUILDING 4249 SOIL BORING LOCATIONS
SA 39 ACTION MEMORANDUM
FORT DEVENS, MASSACHUSETTS
ABB Environmental Services, Inc.



BASE MAP SOURCE: ARTHUR D. LITTLE

FIGURE 5
BUILDING 4250 SOIL BORING, SURFACE WATER, AND SEDIMENT SAMPLE LOCATIONS
SA 39 ACTION MEMORANDUM
FORT DEVENS, MASSACHUSETTS

ABB Environmental Services, Inc.

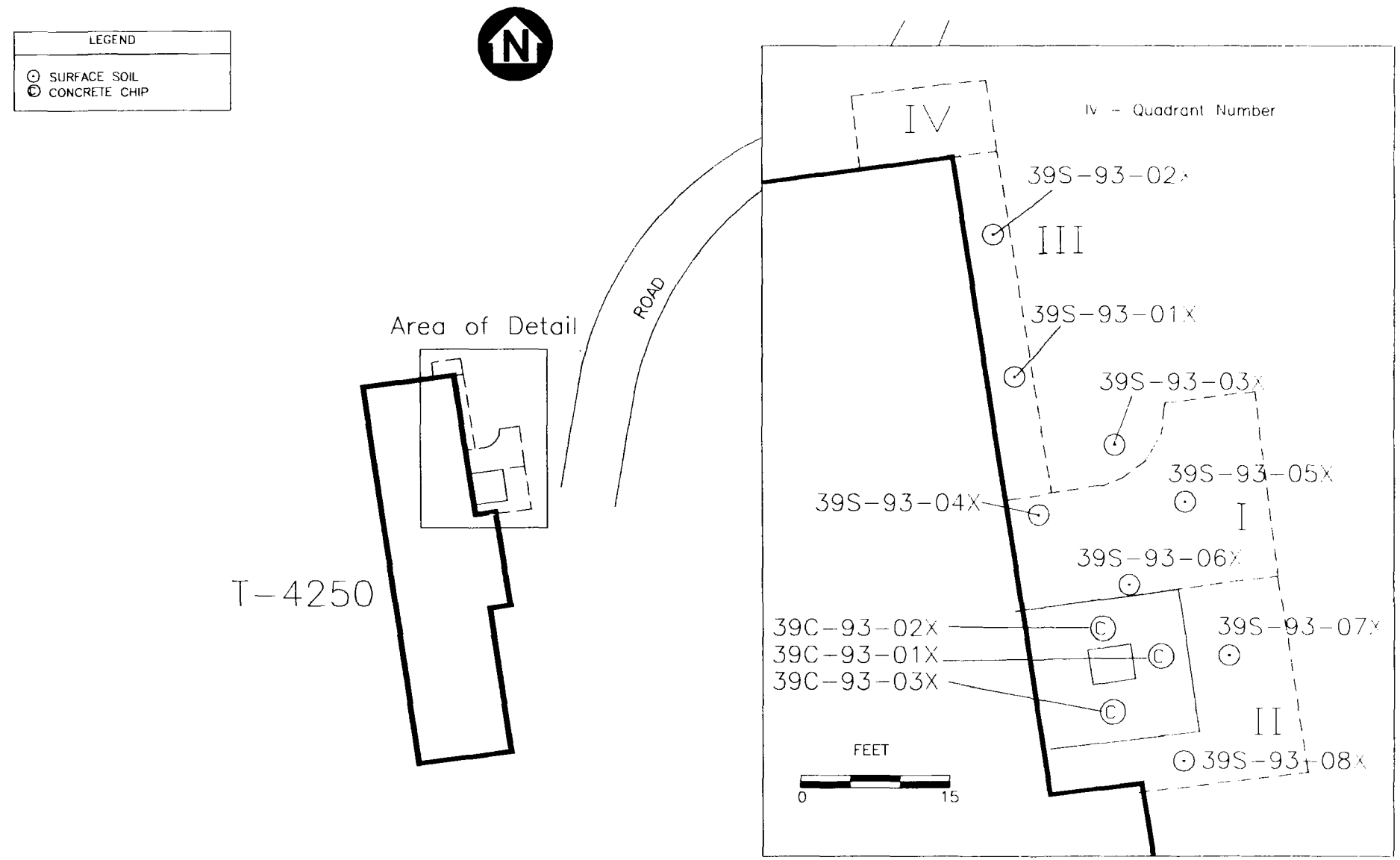


FIGURE 6
SURFACE SOIL AND CONCRETE CHIP SAMPLE LOCATIONS
SA 39 ACTION MEMORANDUM
FORT DEVENS, MASSACHUSETTS
ABB Environmental Services, Inc.

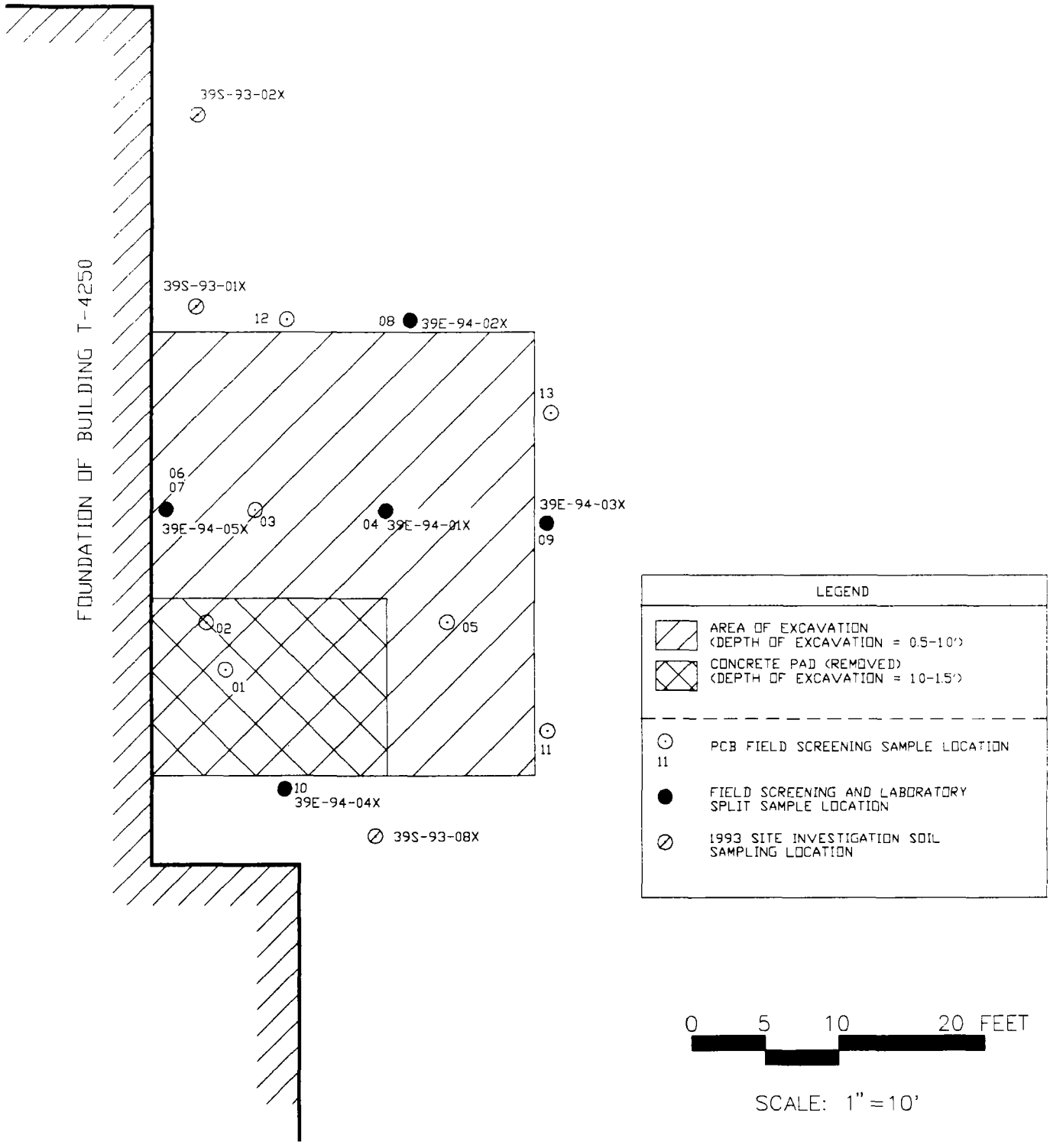
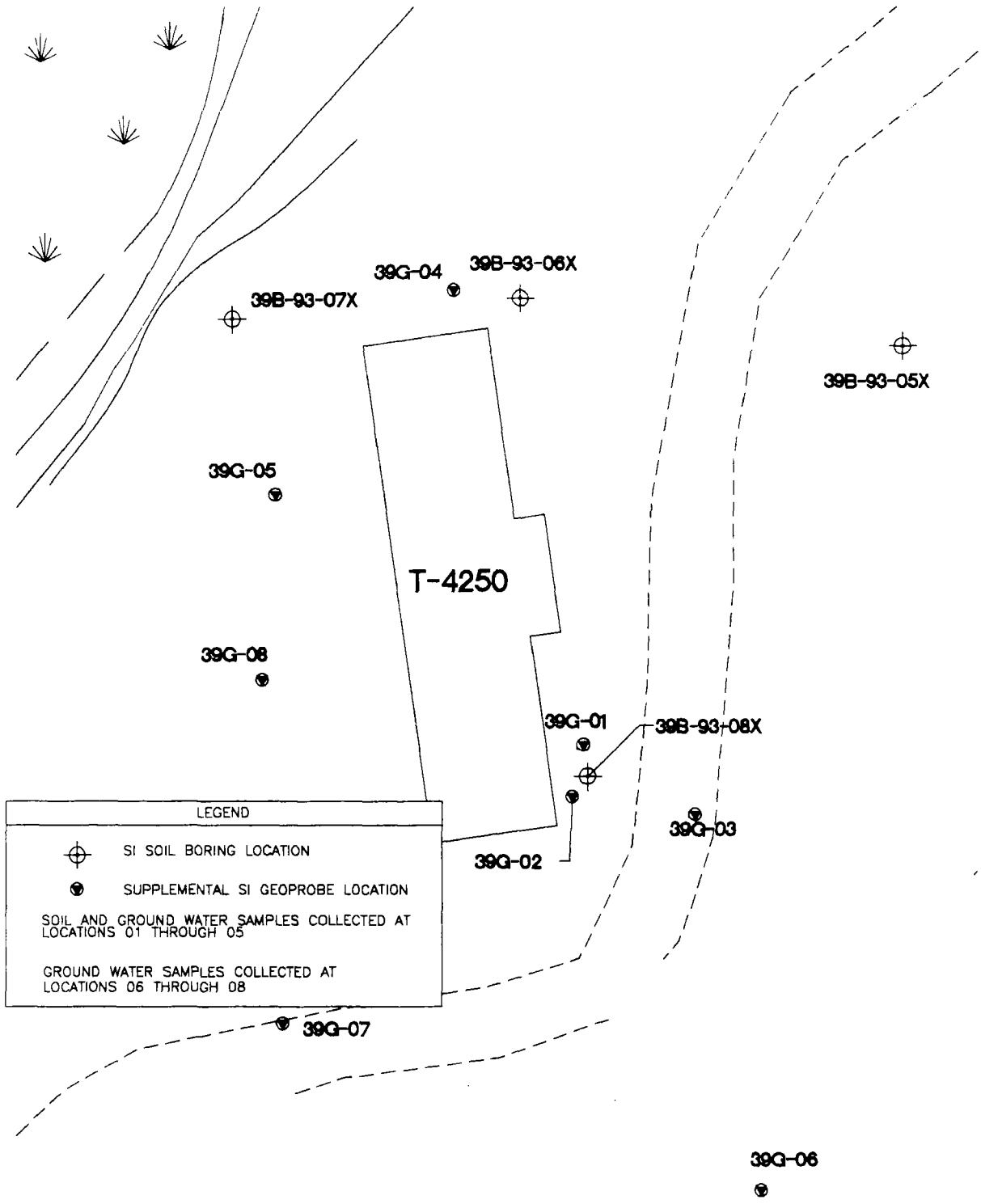


FIGURE 7
EXTENT OF EXCAVATION AND CONFIRMATORY SOIL SAMPLE LOCATIONS
SA 39 ACTION MEMORANDUM
FORT DEVENS, MASSACHUSETTS

BASE MAP SOURCE: ARTHUR D. LITTLE

ABB Environmental Services, Inc.



BASE MAP SOURCE: ARTHUR D. LITTLE

FIGURE 8
GEOPROBE LOCATIONS
SA 39 ACTION MEMORANDUM
FORT DEVENS, MASSACHUSETTS
ABB Environmental Services, Inc.

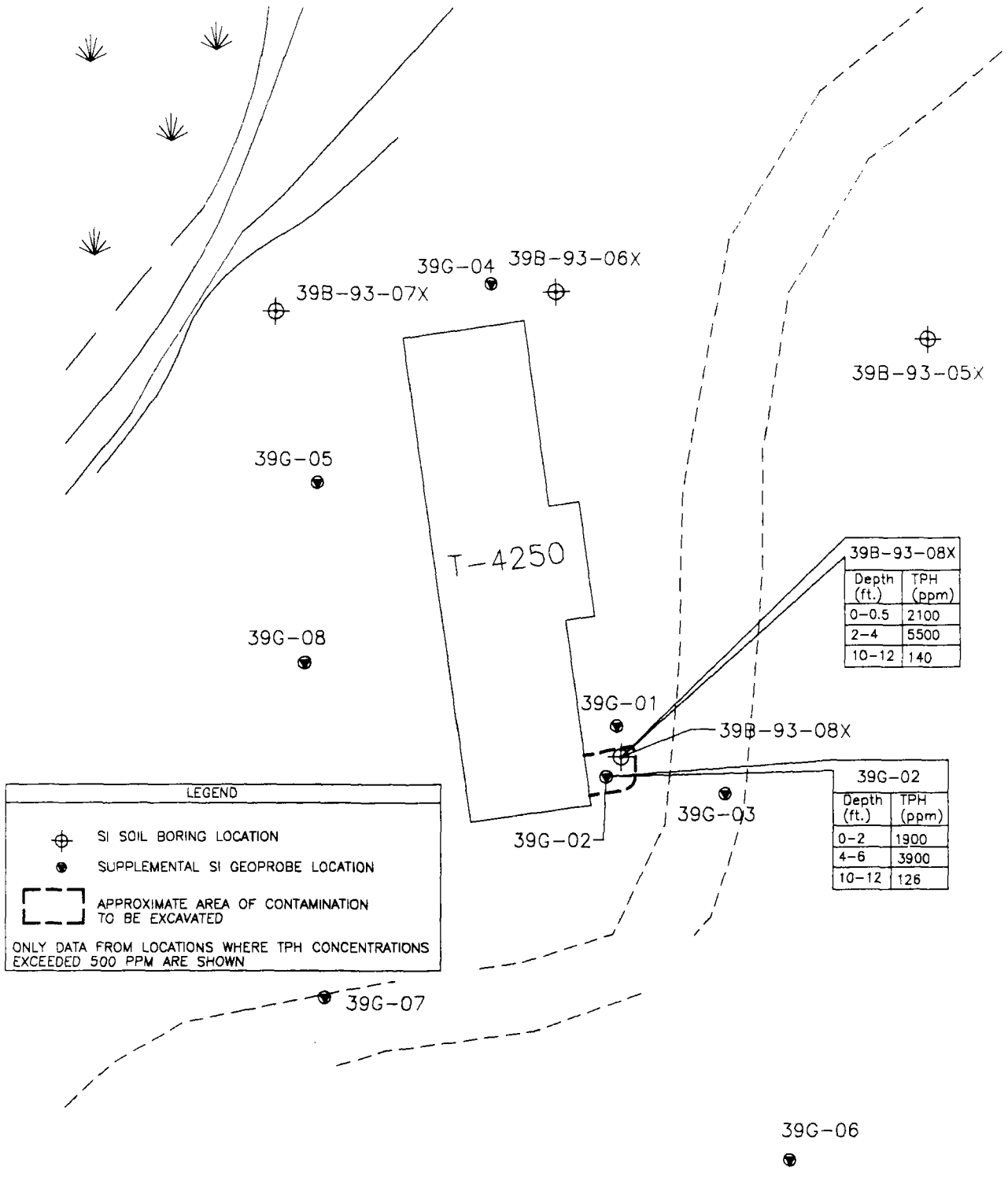


FIGURE 9
PETROLEUM-CONTAMINATED SOIL TO BE EXCAVATED
SA 39 ACTION MEMORANDUM
FORT DEVENS, MASSACHUSETTS
ABB Environmental Services, Inc.

TABLE 1
SAMPLE RESULTS FROM SPILL AT BUILDING 4250
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

QUADRANT SAMPLED	DATE	LOCATION SAMPLED	DEPTH (INCHES)	PCB CONC. (PPM)
I	9/26/84	10 ft from building, 4 ft from concrete pad	1	60
I	11/09/84	10 ft from building, 4 ft from concrete pad	4	11
I	11/09/84	10 ft from building, 4 ft from concrete pad	12	5.2
II	12/13/84	Concrete pad	1	5.3
III	12/13/84	8 ft from right front of building	1–2	7.5
IV	12/13/84	Next to fill pipes	1–2	14.3

Notes:
PCB = polychlorinated biphenyl
ppm = parts per million

Source: Master Environmental Plan (Biang, et al., 1992).

TABLE 2
CONFIRMATION SAMPLE RESULTS FROM QUADRANT I
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

LOCATION SAMPLED	DEPTH (INCHES)	PCB CONC. (PPM)
10 ft from building, 4 ft from concrete pad	2	20
16 ft from building, 4 ft from concrete pad	2	15
20 ft from building, 4 ft from concrete pad	2	20
10 ft from building, 4 ft from concrete pad	6	20

Notes:
PCB = polychlorinated biphenyl
ppm = parts per million

Source: Master Environmental Plan (Biang, et al., 1992).

TABLE 3
ANALYTES IN SOIL BORINGS
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE	BACK-GROUND	RESIDENTIAL CRITERIA	ECOLOGICAL CRITERIA	BORING DEPTH	39B-93-01X 0-0.5 FT	39B-93-01X 0-0.5 FT (DUP)	39B-93-01X 2-4 FT	39B-93-01X 6-10 FT	39B-93-02X 0-0.5 FT
TOTAL PETROLEUM HYDROCARBON COMPOUNDS (ug/g)									
TPHC		500			20	10	< 10	< 10	20
SEMIVOLATILE ORGANIC COMPOUNDS (ug/g)									
BIS(2-ETHYLHEXYL)PHTHALATE		*46*	*84*		*< 0.48*	*< 0.48*	*< 0.48*	*< 0.48*	*< 0.48*
ORGANOCHLORINE PESTICIDES AND PCBS (ug/g)									
ENDOSULFAN II		0.2	–		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
CHLORDANE		0.49	0.29		< 0.068	< 0.068	< 0.068	< 0.068	< 0.068
DIELDRIN		0.03	–		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
ENDRIN		0.6	–		< 0.007	< 0.007	< 0.007	< 0.007	< 0.007
P,P'-DDD		2	1.07		< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
P,P'-DDE		1.9	1.07		< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
P,P'-DDT		1.9	1.07		0.005	0.006	< 0.004	< 0.004	0.009
ENDOSULFAN I		0.2	–		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 1260		2	3.1		< 0.048	< 0.048	< 0.048	< 0.048	< 0.048
INORGANICS (ug/g)									
ALUMINUM	18000	78000	1700		7700	7900	10700	3390	7910
ARSENIC	19	23	33		18.3	14.7	12.5	34	19.3
BARIUM	54	5500	41		17.2	17.5	72.1	12.2	21.4
CALCIUM	810	–	–		884	809	1790	793	933
CHROMIUM	33	390	180		20.2	37.1	30	4.96	20.7
COBALT	4.7	500	50		5.86	6.43	5.98	< 2.5	6.53
COPPER	13.5	2900	34		12.2	13.2	10.5	< 2.84	10.9
IRON	18000	–	–		16600	16600	17800	5790	16900
LEAD	48	300	4		15	15	5.36	1.86	14
MAGNESIUM	550	–	–		4400	4460	5330	1090	4040
MANGANESE	380	390	1500		247	243	214	56.3	245
NICKEL	14.6	300	100		21.1	20.5	15.9	3.97	21.5
POTASSIUM	2400	–	–		511	562	4520	773	713
SODIUM	234	–	–		52.7	55.7	173	< 38.7	54.5
VANADIUM	32.3	400	10		13	13.7	23.2	5.8	13.2
ZINC	43.9	2500	640		35.2	35.9	30.7	17.8	35

Notes:

Table lists detected analytes only.

Background values updated by Ecology & Environment, August, 1994.

< = less than detection limit shown

> = greater than detection limit

ug/g = micrograms per gram

Source: Arthur D. Little, 1995.

TABLE 3, continued
ANALYTES IN SOIL BORINGS
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE	BACK-GROUND	RESIDENTIAL CRITERIA	ECOLOGICAL CRITERIA	BORING DEPTH	39B-93-02X 2-6 FT	39B-93-02X 8-10 FT	39B-93-03X 0-0.5 FT	39B-93-03X 2-4 FT	39B-93-03X 8-10 FT
TOTAL PETROLBUM HYDROCARBON COMPOUNDS (ug/g)									
TPHC		500			< 10	< 10	60	< 10	20
SEMIVOLATILB ORGANIC COMPOUNDS (ug/g)									
BIS(2-ETHYLHEXYL)PHTHALATE		46	84		< 0.48	< 0.48	< 0.48	< 0.48	< 0.48
ORGANOCHLORINB PESTICIDES AND PCBS (ug/g)									
ENDOSULFAN II		0.2	–		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
CHLORDANE		0.49	0.29		< 0.068	< 0.068	0.136	< 0.068	< 0.068
DIELDRIN		0.03	–		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
ENDRIN		0.6	–		< 0.007	< 0.007	0.011	< 0.007	< 0.007
P,P'-DDD		2	1.07		< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
P,P'-DDE		1.9	1.07		< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
P,P'-DDT		1.9	1.07		< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
ENDOSULFAN I		0.2	–		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 1260		2	3.1		< 0.048	< 0.048	< 0.048	< 0.048	< 0.048
INORGANICS (ug/g)									
ALUMINUM	18000	78000	1700		3750	2850	4030	3280	3180
ARSENIC	19	23	33		7.04	5.19	6.58	4.79	5
BARIUM	54	5500	41		11.1	8.77	10.9	10.4	11.2
CALCIUM	810	–	–		726	794	696	734	756
CHROMIUM	33	390	180		5.28	3.68	7.39	4.07	4.18
COBALT	4.7	500	50		< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
COPPER	13.5	2900	34		< 2.84	< 2.84	5.37	< 2.84	< 2.84
IRON	18000	–	–		7110	5110	7880	5550	5750
LEAD	48	300	4		2.09	1.63	7.34	2.04	1.75
MAGNESIUM	550	–	–		1100	787	1540	948	997
MANGANESE	380	390	1500		60.8	40.4	89.8	56.1	77.5
NICKEL	14.6	300	100		< 2.74	< 2.74	6.66	3.6	3.95
POTASSIUM	2400	–	–		657	466	476	544	620
SODIUM	234	–	–		< 38.7	< 38.7	< 38.7	< 38.7	< 38.7
VANADIUM	32.3	400	10		6.08	4.74	6.76	6.04	5.29
ZINC	43.9	2500	640		10.7	7.74	24.4	12.4	10.6

Notes:

Table lists detected analytes only.

Background values updated by Ecology & Environment, August, 1994.

< = less than detection limit shown

> = greater than detection limit

ug/g = micrograms per gram

Source: Arthur D. Little, 1995.

TABLE 3, continued
ANALYTES IN SOIL BORINGS
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE	BACK-GROUND	RESIDENTIAL CRITERIA	ECOLOGICAL CRITERIA	BORING DEPTH	39B-93-04X 0-0.5 FT	39B-93-04X 2-4 FT	39B-93-04X 8-10 FT	39B-93-05X 0-0.5 FT	39B-93-05X 2-4 FT
TOTAL PETROLEUM HYDROCARBON COMPOUNDS (ug/g)									
TPHC		500			< 10	< 10	< 10	< 10	< 10
SEMIVOLATILE ORGANIC COMPOUNDS (ug/g)									
BIS(2-ETHYLHEXYL)PHTHALATE		46	84		< 0.48	< 0.48	< 0.48	< 0.48	< 0.48
ORGANOCHLORINE PESTICIDES AND PCBS (ug/g)									
ENDOSULFAN II		0.2	–		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
CHLORDANE		0.49	0.29		< 0.068	< 0.068	< 0.068	< 0.068	< 0.068
DIELDRIN		0.03	–		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
ENDRIN		0.6	–		< 0.007	0.007	< 0.007	< 0.007	< 0.007
P,P'-DDD		2	1.07		< 0.003	0.008	< 0.003	0.074	< 0.003
P,P'-DDE		1.9	1.07		< 0.003	0.005	< 0.003	0.081	< 0.003
P,P'-DDT		1.9	1.07		< 0.004	0.21	< 0.004	0.3	< 0.004
ENDOSULFAN I		0.2	–		< 0.001	< 0.001	< 0.001	0.003	< 0.001
PCB 1260		2	3.1		< 0.048	< 0.048	< 0.048	< 0.048	< 0.048
INORGANICS (ug/g)									
ALUMINUM	18000	78000	1700		5620	4450	4210	5360	3590
ARSENIC	19	23	33		11.9	4.39	< 2.5	5.02	6.37
BARIUM	54	5500	41		12.3	11	13	12	9.36
CALCIUM	810	–	–		798	811	1030	367	472
CHROMIUM	33	390	180		10.6	4.37	6.54	4.59	4.86
COBALT	4.7	500	50		3.34	< 2.5	< 2.5	< 2.5	< 2.5
COPPER	13.5	2900	34		6.78	< 2.84	< 2.84	< 2.84	3.73
IRON	18000	–	–		9850	5390	5750	6360	5770
LEAD	48	300	4		9.49	3.17	2.27	8.06	2.4
MAGNESIUM	550	–	–		2290	762	1270	682	953
MANGANESE	380	390	1500		123	90.2	59.2	105	51.4
NICKEL	14.6	300	100		10.4	< 2.74	< 2.74	3.23	3.61
POTASSIUM	2400	–	–		568	357	748	270	433
SODIUM	234	–	–		< 38.7	< 38.7	< 38.7	< 38.7	< 38.7
VANADIUM	32.3	400	10		9.59	5.35	6.72	5.95	5.68
ZINC	43.9	2500	640		24.5	47.2	10.8	12.4	9.31

Notes:

Table lists detected analytes only.

Background values updated by Ecology & Environment, August, 1994.

< = less than detection limit shown

> = greater than detection limit

ug/g = micrograms per gram

Source: Arthur D. Little, 1995.

TABLE 3, continued
ANALYTES IN SOIL BORINGS
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE	BACK-GROUND	RESIDENTIAL CRITERIA	ECOLOGICAL CRITERIA	BORING DEPTH	39B-93-05X 12-14 FT	39B-93-06X 0-0.5 FT	39B-93-06X 2-4 FT	39B-93-06X 8-10 FT	39B-93-07X 0-0.5 FT
TOTAL PETROLEUM HYDROCARBON COMPOUNDS (ug/g)									
TPHC		500			< 10	190	420	96	< 90
SEMIVOLATILE ORGANIC COMPOUNDS (ug/g)									
BIS(2-ETHYLHEXYL)PHTHALATE		46	84		< 0.48	< 0.48	< 0.48	< 0.48	< 0.48
ORGANOCHLORINE PESTICIDES AND PCBS (ug/g)									
ENDOSULFAN II		0.2	–		< 0.001	< 0.001	0.002	< 0.001	< 0.001
CHLORDANE		0.49	0.29		< 0.068	< 0.068	< 0.068	< 0.068	< 0.068
DIELDRIN		0.03	–		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
ENDRIN		0.6	–		< 0.007	< 0.007	< 0.007	< 0.007	< 0.007
P,P'-DDD		2	1.07		< 0.003	0.006	0.014	< 0.003	< 0.003
P,P'-DDE		1.9	1.07		< 0.003	< 0.003	0.007	< 0.003	< 0.003
P,P'-DDT		1.9	1.07		< 0.004	0.029	0.069	0.009	< 0.004
ENDOSULFAN I		0.2	–		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 1260		2	3.1		< 0.048	0.112	0.414	< 0.048	< 0.048
INORGANICS (ug/g)									
ALUMINUM	18000	78000	1700		5270	4220	3950	2600	11400
ARSENIC	19	23	33		4.73	5.43	5.62	4.99	22.3
BARIUM	54	5500	41		16.3	10.1	11.1	8.36	22.3
CALCIUM	810	–	–		539	616	668	579	1970
CHROMIUM	33	390	180		16.5	5.48	5.42	4.42	29.5
COBALT	4.7	500	50		< 2.5	< 2.5	< 2.5	< 2.5	8.71
COPPER	13.5	2900	34		4.47	4.71	4.3	< 2.84	18.4
IRON	18000	–	–		9080	6680	6160	5060	23000
LEAD	48	300	4		2.36	9.24	8.75	3.47	8.25
MAGNESIUM	550	–	–		2840	1040	955	827	6740
MANGANESE	380	390	1500		96.3	66.5	70.9	45.7	301
NICKEL	14.6	300	100		8.17	4.39	4.46	3.06	35.2
POTASSIUM	2400	–	–		1120	483	445	433	979
SODIUM	234	–	–		< 38.7	< 38.7	< 38.7	< 38.7	83.9
VANADIUM	32.3	400	10		9.67	7.01	5.72	4.77	17.9
ZINC	43.9	2500	640		17.8	23.9	22.8	11.8	40.7

Notes:

Table lists detected analytes only.

Background values updated by Ecology & Environment, August, 1994.

< = less than detection limit shown

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ug/g = micrograms per gram

Source: Arthur D. Little, 1995.

TABLE 3, continued
ANALYTES IN SOIL BORINGS
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE	BACK-GROUND	RESIDENTIAL CRITERIA	ECOLOGICAL CRITERIA	BORING DEPTH	39B-93-07X 2-4 FT	39B-93-07X 12-14 FT	39B-93-08X 0-0.5 FT	39B-93-08X 2-4 FT	39B-93-08X 10-12 FT
TOTAL PETROLEUM HYDROCARBON COMPOUNDS (ug/g)									
TPHC		500			< 90	< 90	2100	5500	140
SEMIVOLATILE ORGANIC COMPOUNDS (ug/g)									
BIS(2-ETHYLHEXYL)PHTHALATE		46	84		< 0.48	< 0.48	< 0.48	< 0.48	2.2
ORGANOCHLORINE PESTICIDES AND PCBS (ug/g)									
ENDOSULFAN II		0.2	–		< 0.001	< 0.001	0.009	< 0.001	< 0.001
CHLORDANE		0.49	0.29		< 0.068	< 0.068	< 0.068	< 0.068	< 0.068
DIELDRIN		0.03	–		< 0.002	< 0.002	0.004	< 0.002	< 0.002
ENDRIN		0.6	–		< 0.007	< 0.007	< 0.007	< 0.007	< 0.007
P,P'-DDD		2	1.07		0.004	< 0.003	0.015	0.033	0.007
P,P'-DDE		1.9	1.07		0.004	< 0.003	0.008	0.024	< 0.003
P,P'-DDT		1.9	1.07		0.008	< 0.004	0.03	0.074	0.004
ENDOSULFAN I		0.2	–		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB 1260		2	3.1		< 0.048	< 0.048	< 0.048	< 0.048	< 0.048
INORGANICS (ug/g)									
ALUMINUM	18000	78000	1700		4990	3130	6380	6930	3060
ARSENIC	19	23	33		5.39	5.32	4.95	3.51	4.17
BARIUM	54	5500	41		11.6	10.9	10.8	13.4	9.15
CALCIUM	810	–	–		841	802	376	256	564
CHROMIUM	33	390	180		8.3	6.37	5.47	5.66	4.97
COBALT	4.7	500	50		2.74	< 2.5	< 2.5	< 2.5	< 2.5
COPPER	13.5	2900	34		3.67	< 2.84	4.17	< 2.84	4.07
IRON	18000	–	–		7280	5770	7610	7400	5500
LEAD	48	300	4		2.72	2.44	8.51	3.64	2.51
MAGNESIUM	550	–	–		1660	1050	863	776	862
MANGANESE	380	390	1500		84.3	67.2	87.1	69.3	71
NICKEL	14.6	300	100		7.08	3.9	5.05	3.97	< 2.74
POTASSIUM	2400	–	–		555	569	269	348	410
SODIUM	234	–	–		< 38.7	< 38.7	< 38.7	< 38.7	< 38.7
VANADIUM	32.3	400	10		7.65	5.94	7.44	6.93	4.74
ZINC	43.9	2500	640		13	16.6	19.2	14.8	9.46

Notes:

Table lists detected analytes only.

Background values updated by Ecology & Environment, August, 1994.

< = less than detection limit shown

> = greater than detection limit

ug/g = micrograms per gram

Source: Arthur D. Little, 1995.

TABLE 4
POLYCHLORINATED BIPHENYLS IN SURFACE SOIL
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE	RESIDENTIAL CRITERIA	ECOLOGICAL CRITERIA	SAMPLE DEPTH	39S–93–01X 0–0.5 FT	39S–93–02X 0–0.5 FT	39S–93–03X 0–0.5 FT	3SB–93–04X 0–0.5 FT	39S–93–05X 0–0.5 FT	39S–93–06X 0–0.5 FT	39S–93–07X 0–0.5 FT	39S–93–08X 0–0.5 FT
POLYCHLORINATED BIPHENYLS (ug/g)											
AROCLOR 1260	2	3.1		0.498	0.201	0.052	3.3	4.8	5.8	1.55	0.077

Notes:
ug/g = micrograms per gram

Source: Arthur D. Little, 1995.

TABLE 5
POLYCHLORINATED BIPHENYLS IN CONCRETE
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE / SAMPLE	39C-93-01X	39C-93-02X	39C-93-02X	39C-93-03X
DEPTH	0-0.1 FT	0-0.1 FT	0-0.1 FT (DUP)	0-0.1 FT
POLYCHLORINATED BIPHENYLS (ug/g)				
PCB 1260	2.8	5.5	5.1	8.1

Notes:
ug/g = micrograms per gram

Source: Arthur D. Little, 1993.

TABLE 6
ANALYTES IN SURFACE WATER
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE	AMBIENT WATER QUALITY CRITERIA	SAMPLE DEPTH	39W-93-01X 0-0.5 FT	39W-93-02X 0-0.5 FT	39W-93-03X 0-0.5 FT
METALS (ug/L)					
ALUMINUM	–		112	112	< 112
ARSENIC	48		< 2.35	< 2.35	3.04
BARIUM	–		7.23	7.77	< 2.82
CALCIUM	–		9120	9400	10400
IRON	1000		472	470	180
MAGNESIUM	–		1690	1780	1820
MANGANESE	–		27.2	32.4	20.2
NICKEL	40.4		< 32.1	35.1	< 32.1
POTASSIUM	–		1350	< 1240	< 1240
SODIUM	–		13600	14200	16100
ZINC	27.1		94.5	143	21.1
WATER QUALITY PARAMETERS (ug/L)					
ALKALINITY	20000		15000	16000	17000
NITRATE/NITRITE	–		< 10	27.9	< 10
TOTAL PHOSPHORUS	–		13	22.3	< 10
TOTAL NITROGEN	–		188	290	231
CHLORIDE	–		21000	22000	24000
SULFIDE	–		8400	8100	8400
HARDNESS	–		900	29000	29000

Notes:

Table lists detected analytes only.

< = less than detection limit shown

ug/L = micrograms per liter

Source: Arthur D. Little, 1995.

TABLE 7
ANALYTES IN SEDIMENT
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE	TOC–ADJUSTED NYSDEC SEDIMENT CRITERIA	NOAA SEDIMENT CRITERIA	ECOLOGICAL SURFACE SOIL CRITERIA	FT. DEVENS SOIL BACKGROUND	SAMPLE DEPTH	39D–93–01X 0–0.5 FT	39D–93–02X 0–0.5 FT	39D–93–03X 0–0.5 FT
TOTAL PETROLEUM HYDROCARBONS (ug/g)								
TPHC	–	–	–			230	230	510
ORGANOCHLORINE PESTICIDES (ug/g)								
P,P'–DDE	35.7	0.002	1.07			< 0.003	0.178	< 0.003
P,P'–DDT	–	0.001	1.07			< 0.004	0.025	< 0.004
METALS (ug/g)								
ALUMINUM	–	–	1700	18000		9480	10800	8390
ARSENIC	5	33	33	19		< 2.5	< 2.5	35.8
BARIUM	–	–	41	54		48.5	73.5	59.8
CALCIUM	–	–	–	810		4520	8790	10500
CHROMIUM	26	80	180	33		13	15	14.4
IRON	–	–	–	18000		5530	3630	11000
LEAD	27	35	4	48		45.1	62	62.1
MAGNESIUM	–	–	–	5500		1240	948	1480
MANGANESE	428	–	1500	380		< 9.87	226	675
MERCURY	0.11	0.15	3.6	0.11		< 0.05	0.46	< 0.05
VANADIUM	–	–	10	32.3		14.5	13.7	24.9
ZINC	85	120	640	43.9		57.4	32.1	69.3

Notes:

Table lists detected analytes only.

Metals not adjusted for total organic carbon (TOC).

< = less than detection limit shown

ug/g = micrograms per gram

Source: Arthur D. Little, 1995.

TABLE 8
POLYCHLORINATED BIPHENYLS IN CONFIRMATION SAMPLES
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE	RESIDENTIAL CRITERIA	ECOLOGICAL CRITERIA	SAMPLE DEPTH	39B-94-01X 1-3 FT	39B-94-01X 1-3 FT (DUP)	39B-94-02X 0-0.5 FT	39B-94-03X 0-0.5 FT	39B-94-04X 0-0.5 FT	39B-94-05X 0-0.5 FT
POLYCHLORINATED BIPHENYLS (ug/g)									
AROCLOR 1260	2	3.1		2.5	1.83	< 0.0479	0.221	5.3	4.6

Notes:

< = Less than detection limit shown.
ug/g = micrograms per gram

Source: Arthur D. Little, 1995.

TABLE 9
SUMMARY OF FIELD ANALYTICAL RESULTS – GEOPROBE BORINGS
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE	SAMPLE	39G-01U	39G-01M	39G-01L	39G-02U	39G-02M	39G-02L	39G-03U	39G-03M
	DEPTH	0-2 FT	4-6 FT	10-12 FT	0-2 FT	4-6 FT	10-12 FT	0-2 FT	4-6 FT
TOTAL PETROLEUM HYDROCARBONS (ppm)		22.7	10.9	7.90	1900	3900	125.8	17.8	10

NOTES:
ppm = parts per million

Source: Arthur D. Little, Inc., 1995.

TABLE 9, continued
SUMMARY OF FIELD ANALYTICAL RESULTS – GEOPROBE BORINGS
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE	SAMPLE	39G-03L	39G-04U	39G-04M	39G-04L	39G-05U	39G-05M	39G-05L
	DEPTH	10-12 FT	0-2 FT	4-6 FT	10-12 FT	0-2 FT	4-6 FT	10-12 FT
TOTAL PETROLEUM HYDROCARBONS (ppm)		11	93.3	0.00	0.00	3.80	2.30	0.78

NOTES:
ppm = parts per million

Source: Arthur D. Little, Inc., 1995.

TABLE 10
SUMMARY OF LABORATORY ANALYTICAL RESULTS – GEOPROBE BORINGS
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE	RESIDENTIAL CRITERIA	ECOLOGICAL CRITERIA	SAMPLE DEPTH	39G-94-01X 0-2 FT	39G-94-01X 4-6 FT	39G-94-02X 4-6 FT
TOTAL PETROLEUM HYDROCARBON COMPOUNDS (ug/g)						
TPHC	500	–		3400	4800	< 10

Notes:

< = Less than detection limit shown.
ug/g = micrograms per gram

Source: Arthur D. Little, 1995.

TABLE 11
ANALYTES IN GROUNDWATER
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE	BACK-GROUND	RESIDENTIAL CRITERIA	SITE ID	39G-01W	39G-02W	39G-02WD	39G-03W	39G-04W
VOLATILE ORGANIC COMPOUNDS (ug/L)								
1,2,4-TRIMETHYLBENZENE		3		< 1	< 1	< 1	< 1	< 1
INORGANICS (ug/L)								
ALUMINUM	6870	37000		8700	16000	32000	68000	< 100
ARSENIC	10.5	11		10	18	34	64	23
BARIUM	39.6	2000		40	70	130	190	40
CADMIUM	4.01	5		< 5	< 5	< 5	7	< 5
CALCIUM	14700	–		4100	5100	7300	18000	3900
CHROMIUM	14.7	100		20	20	50	80	20
COBALT	25	2200		< 20	< 20	30	30	< 20
COPPER	8.09	1300		10	< 12	30	60	10
IRON	9100	–		3600	12000	31000	61000	13000
MAGNESIUM	3480	–		1100	2300	5900	12000	2400
MANGANESE	291	180		100	270	510	720	170
NICKEL	34.3	100		< 25	< 25	< 25	81	< 25
POTASSIUM	2370	–		< 2300	< 2300	5600	9000	2500
SODIUM	10800	20000		2200	1900	3300	4400	1800
VANADIUM	11	50		< 10	20	40	70	10
ZINC	2	2000		30	50	110	130	30

Notes:
Table lists detected analytes only.
< = less than detection limit shown
ug/L = micrograms per liter

Source: Arthur D. Little, 1995.

TABLE 11, continued
ANALYTES IN GROUNDWATER
SA 39 – SYLVANIA BUILDING SITE

ACTION MEMORANDUM
FORT DEVENS, MA

ANALYTE	BACK-GROUND	RESIDENTIAL CRITERIA	SITE ID	39G-05W	39G-06W	39G-07W	39G-08W
VOLATILE ORGANIC COMPOUNDS (ug/L)							
1,2,4-TRIMETHYLBENZENE		3		< 1	4.9	< 1	< 1
INORGANICS (ug/L)							
ALUMINUM	6870	37000		15000	27000	15000	13000
ARSENIC	10.5	11		23	42	< 5	13
BARIUM	39.6	2000		90	90	80	80
CADMIUM	4.01	5		< 5	< 5	< 5	< 5
CALCIUM	14700	–		6800	22000	5600	8100
CHROMIUM	14.7	100		30	40	30	30
COBALT	25	2200		20	< 20	< 20	< 20
COPPER	8.09	1300		20	30	10	10
IRON	9100	–		21000	31000	15000	16000
MAGNESIUM	3480	–		4300	8700	3800	3600
MANGANESE	291	180		310	720	420	450
NICKEL	34.3	100		31	40	< 25	27
POTASSIUM	2370	–		4400	5300	< 2300	3700
SODIUM	10800	20000		2500	3100	2400	< 500
VANADIUM	11	50		20	300	< 10	20
ZINC	2	2000		240	80	< 10	70

Notes:
Table lists detected analytes only.
< = less than detection limit shown
ug/L = micrograms per liter

Source: Arthur D. Little, 1995.