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November 1996

EPA Superfund Record of Decision:

Fort Devens South Post Impact Area and Area of Contamination 41 Groundwater and Areas of Contamination 25, 26, & 27, MA 7/5/1996

DECLARATION FOR THE RECORD OF DECISION

SOUTH POST IMPACT AREA AND AREA OF CONTAMINATION 41 GROUNDWATER AND AREAS OF CONTAMINATION 25, 26, AND 27 FORT DEVENS, MASSACHUSETTS

STATEMENT OF PURPOSE

In December 1989, Fort Devens was listed as a National Priorities List (NPL) site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Fort is located in Middlesex and Worcester counties and is within the towns of Ayer, Harvard, Lancaster, and Shirley, Massachusetts. Seventy-three study areas (SAs) and areas of contamination (AOCs) at Fort Devens have been investigated under CERCLA.

This Record of Decision (ROD) addresses AOCs 25 (Explosive Ordnance Disposal (EOD) Range), 26 (Zulu Ranges), and 27 (Hotel Range) and AOC 41 groundwater and a subset of the groundwater within the South Post Impact Area (SPIA). This subset is located north and west of the groundwater divide and covers approximately 964 acres. This area is referred to in this document as the "SPIA monitored-area" and is shown in Figure 1 of Appendix A. The SPIA is approximately 1,500-acre and is located within the 4,800-acre South Post section of Fort Devens. This Record of Decision presents the selected remedial action for the site, chosen in accordance with CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP). This ROD does not affect assessment or remedial activities on areas not specifically mentioned herein.

AOC 41 groundwater has been added to this ROD since the public meeting based on the results of the Final Remedial Investigation (RI) completed for AOC 41 (February 1996). The RI indicates that proposed actions are the same for the SPIA monitored-area and AOC 41 groundwater, AOC 41 is adjacent to the SPIA monitored-area, and AOC 41 is small in area (6 acres). Adding AOC 41 to this ROD would only increase the total land area covered in this ROD by 0.6 percent. Therefore, the U.S. Environmental Protection Agency-(USEPA) New England (Region I) recommended including AOC 41 groundwater in this ROD.

The Fort Devens Base Realignment and Closure (BRAC) Environmental Coordinator, the Commander Devens Reserve Forces Training Area (RFTA), and the USEPA-New England Administrator have been delegated the authority to approve this ROD.

The Commonwealth of Massachusetts has concurred with the selected remedy. A copy of the declaration of concurrence is included as Appendix B of this ROD.

STATEMENT OF BASIS

This decision is based on the Administrative Record for the site that was developed in accordance with Section 113(k) of CERCLA. The Administrative Record is available for public review at the Fort Devens BRAC Environmental Office, Building P12, Fort Devens, Massachusetts, and the Ayer Town Hall, Main Street, Ayer, Massachusetts. The Administrative Record Index (Appendix C of the ROD) identifies each of the items composing the Administrative Records upon which the selection of the remedial action is based.

ASSESSMENT OF THE SITE

Risk assessment results show that human health risks were identified to be within USEPA risk guidelines for the pathways that were assessed. Risk to on-site ecosystems, in some instances, were found to be outside of USEPA risk guidance; however, their impacts were deemed acceptable.

DESCRIPTION OF SELECTED REMEDY

"No action" is the selected remedy for SPIA monitored-area groundwater, AOC 41 groundwater, and the surface water, sediment, and soils at the EOD, Zulu, and Hotel Ranges. Under this alternative, no formal remedial action will be taken and the site will be left "as is," with no additional institutional controls, containment, removal, treatment, or other mitigating measures. Long-term groundwater monitoring will be conducted at the site under this "no action" ROD.

The Army along with USEPA-New England and Massachusetts Department of Environmental Protection (MADEP) will develop and implement a long-term Integrated Natural Resources Management Plan and a Groundwater Monitoring Plan for the South Post of Fort Devens. These plans will be developed within 6 months of ROD signature.

Should the Army close or transfer or change the use of the property an Environmental Baseline Survey (EBS) will be conducted, and the "no action" decision of this ROD will be re-examined in light of the changed risk factors resulting from this closure/transfer. The EBS will be provided to the USEPA-New England and MADEP for comment.

DECLARATION STATEMENT

No remedial action is necessary to ensure the protection of human health and the environment unless the land use changes. Under CERCLA, any action that results in contaminants remaining on-site must be reviewed at least every 5 years. During 5 year reviews, an assessment is made of whether the implemented remedy remains protective of human health and the environment and whether alternative remedial actions are needed to ensure adequate protection.

The foregoing represents the selection of a remedial action by the Department of the Army and the USEPA-New England, with the concurrence of the Commonwealth of Massachusetts (MADEP). Concur and recommend for immediate implementation:

UNITED STATES DEPARTMENT OF THE ARMY

James C Chambers
JAMES C. CHAMBERS
Fort Devens
BRAC Environmental Coordinator

27 JUNE 1996
Date

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The foregoing represents the selection of a remedial action by the Department of the Army and the USEPA-New England, with the concurrence of the Commonwealth of Massachusetts MADEP. Concur and recommend for immediate implementation:

UNITED STATES DEPARTMENT OF THE ARMY

H. Carter Hunt, Jr.
Commander
Devens Reserve Forces Training Area (RFTA)

28 June 1996
Date

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The foregoing represents the selection of a remedial action by the Department of the Army and the USEPA-New England, with the concurrence of the Commonwealth of Massachusetts MADEP. Concur and recommend for immediate implementation:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Linda M. Murphy
Director of the Office of Site Remediation and Restoration

July 5, 1996
Date

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RECORD OF DECISION SUMMARY
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EXECUTIVE SUMMARY

Fort Devens is located in Middlesex and Worcester counties and is within the towns of Ayer, Harvard, Lancaster, and Shirley, Massachusetts. Seventy-three study areas (SAs) and areas of contamination (AOCs) at Fort Devens have been investigated for potential environmental restoration.

This Record of Decision (ROD) addresses AOCs 25 (the Explosives Ordnance Disposal (EOD) Range), 26 (Zulu Ranges), and 27 (Hotel Range) and a subset of the groundwater within the South Post Impact Area (SPIA). This subset is located north and west of the groundwater divide and covers approximately 964 acres. This area is referred to in this document as the "SPIA monitored-area" and is shown in Figure 1 of Appendix A.

AOC 41 groundwater has been added to this ROD since the public meeting. The logic for including the AOC 41 groundwater in this ROD is based on the results of the Final Remedial Investigation (RI) completed for AOC 41 (February 1996). The RI indicates that (1) proposed actions are the same for the SPIA monitored-area and AOC 41 groundwater, (2) AOC 41 is adjacent to the SPIA monitored-area, and (3) AOC 41 is small in area (6 acres). Adding AOC 41 to this ROD would only increase the total land area covered in this ROD by 0.6 percent. The details of AOC 41 groundwater are presented in Section IX of this ROD. The landfill portion of AOC 41 will be addressed under a separate action.

This ROD presents the selected remedial action for the site, chosen in accordance with Comprehensive Environmental Response Compensation and Liability Act (CERCLA), as amended by Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for the site. The Administrative Record is a collection of all the documents used by the Army in determining the most appropriate action to take at the SPIA monitored-area. The Administrative Record is available for public review at the Fort Devens Base Realignment and Closure (BRAC) Environmental Office and the Ayer Town Hall, Ayer, Massachusetts. This ROD does not affect assessment or remedial activities on areas not specifically mentioned herein.

The entire SPIA is approximately 1,500 acres and is located within the 4,800-acre South Post section of Fort Devens. The SPIA is, and will be for the foreseeable future, an active weapons and ordnance discharge area used by the Army, the Massachusetts National Guard, and nearby law enforcement agencies for training purposes.

Metals, organic compounds, petroleum hydrocarbons, and explosive chemicals were detected in soil, sediments, groundwater, and surface water during the Remedial Investigation (RI) of SPIA monitored-area groundwater and the EOD, Zulu, and Hotel Ranges. Using data from the RI, the Army prepared a Baseline Risk Assessment to determine potential risks to human health and the environment under reasonable exposure assumptions.

No unacceptable risks to human health and the environment were found to be associated with the SPIA monitored-area groundwater, even though levels exceeded Army and USEPA action levels. No hazardous substances were detected in the one drinking water well on the South Post, Well D-

1. Well D-1, which is located near the northeast edge of the SPIA monitored-area, is used on a limited basis by military personnel during training activities. Also, no unacceptable ecological risk to surrounding habitats were found to be associated with the SPIA monitored-area groundwater due to the absence of a pathway for any known ecological receptor to access the SPIA monitored-area groundwater.

Risk assessment results for the EOD, Zulu, and Hotel Ranges show that human health risks were identified to be within USEPA risk guidelines for assessed pathways. Risk to on-site ecosystems, in some instances, were found to be outside of USEPA risk guidance; however, ecological risks identified on the EOD, Zulu, and Hotel Ranges were deemed to be acceptable due to the continued use of the Impact Area for military training activities. Risk assessment results for AOC 41 show that there is no unacceptable risk to human health from the groundwater at the South Post Well D-1 nor are site-related contaminants adversely impacting ecological receptors in New Cranberry Pond.

"No action" is the selected remedy for the SPIA monitored-area groundwater and AOC 41 groundwater. Under this alternative, no formal remedial action is taken and the site is considered to be left "as is," with no additional institutional controls, containment, removal, treatment, or other mitigating measures. "No action" is also the selected remedy for the surface water, sediment, and soil at the EOD, Zulu, and Hotel Ranges. The Army has submitted a Closure Report under the Resource Conservation and Recovery Act (RCRA) Subpart X; formal approval of the closure of EOD Range will occur prior to ROD signature.

As part of this remedy, Fort Devens will ensure the following:

- Groundwater monitoring for potential contaminant migration out of the SPIA monitored-area will continue:
  - Wells will be used to monitor the groundwater from the EOD Range, Zulu Ranges, Hotel Range, and AOC 41.
  - Wells will be used to monitor the north, northeast, southeast, and east sides of the SPIA monitored-area.
- The monitoring wells will be sampled for explosives, Target Compound List (TCL), and the Target Analyte List (TAL) metals.
- A Groundwater Monitoring Plan for the South Post will be developed that will include detailed groundwater monitoring at discharge points. The plan may include installing sentinel wells to monitor potential off-site groundwater flow. Details of the plan will be developed jointly by the Army, USEPA-New England, and Massachusetts Department of Environmental Protection (MADEP) within 6 months of ROD signature. The Army will rerun the groundwater model to incorporate data from new sentinel well(s) and ascertain any potential impacts to MCI Shirley.

- Well D-1 will be sampled and analyzed for explosives and Massachusetts and Federal drinking water requirements (MMCLs/MCLs).

- The Army will not develop new drinking water sources within the SPIA monitored-area.

- An Integrated Natural Resources Management Plan will be developed and implemented to monitor the impacts to ecosystems in the SPIA monitored-area. The details of this plan will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Service, and MADEP within 6 months of the ROD signature.

Monitoring reports will include a description of site activities and a summary of analytical results. The Army will review and submit these monitoring reports to MADEP and USEPA annually. If there is an indication of contamination emanating from the SPIA monitored-area, the Army will evaluate the need for additional assessment.

This site, as required by CERCLA, will be subject to 5 year reviews. During a 5 year review, an assessment is made as to whether the implemented remedy is protective of human health and the environment and whether the implementation of alternative remedial actions are needed to ensure adequate protection. If on-site hazardous substances, pollutants, or contaminants that may present an imminent and substantial endangerment to public health and welfare migrate off site, the Army will take the necessary and appropriate actions to protect human health and the environment as required under CERCLA. More frequent reviews will be conducted if site conditions change. Should the Army close or transfer or change the use of the property an Environmental Baseline Survey (EBS) will be conducted, and the "no action" decision of this ROD will be re-examined in light of the changed risk factors resulting from this closure/transfer. The EBS will be provided to the USEPA-New England and MADEP for comment.

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RECORD OF DECISION SUMMARY
SOUTH POST IMPACT AREA AND
AREA OF CONTAMINATION 41 GROUNDWATER AND
AREAS OF CONTAMINATION 25, 26, AND 27
FORT DEVENS, MASSACHUSETTS

June 18, 1996

I. SITE NAME, LOCATION, AND DESCRIPTION

In December 1989, Fort Devens was listed as a National Priorities List (NPL) site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Fort is located in Middlesex and Worcester counties and is within the towns of Ayer, Harvard, Lancaster, and Shirley, Massachusetts, approximately 35 miles west of Boston. Seventy-three study areas (SAs) and areas of contamination (AOCs) at Fort Devens have been investigated for potential environmental restoration.

This Record of Decision (ROD) addresses AOCs 25 (the Explosives Ordnance Disposal (EOD) Range), 26 (Zulu Ranges), and 27 (Hotel Range) and a subset of the groundwater within the South Post Impact Area (SPIA). This subset is located north and west of the New Cranberry Pond/unnamed stream groundwater divide and covers approximately 964 acres. This area is referred to in this document as the "SPIA monitored-area" and is shown in Figure 1 of Appendix A.

AOC 41 groundwater has been added to this ROD since the public meeting. The logic for including the AOC 41 groundwater in this ROD is based on the results of the Final Remedial Investigation (RI) completed for AOC 41 (February 1996). The RI indicates that (1) proposed actions are the same for the SPIA monitored-area and AOC 41 groundwater, (2) AOC 41 is adjacent to the SPIA monitored-area, and (3) AOC 41 is small in area (6 acres). Adding AOC 41 to this ROD would only increase the total land area covered in this ROD by 0.6 percent. The details of AOC 41 groundwater are presented in Section IX of this ROD. The landfill portion of AOC 41 will be addressed under a separate action.

The entire SPIA covers approximately 1,500 acres and is located within the 4,800-acre South Post section of Fort Devens (Figure 1 of Appendix A). The SPIA is an active weapons and ordnance discharge area used by the Army, the Massachusetts National Guard, and nearby law enforcement agencies for training purposes. The area is generally bounded by Old Turnpike Road, Firebreak Road, the southern portion of Harvard Road, Trainfire Road, and Dixie Road. The SPIA covers AOCs 25, 26, 27, and 41 as well as several SAs, and a number of other firing ranges along Dixie Road and Trainfire Road that are not designated as AOCs.

This ROD presents the selected remedial action for the site, chosen in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

EOD Range (AOC 25) is located east of Firebreak Road, approximately 2 miles south of the main entrance to the South Post. The site is rectangular and measures approximately 600 feet by 1,500 feet.

Zulu Ranges (AOC 26) are located 2,000 feet north of the EOD Range (AOC 25), approximately 1.6 miles southwest of the main entrance to the South Post. The Zulu Ranges cover approximately 16 acres and consist of two adjacent land tracts (Zulu 1 and Zulu 2). Zulu 1 and 2 cover approximately 10 and 6 acres, respectively.

Hotel Range (AOC 27) is adjacent to Cranberry Pond and is located approximately 1 mile south of the main entrance to the South Post. The Hotel Range covers approximately 23 acres and is currently used exclusively for firing small-caliber automatic weapons. The area of concern where open burning/open detonation (OB/OD) occurred is located exclusively south of the Old Turnpike Road.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Land-Use and Response History

Fort Devens was established as Camp Devens in 1917. It was used as a temporary training camp for soldiers from the New England area. The camp became a permanent installation in 1931 and was renamed Fort Devens. Throughout its history, Fort Devens has served as a training and induction center for military personnel and as a unit mobilization and demobilization area. The installation was used in this capacity, to varying degrees, during World Wars I and II, the Korean War, the Vietnam Era, and operations Desert Shield and Desert Storm. The primary mission of Fort Devens is to command, train, and provide logistical support for nondivisional troop units and to support and execute Base Realignment and Closure (BRAC) activities. The installation also supports the Army Readiness Region and the National Guard units in the New England area.

The South Post consists mainly of undeveloped and under-developed land. In the past, some timbering and limited farming have taken place. The ranges on the South Post are currently used for various types of artillery and small arms fire, grenade detonation, and ordnance demolition. Managed forest accounts for much of the remainder of the area.

At least some portion of the SPIA has been used for military training since the inception of Fort Devens as Camp Devens in 1917. At various times, demolition training and OB/OD have been conducted at the EOD, Zulu, and Hotel Ranges. A discussion of land-use activities at these ranges follows.

EOD Range (AOC 25) — From 1979 to 1992, approximately 1,200 pounds per year of explosives and ammunition were disposed of in the disposal area by OB/OD. A 1-acre disposal area is located along the southeastern boundary of the range. The Army has submitted a Closure Report under the Resource Conservation and Recovery Act (RCRA) Subpart X; formal approval of the closure of EOD Range will occur prior to ROD signature. Currently, the range operates under a RCRA emergency permit and is used once or twice a year.

Zulu Ranges (AOC 26) — Prior to 1979, the range was used for OB/OD of waste explosives and associated waste items. Zulu 1 is primarily used for demolition training. The demolition training area is located in the center of Zulu 1. Zulu 2 is used primarily as a practice range for hand grenade training. The grenade training area is located on the eastern end of Zulu 2 and consists of two concrete bunkers, which are used for cover and protection, and two sand pits, which are used for receiving grenades.

Hotel Range (AOC 27) — Before 1979, the Hotel Range was used for OB/OD of small arms, smoke grenades, and pyrotechnics. After 1979, the Hotel Range was modified and extended to the north side of the Old Turnpike Road and used for M-16s and small caliber weapons. Prior to 1989, the range was used as an M-70 range, but after 1989 the range was modified to an M60-SAW range.

B. Enforcement History

In conjunction with the Army's Installation Restoration Program (IRP), Fort Devens and the U.S. Army Environmental Center (USAEC; formerly the U.S. Army Toxic and Hazardous Materials Agency) initiated a Master Environmental Plan (MEP) in 1988. The MEP assesses the environmental status of SAs, specifies necessary investigations, and provides recommendations for response actions with the objective of identifying priorities for environmental restoration at Fort Devens. The MEP recommended that a record search be conducted to better define past and current activities. It also recommended that the extent of contamination be determined by collecting soil samples and analyzing the samples for the United States Environmental Protection Agency (USEPA) hazardous substance list compounds and total petroleum hydrocarbons (TPHC). The MEP also suggested installing monitoring wells if hazardous substances were detected in deeper soils.

On December 21, 1989, Fort Devens was placed on the NPL. Fort Devens was listed as an NPL site because hazardous substances were detected at two sites other than the EOD, Zulu, and Hotel Ranges (volatile organic compound (VOC) contamination in the groundwater at the Shepley's Hill Landfill and metal contamination in the groundwater at the Cold Spring Brook Landfill). A Federal Facilities Interagency Agreement (IAG) was developed and signed by the Army and USEPA-New England (Region I) on May 13, 1991 and finalized on November 15, 1991. The IAG provides the framework for implementing the CERCLA/SARA process at Fort Devens.

Under Public Law 101-510, the Defense Base Realignment and Closure Act of 1990, Fort Devens was selected for cessation of operations and closure. However, the SPIA will be retained by the Army for continued use as a training range. An important aspect of BRAC actions is to determine environmental restoration requirements before property transfer can be considered. As a result, an Enhanced Preliminary Assessment (PA) was performed at Fort Devens to address areas not normally included in the CERCLA process, but that required review prior to base closure. Although the Enhanced PA covers MEP activities, its main focus is to determine if additional areas require detailed records review and site investigation. The Enhanced PA also provides information and procedures to investigate installation-wide areas requiring environmental evaluation. A final version of the Enhanced PA report was completed in April 1992.

RIs were prepared for the SPIA monitored-area groundwater and EOD, Zulu, and Hotel Ranges. These were submitted to the USEPA-New England and the Massachusetts Department of Environmental Protection (MADEP) in August 1994. A Proposed Plan and summary Fact Sheet have been prepared for the SPIA monitored-area groundwater and EOD, Zulu, and Hotel Ranges. These documents have been placed in the Administrative Record and are available for public review at the Fort Devens BRAC Environmental Office and the Ayer Town Hall, Ayer, Massachusetts.

III. COMMUNITY PARTICIPATION

The Army has kept the community and other interested parties apprised of site activities through regular and frequent informational meetings, fact sheets, press releases, and public meetings.

After receiving public comments on an earlier draft, the Army released a final Community Relations Plan in February 1992. The plan outlines a program to address community concerns and inform citizens, as well as involve them in activities during remedial activities. As a part of this plan, the Army established a Technical Review Committee (TRC) in March 1991. The TRC, as required by SARA Section 211 and Army Regulation 200-1, includes representatives from USEPA-New England, USAEC, Fort Devens, the MADEP, local officials, and the community. The committee provided review and technical comments on work products, schedules, work plans, and proposed activities for the SAs at Fort Devens. The RI and Feasibility Study (FS) Reports, Proposed Plan, and other related support documents were all submitted to the TRC for their review and comment. Additionally, the SPIA monitored-area groundwater and EOD, Zulu, and Hotel Range activities were specifically discussed at TRC meetings held September 29, 1992; March 31, 1993; and January 26, 1994. A Citizen's Advisory Committee (CAC) was also established to address Massachusetts Environmental Policy Act (MUSEPA)/Environmental Assessment issues concerning the reuse of property at Fort Devens.

The TRC typically met quarterly until January 1994, when it was replaced by the Restoration Advisory Board (RAB). As part of the Army's commitment to involving the affected communities, a RAB is formed when an installation closure involves transfer of property to the community. The RAB was formed in February 1994 to join members of the CAC with current TRC members. The RAB consists of 28 members (15 original TRC members plus 13 new members) who are representatives from the Army, USEPA-New England, MADEP, local governments, and citizens of the local communities. It meets monthly. Specific responsibilities include addressing cleanup issues such as land use and cleanup goals, reviewing plans and documents, identifying proposed requirements and priorities, and conducting regular meetings that are open to the public. The proposed plan for the SPIA monitored-area groundwater and EOD, Zulu, and Hotel Ranges was presented at the February 1, 1996 RAB meeting.

During the week of January 29, 1996 the Army published a public notice concerning the Proposed Plan and public hearing in the Lowell Sun, The Public Spirit (Ayer), and the Fort Devens Chronicle and distributed a summary Fact Sheet to 647 interested parties. The Army also made the Plan available to the public at Fort Devens BRAC Environmental Office and the Ayer Town Hall.

From February 1 to March 1, 1996, the Army held a 30-day public comment period to accept public comments on the alternatives presented in the Proposed Plan, as well as other documents released to the public. On February 21, 1996 the Army held a formal public meeting at Fort Devens to discuss the Proposed Plan and to accept any verbal comments from the public. A transcript of this meeting and the comments and the Army's response to comments are included in the attached responsiveness summary (Appendix D).

All supporting documentation for the decision regarding the SPIA monitored-area groundwater and the EOD, Zulu, and Hotel Ranges has been placed in the Administrative Record for review. The Administrative Record is a collection of all the documents considered by the Army in choosing the remedy for the SPIA monitored-area groundwater and the EOD, Zulu, and Hotel Ranges. The Administrative Record is available for public review at the Fort Devens BRAC Environmental Office and at the Ayer Town Hall, Ayer, Massachusetts. An index to the Administrative Record is available at the USEPA-New England Records Center, 90 Canal Street, Boston, Massachusetts and is provided as Appendix C. In addition, information repositories that contain information relative to ongoing Fort Devens environmental actions are located in the Lancaster, Shirley, Harvard, and Ayer libraries.

IV. SCOPE AND ROLE OF THE RESPONSE ACTION

The remedy selected for the SPIA monitored-area groundwater and EOD, Zulu, and Hotel Ranges is protective of human health and the environment. Risks to human health were found to be within USEPA guidelines, while risks to ecological receptors were found to be minimal. The risks to on-site ecosystems were deemed acceptable. However, the Army, once the final ROD is approved, will develop long-term plans for an Integrated Natural Resources Management Plan to address identified concerns. This plan will be completed within 6 months of ROD signature.

The Army proposes "no action" for the SPIA monitored-area groundwater and the EOD, Zulu, and Hotel Ranges. The Army will maintain control of the South Post for future military training activities. Public access to the site will continue to be restricted, and unauthorized personnel will be prohibited. Currently, the South Post is enclosed by a fence and access can only be gained through gates that are controlled by the Army Range Control. However, if the Army were to relinquish control and release the land for other purposes, additional assessments will be required depending on the reuse of the property.

V. SUMMARY OF SITE CHARACTERISTICS

RIs were conducted for the EOD, Zulu, and Hotel Ranges to characterize the nature and extent of site-related contamination. Samples from groundwater, surface water, sediments, and soil were taken. Chemical analyses were performed on the samples taken from the various media, and the results were compared with screening values previously developed. The results of the chemical analyses were reviewed to determine whether hazardous substances detected were related to site activities or were naturally occurring. A detailed presentation of the range characteristics is presented in Volumes II, III, and IV of the RI report for the EOD, Zulu, and the Hotel Ranges, respectively.

A. Groundwater

Groundwater at Fort Devens occurs largely in the permeable glacial-deltaic outwash deposits of sand, gravel, and boulders. Groundwater is found under the South Post at depths of 0 to 30 feet. The flow of groundwater on the South Post is determined by the bedrock and till topography. A number of springs can be found around the circumference of SPIA.

The SPIA can be regarded as predominantly two hydrologic units, one of which drains to the west and north and the other to the south and east. These units are determined by the bedrock ridge which forms a groundwater divide across the northern portion of the SPIA. As a result of this ridge, groundwater from the Zulu and Hotel Ranges and Cranberry Pond in the northeast corner of the SPIA flows north into Slate Rock Brook and Slate Rock Pond. At the same time, groundwater from the EOD Range and most of the remaining portions of the SPIA flows southeast and east to the unnamed brook and New Cranberry Pond or to the north of New Cranberry Pond directly to the Nashua River and its wetland.

Groundwater in the vicinity of the ranges discharges to surface water before it leaves the South Post. More than 50 percent of the SPIA overlies a medium yield aquifer that is a potential source of drinking water. MADEP concurrence with this ROD constitutes MADEP's agreement that the site is adequately regulated under the provisions of 310 CMR 40,000, the Massachusetts Contingency Plan. Measurements of hydraulic head in the groundwater and in streams and ponds within the South Post show that the streams around the SPIA are gaining streams (i.e., groundwater discharges into the streams).

Fort Devens withdraws groundwater from wells on the Main Post and the North Post. The Fort maintains a transient noncommunity[1] supply well, Well D-1, on the South Post along Dixie Road at Echo Range (E) near the north end of Alpha Range (A) (Figure 1 of Appendix A). This well is not used to serve the general public, but is used to supply troops who train on the South Post.

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[1] Transient noncommunity water system serve at least 25 people per day for at least 60 days per year, but not the same 25 people each day. Examples include parks, wayside rests, small-sized resorts and hotels, restaurants, bars, and campgrounds.

These troops spend no more than 2 weeks per year at the site. Fort Devens Range Control Staff do not use this well and there are no plans to provide connections to the Range Control Offices.

Groundwater quality samples collected from Well D-1 show that no chemicals or metals were detected at concentrations above USEPA guidelines. Specifically, five samples have been collected from Well D-1 (May 1991, June 1991, two samples in April 1992, and March 1993) and were analyzed for USEPA's Target Analyte List (TAL) metals, USEPA's Target Compound List (TCL), total organic carbon (TOC), and water quality parameters. A summary of results is presented in Table 1 in Appendix E. Only one chemical, bis(2-ethylhexyl)phthalate, exceeded a screening value (USEPA's Maximum Contaminant Level (MCL)). As two of the samples show no detectable concentration of bis(2-ethylhexyl)phthalate, the RI Report attributes the finding of this chemical to sampling or laboratory error.

Groundwater quality samples for the EOD and Zulu Ranges were taken in November 1992, March 1993, and June 1993 (Figures 2 and 3 of Appendix E show well locations). Samples were collected from eight monitoring wells at the EOD Range and seven wells at the Zulu Ranges. At the Hotel Range, groundwater samples from four wells were taken in September 1992 and January 1993, and an additional six wells were sampled as part of the RI in August and November 1993 (Figure 4 of Appendix A shows well locations).

The samples taken at the EOD Range were analyzed for TAL metals and explosives, as well as hardness. The samples taken at the Zulu Ranges were analyzed for TCL organics, TAL metals, explosives, and TPHC, as well as hardness. Samples taken at the Hotel Range were analyzed for TAL metals, TCL pesticides, explosives, TPHC, and water quality parameters.

EOD Range (AOC 25) — Unfiltered samples from the EOD Range showed levels of iron, aluminum, and other metals above the concentrations found in local background samples. Background samples are those collected in a similar medium (i.e., water, soil, sediment) that are not believed to be contaminated. Samples that were filtered to eliminate suspended solids (i.e., soil and sediments to which metals may adhere) and measure only the metal dissolved in the water, showed concentrations several orders of magnitude lower than in the unfiltered samples (Tables 2 and 3 of Appendix E). Manganese and calcium exceeded background concentrations in filtered samples. None of the metals in filtered samples, however, exceeded health-based screening values described in the RI report. Four explosives or explosive-related organic compounds (cyclonite (RDX), cyclotetramethylene tetranitramine (HMX), pentaerythritol tetranitrate (PETN), and trinitrotoluene (TNT)) were also detected in the samples. Only RDX exceeded the screening value. Organic compound results are shown on Figure 5 of Appendix A.

Zulu Ranges (AOC 26) — Metals concentrations in the Zulu Ranges groundwater samples (unfiltered) were higher than concentrations found in local background samples. As with the samples collected in the EOD, filtered samples showed lower concentrations than the unfiltered samples in the Zulu Ranges (Tables 4 and 5 of Appendix E). The maximum concentration of manganese in filtered samples (62 micrograms per liter, (μg/L)) exceeded the screening value[2](50 μg/L). Several explosives or explosive-related organic compounds (RDX, HMX, and TNT) were also detected in these samples. RDX at 390 μg/L exceeded its health-based screening value[3](2 μg/L). The monitoring wells showing the most significant concentrations of explosives-related substances are located where grenade-throwing and demolition are practiced. The groundwater from the Zulu Ranges discharges to surface water located within the South Post. Organic compound results are shown on Figure 6 of Appendix A.

Hotel Range (AOC 27) — Metals concentrations in the EOD Range groundwater samples (unfiltered) also exceeded concentrations found in local background samples. Filtered samples showed lower concentrations than the unfiltered samples (Tables 6 and 7 of Appendix E). The maximum concentration of manganese in filtered samples (74.1 μg/L) exceeded the screening value of 50 μg/L. In addition, aluminum at concentrations up to 72.3 μg/L exceeded the screening value[4](50 μg/L) in some filtered samples. All wells in this area indicated some level of explosives contamination. RDX (up to 17.9 μg/L) and 1,3-dinitrobenzene (up to 1.82 μg/L) exceeded their screening values[5](2 μg/L and 1 μg/L, respectively). Organic compound results are shown on Figure 7 of Appendix A.

Summaries of groundwater sample results for the EOD, Zulu, and Hotel Ranges are presented in Tables 2 through 7 in Appendix E. Complete analytical results are presented in the RI Report.

B. Surface Water

The SPIA is drained primarily by two streams, Slate Rock Brook north and west of the SPIA monitored-area and an unnamed stream in the southeast portion of the site.

EOD Range (AOC 25) — No surface water is known to exist within or adjacent to the EOD. During the RI, one surface water sample was collected from the emergence of Slate Rock Brook near the EOD Range, although the RI report notes that the sample is not representative of surface water originating at the EOD Range. This sample was analyzed for TAL metals, TCL organics, explosives, and water quality parameters. Several metals in the sample exceeded USEPA's Ambient Water Quality Criteria (AWQC) for the Protection of Aquatic Organisms (Freshwater Chronic)[6]. Sample analysis results are presented in Table 8 of Appendix E.

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[2] Massachusetts Secondary Maximum Contaminant Levels (MCL).

[3] USEPA Office of Water Lifetime Health Advisory level.

[4] Massachusetts Secondary MCL.

[5] USEPA Office of Water Lifetime Health Advisory level.

[6] The analytical data and other information presented in the RI report indicate that the surface water samples were not filtered. The concentrations of metals detected may reflect the presence of solids in the samples. Metals that adhere to the suspended solids may pose less risk to aquatic organisms potentially of concern because the metals may not be "bioavailable."

Zulu Ranges (AOC 26) — Thirteen surface water samples were collected for the RI from wetlands and drainage areas potentially affected by activities at the Zulu Ranges. Figure 8 of Appendix A shows surface water sampling locations in the Zulu Ranges. These 13 samples were analyzed for TCL organics, TAL metals, explosives, TPHC, and water quality parameters. Sample analysis results are presented in Table 9 of Appendix E.

Analysis of the Zulu Range samples collected during the RI showed two metals exceeding USEPA AWQC: arsenic detected at a concentration of 7.18 µg/L (AWQC of 0.018 µg/L) and lead at a maximum concentration of 106 µg/L (AWQC of 3.2 µg/L). Earlier samples collected as part of a previous investigation, the Site Inspection (SI), showed higher concentrations than those found in the RI samples. The differences between the two investigations may reflect different sampling methods, field conditions, or laboratory procedures. Explosives (including RDX and HMX), as well as several organic compounds, were detected in samples from the Zulu Ranges. One of the thirteen samples contained a detectable concentration of DDD (0.086 µg/L) that exceeded the AWQC (0.00083 µg/L).

Hotel Range (AOC 27) — Nine surface water samples were collected for the RI within Cranberry Pond, adjacent to the Hotel Range. (Three samples had been collected earlier during the SI.) The six RI samples were analyzed for TCL, VOCs, pesticides, and polycyclic aromatic hydrocarbons (PAHs); TAL metals; explosives; TPHC; and water quality parameters. Figure 4 of Appendix A shows surface water sampling locations in the Hotel Range. Sample analysis results are presented in Table 10 of Appendix E

Several metals were detected in the surface water samples collected in the Hotel Range. One metal, lead, was detected at a concentration of 18.2 µg/L, which exceeded the AWQC (3.2 µg/L). Trace levels of explosives or explosive-related compounds were detected in these samples.

Complete analytical results are presented in the RI report.

C. Sediments

Samples of sediments were taken in conjunction with the surface water samples discussed above. The samples taken at the EOD Range, Zulu Ranges, and Hotel Range were analyzed for TAL metals, TCL organics, explosives, TPHC, TOC, and grain size.

EOD Range (AOC 25) — Several metals in the EOD Range sample exceeded the concentrations detected in a local background sediment sample. Sample analysis results are presented in Table 11 of Appendix E.

Zulu Ranges (AOC 26) — Most metals in the Zulu Range samples were detected above background concentrations in at least one sample. Explosives, pesticides, VOCs, and TPHC were also detected. Sample analysis results are presented in Table 12 of Appendix E. No screening values were established in the RI for organic compounds in sediments.

Hotel Range (AOC 27) — Most samples collected in Cranberry Pond contained some metal concentrations in excess of those naturally occurring in the sediment. However, the data indicate that only one sample is unequivocally contaminated with metals. The explosive 4-amino-2,6-dinitro toluene was detected in one third of the samples. VOCs, pesticides, TPHC, and two PAHs: benzo(b)fluoranthene and pyrene were also detected. Sample analysis results are presented in Table 13 of Appendix E. Complete analytical results are presented in the RI report.

D. Soils

The predominant soil in the South Post, including the areas of investigation, is the Hinkley-Merrimac-Windsor (HMW) association. This soil consists of loams or sandy loams, loamy fine sands, and other sands over sand or sand and gravel. In the active ranges, including the EOD, Zulu, and Hotel Ranges, the natural soils are disturbed. A soil mapping of the SPIA monitored-area found that, almost without exception, the soils are sandy and well drained. The exceptions are in wetland areas outside the three ranges.

EOD Range (AOC 25) — Surface and subsurface soil samples collected during the RI at the EOD Range in November 1993 were analyzed for TAL metals, explosives, and TPHC. Figure 8 of Appendix A shows soil sampling locations in the EOD Range. Several metals were detected at levels above background in at least one sample. Copper and zinc exceeded the background concentration in three surface samples. Two explosives were also detected in EOD Range surface soil samples: nitrocellulose (detected in two samples) and nitroglycerine (detected in one sample). Low levels of TPHC were detected (maximum concentration of 45.2 μg/g). None of the substances detected exceeded the health-based soil screening criteria established for the RI[7]. Sample analysis results are presented in Table 14 of Appendix E.

Zulu Ranges (AOC 26) — Surface and subsurface soil samples were taken at the Zulu Ranges as part of the SI and RI. Figure 9 of Appendix A shows soil sampling locations in the Zulu Ranges. These samples were analyzed for TCL organics, TAL metals, explosives, and TPHC. Although several metals exceeded background concentrations in at least one surface and subsurface sample, none of the metals detected exceeded the health-based screening values. PAHs were detected in up to three surface and subsurface samples. One of the PAHs, benzo(b)fluoranthene (0.81 μg/g), exceeded the screening concentration[8](0.7 μg/g). RDX and TPHC were also detected. The maximum concentration of RDX in subsurface soil (38 μg/g) exceeded the health-based screening level[9](26 μg/g). Sample analysis results are presented in Table 15 and 16 of Appendix E.

Hotel Range (AOC 27) — Subsurface soil samples were collected from boreholes at the Hotel Range and analyzed for TPHC, TAL metals, explosives, and TCL organics. Figure 10 of

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[7] Either the Massachusetts Contingency Plan Human Health Level for Soil, the USEPA Region III Risk-Based Concentration, or, for lead, the level set in the *USEPA Interim Guidance on Soil Lead Cleanup Level.*

[8] Massachusetts Contingency Plan Human Health Level for Soil.

[9] USEPA Region III Risk-Based Concentration.

Appendix A shows borehole locations. None of the metals exceeded the screening values. Low levels of TPHC (maximum concentration of 75.6 μg/g), below the screening level of 5,000 μg/g, were detected in some samples. VOCs and pesticides were also detected at concentrations just above the detection limit. These levels were well below screening values. Sample analysis results are presented in Table 17 of Appendix E.

Complete analytical results are presented in the RI report.

VI. SUMMARY OF SITE RISKS

A risk assessment was performed to estimate the probability and magnitude of potential human health and environmental effects associated with exposure to contaminated media at the site. The following sections discuss the general approach and assumptions, the results of the human health risk evaluation, and the ecological risk evaluation.

A. Baseline Risk Assessment Approach and Assumptions

The human health risk assessment followed a four-step process: (1) contaminant identification, which identified those hazardous substances that, given the specifics of the site, were of significant concern; (2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; (3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances; and (4) risk characterization, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the site, including carcinogenic and noncarcinogenic risks. A summary discussion of the human health risk assessment approach is presented in Section 5 of the RI report, Volume I, while more detailed discussions are presented in Section 8 of Volumes II, III, and IV of the RI report for the EOD, Zulu, and Hotel Ranges, respectively.

All organic chemicals that were positively detected (detected concentrations not discounted for reasons explained in the RI report) were selected as contaminants of potential concern (COPCs) for the human health risk assessment. Some, notably pesticides which were widely applied in the past at Fort Devens, are probably not directly related to range activities. Also, organic compounds that could not be quantitatively eliminated during the Quality Control (QC) review as being not site-related, but were considered to be questionable, were still considered as part of the risk assessment. Tables 18, 19, and 20 of Appendix E present the COPCs for each sampled media at the EOD, Zulu, and Hotel Ranges, respectively. A summary of the health effects of each of the COPC can be found in Section 5, Volume 1 of the RI report.

Potential human health effects associated with exposure to the contaminants of concern were estimated quantitatively or qualitatively by developing several hypothetical exposure pathways. These hypothetical pathways were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the site. The following is a brief summary of the exposure pathways evaluated for the human health risk and ecological risk evaluations. A more thorough description can be found in Section 8 and 9 of Volumes II, III, and IV of the RI report for the EOD, Zulu, and Hotel Ranges, respectively.

1. Exposure Pathways for the Human Health Risk Evaluation

EOD Range (AOC 25)

- Direct contact (dermal contact and incidental ingestion) with contaminated surface soils
- Inhalation of airborne soil particles

Zulu Ranges (AOC 26)

- Direct contact (dermal contact and incidental ingestion) with contaminated surface soils
- Inhalation of airborne soil particles
- Direct contact with sediment and surface water in the adjacent wetlands

Hotel Range (AOC 27)

- Direct contact (dermal contact and incidental ingestion) with contaminated surface soils
- Inhalation of airborne soil particles
- Direct contact with contaminated sediment and surface water at Cranberry Pond

Groundwater in the vicinity of these ranges is not currently used as a water supply source, nor is it expected to be used for that purpose in the future; therefore, direct contact with groundwater is not a complete exposure pathway and was not addressed further in the risk assessment. Any future use of the SPIA monitored-area groundwater will require a human health risk assessment.

2. Exposure Pathways for the Ecological Risk Evaluation

EOD Range (AOC 25) — COPCs at the EOD Range include mercury, zinc, and nitroglycerin. The only medium of exposure is soil. The species selected as potentially exposed were herbaceous vegetation, white-footed mouse, killdeer, and red fox. The following pathways were identified as sources of potential exposure:

- Root uptake from contaminated soil

- Contact and absorption, incidental ingestion, and feeding on contaminated food and soil

- Bioaccumulation from vegetation or animal prey

Zulu Ranges (AOC 26) — COPCs identified at the Zulu Ranges include metals, explosives, and organics. Media of exposure include soils, sediments, and surface water. Selected terrestrial species were herbaceous vegetation, white-footed mouse, grasshopper sparrow, killdeer, and red fox. Selected aquatic and semiaquatic species were aquatic invertebrates, Blanding's turtle, and mink.

Terrestrial and aquatic pathways include the following:

- Root uptake from contaminated soil

- Contact and absorption, incidental ingestion, and feeding on contaminated food and soil

- Incidental ingestion and drinking of contaminated surface water

- Bioaccumulation from vegetation or animal prey

Hotel Range (AOC 27) — Antimony, copper, lead, mercury, nickel, and 4-amino-2,6-dinitro toluene were selected as ecological COPCs in Cranberry Pond sediments, which are potentially affected by activities at Hotel Range. Lead was selected as a COPC in surface water of Cranberry Pond. Selected species were aquatic invertebrates, raccoons, and mallard.

The following migration pathways were identified:

- Uptake from contaminated sediment

- Contact and absorption, incidental ingestion, and feeding on contaminated food and sediments

- Contact and absorption, incidental ingestion, and drinking of contaminated surface water

- Bioaccumulation from vegetation or animal prey

B. Baseline Risk Assessment Results

Excess lifetime cancer risks were determined for each exposure pathway by multiplying the exposure level with the chemical-specific cancer factor. Section 8 of Volumes II, III, and IV of the RI report present detailed descriptions of the exposure assumptions. USEPA has developed cancer potency factors from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is unlikely to be greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g., 1×10^{-6} for 1/1,000,000) and indicate (using this example), that an average individual is not likely to have greater than a one in a million chance of developing cancer over 70 years as a result of site-related exposure to the compound at the stated concentration. Current USEPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

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

Under the current USEPA Superfund policy, acceptable exposures to carcinogens are those that represent an excess upper bound lifetime cancer risk of between 10^{-4} to 10^{-6}. For noncarcinogenic effects, acceptable exposures levels are those with a HI of 1.0 or less. Using the exposure assumptions described in the RI report and chemical concentration data obtained during the RI, the Baseline Risk Assessment evaluated both potential carcinogenic and noncarcinogenic risks to potentially exposed persons.

The human health risk assessment of the RI report identified the following potential human health risks:

SPIA Monitored-Area Groundwater - Actual use of Well D-1 groundwater by an individual occurs less than 14 days per year, far less frequently than the 350 days per year that is assumed for residential exposure. Actual exposure duration, which probably does not exceed 10 years, also is significantly less than the residential assumption of 30 years (which includes childhood). Given their limited exposures, the potential risks to the troops who currently use Well D-1 are estimated to be at least two orders of magnitude less than those estimated for residential tap water, lowering the excess lifetime cancer risks to current groundwater users from arsenic and chloroform below the lower extreme of the 10^{-4} to 10^{-6} range considered acceptable by USEPA. Therefore, groundwater at the South Post of Fort Devens does not pose any unacceptable risks to human health. Table 21 of Appendix E shows the calculated risks for using Well D-1 groundwater.

EOD Range (AOC 25) — The estimated potential cancer risks under the case of "reasonable maximum exposure" (RME) to contaminants at the EOD Range ranged from 1.2×10^{-9} for a site worker's exposure to soil, to 1.7×10^{-8} for an adult trespasser's exposure to soil. These are all well below USEPA's benchmark 10^{-4} to 10^{-6} range. Table 22 of Appendix E presents a summary of the excess cancer risks associated with the EOD Range. The RME and the average exposure cases evaluated in the human health risk assessment were based on the maximum and average chemical concentrations in the exposure media, in accordance with USEPA-New England guidance. The cancer risks associated with average exposures were less than 33 percent of the RME risks.

The HIs for potential RME scenarios involving noncarcinogenic COPCs from the EOD Range ranged from 9.0×10^{-4} for site worker exposures to soil to 1.1×10^{-3} for the adolescent trespasser. All were well below USEPA's benchmark value of 1.0. Table 23 of Appendix E presents a summary of the estimated hazard indices for noncarcinogenic effects associated with the EOD Range.

Zulu Ranges (AOC 26) — The estimated potential cancer risks for RME's to contaminants at the Zulu Ranges ranged from 7.6×10^{-9} for an adolescent site trespasser's exposure to sediment to 8.9×10^{-8} for an adult's consumption of fish. These numbers are all below the 10^{-4} to 10^{-6} range. Table 24 of Appendix E presents a summary of the excess cancer risks associated with the Zulu Ranges. The RME case assumes that all of a receptor's exposure is to 33 maximum contaminant concentrations observed at site. For all of the pathways evaluated, the cancer risks associated with average exposures were approximately 25 percent as great as the RME risks.

Both the soil and sediment exposure pathways could reasonably apply to the same trespassers. In addition, the same individuals could fish from Slate Rock Pond. Therefore, the estimated risks from soil contact, sediment contact, and fish consumption were summed to estimate the total receptor risk. Combining the RME risk estimates from the three pathways results in total estimated cancer risks of 1.7×10^{-7} for adults and 4.1×10^{-8} for adolescents, still below the 10^{-6} level.

The HIs for potential RME scenarios involving noncarcinogenic COPCs from the Zulu Ranges ranged from 1.0×10^{-3} for adult trespasser exposure to soil to 3.3×10^{-3} for site worker soil exposures. All were well below USEPA's benchmark value of 1.0. The total HIs of trespassers from soil contact, sediment contact, and fish consumption pathways were also well below 1.0. Table 25 of Appendix E presents a summary of the estimated hazard indices for noncarcinogenic effects associated with the Zulu Ranges.

Hotel Range (AOC 27) — Estimated potential cancer risks for RMEs to contaminants at the Hotel Range ranged from 4.1×10^{-9} for an adolescent site trespasser's exposure to soil to 1.7×10^{-8} for an adult trespasser's exposure to sediment. These numbers are all below the 10^{-4} to 10^{-6}

range. Table 26 of Appendix E presents a summary of the excess cancer risks associated with the Hotel Range. The RME case assumes that all of a receptor's exposure is to the maximum contaminant concentrations observed at the site. For soil exposure pathways, the cancer risks associated with average exposures were up to a 33 percent less than the RME risks. Cancer risks associated with average exposures to sediments were less than the RME risks by an order of magnitude.

Both the soil and sediment exposure pathways could reasonably apply to the same site trespassers. Therefore, the estimated risks from soil and sediment contact were summed to estimate the total receptor risk. Combining the RME risk estimates from these two pathways results in total estimated cancer risks of 1.4×10^{-7} for adults and 3.2×10^{-8} for adolescents, still well below the 10^{-6} level.

The HIs for potential RMEs to carcinogenic COPCs for the Hotel Range ranged from 7.7×10^{-4} for the adult trespasser exposures to soil to 1.9×10^{-2} for site worker soil exposures. All were well below USEPA's benchmark value of 1.0. The total HIs of trespassers from soil and sediment contact pathways together were also well below 1.0. Table 27 of Appendix E presents a summary of the estimated HIs for noncarcinogenic effects associated with the Hotel Range.

C. Ecological Risk Assessment

An ecological risk assessment was performed for the SPIA monitored-area. The following sections present a summary of the results of the ecological risk evaluations.

SPIA Monitored-Area Groundwater — Groundwater from within the SPIA monitored-area is discharging to on-site surface waters prior to leaving the South Post. No ecological risk to surrounding habitats are associated with groundwater in the SPIA monitored-area. Ecological impacts from the surface water/sediment for each individual range are described within this ROD in the following sections.

EOD Range (AOC 25) — Concentrations of mercury, zinc, and nitroglycerin in soils exceed USEPA guidelines for plants or small mammals, but only for the worst case scenario. Ecological risks identified on the EOD Range were deemed acceptable due to the continued use of the Impact Area for military training activities. Table 28 of Appendix E presents, for the average exposure case, a summary of the hazard quotients for endpoint species at the EOD Range. Table 29 of Appendix E presents a summary of hazard quotients for the RME case.

Zulu Ranges (AOC 26) — Levels of lead, zinc, and cyclonite in soils exceed USEPA risk guidelines for plants, small mammals, and songbirds. Several metals were detected in the sediments of the nearby wetlands at levels above local background concentrations. Despite some exceedances, these metals were not considered to be of concern because exceedances of background or criteria were few and the magnitude of exceedance was not great. Ecological risks identified on the Zulu Range were deemed acceptable due to the continued use of the Impact Area for military training activities. Tables 30 and 31 of Appendix E present, for the average exposure case, a summary of the hazard quotients for aquatic and terrestrial endpoint species at the Zulu Ranges, respectively. Tables 32 and 33 present, for the RME case, a summary of hazard quotients for aquatic and terrestrial endpoint.

Lead and other chemicals found in the surface water do not pose significant risks to wildlife or to aquatic life. Levels of lead exceed water quality criteria, but water samples were not toxic when tested in the laboratory with aquatic invertebrates and fish.

Hotel Range (AOC 27) — Metals, explosives, and other organic chemicals found in soils at the Hotel Range do not pose unacceptable risks to plants or wildlife. Levels of lead exceed water quality criteria; however comparable water samples from the Zulu Range, which also contains elevated levels of lead, were not toxic when tested in the laboratory with aquatic invertebrates and fish. Several metals were detected in the sediments of Cranberry Pond at levels above local background concentrations. Despite some exceedances, these metals were not considered to be of concern because exceedances of background or criteria were few and the magnitude of exceedance was not great. In addition, the highest detected concentrations of these metals were within or only slightly exceeded the range of regional background levels reported for remote New England and for unimpacted lakes and ponds in Massachusetts. Ecological risks identified on the Hotel Range were deemed acceptable due to the continued use of the Impact Area for military training activities. Table 34 of Appendix E presents, for the average exposure case, a summary of the hazard quotients for aquatic endpoint species at the Hotel Range. Table 35 presents a summary of the hazard quotients for the RME case.

The assessment concluded that explosives and other chemicals in the soil do not pose unacceptable risks to plants or wildlife. In addition, lead, zinc, and other chemicals in the surface water pose no unacceptable ecological risk.

VII. ARMY RATIONAL FOR PROPOSING "NO ACTION"

The 1991 Defense BRAC Report to the President indicates that the Army will retain the South Post and continue operating its training ranges. Therefore, the South Post will not be cleaned up for unrestricted use. The Army Range Control will continue to restrict public access, and unauthorized personnel will be prohibited. Currently, the South Post is enclosed by a fence and access can only be gained through gates that are controlled by the Army Range Control.

Risk assessment results show that human health risks identified are within USEPA risk guidelines. Risk to on-site ecosystems were deemed acceptable.

VIII. DESCRIPTION OF THE NO ACTION ALTERNATIVE

"No action" is the selected remedy for the SPIA monitored-area groundwater and AOC 41 groundwater. Under this alternative, no formal remedial action is taken and the site is considered to be left "as is," with no additional institutional controls, containment, removal, treatment, or other mitigating measures. "No action" is also the selected remedy for the surface water, sediment, and soil at the EOD, Zulu, and Hotel Ranges. The Army has submitted a Closure Report under the RCRA Subpart X; formal approval of the closure of EOD Range will occur prior to ROD signature.

As part of this remedy, Fort Devens will ensure the following:

- Groundwater monitoring for potential contaminant migration out of the SPIA monitored-area will continue:
  - Wells will be used to monitor the groundwater from the EOD Range, Zulu Ranges, Hotel Range, and AOC 41.
  - Wells will be used to monitor the north, northeast, southeast, and east sides of the SPIA monitored-area.
- The monitoring wells will be sampled for explosives, TCL, and TAL metals.
- A Groundwater Monitoring Plan for the South Post will be developed that will include detailed groundwater monitoring at discharge points. The plan may include installing sentinel wells to monitor potential off-site groundwater flow. Details of the plan will be developed jointly by the Army, USEPA-New England, and MADEP within 6 months of ROD signature. The Army will rerun the groundwater model to incorporate data from new sentinel well(s) and ascertain any potential impacts to MCI Shirley.
- Well D-1 will be sampled and analyzed for explosives and Massachusetts and Federal drinking water requirements (MMCLs/MCLs).
- The Army will not develop new drinking water sources within the SPIA monitored-area.
- An Integrated Natural Resources Management Plan will be developed and implemented to monitor the impacts to ecosystems in the SPIA monitored-area. The details of this plan will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Service, and MADEP within 6 months of the ROD signature.

Monitoring reports will include a description of site activities and a summary of analytical results. The Army will review and submit these monitoring reports to MADEP and USEPA annually. If there is an indication of contamination emanating from the SPIA monitored-area, the Army will evaluate the need for additional assessment.

This site, as required by CERCLA, will be subject to 5 year reviews. During a 5 year review, an assessment is made as to whether the implemented no action alternative remains protective of human health and the environment and whether the implementation of alternative remedial actions are needed to ensure adequate protection. If on-site hazardous substances, pollutants, or contaminants that may present an imminent and substantial endangerment to public health and welfare migrate off site, the Army will take the necessary and appropriate actions to protect human health and the environment as required under CERCLA. More frequent reviews will be conducted if site conditions change. Should the Army close or transfer or change the use of this property, an Environmental Baseline Survey (EBS) will be conducted, and the "no action" decision of this ROD will be re-examined in light of the changed use and risk factors resulting from this closure/transfer. The EBS will be provided to the USEPA-New England and MADEP for comment.

The implementation of the "no action" alternative will cost approximately $500,000.

IX. DOCUMENTATION OF SIGNIFICANT CHANGES

The Army presented a Proposed Plan identifying "no action" as the preferred alternative for the site. The plan was presented at a public meeting held on February 21, 1996. Comments obtained from the public were incorporated into the development of this Final ROD for the SPIA monitored-area groundwater and AOCs 25, 26, and 27. Concurrent to the development of this ROD, the Army was finalizing the RI for AOC 41. AOC 41 is approximately 6-acres in size and is located between Harvard Road, New Cranberry Road, and an eastern portion of the SPIA monitored-area (Figure 11 of Appendix A shows the location of a AOC 41).

The results of the AOC 41 RI indicate that the most appropriate remedial action for the groundwater at AOC 41 would be "no action." This is the same action to be taken for the SPIA monitored-area groundwater. The RI also shows that AOC 41 is adjacent to the SPIA monitored-area, and AOC 41 is small in area (6 acres). Adding AOC 41 to this ROD would only increase the total land area covered in this ROD by 0.6 percent. Therefore, the USEPA-New England recommended including AOC 41 in this ROD. The landfill portion of AOC 41 will be addressed under a separate action.

The overall result of including AOC 41 groundwater with the SPIA monitored-area groundwater is that a slightly larger land area is addressed, and the Army can more rapidly proceed in the development and implementation of the long-term monitoring programs for the site. A Groundwater Monitoring Plan for the South Post will be developed that will include monitoring the groundwater under AOC 41. The plan may include installing sentinel wells to monitor potential off-site groundwater flow. Details of the plan will be developed jointly by the Army, USEPA-New England, and MADEP within 6 months of ROD signature.

A. Site History

AOC 41 is approximately 6 acres in size and is located between Harvard Road, New Cranberry Pond, and an eastern portion of the impact area in the South Post (Figure 11 of Appendix A). The landfill material occupies an area approximately 75 feet by 75 feet in the central portion of the site. It appears to have been associated with an old brick-making kiln that was operated in this area in the 1800s. The AOC is overgrown with trees and swampy vegetation, and no records are available detailing when the site was used or what type of material was disposed of in this area. It is believed that this AOC was used until the 1950s for disposal of nonexplosive military and household debris. Miscellaneous debris is scattered over a small hill located approximately 75 feet north of New Cranberry Pond. The hill slopes down to a low area at the base of the hill. The ground surface elevation rises to the south, then slopes again down to New Cranberry Pond. The water level in New Cranberry Pond is controlled by a culvert located on the eastern shore of the pond that impedes the water flow, which in turn increases the water level in the pond. Installation personnel attempt to keep the culvert clear in an effort to maintain a constant water level in the pond.

The results of the SI and Supplemental SI (SSI) indicated that some residual surface soil contamination was present on the waste material. However, the main human health risk was associated with the concentration of chlorinated solvents found in the groundwater. SA 41 was recommended for an RI/FS after the SSI and the site designation was changed from SA 41 to AOC 41. The RI for AOC 41 concentrated on defining the distribution of chlorinated solvents in groundwater. The findings of the RI indicate that (1) the waste material is not the source of the groundwater contamination, (2) the source of the groundwater contamination appears to be within the area investigated, (3) groundwater contaminant distribution is well defined, and (4) contamination does not appear to be impacting the surface water or sediment quality in New Cranberry Pond.

B. Summary of Site Characteristics

The following subsections address the nature and distribution of analytes detected in soil and groundwater during the 1992 SI, 1993 SSI, and 1994 RI. In addition to the off-site analytical laboratory analysis, field analytical data is presented and discussed. Table 36 presents a list of the analytical tests performed on each sample in each media during the SI, SSI, and RI. Figure 12 and 13 of Appendix A show the soil and groundwater sampling locations for field and off-site laboratory analysis.

1. Soils

The soil type encountered in one boring advanced at AOC 41 included clayer silt from 4 to 36 feet below ground surface. This material was mapped as Ayer Stage lake deposits.

Field Analytical Results — Samples for field analysis collected as part of the RI include: 22 soil gas samples from 13 locations; 30 soil samples from the 13 soil gas survey points; 12 soil samples from 5 test pits; and 14 soil samples from the installation of one monitoring well.

Field analytical results indicate that 2 of the 13 soil gas samples contained detectable levels of trichloroethylene (TCE) (3.6 parts per billion (ppb) and 3.9 ppb). TCE and trans-dichloroethylene (DCE) were detected in soil samples collected from the soil gas sampling points between 30 and 37 feet below ground surface. Values of TCE ranged from less than the analytical detection limit (1.0 ppb) to 180 ppb while trans-DCE concentrations ranged from below detection limit to 9.1 ppb. The vertical distribution of observed TCE contamination coincides with the depth of the water table at this area. None of the soil samples collected from the test pits indicated the presence of any target analyte. Of the 14 soil samples collected during the installation of the monitoring well, only those collected at 30 to 32, 35 to 37, and 40 to 42 feet below ground surface contained TCE (4.55 ppb, 5.33 ppb, and 8.58 ppb respectively). This data also suggests a correlation between the vertical distribution of contamination and the depth to groundwater at this site.

The field analytical results for the soil gas samples, the soil samples collected at soil gas survey points, the soil samples from the test pits, and the soil samples from the installation of one monitoring well are presented in Tables 37, 38, 39, and 40 of Appendix E, respectively.

Off-Site Laboratory Results — Soil samples were collected for off-site laboratory analysis from test pits and monitoring well boring locations completed during the SI, SSI, and RI. VOCs, pesticides/PCBs, and explosives were not detected in any of the soil samples collected during the SI and SSI. Sodium was the only inorganic attribute detected above Fort Devens background in all soil samples. Other analytes detected above background include calcium, copper, and nickel. The results of these analysis are presented in Table 41 of Appendix E.

Twelve of the 21 soil samples collected during the RI were analyzed for VOC, semivolatile organic compounds (SVOC), inorganics, toxicity characteristic leaching procedure (TCLP), TPHC, and TOC. The remaining 9 samples were analyzed for all of the previously listed parameters except TCLP.

Off-site analytical results indicate that only 1 of the 17 samples collected from potential groundwater contamination test pits contained VOCs (1,1,2,2-trichloroethane (TCA) and toluene). A review of laboratory quality control indicates that the Freon and toluene detected in samples beneath the waste material and the remaining detected VOC can be attributed to laboratory contamination. SVOCs (acenaphthylene, benzo[b]fluoranthane, benzo[k]fluoranthane, chrysene, fluoranthane, phenanthrene, and pyrene) were detected at low concentrations in 3 of these 17 soil samples.

Cobalt, copper, nickel, and sodium exceeded Fort Devens background in 4 samples while sodium exceeded background in all 12 samples analyzed using TCLP; but each sample passed the TCLP.

The off-site analytical results for the soils analysis are presented in Table 41 of Appendix E.

2. Groundwater

Groundwater samples were collected in six separate rounds at this site (Rounds 1 through 6).

Field Analytical Results — Groundwater samples were collected for field analysis only during the 1994 RI field program. Field analysis of groundwater samples consisted of collection and analysis of groundwater samples from screened auger borings and all pre-1994 monitoring wells. Each of the groundwater samples was analyzed with field gas chromatography (GC) for vinyl chloride; t-1,2-DCE; c-1,2-DCE; benzene; TCE; toluene; TCA; ethylbenzene; m/p xylene; o-xylene; 1,1,2,2-TCA; and 1,2-DCE.

Based on field analytical data, the site-related VOC (TCE, 1,1,2,2-TCA, and c-1,2-DCE) plume appears to be vertically confined to the soils at the water table, and centered along a line trending northeast to southwest. Figures 14 and 15 of Appendix A show the interpretive field analytical concentration contours for TCE and 1,1,2,2-TCA in groundwater, respectively.

The results of the 1994 RI sampling analysis are presented in Table 42 of Appendix E.

Off-Site Laboratory Results — Two rounds of off-site laboratory analytical samples were collected during each of the field investigations conducted at AOC 41.

Off-site analytical results for groundwater samples collected during rounds 1 and 2 (September 1992 and January 1993, respectively) indicate that several VOC (TCE, tetrachloroethylene (PCE), and 1,1,2,2-TCA) were present in the groundwater. One explosive-related compound (2,4,6-trinitrotoluene) was detected in round 1 but not round 2, while one pesticide (eldrin) was detected in round 2 but not round 1. No other VOC, SVOCs, pesticides/PCBs, or TPHC were detected in either round. The results of the rounds 1 and 2 sampling analysis are presented in Table 43 of Appendix E.

Five additional monitoring wells were installed between round 2 and 3. Off-site analytical results for groundwater samples collected during rounds 3 and 4 (October 1993 and January 1994, respectively) indicate that VOC (TCE, 1,1,2,2,-TCA, 1,2-DCE) were detected in the previously existing well and 2 of the new monitoring wells. Nitroglycerine was detected in 1 well during round 4. SVOCs detected during both rounds were identified as laboratory contaminants. Several inorganic analytes (antimony, arsenic, and manganese) were detected at concentrations slightly above Fort Devens background in unfiltered samples. The results of the rounds 3 and 4 sampling analysis are presented in Table 43 of Appendix E.

Eleven additional wells were installed as part of the RI field investigation. Two rounds (5 and 6) of groundwater samples were collected during the RI field investigation. Round 5 was completed in December 1994 and round 6 was completed in March 1995. Off-site analytical results for groundwater samples indicate that several VOC (TCE, PCE, 1,1,2,2-TCA, cis- and trans-1,2-DCE, toluene, carbon tetrachloride, and carbon disulfide) were detected in one or more wells during either or both rounds. The only SVOC detected appears to be attributable to laboratory contamination.

Each of the PAL inorganic analytes, except for mercury, was detected above its Fort Devens background concentrations in the unfiltered groundwater samples. However, results for filtered inorganic samples indicated that only antimony, arsenic, potassium, copper, manganese, magnesium, sodium, and zinc were detected above Fort Devens background.

The results of all sampling analysis are presented Table 43 of Appendix E.

C. Summary of Groundwater Impacts

The groundwater results of Rounds Five and Six at AOC 41 indicate the presence of several VOCs (TCE; PCE; 1,1,2,2-TCA; cis- and trans-1,2-DCE; toluene; carbon tetrachloride; and carbon disulfide) and several inorganic analytes above their Fort Devens background concentrations in unfiltered samples. The distribution and relative concentration of the VOC contaminants is consistent in both field and off-site laboratory results. This observation is the most significant feature of the contamination assessment at this site. The groundwater is contaminated with VOCs, but the distribution of that contaminant plume appears to be well defined. The source of this VOC contamination, particularly the chlorinated solvents, has not been precisely located; however, it does appear to be within the area investigated during the RI. It is important to note that the VOC contamination appears to have almost no movement based upon the consistent contaminant values and the lack of contamination in down gradient monitoring wells (i.e., 41M-94-09A, 41M-94-09B, 41M-94-11X, and 41M-94-12X).

The hydrogeologic data collected at the site indicates that groundwater flow is slow, generally less than 1 foot per year, and therefore contaminant migration would be within a similar order of magnitude.

D. Summary of Risks

The focus of the baseline human health risk assessment for AOC 41 is the groundwater operable unit at AOC 41. Other media including soil, sediment, and surface water were sampled in earlier investigations, but were not included in the baseline risk assessment. Based on the findings presented RI report and previous investigations (see Appendix C — Administrative Record), it appears that the groundwater contamination source is within AOC 41, but is not the waste material.

Groundwater associated with AOC 41 is not currently used for drinking water or for any other purpose. Except for the Fort Devens South Post Water Point (Well D-1), groundwater on the South Post (where AOC 41 is located) does not represent a current or potential future source of drinking water.

Groundwater supplies at Fort Devens have consistently met Massachusetts water quality standards. Except for sodium, the physical and chemical qualities of on-site potable water have complied with State standards. The installation has been complying with the State regulation for reporting sodium concentrations in excess of 20 milligrams per liter (mg/L). The sodium notification requirement is designed to alert persons on a sodium-restricted diet of high sodium levels in their drinking water.

The noncarcinogenic risks (as hazard indices) and carcinogenic risks associated with the analytes detected in Well D-1 were calculated and are reported in Table 21 of Appendix E. The exposure frequency was assumed to be 14 days per year. Cancer risks were calculated for two possible exposure durations: 10 years, which is probably greater than any individual exposure, and 2 years, which is more typical.

A USEPA Office of Solid Waste and Emergency Response (OSWER) directive, *The Role of Baseline Risk Assessment in Superfund Remedy Selection Decisions*, indicates that action is generally warranted at a site when carcinogenic risks are greater than $1x10^{-4}$ or noncarcinogenic HIs exceed 1 (based on RME assumptions). USEPA Superfund guidelines also state that when the total incremental carcinogenic risk for an individual resulting from exposure at a hazardous waste site is within the range of $1x10^{-4}$ to $1x10^{-6}$, a decision about whether to take action or not is a site-specific decision. This range of $1x10^{-4}$ to $1x10^{-6}$ is often referred to as the Superfund target risk range.

All of the HIs are well below the USEPA threshold of 1, indicating that there are no unacceptable noncarcinogenic health risks. The carcinogenic risks are all below $1x10^{-4}$. For one exposure scenario, assuming a 10-year exposure duration, the cancer risk slightly exceeds $1x10^{-6}$, at $1.3x10^{-6}$. This cancer risk is, however, at the low end of the Superfund target risk range.

The RI concludes that there are no unacceptable risks to human health from the groundwater at the South Post Well D-1 and that no further action would be required under CERCLA.

An evaluation of health risks associated with exposure to soil at AOC 41 is not included in the baseline risk assessment. Surface soil at AOC 41 will be addressed separately under the Fort Devens landfill consolidation study. Subsurface soil will not be addressed in the baseline risk assessment due to the lack of an exact location of a contaminant source area.

Data collected from surface water and sediment at New Cranberry Pond during previous investigations demonstrates that surface water from New Cranberry Pond recharges groundwater below AOC 41. Therefore, it appears that site-related contaminants from AOC 41 are not impacting ecological receptors in New Cranberry Pond.

E. The Army's Rational for Proposing the Preferred Alternative

The 1991 Defense BRAC Report to the President indicated that the Army will retain the South Post and continue operating its training and detonation ranges. Therefore, the contaminants detected in the South Post groundwater will not be cleaned up for unrestricted use.

Groundwater from AOC 41 is flowing to the north-northeast and would eventually discharge to the Nashua River. No ecological risk to surrounding habitats in New Cranberry Pond have been identified.

No potential threats to human health and the environment are associated with the groundwater at Well D-1 (which is the only present and planned future exposure point closest to AOC 41); therefore, the "no action" alternative is proposed. The same pathways will also exist under future site conditions since the land use is expected to remain unchanged. The Army will maintain the South Post, AOC 41 and associated ranges, continue training, maintain security, and develop long-term Integrated Natural Resources Management and Groundwater Monitoring Plans. These plans will incorporate the SPIA monitored-area groundwater, AOC 41 groundwater, and AOCs 25, 26, and 27 and will be developed within 6 months of ROD signature.

The Groundwater Monitoring Plan will include the installation of sentinel wells to monitor the groundwater. Details of the monitoring plan will be developed jointly by the Army, USEPA-New England, and MADEP.

Monitoring reports will include a description of site activities and a summary of analytical results. Reports will be submitted to MADEP and USEPA. Under CERCLA, any action that results in contaminants remaining on-site must be reviewed at least every 5 years. During 5-year reviews, an assessment is made of whether the no action alternative remains protective of human health and the environment and whether the implementation of additional remedial actions are appropriate.

Based on current information and analysis of the SI, SSI, and RI reports, the Army believes that the preferred alternative of "no action" for control of groundwater contamination at AOC 41 is consistent with the requirements of the Superfund law and its amendments, specifically Section 121 of CERCLA, and to the extent practicable, the NCP. No action is necessary to ensure protection of human health and the environment.

X. STATE ROLE

The Commonwealth of Massachusetts has reviewed the various alternatives and concurred with the selected remedy for the SPIA monitored-area groundwater and EOD Range, Zulu Ranges, and Hotel Range. The State has also reviewed the RI and Risk Evaluation to determine if the selected remedy is in compliance with applicable or relevant and appropriate State environmental laws and regulations. A copy of the declaration of concurrence is attached as Appendix B.

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RECORD OF DECISION SUMMARY
SOUTH POST IMPACT AREA AND
AREA OF CONTAMINATION 41 GROUNDWATER AND
AREAS OF CONTAMINATION 25, 26, AND 27
FORT DEVENS, MASSACHUSETTS

APPENDIX A

FIGURES

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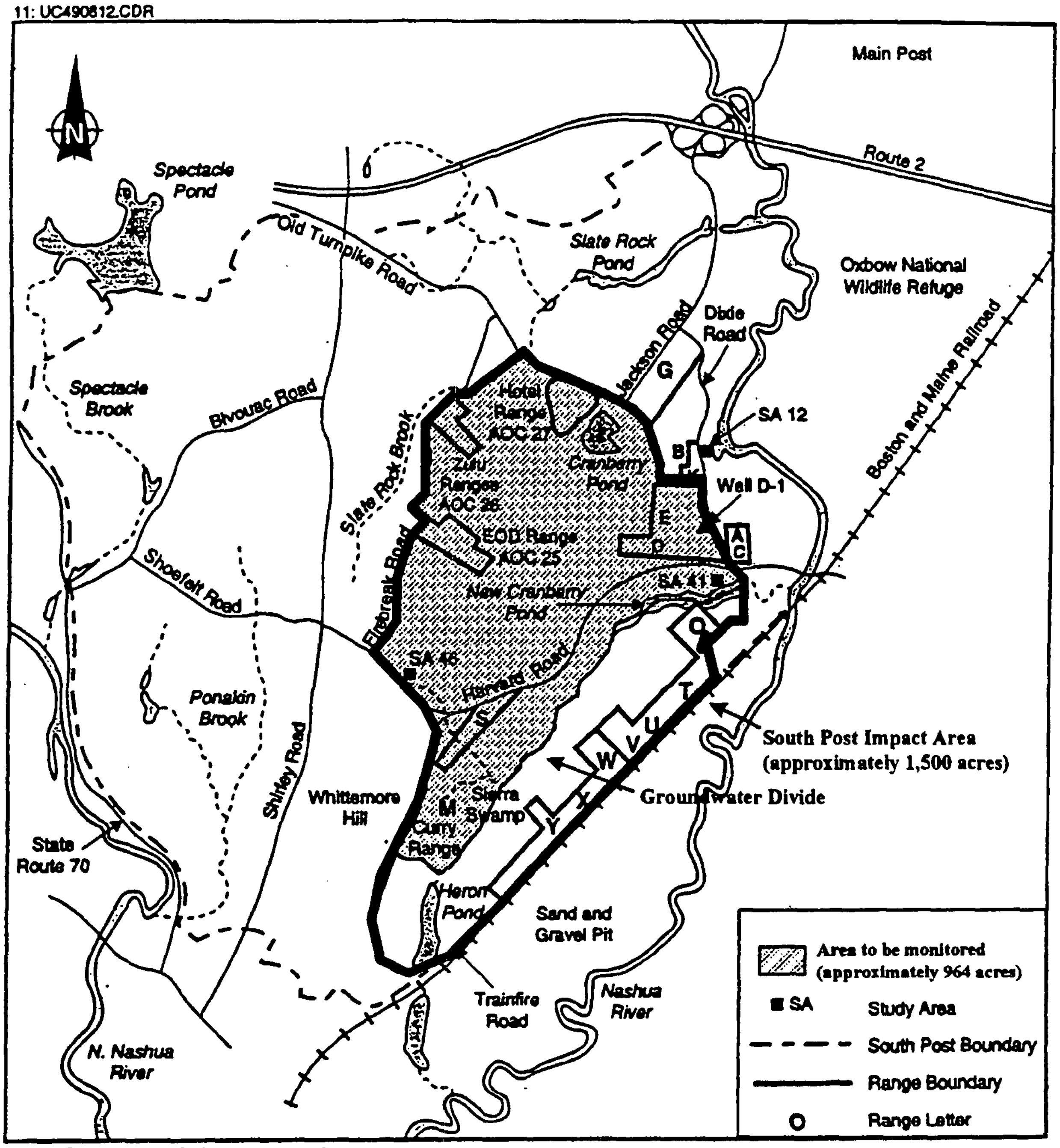

SOURCE: Ecology and Environment, Inc. 1994

SCALE
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Fgure 1 South Post Impact Area AOC 25, 26, and 27.

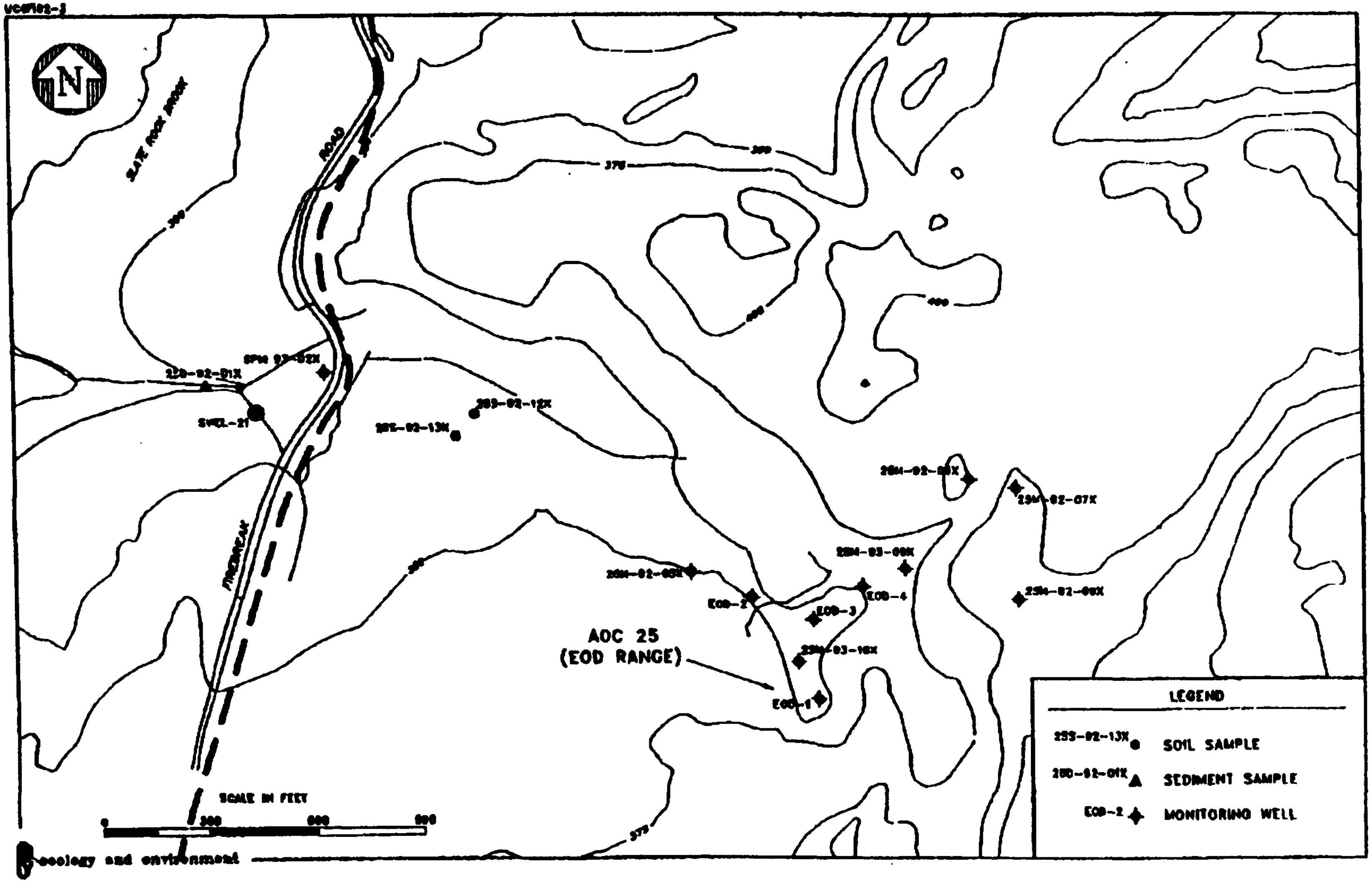


Figure 2 Location of Samples at AOC 25

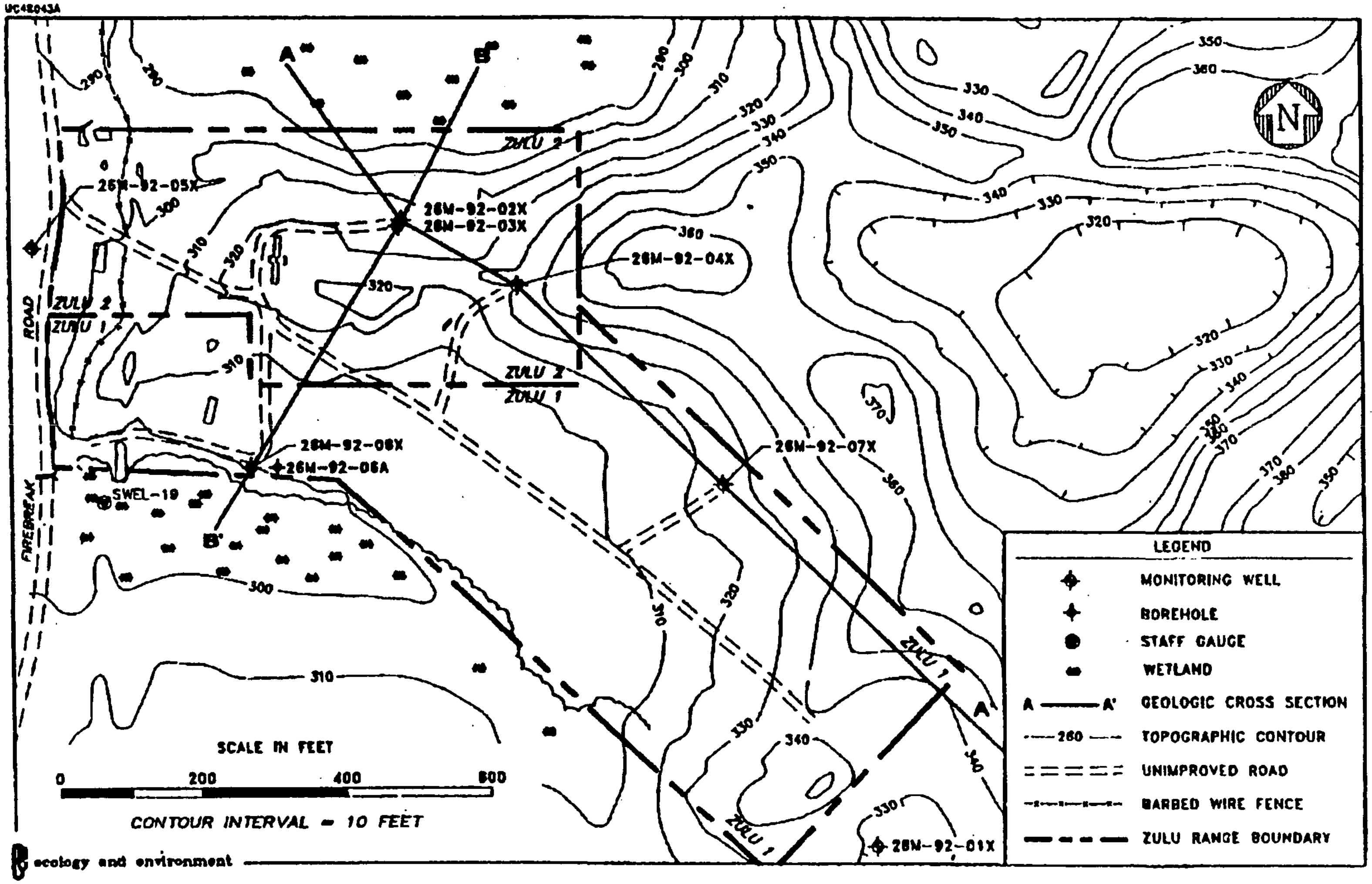


Figure 3 Location of Monitoring Wells at AOC 26

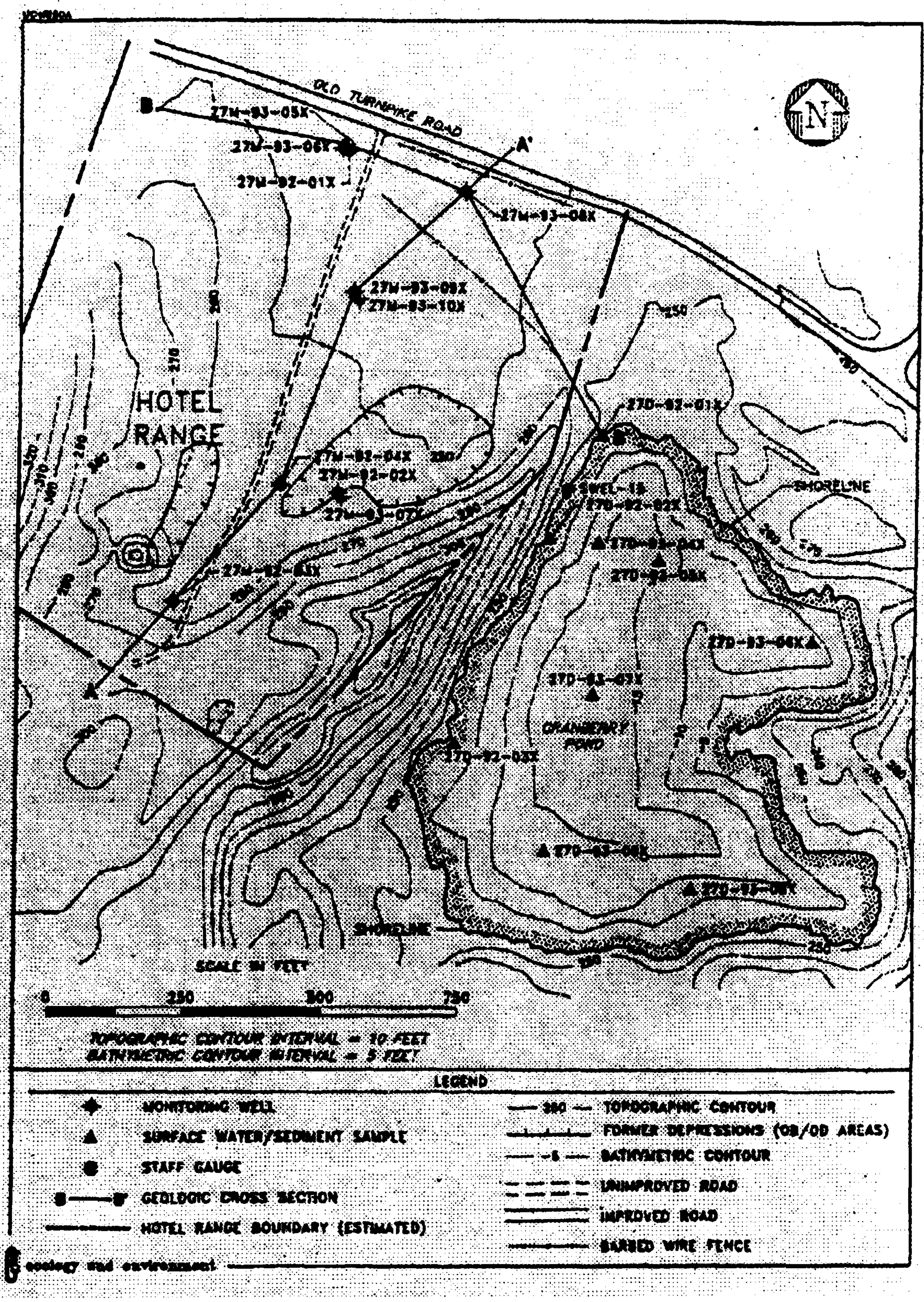


Figure 4 Location of Monitoring Wells and Surface Water/Sediment Samples at AOC 27

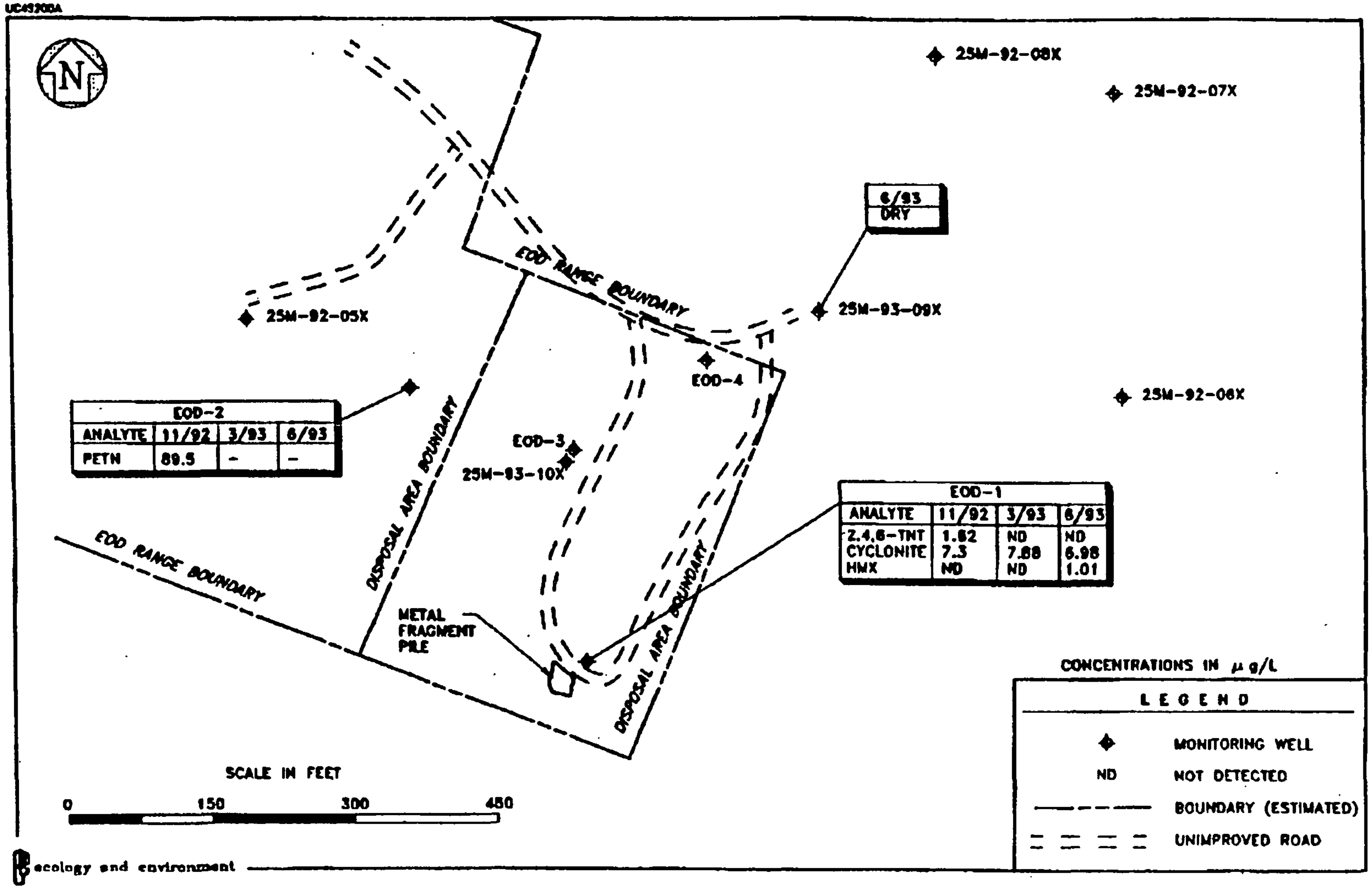
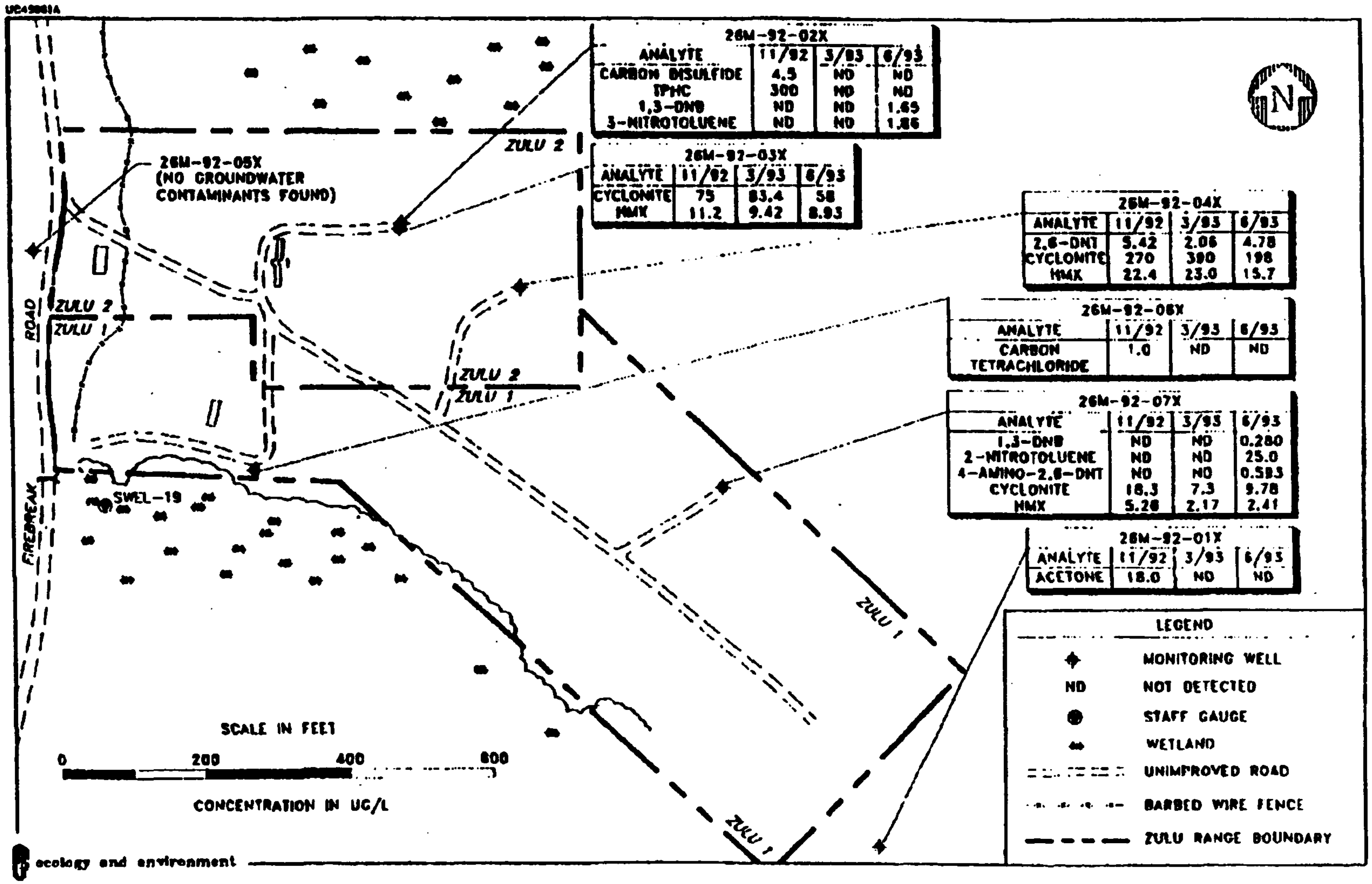


Figure 5 Organic Compounds in Groundwater at AOC 25



26M-92-02X

ANALYTE	11/92	3/93	6/93
CARBON DISULFIDE	4.5	ND	ND
TPHC	300	ND	ND
1,3-DNB	ND	ND	1.65
3-NITROTOLUENE	ND	ND	1.86

26M-92-03X

ANALYTE	11/92	3/93	6/93
CYCLONITE	75	83.4	58
HMX	11.2	9.42	8.93

26M-92-04X

ANALYTE	11/92	3/93	6/93
2,6-DNT	5.42	2.06	4.78
CYCLONITE	270	390	198
HMX	22.4	23.0	15.7

26M-92-06X

ANALYTE	11/92	3/93	6/93
CARBON TETRACHLORIDE	1.0	ND	ND

26M-92-07X

ANALYTE	11/92	3/93	6/93
1,3-DNB	ND	ND	0.280
2-NITROTOLUENE	ND	ND	25.0
4-AMINO-2,6-DNT	ND	ND	0.583
CYCLONITE	18.3	7.3	9.78
HMX	5.26	2.17	2.41

26M-92-01X

ANALYTE	11/92	3/93	6/93
ACETONE	18.0	ND	ND

Figure 6 Organic Compounds in Groundwater at AOC 26

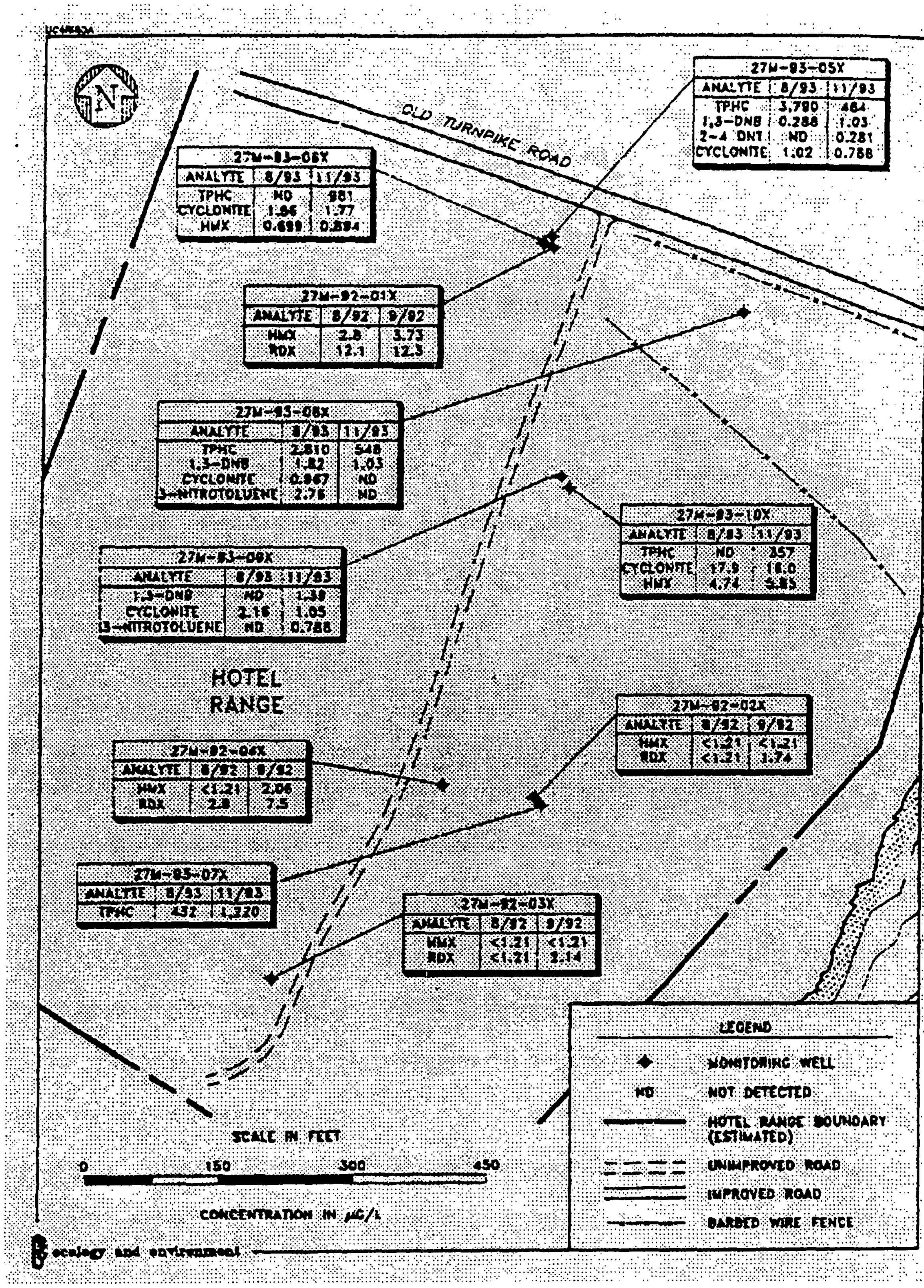


Figure 7 Organics in Groundwater at AOC 27

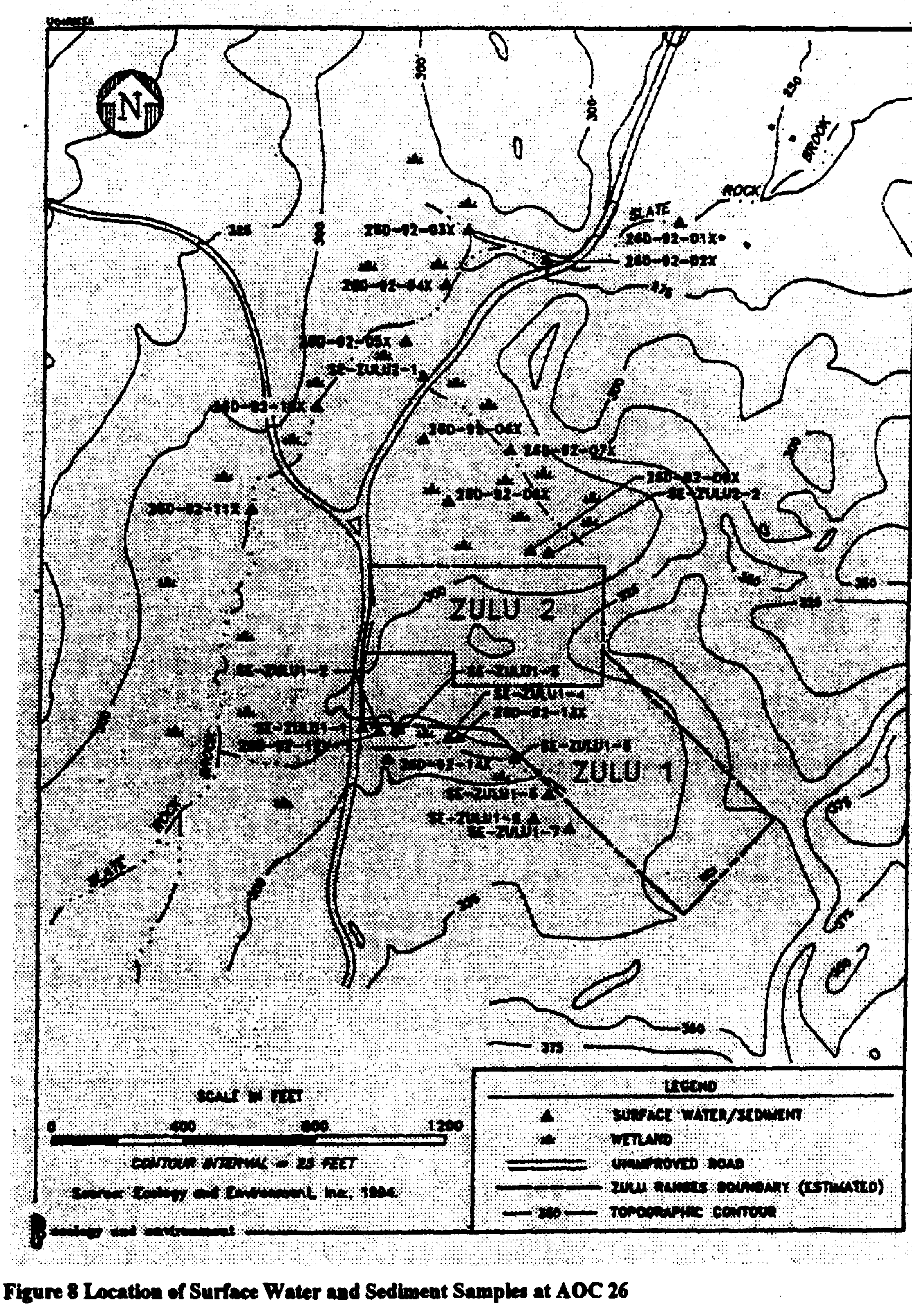


Figure 8 Location of Surface Water and Sediment Samples at AOC 26

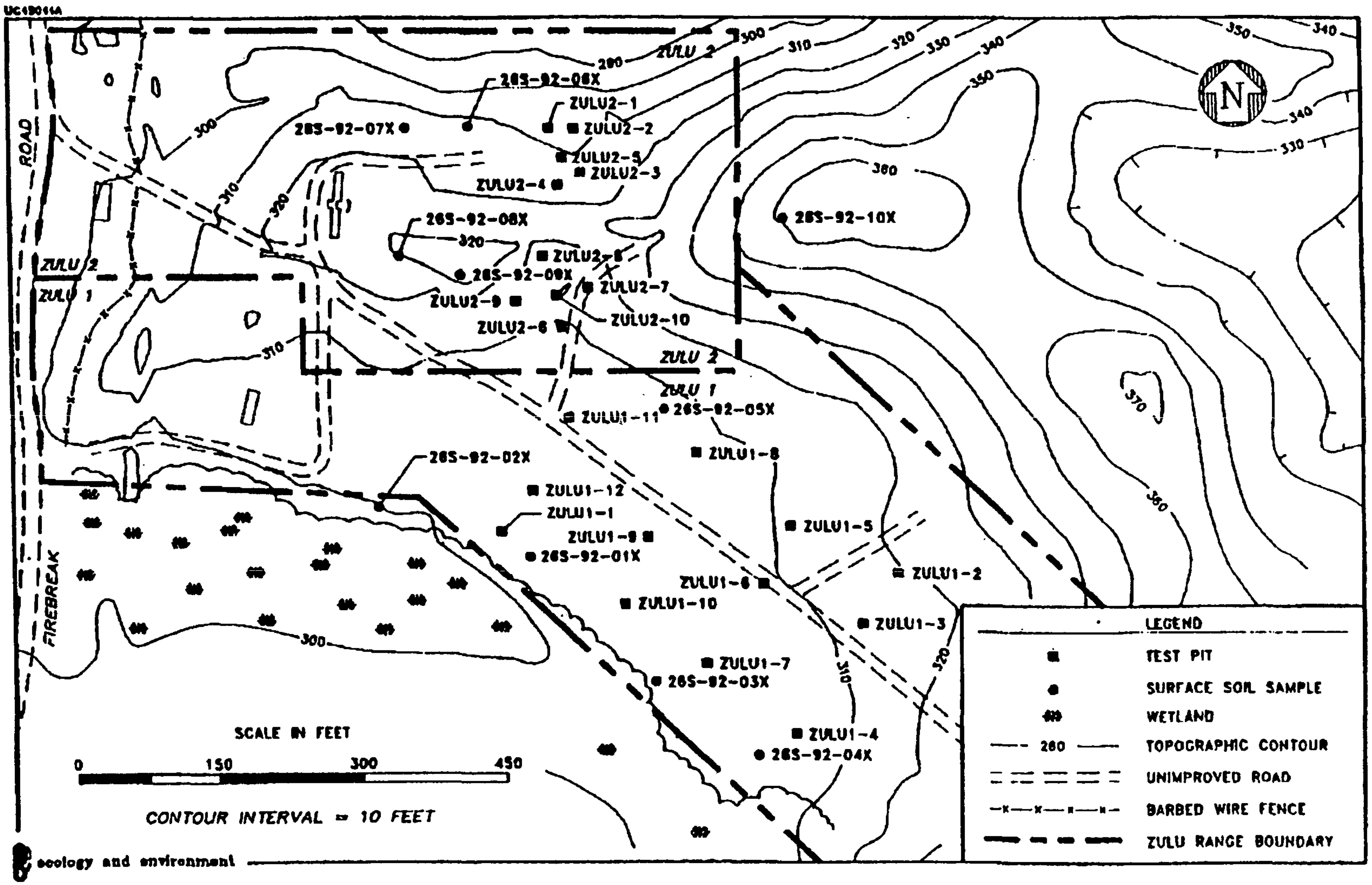


Figure 9 Location of Soil Samples at AOC 26

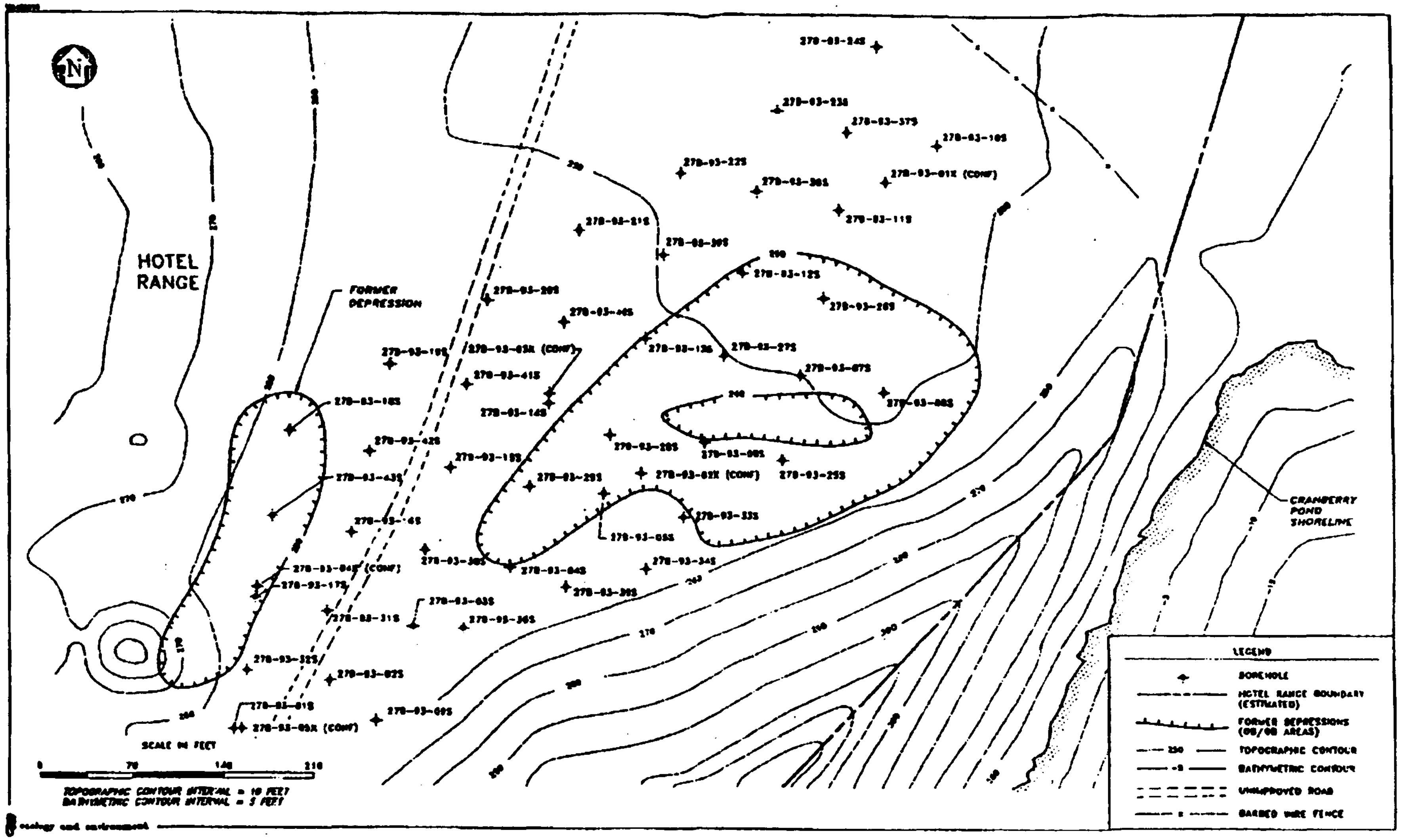


Figure 10 Location of Soil Samples at AOC 27

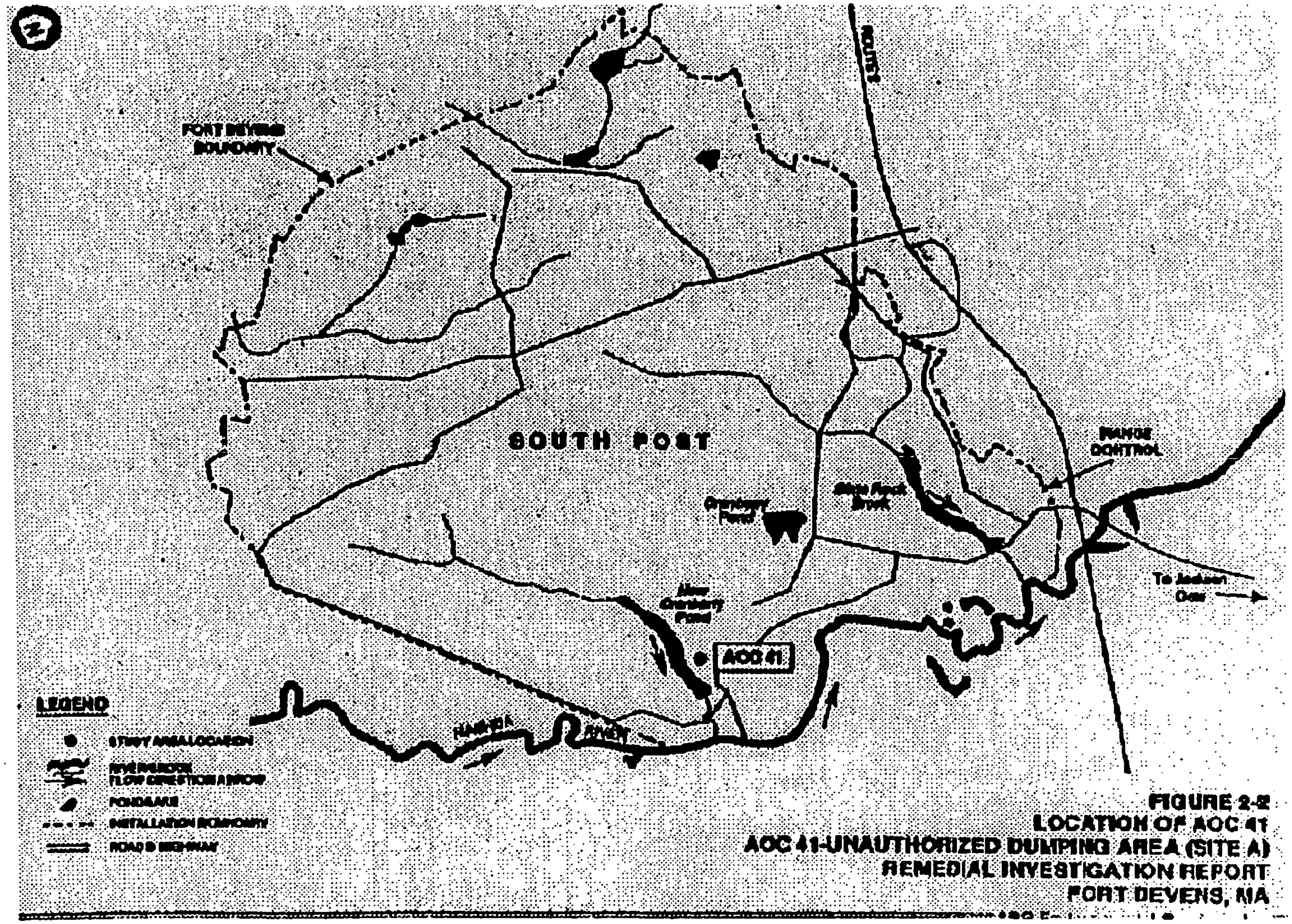


Figure 11 Location of AOC 41 in South Post

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RECORD OF DECISION SUMMARY
SOUTH POST IMPACT AREA AND
AREA OF CONTAMINATION 41 GROUNDWATER AND
AREAS OF CONTAMINATION 25, 26, AND 27
FORT DEVENS, MASSACHUSETTS

APPENDIX B

DECLARATION OF STATE CONCURRENCE

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COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
CENTRAL REGIONAL OFFICE

WILLIAM F. WELD
Governor

ARGEO PAUL CELLUCCI
Lt. Governor

TRUDY COXE
Secretary

DAVID B. STRUHS
Commissioner

July 2, 1996

Ms. Linda Murphy, Director
Office of Site Remediation and Restoration
U.S. Environmental Protection Agency
Region I-JFK Federal Building
Boston, MA 02203

RE: Record of Decision; South Post Impact Area and Area of Contamination 41 Groundwater and Areas of Contamination 25, 26, and 27, Fort Devens, Massachusetts

Dear Ms. Murphy,

The Massachusetts Department of Environmental Protection (MADEP) has reviewed the above-referenced Record of Decision (SPIA ROD) as recommended by the United States Army and the U.S. Environmental Protection Agency, Region I (EPA) for the remediation of the Fort Devens South Post Impact Area (SPIA) of the former Fort Devens. The MADEP has worked closely with the Army and EPA in the development of the preferred alternative and herein concurs with the Army's choice of remedy while expressing the concerns summarized below.

The SPIA ROD covers a total of 964 acres and includes Area of Contamination (AOC) 41 groundwater as well as AOCs 25, 26, 27. The chosen remedy now incorporates MADEP recommended elements and includes development and implementation of: a Long Term Groundwater Monitoring Plan and Ecological Management Plan; refinement of the existing groundwater model; annual sampling and analysis of well D-1; a prohibition on future development of drinking water sources in the SPIA monitored area; five year site review provisions; and final RCRA closure of AOC 25.

75 Grove Street • Worcester, Massachusetts 01605 • Telephone (508) 792-7650

Fax (508)792-7621

TTD #(508)767-2788

MADEP's concurrence with this remedy is premised on the assumption contained in the remedy that contaminants will be contained by natural barriers within the SPIA. The SPIA ROD anticipates development of a Long Term Groundwater Monitoring Plan designed to demonstrate contaminant containment and which will enhance the Groundwater Model upon which the remedy relies. Because of MADEP's concern for the potential of continued contaminant migration, the Army has agreed that the Plan will require the installation and monitoring of additional sentinel wells or "early warning" wells to monitor off-site groundwater flow. In addition, due to the presence of contaminants from prior Army training activities and the future Army use of the SPIA, MADEP considers the development of an ecological management plan and an environmentally sound plan for the control releases from OB/OD to be of considerable importance and key to MADEP's concurrence in this ROD.

Exposure point concentration of explosive contaminants in AOC 26 groundwater and non-compliance with the total petroleum hydrocarbon MCP Method 1, GW-1 standard as promulgated in 310 CMR 40.0974(2) in four SPIA groundwater monitoring wells continues to be a cause for concern. Therefore, MADEP intends to be vigilant in reviewing the future effectiveness of the remedy. Should future subsurface contaminant migration be observed during the remedial review process, MADEP will take necessary action to ensure that the cleanup standard set forth in CERCLA § 121(d)(2)(A) is met..

The MADEP would like to thank the US Army, particularly Jim Chambers, Fort Devens BRAC Environmental Coordinator, Mark Applebee and Darrel Deleppo of the US Army Corps of Engineers, and Charles George, US Army Environmental Center for their efforts to ensure that the people and the environment of the Commonwealth of Massachusetts are protected in the selection of the remedy for these complex sites.

We look forward to continuing to work with EPA and the Army in the implementation of the remedial alternative at the SPIA and further clean-up activities on the other Devens sites. If you have any questions, please feel free to contact John Regan at (508) 767-2840 or Lynne Welsh at (508) 792-7653, ext. 3851.

Sincerely,

E. Gail Suchman

E. Gail Suchman
Regional Director
DEP-CERO

cc: Fort Devens Mailing List (cover letter only)
Informational Repositories
Jim Chambers, Fort Devens BEC
Jim Byrne, EPA
Charles George, AEC
Mark Applebee, ACOE
Ron Ostrowski, Mass Land Bank
Jay Naparstek, MADEP
Rebecca Cutting, MADEP

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EXECUTIVE SUMMARY

Fort Devens is located in Middlesex and Worcester counties and is within the towns of Ayer, Harvard, Lancaster, and Shirley, Massachusetts. Seventy-three study areas (SAs) and areas of contamination (AOCs) at Fort Devens have been investigated for potential environmental restoration.

This Record of Decision (ROD) addresses AOCs 25 (the Explosive Ordnance Disposal (EOD) Range), 26 the Zulu Ranges), and 27 (the Hotel Range), and groundwater within the South Post Impact Area (SPIA) north and west of the New Cranberry Pond groundwater divide. This area is approximately 964 acres and is referred to in the ROD as the "SPIA monitored-area" (See Figure 1). AOC 41 (Unauthorized Landfill) groundwater was added to the ROD subsequent to the February 21, 1996 public meeting. Additional time for public review and comment was provided. The logic for including the AOC 41 groundwater in this ROD is based on the results of the Final Remedial Investigation (RI) completed for AOC 41 (February 1996). The RI indicates that proposed actions are the same for the SPIA and AOC 41 groundwater, AOC 41 adjacent to the SPIA, and AOC 41 is small in area (6 acres). Adding AOC 41 to this ROD would only increase the total land area covered in this ROD by a small increment. Therefore, the U.S. Environmental Protection Agency-(USEPA) New England recommended including AOC 41 groundwater into this ROD.

This ROD presents the selected remedial action for the site, chosen in accordance with Comprehensive Environmental Response Compensation and Liability Act (CERCLA), as amended by Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for the site. The Administrative Record is a collection of all the documents used by the Army in determining the most appropriate action to take at the SPIA. The Administrative Record is available for public review at the Fort Devens Base Realignment and Closure (BRAC) Environmental Office and the Ayer Town Hall, Ayer, Massachusetts.

The entire SPIA, including the 964 acre SPIA monitored-area, is approximately 1,500 acres and is located within the 4,800-acre South Post section of Fort Devens. The SPIA is, and will be for the foreseeable future, an active weapons and ordnance discharge area used by the Army, the Massachusetts National Guard, and nearby law enforcement agencies for training purposes.

Metals, organic compounds, petroleum hydrocarbons, and explosive chemicals were detected in soil, sediments, groundwater, and surface water during the Remedial Investigation (RI) of SPIA groundwater and the EOD, Zulu, and Hotel Ranges. Using data from the RI, the Army prepared a Baseline Risk Assessment to determine potential risks to human health and the environment under reasonable exposure assumptions.

No unacceptable risks to human health and the environment were found to be associated with the SPIA groundwater, even though levels exceeded Army and USEPA action levels. No hazardous substances were detected in the one public drinking water well on the South Post, Well D-1. Well D-1, which is located near the northeast edge of the SPIA, is used on a limited basis by military personnel during training activities. Also, no unacceptable ecological risk to surrounding habitats were found to be associated with the SPIA groundwater due to the absence of a pathway for any known ecological receptor to access the groundwater.

Risk assessment results for the EOD, Zulu, and Hotel Ranges show that human health risks were identified to be within USEPA risk guidelines for assessed pathways. Risk to on-site ecosystems, in some instances, were found to be outside of USEPA risk guidance, however, ecological risks identified on the EOD, Zulu, and Hotel Ranges were deemed by USEPA-New England to be acceptable due to their low level.

"No action" is the selected remedy for the SPIA groundwater. Under this alternative, no formal remedial action is taken and the site is considered to be left "as is," with no additional institutional controls, containment, removal, treatment, or other mitigating measures. This remedy includes the development and implementation of an Ecological Management Plan and a Groundwater Monitoring Plan. The Groundwater Monitoring Plan will include the installation of sentinel wells to monitor the groundwater. Details of the monitoring plan will be developed jointly by the Army, USEPA-New England, and Massachusetts Department of Environmental Protection (MADEP) within 6 months of ROD signature.

As part of this remedy, the Army will ensure the following:

- Groundwater monitoring will continue for potential contaminant migration out of the SPIA. Monitoring wells will be sampled for explosives, Target Compound List (TCL), and the Target Analyte List (TAL) metals annually. The Army will rerun the groundwater model to incorporate data from new sentinel well(s) and ascertain any potential impacts to MCI Shirley.

- A Groundwater Monitoring Plan for the South Post will be developed, that will include detailed groundwater monitoring at discharge points. The plan will include specific information on additional sentinel wells to monitor potential off-site groundwater flow. The groundwater monitoring plan will be completed within 6 months of ROD signature.

- Well D-1 will be sampled annually and analyzed for explosives and Massachusetts and Federal drinking water requirements (MMCLs/MCLs). No new drinking water sources will be developed within the SPIA.

- An Ecological Management Plan will be developed and implemented to monitor any impacts to ecosystems in the SPIA.

Monitoring reports will include a description of site activities and a summary of analytical results. Reports will be submitted to MADEP and USEPA annually.

"No action" is also the selected remedy for the surface water, sediment, and soils at the EOD, Zulu, and Hotel Ranges. The Army has submitted a Closure Report under the Resource Conservation and Recovery Act (RCRA) Subpart X; formal approval of the closure of EOD Range will occur prior to ROD signature.

Once the final ROD is approved, the Fort Devens environmental staff will ensure the development and implementation of a long-term Ecological Management Plan. The details of this plan will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Service, and MADEP within 6 months of the ROD signature.

This site, as required by CERCLA, will be subject to 5 year reviews. During a 5 year review, an assessment is made as to whether the implemented remedy is protective of human health and the environment and whether the implementation of alternative remedial actions are needed to ensure adequate protection. Should on-site hazardous substances migrate off-site, the Army will take the necessary and appropriate actions to protect human health and the environment as required under CERCLA. More frequent reviews may be conducted if site conditions change. Should the Army close and/or transfer this property, an Environmental Baseline Survey (EBS) will be conducted. The EBS will be provided to the USEPA-New England and MADEP for comment.

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COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
CENTRAL REGIONAL OFFICE

WILLIAM F. WELD
Governor

ARGEO PAUL CELLUCCI
Lt. Governor

TRUDY COXE
Secretary

DAVID B. STRUHS
Commissioner

MEMORANDUM

TO: Gail Suchman, Regional Director, CERO

FROM: Lynne Welsh, Section Chief, CERO Federal Facilities

DATE: July 2, 1996

SUBJECT: South Post Impact Area and Area of Contamination 41 Groundwater and Areas of Contamination 25, 26 and 27, Fort Devens, Massachusetts; Evaluation of Remedial Action Record of Decision under M.G.L. c. 21E and the Massachusetts Contingency Plan (MCP)

I. INTRODUCTION

The Record of Decision (ROD) addresses AOCs 25 (Explosive Ordnance Disposal (EOD) Range), 26 (Zulu Ranges), and 27 (Hotel Range and AOC 41 (unauthorized dumping area) groundwater and groundwater within the South Post Impact Area (SPIA). The site locations are depicted in Figure 1 and are described below.

SPIA The approximately 1500 acre SPIA is located within the 4800 acre South Post section of Fort Devens (Figure 1). The SPIA is generally bounded by Old Turnpike Road, Firebreak Road, the southern portion of Harvard Road, Trainfire Road and Dixie Road. The SPIA includes AOCs 25, 26, 27 and 41 as well as several study areas, and a number of ranges along Dixie Road and Trainfire Road that are not designated as AOCs. The SPIA area covered in the ROD encompasses the 964 acres north and west of New Cranberry Pond - unnamed stream wetland groundwater divide. This area is referred to as the SPIA monitored-area. The AOCs and the SPIA are detailed in Figure 1.

EOD Range (AOC 25) is located east of Firebreak Road, approximately two miles south of the main entrance to the South Post. The site is rectangular and measures approximately 600 feet by 1,500 feet.

Zulu Ranges (AOC 26) are located 2,000 feet north of the EOD range, approximately 1.6 miles southwest of the main entrance to the South Post. The Zulu Ranges cover approximately 16 acres and consist of two adjacent land tracts (Zulu 1 and Zulu 2).

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Hotel Range (AOC 27) is adjacent to Cranberry Pond and is located approximately one mile south of the main entrance to the South Post. The Hotel Range covers approximately 23 acres and is currently used exclusively for firing small caliber weapons. The area of concern where open burning/open detonation of explosive materials is located exclusively south of Old Turnpike Road.

Unauthorized Landfill (AOC 41) is located immediately north of New Cranberry Pond, approximately two miles south east of the main entrance to South Post.

The ROD presents the selected remedial action for the site, chosen in accordance with CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA).

EPA has scheduled the signing of the ROD documenting the selection of the proposed remedial action for the South Post Impact Area (SPIA) and Area of Contamination (AOC) 41 groundwater and AOCs 25, 26 and 27 for the end of June 1996, The ROD will detail the Army's decision to implement a no-action ROD that addresses the principal known threats at the site through the design and implementation of a long term Groundwater Monitoring Plan and a long term Ecological Management Plan.

This memorandum briefly describes the site, the reasons for implementation of a no-action ROD and a discussion of its effectiveness at controlling site risks. The alternative is then evaluated with respect to the statutory requirements of M.G.L c. 21E and the regulatory requirements of the MCP. The purpose of this memorandum is to outline the Massachusetts Department of Environmental Protection's (MADEP) reasoning leading to concurrence with the ROD.

The proposed plan was initially released by the Army for thirty day public comment on February 1, 1996. This plan described a no-action remedy for the SPIA and AOCs 25, 26 and 27. These sites are collectively known as Functional Area (FA) I. Concurrent with the release of the proposed plan, the Army published a Preliminary Draft Record of Decision for the South Post Impact Area Groundwater and Areas of Contamination 25, 26 and 27. Subsequent to the publication of this plan, a decision was made by the Base Cleanup Team (BCT) to incorporate AOC 41 groundwater into the plan due to its South Post location and similarities to the FA I sites. The inclusion of AOC 41 precipitated the publication of a Draft Final Record of Decision for the South Post Impact Area and Area of Contamination 41 Groundwater and Areas of Contamination 25, 26 and 27. No proposed plan was published to reflect this draft ROD. Instead, the final draft served as the vehicle for a second public comment period which was conducted during the period of May 17 through June 4, 1996.

I. PREFERRED REMEDIAL ACTION ALTERNATIVE

The remedial alternative preferred by the Army and described in the ROD addresses the principal known threats to the AOCs and the SPIA through the implementation of a no-action ROD. The Army's preferred remedy is presented in Section VIII and IX of the Final Record of Decision for the South Post Impact Area and Area of Contamination 41 Groundwater and Areas of Contamination 25, 26 and 27. No CERCLA Feasibility Study was conducted for the SPIA sites. However, it was concluded from the results of the Remedial Investigations (RI) and the human health and ecological risk assessments that no further action was necessary for the sites. Based on these conclusions and given that the Army will continue to be active within the SPIA, no further action or remediation was recommended for the subject sites and no remedial action objectives were set.

"No Action" is the selected remedy for the SPIA and AOC 41 groundwater as well as soils and sediments at AOCs 25, 26, 26. Under this alternative, no formal remedial action is taken and the site is left "as is" with no additional institutional controls, containment, removal, treatment, or other mitigating measures. However, the remedy does require the design and implementation of a Long Term Groundwater Monitoring Plan and Ecological Management Plan. The ROD does not preclude further remediation of soils, sediments and solid waste at AOC 41. The Army has submitted a Closure Report under the RCRA Subpart X. Formal approval of the closure of AOC 25, the EOD range, will occur prior to ROD signature.

he groundwater modeling plan will include sentinel wells to monitor the groundwater. The MADEP, USEPA and the U.S. Army will jointly develop details of the monitoring plan within six months of ROD signature. As part of this remedy, Fort Devens will ensure the following:

- Groundwater monitoring for potential contaminant migration from the SPIA will be implemented. Monitoring wells will be installed to monitor groundwater from AOCs 25, 26, 27 and 41. The installation of wells at these locations provides the capacity to monitor groundwater flow emanating from the SPIA.

- The monitoring wells will be sampled for explosives, target compound list (TCL) and the target analyte list (TAL) metals annually in the fall.

- A Groundwater Monitoring Plan for the South Post will be developed that will include detailed groundwater monitoring at discharge points. The plan will include specific information on additional sentinel wells to monitor off site groundwater flow. The plan will be developed and implemented within six months of ROD signature. Monitoring reports will include a description of site activities and a summary of analytical results. Further assessment and/or remedial action will be implemented if the long term monitoring plan indicates an increase or transport of contaminants.

- The South Post groundwater model will be refined with the inclusion of the new wells. The model will be expanded to reflect any potential impacts on MCI Shirley.

- Well D-1, the South Post drinking water well, will be sampled annually and analyzed for explosives and Massachusetts and Federal drinking water requirements (MMCLs & MCLs). No new drinking water supplies will be developed within the SPIA.

- An Ecological Management Plan will be developed and implemented within six months of ROD signature.

The remedy selected for the SPIA and AOC 41 Groundwater and AOCs 25, 26, and 27 are protective of human health and the environment. Risks to human health were found to be within USEPA guidelines. Risks to ecological receptors were found to be minimal. Toxicity tests AOC 26 indicate that metals, explosives, and other organic compounds found on the sites do not pose unacceptable risks to plants or wildlife.

The Army will maintain control of the South Post for future military training activities. Public access to the site will continue to be restricted, and admittance by unauthorized personnel will be prohibited. Currently the South Post is enclosed by a fence and legal access can only be gained through gates that are controlled by the Army Range Control Office. However, if the Army were to surrender control of the South Post and release the land for other purposes, additional assessments would be required by the Army. Should the Army close or transfer the property, an Environmental Baseline Survey (EBS) will be conducted. The EBS will be provided to both the USEPA and MADEP for comment.

The SPIA and AOCs will be subject to five year CERCLA reviews. During the reviews, an assessment will be made as to whether the implemented action remains protective of human health and the environment and whether additional remedial actions are necessary.

III. SITE HISTORY AND DESCRIPTION

A. SITE HISTORY

Fort Devens was established as Camp Devens in 1917. It was used as a temporary training camp for soldiers from the New England area. The camp became a permanent installation in 1931 and was renamed Fort Devens. Throughout its history, Fort Devens has served as a training and induction center for military personnel and as a unit mobilization and demobilization unit. The installation was used in this capacity, to varying degrees, during World Wars I and II, the Korean War, the Vietnam Era, and operations Desert Shield and Desert Storm. The primary mission of Fort Devens is to command, train, and provide logistical support for nondivisional troop units and to support and execute Base Realignment and Closure (BRAC) activities. The installation also supports the Army Readiness Region and the National Guard units in the New England area.

The South Post consists mainly of undeveloped land. In the past, some logging and limited farming have taken place. The ranges on the South Post are currently used for mortar, light anti-tank, small arms and grenade detonation. No artillery or heavy weapons are fired at Fort Devens. Managed forest accounts for much of the remainder of the area.

At least some portion of the SPIA has been used for military training since the inception of Fort Devens as Camp Devens in 1917. At various times, demolition training and OB/OD have been conducted at the EOD, Zulu, and Hotel Ranges. A discussion of land-use activities at these ranges follows.

EOD Range (AOC 25) - From 1979 to 1992, approximately 1,200 pounds per year of explosives and ammunition were disposed of in the disposal area by OB/OD. The Army has submitted a Closure Report under the Resource Conservation and Recovery Act (RCRA) Subpart X; formal approval of the closure of EOD Range will occur prior to ROD signature. Currently, the range operates under a RCRA emergency permit and is used once or twice a year. A 1-acre disposal area is located along the southeastern boundary of the range.

Zulu Ranges (AOC 26) - Prior to 1979, the range was used for OB/OD of waste explosives and associated waste items. Zulu 1 is primarily used for demolition training. The demolition training area is located in the center of Zulu 1. Zulu 2 is used primarily as a practice range for hand grenade training. The grenade training area is located on the eastern end of Zulu 2 and consists of two concrete bunkers, which are used for cover and protection, and two sand pits, which are used for receiving grenades.

Hotel Range (AOC 27) - Before 1979, the Hotel Range was used for OB/OD of small arms, smoke grenades, and pyrotechnics. After 1979, the Hotel Range was modified and extended to the north side of the Old Turnpike Road and used for M-16s and small caliber weapons. Prior to 1989, the range was used as an M-70 range, but after 1989 the range was modified to an M60-SAW range.

Unauthorized Landfill (ACO 41) - AOC 41 is approximately 6 acres in size and is located between Harvard Road, New Cranberry Pond, and an eastern portion of the impact area in the South Post (Figure 11 of Appendix A). The landfill material occupies and area approximately 75 feet by 75 feet in the central portion of the site. It appears to have been associated with an old brick-making kiln that was operated in this area in the 1800s. The AOC is overgrown with trees and swampy vegetation and no records are available detailing when the site was used or what type of material was disposed of in this area. It is believed that this AOC was used until the 1950s for disposal of nonexplosive military and household debris. Miscellaneous debris is scattered over a small hill located approximately 75 feet north of New Cranberry Pond. The hill slopes down to a low area at the base of the hill. The ground surface elevation rises to the south, then slopes again down to New Cranberry Pond.

In conjunction with the Army's Installation Restoration Program (IRP), Fort Devens and the U.S. Army Environmental Center (USAEC, formerly the U.S. Army Toxic and Hazardous Materials Agency) initiated a Master Environmental Plan (MEP) in 1988. The MEP assesses the environmental status of Study Areas (SA), specifies necessary investigations, and provides recommendations for response actions with the objective of identifying priorities for environmental restoration at Fort Devens. The MEP recommended that a record search be conducted to better define past and current activities. It also recommended that the extent of contamination be determined by collecting soil samples and analyzing the samples for the United States Environmental Protection Agency (USEPA) hazardous substance list compounds and total petroleum hydrocarbons (TPHC). The MEP also suggested installing monitoring wells if hazardous substances were detected in deeper soils.

On December 21, 1989, Fort Devens was placed on the NPL. Fort Devens was listed as an NPL site because hazardous substances were detected at two sites other than the EOD, Zulu, and Hotel Ranges (volatile organic compound (VOC) contamination in the groundwater at the Shepley's Hill Landfill and metal contamination in the groundwater at the Cold Spring Brook Landfill). A Federal Facilities Interagency Agreement (IAG) was developed and signed by the Army and USEPA-New England (Region I) on May 13, 1991 and finalized on November 15, 1991. The IAG provides the framework for implementing the CERCLA/SARA process at Fort Devens.

Under Public Law 101-510, the Defense Base Realignment and Closure Act of 1990, Fort Devens was selected for cessation of operations and closure. However, the SPIA will be retained by the Army for continued use as a training range. An important aspect of BRAC actions is to determine environmental restoration requirements before property transfer can be considered. As a result, an Enhanced Preliminary Assessment (PA) was performed at Fort Devens to address areas not normally included in the CERCLA process, but that required review prior to base closure. Although the Enhanced PA covers MEP activities, its main focus is to determine if additional areas require detailed records review and site investigation. The Enhanced PA also provides information and procedures to investigate installation-wide areas requiring environmental evaluation. A final version of the Enhanced PA report was completed in April 1992.

RIs were prepared for the SPIA Groundwater and EOD, Zulu, and Hotel Ranges. These were submitted to the USEPA-New England and the Massachusetts Department of Environmental Protection (MADEP) in August 1994. An RI was completed for AOC 41 in February 1996. A Proposed Plan and summary Fact Sheet have been prepared for the SPIA and AOC 41 Groundwater and EOD, Zulu, and Hotel Ranges. These documents have been placed in the Administrative Record and are available for public review at the Fort Devens BRAC Environmental Office and the Ayer Town Hall, Ayer, Massachusetts.

B. NATURE AND EXTENT OF CONTAMINATION

RIs were conduction for the EOD, Zulu, Hotel Ranges and AOC 41 to characterize the nature and extent of site-related contamination. Samples from groundwater, surface water, sediments, and soil were taken. Chemical analyses were performed on the samples taken from the various media, and the results were compared with screening values previously developed. The results of the chemical analyses were reviewed to determine whether hazardous substances detected were related to site activities or were naturally occurring.

1. GROUNDWATER

Groundwater at Fort Devens occurs largely in the permeable glacial-deltaic outwash deposits of sand, gravel, and boulders. Groundwater is found under the South Post at depths of 0 to 60 feet. The flow of groundwater on the South Post is determined by the bedrock and till topography. A number of springs can be found around the circumference of SPIA.

Groundwater in the vicinity of the ranges discharges to surface water before it leaves the South Post. More than 50 percent of the SPIA overlies a medium yield aquifer that is a potential source of drinking water. MADEP concurrence with this ROD constitutes MADEP's agreement that the site is adequately regulated under the provisions of 310 CMR 40,000, the Massachusetts Contingency Plan. Measurements of hydraulic head in the groundwater and in streams and ponds within the South Post show that the streams around the SPIA are gaining streams (i.e., groundwater discharges into the streams). Groundwater flow direction is complex in certain areas of the SPIA. At the EOD Range, overall groundwater discharge is to the east from the north end of the disposal area. At the Zulu Ranges, groundwater moves north toward a wetland and Slate Rock Brook. At the Hotel Range, groundwater flow is east to Cranberry Pond and north. AOC 41 groundwater generally flows east towards the Nashua River, however, there is some local flow, south, to New Cranberry Pond. Groundwater models developed in conjunction with the RI report indicate that there are several groundwater divides in the area and that most groundwater discharges to surface water before leaving the SPIA. Inconsistencies in the groundwater models are expected to be resolved during future modeling efforts which will incorporate data from the proposed new sentinel wells.

Fort Devens withdraws groundwater from wells on the Main Post and the North Post. The Fort maintains a transient noncommunity supply well, Well D-1, on the South Post along Dixie Road at Echo Range (E) near the north end of Alpha Range (A) (Figure 1 of Appendix A). This well is not used to serve the general public, but is used to supply troops who train on the South Post. These troops spend no more than 2 weeks per year at the site. Fort Devens Range Control Staff do not use this well and there are no plans to provide connections to the Range Control Offices.

Groundwater quality samples collected from Well D-1 show that no chemicals or metals were detected at concentrations above USEPA guidelines. Specifically, five samples have been collected from Well D-1 (May 1991, June 1991, two samples in April 1992, and March 1993) and were analyzed for USEPA's Target Analyte List (TAL) metals, USEPA's Target Compound List (TCL), total organic carbon (TOC), and water quality parameters. A summary of results is presented in Table 1 in Appendix E of the ROD. Only one chemical, bis(2-ethylhexyl) phthalate, exceeded a screening value (USEPA's Maximum Contaminant Level (MCL)). As two of the samples show no detectable concentration of bis(2-ethylhexyl) phthalate, the RI Report attributes the finding of this chemical to sampling or laboratory error.

Groundwater samples were collected from the SPIA monitoring wells and the data is presented in Table 8-2 of the final RI.

Groundwater quality samples for the EOD and Zulu Ranges were taken in November 1992, March 1993, and June 1993 (Figures 2 and 3 of Appendix E show well locations). Samples were collected from eight monitoring wells at the EOD Range and seven wells at the Zulu Ranges. At the Hotel Range, groundwater samples from four wells were taken in September 1992 and January 1993, and an additional six wells were samples as part of the RI in August and November 1993.

The samples taken at the EOD Range were analyzed for TAL metals and explosives, as well as hardness. The samples taken at the Zulu Ranges were analyzed for TCL organics, TAL metals, explosives, and TPHC, as well as hardness. Samples taken at the Hotel Range were analyzed for TAL metals, TCL pesticides, explosives, TPHC, and water quality parameters.

Two rounds of off-site laboratory analytical samples were collected during each of the field investigations conducted at AOC 41. The focus was on the 1994 RI sampling results (Rounds Five and Six) because these rounds included all new and existing monitoring wells. The results of the 1994 RI sampling analysis are presented in Section 7.0 of the RI Report.

SPIA - Sampling events from the SPIA monitoring wells indicated the presence of explosives (dinitrobenzene and cyclonite) in three wells. Although their concentrations were low, no obvious source of the contamination was found. Additionally, four wells were found to have low concentrations (below MCP Method 3 UCL, but exceeding Method 1 standard for GW-1) of total petroleum hydrocarbons and one unfiltered sample was found to contain lead. The results of the SPIA monitoring are contained in Table 8-2, Volume I of the RI.

EOD Range (AOC 25) - Unfiltered samples from the EOD Range showed levels of iron, aluminum, and other metals above the concentrations found in local background samples. Background samples are those collected in a similar medium (i.e., water, soil, sediment) that are not believed to be contaminated. Samples that were filtered to eliminate suspended solids (i.e., soil and sediments to which metals may adhere) and measure only the metal dissolved in the water, showed concentrations several orders of magnitude lower than in the unfiltered samples (Tables 2 and 3 of Appendix E of the ROD). Manganese and calcium exceeded background concentrations in filtered samples. None of the metals in filtered samples, however, exceeded health-based screening values described in the RI report. Four explosives or explosive-related organic compounds (Cyclonite (RDX), cyclotetramethylene tetranitramine (HMX), pentaerythritol tetranitrate (PETN), and trinitrotoluene (TNT) were also detected in the samples. Only RDX exceeded the screening value. Organic compound results are shown on Figure 5 of Appendix A.

Zulu Ranges (AOC 26) - Metals concentrations in the Zulu Ranges groundwater samples (unfiltered) were higher than concentrations found in local background samples. As with the samples collected in the EOD, filtered samples showed lower concentrations than the unfiltered samples in the Zulu Ranges (Tables 4 and 5 of Appendix E). The maximum concentration of manganese in filtered samples (62 micrograms per liter, (μg/L)) exceeded the screening value (50 μg/L). Several explosives or explosive-related organic compounds (RDX, HMX, and TNT) were also detected in these samples. RDX at 390 μg/L exceeded its health-based screening value (2 μg/L). The monitoring wells showing the most significant concentrations of explosives-related substances are located where grenade-throwing and demolition are practiced. The groundwater from the Zulu Ranges discharges to surface water located within the South Post. Organic compound results are shown on Figure 6 of Appendix A.

Hotel Range (AOC 27) - Metals concentrations in the EOD Range groundwater samples (unfiltered) also exceeded concentrations found in local background samples. Filtered samples showed lower concentrations than the unfiltered samples (Tables 6 and 7 of Appendix E). The maximum concentration of manganese in filtered samples (74.1 μg/L) exceeded the screening value of 50 μg/L. In addition, aluminum at concentrations up to 72.3 μg/L exceeded the screening value (50 μg/L) in some filtered samples. All wells in this area indicated some level of explosives contamination. RDX (up to 17.9 μg/L) and 1,3-dinitrobenzene (up to 1.82 μg/L) exceeded their screening values (2 μg/L and 1 μg/L, respectively). Organic compound results are shown on Figure 7 of Appendix A.

Unauthorized Landfill (AOC 41) - Groundwater at AOC 41 is contaminated with several VOCs. However, three VOCs (1,1,2,2-TCA, PCE and TCE) have been found to have the widest dispersion and concentrations. 1,1,2,2-TCA was detected at a maximum concentration of 170 μg/L, PCE was detected at a maximum concentration of 10 μg/L and TCE at a maximum concentration of 220 μg/L. The groundwater results also indicated that several inorganics (aluminum, arsenic, beryllium, chromium, cobalt, iron, lead, manganese, and nickel) were present in unfiltered groundwater samples above the established Fort Devens background and drinking water standards. However, a comparison of these results to filtered groundwater samples and TSS concentrations indicate that the unfiltered concentrations are a likely result of suspended solids and not dissolved site-related contaminants.

No obvious source of VOC contamination was precisely located, however, it was determined that the waste material located at AOC 41 was not the source.

2. SURFACE WATERS

The SPIA is drained primarily by two streams, Slate Rock Brook north and west of the SPIA and an unnamed stream in the southeast portion of the site.

EOD Range (AOC 25) - No surface water is known to exist within or adjacent to the EOD. During the RI, one surface water sample was collected from the emergence of Slate Rock Brook near the EOD Range, although the RI report notes that the sample is not representative of surface water originating at the EOD Range. This sample was analyzed for TAL metals, TCL organics, explosives, and water quality parameters. Several metals in the sample exceeded USEPA's Ambient Water Quality Criteria (AWQC) for the Protection of Aquatic Organisms (Freshwater Chronic). Sample analysis results are presented in Table 8 of Appendix E.

Zulu Ranges (AOC 26) - Thirteen surface water samples were collected for the RI from wetlands and drainage areas potentially affected by activities at the Zulu Ranges. Figure 8 of Appendix A shows surface water sampling locations in the Zulu Ranges. These 13 samples were analyzed for TCL organics, TAL metals, explosives, TPHC, and water quality parameters. Sample analysis results are presented in Table 9 of Appendix E.

Analysis of the Zulu Range samples collected during the RI showed two metals exceeding USEPA AWQC: arsenic detected at a concentration of 7.18 $\mu g/L$ (AWQC of 0.018 $\mu g/L$) and lead at a maximum concentration of 106 $\mu g/L$ (AWQC of 3.2 $\mu g/L$). Earlier samples collected as part of a previous investigation, the Site Inspection (SI), showed higher concentrations than those found in the RI samples. The differences between the two investigations may reflect different sampling methods, field conditions, or laboratory procedures. Explosives (including RDX and HMX), as well as several organic compounds, were detected in samples from the Zulu Ranges. One of the thirteen samples contained a detectable concentration of DDD (0.086 $\mu g/L$) that exceeded the AWQC (0.00083 $\mu g/L$).

Hotel Range (AOC 27) - Nine surface water samples were collected for the RI within Cranberry Pond, adjacent to the Hotel Range. (Three samples had been collected earlier during the SI.) The six RI samples were analyzed for TCL VOCs, pesticides, and polycyclic aromatic hydrocarbons (PAHs); TAL metals; explosives; TPHC; and water quality parameters. Figure 4 of Appendix A shows surface water sampling locations in the Hotel Range. Sample analysis results are presented in Table 10 of Appendix E.

Several metals were detected in the surface water samples collected in the Hotel Range. One metal, lead, was detected at a concentration of 18.2 $\mu g/L$, which exceeded the AWQC (3.2 $\mu g/L$). Trace levels of explosives or explosive-related compounds were detected in these samples.

Unauthorized Landfill (AOC 41) - The results of the soil sampling completed during the three field investigations indicated that some contamination was present on the surface soil of the waste material. The remediation of the soil contamination will be completed under Massachusetts Solid Waste Regulations.

3. SEDIMENTS

Samples of sediments were taken in conjunction with the surface water samples discussed above. The samples taken at the EOD Range, Zulu Ranges, and Hotel Range were analyzed for TAL metals, TCL organics, explosives, TPHC, TOC, and grain size.

SPIA - Three sediment samples collected from the unnamed wetland southwest of New Cranberry Pond exhibited exceedances of local background. However, the metal concentrations in sediments appeared to be influenced by sorbed solids on organic carbon. There is no evidence that the metals present in the sediments are related to contamination, but may be due to the high levels of total organic carbon present in the wetlands.

EOD Range (AOC 25) - Several metals in the EOD Range sample exceeded the concentrations detected in a local background sediment sample. Sample analysis results are presented in Table 11 of Appendix E.

Zulu Ranges (AOC 26) - Most metals in the Zulu Range samples were detected above background concentrations in at least one sample. Explosives, pesticides, VOCs, and TPHC were also detected. Sample analysis results are presented in Table 12 of Appendix E. No screening values were established in the RI for organic compounds in sediments.

Hotel Range (AOC 27) - Most samples collected in Cranberry Pond contained some metal concentrations in excess of those naturally occurring in the sediment. However, the data indicate that only one sample is unequivocally contaminated with metals. The explosive 4-amino-2,6-dinitro toluene was detected in one third of the samples. VOCs, pesticides, TPHC, and two PAHs: benzo (b) fluoranthene and pyrene were also detected. Sample analysis results are presented in Table 13 of Appendix E. Complete analytical results are presented in the RI Report.

4. SOIL

The predominant soil in the South Post, including the areas of investigation, is the Hinkley-Merrimac-Windsor (HMW) Association. This soil consists of loams or sandy loams, loamy fine sands, and other sands over sand or sand and gravel. In the active ranges, including the EOD, Zulu, and Hotel Ranges, the natural soils are disturbed. A soil mapping of the SPIA found that, almost without exception, the soils are sandy and well drained. The exceptions are in wetland areas outside the three ranges.

EOD Range (AOC 25) - Surface and subsurface soil samples collected during the RI at the EOD Range in November 1993 were analyzed for TAL metals, explosives, and TPHC. Figure 8 of Appendix A shows soil sampling locations in the EOD Range. Several metals were detected at levels above background in at least one sample. Copper and zinc exceeded the background concentration in three surface samples. Two explosives were also detected in EOD Range surface soil samples: nitrocellulose (detected in two samples) and nitroglycerine (detected in one sample). Low levels of TPHC were detected (maximum concentration of 45.2 $\mu g/g$). None of the substances detected exceeded the health-based soil screening criteria established for the RI7. Sample analysis results are presented in Table 14 of Appendix E.

Zulu Ranges (AOC 26) - Surface and subsurface soil samples were taken at the Zulu Ranges as part of the SI and RI. Figure 9 of Appendix A shows soil sampling locations in the Zulu Ranges. These samples were analyzed for TCL organics, TAL metals, explosives, and TPHC. Although several metals exceeded background concentrations in at least one surface and subsurface sample, none of the metals detected exceeded the health-based screening values. PAHs were detected in up to three surface and subsurface samples. One of the PAHs, benzo (b) fluoranthene (0.81 $\mu g/g$), exceeded the screening concentration (0.7 $\mu g/g$). RDX and TPHC was also detected. The maximum concentration of RDX in subsurface soil (38 $\mu g/g$) exceeded the health-based screening level (26 $\mu g/g$). Sample analysis results are presented in Table 15 and 16 of Appendix E.

Hotel Range (AOC 27) - Subsurface soil samples were collected from boreholes at the Hotel Range and analyzed for TPHC, TAL metals, explosives, and TCL organics. Figure 10 of Appendix A shows borehole locations. None of the metals exceeded the screening values. Low levels of TPHC (maximum concentration of 75.6 $\mu g/g$), below the screening level of 5,000 $\mu g/g$, were detected in some samples. VOCs and pesticides were also detected at concentrations just above the detection limit. These levels were well below screening values.

Unauthorized Landfill (AOC 41) - A March 1995 soil gas survey conducted in the shallow soils around monitoring wells 41M-93-03X and 41M-94-03B in an attempt to find the source area for the chlorinated solvent contamination detected in the groundwater. The soil gas survey indicated two detectible concentrations of TCE around the two wells. Soil samples collected from the same TerraProbe points used in the soil gas survey indicated TCE to be present in soils adjacent to the two wells at the 30 to 37 foot level.

Soil samples collected from five test pits in the area did not indicate the presence of any target analytes. Soil samples were collected from the monitoring well borings during their emplacement in October 1994 indicated the presence of TCE below the 30' BGS level. The versatile distribution of the TCE contamination coincides with the depth of the water in the boring.

Therefore, it appears that the TCE contamination is due to the adsorption of TCE from groundwater to soil particles within the zone of the water table fluctuation. The area around 41M-93-03X and 41m-94-03B does not appear to be the source of the groundwater contamination.

IV. REVIEW SUMMARY

A. DOCUMENTS REVIEWED

Numerous documents/reports have been produced by various parties as part of the remedial investigations on Shepley's Hill Landfill. The reports that served as a basis for selection of the remedial actions and which have been reviewed by the USEPA and MADEP are included in the Administrative Record for this site.

B. PUBLIC PARTICIPATION

The Army has kept the community and other interested parties apprised of site activities through regular and frequent informational meetings, fact sheets, press releases, and public meetings.

The Army has developed and implemented a Community Relations Plan. As part of this plan, the Army established a Technical Review Committee (TRC) in March 1991. The TRC includes representatives from the USEPA, U.S. Army Environmental Center, MADEP, local officials and the community. The committee provided review and technical comments on work products, schedules, work plans and proposed activities at the Fort Devens sites. The TRC met quarterly until January 1994 when it was replaced by the Restoration Advisory Board (RAB). A RAB is formed when a military installation closure involves transfer of property to the community. The RAB consists of 28 members (fifteen original TRC member plus thirteen new members who are representatives from the Army, USEPA, MADEP, local governments and citizens of local communities. It meets on a monthly schedule. Specific responsibilities include addressing cleanup issues such as land use and cleanup goals, reviewing plans and documents, identifying proposed requirements and priorities, and conducting regular meetings which are open to the public.

The proposed plan for the SPIA groundwater and AOCs 25, 26 and 27 was presented at the February 1, 1996 RAB meeting. During the week of January 29, 1996, the Army published notices in local newspapers concerning the proposed plan and public hearing and distributed a summary Fact Sheet to 647 interested parties. The proposed plan was made available to the public at the Fort Devens BRAC Environmental Office and the Ayer Town Hall.

From February 1, 1996 to March 1, 1996, the Army held a thirty day public comment period to accept public comments regarding the proposed plan and other SPIA documents. On February 21, 1996 the Army held a formal public meeting at Fort Devens to discuss the Proposed Plan and to accept any verbal comments from the public. A transcript of this meeting is included in the responsiveness summary of the ROD.

Subsequent to this meeting, a determination was made to expand the ROD to encompass groundwater within AOC 41, an Unauthorized Landfill. A final Proposed Plan describing this change and a final Record of Decision was published on May 17, 1996. The decision and information regarding AOC 41 was included in this version of the ROD in Section IX, Documentation of Significant Changes. Concurrent with the publication of the new proposed plan, the Army initiated a new public comment period. This period, not required under CERCLA, ran for twenty days and ended on June 4, 1996.

All supporting documentation for the decision regarding SPIA groundwater and AOCs 25, 26, 27 and 41 has been placed in the administrative record for review. The administrative record is available for public review at the Fort Devens BRAC Environmental Office and the Ayer Town Hall.

V. CONCLUSIONS AND RECOMMENDATIONS

A. SPIA

The human health risk assessment found that there are no risks to human health from the SPIA activities, above the range considered acceptable by the USEPA under CERCLA and the MADEP under the MCP.

No significant risks to plants or wildlife were identified in SPIA soils, but potential risks were noted for aquatic life from surface water and sediments. A moderate impact on macroinvertebrates at one station in Slate Rock Brook was observed, but toxicity testing, using water from the contaminated wetlands north and south of Zulu Ranges, did not identify any site related impacts. Continued observation of wildlife on the SPIA is recommended to evaluate the impacts of continuing Army activities.

No further investigation or remedial actions are recommended. For this reason no site specific remedial action objectives were selected.

B. AOC 25 (EOD Range)

Soils at the EOD Range ordnance detonation area significantly exceeded background in beryllium, cobalt, copper, iron, manganese, mercury, nickel, selenium, and zinc, although only zinc and copper exceeded background three times, and only beryllium, manganese, and selenium exceeded background twice. The remaining four metals exceeded background in only one sample which was significantly higher in silt and clay than other samples from the site. Nitrocellulose, nitroglycerine, and TPHC were also found in surface soils and TPHC and a trace of tetrachloroethene were noted in subsurface soils. The two RCRA TCLP soil samples showed no levels exceeding soil toxicity characteristics. Metals in filtered groundwater samples showed increased concentrations and increased frequency of detection in downgradient wells when compared to a local background well, but only manganese exceeded its MCL. Manganese levels are probably natural since they cannot be correlated to site activities and manganese is above MCL in many Fort Devens wells. Several explosives were noted in groundwater within the AOC, but only Cyclonite exceeded its screening value, and then only in one well.

Since the EOD will continue to be part of the SPIA under Army control, then the groundwater will not be available to the public for human consumption and will not be a completed pathway of exposure. As such, the risk of groundwater consumption was not estimated. Other pathways of exposure examined gave reasonable maximum exposures resulting in the assessed rick being below those deemed acceptable by the USEPA under current Superfund policy. This human health risk assessment addresses the toxicological risks from explosives but does not address the far more substantial physical risks of unexploded ordnance located at EOD and throughout the SPIA.

The ecological risk assessment concluded that there were potential risks to small mammals and to plants in the ordnance detonation area, under reasonable maximum exposures, but not under average exposures. Based on the marginal exceedences of toxicity reference values, the potential for adverse ecological toxicological effects are minimal. The ecosystems in the general vicinity of the site have not been impacted by the EOD range, and the analytes detected are not ecologically significant. The ecological risk assessment concluded that no further action is necessary at the EOD range to further investigate or mitigate ecological risks from soil or other media in which analytes were detected. The ecological risk assessment addressed toxicological risks but did not evaluate the much more substantial physical risks from unexploded ordnance which will continue at EOD and throughout the SPIA.

From the extensive environmental investigations and ecological and human health risk assessments conducted on the EOD range, it is concluded that no further investigation or remediation is warranted at AOC 25, and no remedial action objectives will be developed.

<u>C. AOC 26 (Zulu Range)</u>

Soils at AOC 26 were found to be contaminated with a number of chemicals, the most important of which were explosives, primarily Cyclonite; pesticides, primarily DDT; some PAHs; and traces of PCBs and volatiles. TCLP testing for surface soils showed only barium and chloroform present, both below RCRA toxicity characteristic levels. Lead, zinc, antimony, arsenic, beryllium, and cadmium exceed background but only lead and zinc could be related to possible site activities. Groundwater is contaminated with explosives, mainly Cyclonite (exceeding a Drinking Water Health Advisory level used as a screening value) and HMX, and by bis(2-ethylhexyl) phthalate, also at levels exceeding a screening value, and it discharges both to surface water and sediment in the wetland north of the ranges and probably to Slate Rock Brook north of the ranges. Unfiltered groundwater shows several elevated metals, but filtered groundwater shows exceedances of drinking water standards only for manganese. Surface water showed explosives, mainly Cyclonite, and methylphenol and traces of VOC. Contaminants of Potential Concern (COPCs) were found in the wetlands both south and north of the ranges. Sediments in the wetlands showed explosives, pesticides, and traces of volatiles. Many metals exceeded background and were selected as COPCs. Because the ranges will remain active as a training facility and under DOD jurisdiction for the foreseeable future, the groundwater pathway is considered incomplete and was not assessed. Estimated human health risks of exposure under any probable scenario do not exceed the upper boundary of acceptable risks us by the USEPA under current Superfund guidance. These are 1^{-6} lifetime risk of cancer and a Hazard Index (HI) of one.

The ecological risk assessment found that some soils data exceed reference values for plants, small mammals, and songbirds, but that those levels are of such limited extent and the habitat so disturbed at those locations from ongoing military training activities as to be ecologically insignificant. Levels of lead in surface water exceed water quality criteria, but toxicity testing indicated no toxicity attributed to lead for an aquatic invertebrate and a fish that were tested. Substantial uncertainty exists in extrapolating from avian toxicity to reptilian toxicity, but, using avian data, no risks were identified for turtles. The ecosystems at AOC 26 do not appear to be impacted, as indicated by the thriving communities of benthic invertebrates and wildlife observed during the field surveys.

There are no unacceptable risks to human health or demonstrated impacts on wildlife at AOC 26, and no further investigation or remedial action is recommended for this site.

D. AOC 27 (Hotel Range)

The soil and groundwater at AOC 27 are affected by military training activities, shown primarily by the presence of explosives, pesticides, and TPHC in soil, groundwater, surface water, and sediment. Lead levels were also elevated in subsurface soil and in surface water. The pesticides, mostly DDT and its derivatives DDD and DDE, are below background in soils, and were not present in groundwater which only showed low levels of delta-BHC (0.045 μg/L in the one confirmed result). Pesticide levels are likely due to pest control rather than training activities at the site. Explosives in the groundwater are by far the most conclusive evidence of impacts from site operations. All wells showed at least some levels of explosives related compounds, with Cyclonite, HMX, and 1,3-dinitrobenzene the most frequently observed compounds. The groundwater affected by the site is flowing north across Old Turnpike Road, to discharge to a wetland within the northern part of Hotel Range, or possibly continuing on towards Slate Rock Pond.

The risk to human health at AOC 27 has been calculated for users, site workers, and trespassers. All estimated potential risks for carcinogens and non-carcinogens are below current EPA Superfund policy lower limits for lifetime risks. The occurrence of carcinogenic effects is below 10^{-6} per lifetime, and non-carcinogenic health effects are highly unlikely.

No evidence of site related chemical stress to plants or wildlife was observed during the field surveys. The toxicity testing done at Zulu Ranges (AOC 26) imply that the level of lead in Cranberry Pond water does not pose a hazard to aquatic biota. The mean concentrations of contaminants of potential concern are unlikely to pose a risk to the selected receptors, mallards and raccoons, with the possible exception of the effect of copper on mallards. Potential risks to benthic invertebrates from several metals in sediments (antimony, copper, lead, mercury, and nickel), and also from 4-amino-2,6-dinitrotoluene, were noted. These risks have high levels of uncertainty and do not apply to average levels but only to reasonable maximum exposure levels. In general, this risk assessment is more likely to overestimate risks than to underestimate them. The risk assessments have been conducted for the toxicological risks of analytes detected at AOC 27, but does not address the more significant physical risks from unexploded ordnance.

As the Army continues to use the site, efforts should be made to ensure that no activities further contribute to contamination of Cranberry Pond. Periodic review of the risk assessment in light of increased toxicological information of the effects of the existing levels of contamination, should be used to more accurately assess the risk to the environment. Based on the results of the environmental investigations and the human health and ecological risk assessments, no contamination is present in levels which pose unacceptable risks to human health or the environment. AOC 27 will continue to be used as a firing range by the Army, and no further investigation or remedial action is recommended at the Hotel Range.

E. AOC 41 (Unauthorized Landfill)

The following conclusions are based on interpretation of data collected from each of the previous investigations (SI, SSI and RI) completed at AOC 41.

The geologic setting at AOC 41 includes an upper sand layer underlain by a discontinuous clayey silt layer, a lower silty sand layer, and finally and lower sand layer. Bedrock was not encountered in any of the borings completed at AOC 41.

The aquifer below AOC 41 can be classified as an unconfined overburden groundwater aquifer. The aquifer is recharged by surface water infiltration and percolation, and recharge from surface water from New Cranberry Pond. This hydraulic condition is caused by a road culvert located at the eastern end of the pond which artificially raises the surface water elevation in the pond, thus causing the surface water to recharge groundwater below AOC 41. The predominant local groundwater flow at AOC 41 is to the north-northeast, eventually discharging into the Nashua River.

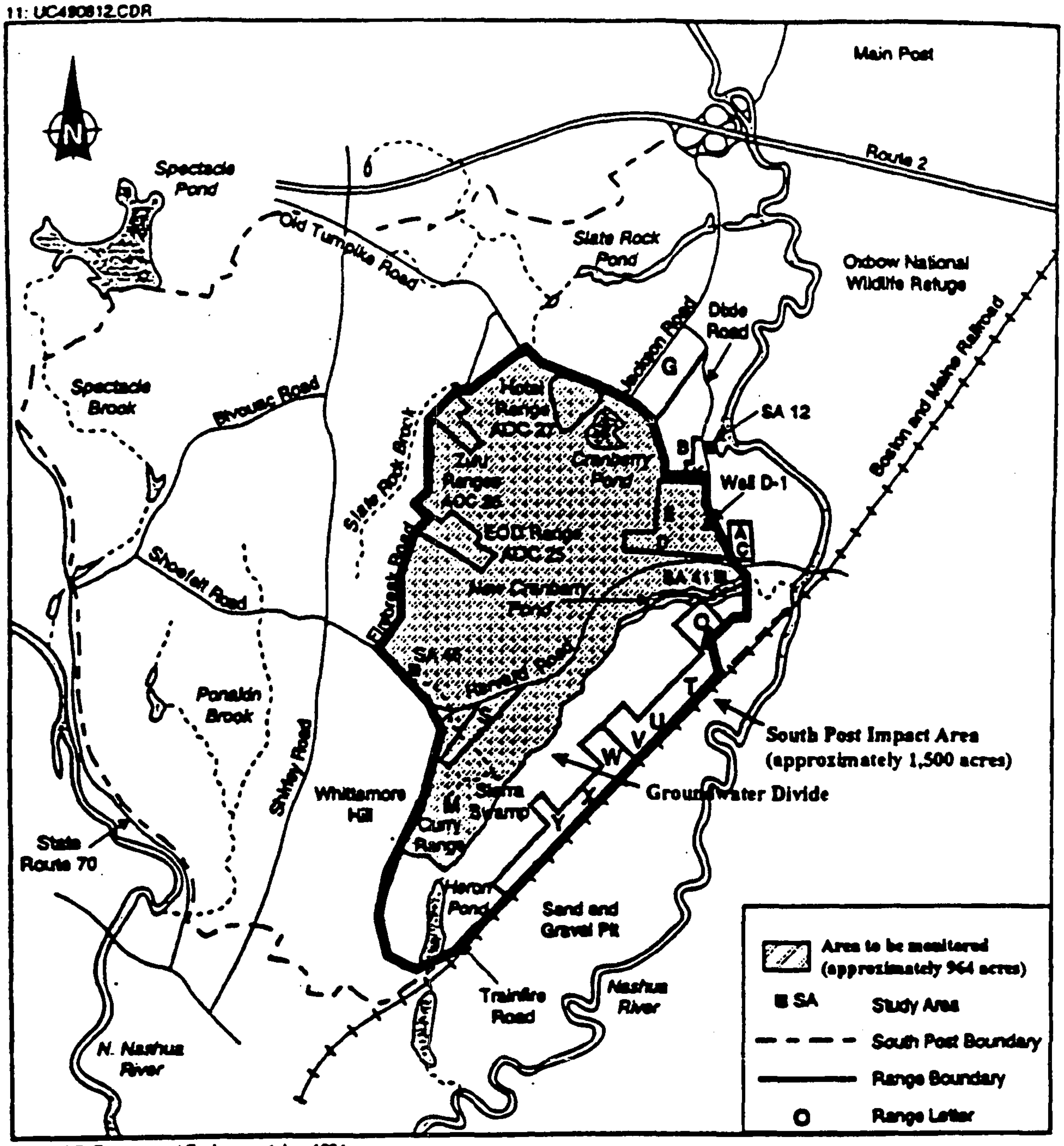
The results of RI groundwater sampling and field analysis completed during the RI, indicate that the existing groundwater contaminant plume appears to be confined to the upper portion (water table) of the aquifer and it is oriented in a northeast-southwest direction. Based on the chemical properties of the contaminants, the slow rate of groundwater flow in the clayey silt, and the existing downgradient groundwater results (41M-94-09A and B), it appears that the distribution of the groundwater contamination has been determined, and that contaminant migration to any exposure point (Well D-1) is minimal.

Surface water and sediment from New Cranberry Pond were sampled during previous investigations. However, data collected during the SSI and the RI, demonstrate that New Cranberry Pond surface water recharges groundwater below AOC 41. An assessment of the potential surface soil migration pathways showed that no migration pathway (i.e., overland transport of surface soil via surface water) exists between the contaminants detected in the surface soil on the waste material and New Cranberry Pond surface water and sediment. Because of these reasons, the previous surface water and sediment data was not evaluated in the RI.

The base-line human health risk assessment was limited to an evaluation of the exposure potential to groundwater at AOC 41, and a summary of quantitative risk evaluation for groundwater from Well D-1. The risk assessment concluded that there are no unacceptable risked to human health from the groundwater at Well D-1 for troops that consume the water for approximately 14 days per year, and that no further action would be required under CERCLA.

Based on the results and interpretation of the physical and chemical data and taking into account that the future land and groundwater use of this AOC will be similar to the present use, it was recommended that the Army complete a monitoring ROD and Proposed Plan for the groundwater at AOC 41 to include the AOC 41-related contaminants in the analysis of the groundwater samples from Well D-1.

11: UC490812.CDR



SOURCE: Ecology and Environment, Inc. 1994

SCALE

0 2000 4000 Feet

Fgure 1 South Post Impact Area AOC 25, 26, and 27.

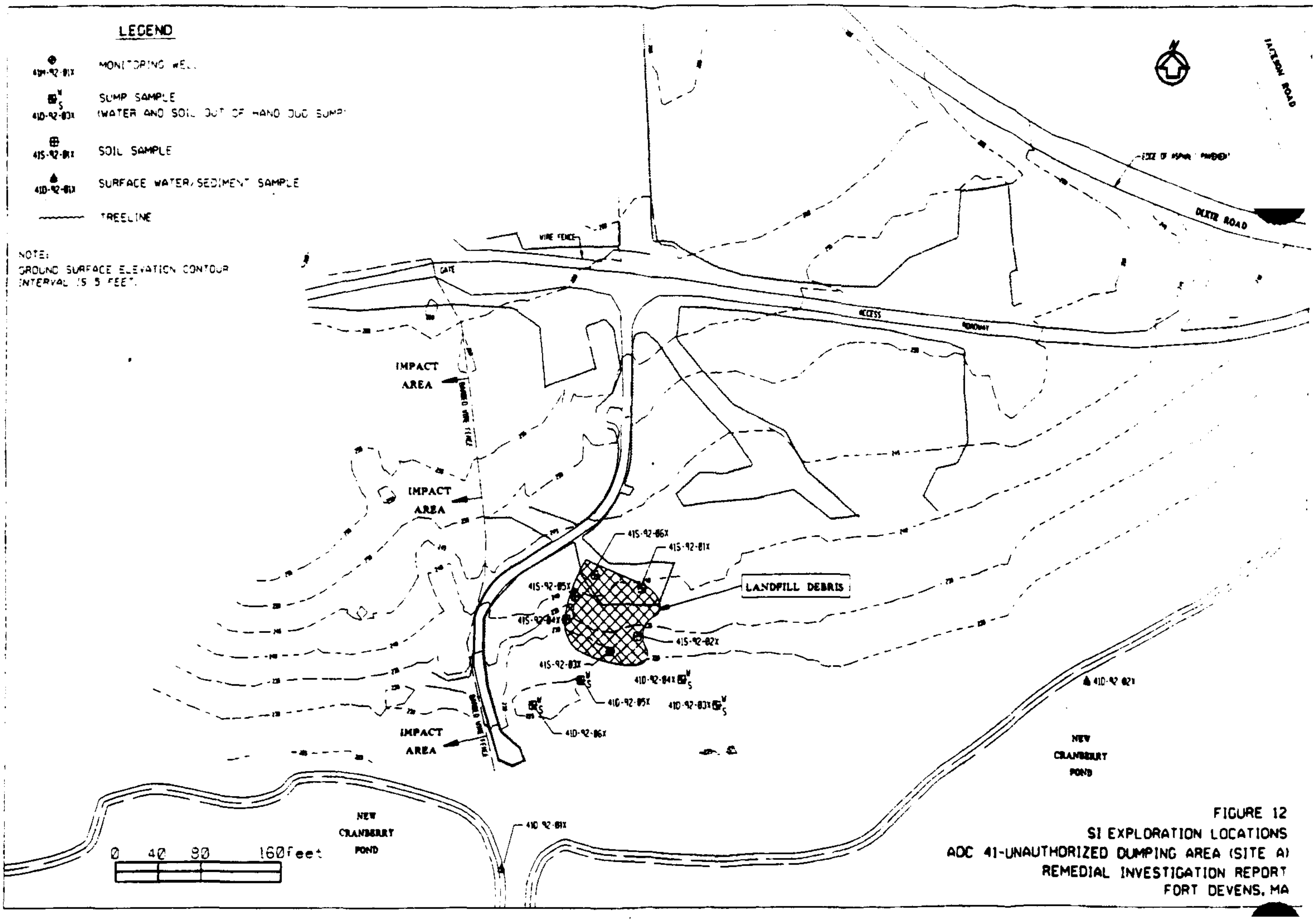


FIGURE 12
SI EXPLORATION LOCATIONS
AOC 41-UNAUTHORIZED DUMPING AREA (SITE A)
REMEDIAL INVESTIGATION REPORT
FORT DEVENS, MA

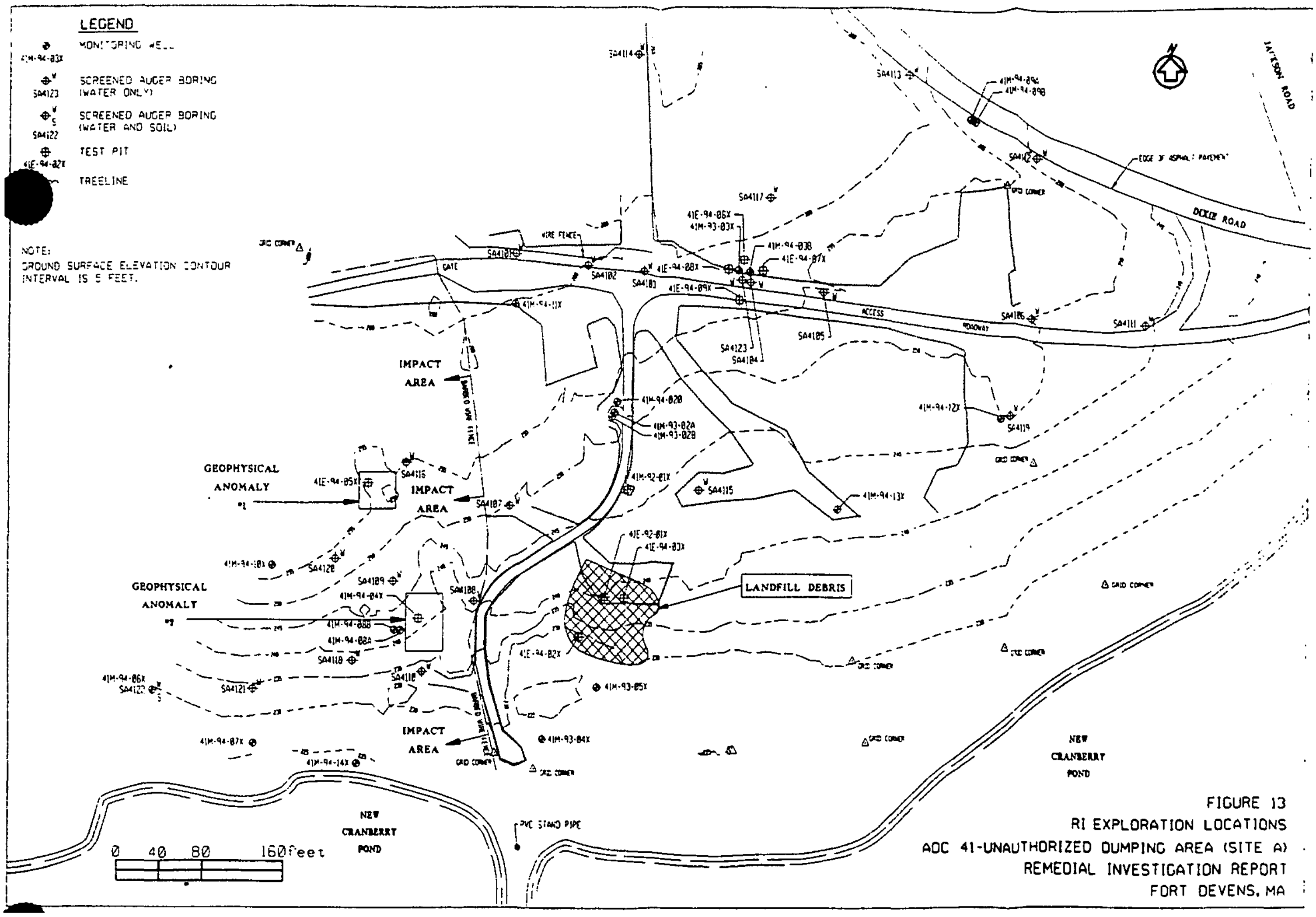


FIGURE 13
RI EXPLORATION LOCATIONS
AOC 41-UNAUTHORIZED DUMPING AREA (SITE A)
REMEDIAL INVESTIGATION REPORT
FORT DEVENS, MA

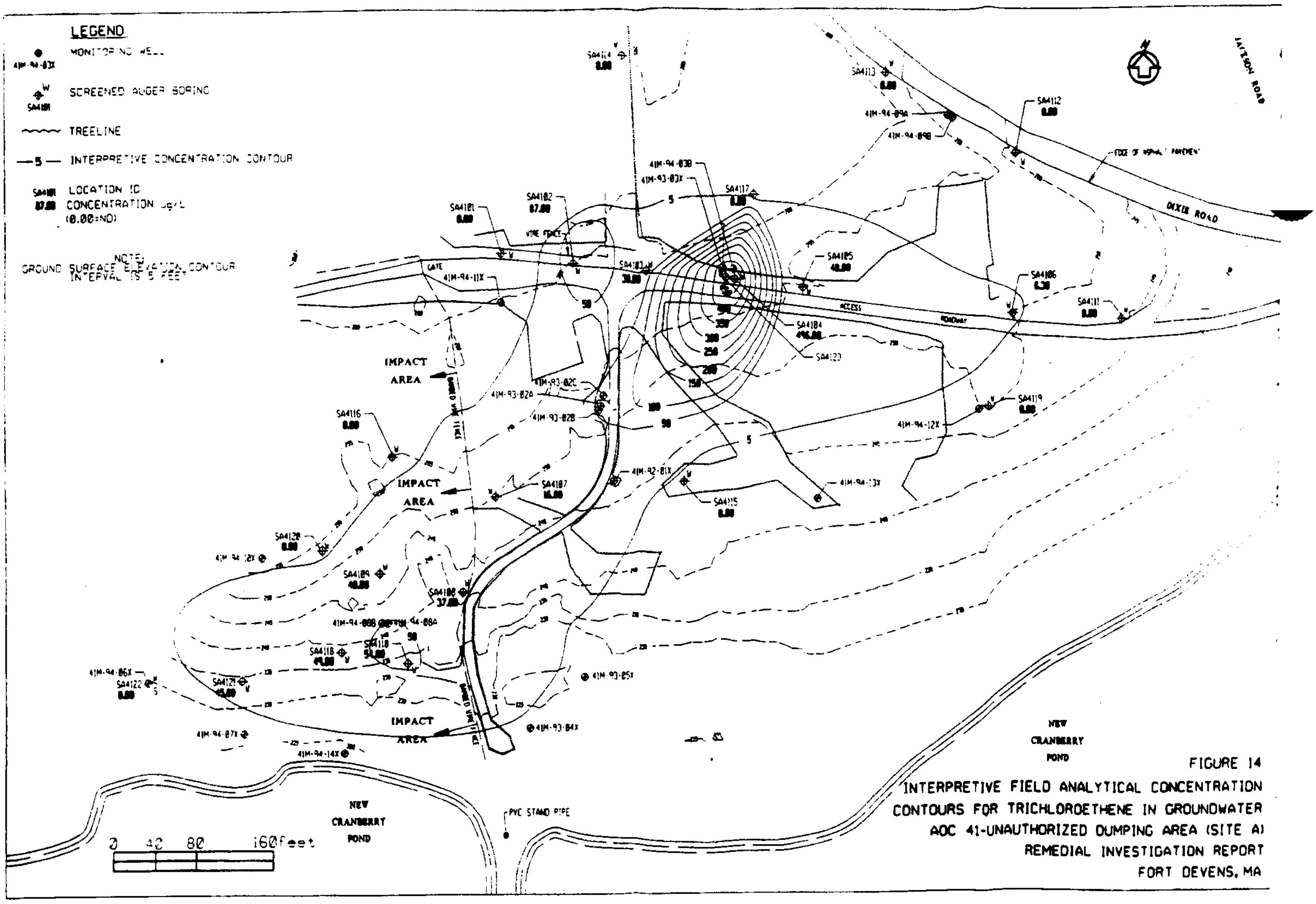


FIGURE 14
INTERPRETIVE FIELD ANALYTICAL CONCENTRATION CONTOURS FOR TRICHLOROETHENE IN GROUNDWATER
AOC 41-UNAUTHORIZED DUMPING AREA (SITE A)
REMEDIAL INVESTIGATION REPORT
FORT DEVENS, MA

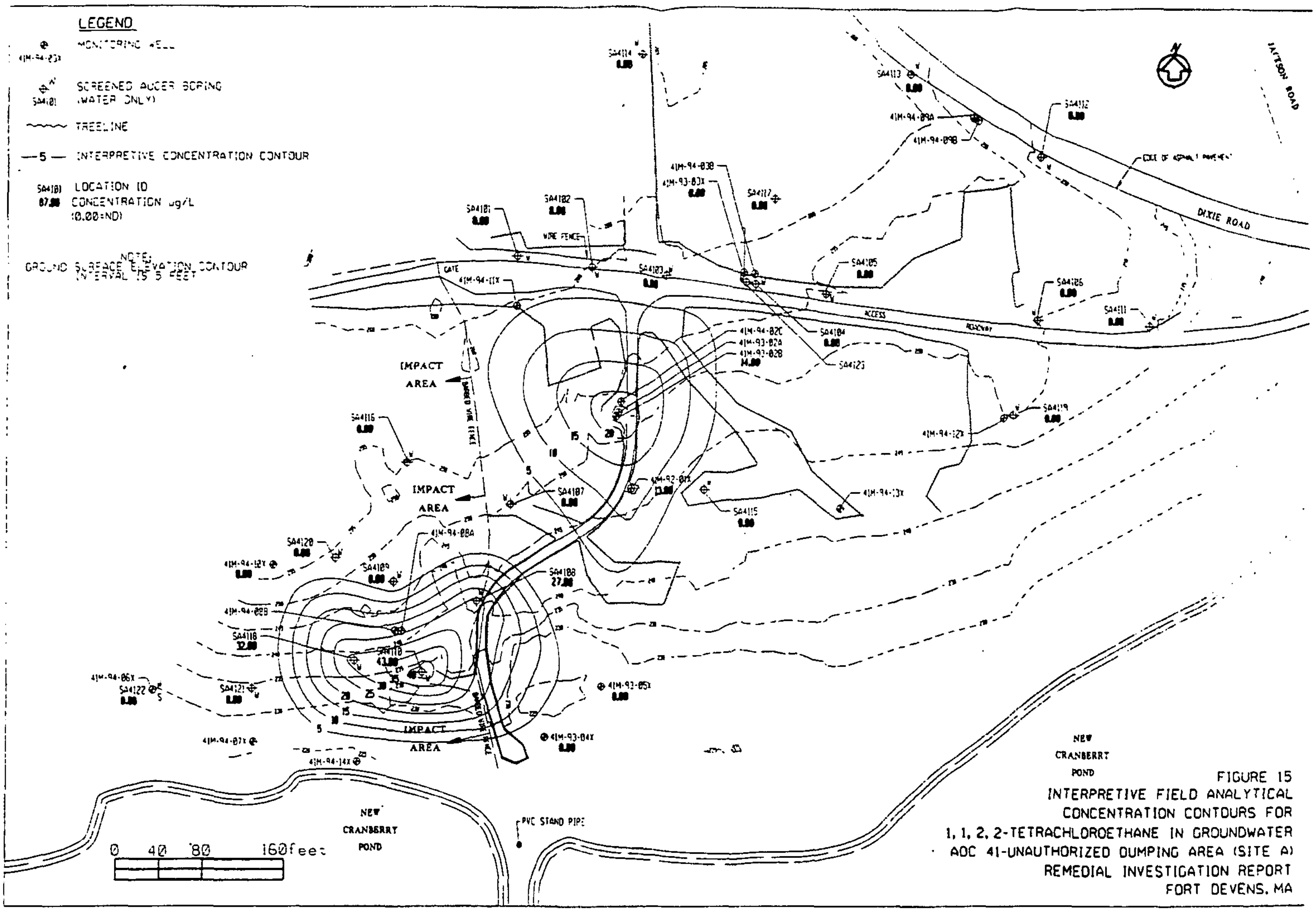


FIGURE 15
INTERPRETIVE FIELD ANALYTICAL CONCENTRATION CONTOURS FOR 1, 1, 2, 2-TETRACHLOROETHANE IN GROUNDWATER
AOC 41-UNAUTHORIZED DUMPING AREA (SITE A)
REMEDIAL INVESTIGATION REPORT
FORT DEVENS, MA

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RECORD OF DECISION SUMMARY
SOUTH POST IMPACT AREA AND
AREA OF CONTAMINATION 41 GROUNDWATER AND
AREAS OF CONTAMINATION 25, 26, AND 27
FORT DEVENS, MASSACHUSETTS

APPENDIX C

ADMINISTRATIVE RECORD INDEX

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Fort Devens

Groups 2 & 7 Sites

Administrative Record File for

Index

Prepared for
New England Division
Corps of Engineers

by
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Section I

Site-Specific Documents

Introduction

This document is the Index to the Administrative Record File for the Fort Devens Groups 2 & 7 Sites. Section I of the Index cites site-specific documents and Section II cites guidance documents used by U.S. Army staff in selecting a response action at the site. Some documents in this Administrative Record File Index have been cited but not physically included. If a document has been cross referenced to another Administrative Record File Index, the available corresponding comments and responses have been cross referenced as well.

The Administrative Record File is available for public review at EPA Region I's Office in Boston, Massachusetts, at the Fort Devens Environmental Management Office, Fort Devens, Massachusetts, and at the Ayer Town Hall, 1 Main Street, Ayer, Massachusetts. Supplemental/Addendum volumes may be added to this Administrative Record File. Questions concerning the Administrative Record should be addressed to the Fort Devens Base Realignment and Closure Office (BRAC).

ADMINISTRATIVE RECORD INDEX FILE

for

Fort Devens Groups 2 & 7 Sites

Compiled: August 8, 1996

1.0 Pre-Remedial

1.2 Preliminary Assessment

Cross Reference: The following Reports, Comments, and Responses to Comments (entries 1 through 6) are filed and cited as entries 1 through 6 in minor break 1.2 Preliminary Assessment of the Fort Devens Group 1A Administrative Record File Index.

Reports

1. "Final Master Environmental Plan for Fort Devens," Argonne National Laboratory (April 1992).
2. "Preliminary Zone II Analysis for the Production Wells at Fort Devens, MA, Draft Report", ETA Inc. (January 1994).

Comments

3. Comments Dated May 1, 1992 from Walter Rolf, Montachusett Regional Planning Commission on the April 1992 "Final Master Environmental Plan for Fort Devens," Argonne National Laboratory.
4. Comments Dated May 7, 1992 from James P. Byrne, EPA Region I on the April 1992 "Final Master Environmental Plan for Fort Devens," Argonne National Laboratory.
5. Comments Dated May 23, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the January 1994 "Preliminary Zone II Analysis for the Production Wells at Fort Devens, MA, Draft Report", ETA Inc.

Responses to Comments

6. Response Dated June 29, 1992 from Carrol J. Howard, Fort Devens to the May 7, 1992 Comments from James P. Byrne, EPA Region I.

1.3 Site Inspection

Reports

1. "Final Task Order (Site Investigations) Work Plan," ABB Environmental Services, Inc. (December 1992).
2. "Final Task Order (Site Investigations) Work Plan - Historic Gas Stations," ABB Environmental Services, Inc. (December 1992).
3. "SI Data Packages - Army Environmental Center - Volume I," ABB Environmental Services, Inc. (January 1993).
4. "SI Data Packages - Army Environmental Center - Volume II," ABB Environmental Services, Inc. (January 1993).
5. "SI Data Package Meeting Notes for Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc. (April 1993).
6. "Final SI Report, Groups 2 & 7 and Historic Gas Stations, Volume I," ABB Environmental Services, Inc. (May 1993).
7. "Final SI Report, Groups 2 & 7 and Historic Gas Stations, Volume II," ABB Environmental Services, Inc. (May 1993).
8. "Final SI Report, Groups 2 & 7 and Historic Gas Stations, Volume III" ABB Environmental Services, Inc. (May 1993).
9. "Final SI Report, Groups 2 & 7 and Historic Gas Stations, Volume IV," ABB Environmental Services, Inc. (May 1993).
10. "Final Supplemental Site Investigation Work Plan," ABB Environmental Services, Inc. (August 1993).
11. "Supplemental Site Investigation Data Package Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc. (January 1994).
12. "Supplemental Site Investigation Data Package Meeting Notes Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc. (March 1994).

Missing 13. "Supplemental Sampling Plan for Study Area 42, Popping Furnace," OHM Remediation Corporation (October 14, 1994).

14. "Revised Final Site Investigation Report, Groups 2 & 7 and Historic Gas Stations," Volumes I, II, III and IV, ABB Environmental Services, Inc. (October 1995).

Comments

15. Comments Dated January 11, 1993 from D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection on the December 1992 "Final Task Order (Site Investigation) Work Plan," ABB Environmental Services, Inc.
16. Comments Dated January 12, 1993 from James P. Byrne, EPA Region I on the December 1992 "Final Task Order (Site Investigation) Work Plan," ABB Environmental Services, Inc. and the December 1992 "Final Task

Order (Site Investigation) Work Plan - Historic Gas Stations," ABB Environmental Services, Inc.

17. Comments Dated July 15, 1993 from James P. Byrne, EPA Region I on the May 1993 "Final SI Report, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc.
18. Comments Dated July 9, 1993 and July 19, 1993 from D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection on the May 1993 "Final SI Report, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc.
19. Comments Dated March 7, 1994 from Molly Elder, Commonwealth of Massachusetts Department of Environmental Protection on the January 1994 "Supplemental Site Investigation Data Package, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc.
20. Comments Dated March 23, 1994 from James P. Byrne, EPA Region I on the January 1994 "Supplemental Site Investigation Data Package, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc.
21. Comments Dated November 2, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the October 14, 1994 "Supplement Sampling Plan for Study Area 42, Popping Furnace," OHM Remediation Corporation.

Responses to Comments

22. Responses Dated September 1993 from U. S. Army Environmental Center on the following document: Final Site Investigation Report, Groups 2 & 7 and Historic Gas Stations, dated May 1993.
23. Cross Reference: Responses Dated September 1993 from U.S. Army Environmental Center on the following document: Draft Supplemental Site Investigation Work Plan, (Appendix M of Final SI Report), dated May 1993. [These Responses are filed and cited as entry number 18 in the Responses to Comments section of this minor break].
24. Responses Dated September 1994 from U.S. Army Environmental Center on the Supplemental Site Investigation Data Package, Fort Devens Groups 2 & 7 and Historic Gas Stations.

Comments to Responses to Comments

25. Comments Dated September 30, 1993 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the Responses to Comments Package dated September 1993 from the U.S. Army Environmental Center.
26. Comments Dated November 27, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the Army Responses to Comments, Supplemental Site Investigation

Data Package, Groups 2, 7, and Historic Gas Stations, Fort Devens, Ma.

2.0 Removal Response

2.2 Removal Response Reports

Reports

1. "Draft Final Closure Report Study Area 49, Fort Devens, Massachusetts," OHM Remediation Services Corporation (October 28, 1994).
2. "Draft Final Closure Report Study Area 43D, Fort Devens, Massachusetts," OHM Remediation Services Corporation (November 21, 1994).
3. "Draft Final Closure Report Study Area 56, Fort Devens, Massachusetts," OHM Remediation Services Corporation (January 24, 1995).

Comments

4. Comments Dated December 29, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the October 28, 1994 "Draft Final Closure Report, Study Area 49, Fort Devens, Massachusetts," (OHM Remediation Services Corporation).
5. Comments Dated January 6, 1995 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the November 21, 1994 "Draft Final Closure Report, Study Area 43D, Fort Devens, Massachusetts," (OHM Remediation Services Corporation).
6. Comments Dated March 17, 1995 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the January 24, 1995 "Draft Final Closure Report, Study Area 56, Fort Devens, Massachusetts," OHM Remediation Services Corporation.

2.9 Action Memoranda

Reports

1. "Final Contract Plans and Specifications Clean Out and Closure, Lake George Study Area 45 (SA 45)," ABB Environmental Services, Inc. (January 1994).
2. "Final Contract Design Plans and Specifications Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (April 1994).
3. "Final Action Memoranda, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (June 1994).
4. "Addendum - Revision 2 for Final Contract Design Plans & Specifications Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts,"

ABB Environmental Services, Inc. (September 9, 1994).

5. "Addendum - Revision 3 for Final Contract Design Plan & Specifications Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (September 16, 1994).
6. "Final Addendum - Revisions 2 and 3 for Final Contract Design Plan & Specifications Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (October 28, 1994).
7. "Draft Addendum - Revision 4 for Final Contract Design Plans & Specifications Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (March 17, 1995).

Comments

8. Comments Dated February 17, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the January 1994 "Draft Contract Design Plans and Specifications Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc.
9. Comments Dated May 5, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the April 1994 "Draft Action Memoranda, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc.
10. Comments Dated May 19, 1994 from James P. Byrne, EPA Region I on the April 1994 "Draft Action Memoranda, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc.
11. Comments Dated June 10, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the April 1994 "Final Contract Design Plans and Specifications, Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc.
12. Comments Dated August 11, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the June 1994 "Final Action Memoranda, Various Sites, Fort Devens, Massachusetts," ABB Environmental Services,Inc.
13. Comments Dated August 16, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the June 10, 1994 "Addendum - Revision 1 for Final Contract Design Plans & Specifications, Contaminated Soil Removal, Various Sties, Fort Devens, Massachusetts (ABB Environmental Services, Inc.).
14. Comments Dated September 28, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the September 9, 1994 "Addendum - Revision 2 for Final Contract Design Plans and Specifications Contaminated Soil Removal Various Sites, Fort Devens, Massachusetts," (ABB Environmental Services, Inc.).

15. Comments Dated December 20, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the October 28, 1994 "Final Addendum - Revisions 2 and 3 for Final Contract Design Plans & Specifications, Contaminated Soil Removal Various Sites, Fort Devens, Massachusetts," (ABB Environmental Services, Inc.).

Responses to Comments

16. Responses Dated March 1994 from U.S. Army Environmental Center on the following document: Draft Contract Design Plans and Specifications Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts dated January 1994.
17. Responses Dated June 1994 from U.S. Army Environmental Center on the following document: Draft Action Memoranda, Various Sites, Fort Devens, Massachusetts dated April 1994.
18. Responses Dated January 25, 1994 from U.S. Army Environmental Center on the following document: "Draft Design Specifications and Plans Lake George Street Vehicle Wash Area (Study Area 45).
19. Responses Dated September 9, 1994 from U.S. Army Environmental Center on the Addendum - Revisions 2 Final Contract Design Plans & Specifications Contaminated Soil Removal Various Sites, Fort Devens, Massachusetts.
20. Response Dated October 28, 1994 from U.S. Army Environmental Center on the Final Addendum - Revisions 2 and 3 for Final Contract Design Plans & Specifications, Contaminated Soil Removal, Various Sites, Fort Devens, Massachusetts.

3.0 Remedial Investigation (RI)

3.1 Correspondence

1. Letter Dated February 15, 1996 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection, acknowledging receipt of: 1. Final Remedial Investigation (RI) Reports, AOCs 41, 43G, and 43J. 2. Draft Feasibility.

3.2 Sampling and Analysis Data

Reports

1. Cross Reference: "Method for Determining Background Concentrations - Inorganic Analytes in Soil and Groundwater - Fort Devens," ABB Environmental Services, Inc. (January 20, 1993) [Filed and cited as entry

number 1 in minor break 3.2 Sampling and Analysis Data of the Fort Devens Group 1A Sites Administrative Record Index].

2. "Data Comparison Report, Group 2 & 7 Sites Through Round 1 Sampling," CDM Federal Programs Corporation (March 1993).
3. "Draft Quality Assurance Project Plan, Remedial Investigations, Groups 2 & 7 and South Post Impact Area, Fort Devens, Massachusetts," Ecology and Environment, Inc. (June 1993).

3.4 Interim Deliverables

Reports

1. Cross Reference: "Final Ground Water Flow Model at Fort Devens," Engineering Technologies Associates, Inc. (May 24, 1993) [Filed and cited as entry number 1 in minor break 3.4 Interim Deliverables of the Fort Devens Group 1A Sites Administrative Record Index].
2. "Final Projects Operations Plan - Volume I of III," ABB Environmental Services, Inc. (December 1992).
3. "Final Projects Operations Plan - Volume II of III - Appendix A: Health and Safety Plan," ABB Environmental Services, Inc. (December 1992).
4. "Final Projects Operations Plan - Volume III of III - Appendix B: Laboratory QA Plan; Appendix C: USATHAMA-Certified Analytical Methods," ABB Environmental Services, Inc. (December 1992).

Comments

5. Comments Dated January 12, 1993 from James P. Byrne, EPA Region I on the December 1992 "Final Projects Operations Plan," ABB Environmental Services, Inc.
6. Cross Reference: Comments Dated February 1, 1993 from James P. Byrne, USEPA Region I and D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection on the October 30, 1992 "Draft Final Ground Water Flow Model at Fort Devens," Engineering Technologies Associates, Inc. [Filed and cited as entry number 2 in minor break 3.4 Interim Deliverables of the Fort Devens Group 1A Sites Administrative Record File Index].
7. Comments Dated February 17, 1993 from D. Lynne Chappell, Commonwealth of Massachusetts Department of Environmental Protection on the December 1992 "Final Project Operations Plan," ABB Environmental Services, Inc.

3.5 Applicable or Relevant and Appropriate Requirements (ARARs)

Cross Reference: The following report (entries 1 and 2 are filed and cited as entries 1 and 2 in minor break 3.5 Applicable or Relevant and Appropriate Requirements (ARARs) of the Fort Devens Groups 3, 5, & 6 Sites Administrative Record Index.

Reports

1. "Draft Applicable or Relevant and Appropriate Requirements (ARARs) for CERCLA Remedial Actions," U.S. Army Toxic and Hazardous Materials Agency (June 1992).
2. "Draft Assessment of Location-Specific Applicable or Relevant and Appropriate Requirements (ARARs) for Fort Devens, Massachusetts," U. S. Army Toxic and Hazardous Materials Agency (September 1992).

3.6 Remedial Investigation (RI) Reports

Reports

1. "Draft Remedial Investigation Report AOC 41", Volumes I, II and III, ABB Environmental Services, Inc. (July 1995).
2. "Final Remedial Investigation Report AOC 41", Volumes I and II, ABB Environmental Services, Inc. (February 1996).

Comments

3. Comments Dated March 15, 1996 from John Regan, Massachusetts Department of Environmental Protection on the February 1996 "Final Remedial Investigation Report AOC 41", Volumes I and II, ABB Environmental Services, Inc.

Response to Comments

4. Response Dated February 1, 1996 from ABB Environmental Services, Inc. on the following document: Draft Remedial Investigation Report, AOC 41.

3.7 Work Plans and Progress Reports

Reports

1. "Draft Task Order Work Plan Area of Contamination (AOC) 41, AOC 43G and 43J, Fort Devens, Draft Remedial Investigation/Feasibility Study Work Plan, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc. (May 1994).
2. "Final Task Order Work Plan Area of Contamination (AOC) 41, AOC 43G, and AOC 43J, Fort Devens, Final Remedial Investigations/Feasibility

Study Work Plan, Groups 2, 7, and Historic Gas Stations," ABB Environmental Services, Inc. (August 1994).

3. "Revised Final Task Order Work Plan Area of Contamination (AOC) 41, AOC 43G, and AOC 43J, Fort Devens, Revised Final Remedial Investigations/Feasibility Study Work Plan, Groups 2, 7, and Historic Gas Stations," ABB Environmental Services, Inc. (October 1994).

Comments

4. Comments Dated July 06, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection the May 1994 "Draft Task Order Work Plan Area of Contamination (AOC) 41, AOC 43G and 43J, Fort Devens, Draft Remedial Investigation/Feasibility Study Work Plan, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc.
5. Comments Dated October 19, 1994 from James P. Byrne, USEPA Region I, on the Final RI/FS Work Plan for AOCs 41, 43G, and 43J and the Response to Comments for this Document.
6. Comments Dated October 21, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the August 1994 "Final Task Order Work Plan, Area of Contamination (AOC) 41, 43G, and AOC 43J.
7. Comments Dated December 15, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the Revised Final Remedial Investigation/Feasibility Study, Revised Final Task Order Work Plans AOC 41, AOC 43G, and AOC 43J.

Response to Comments

8. Responses Dated September 1994 from U.S. Army Environmental Center on the following Document: Draft RI/FS Work Plans for Area of Contamination (AOC) 41, AOC 43G, and AOC 43J.
9. Response Dated February 1, 1996 from ABB Environmental Services, Inc. on the following document: Draft Alternative Screening Report, AOC 41.

Comments to Responses to Comments

10. Cross Reference: Comments Dated October 19, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the Final RI/FS Work Plan for AOCs 41, 43G and 43J and the Response to Comments for this document. [Filed and cited as entry number 6 in the Comments section of this minor break].

4.0 Feasibility Study (FS)

4.7 Work Plans and Progress Reports

Reports

1. Cross Reference: "Draft Task Order Work Plan Areas of Contamination (AOC) 41, AOC 43G and 43J, Fort Devens, Draft Remedial Investigation/Feasibility Study Work Plan, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc. (May 1994) [Filed and cited as entry number 1 in minor break 3.7 Work Plans and Progress Reports]
2. "Draft Work Plan Predesign Field Work and Landfill Study, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (June 1994).

Comments

3. Cross Reference: Comments Dated July 6, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection the May 1994 "Draft Task Order Work Plan Area of Contamination (AOC) 41, AOC 43G and 43J, Fort Devens, Draft Remedial Investigation/Feasibility Study Work Plan, Groups 2 & 7 and Historic Gas Stations," ABB Environmental Services, Inc. [Filed and cited as entry number 2 in the minor break 3.7 Work Plans and Progress Reports].

4.9 Proposed Plans for Selected Remedial Action

Reports

1. "Draft Proposed Plan for Groundwater Contamination at AOC 41, Unauthorized Dumping Area (Site A)," ABB Environmental Services, Inc. (March 1996).

5.0 Record of Decision (ROD)

5.1 Correspondence

1. Cross Reference: Letter Dated April 30, 1996 from James P. Byrne, EPA Region 1 on the Inclusion of AOC 41 in the South Post Impact Area ROD, [Filed and cited in minor break 5.1 Correspondence of the Fort Devens Group 1B Sites Administrative Record Index.]
2. Cross Reference: Letter Dated July 2, 1996 from E. Gail Suchman, Commonwealth of Massachusetts Department of Environmental Protection on the "Record of Decision, South Post Impact Area and AOC 41 Groundwater, and AOCs 25, 26, and 27, Fort Devens, Massachusetts",

[Filed and cited in minor break 5.1 Correspondence of the Fort Devens Group 1B Sites Administrative Record Index.]

5.4 Record of Decision

Reports

1. "No Further Action Decision Document Under CERCLA, Fort Devens Study Area 58, Buildings 2648 and 2650 Fuel Oil Spills," ABB Environmental Services, Inc. (January 1994).
2. "No Further Action Decision Document Under CERCLA, Fort Devens Study Area 43C,E,F,K,L,M,P,Q,R, and S," ABB Environmental Services, Inc. (January 1994).
3. "No Further Action Decision Document Under CERCLA, Fort Devens Study Area 28, Fort Devens Waste Explosives Detonation Range (Training Area 14)," ABB Environmental Services, Inc. (January 1994).
4. "No Further Action Decision Document Under CERCLA, Decision Briefing, Fort Devens Study Area 28, Fort Devens Waste Explosives Detonation Range (Training Area 14)," ABB Environmental Services, Inc. (January 1994).
5. "Draft No Further Action Decision Document Under CERCLA, Study Area 13, Landfill No. 9, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (May 1994).
6. "Draft No Further Action Decision Document Under CERCLA, Study Area 12, Landfill No. 8, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (May 1994).
7. "Draft No Further Action Decision Document Under CERCLA, Study Area 14, Landfill No. 10, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (May 1994).
8. "Draft No Further Action Decision Document Under CERCLA, Study Area 43B Historic Gas Station Sites, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (May 1994).
9. "Draft No Further Action Decision Document Under CERCLA, Study Area 43N, Historic Gas Station Sites, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (May 1994).
10. "No Further Action Decision Under CERCLA, Study Area 43B, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
11. "No Further Action Decision Under CERCLA, Study Area 43C, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
12. "No Further Action Decision Under CERCLA, Study Area 43E, Historic

Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).

13. "No Further Action Decision Under CERCLA, Study Area 43F, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
14. "No Further Action Decision Under CERCLA, Study Area 43K, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
15. "No Further Action Decision Under CERCLA, Study Area 43L, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
16. "No Further Action Decision Under CERCLA, Study Area 43M, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
17. "No Further Action Decision Under CERCLA, Study Area 43N, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
18. "No Further Action Decision Under CERCLA, Study Area 43P, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
19. "No Further Action Decision Under CERCLA, Study Area 43Q, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
20. "No Further Action Decision Under CERCLA, Study Area 43R, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
21. "No Further Action Decision Under CERCLA, Study Area 43S, Historic Gas Station Sites, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
22. "No Further Action Decision Under CERCLA, Study Area 14, Landfill No. 14, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
23. "No Further Action Decision Under CERCLA, Fort Devens Study Area 28, Waste Explosives Detonation Range (Training Area 14)," ABB Environmental Services, Inc. (January 1995).
24. "No Further Action Decision Under CERCLA, Study Area 48, Building 202 Leaking Underground Storage Tank Site, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1995).
25. Cross Reference: "Draft Final ROD for the South Post Impact Area and AOC 41 Groundwater and AOCs 25, 26, and 27, Fort Devens, Massachusetts," Horne Engineering (April 1996), [Filed and cited in minor break 5.4 Record of Decision (ROD) of the Fort Devens Group 1B Sites Administrative Record Index.]

Comments

26. Comments Dated September 30, 1993 from James P. Byrne, EPA Region I on the August 1993 "Draft Decision Document, Fort Devens Study Area 58, Buildings 2648 and 2650 Fuel Oil Spills," ABB Environmental Services, Inc.
27. Comments Dated October 1 1993 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the August 1993 "Draft Decision Document, Fort Devens Study Area 58, Buildings 2648 and 2650 Fuel Oil Spill," ABB Environmental Services, Inc.
28. Comments Dated September 30, 1994 from James P. Byrne, EPA Region I on the August 1993 "Draft Decision Document, Fort Devens Study Area 28, Waste Explosives Detonation Range (Training Area 14)," ABB Environmental Services, Inc.
29. Comments Dated November 3, 1993 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the September 1993 "Draft Decision Document Fort Devens Historic Gas Stations, Study Area 43C,E,F,K,L,M,P,Q,R, and S," ABB Environmental Services, Inc.
30. Comments Dated November 17, 1993 from James P. Byrne on the September 1993 "Draft Decision Document Fort Devens Historic Gas Stations, Study Area 43C,E,F,K,L,M,P,Q,R, and S," ABB Environmental Services, Inc.
31. Comments Dated June 29, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the May 1994 "Draft No Further Action Decision Document Under CERCLA, Study Area 13, Landfill No. 9, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc., "Draft No Further Action Decision Document Under CERCLA, Study Area 12, Landfill No. 8, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc., "Draft No Further Action Decision Document Under CERCLA, Study Area 14, Landfill No. 10, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc., "Draft No Further Action Decision Document Under CERCLA, Study Area 43B, Historic Gas Station Sites, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc., "Draft No Further Action Decision Document Under CERCLA, Study Area 43N, Historic Gas Station Sites, Groups 2 & 7 and Historic Gas Stations, Fort Devens, Massachusetts," ABB Environmental Services, Inc.
32. Comments Dated September 30, 1994 from James P. Byrne, EPA Region I on the August 1993 "Draft Decision Document, Fort Devens Study Area 28, Waste Explosives Detonation Range (Training Area 14)," ABB Environmental Services, Inc.

33. Comments Dated June 30, 1994 from James P. Byrne, USEPA Region I on the No Further Action Decision Under CERCLA Documents for Study Area 28 and 47.
34. Comments Dated March 17, 1995 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental
35. Cross Reference: Comments Dated on March 22, 1996 from James P. Byrne, USEPA Region 1 on "Draft ROD for the South Post Impact Area and AOCs 25, 26, and 27, Fort Devens, Massachusetts," Horne Engineering (February, 1996), [Filed and cited in minor break 5.4 Record of Decision (ROD) of the Fort Devens Group 1B Sites Administrative Record Index.]
36. Cross Reference: Comments dated on March 25, 1996 from John Regan (MADEP) on the "Preliminary Draft ROD for the South Post Impact Area Groundwater and AOCs 25, 26, and 27, Ft. Devens, Mass." (Horne, February 1996), [Filed and cited in minor break 5.4 Record of Decision (ROD) of the Fort Devens Group 1B Sites Administrative Record Index.]
37. Cross Reference: Comments dated on May 10, 1996 from John Regan (MADEP) on "Draft Final ROD for the South Post Impact Area and AOC 41 Groundwater and AOCs 25, 26, and 27" (Horne, April 1996), [Filed and cited in minor break 5.4 Record of Decision (ROD) of the Fort Devens Group 1B Sites Administrative Record Index.]
38. Cross Reference: Comments dated on June 14, 1996 from John Regan (MADEP) on "Final ROD for the South Post Impact Area and AOC 41 Groundwater and AOCs 25, 26, and 27, Ft. Devens, Mass." (Horne, April 1996), [Filed and cited in minor break 5.4 Record of Decision (ROD) of the Fort Devens Group 1B Sites Administrative Record Index.]

Response to Comments

34. Responses Dated January 1995 from U.S. Army Environmental Center on the following documents: Draft No Further Action Decision Under CERCLA SA 14, SA 43B and SA 43N - Groups 2, 7, and Historic Gas Stations, Fort Devens, Massachusetts.
35. Responses Dated January 1995 from U.S. Army Environmental Center on the following documents: Draft No Further Action Decision Under CERCLA SA 43C, E, F, L, M, P, Q, R, S - Groups 2, 7, and Historic Gas Stations, Fort Devens, Massachusetts.
36. Responses Dated January 1995 from U.S. Army Environmental Center on the following documents: Draft No Further Action Decision Under CERCLA SA 58 - Groups 2, 7, and Historic Gas Stations, Fort Devens, Massachusetts.

10.0 Enforcement

10.16 Federal Facility Agreements

1. Cross Reference: "Final Federal Facility Agreement Under CERCLA Section 120," EPA Region I and U.S. Department of the Army (November 15, 1991) with attached map [Filed and cited as entry number 1 in minor break 10.16 Federal Facility Agreements of the Fort Devens Group 1A Sites Administrative Record Index].

13.0 Community Relations

13.2 Community Relations Plans

Reports

1. Cross Reference: "Final Community Relations Plan," Ecology and Environment, Inc. (February 1992) [Filed and cited as entry number 1 in minor break 13.2 Community Relations Plans of the Fort Devens Group 1A Sites Administrative Record Index].

Comments

2. Cross Reference: Letter from James P. Byrne, EPA Region I to F. Timothy Prior, Fort Devens (March 19, 1992), concerning approval of the February 1992 "Final Community Relations Plan," Ecology and Environment, Inc.

13.11 Technical Review Committee Documents

Cross Reference: The following documents cited below as entries number 1 through 8 are filed and cited as entries number 1 through 8 in minor break 13.11 Technical Review Committee Documents of the Fort Devens Group 1A Sites Administrative Record.

1. Technical Review Committee Meeting Agenda and Summary (March 21, 1991).
2. Technical Review Committee Meeting Agenda and Summary (June 27,1991).
3. Technical Review Committee Meeting Agenda and Summary (September 17, 1991).
4. Technical Review Committee Meeting Agenda and Summary (December 11, 1991).
5. Technical Review Committee Meeting Agenda and Summary (March 24,

1992).
6. Technical Review Committee Meeting Agenda and Summary (June 23, 1992).
7. Technical Review Committee Meeting Agenda and Summary (September 29, 1992).
8. Technical Review Committee Meeting Agenda and Summary (January 5, 1993).

17.0 Site Management Records

17.6 Site Management Plans

Cross Reference: The following Reports, Comments, and Responses to Comments (entries 1 through 9) are filed and cited in minor break 17.6 Site Management Records of the Groups 3, 5, & 6 Administrative Record Index unless otherwise noted below.

Reports

1. "Final Quality Assurance Project Plan," Ecology and Environment, Inc. (November 1991).
2. "General Management Procedures, Excavated Waste Site Soils, Fort Devens, Massachusetts," ABB Environmental Services, Inc. (January 1994).

Comments

3. Cross Reference: Comments from James P. Byrne, EPA Region I on the November 1991 "Final Quality Assurance Project Plan," Ecology and Environment, Inc. [These Comments are filed and cited as a part of entry number 8 in the Responses to Comments section of this minor break].
4. Comments Dated December 16, 1993 from Molly J. Elder, Commonwealth of Massachusetts Department of Environmental Protection on the November 1993 "Draft General Management Procedures, Excavated Waste Site Soils, Fort Devens, Massachusetts," ABB Environmental Services, Inc.
5. Comments Dated December 27, 1993 from James P. Byrne, EPA Region I on the November 1993 "Draft General Management Procedures, Excavated Waste Site Soils, Fort Devens, Massachusetts," ABB Environmental Services, Inc. [Filed and cited as entry number 4 in minor break 4.4 Interim Deliverables of the AOCs 44/52 Administrative Record Index.]
6. Comments Dated March 11, 1994 from D. Lynne Welsh, Commonwealth of Massachusetts Department of Environmental Protection on the January

1994 "General Management Procedures, Excavated Waste Site Soils, Fort Devens, Massachusetts," ABB Environmental Services, Inc.

Responses to Comments

7. Cross Reference: U. S. Army Environmental Center Responses to Comments on the following documents: Feasibility Study Report; Biological Treatability Study Report; Feasibility Study Report - New Alternative 9; Draft General Management Procedures Excavated Waste Site Soils; and Draft Siting Study Report, dated January 25, 1994. [These Responses to Comments are filed and cited as a part of entry number 7 in the Responses to Comments section of minor break 4.4 Interim Deliverables of the AOCs 44/52 Administrative Record Index.]
8. Response from Fort Devens to Comments from James P. Byrne, EPA Region I on the November 1991 "Final Quality Assurance Project Plan," Ecology and Environment, Inc.
9. Cross Reference: U.S. Army Environmental Center Responses to Comments for the following documents: Final Feasibility Study Report; Draft Proposed Plan; Revised Draft Proposed Plan; Draft Excavated Soils Management Plan; Final General Management Procedures Excavated Waste Site Soils; and Biological Treatability Study Report, dated May 1994. [These Responses to Comments are filed and cited as entry number 8 in the Responses to Comments section of minor break 4.4 Interim Deliverables of the AOCs 44/52 Administrative Record Index.]

17.9 Site Safety Plans

Cross Reference: The following documents (entries 1 through 3) are filed and cited in minor break 17.9 Site Safety Plans of the Fort Devens Group 1A Administrative Record File Index unless otherwise noted below.

Reports

1. "Final Health and Safety Plan," Ecology and Environment, Inc. (November 1991).

Comments

2. Cross Reference: Comments from James P. Byrne, EPA Region I on the November 1991 "Final Health and Safety Plan," Ecology and Environment, Inc. [These Comments are filed and cited as a part of entry number 8 in minor break 17.6 Site Management Plans of the Group 1A Sites Administrative Record File Index].

Responses to Comments

3. Response from Fort Devens to Comments from James P. Byrne, EPA Region I on the November 1991 "Final Health and Safety Plan," Ecology and Environment, Inc.

GUIDANCE DOCUMENTS

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

1. Occupational Safety and Health Administration (OSHA). Hazardous Waste Operation and Emergency Response (Final Rule, 29 CFR Part 1910, Federal Register. Volume 54, Number 42) March 6, 1989.
2. USATHAMA. Geotechnical Requirements for Drilling Monitoring Well, Data Acquisition, and Reports, March 1987.
3. USATHAMA. IRDMIS User's Manual, Version 4.2, April 1991.
4. USATHAMA. USATHAMA Quality Assurance Program: PAM-41, January 1990.
5. USATHAMA. Draft Underground Storage Tank Removal Protocol - Fort Devens, Massachusetts, December 4, 1992.
6. U.S. Environmental Protection Agency. Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring: OWRS QA-1, May 1984.
7. U.S. Environmental Protection Agency. Office of Research and Development Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans: QAMS-005/80, 1983.
8. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, (OSWER Directive 9355.3-01, EPA/540/3-89/004, 1986.
9. U.S. Environmental Protection Agency. Test Methods for Evaluating Solid Waste: EPA SW-846 Third Edition, September 1986.
10. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), (EPA/540/1-89/002), 1989.
11. U.S. Environmental Protection Agency. Hazardous Waste Management System: Identification and Listing of Hazardous Waste: Toxicity Characteristic Revisions, (Final Rule, 40 CFR Part 261 et al., Federal Register Part V), June 29, 1990.

Section II

Guidance Documents

RECORD OF DECISION SUMMARY
SOUTH POST IMPACT AREA AND
AREA OF CONTAMINATION 41 GROUNDWATER AND
AREAS OF CONTAMINATION 25, 26, AND 27
FORT DEVENS, MASSACHUSETTS

APPENDIX D

RESPONSIVENESS SUMMARY

1. Originating Organization of Document: U.S. Army Environmental Center					
2. Document Title: Draft Final Record of Decision for the South Post Impact Area and Area of Contamination 41 Groundwater, and Areas of Contamination 25, 26, and 27					
3. Date Comments Required: Response document					
4. Reviewed by:	5. Page	6. Line	7. Section	8. Comment	9. Comment Response
PROPOSED PLAN for SPIA Groundwater and AOCs 25, 26, and 27 - January 30, 1996					
Nashua River Watershed Association, Feb. 21, 1996	7			Groundwater Investigations Results, p.7 - What is the Army's degree of confidence for its stated conclusion that "...contamination found in the southern SPIA wells are not impacting the Nashua River." Even if performed over four consecutive years, once annual sampling at one site (Well D-1) for one set of contaminants ("explosive-related organics") seems inadequate. Were other contaminants sampled for during this four year period? If so, what do their results show?	Sampling was done in accordance with our approved QA/QC plan. D-1 has been sampled for the complete list of TAL, VOCs, semivolatiles, PCBs, explosives, and semi-volatiles.
Nashua River Watershed Association, Feb. 21, 1996	8 & 9			Groundwater Monitoring and Ecological Management Plans, pp. 8 & 9. The Army's decision to develop and implement such plans is welcome re-assurance. NRWA requests that the monitoring reports mandated by these plans be submitted as well to local Boards of Health and Conservation Commissions. In addition, these plans should prescribe mitigation measures to be taken in the event that EPA thresholds for any of the contaminants sampled are exceeded.	The Army, USEPA-New England, and MADEP will develop the details of the Integrated Natural Resources Management Plan. This plan will be developed within 6 months of ROD signature. This issue will be addressed in the plan.
Nashua River Watershed Association, Feb. 21, 1996	10			EOD Range Risk Assessment, p. 10—This plan should adequately describe the worst case scenario projected. The plan assumes that continuing habitat disturbance will keep animals and plants off the range and for this reason continuing contaminant accedences will be ecologically insignificant because potential receptors will not be present. However, periods of inactivity will very likely bring about the re-establishment of animals and plants long before heavy-metal concentrations fall below EPA's thresholds.	The Army, USEPA-New England, and MADEP will develop the details of the Integrated Natural Resources Management Plan. This plan will be developed within 6 months of ROD signature. This issue will be addressed in the plan
Nashua River Watershed Association, Feb. 21, 1996	12			Zulu Ranges Risk Assessment, p. 12—What laboratory test was performed (And what were its results?) that showed water samples were not toxic to aquatic invertebrates and fish despite lead accedences? Again, if animals and plants return to disturbed habitat during these times of disuse, excessive concentrations of heavy metals will likely prove ecologically significant.	The laboratory tests performed were surface water chronic toxicity tests with invertebrates and fathead minnows. tests were performed according to EPA guidance. Results are provided in Appendix K to Volume V of the Ft. Devens Functional Area I RI Report (August 1994). Water for testing was collected from three sites in the north Zulu wetland and one site in the south Zulu wetland. No effects on survival and fecundity were observed. These results suggest that indigenous biota would not be adversely affected by the levels of contamination in wetlands associated with the Zulu site. The Army, USEPA-New England, and MADEP will develop the details of the Integrated Natural Resources Management Plan. This plan will be developed within 6 months of ROD signature. This issue will be addressed in the plan

1. Originating Organization of Document : U.S. Army Environmental Center					
2. Document Title: Draft Final Record of Decision for the South Post Impact Area and Area of Contamination 41 Groundwater, and Areas of Contamination 25, 26, and 27					
3. Date Comments Required: Response document					
4. Reviewed by:	5. Page	6. Line	7. Section	8. Comment	9. Comment Response
Nashua River Watershed Association, Feb. 21, 1996	13			Hotel Range Risk Assessment, p. 13—This section's phrasing suggests that water samples were not taken from Cranberry Pond. If not, why not? How can the Army be sufficiently confident that samples from Zulu Range are comparable to any that might be taken from Cranberry Pond? Once again, there is concern about the ecological consequences of the settling of disturbed habitat and the reappearance of animals and plants.	Six samples were collected in the RI and 3 in the SI at Cranberry Pond. As stated in the ecological risk assessment for Hotel Range, the lack of toxicity of lead in nearby Zulu surface water samples suggests that the lead is in a chemical form which is not bioavailable and does not pose a threat to aquatic life. The Army, USEPA-New England, and MADEP will develop the details of the Integrated Natural Resources Management Plan. This plan will be developed within 6 months of ROD signature. This issue will be addressed in the plan
U.S. DOI, Fish and Wildlife Service, Feb. 29, 1996				AOC 25 (Explosive Ordnance Disposal Range) Elevated levels of metals were reported in the RI (Vol. II pg. 5-1, Line 45) at sampling location 255-92-06X. This portion of AOC #25 is an area designated for emergency disposal of waste ordnance. The proposed Plan (pg.10) discusses conducting an additional human health risk assessment if the Army were to relinquish control of AOC #25 and release the land for other purposes. This type of language should also be included for ecological receptors and a new ecological risk assessment when military activities (e.g., emergency disposal of waste ordnance) cease at the site. Current contaminant concentrations at AOC #25 may not warrant immediate removal actions, but subsequent military activities since the RI investigation may cause additional contamination requiring reexamination.	The following text has been added to the ROD "Should the Army close and/or transfer this property, an Environmental Baseline Survey (EBS) will be conducted. The EBS will be provided to the USEPA-New England and MADEP for comment." The Army, USEPA-New England, and MADEP will develop the details of the Integrated Natural Resources Management Plan. This plan will be developed within 6 months of ROD signature. This issue will be addressed in the plan.
U.S. DOI, Fish and Wildlife Service, Feb. 29, 1996				AOC 25 (Explosive Ordnance Disposal Range) In the Nature and Extent section of the RI (Vol. II, page. 5-33, Table 5-5), copper (29.7 µg/l) and lead (18.8 µg/l) at AOC #25 exceed the acute and chronic freshwater Ambient Water Quality Criteria, respectively. These elevated concentrations were not discussed in the RI ecological risk assessment (ERA). The ERA summary in the Proposed Plan (pg. 10) also does not mention these contaminants	No surface water resources are located within AOC 25. A natural spring and its associated stream are located west of the site across Firebreak Road, which flows into Slate Rock Brook. This spring was very shallow and the sample collected from it was turbid, explaining the elevated metals. There is a groundwater divide between the EOD disposal area and the spring so that the disposal area cannot possible affect the water quality at the spring. The ecological risks of contaminants in Slate Rock Brook were evaluated in the assessment of the SPIA provided in Section 9 of Volume I of the Ft. Devens Functional Area I RI Report.

1. Originating Organization of Document: U.S. Army Environmental Center					
2. Document Title: Draft Final Record of Decision for the South Post Impact Area and Area of Contamination 41 Groundwater, and Areas of Contamination 25, 26, and 27					
3. Date Comments Required: Response document					
4. Reviewed by:	5. Page	6. Line	7. Section	8. Comment	9. Comment Response
U.S. DOI, Fish and Wildlife Service, Feb. 29, 19960				AOC 25 (Explosive Ordnance Disposal Range) In the RI (Vol. II, pg. 9-1, Line 44), we found an inconsistency in the discussion of potential polycyclic aromatic hydrocarbon (PAH) contamination in surface soils. The ERA stated that since PAHs were not detected in subsurface soils, the same organic analytical results would be expected in surface soils, which were not analyzed for PAHs. This logic in the ERA for soil PAHs did not make sense. We could accept the opposite (i.e., if the surface was uncontaminated the subsurface would likely be uncontaminated), but the supposition that the surface soils are clean because the subsurface soils were uncontaminated is illogical. Was this issue ever resolved? To us, this is an inconsistency that should have been addressed before a Proposed Plan of No Action was issued. Sampling to determine potential PAH surface soil contamination appears warranted.	The presumed lack of PAH contamination in surface soils was based on the fact that TPHCs were found at approximately the same concentration in both surface soil and subsurface soil, yet PAHs (a component of petroleum hydrocarbons) were not detected in subsurface samples.
U.S. DOI, Fish and Wildlife Service, Feb. 29, 1996				AOC 26 (Zulu Ranges) We pointed out that elevated contaminant concentrations were omitted from the RI (Vol III, pg. 5-1, Line 12) discussion if they could not be related to the site. If an environmental contaminant was found at concentrations likely to cause a biological effect, the RI should have mentioned the elevated level and its consequences even if the contaminant could not be directly attributable to military training or demolition activity	The concentrations of these chemicals was equivalent to the local background concentrations. However, the Army, USEPA-New England, and MADEP will develop the details of the Integrated Natural Resources Management Plan. DOI concerns of data gaps will be discussed during this plans development. This plan will be developed within 6 months of ROD signature. This issue will be addressed in the plan.
U.S. DOI, Fish and Wildlife Service, Feb. 29, 1996				AOC 26 (Zulu Ranges) The RI ERA (Vol. III, pg. 9-23) recommended additional toxicity tests, chemical analysis of sediment pore water, and/or other ecological investigations in the Zulu wetlands. The Proposed Plan (pg 12), however, only mentions that water samples were not toxic to aquatic invertebrates and fish.	The Army, USEPA-New England, and MADEP will develop the details of the Integrated Natural Resources Management Plan. This plan will be developed within 6 months of ROD signature. This issue will be addressed in the plan.
U.S. DOI, Fish and Wildlife Service, Feb. 29, 1996				AOC 26 (Zulu Ranges) The USFWS concurred with the Army that remediation was not necessary at AOC #26 if explosive and ordnance training were to continue (Vol. III, pg 5-2, Line 32). We qualified this statement in our letter with the condition that new contamination from ongoing military activities may require a reassessment if the South Post closes and new land-uses may be implemented. Specifically, lead and explosive contaminants should be reassessed following closure. We also concurred with the RI findings that further investigation is warranted to evaluate risk to ecological receptors using the Zulu wetlands (Vol. III, pg. 9-23, Line 11).	No response required.
U.S. DOI, Fish and Wildlife Service, Feb. 29, 1996				AOC 27 (Hotel Range) Surface soil contamination at AOC #27 requires further evaluation. In the review of the RI (see USFWS comments for Vol. IV, pg. 5-1 and 9-8), it was unclear to us how the subsurface soil boring data related to potential surficial contamination. Although, we recommended limited surface soil sampling to resolve the issue, it apparently was never conducted.	Subsurface soils were collected in the RI, and in the SI 10 soil samples were collected at depths of 0 to 20 feet. Both the SI and RI data were evaluated in the ecological risk assessment, and no COPCs were identified. In addition, the entire former disposal area has been deeply buried as a result of profound remodeling. All surface soils at the AOC are recently bulldozed subsoils or originate from outside the former disposal area. Therefore, additional soil sampling does not appear to be warranted.

1. Originating Organization of Document: U.S. Army Environmental Center					
2. Document Title: Draft Final Record of Decision for the South Post Impact Area and Area of Contamination 41 Groundwater, and Areas of Contamination 25, 26, and 27					
3. Date Comments Required: Response document					
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U.S. DOI, Fish and Wildlife Service, Feb. 29, 1996				AOC 27 (Hotel Range) The ERA focused on potential risks to aquatic invertebrates in Cranberry Pond (Vol. IV, pg. 9-14, Line 17). Although lead was detected in surface water, the ERA did not include a discussion of possible risks to the warm water fish community in the pond.	As discussed in section 9 of Volume IV of the Fort Devens Functional Area I RI Report, page 9-12, line 15, the assessment of risks to aquatic invertebrates was done using toxicity reference values that address all forms of aquatic life, including fish and aquatic plants.
U.S. DOI, Fish and Wildlife Service, Feb. 29, 1996				AOC 27 (Hotel Range) The RI (Vol. IV, pg. 9-16, Line 5) suggested that toxicity tests conducted for AOC #26 may also be applicable to AOC #27. The Proposed Plan (pg. 13) also attempts to make this connection. As we noted, site-specific conditions and variations in concentrations of inorganic and other contaminants between the sites may make this an invalid hypothesis. We agreed with a conclusion in the ERA (Vol. IV, pg. 9-19, Line 20) that the benthic community may be at risk from AOC #27 contaminants. To resolve this issue, toxicity tests for AOC #27 should be considered in the proposed Environmental Management Monitoring Plan.	The Army, USEPA-New England, and MADEP will develop the details of the Integrated Natural Resources Management Plan. This plan will be developed within 6 months of ROD signature. This issue will be addressed in the plan.
U.S. DOI, Fish and Wildlife Service, Feb. 29, 1996				AOC 27 (Hotel Range) The RI ERA (Vol. IV, pg. 9-18, Line 9) recommended additional sediment sampling to define the nature and extent of contamination in Cranberry Pond. The Proposed Plan (pg. 12) mentions that only one sediment sample showed elevated metals and dismisses the need for additional sampling. We concur with the recommendations in the ERA, and restate our opinion that additional sediment sampling is warranted in Cranberry Pond.	The Army, USEPA-New England, and MADEP will develop the details of the Integrated Natural Resources Management Plan. This plan will be developed within 6 months of ROD signature. This issue will be addressed in the plan.
U.S. DOI, Fish and Wildlife Service, Feb. 29, 1996				AOC 27 (Hotel Range) In the Proposed Plan (pages 10,12, & 13), the summaries of Ecological Risk Assessments for all three AOCs state that the risk at these sites would not be ecologically significant due to the disturbed nature of the habitat. These statements attempt to devalue the habitat provided by the SPIA to fish and wildlife resources. Although military activities are disruptive and the habitat may be disturbed at certain times of the year, training activities do not occur continuously. Many species will utilize the habitants associated with the AOCs in other seasons when training is sporadic. Some species are even more tolerant of military training and may continue to use the areas throughout the year adjusting their activity patterns to periods of the day (i.e., dawn and dusk) or night when training may be less intensive or frequent.	No response required.
U.S. DOI, Fish and Wildlife Service, Feb. 29, 1996				We reiterate our strong beliefs that the issues and concerns discussed above (and the other issues we mentioned in our April 27, 1995 letter) should have been addressed before a No Action plan were adopted for the SPIA. While the USFWS has no desire to delay the cleanup/remedial process at Fort Devens, we cannot support the Proposed Plan in its present form. If the recommendations and data gaps identified in this letter are completely addressed within the Ecological Management Monitoring Plan, and it is made clear to the Army the remedial actions may be required in the future, prior to any land transfer, we could join EPA in supporting the Army's Proposed Plan of No Action. We suggest that language be added to the ROD that requires the Army to accomplish the ERA recommendations and investigate or resolve all RI data gaps. Without this language, we believe that a No Action ROD could be used later in the process to refute the need for additional assessment, sampling, or remedial action.	Additional work as recommended by DOI will be discussed during development of the Integrated Natural Resources Management Plan.

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MADEP Feb. 29, 1996	6		Par. 1	The proposed plan should note that the ROD does not affect assessment or remedial activities on the other South Post sites. These sites include AOC 41 (Beer Can Landfill), SA 6 (household Landfill), SA 12 (Range Control Landfill), SA (Popping Furnace), and RCRA closure of SA 28.	The following text was added to the ROD Declaration statement and Executive Summaries "This ROD does not affect assessment or remedial activities on areas not specifically mentioned herein."
MADEP Feb. 29, 1996	7		Par. 5	The MADEP recommends that the proposed plan note the location of the groundwater divide. Additionally, the plan should note that an explosive related organic, dinitrobenzene is found in monitoring wells SPM-93-8X, SPM-93-10X, and SPM-93-16X which are north of the New Cranberry Pond Groundwater divide.	The purpose of the fact sheet and proposed plan is to summarize the information on each AOC. For detailed information, the RI Report should be consulted. Even though explosives and other contaminants were found in the referenced wells, no exposure exists at these points based on the current and future use (Army training activities). The ecological concerns will be addressed in the Integrated Natural Resources Management Plan which will be developed post-ROD.
MADEP Feb. 29, 1996	9		Par. 5	Please note that explosives were analyzed in groundwater samples collected from EOD-1 and metals were present in groundwater samples collected from EOD-4.	The purpose of the fact sheet and proposed plan is to summarize the information on each AOC. For detailed information, the RI Report should be consulted. Even though explosives and other contaminants were found in the referenced wells, no exposure exists at these points based on the current and future use (Army training activities). The ecological concerns will be addressed in the Integrated Natural Resources Management Plan which will be developed post-ROD.
MADEP Feb. 29, 1996	10		Par. 7	The MADEP recommends that the plan note the presence of explosives and metals in AOC 26 groundwater.	The purpose of the fact sheet and proposed plan is to summarize the information on each AOC. For detailed information, the RI Report should be consulted. Even though explosives and other contaminants were found in the referenced wells, no exposure exists at these points based on the current and future use (Army training activities). The ecological concerns will be addressed in the Integrated Natural Resources Management Plan which will be developed post-ROD.
MADEP Feb. 29, 1996	12		Par. 4	Although the proposed plan notes the presence of metal contamination in one Cranberry Pond sediment sample, the analytical data indicates numerous accedences of background and sediment criteria in other Cranberry Pond sediment samples. The MADEP recommends that the Army review the available sediment data and include language in the proposed plan noting the accedences. Additionally the proposed plan should note the presence of explosives in groundwater on the site.	The purpose of the fact sheet and proposed plan is to summarize the information on each AOC. For detailed information, the RI Report should be consulted. Even though explosives and other contaminants were found in the referenced wells, no exposure exists at these points based on the current and future use (Army training activities). The ecological concerns will be addressed in the Integrated Natural Resources Management Plan which will be developed post-ROD.

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FACT SHEET SPIA Groundwater and AOC 25, 26, and 27 - January 30, 1996					
MADEP Feb. 29, 1996	1			Please note that the "no-action" ROD does not preclude future assessment and remediation activity should implementation of the monitoring plan detect any increase in contamination or threat to human health or the environment.	The Army understands and agrees with MADEP that any future actions will need to be assessed to determine their potential impact and the need for additional investigations.
MADEP Feb. 29, 1996	2			The MADEP recommends that the fact sheet state that the ROD does not affect assessment or remedial activities on the other South Post sites. These sites include AOC 41 (Beer Can Landfill), SA 6 (Household Landfill), SA 12 (Range Control Landfill), SA 42 (Popping Furnace) and RCRA closure of SA 28.	The following text was added to the ROD Declaration statement and Executive Summaries "This ROD does not affect assessment or remedial activities on areas not specifically mentioned herein."
MADEP Feb. 29, 1996	2			The MADEP recommends that this section be corrected to note that dinitrobenzene was found in groundwater in wells north of the groundwater divide. This explosive related organic was found in monitoring wells SPM-93-8X, SPM-93-10X, SPM-93-16. Other instances of contamination that should be discussed in this section include: AOC 25: Heavy metal groundwater contamination in EOD-4 and 25M-93-10X, explosive groundwater contamination in EOD-1 and surficial soil contamination in 25S-92-05X and 25S-92-06X. AOC 26: Explosive groundwater contamination in 26M-92-02X, 26M-92-03X, 26M92-04X. AOC 27: All Cranberry Pond sediment samples exhibit heavy metals contamination in excess of background and ecological criteria. Additionally, please note that both explosives and dissolved heavy metals were found in AOC 27 groundwater.	The purpose of the fact sheet and proposed plan is to summarize the information on each AOC. For detailed information, the RI Report should be consulted. Even though explosives and other contaminants were found in the referenced wells, no exposure exists at these points based on the current and future use (Army training activities). The ecological concerns will be addressed in the Integrated Natural Resources Management Plan which will be developed post-ROD.
MADEP Feb. 29, 1996	2			The MADEP recommends that the fact sheet note that the risks posed to human health are within the EPA's standard for acceptable use based on current use.	The Army agrees that the risks are within USEPA standards based on current and future use. The Army has included statement to that effect in the ROD.
MADEP Feb. 29, 1996	3			Although the MADEP acknowledges that there is no threat to human health associated with SPIA groundwater based on risk assessments and current use, we recommend that the fact sheet note that the risk assessments did not consider groundwater as a contaminant pathway.	The Army did address groundwater as a contaminant pathway in the RI.
DRAFT ROD for SPIA Groundwater and AOC 25, 26, and 27 - February 14, 1996					
USAEC Public Affairs Office	7	4		Explain what is meant by local background samples.	Added the following text after first mention of local background samples "Background samples are those collected in a similar medium (i.e., water, soil, sediment) that are not believed to be contaminated"
USAEC Public Affairs Office	7	21		More space is needed between "L" and the superscript "2."	Changed text to "screening value[3] (50 μg/L)"
USAEC Public Affairs Office	7	23		More space is needed between "L" and the superscript "3."	Changed text to "screening value[3] (2 μg/L)."
USAEC Public Affairs Office	7	35		More space is needed between "L" and the superscript "4."	Changed text to "screening value[4] (50 μg/L)"

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EPA-New England (no date)	Gen.			Please delete "deemed acceptable by USEPA-New England" and change to read "deemed acceptable" in all section of the ROD that have this statement.	Global search done to remove "deemed acceptable by USEPA-New England" and replace with "deemed acceptable."
EPA-New England (no date)	ES-1	20		Please change this line; the sentence is duplicative.	Changed sentence to read "The SPIA is approximately.."
EPA-New England (no date)	ES-1	23		Please add that this will be the use for the foreseeable future also.	Changes text to read "SPIA is and will be for the foreseeable future an active.."
EPA-New England (no date)	ES-2	4		Please add at the end of the sentence: "within 6 months of ROD signature."	Text was added.
EPA-New England (no date)	ES-2	18		Please add the additional parameters that this will be sampled for (i.e., MCLs/MMCLs).	The following text was added to the end of this bullet "Massachusetts and Federal drinking water requirements (MMCLs/MCLs)."
EPA-New England (no date)	ES-2	20		Please make the development of this plan a separate paragraph. Please add "the details of this plan will be developed jointly by the Army. EPA New England, US Fish and Wildlife Service, and MADEP within 6 months of ROD signature."	Bullet was not changed. Text was separated from a subsequent paragraph and made a stand alone paragraph that focuses on this plan.
EPA-New England (no date)	ES-2	24		Please add to the end of the sentence: "annually."	Text was added.
EPA-New England (no date)	ES-2	36		Please add a sentence describing the Army's responsibilities if the land use changes as a result of closure and/or transfer.	The following text has been added to the ROD "Should the Army close and/or transfer this property, an Environmental Baseline Survey (EBS) will be conducted. The EBS will be provided to the USEPA-New England and MADEP for comment."
EPA-New England (no date)	ES-2	38		Please add to the end of this sentence: "as required under CERCLA."	Text was added.
EPA-New England (no date)	3		Par. 3	Please reference the fact that the SPIA was retained and will continue to be used as a training range.	The following text was added " However, the SPIA will be retained by the Army for continued use as a training range."
EPA-New England (no date)	4	9		The TRC was established in March, 1991.	The text was modified to read correctly.
EPA-New England (no date)	5	20		Please specify what the "future activities" are (i.e., military training).	The text was modified to read "..future military training activities.."
EPA-New England (no date)	14	18		1E-6 is 1/1,000,000 not 1/100,000. Please change.	The text was modified to read correctly.

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EPA-New England (no date)	16	12		1.2E-1 is not within or below the EPA's risk range. Is this a typo? Please clarify.	Number was entered incorrectly, the appropriate value "1.7×10^{-6}" has been entered.
EPA-New England (no date)	17	35		How does the Army Range Control restrict access? Are there security patrols, etc.? Please expand this section.	Text adequately describes restrictions.
EPA-New England (no date)	18	11	VIII	Please add at the end of the sentence: "within 6 months of ROD signature."	The desired text has been added.
EPA-New England (no date)	18	22		Under this bullet, I would suggest not listing specific wells; this plan still needs to be negotiated between Army, EPA, and MADEP.	Specific reference has been removed.
EPA-New England (no date)	18	29		Please add that the Plan will be developed within 6 months of the ROD.	The following text was added to this paragraph "The plan will be developed within 6 months of ROD signature."
EPA-New England (no date)	18	37		Please make this a separate paragraph and explain that this plan will be jointly developed by the Army, EPA, US Fish and Wildlife Service, and MADEP within six months of ROD signature.	The desired text was added.
EPA-New England (no date)	18	41		Please add at the end of the sentence: "annually."	The desired text was added.
EPA-New England (no date)	19	3	Par. 1	Who will implement the long term groundwater monitoring plan? This needs to be mentioned also. Also in this paragraph, please reference the Army's responsibilities under CERCLA as a result of closure and/or transfer.	The details of the ghround water monitoring plan (including number and location of monitoring points) will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Association, and MADEP.
EPA-New England (no date)	A-E			Please add the risk tables to the appendix.	The appropriate tables have been added to Appendix E.
MADEP Mar. 25, 1996				Recommends further review of South Post groundwater flow directions, hydraulic conductivity, well construction details and analyzed contaminant levels in the development of the final plan.	The details of the ghround water monitoring plan (including number and location of monitoring points) will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Association, and MADEP.
MADEP Mar. 25, 1996	D 1	45		Add at the end of the sentence "for the pathways that were assessed."	The desired text has been added.
MADEP Mar. 25, 1996	D 2	6		Please note that the no-action ROD does involve long term monitoring of groundwater.	The following sentence was added to the end of the subject paragraph "Long term groundwater monitoring will be conducted at the site under this "no action" ROD."

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MADEP Mar. 25, 1996	D 2	16		Add at the end of the sentence "unless the land use changes."	The desired text was added.
MADEP Mar. 25, 1996	ES-1	32		Add at the end of the sentence "even though levels exceeded Army and EPA action levels."	The desired text was added.
MADEP Mar. 25, 1996	ES-1	35		Add to end of sentence "due to the absence of a pathway for any known ecological receptor to access SPIA groundwater."	The desired text was added.
MADEP Mar. 25, 1996	ES-1	38		Add at the end of sentence "for assessed pathways."	The desired text was added.
MADEP Mar. 25, 1996	ES-2	11		Add to end of sentence "to incorporate data from new sentinel well (s) and ascertain any potential impacts to MCI Shirley."	The desired text was added.
MADEP Mar. 25, 1996	ES-2	13		Please note that the Groundwater Monitoring Plan will be completed within six months of ROD signature.	The following text was added to the end of the paragraph "The groundwater monitoring plan will be completed within 6 months of ROD signature"
MADEP Mar. 25, 1996	ES-2	20		Please note that the Ecological Monitoring Plan will be completed within six months of ROD signature.	This information is incorporated in a paragraph dedicated to the Integrated Natural Resources Management Plan, following the specified bullet.
MADEP Mar. 25, 1996	ES-2	33		Please change the text to note that reviews may be needed on a more frequent basis than five years should site conditions change. An example of this would be evidence of transport of a contaminant off-post or a sharp rise in a contaminant concentration in a sampled monitoring well.	The following sentence was added to the end of the paragraph "More frequent reviews may be conducted should site conditions change."
MADEP Mar. 25, 1996	1	24		Please check the acreage figure stated in this sentence. A review of the area indicates that the acreage for the SPIA could be 50% higher than stated.	Total SPIA acreage is 1450 to 1500 acres, however, in this ROD we are only addressing the area of the SPIA north and west of the groundwater divide. This area is about 964 acres. Language has been added to the text to clarify this statement.
MADEP Mar. 25, 1996	1	28		Please note that the SPIA also encompasses several study areas	The text has been modified to read "..as well as several study areas (SA's), and a number of other.."
MADEP Mar. 25, 1996	4	43		Please note that there are information repositories in the Lancaster, Shirley, Harvard and Ayer libraries that contain information relative to ongoing Fort Devens environmental actions.	The following text was added to the end of this section "In addition, there are information repositories in the Lancaster, Shirley, Harvard, and Ayer libraries that contain information relative to ongoing Fort Devens environmental actions. "
MADEP Mar. 25, 1996	5	17		Please note that the Ecological Monitoring Plan will be completed within six months of ROD signature.	The following sentence was added to the end of this paragraph "This plan will be completed within 6 months of ROD signature."

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MADEP Mar. 25, 1996	6	1		Please note in this paragraph that more than 50% of the SPIA overlies a medium yield aquifer which is a potential source of drinking water. Therefore, MADEP concurrence with the ROD constitutes MADEP's agreement that the site is adequately regulated under the provisions of 310 CMR 40,000, the Massachusetts Contingency Plan.	The following text was added to this paragraph "More than 50 percent of the SPIA overlies a medium yield aquifer which is a potential source of drinking water. MADEP concurrence with this ROD constitutes MADEP's agreement that the site is adequately regulated under the provisions of 310 CMR 40,000, the Massachusetts Contingency Plan."
MADEP Mar. 25, 1996	9	40		The MADEP recommends that the metal concentrations of sediments from Cranberry Pond and Zulu Range be reviewed and compared and the sentence corrected as necessary. Cranberry Pond sediment metal concentrations for arsenic, copper, chromium lead, mercury, nickel and zinc appear to be generally higher than those analyzed in Zulu Range sediments.	The sentence has been rewritten and the subject text removed.
MADEP Mar. 25, 1996	12	38		Please note that any future use of SPIA groundwater will require a human health risk assessment.	The following text was added to the end of the paragraph "Any future use of the SPIA groundwater will require a human health risk assessment."
MADEP Mar. 25, 1996	16	30		The MADEP notes that although the section contains a discussion of SPIA groundwater, the section cannot be considered complete unless it also encompasses a discussion regarding potential impacts on ecological receptors from contaminated sediments. The MADEP recommends that the section include discussions on soil and sediments.	Appropriate text has been added.
MADEP Mar. 25, 1996	18	16		The MADEP recommends the installation of the following additional monitoring wells to facilitate SPIA groundwater monitoring and enhance the South Post Groundwater Model: Install a monitoring well between SPM-93-08X and the drinking water well, D-1. The installation of this well was recommended on December 7, 1994 by the Agency for Toxic Substances and Disease Registry	The details of the ghround water monitoring plan (including number and location of monitoring points) will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Association, and MADEP.
MADEP Mar. 25, 1996				The MADEP recommends the installation of the following additional monitoring wells to facilitate SPIA groundwater monitoring and enhance the South Post Groundwater Model: Add wells south of New Cranberry Pond to detect potential transport of contaminants off-post. The MADEP recommends the installation of three monitoring wells northwest of Trainfire Road.	The details of the ghround water monitoring plan (including number and location of monitoring points) will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Association, and MADEP.
MADEP Mar. 25, 1996	18	18		The MADEP concurs with the inclusion of EPD-1 in the LTMP. However, we recommend that 26M-92-03X due to the proximity of the two wells, and the variance in contaminants analyzed in the wells' groundwater samples as well as the variance in the screening depth of the two wells. The inclusion of both wells in the LTMP will greatly enhance the Army's ability to detect contaminant transport.	The details of the ghround water monitoring plan (including number and location of monitoring points) will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Association, and MADEP.
MADEP Mar. 25, 1996				The MADEP recommends that 27M-92-01X be enhanced in the LTMP with the inclusion of both 27M-93-05X or 27M-93-06X. Both of these latter wells are adjacent to 27M-92-01X and are screened at varying depths and contain disparate contaminants which may be related to their screening level.	The details of the ghround water monitoring plan (including number and location of monitoring points) will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Association, and MADEP.

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MADEP Mar. 25, 1996	18	22		The MADEP recommends the inclusion of SPM-93-12X in the LTMP. This well provides better screening of the southern portion of the SPIA and intercepts groundwater flow from AOC 25.	The details of the ghround water monitoring plan (including number and location of monitoring points) will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Association, and MADEP.
MADEP Mar. 25, 1996	18	29		Please note that the Groundwater Monitoring Plan will be completed within six months of ROD signature.	Text was added.
MADEP Mar. 25, 1996	18	37		Please note that the Ecological Management Plan will be developed within six months of ROD signature.	This information is incorporated in a paragraph dedicated to the Integrated Natural Resources Management Plan, following the specified bullet.
CHPPM for OSG (no date)	13		2	Comment: "Redfox" in this paragraph should be two words. Recommendation: Replace with "red fox"	The desired changes has been made.
CHPPM for OSG (no date)	14		B	Comment: In this paragraph, an example of scientific notation is given in the parentheses. To correspond to the 1x10-6, the 1/100,000 should be 1/1,000,000. Recommendation: Please make correction.	The text was modified to read correctly.
CHPPM for OSG (no date)	15		2	Comment: The RME is defined here as exposure to the "maximum contaminant concentrations" at a site. This is misleading because the RME's only equivalent to the maximum detected concentration when the 95 percent UCL exceeds the maximum. Recommendation: If a decision was made to use the maximum concentration as the RME (not the 95 percent UCL) in the risk assessment, this should be stated clearly in the ROD.	The text in this section was modified to read "and the average exposure cases evaluated in the human health risk assessment were based on the maximum and average chemical concentrations in the exposure media, in accordance with USEPA-New England (USEPA 1989) guidance."
CHPPM for OSG (no date)	16		4	Comment: The cancer risk for an adult exposed to sediment is reported to be 1.2x10-1. This must be a typo considering the combine risk to an adult is 1.4x10-7. Recommendation: Please correct.	Number was entered incorrectly; the appropriate value "1.7×10^{-6}" has been entered.
CHPPM for OSG (no date)	17		C.2	Comment: In both of these sections, the statement is made that some COCs exceeded USEPA guidelines, but the ecological risks were deemed acceptable by USEPA-New England. This appears that the USEPA-New England ignores USEPA guidelines. Recommendation: To avoid misinterpretation by the public, it would be helpful if a sentence was added to these two sections explaining why continued use of the Impact Areas for military training would support USEPA-New England conclusion that the ecological risk is acceptable.	Subject text was removed.
CHPPM for OSG (no date)	18		VII	Comment: According to this section, the Groundwater Monitoring Plan will be further developed but is stated that Well D-1 will be sampled annually. Well D-1 is currently a potable water source to transient personnel while training for two week periods. Recommendation: As part of the Groundwater Monitoring Plan, in accordance with the suggestion of the Agency for Toxic Substances and Disease Registry, a sentinel well should be installed between SPM-93-08X and Well D-1 to detect contaminant migration. This will allow for actions such as prohibiting the use of D-1 as needed if significant concentrations of contaminants should be migrating in that direction.	The details of the ghround water monitoring plan (including number and location of monitoring points) will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Association, and MADEP.

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CHPPM for OSG (no date)	Gen.			Throughout the text, the term "Contaminants of Potential Concern" is used. However, Tables 18-20 in Appendix E are entitled "Chemicals of Potential Concern". Since the use of "chemicals" is much less negative, suggest replacing "contaminants" with "chemicals" in the ROD.	COPC stands for "Contaminants of Potential Concern", therefore the titles Tables 18-20 in Appendix E will be corrected.
CHPPM for OSG (no date)	Gen.			Overall, concur that the "No Action" alternative is sufficiently protective of human health under current and reasonable anticipated future use scenarios.	No response required.
GENERAL					
Ms. Early Feb. 29, 1996				I am requesting that the Army install test wells at regular intervals surrounding the Fort's perimeter, at variable depths, and test for all possible pollutants including explosives.	The details of the ghround water monitoring plan (including number and location of monitoring points) will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Association, and MADEP.
DRAFT PROPOSED PLAN Unauthorized Dumping Area, AOC 41 - February 1996					
MADEP Mar. 27, 1996	1		2	Please clarify the scope of the monitoring plan presented in this paragraph. The stated monitoring of only well D-1 conflicts with the long term monitoring plan information provided in the description of the proposed groundwater monitoring presented on page 20.	The details of the ghround water monitoring plan (including number and location of monitoring points) will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Association, and MADEP.
MADEP Mar. 27, 1996	5		1	Please note that the implementation of the Landfill Consolidation Plan will alleviate the problems associated with contaminated soil on the site. Please note in this paragraph that the source of the chlorinated solvents in the groundwater is unknown.	Not applicable. Subject text was omitted or rewritten.
MADEP Mar. 27, 1996	8		3	The results of the Field Investigation should include a discussion of surface water sediment contamination. A review of data contained in the Final Site Investigation, Groups 2 & 7 (may 1993) indicates sediment arsenic, lead, zinc, heptachlor, DDD and DDE exceedances of NYSDEC and Province of Ontario Criteria. Additionally, lead and iron exceeded USEPA ambient water quality criteria as well as both Massachusetts and EPA drinking water standards.	Not applicable. Subject text was omitted or rewritten.
MADEP Mar. 27, 1996	12		4	The MADEP recommends that the Army review groundwater flow data for the area and provide additional groundwater information as necessary. As we noted in our comments on the final remedial investigation, the MADEP agrees that regional groundwater flow is in an easterly direction and discharges to the Nashua River. However, an inspection of groundwater data levels of site groundwater monitoring wells indicates at least some local groundwater flow towards New Cranberry Pond. A review of Figure 3, referenced in this paragraph, indicates the presence of contours on the figure. Please indicate on the legend whether these contours are for surface topography or groundwater.	The details of the ghround water monitoring plan (including number and location of monitoring points) will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Association, and MADEP.
MADEP Mar. 27, 1996	20		5	The MADEP concurs with the inclusion 41M-94-09A, 41M-94-09B, and 41M-94-11X in the long term monitoring plan. However, we recommend the provision of further rationale for the inclusion of 41M-94-12X in the plan. Additionally, we recommend inclusion of a monitoring well on the southern portion of the site for incorporation into the plan. Either 41M-94-04X or 41M-94-14X would be appropriate for the detection of any potential contaminant transport.	The details of the ghround water monitoring plan (including number and location of monitoring points) will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Association, and MADEP.

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AEC (unspecified)	1		Par. 1	Spell out AOC.	"AOC" is in the "Acronyms" section of the ROD.	
AEC (unspecified)	1		Par. 2	Change "the groundwater will be monitor at the" to "the groundwater will be monitored at the"	Not applicable. Subject text was omitted or rewritten.	
AEC (unspecified)	1		Par. 2	Change "adversely effect" to "adversely affect"	Not applicable. Subject text was omitted or rewritten.	
AEC (unspecified)	2		Par. 1	Why are we saying this twice.	Not applicable. Subject text was omitted or rewritten.	
AEC (unspecified)	3		Par. 1	Add address info and/or phone numbers.	Not applicable. Subject text was omitted or rewritten.	
AEC (unspecified)	4		Par. 1	Spell out MADEP.	MADEP is defined in the ROD.	
AEC (unspecified)	8		Par. 2	Define "fluvial" or use simpler term.	Not applicable. Subject text was omitted or rewritten.	
AEC (unspecified)	8		Par. 7	Add "micrograms per liter, or" prior to µg/L.	Not applicable. Subject text was omitted or rewritten.	
AEC (unspecified)	8		Par. 7	Is there some more descriptive way that these numbers can be presented so that the public understands?	Not applicable. Subject text was omitted or rewritten.	
AEC (unspecified)	10		Tab. 1	Spell out c-1,2-DCE	Not applicable. Subject text was omitted or rewritten.	
AEC (unspecified)	10		Par. 6	Spell out "VOCs" and reference in glossary.	"VOCs" is in the "Acronyms" section of the ROD	
AEC (unspecified)	12		Par. 6	What is the allowable level of TCE? Might want to include.	Not applicable. Subject text was omitted or rewritten.	
AEC (unspecified)	13		Par. 1	Define "based on the blank data assessment"	Not applicable. Subject text was omitted or rewritten.	
AEC (unspecified)	18		Par. 4	Need to put risks in terms the public can understand - for example if risks are 1x10-6, say "The risk is that one person in one million of developing cancer." See Section B, P.14 of ROD for AOCs 25, 26, and 27.	Not applicable. Subject text was omitted or rewritten.	
DRAFT FINAL ROD SPIA and AOC 41 Groundwater and AOCs 25, 26, and 27 - April 29, 1996						
MADEP May 10, 1996	DS-2		3	Please change "three AOCs" to "four AOCs"	The indicated change is not appropriate. However, the text has been changed to read "SPIA groundwater, AOC 41 groundwater, and the three AOCs"	
MADEP May 10, 1996	DS-2		4	Please note that the Groundwater Monitoring Plan and Ecological Monitoring Plan are to be Implemented within 6 months of ROD signing.	The desired change has been made.	
MADEP May 10, 1996	ES-2		3	Please note that the Ecological Management Plan will be completed and implemented within 6 months.	No change was made since this is stated in the 9nth paragraph on that page.	
MADEP May 10, 1996	5		1	The public meeting transcript is not included in the Responsiveness Summary as stated in the text. Please include them in the final draft.	They will be included in the Final ROD.	

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MADEP May 10, 1996	6		2	Please discuss South Post Impact Area (SPIA) groundwater discharge in this paragraph. Although it is noted that groundwater from the ranges does not leave the SPIA, some discussion regarding flows of groundwater from the SPIA itself would be appropriate.	A paragraph from the RI which discusses this issue will be incorporated into the ROD in its entirety.
MADEP May 10, 1996	17		5	Although information regarding AOC 41 is noted in the Documentation of No Significant Changes, a description of the remedial alternative for the site should be included in Section VII in order to enhance the continuity of the report.	All information regarding AOC 41 is included in the Documentation of Significant Changes in accordance with EPA-New England guidance
MADEP May 10, 1996	18		1	Please note that wells will be used to monitor the southern portion of the SPIA as well as the other sides mentioned in the paragraph. The MADEP considers the inclusion of wells located on the southern portion of the SPIA to be an integral part of any long term monitoring plan in that there are off-post areas in this direction that are impacted by SPIA groundwater flow prior to flow reaching the Nashua River.	Mention of specific groundwater monitoring wells are not made in the ROD. The details of the ghround water monitoring plan (including number and location of monitoring points) will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Association, and MADEP.
MADEP May 10, 1996	18		3	Please note that further assessment of remedial action will be required if implementation of the long term monitoring plan indicates an increase or transport of contaminants.	An evaluation of all monitoring data will be conducted every 5 years in accordance with EPA guidance.
MADEP May 10, 1996	18		5	Please note that the Ecological Management Plan will be developed and implemented within six months of ROD signature.	No change was made since this is stated in the 7nth complete paragraph on that page.
MADEP May 10, 1996	18		5	Please add an additional paragraph stating that the South Post Groundwater model will be refined to include MCI Shirley and to provide better resolution of the southern portion of the South Post.	The South Post groundwater model will not include MCI Shirley. The Army will share the data with MCI Shirley if they should chose to run their own model.
MADEP May 10, 1996	18		7	Please change "three AOCs" to "four AOCs"	The indicated change is not appropriate. Only AOC 41 groundwater is addressed in this ROD. The 5fth paragraph on the previous page was altered to reflect this comment.
MADEP May 10, 1996	18		9	The MADEP recommends a review of data generated by the long term monitoring plan on an annual basis. A five year review is insufficient to be protective of human health and the environment.	Monitoring will be conducted annually and the data will be evaluated every 5 years in accordance with EPA guidance.
MADEP May 10, 1996	20		5	The off-site laboratory results should be presented for AOC 41 in this paragraph as was done for the other AOCs rather than referring the reader to the RI report.	This will be included in the ROD.
MADEP May 10, 1996	21		3	Please present the results of the baseline risk assessment in this section as opposed to referring the reader to other documentation.	This will be included in the ROD
MADEP May 10, 1996	21		4	The MADEP's review of groundwater data indicates that New Cranberry Pond surface water is not recharging AOC 41 groundwater, therefore the Army's statement that groundwater from AOC 41 cannot impact New Cranberry Pond ecological receptors may be flawed. MADEP recommends that this issue be resolved before this statement is included in the ROD.	The Army disagrees with this statement. New Cranberry Pond is man made. Because of these artificial surface water elevations, New Cranberry Pond recharges to the AOC 41 groundwater.

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MADEP May 10, 1996	D-5			The MADEP disagrees with the Army's statement that a number of MADEP comments regarding the Proposed Plan were received subsequent to the Proposed Plan's finalization. The MADEP forwarded its comments on the Proposed Plan within 30 days of our January 31, receipt of the plan. The MADEP recommends that the Army respond to our comments.	The MADEP comments received by the Army that were not addressed pertained to the content and wording of the Proposed Plan or Fact Sheet. When these were published in January 1996 they were final. All comments received following their publication were incorporated, as appropriate, into the ROD.
USEPA-New England May 14, 1996	DS			The first sentence should read "...SPIA groundwater, AOC 41 groundwater, and the three AOCs..."	The desired change was made.
USEPA-New England May 14, 1996	ES-1		2	Please mention that the landfill portion of AOC 41 will be handles separately (under State solid waste program?).	The following text was added to the end of this paragraph "The landfill portion of AOC 41 will be addressed under a separate action."
USEPA-New England May 14, 1996	ES-2		1	In the fourth sentence, please delete "by EPA New England".	The indicated text was deleted.
USEPA-New England May 14, 1996	ES-2		1st bullet	At the end of the third sentence, delete the word "annually", we have not decided on the sampling frequency as of yet.	The indicated text was deleted.
USEPA-New England May 14, 1996	ES-2		3rd bullet	Delete the word "annually", we have not decided on the sampling frequency as of yet.	The indicated text was deleted.
USEPA-New England May 14, 1996	5		1	Please add the public meeting summary and responsiveness summary to appendix D.	They will be included in the Final ROD.
USEPA-New England May 14, 1996	17			In the first sentence please add "...SPIA groundwater, AOC 41 groundwater, and the three AOCs..."	The desired changes was made.
USEPA-New England May 14, 1996	18		1st and 3rd bullets	Please delete the word "annually", we have not decided on the sampling frequency as of yet	The indicated text was deleted
USEPA-New England May 14, 1996	19		1	Please mention that the landfill portion of AOC 41 will be handles separately (under State solid waste program?).	The following text was added to the end of this paragraph "The landfill portion of AOC 41 will be addressed under a separate action."
USEPA-New England May 14, 1996	20			Please briefly discuss the sampling results in the same level of detail you do for other AOCs.	This will be included in the Final ROD.
USEPA-New England May 14, 1996	21 - 22			Please briefly discuss the sampling results in the same level of detail you do for other AOCs.	This will be included in the Final ROD.

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USEPA-New England May 14, 1996	A			On Page 1, this map should be larger and clearer in detail. It is difficult to read as presented. There should also be a maps of AOC 41 similar to the ones you have for the other AOCs (sampling and monitoring locations, results, etc.) On Page 1, this map should be larger and clearer in detail. It's difficult to read as presented.	This will be included in the Final ROD.
USEPA-New England May 14, 1996	D			Please add the public meeting transcript and responsiveness summary to Appendix D.	This will be included in the Final ROD.
USEPA-New England May 14, 1996	E			There are a number of AOC 41 tables missing in the Appendix. Please insert the appropriate AOC 41 results tables (groundwater, soils, COPCs, risk, etc.).	This will be included in the Final ROD.
Conservation Comision, Lancaster, MA May 29, 1996	Gen.			We request that the monitoring stations be placed such that migration can be detected in any direction and will be detected well before it could travel off post, regardless of new well development in Lancaster.	The details of the ghround water monitoring plan (including number and location of monitoring points) will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Association, and MADEP.
Conservation Comision, Lancaster, MA May 29, 1996	Gen.			We would like to know at what point a clean-up would be initiated.	If contamination is detected off site, remedial action will be initiated by the Army with consultation with EPA-New England and MADEP.
Conservation Comision, Lancaster, MA May 29, 1996	Gen.			We also request that a report of findings be provided on an annual basis and that it be submitted to the Conservation Commission as well as the Board of Health, Planning Board, Board of Selectmen, as well as the Town Library. This report should contain a summary and/or benchmarks for comparing data so they can be understood by people outside the hazardous waste profession.	The Army agrees. The Conservation Commission as well as the Board of Health, Planning Board, Board of Selectmen, and Town Library will be added to the distribution list if not already listed. The details of the monitoring report content and presentation will be developed during the preparation of the groundwater monitoring plan.
Conservation Comision, Lancaster, MA May 29, 1996	Gen.			We suggest that provisions for meetings and public information activities be reserved in the event that migration or increased contamination is detected. Public involvement notices and legal notices should be placed in newspapers that serve the Town of Lancaster instead of surrounding towns which has apparently been the case.	The Army conducts Restoration Advisory Board meetings monthly. These are open to the public and serve as a forum for the public to comment on Army restoration activities and obtain information. The Ft. Devens BEC can provide the interested parties with the schedule and location of these meetings.
Conservation Comision, Lancaster, MA May 29, 1996	Gen.			We beleive that the addition of site #41 after the public meeting was somewhat confusing and the information about this site is not clearly presented in the report. During the public meeting a question was raised concering what would be done at the landfills on the South Post. It was stated that a plan was being developed that would include consideration of excavation and other alternetives. We understand that #41 is a landfill and yet the report makes no mention of landfill cleanup.	Section IX of the ROD states that "The landfill portion of AOC 41 will be addressed under a separate action." The Army intends to address this under the Massachusetts solid waste regulations.

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Conservation Comission, Lancaster, MA May 29, 1996	Gen.			We respectfully request that the Town be kept informed of proposed actions for the cleanup of dumps and landfills, as well as groundwater monitoring.	The Army agrees the Conservation Commission as well as the Board of Health, Planning Board, Board of Selectmen, and Town Library will be added to the distribution list if not already listed.
FINAL ROD SPIA and AOC 41 Groundwater and AOCs 25, 26, and 27 - May 30, 1996					
USEPA-New England June 11, 1996	Decl. Pg. 2		Last Para.	Suggested change: "Should the Army close of transfer or change the use of this property an EBS will be conducted, and the "no action" decision in this ROD will be re-examined in light of the changed use and risk factors resulting from this closure/transfer.	Suggested change was made.
USEPA-New England June 11, 1996	ES-2			Suggested change: Risk assessment refers only to EOD, Zulu, and Hotel Ranges. Please discuss the AOC 41 risk assessment briefly.	Additional text was added.
USEPA-New England June 11, 1996	ES-3			Suggestd change: If on-site hazardous substances, pollutants or contaminants that may present an imminent and substantial endangerment to the public health and welfare..", This statement should also appear in the body of the ROD, in "Description of the No action Alternatives" Section.	Suggested change was made.
USEPA-New England June 11, 1996	ES-3			Suggested change: If the Army closes or transfers or changes the use of the property, an EBS will be conducted, and the "no action" decision of this ROD will be re-examined	Suggested change was made.
USEPA-New England June 11, 1996	1		2	Please add that the landfill portion of AOC 41 will be handled under a separate action as you have done in the Executive Summary.	Suggested text was added.
USEPA-New England June 11, 1996	4		Community Participation	Correction: A typo - public meetings	Correction was made.
USEPA-New England June 11, 1996	5		Sect IV, last full line	Change: "additional assessments may be required" to additional assessments will be required"	Suggested text was added.
USEPA-New England June 11, 1996	17		Sect. VIII, 1st sent.	Please add "...and AOC 41 groundwater"	Suggested text was added.
USEPA-New England June 11, 1996	18		Last ara., 2nd line	Please add: "...an assessment is made as to whether the implemented no action alternative remains protective"	Suggested text was added.
USEPA-New England June 11, 1996	18		Last para., 4th line	Please change to: "If on-site hazardous substances, pollutants or contaminants that may present an immenent and substantial endangerment to public health and welfare..".	Suggested change was made.
USEPA-New England June 11, 1996	18		Last para., 7th line	Please change to:"If the Army closes or transfers or changes the use of the property, an EBS will be conducted, and the "no action" decision of this ROD will be re-examined."	Suggested change was made.

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USEPA-New England June 11, 1996	24	4		Please add: "...an assessment is made whether the no action alternative remains protective of human..."	Suggested text was added.
USEPA-New England June 11, 1996	25		1st para., last sent.	It is not appropriate to speak of a "no action" decision as "using permanent solutions to the maximum extent practicable." Please delete this sentence, and state that "no action is necessary to ensure protection of human health and the environment."	Text was deleted and added as suggested.
USEPA-New England June 11, 1996	App. A			Please add maps of AOC 41 similar to the ones you have for the other AOCs (sampling & monitoring location, results, etc.) On page A-11 - please improve the quality of this map, it is difficult to interpret.	Maps were added. They are as similar as possible. However, two separate firms prepared the RI's for AOC 25, 26, and 27 and AOC 41each in their own format, therefore the maps will not be identical in their information content and presentation.
MADEP June 14, 1996	ES-2		4	The MADEP recommends that the description of the remedy include the following: A preclusion of further development of drinking water supplies in the monitored areas.	The Army will preclude the development of drinking water sources in the monitored area.
MADEP June 14, 1996	ES			Add AOC 41 to the list of sites where groundwater monitoring will be conducted. The first paragraph of the remedial description notes that monitoring will be conducted at EOD, Zulu and Hotel Ranges. AOC 41 should be included in that Section IX, Documentation of Significant Changes, includes no provisions for groundwater monitoring at AOC 41.	The Army will add AOC 41 to this list.
MADEP June 14, 1996	ES			The MADEP requests that the remedial description note that the sites will be subjected annual reviews and that any indications of contaminant transport, emanating from the AOCs, within the SPIA or off the SPIA will precipitate further assessment actions.	The desired text was added.
MADEP June 14, 1996	ES			Any change of use will require further assessment action. Although this is mentioned in Section IV of the document, it should be listed as a component of the remedy.	The desired text was added.
MADEP June 14, 1996	1		4	Please refine the description of the area to be covered by the ROD. The description currently presented defines the entire SPIA and not the ROD coverage area noted in the executive summary. Additionally, an appropriate figure should be presented which delineates the areal scope of the ROD.	The text was modified.
MADEP June 14, 1996	5		1	Please delete references to any Feasibility Study (FS) having been conducted for the ROD sites. The ROD alludes to an FS having been conducted for the SPIA and associated sites. However, no FS was conducted for the sites. An Initial Screening of Alternatives for Functional Areas I and II was published in June 1994, but presented no alternatives were presented for the South Post.	The indicated text was deleted.
MADEP June 14, 1996	5		3	Please explain how continued use of the SPIA makes the risks to on-site ecosystems acceptable. Continued use of the area does not appear to do anything to ameliorate ecological risk and may actually enhance risk. The sentence describing this phenomenum is repeated several times in the ROD and should be expunged or clarified.	The text was modified.
MADEP June 14, 1996	16			Please note Comment 4 regarding the Ecological Risk Assessment Section.	The text was modified.
MADEP June 14, 1996	16		5	Please correct the paragraph heading that notes Hotel Range as AOC 25. The EOD Range is the correct designation for AOC 25.	The change was made.

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MADEP June 14, 1996	17		1	Please correct the paragraph describing conduct of toxicology tests on AOC 27 surface water. A review of the RI indicates that the toxicology tests were conducted on AOC 26.	The toxicity testing did take place at AOC 26. This paragrapgh referes to the results of that testing for comparison purposes.
MADEP June 14, 1996	17		5	Please describe the Army's plan for future explosive ordnance disposal.	No UXO disposal activities are occuring at this time.
MADEP June 14, 1996	18		1	See Comment #1.	The text was modified.
MADEP June 14, 1996	25		1	Please describe how the remedial alternative would "use permanent solutions to the maximum extent possible". The MADEP is of the opinion that the lack of source identification and control inherent in the no-action alternative is a temporary solution.	The text was modified.
MADEP June 14, 1996	25		1	See Comment #3.	The text was modified.

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CASE TRANSCRIPT MANAGER

UNITED STATES ARMY
BRAC ENVIROMENTAL OFFICE
In Coordination With The
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

BEFORE: James C. Chambers, BRAC Environmental Coordinator, U.S. Army

PRESENT: Hussein Aldis, Ecology and Environmental, Inc.; James P. Byrne, U.S. Environmental Proctection Agency

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Deponent/Witness	Taken	Delv'd	Orig to	To Be Signed Y or N
Public Hearing	2/21/96	3/05/96	Devo	N/A

Upon request, ASCII and/or Min-U-Script with Word Index will be provided at no charge to the moving party when ordered at the time of the proceedings

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UNITED STATES ARMY
BRAC ENVIRONMENTAL OFFICE
In Coordination With The
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

PUBLIC HEARING ON THE PROPOSED PLAN

FOR THE SOUTH POST IMPACT AREA
GROUNDWATER AND AREAS OF
CONTAMINATION 25, 26 and 27

BEFORE CHAIRMAN:

James C. Chambers, BRAC Environmental Coordinator, U.S. Army

PRESENT:

Hussein Aldis, Ecology and Environment, Inc., Buffalo Corporate Center, 368 Pleasantview Drive, Lancaster, NY 14086.

James P. Bryne, U.S. Environmental Protection Agency, Region 1, J.F.K. Federal Building, Boston, MA 02203.

Building P-12, Buena Vista Street
Fort Devens, Massachusetts
Wednesday, February 21, 1996
7:05 p.m.

(Anne H. Bohan, Registered Diplomate Reporter)

I N D E X

* * *

P R O C E E D I N G S

CHAIRMAN CHAMBERS: We're going to get started. Welcome everybody. This is a Public Hearing on the Proposed Plan for the South Post Impact Area. My name is James C. Chambers; I'm the BRAC Environmental Coordinator here for the U.S. Army at Fort Devens. This evening we're meeting here; my offices are upstairs. This is now space operated by the Massachusetts Government Land Bank, so we thank them for providing us the space for this evening's meeting.

Tonight we're going to have Mr. Hussein Aldis from Ecology and Environment who is a consultant with the Army Environmental Center out of Aberdeen, Maryland. He's going to discuss the studies that were done at South Post and what our proposed plan is for the actions necessary for the environment down there. There was a study done, a remedial investigation done of the South Post Impact Area and how it affects the groundwater, and that's what he'll be discussing tonight.

Now, he's going to give his presentation. You've welcome to ask questions at any time, but I must remind you that this is a public hearing. I would ask everybody who's in attendance to sign the attendance sheet, because this is a matter of public record, so we want to know who is at the meeting this evening. If you choose to speak, please announce your name and what town or organization you are from.

So I'll start by asking if there are any questions right now before we start the presentation.

I would also like to thank you all for coming out tonight. I know the weather is quite horrible out there, we've had a number of public meetings, and I must say that this is one of the more attended ones that we've had. So I do thank you all for coming out this evening.

MR. CHRISTOPH: Actually, we came to check the water contamination; that's why we're all here. Never mind.

CHAIRMAN CHAMBERS: Mr. Hussein Aldis from Ecology and Environment.

MR. ALDIS: First of all, I would like to explain that all of this material which I am presenting is taken directly from the remedial investigation reports that are available in the public repositories in various towns or in the area, so you can check the details in those remedial investigation reports. All of the material that I'm presenting tonight is also displayed on the boards at the back of the room. These will remain here and will be available from the BRAC office.

If you find that I am going too fast, by all means, stop me. But of course in trying to explain the results of, say, three years of work at essentially five different sites, I am going to be touching on a large amount of work very lightly, just trying to hit the highlights and give you a feeling for the conclusions and the results and, as a result of the investigation, what it is that the Army is likely to do with the South Post area.

First of all, I would like to start off by defining --

MRS. vom EIGEN: Excuse me, I have a question. You said the information was on file in the town library, and I understand there is no file at the Lancaster Library, so that we could check it with regard to the reports that were done.

CHAIRMAN CHAMBERS: Could you state your name, please.

MRS. vom EIGEN: Florence vom Eigen of Lancaster.

CHAIRMAN CHAMBERS: Well, we do maintain repositories of information at public libraries, and Lancaster is one of them. If this particular information is not there, I'm not aware of that.

MRS. vom EIGEN: Well, I was told by someone that it was not in the Lancaster Library, and I'll have to check that out.

MR. LIDSTONE: Is there some way that people should refer to this body of documentation when they talk to the library? Maybe the librarian didn't understand what they're looking. I'm Bob Lidstone, Lancaster Conversation Commission.

CHAIRMAN CHAMBERS: Some of you know, but because this is a public hearing, it's part of the process that you must announce your name.

Again, we make regular distributions to the four towns: Ayer, Harvard, Shirley and Lancaster, as well as the Davis Library here on Post. And there's an administrative record maintained in the Town Hall in Ayer. So what they should do is ask for -- we refer to it as the "information repository." And we make a periodic notification in the newspapers of what documents are available at the repositories, as well as we do a mass mailing to a certain mailing list to announce that these documents are available.

So I will make a note and then check to see if these documents are there. But I can assure you, there are volumes of documents relating to the environmental restoration at Fort Devens maintained at the Lancaster Library.

MRS. vom EIGEN: It was Mr. Lidstone who told me that there weren't any.

MR. LIDSTONE: Oh, yeah?

MRS. vom EIGEN: This afternoon. Sorry, I didn't recognize you.

MR. ALDIS: I would like to explain the limitations of what I'm going to talk about tonight, because we didn't investigate the entire South Post. What we did was, we investigated those sites that had been identified, as a result of their history and use, as being areas of potential concern; and they were primarily within what is known as the South Post Impact Area.

This diagram shows part of the South Post. The boundary of the South Post goes close to or along the Nashua River, as you probably are aware, and across to the North Nashua to the west. But this area outlined with the red dashed line is what's known as the South Post Impact Area, and it's the impact area for weapons firing in the South Post. They have fired antitank weapons; they have fired shells from the Main Post across Route 2 into this area; they have fired bazookas and mortars and small arms of all kinds. This has been the area which has received the impacts of those weapons.

The four ranges that we specifically investigated were, from the south to the north, the Explosives Ordnance Disposal, the EOD range, AOC 25 as it's known, which is the area of contamination or area of concern.. Then the Zulu Ranges on the west side of the impact area; one of them is a grenade range, and one is a demolitions practice area. The Hotel Range is now a small arms firing range, but it was formerly used for the disposal of explosives and munitions. And Cranberry Pond, right next to Hotel Range, it was discovered during the course of the RI had been used to dispose of explosives by detonating them on the surface of the pond when it was frozen in winter. So that area was expanded to include

Cranberry Pond as well as Hotel Range.

Other sites around the impact area have included a small landfill at SA 12, a burn pit up here at SA 15, a small what was known as the beer can landfill at SA 41. Those have been the subject of other previous investigations or even subsequent investigations and are reported separately.

We looked at the overall impact not only of the individual ranges within the South Post Impact Area but the whole impact area itself. And I'd like to explain that it's really divided physically into two portions. On the north and west side is Slate Rock Brook which receives the groundwater discharge from the west side of the range -- of the impact area. On the other side there is this unnamed stream, Heron Pond, another unnamed stream leading to New Cranberry Pond, that runs through the middle of the impact area.

So that, basically, the area is divided into three sections: that which drains to Slate Rock Brook; that which drains to the unnamed streams here; and that which drains to the unnamed streams from the southeast side. Almost no groundwater which is generated by rainfall or snow melt on the

South Post Impact Area leaves the South Post without first discharging to surface water. The only possible impact area are a few acres along the very southeast side, and this is not the impact area of the ranges here but the firing point of the ranges down here.

Now, what I'd like to do is run briefly through this slide show, and I really will make it brief.

(Whereupon, there was a slide presentation)

MR. ALDIS: I think most people who are members of the public around here have not probably been on South Post. It is open for fishing and for hunting under certain conditions with certain permissions and certain times, but most people probably aren't aware of what the South Post Impact Area looks like. Let me see if I can show you something.

This is what most people see, the public, I mean. That's the entrance, and if you're going in there to hunt or fish with specific permission at specific times, you're not going to see anything much else of the South Post Impact Area except by looking through the fencing that otherwise surrounds the site. It is controlled access. This is the range control at the main gate.

I've already discussed the fact that the area was the target of a large variety of weapons over a long period of time. One of the points that needs to be made is that its future use will continue to be military training, and as far as we know, the Army is going to retain it for the foreseeable future.

The scope of our study was to look at the overall impact of the SPIA on the groundwater, the sediments and surface water around it, as well as the specific ranges within it.

This is the same map that I was discussing at the introduction showing the topography and drainage. The blue arrows are the direction of the groundwater flows, as far as we can deduce them, from the wells that we install.

Some parts of the South Post Impact Area are quite open; they are burned off fairly regularly to help explode any munitions which didn't explode on impact. This is one of the ranges used for antitank weapons. The dark shadows in the middle ground are some target vehicles that you use for mortar and antitank fire.

This is another area which is kept in a mowed and controlled state; it's used as a sniper range.

Other areas are wetlands. As you saw, there are streams on either side and in the middle of the South Post Impact Area.

And some parts of it are quite forested.

This is a beaver pond on Slate Rock Brook.

One of the things that's rather obvious to people who visit the South Post is it's really a nice, natural area, and it's become almost a wildlife refuge. The scope of our investigation is outlined in these slides where we have the writing, but I don't want to go into it in great detail. You can read up on that yourself.

What we found as a result of the studies that we had done on the groundwater was that the major control for groundwater flow is not the surface topography, which consists of glacial sands and gravels, but the underlying bedrock. You may not be able to see this very well, but the bedrock contours show a ridge of phyllite or slate that runs underneath here, underneath the area colored green, which is the impact area, and the groundwater flows off that ridge to either side to discharge to the surface water.

None of the groundwater that's generated by the South Post Impact Area leaves the South Post without first entering surface water, either this unnamed stream or Slate Rock Brook directly to the Nashua River, with the sole exception of a very small area down here on the southeast corner, as I mentioned before.

MR. LIDSTONE: Question. Bob Lidstone. Does that mean that the significant aquifer that runs under the Main Post does not get any recharge from the South Post or at least from the impact area --

MR. ALDIS: That's correct.

MR. LIDSTONE: -- without going off the South Post first?

MR. ALDIS: That's correct. The groundwater that's generated within the South Post Impact Area enters surface water before it can ever reach the Main Post.

MR. LIDSTONE: But from the surface water, it doesn't then go down into an aquifer recharge without going off the Post?

MR. ALDIS: The Nashua River is a gaining stream, which means groundwater is discharging to the river, not the river to the groundwater, at any point along its course. Fortunately, the only place that can possibly happen is where there is a pump well, and the only instance I know of that is the McPherson well in North Post, which is near the river. If the McPherson well is pumped at high volume for a long period of time, it did induce some flow from the Nashua River into the well.

MR. LIDSTONE: But the only way for this water to get into the aquifer of the Main Post would be through the river?

MR. ALDIS: Through the river, that is correct.

MR. LIDSTONE: Good.

MR. ALDIS: Going backwards again. The nature and extent of contamination that we found on investigation was in the wells that were placed around the SPIA and within the SPIA; that is, not specifically at an individual range. It was very low levels of explosives, low levels of pesticides, like DDT and its derivatives primarily, which are almost certainly the result of spraying from mosquito control, et cetera.

There are two places -- let me show you -- on the east side. This well is slightly contaminated with explosives. This well directly downgradient from it is completely clean. This well is slightly contaminated with explosives, and so is this well. This is three out of the 13 wells which are placed around the SPIA. And this well, which is the only water supply well on the South Post, has also been tested and found to be clean. So these wells between impacted areas of the South Post where there are slight levels of explosives in the groundwater are in fact between them and the discharge points in the river, and they're found to be clean.

We have found some slight traces of explosives getting into surface water and sediment, and I'll cover that later.

DR. CRAMER: Dr. Cramer, David Cramer. I have a question. Contaminated with explosives?

MR. ALDIS: Yes.

DR. CRAMER: Excuse my ignorance. What's an "explosive"?

MR. ALDIS: They're usually oxygen and nitrogen organic compounds. They contain their own oxygen, and, consequently, when they react violently, the explosive basically decomposes very rapidly burning the oxygen within the molecule of the explosive. It's the rapidity of reaction which distinguishes them from other compounds.

DR. CRAMER: So what's left over?

MR. ALDIS: Nitrous oxide, carbon dioxide, oxygen; just simple molecules usually. What we have found is actual molecules of the explosive, HRX, RDX, these are fairly complex molecules, with nitrate groups attached, which provide the oxygen result which causes them to be reactive. They're relatively unstable; that's their distinguishing mark. They could be set off by other explosives or by simple heat or friction or impact.

DR. CRAMER: Okay. Now, when you say that one well is contaminated -- two wells are contaminated with the explosives, so these are unspent chemical compounds that are in there? Let's say, for example, stuff that's leached out of shells or compounds that have not exploded, not reacted; is that what I hear you saying?

MR. ALDIS: That's the assumption, that these were explosives that were in part of the munitions, and they just didn't react at the time that they were fired. Either they never exploded at all, or they were not completely destroyed in the explosion. We are talking about micrograms per liter; that's parts per billion, low-level parts per billion. Nothing more than 6 parts per billion of any explosive was found in any groundwater well.

DR. CRAMER: Okay. So you could drink that water, and you wouldn't get sick?

MR. ALDIS: Oh, yes. The fact is that not a great deal is known about the long-term medical or health impacts of drinking water contaminated with explosives, because there's very little data on it. But as far as risks are concerned, they're extremely low, even if they were being drawn.

DR. CRAMER: The next question for my own education. You have wells in that area, and certain wells are contaminated with low volumes -- low concentrations of the pollutants, or whatever you want to call it. Now, how come the other wells in the same area are not contaminated? My concept is that there's like an underground aquifer and the wells all tap into the same aquifer. This is where my education leaves me. And if one well is contaminated, aren't they drawing from the same underground lake or river or aquifer?

MR. ALDIS: What I would say about groundwater is that it's all generated by rainfall and snow melt, that it sinks into the ground. It initiates from the point where the rainfall and the snow melts start. And it depends entirely on whether the soils, which have rain and snow melt, passing through have been contaminated.

Now, the impact area has been subject to a large number of explosions, but very erratically distributed. And clearly, it's a matter of chance or happenstance if one well happens to be directly downgradient from an explosion that left some unexploded material there.

DR. CRAMER: So those areas, those underground pockets of water don't necessarily communicate with each other?

MR. ALDIS: They're all interconnected; but groundwater flow is so slow that it's not turbulent, so it doesn't mix. And if you followed the path of a single drop of rain that fell on the surface, it would go down to the water table, and it would travel in a single-flow path that would not cross any other until it reached surface water and discharge.

So each individual area of the aquifer can be considered to be unmixed, except for those parts of the aquifer directly upgradient of it. It's like a series of streams that run side by side but don't mix. It's only if you disturb them in some way. If you place a well in them and you pump the water, then it will draw water from around it.

DR. CRAMER: So would you at some time later give me a reading list? I'm interested about the aquifers and which way the -- what you just explained to me --

MR. CHRISTOPH: The flow.

DR. CRAMER: The flow, I'd like to read about that, for somebody that's a beginner like me.

MR. ALDIS: I think the best thing you could do is probably look at the references in the back of the remedial investigation reports for the South Post Impact Area --

DR. CRAMER: Okay, thank you.

MR. ALDIS: -- as a start.

DR. CRAMER: Thank you.

MR. ALDIS: This is repeating what I just said about the three wells being slightly contaminated with explosives, and yet there don't appear to be any explosives leaving the South Post in the groundwater, because at least two wells between those that are contaminated and the rivers are in fact themselves uncontaminated.

There is one water supply well on South Post that's used by troops who exercise there, and it was analyzed several times, and it does not contain anything above drinking water standards.

There are no risks to human health from the groundwater as a result of existing use, and because the Army is going to retain the area and no new wells will be installed, there cannot be any new wells which will have risks. The existing water supply well will continue to be evaluated and analyzed on a regular basis to make sure that no change occurs which will not be detected.

MRS. BIRTWELL: Anne Birtwell, Lancaster. How deep are the wells you're using to test?

MR. ALDIS: The D-1 well is 65 feet; it's quite shallow.

MRS. BIRTWELL: That's a drinking water well?

MR. ALDIS: Yes.

MRS. BIRTWELL: And that's quite shallow.

MR. ALDIS: This was quite shallow. There was no need for them to go deeper to get the volume of flow that they needed.

MRS. BIRTWELL: To get water.

MR. ALDIS: Incidentally, it's almost the same depth as the well which is contaminated directly offgradient of -- no, I take that back. It's almost the same depth as the contaminated well on the South Post near it, so it's clear that the explosives can reach that depth.

MRS. BIRTWELL: You don't know how far down they go.

MR. ALDIS: They travel in the groundwater, they're dissolving in the groundwater, and it depends on the flow patterns of the groundwater. They're not going to go to any great depth before they resurface at the river, because they discharge to the river.

MRS. vom EIGEN: I have a question about how long has the contaminated well been in use over and above the uncontaminated ones, so that is there a pattern of migration of the contamination?

MR. ALDIS: The drinking water well I am not sure of the age of. I think it was 1939 or something similar. Can anyone tell me that? It's been there a fairly long time. The monitoring well, which was found to be contaminated, was I believe installed in '93; and you can tell by looking at the name of the well. It's not marked, but I believe it was '93, and certainly it's about that time. So this was installed considerably after the drinking water well.

MR. CHRISTOPH: This is not what you would really consider a contaminated well, except as it showed up in the test.

CHAIRMAN CHAMBERS: Again, sir, this is a public hearing.

MR. CHRISTOPH: Eugene Christoph, Lancaster.

MR. ALDIS: What we call "contaminated" is a well which has a detectable level of a foreign substance which is clearly not naturally derived. And, as I said, these wells have less than six parts per billion of detectable explosive in them. So it's at an extremely low level.

One of the factors that we also looked at on the South Post was, since the groundwater discharges to surface water, is the surface water and the sediment associated with it also impacted? So we did look at the ecological impact, and some potential risks were identified. The odd thing is that they were not from things which you would expect to be from the ranges, lead and zinc, possibly lead, could come from the ranges. Lead, zinc and DDT were identified as being potential risks to some aquatic invertebrates; but these were regarded as being very marginal. They might have detectable effects, but they were definitely marginal. In fact, the wildlife was found to be flourishing generally in South Post.

MR. LIDSTONE: Are aquatic invertebrates more sensitive to lead, zinc and DDT than humans; is that why it's an ecological and not human health risk?

MR. ALDIS: No. The reason they're selected is because they are the most widespread and common biological organisms that are used to assess the health of an aquatic system.

MR. LIDSTONE: So the lead, zinc and DDT could be a hazard to human health if someone were to drink the water, but nobody is planning on drinking the water?

MR. ALDIS: No. This was an effect in the sediments, and as far as humans were concerned, there was no significant impact at all from exposure to sediments.

MR. LIDSTONE: Because nobody plans to eat the sediment.

MR. ALDIS: Well, not so much that, but even trespassers who splash through the mud and in marshy areas might get some on the skin and could presumably absorb a tiny amount. This was considered, and there was no health effect from that.

MR. LIDSTONE: That's sediment not in the water itself.

MR. ALDIS: That's right.

In fact, one of the interesting things was to see some of the rarer animals you find on South Post. This is a beaver lodge along Slate Rock Brook.

And this was a Blanding's turtle which was found at Zulu Ranges.

Now, the individual explosives that were looked at in the Explosive Ordnance Disposal Range, EOD Range, this is a picture of it taken from the air looking southeast. The actual disposal area was this closed depression which you can see here. You may be able to detect faintly a track which runs around it. This was the area that explosives were disposed of by open burning or other detonation. Three sides have banks of sand around it that contain the force of any explosion.

And if you look across the rest of the South Post Impact Area across to here, this is the stream and wetland which divides the SPIA into two. These are the ranges on the other side, and the trees beyond the wetland along the Nashua River. So this is looking southeast across the range, just to give you a feel for it.

There are no boundaries on the South Post Impact Area, very few fences; this is just an arbitrary line today drawn around the area where they disposed of explosives. We put several wells in here; one, two, three, four, five, six, seven, eight, nine and ten wells were dotted around the area. Quite a number of soil samples were taken, bore holes were placed to sample the soils, and in effect what we found was almost nothing.

The groundwater discharges through the disposal area and turns to the east and discharges to the unnamed stream and New Cranberry Pond. The only well which showed any contamination at all at the end of the RI was this one, which had minuscule amounts -- again talking parts per billion here -- it had the nearly 7 parts per billion of RDX and just 1 part per billion of HRX, which are two explosives that were disposed of on the site.

MR. CHRISTOPH: The area that you just described there, is that perhaps an old course of the Nashua River?

MR. ALDIS: No. This is an area of a glacial delta into a glacial lake, and the reason there is this depression in the ground is probably because a lot of ice was stranded there, surrounded with sand and melted, and where the ice melted, it left a depression.

This shows the effects of the explosive disposal and the surface; it blew holes in it, basically.

What we did was we tried to determine the depth of bedrock, to choose the locations to put the monitoring wells, since we believed the bedrock determined the flow of groundwater, as it appeared to do. We installed bore holes, took surface soil samples and subsurface soil samples. And we did take one surface water and sediment sample, but it turned out to be in an area that could not possibly be impacted by the site.

This gives you an idea of the actual site itself. The only real impact has been the removal of the natural vegetation to a large extent.

There were no human health risks found from exposure to the soils. There was no potential for exposure to the groundwater and therefore no risks.

And small areas of the soil were obviously affected, but they were so small that the ecological effects were minimal, and the surface water and sediment is not affected by this site, period.

Zulu Range consists of two side-by-side ranges. This is the spur of a hill seen from the east; from an aerial view looking west towards the wetlands along Slate Rock Brook, the forested wetlands. There's a wetland to the north, a wetland to the south. This spur was modified with a berm and a couple of amphitheaters of sand here, and there are a couple of positions here, concrete boxes that you could throw grenades from safely. This is the range control.

Here is Zulu I, which is the demolition practice area. They have a bunker here where they hide when they're letting off explosives; but basically, they construct things and then demolish them to show people how to practice demolitions.

What we found on investigating this, we installed about seven wells, one here, two, three, a pair here at different depths, and two here. All the downgradient wells were contaminated with explosives. So the groundwater flow is from the south to the north. Here's a SPIA well over here, and it appears to indicate the flow is going north to Slate Rock Brook. But these wells that monitor the groundwater on the range are all contaminated on the north side, which shows that the groundwater is contaminated on the range and is discharging to this wetland on the north side. The soil effects are less.

This is a wetland which receives the flow of contaminated groundwater. This is a wetland on the south side which appears to be less affected.

This is a view of the grenade range with the berm and the two grenade-throwing positions.

This is a shot of the mock bridge that was erected for demolition as a practice exercise on Zulu I. These are just to give you a feeling of the nature of the country. It's been largely open, and of course there's been disturbance where the explosives and the construction modifications have taken place.

We did a seismic survey to determine the depths of bedrock and where to put in monitoring wells. We took a number of surface soil samples, we did a number of test pits, and we took a lot of surface water and sediment samples around the two ranges.

One well showed manganese slightly elevated, and this seems to be pretty certainly of natural origin. We found high manganese in a number of wells around Fort Devens which are clearly not affected by any site activities.

The soils have shown some polynuclear aromatic hydrocarbons, PAHs, soot, you might call it, probably as a result of their burning on-site. They did dispose of some explosives by burning. One soil sample showed Cyclonite (RDX), as well as DDT and its derivatives, and some TPH, total petroleum hydrocarbons, and toluene.

MR. BIRTWELL: Toluene?

MR. ALDIS: Yes, from fuels. Gasoline contains benzene-toluene-xylene, BTX.

MR. BIRTWELL: That's highly --

MR. ALDIS: Not highly; we deal with it every day. We breathe it in every time we gas up our cars.

MR. BIRTWELL: We had toluene and they shut our plant down.

MR. ALDIS: Because of the exposure of the workers to toluene?

MR. BIRTWELL: Air. We moved it and then put in a recovery system.

MR. ALDIS: However, it's not particularly toxic in comparison to many other compounds; it just depends on the concentration.

We did find some explosives in the soil, and this was particularly during the RI, but there were none we discovered during the SI aside from that slight trace of Cyclonite.

There were impacts on sediments but not on surface water. There were low level hits of explosives, particularly in the northern wetlands; again, some other compounds you might or might not recognize. Where these came from, it's not clear. Some of them might be breakdowns of explosives; some might be originating in phenolic herbicides; the trichloroethylene might have come from some solvent, perhaps used for cleaning something. But we have no reason to suppose that these are widely used there.

There were lead levels in the sediment that were above background, but these did not seem to come from range activities, and they may be of natural origin.

When we looked at the risks for that lead, just to continue with the same thought, the elevated lead levels in the sediment were tested with aquatic organisms, and they were found to have no discernible impact. So they're not bioavailable, and they're not toxic to the aquatic invertebrates that were living in the sediment.

The ecosystems around the ranges appear to be in good shape; in fact, the turtles may benefit from the disturbance of the soil and the creation of open sandy areas, because they like to bury their eggs in sand, even though they live themselves in wetlands. The wildlife risks as a whole were minimal. There is no human health impact of any discernible level, because the groundwater is not being used and will not be used as long as the Army has the area. And the soils levels are well below those that would affect people working on the ranges or visiting the ranges or trespassers or sportsmen.

Hotel Range, as I said, was an impact area for small arms. Right now they use it for machine gun firing; but prior to its extensive modification and creation for its present use, it was the site of disposal of explosives by open burning and open detonation.

The Cranberry Pond, which is right next to it -- this is a map showing their relationship. This is an embankment in the hill with banks of gravel, natural banks of gravel surrounding it. This is used as a target area for Hotel Range. And formerly at the foot of these gravels banks there was an area where they disposed of explosives by open burning or open detonation, but they also apparently took explosives out onto the ice in winter in Cranberry Pond and detonated there. So once this was discovered during the course of the RI, the Army asked us to take sediments and surface water samples within Cranberry Pond to investigate those possible impacts also.

This is a view of the southwest corner of Cranberry Pond. You can see it's really a lovely place.

North of the range there is a small stream beginning in a wetland. This area is kept cleared of vegetation, because it's part of the area over where the machine guns were fired; but you can see the stream which starts in this wetlands, and this is the point where the groundwater appears to discharge.

The range of our investigation is much the same as the others. We did a seismic survey to try and determine depth of bedrock, to select locations for installing monitoring wells. We did do a geophysical survey looking for scrap metal that had been dumped in Cranberry Pond, and we found quite a bit, primarily steel drums. We did a large number of borings and took a large number of soil samples over the former disposal and burning area. We installed several monitoring wells. There were already four from the site investigation.

MR. CHRISTOPH: The drums that you found in Cranberry Pond, where are they now?

MR. ALDIS: They are mostly rotted out and still lying right there.

MR. CHRISTOPH: In the pond?

MR. ALDIS: In the pond.

DR. CRAMER: What's in the drums?

MR. ALDIS: Nothing.

DR. CRAMER: What was in them?

MR. ALDIS: What was in them, we have no idea. I mean, there are several of them that I have seen photographs of. I didn't take part in this, but several photographs are just rotted steel drums. Mainly you just have the hoops and a few bits of rusted metal between them. I have no idea how they got there or what they contained, but they certainly have not had, as you'll see, an impact on the pond that we can discern. We did collect the surface water and sediment within the pond, and that was the basis for our conclusions.

There were no impacts from metals on the groundwater, but all the wells within the Hotel Range itself, all of them have some level of explosives in them.

Because of the location of the disposal area right at the foot of the steep slope we could not put any wells upgradient of them within the range, but we did have a well here which was part of the South Post Impact Area well monitoring system, and this is completely uncontaminated. So all of these wells in this area are either within or downgradient of the disposal area, and they did show low levels of explosives.

The same sort of thing, RDX and HMX, as we saw elsewhere. The sediment samples from the bottom of Cranberry Pond did show elevated metals, but they also had a much higher level of organic carbon than the sediments to which we compared them around the South Post. There was no contamination in the surface water, and I'll discuss the risk from the sediments in the next slide.

The soils themselves had no trace beyond the very lowest levels of any of the disposal activities. So evidently significant accumulations of either the fuels that we use for burning or the explosives from South Post were not found in the soil.

MRS. vom EIGEN: Florence vom Eigen, Lancaster. Could you please explain the difference between "sediment" and "soil."

MR. ALDIS: Well, sediment is found underwater, basically. And the thing that we found around the South Post Impact Area is that most of the sediments have high organic carbon, they have a lot of plant material, rotting plant material in them, leaves and aquatic plants, stems and twigs, and so on. These have an impact on the way in which metals or organics can accumulate in them, because organic carbon tends to absorb materials, and the difference is simply where they're found.

MRS. vom EIGEN: Okay. Essentially --

MR. ALDIS: In the bottoms of ponds or streams, they're sediment; elsewhere they're soils.

MRS. vom EIGEN: Thanks.

MR. ALDIS: The human health risk was found to be negligible as far as the soils were concerned. The groundwater exposure doesn't exist and will not exist as long as the Army retains the base.

The ecological risks were found to be possible, certainly several of the metals were high enough and certainly one sediment sample from Cranberry Pond. They weren't uniformly high, and there was 4-amino-2,6-dinitrotoluene, which I think is a derivative from explosives, which was found in the sediment. The only metal that was found to be of concern in the sediment was the copper was high enough it might have some effect on mallards, although we did find mallards nesting around Cranberry Pond.

And this is a clutch of mallard eggs photographed by the biologist.

The whole point around our investigation was we spent a great deal of time, effort and money; and we did a very intensive investigation of the entire area, particularly the ranges, and the levels of contamination that we found were very slight. Particularly the explosives, which were disposed of and have been disposed of and are being used there in large quantities, we found minuscule amounts of them in the groundwater, in the soils, in the sediment. And certainly they do not appear to have a significant impact, they can't have on human health at present usage. They don't appear to have a significant impact on the wildlife. Some other slight impacts were noted, but on the whole the ecological situation in South Post is excellent, and the wildlife are flourishing.

MR. LIDSTONE: The Cranberry Pond made me think, because of a finding of drums in there, that opens up the point that we don't know what it was that was in those drums. But were there tests done of a wide range of potential contaminants, or were tests only done for the things that we were expecting, like explosives and heavy metals?

MR. ALDIS: A wide range of analyses were done. And you see that we took -- these were taken during the site investigation; the other samples were taken during the RI. We did both surface water and sediment samples. Considering the area of the pond, which is only 12 acres, we took a fairly intensive series of samples there. And this sample showed high levels of metals, and that was basically it.

MR. LIDSTONE: But you tested for a wide range of potential contaminants?

MR. ALDIS: We did, yes, we did.

MR. LIDSTONE: Good.

MR. ALDIS: The wells, as you see, the groundwater enters the pond from the south and exits from the north; it's basically an outcrop of the water table, you might say. It's another kettle pond; that is to say, it's the result of a block of ice being stranded there and then melting. And this is in effect an outcrop of the water table. This flows out on the west side and discharges through Hotel Range, so these wells are in fact measuring the water quality coming out of Cranberry Pond.

They're also measuring the water quality of the groundwater which is affected by the soils in the area of the disposal. And yes, they do show contamination. But most of it is discharging to this wetland and stream north of here, and whatever is not is going to end up in Slate Rock Pond. So all of it is going to enter the surface water before it exits South Post.

MR. LIDSTONE: And that stream flows into Slate Rock Pond also.

MR. ALDIS: This also flows into Slate Rock Brook and then to Slate Rock Pond. And as I said, the biological surveys that we did seem to suggest that the ecology in South Post is flourishing. It's really a wildlife refuge in many ways.

MR. CHRISTOPH: In the report that I have read -- and I'm in the process of rereading a second or third time to make sure I can get on top of it -- I keep hearing repeatedly that the Army is going to stay here, the Reserves, for the foreseeable future.

MR. ALDIS: Yes

MR. CHRISTOPH: I doubt that anybody in the room, or perhaps in Northern Worcester County, would have guessed five years ago that Fort Devens would have been closing, since at that time the Congress had voted to enlarge the Intelligence School by bringing facilities here; and all of a sudden, bang, we're on the hit list and Main Post and North Post are vacated.

Now, if in fact the Reserves left here in the next five years, for whatever reason, unforeseeable tonight, obviously, what shape would South Post be in? For example, Lancaster's willingness to tap into the big aquifer on South Post related to the Nashua River, so that we could sell that 3 1/2 million gallons a day to Main Post for industrial purposes or to Boston, as has been discussed with the Fish & Wildlife Service. Could you enlighten me at all.

MR. ALDIS: As far as the groundwater is concerned, I think I'd be the one to answer that. The Army may want to respond to other issues.

MR. CHRISTOPH: That's what I'm after, your response.

MR. ALDIS: As far as the groundwater is concerned, as I mentioned in the course of describing this work, there is not a very good basis for estimating the toxicity of explosives in drinking water sources. Because of the EPA's methodology in estimating risks, they always tend to overestimate them, because they take conservative values at every stage of the risk investigation. These levels that have been found in the groundwater may conceivably have some effect on someone drinking them for a lifetime; but the issue is, are these just the declining residual amounts that are there as a result of past activities?

In this case of EOD Range, for example, it was very clear during the course of our investigation the explosives levels in the groundwater were declining.

MR. CHRISTOPH: That's good.

MR. ALDIS: Yes. In the case of Hotel Range, there were only samples taken twice, and it's not clear that they are declining, but they are at such low levels it's extremely unlikely they would see any human health impact.

The other issue is, of course, the Army maintains responsibility for this no matter what happens to the land in the future, and I think really the Army needs to sort of address the issue of land use.

MR. CHRISTOPH: I'm more concerned with water quality, because the Army is less predictable than the water is, I think.

MR. ALDIS: None of the water in the South Post is contaminated to a level that I would think is significant. As I said, there may be excedences of no detectable effect levels as derived from certain approaches used by the EPA in estimating risks; but these are very conservative approaches, and they tend to overestimate risk.

MR. CHRISTOPH: I'm glad to hear it's a conservative approach, because you mentioned in one of the wells there have been two tests. Over how long a period of time was that?

MR. ALDIS: In the case of Hotel Range, EPA took the samples during the SI, and we took samples during the RI, and I think they were separated by about a year and a half.

MR. CHRISTOPH: In your customary area of expertise, would that year and a half two samplings be sufficient to give you satisfaction that the water there is not contaminated?

MR. ALDIS: But it is contaminated. And it's because very similar levels were found in both samplings that we are satisfied that we have a good understanding of what the levels are based on.

MR. CHRISTOPH: And they are not increasing?

MR. ALDIS: They're not increasing, and there are no additional sources. The results that we found are consistent with the historical disposal of explosives there, not with the current use.

MR. CHRISTOPH: That current use doesn't concern me; it's the future use at some point in time when the Department of Defense vacates South Post. Now, the foreseeable future, as I said, it may be five years, it may be ten, it may be fifty; but I'm concerned, will we be able to market that water for drinking purposes, whenever it is vacated?

MR. ALDIS: I would refer you to Mr. Byrne.

MR. BYRNE: My name is from James Byrne from the EPA Regional Office in Boston. Basically, right now the reason we're making this decision to basically leave things be is because it's under the current foreseeable future use as we discussed. When and if the property changes hands, what we would require under law is that another assessment take place on the status of the water at that point in time, whether it be tomorrow or ten years from now. And at that time we would look at those contaminants, and in fact the record of contaminants.

I'm kind of jumping the gun here, but part of this record of decision we're signing here is to sign a long-term monitoring plan to measure those contaminants from the Army explosives ordnance disposal. What we plan to do is look at that data and make sure, number one, it is staying on South

Post. If it were to migrate off Post during the next five years, say, when the Army still owns the land, the Army again would be obligated to do something about that.

So there were basically two trigger points here. Point one, for the foreseeable future the Army is using the land, and we're instituting a type of long-term groundwater monitoring plan to take a look at this to make sure that none of these contaminants migrate off Post and cause any harm in the drinking water supplies.

Point two would be if sometime in the near future the Army leaves this area, and the property is going to be transferred or sent to another agency or back into private hands. We would take a look at that library of groundwater data, we would take a look at groundwater data at the current situation and make an assessment at that point as to whether this water is safe for Lancaster, for instance, to tap into and start marketing, or is additional clean-up or something needed before you could undertake that activity.

MR. CHRISTOPH: Okay. You can understand my concern.

MR. BYRNE: Yes, I can.

MR. CHRISTOPH: With decreasing availability of good water, especially in this area, our understanding, at least verbally, is that it is the Fish & Wildlife Service on a federal basis who would probably be assuming the property. It is obviously to our advantage and interest to ascertain that enough will be done in the way of monitoring to make sure that we do have in fact a marketable source.

MR. BYRNE: What we would do is similar to what we did now. We would look at the situation at the point, what you people intend or something like that, and run these risk numbers, exposure numbers based on the contamination we see. And what would come out of that is, in a sense, a yes, go ahead and use it with no problem; or a maybe, let's hold on, this water might need some additional treatment before you can use it; or worst case, no, forget about it.

MR. CHRISTOPH: Well, if worst case ever occurred, who do we sue?

MR. BYRNE: The Army would come back; they'd be obligated to do something. The worst case is if the Federal Government goes broke.

MR. CHRISTOPH: You wouldn't sue.

DR. CRAMER: Two questions. Actually, three questions. Number one, if, let's say, the water is to be sold today to Boston or tomorrow, given the information you have, would they buy it? Could they drink it?

MR. BYRNE: That's a tough question, because we really didn't look at that. Basically, we'd have to look at that scenario. That's one we did not look at.

MS. WELSH: I can answer that question. Lynne Welsh from the Massachusetts Department of Environmental Protection. I've worked with Jim and Jim on evaluating the results of testing that they've done. We're three different agencies; we have three slightly different ways of evaluating the data that came in.

We have concurred with the EPA and the Army that, for right now, this is the best way to handle the situation at Fort Devens. A lot of study has been done, but because the activities are going to continue on at the Post, they're going to somehow slightly alter the results that we have from today to year one and year two on out. And the Army is going to be here, and they have to have training facilities. But we did some calculations of our own on the water -- the risk from the contamination levels at the worst case that the Army found in their investigations and found that they did exceed our 1-in-100,000 cancer risk factors.

So to answer your question, yes. But also the good news is, you can treat this water, these chemicals can be treated. So that if you did need to use the water today, which is not likely and is not going to happen, you could treat it to make it safe.

MR. LIDSTONE: I think I'm missing something here. There are no suggestions that there's a substantial aquifer that this water is involved with, correct?

MS. WELSH: No, there are.

MR. LIDSTONE: We're talking about water on top of slate here.

MS. WELSH: No.

MR. LIDSTONE: This water could contaminate significant aquifers?

MR. ALDIS: May I answer that. For the

most part the South Post Impact Area has only a thin and not very productive aquifer, but there is a fairly productive aquifer under the Nashua River, and part of this is under the eastern margin and on the northern side of the South Post Impact Area. So there's a similar --

MR. LIDSTONE: So while the contamination would likely get into this aquifer through the river -- or could it get in there -- I guess my question is, can the aquifer be contaminated without this water leaving the South Post?

MR. ALDIS: The answer to that is an aquifer that could be usable and is used in the South Post water point well could be impacted by some of the water off the South Post Impact Area, yes.

MR. LIDSTONE: So there is some significant aquifer that is at risk.

MS. WELSH: There is glacial outwash sand and gravel, what we call an aquifer, running through the South Post, and it does have samples indicating contamination. One of the things that we have worked on with the EPA, and we're discussing with the Army, is to tighten up the monitoring that's going on, so that we have assurances that that contamination is not moving off Post and is not going to impact either private wells in the area, or we have other wells besides Fort Devens, we have MCI-Shirley that is a significant water supply for this area. So that while there is contamination, the monitoring is going to ensure that it's not going to affect people.

MR. LIDSTONE: That it could be getting worse, that it could be spreading.

MS. WELSH: That's correct.

MR. LIDSTONE: Not to push everyone aside, but are there, I guess, some procedures to be changed, so that this contamination would be reduced in the future compared to what's happened so far, or should we expect this aquifer to remain contaminated for the foreseeable future and we'll simply have to watch it closely as it spreads?

MS. WELSH: That is what we hope long-term monitoring will tell us. There is contamination because of training, but there's also, we think, contamination because of concentrated disposal in the areas that Hussein identified for you. And we have asked and are working with the Army to change those concentrated disposal activities so that they are more environmentally -- happen in a more environmentally sound way and those are concentrated areas of emissions disposal. And the Army staff -- and Jim should speak to this -- is looking at the way they do training, so that it has less environmental impact than past activities. So this long-term monitoring plan, again with Army procedures and with the change of the concentrated munitions disposal, hopefully doesn't make the matter worse.

MR. LIDSTONE: And those procedural changes will be documented in the near future?

MS. WELSH: They will be in some cases.

CHAIRMAN CHAMBERS: I'm not sure I understand "procedural changes."

MR. LIDSTONE: In the disposal of munitions. Since there appears to have been some contamination from past practices, will there be any attempt to change future practices so that we reduce the contamination going into the aquifers?

CHAIRMAN CHAMBERS: Okay. Well, first of all, yes, past practices is that there were disposal of munitions. Current practice is there is only disposal in the event of an emergency or something. Typically, waste munitions are not disposed of.

MR. LIDSTONE: Oh, is that right? That's a big change. I have to admit, I haven't heard any bangs lately.

CHAIRMAN CHAMBERS: Another thing to be aware of is that there has been a change of activity on the South Post. It continues to be a training area and will continue to be a training area, but we don't have the same type of military units training there. So that a majority of the type of training that involves munitions is small arms training now, rifles and handgun-type training, not so much of explosive munitions.

MR. LIDSTONE: Less total explosives to be disposed of?

CHAIRMAN CHAMBERS: Yes. The other thing is, you said spreading. There is no evidence of this spreading. That's one of the reasons that we're proposing the groundwater monitoring, to ensure that there is no spreading. But if that had been the case -- and that will probably be not what we would be proposing -- there will probably be some more proactive action being taken.

In answer as far as future use of the water, I can't really speak to that. But I can say, from my experience, that the locating of the wells, we're talking about the impact area here, and where the location of the well is, whoever does that type of hydrogeological study that needs to be done to locate a well probably would have to take into account Massachusetts regulations as far as where to locate it -- not probably but we'd certainly have to -- and where. They would seek the point where they could get the most production out of that well but would have to be at a certain distance away and probably would be minimally impacted by the activity that's here.

DR. CRAMER: Question 1-B. Or A, because you made a statement. You say the water as is can be made fit to drink. In Pennsylvania I had a home with a water purification system, supposedly we didn't need it, but for the money I spent, it was peace of mind. So basically, it was an activated charcoal system for organics and halogens, and then there was a three-way system for heavy metals and a polishing filter and stuff for bacteria, whatever. So I can relate to that. But on a commercial basis, how does that water -- let's say, for example, you've got organic pollutants, for lack of a better word. How does that get taken care of?

MS. WELSH: Lynne Welsh from the Massachusetts DEP. The same things you did on your individual home, activated carbon; there's also air stripping, because these are volatile compounds, which can be done on a commercial basis. In fact, several towns also already do that. Acton, for one, has --

DR. CRAMER: Really.

MS. WELSH: They have air strippers on their water supply, because there has been past contamination. I'm sorry, I can't speak to the cost of that, but they are available commercially.

The statement I was trying to make is that these chemicals, while they are explosive and exotic, have chemical reactions that can be dealt with under present technology.

DR. CRAMER: Okay.

MR. ALDIS: May I point out that these compounds also naturally biodegrade as a result of bacterial action in the groundwater and in surface water.

DR. CRAMER: Question number two. Fantasyland. I'm President of the United States -- okay, we're all laughing, okay -- and I say to you folks, "I'm the boss, executive order, clean it up. I don't want to take anything -- I won't take no for an answer, just do it." Okay. What do you do to change it? What are the alternatives to leaving this the way it is? What's the opposite?

CHAIRMAN CHAMBERS: Well, first of all, then, as the --

DR. CRAMER: I'm not running, by the way.

CHAIRMAN CHAMBERS: -- as I guess the supreme commander, he would have to say he's not going to have military training here any longer, because in order for there not to be this problem, we would not be able to use the ranges at all down there.

Now, once that happened, then if that were to happen, then we would go through it. We would probably have a good sense of history here, with all the studies that we've done so far, but now we would have to go into a process that we call a remediation investigation feasibility study. The intent of that is to look at the technology that's available and see how it may be applied to the situation that we have.

So that if it involves monitoring, if it involves air stripping, we will evaluate all those alternatives. We would look to evaluating a variety of things, cost being one of them, and not a primary but a parameter to evaluate. We would evaluate risk to human health, risk to ecology, community acceptance. We would be going through the same process that we're doing here this evening, eventually to select a particular remedial action that would allow us to clean the water, if it was deemed necessary.

But it would have to be shown that there is a certain level of risk, that there is a certain benefit to having this water available, and then we would choose a remedy. And then we would have to present it to the public and say, "This is how we've chosen to clean this up, this is how much we intend to spend, this is what the results will be." And we would come up with a record of decision then that the Army would be bound by that record of decision to implement that action.

DR. CRAMER: It would be something like strip-mining for coal; you just bulldoze the whole area and take the stuff away?

CHAIRMAN CHAMBERS: Hypothetically, it would probably involve -- if it was deemed necessary, it might involve a pump-and-treat system where we would pump the water out of the ground, treat it, and then discharge it back to the ground. And then the ground is nature's best filter, and by the time the water was redrawn out for consumption purposes, it would probably be tested again, but it would prove suitable for human consumption.

MR. CHRISTOPH: I won't play President, but I would like to play Speaker of the House for a minute. How comfortable are you that the EPA budget will not be sliced to ribbons so that your function will cease to exist? Any assurances at all?

MR. BYRNE: Call your Congressman.

MS. WELSH: I think what you have are three agencies, the Army, the EPA and the State; we all have individual budgets, and we're all working on this. If EPA, Jim, were to go away tomorrow, I would still be here. And if the Army were to go away tomorrow, we'd still be here. I mean, we are public servants for the Commonwealth of Massachusetts, not the Federal Government or the Army.

MR. CHRISTOPH: Gotcha. And you're fairly comfortable?

MS. WELSH: I'm fairly comfortable that Governor Weld is not going to do anything problematic.

MR. BIRTWELL: Again, first of all, let me preface my remark by saying most of us over the years from the Spec Pond area have been comfortable with Fort Devens and hated very much to see them go. We test our pond every year. I have given copies of that to the Commandant when he was here; the last one went to a ranger. Does anybody know who controls the access to South Post now for fishing or whatever?

CHAIRMAN CHAMBERS: Well, there's range control. We also have the natural resources manager; his name is Tom Poole.

MR. BIRTWELL: It was this year, I know, limited to the Fort Devens personnel. Prior to that other people would come in, which is fine, and we haven't had any problems; we have handouts on file or whatever. The thing that kind of surprises me is that South Post does border Spec Pond. Apparently no testing has been done on Spec Pond.

MR. ALDIS: The flow is from Spectacle Pond to South Post, not the other way around.

MR. BIRTWELL: I understand the aquifer goes east to west.

MR. ALDIS: The flow is --

MR. BIRTWELL: We have that little stream going through, if that's what you mean.

MR. ALDIS: Spectacle Pond is an outcrop of the water table, but it overflows as a small steam, as you say. But even so, the water at Spectacle Pond is from rainfall and snow melt right there, and the discharge is going away from the pond.

MRS. BIRTWELL: And springs.

MR. ALDIS: Well, the springs, of course, themselves are generated from rainfall.

MR. ALDIS: Infiltrating through the soil.

MR. BIRTWELL: You have a well 65 feet deep.

MR. ALDIS: The water circulates; depending on where it falls, it goes deeper or shallower into the ground. The point is, though, that South Post cannot contaminate Spectacle Pond; Spectacle Pond can contaminate South Post.

MR. BIRTWELL: How about the wells in the people's homes? There must be 100 homes in the general Spec Pond area.

MR. ALDIS: Only if they pump an enormous amount of water could they possibly draw anything out from under the South Post. The volume of water that falls on the average acre around here and infiltrates into the ground I think is of the order of 500,000 gallons per acre per year.

MR. BIRTWELL: So what you're saying is, there's absolutely no problem relative to drinking water in the wells surrounding the Spec Pond area.

MR. ALDIS: As for being impacted by South Post, yes, there is no problem at all.

CHAIRMAN CHAMBERS: Sir.

DR. vom EIGEN: I'm thinking about the list of chemicals and contaminants that you mentioned. It seems to me that there are by-products of explosives, and since they are rapidly oxidized chemicals to cause the explosion, they are also probably oxidized in the soil, maybe at a slower rate, but they certainly are.

MR. ALDIS: They are affected by bacterial decay, yes, they are acted on by organisms.

DR. vom EIGEN: This is completely different if you have contamination with lead or zinc or heavy metal, right, they cannot be destroyed.

DR. vom EIGEN: So I think any idea of digging this up or treating it chemically or anything else would be foolish, because it would probably improve itself in time, unless you're going to start shooting a lot of heavy stuff in there again.

MR. ALDIS: That's correct. The points we investigated with the greatest detail were all areas which in the past had been used for open burning or open detonation. Either they bought explosives or munitions there, and they covered them with wood and saturated them with kerosene or something similar and set fire to them, or they detonated them, and those were the areas that were most suspect and the ones that were most intensely evaluated. The additional work that we did around the South Post Impact Area was really because the Army just raised the question that perhaps the overall impact of firing weapons produces a detectable level of contamination, not from concentrated disposal, but just general impact areas on the ranges. And we did find that there were detectable levels, but they were simply not significant. There is certainly no smoking gun, no public health or ecological concern.

DR. vom EIGEN: They would be more likely to be at the point of firing than at the point of impact of the bullet or shell.

MR. ALDIS: That I don't know; it depends if they're explosive shells or just projectiles.

DR. vom EIGEN: I don't think if they used explosive shells here, perhaps they did, or like bazookas. But I think that the results I've heard sound very encouraging that this is going to be a contained area with minor contamination and will improve in time. But are you going to be able to, or do you feel that you should, retest all these areas over periods of time, in a year or two years?

MR. ALDIS: That is the intention.

CHAIRMAN CHAMBERS: Yes, sir. That is what we've proposed to do, that we will have a long-term monitoring plan. We're going to test these wells. And I just want to make the point clear that these wells are not used on a continuing basis, it's not like what we think of as wells at our home where we're constantly pumping water out of them. These wells pretty much have no activity at all until we test them, so the water that's there, it's not like we're cleansing this water by getting fresh water out of it all the time, these are wells that are actually -- we're grabbing samples of what's actually there at that particular time.

DR. vom EIGEN: Will there be reports put in these places in cities and towns that you described of these results when they're done?

CHAIRMAN CHAMBERS: Yes, sir.

DR. vom EIGEN: So it will be available, and if they show improvement, everything goes well. If they start showing things are getting worse, then we have to find out why, I guess.

CHAIRMAN CHAMBERS: Any other?

MR. JANELL: John Janell, Lancaster. You talked a lot about groundwater. I guess I'm concerned about what hasn't gotten in. Has anyone looked at the landfills? I know it wasn't that many years ago we thought lead paint was safe, PCBs, people would just take transformers and throw them away. Today you have to drain out the PCBs. Has anyone ever looked what's in the landfills?

CHAIRMAN CHAMBERS: Yes, sir, there have been studies done, that's another action that we plan to take. Some of the landfills, there's about half a dozen landfills or so that we've identified on the South Post. Most of them are from homesteaders or people that lived there prior to the Army taking over the land. We found old farm dumps, things like that, where we found the pots and pans from whoever lived there were thrown out the back forty, and there they are. But there are a couple of sites from Army activity as well, and we have identified those. The Army is working with US EPA and the Massachusetts Department of Environmental Protection right now to develop a plan on what we're going to do about those landfills, and it could involve excavating those landfills, or we're looking at what other alternatives there are. But that's one of the ones we're considering right now.

MRS. vom EIGEN: Florence vom Eigen, Spectacle Pond. I have a couple incidental-type questions, I think. You haven't mentioned deer, and I've seen deer in the area. I mean, you allow hunters to go into the area. Have any studies been done on them to know whether they're contaminated in any way, and should and can people who hunt take them home and butcher them and eat them?

MR. ALDIS: I think you have to ask someone else about that, because I'm not familiar with that.

MR. BYRNE: As part of my former life I did some wildlife biology work; basically, we performed ecological assessments. Basically what we did, the short answer is, no, we didn't take any deer and cut them up and analyze their tissues. What we did is more or less start at the bottom of the food chain, stuff deer might be eating. And what we found there, as you have seen mentioned in the summary, was minimal impacts to the wildlife populations here at Fort Devens. I mean, there are some contaminants in the soils but not at high enough levels that it would make it all the way to a deer and perhaps make a deer unsafe to eat.

MRS. vom EIGEN: It's my understanding that they eat leaves and twigs.

MS. McCARTNEY: I'm Sheila McCartney with the Army Environmental Center. I'm from Aberdeen, Maryland, and our agency works with many installations like Fort Devens. And work has been done at the Aberdeen and Jefferson Proving Grounds with the deer, specifically during hunting season. And we'll have hunters give us some of their deer, and they've done studies on them at those installations, which have similar contamination as South Post here, and they haven't found any risks.

MS. vom EIGEN: Another thing that concerns me is that you think nothing of disposing or detonating on ice, which then goes into the water, and you say you tested the sediment.

MR. ALDIS: This was a former practice, remember. This was a practice that was discontinued maybe 20 years ago; I don't know.

CHAIRMAN CHAMBERS: I can't speak to that.

MR. ALDIS: The whole point about these areas that we investigated was that they were areas of heavy disposal of explosives and ordnance of various kinds, and the Army has completely stopped doing this, with the solid exception of emergencies like, for example, a bomb squad wishes to dispose of something suspicious and things like that. The Army is not disposing of explosives; they're simply using them as firing ranges now.

MRS. vom EIGEN: All right. Then are there geodetic maps available showing which way the aquifers flow in this area, and do those arrows indicate surface water?

MR. ALDIS: I tried to simplify this to show you the directions of flow, but the individual remedial investigation reports show specific groundwater contours. Now, in a sand and gravel aquifer, the water flows at right angles to the contours, and we indicate on our maps the groundwater with arrows showing the direction flow down the contours; and you can have a look at those in detail. I know that this is true in general. If you were to point to any one particular arrow and say, What's the basis for the evidence, I would simply have to say that it's higher on the left, and it's lower on the right, and it flows from left to right.

MRS. vom EIGEN: That's not the underwater aquifer that you're talking about?

MR. ALDIS: No, I'm talking about the aquifer. This is groundwater. All of the groundwater in South Post definitely goes into the Nashua River or over here into the North Nashua

River. Now, before it gets to the Nashua River, most of it discharges to smaller streams which themselves discharge to the Nashua. And that we know as just a matter of physical behavior of water in the kind of environment. There's no question about it, in my mind. That's where it goes, it goes into the surface water on South Post, and that drains into the Nashua River.

MRS. vom EIGEN: And Spec Pond is a different entity.

MR. ALDIS: Spec Pond is up here.

MRS. vom EIGEN: And you described that as a different type of water.

MR. ALDIS: No, I'm not saying that, I'm saying that Spectacle Pond is full of water which is generated at and immediately around Spectacle Pond, and it is not coming off South Post, it is going on to South Post. As I said, Spectacle Pond could contaminate South Post, but South Post could not contaminate Spectacle Pond.

MRS. vom EIGEN: I'm thinking of Spectacle Pond wells and wondering if there's an underwater flow direction that's different.

MR. ALDIS: No. The water around Spectacle

Pond is flowing into Spectacle Pond, so it's the area immediately adjacent to the pond and the pond itself which is supplying those wells.

MRS. vom EIGEN: My last question has to do with your terminology of "no action." Now, I understand from reading these that the Army is going to recommend no action, which puts on hold --

MR. ALDIS: What they're doing is recommending no clean-up action. What they are recommending is continued monitoring, which is an action, if you like, but it's not a clean-up action. It's simply observation.

MRS. vom EIGEN: When you say "no action," it doesn't mean a closure of the whole thing.

MR. ALDIS: It doesn't mean that nothing is going to happen in the future; it means that only monitoring, no clean-up.

MRS. vom EIGEN: My understanding in perusing the fact sheets was that no action might mean --

MR. ALDIS: Literally that.

MRS. vom EIGEN: -- literally that, right, exactly.

MR. ALDIS: That is a little misleading,

but what it means is that no clean-up action will be taken, just monitoring.

MRS. vom EIGEN: Thank you very much; it's been very informative.

CHAIRMAN CHAMBERS: Okay. I'd like to close this public hearing. Then I guess you have the poster session down here; we could spend a few more minutes there. If anyone else would like to say anything for the record, please do.

MR. CHRISTOPH: I would like to thank the Department of Defense and the other organizations for what I consider to be an openness, a willingness to talk to us. I appreciate that.

CHAIRMAN CHAMBERS: You're welcome.

DR. CRAMER: He stole my thunder.

CHAIRMAN CHAMBERS: One more thing, if I might add, please. The public comment period is open to March 1st, so if you would like to submit any comments in written form, the address is on the fact sheet and the proposed plan; you have until March 1st to submit it in writing.

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

CERTIFICATE

I, Anne H. Bohan, Registered Diplomate Reporter, do hereby certify that the foregoing transcript, Volume I, is a true and accurate transcription of my stenographic notes taken on February 21, 1996.

Anne H. Bohan

Registered Diplomate Reporter

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RECORD OF DECISION SUMMARY
SOUTH POST IMPACT AREA AND
AREA OF CONTAMINATION 41 GROUNDWATER AND
AREAS OF CONTAMINATION 25, 26, AND 27
FORT DEVENS, MASSACHUSETTS

APPENDIX E

TABLES

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Table 1

SUMMARY OF ANALYTICAL RESULTS FOR SPIA WELL D-1 (µg/g)

Analyte	Detection Frequency	Range		Local Background 25M-92-05X	Frequency of Exceedance of Background	Region III RBC for Tapwater	Frequency of Exceedance of RBC and Background
		Minimum	Maximum				
Metals							
Arsenic	2/4	3.80	4.56	<2.54	2/4	11[b] 0.37[c]	0/4 2/4
Barium	1/4	-	2.12	13.2	0/4	2,600	0/4
Calcium	4/4	5,480	6,200	2,745	4/4	NR	-
Copper	1/4	-	6.73	<8.09	0/4	1,400[b]	0/4
Iron	4/4	113	188	2,640	0/4	NR	-
Lead	2/4	2.17	4.23	1.85	2/4	15[e]	0/4
Magnesium	4/4	1,560	1,760	914	4/4	NR	-
Manganese	3/4	3.18	4.02	68.6	0/4	180[b]	0/4
Potassium	4/4	568	1,380	1,575	0/4	NR	-
Sodium	3/4	2,470	2,640	2,105	3/4	NR	-
Zinc	1/4	-	40.5	<21.1	1/4	11,000[b]	0/4
Pesticides							
Endosulfan sulfate	1/4	-	0.260	NA	-	220[b,c]	0/4
Endosulfane, B	1/4	-	0.006	NA	-	220[b]	0/4

Table 1

SUMMARY OF ANALYTICAL RESULTS FOR SPIA WELL D-1 (µg/g)

Analyte	Detection Frequency	Range		Local Background 25M-92-05X	Frequency of Exceedance of Background	Region III RBC for Tapwater	Frequency of Exceedance of RBC and Background
		Minimum	Maximum				
Semivolatile Organics							
2-Ethyl-1-hexanol	1/4	-	10.0	NA	-	NR	-
Bis(2-ethylhexyl)phthalate	2/4	10.0	53.0	NA	-	4.8[c]	2/4
Hexanedioic acid dioctylester	1/4	-	9.0	NA	-	NR	-
Volatile Organics							
Chloroform	1/4	-	1.70	NA	-	0.15[c]	1/4

Source: Ecology and Environment, Inc. 1994

Key: NA = Not analyzed NR = Not reported.

[a] Action level for lead in drinking water
[b] RBC associated with a noncancer hazard index of 1
[c] RBC associated with a cancer risk of 10^{-6}
[d] RBC for endosulfan was used. Toxicities of endosulfan sulfate are similar.

Table 2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS (FILTERED)
AOC 25 - EOD RANGE
(µg/L)

Chemicals	Local Background Concentration			Downgradient Wells		
	Detection Frequency	Range		Detection Frequency	Range	
		Minimum	Maximum		Minimum	Maximum
Metals						
Aluminum	0/1	-	-	2/9	31.6	36
Barium	0/1	-	-	2/9	15.3	16.8
Calcium	1/1	1,850	1,850	9/9	2,280	4,020
Lead	0/1	-	-	1/9	1.41	1.41
Magnesium	0/1	-	-	8/9	537	711
Manganese	1/1	12.4	12.4	6/9	5.1	35.8
Potassium	0/1	-	-	4/9	1,190	1,370
Silver	0/1	-	-	1/9	2.44	2.44
Sodium	0/1	-	-	4/9	1,950	2,510
Zinc	0/1	-	-	1/9	129	129

Source: Ecology and Environment, Inc. 1994.

Table 3

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS (UNFILTERED)
AOC 25 - EOD RANGE
(µg/L)

Chemical	Local Background Concentration			Downgradient Wells		
	Detection Frequency	Range		Detection Frequency	Range	
		Minimum	Maximum		Minimum	Maxmimum
Metals						
Aluminium[a]	3/3	830	1,690[b]	19/19	390	920,000
Antimony[a]	0/3	-	-	4/19	3.04	8.12
Arsenic[a]	0/3	-	-	11/19	2.95	87
Barium[a]	3/3	7.67[b]	13.2[b]	18/19	5.64	2,440
Beryllium[a]	0/3	-	-	2/19	6.27	9.27
Calcium[a]	3/3	2.170[b]	2,750[b]	18/19	2,780	119,000
Chromium[a]	0/3	-	-	14/19	7.48	1,200
Cobalt[a]	0/3	-	-	10/19	11.4	610
Copper[a]	0/3	-	-	13/19	16.2	1,200
Iron[a]	3/3	1,300	2,640[b]	19/19	1,060	1,300,000
Lead[a]	2/3	1.79[b]	1.85[b]	15/19	1.52	400
Magnesium[a]	3/3	693	914	19/19	596	230,000
Manganese[a]	3/3	33.8	68.6[b]	19/19	15.3	24,000
Nickel[a]	0/3	-	-	10/19	25.1	1,900
Pottasium[a]	2/3	801[b]	1,580[b]	17/19	1,570	104,000
Selenium	1/3	2.41[b]	2.41[b]	0/19	-	-
Sodium[a]	2/3	1,990[b]	2,110[b]	16/19	1,950	11,100
Vanadium[a]	0/3	-	-	12/19	12.5	1,100
Zinc	0/3	-	-	14/19	22.1	3,000
Explosives						
2,4,6-Trinitrotoluene[a]	0/3	-	-	1/19	1.62	1.62
Cyclonite (RDX)[a]	0/3	-	-	4/19	0.67	7.88
HMX[a]	0/3	-	-	1/19	1.01	1.01
PETN[a]	0/3	-	-	1/19	89.5	89.5

Source: Ecology and Environment, Inc. 1994

[a] Selected as a COPC
[b] Average of field duplicate samples

Table 4

SUMMARY OF GROUNDWATER RESULTS (FILTERED)
AOC 26 - ZULA RANGE
(µg/L)

Chemical	Local Background Concentration			Downgradient Wells		
	Detection Frequency	Range		Detection Frequency	Range	
		Minimum	Maximum		Minimum	Maximum
Metals						
Aluminum	0/1	-	-	1/8	35.8	35.8
Arsenic	0/1	-	-	1/8	5.07	5.07
Barium	0/1	-	-	2/8	5.92	16.4
Calcium	0/1	1,260	1,260	8/8	656	7,920
Iron	0/1	-	-	2/8	48.2	65.6
Lead	0/1	-	-	1/8	1.74	1.74
Magnesium	0/1	-	-	3/8	589	1,080
Manganese	0/1	-	-	7/8	5.87[a]	62
Potassium	0/1	-	-	2/8	704	1,010
Selenium	0/1	-	-	2/8	1.65[a]	3.56
Sodium	0/1	-	-	7/8	2,070	3,850
Zinc	0/1	-	-	3/8	20.3	76.7

Source: Ecology and Environment, Inc. 1994

[a] Average of field duplicate samples

Table 5

SUMMARY OF GROUNDWATER RESULTS (UNFILTERED)
AOC-26 - ZULU RANGE
(µg/L)

Chemical	Background Well 26M-92-01X			Downgradient Well		
	Detection Frequency	Range		Detection Frequency	Range	
		Minimum	Maximum		Minimum	Maximum
Metals						
Aluminum[a]	1/1	6,600	6,600	18/18	116[b]	24,200
Arsenic[a]	1/1	2.86	2.86	12/18	2.88	100
Barium[a]	1/1	14	14	16/18	5.56[b]	95.8
Calcium[a]	1/1	1,810	1,810	18/18	1,240	18,100
Chromium[a]	0/1	-	-	6/18	4.9[b]	26.6
Cobalt[a]	0/1	-	-	2/18	42.4	44.8
Copper[a]	0/1	-	-	3/18	7.72[b]	32
Iron[a]	1/1	1,600	1,600	18/18	236[b]	31,300
Lead[b]	1/1	14.9	14.9	12/18	1.41	27
Magnesium[a]	1/1	591	591	18/18	530[b]	4,830
Manganese[a]	1/1	42.9	42.7	18/18	17.8	1,210
Nickel[a]	0/1	-	-	2/18	10.7	57.6
Potassium[a]	0/1	-	-	14/18	1,173[b]	5,470
Selenium[a]	1/1	2.11	2.11	1/18	2.05	2.05
Sodium[a]	0/1	-	-	16/18	1,900	6,010
Vanadium[a]	0/1	-	-	2/18	15	24.9
Zinc[a]	0/1		-	-	10/18	99.3
Explosives						
1,3-Dinotrobenzene[a]	0/1	-	-	2/18	0.326	1.65
2,6-Ditrotoluene[a]	0/1	-	-	3/18	0.9	5.42
2-Nitrotoluene[a]	1/1	6.02[U]	6.02[U]	2/6	10	27
3-Nitrotoluene[a]	0/1	-	-	1/6	1.86	1.86
4-Amino-2,6-dinitrotoluene[a]	0/1	-	-	1/6	0.501[b]	0.501[b]
Cyclonite (RDX)[a]	0/1	-	-	10/18	3.53	390
HMX[a]	0/1	-	-	9/18	2.35[b]	23
Nitroglycin[a]	0/1	-	-	1/18	36.7[b]	36.7[b]

Table 5

SUMMARY OF GROUNDWATER RESULTS (UNFILTERED)
AOC-26 - ZULU RANGE
(µg/L)

Chemical	Background Well 26M-92-01X			Downgradient Well		
	Detection Frequency	Range		Detection Frequency	Range	
		Minimum	Maximum		Minimum	Maximum
PETN[a]	0/1	-	-	1/18	17.4[b]	17.4[b]
Semivolatile Organics						
Bis(2-ethylexyl)phthalate[c]	-	-	-	1/12	5.55[b]	5.55[b]
Dimethyl phthalate[c]	-	-	-	1/12	7.2	7.2
Volatile Organics						
Acetone	1/1	18	18	0/12	-	-
Carbon disulfide[a]	0/1	-	-	2/12	4.5	22
Carbon tetrachloride[a]	0/1	-	-	1/12	1	1
Other Organics						
Butyl Carbiol[a]	-	-	-	1/1	8	8
2-Ethyl-1-hexanol[a]	-	-	-	1/1	20	20
Benzothiazole[a]	-	-	-	1/1	4	4
Tetracosane[a]	-	-	-	1/1	4	4
Total Petroleum[a] Hydrocarbons	-	-	-	2/12	143[b]	730[b]

Source: Ecology and Environment, Inc. 1994

[a] Selected as a COPC
[b] Average of field duplicate samples
[c] Attributed to sampling or laboratory error
[U] Results not confirmed in a second column

Table 6

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS (FILTERED)
AOC 27 - HOTEL RANGE
(µg/L)

Chemical	Background Well SPM-93-13X		Downgradient Wells			
	Frequency of Detection	Concentration	Frequency of Detection	Range: Minimum	Range: Maximum	Frequency of Exceedance of Background Concentration
Metals						
Aluminum	1/1	90.1	5/7	9.30	72.3	0/7
Arsenic	0/1	-	1/7	4.96	4.96	1/7
Barium	0/1	-	1/7	5.76	6.10	2/7
Beryllium	0/1	-	5/7	0.087	0.315	5/7
Calcium	1/1	3,560	7/7	4,530[a]	11,400	7/7
Copper	0/1	-	1/7	3.040	3.045[a]	1/7
Iron	1/1	37.9	4/7	21.6	37.35[a]	0/7
Magnesium	1/1	856	7/7	1,170	2,580	7/7
Manganese	1/1	45.4	7/7	1.46	74.1	2/7
Potassium	1/1	1,080	6/7	1,020	2,330	5/7
Sodium	1/1	1,950	7/7	2,290	10,900	7/7
Zinc	0/1	-	6/7	7.54	112	6/7

Source: Ecology and Environment, Inc. 1994

[a] Average of field duplicate samples

Table 7

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS (UNFILTERED)
AOC 27 - HOTEL RANGE
(µg/L)

Chemical	Background Well SPM-93-13X		Downgradient Wells			
	Frequency of Detection	Concentration	Frequency of Detection	Range: Minimum	Range: Maximum	Frequency of Exceedance of Background Concentration
Metals						
Aluminum[a]	1/1	34,000	14/14	148	164,000	3/14
Antimony[a]	1/1	3.06	3/14	6.92	12.9	3/14
Arsenic[a]	1/1	250	11/14	3.31[b]	300	1/14
Barium[a]	1/1	272	14/14	2.62	806	3/14
Beryllium[a]	1/1	1.68	6/14	0.123	7.3	2/14
Calcium[a]	1/1	7,820	14/14	4,250[b]	22,500	9/14
Chromium[a]	1/1	77.7	11/14	5.44[b]	288	3/14
Cobalt[a]	1/1	106	5/14	5.53[b]	282	2/14
Copper[a]	1/1	147	12/14	1.62	553	2/14
Iron[a]	1/1	66,000	14/14	175	305,000	2/14
Lead[a]	1/1	88.3	11/14	2.95	270	3/14
Magnesium[a]	1/1	10,300	14/14	1,240	48,300	3/14
Manganese[a]	1/1	2,400	14/14	29.6	6,540	3/14
Nickel[a]	1/1	154	8/14	7.7[b]	522	2/14
Potassium[a]	1/1	6,860	14/14	1,050	26,300	6/14
Silver[a]	0/1	-	1/14	1.49	1.49	1/14
Sodium[a]	1/1	2,860	14/14	2,220	11,100	12/14
Vanadium[a]	1/1	53.7	9/14	3.89[b]	264	3/14
Zinc[a]	1/1	272	14/14	15.1	795	2/14
Explosives						
Cyclonite[a]	0/1	-	12/14	0.967	17.9	12/14
1,3-Dinitrobenzene[a]	0/1	-	2/14	0.288	1.82	2/14
HMX[a]	0/1	-	5/14	0.699	4.74	5/14

Table 7

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS (UNFILTERED)
AOC 27 - HOTEL RANGE
(µg/L)

Chemical	Background Well SPM-93-13X: Frequency of Detection	Background Well SPM-93-13X: Concentration	Downgradient Wells: Frequency of Detection	Downgradient Wells: Range Minimum	Downgradient Wells: Range Maximum	Downgradient Wells: Frequency of Exceedance of Background Concentration
Pesticides						
delta-BHC[a]	0/1	-	2/6	0.16	0.26	2/6
Other Organic Chemicals						
Total Peroleum Hydrocarbons[a]	0/1	-	3/6	350[b]	3,790	3/6

Source: Ecology and Environment, Inc. 1994

[a] Selected as COPC
[b] Average of duplicate samples

Table 8

CHEMICAL SUMMARY REPORT FOR SURFACE WATERS
AOC 25 - EOD RANGE
(µg/L)

		Site ID	25D-92-01X
		Field Sample ID	WX2501X1
		Sample Date	10/26/92
Test	Parameter	Screening Values	
TAL METAL	Aluminum	N/A	19,600
	Arsenic	0.018 ugl	19.4
	Barium	N/A	40.1
	Calcium	N/A	2,240
	Chromium (total)	11	24.9
	Copper	12	29.7
	Iron	N/A	27,000
	Lead	3.2	18.8
	Magnesium	N/A	4,350
	Manganese	N/A	417
	Potassium	N/A	2,430
	Sodium	N/A	2,880
	Vanadium	N/A	24.7
	Zinc	110	65.6
WQP	Hardness	N/A	10,400
	Nitrogen, Kjeldahl Method	N/A	2,000
	Nitrogen, NO3/NO2	N/A	39.5
	Phosphate	N/A	590
	Total suspended solids	N/A	996,000

Source: USAEC IRDMIS Level 3/E & E, 1994 - Codes following values indicate data useability. (See key above)

Table 9

SUMMARY OF SURFACE WATER RESULTS
AOC 26 - ZULU RANGE (µg/L)

Chemical	Local Background Concentration	RI DATA				SI DATA			
		Detection Frequency	Range		Frequency of Exceedance of Background	Detection Frequency	Range		Frequency of Exceedence of Background
			Minimum	Maximum			Minimum	Maximum	
Metals									
Aluminum[a]	773	7/13	162	3,780	3/13	8/10	1620	31000	8/10
Arsenic[a]	6.72	4/13	3.73	7.18[b]	1/13	8/10	8.09	580	8/10
Barium[a]	40.1	3/13	5.26	309[b]	1/13	10/10	2.5	2200	7/10
Beryllium	5	0/13	-	-	0/13	6/10	0.403	28	1/10
Cadmium	4.01	0/13	-	-	0/13	5/10	2.91	170	4/10
Calcium	20600	13/13	1,200	19,300[b]	0/13	10/10	2400	75000	1/10
Chromium[a]	6.02	1/13	7.855	7.85[b]	1/13	9/10	4.99	410	8/10
Copper	8.1	1/13	10.4725	10.5[b]	1/13	9/10	8.01	3800	8/10
Iron[a]	1630	13/13	81.3	11,500[b]	2/13	10/10	174	50000	8/10
Lead[a]	8.68	12/13	1.63	106[b]	2/13	9/10	6.54	9400	8/10
Magnesium	3340	9/13	667	236[b]	0/13	10/10	730	47000	3/10
Manganese	357	13/13	6.65	101	0/13	10/10	9.52	15000	3/10
Mercury	0.24	0/13	-	-	0/13	1/10	8.2	8.2	1/10
Nickel	34.4	0/13	-	-	0/13	5/10	11.9	300	1/10
Potassium	3150	13/13	560	2,860[b]	0/13	10/10	275	14000	1/10
Selenium	3.02	1/13	3.895	3.89[b]	1/13	2/10	4.95	5.54	2/10

Table 9

SUMMARY OF SURFACE WATER RESULTS
AOC 26 - ZULU RANGE (µg/L)

Chemical	Local Background Concentration	RI DATA				SI DATA			
		Detection Frequency	Range		Frequency of Exceedance of Background	Detection Frequency	Range		Frequency of Exceedence of Background
			Minimum	Maximum			Minimum	Maximum	
Silver	4.6	0/13			0/13	5/10	0.745	14	1/10
Sodium	36300	13/13	2,040	3,840	0/13	9/10	2380	3110	0/10
Vanadium[a]	11	1/13	17	17[a]	1/13	8/10	5.16	340	7/10
Zinc[a]	33.4	2/13	53.2	90.3[b]	2/13	7/10	78	9100	7/10
Explosives									
1,3,5-Trinitrobenzene	-	0/13	-	-	-	3/10	0.495	0.747	-
1,3-Dinitrobenzene	-	0/13	-	-	-	2/10	0.321	1.13	-
Cyclonite[a]	-	3/13	5.76	26.7[a]	-	3/10	1.46	21.3	-
HMX[a]	-	1/13	1.8625	1.86[b]	-	0/10	-	-	-
Pesticides									
p,p'-DDD[a]	-	1/13	0.086	0.086	-	0/10	-	-	-
Semivolatile Organics									
4-Methylphenol	-	0/13	-	-	-	1/10	15	15	-
Bis(2-ethylexyl) phthalate[d]	-	6/13	4.6	15	-	0/10	-	-	-

Table 9

SUMMARY OF SURFACE WATER RESULTS
AOC 26 - ZULU RANGE (µg/L)

Chemical	Local Background Concentration	RI DATA				SI DATA			
		Detection Frequency	Range		Frequency of Exceedance of Background	Detection Frequency	Range		Frequency of Exceedence of Background
			Minimum	Maximum			Minimum	Maximum	
Volatile Organics									
1,1,2-Trichloroethane[a]	-	1/13	3	3	-	0/10	-	-	-
Toluene	-	0/13	-	-	-	2/10	13	13	-

Source: Ecology and Environment, Inc. 1994

Note: SI surface water samples contained elevated levels of suspended sediment resulting in artificially high metals concentrations. Metals were selected as COPCs based on the RI data only.

[a] Selected as a COPC
[b] Average of field duplicate samples
[c] Single exeedance is an average of duplicates from location 26D-92-096X; high result is due to elevated concentration of suspended sediments in one of these duplicates. Concentrations found in the other duplicates were well below background value.
[d] Attributed to laboratory or sampling contamination

Table 10

**SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
AOC 27 - CRANBERRY POND
(µg/L)**

Chemical	Detection Frequency	Range		Local Background Concentration	Frequency of Exceedance of Background
		Minimum	Maximum		
Metals					
Aluminum	8/9	10.5	274	773	0/9
Barium	6/9	3.1	4.79	40.1	0/9
Beryllium	2/9	0.105	0.110	5	0/9
Calcium	9/9	760	931	20,600	0/9
Copper	6/9	1.21	2.85	8.1	0/9
Iron	9/9	482	819	1,630	0/9
Lead*	9/9	5.31	18.2	8.68	2/9
Magnesium	6/9	249	280	3,340	0/9
Manganese	9/9	7.21	11.5	357	0/9
Potassium	6/9	579	797	3,150	0/9
Silver	1/9	2.34	2.34	4.6	0/9
Sodium	9/9	854	1,230	36,300	0/9
Zinc	6/9	6.02	24.5	33.4	0/9

Source: Ecology and Environment, Inc. 1994

* Selected as a COPC

Table 11

CHEMICAL SUMMARY REPORT FOR SURFACE WATERS
AOC 25 - EOD RANGE
(µg/g)

		Site ID	25D-92-01X
		Field Sample ID	DX2501X1
		Sample Date	10/26/92
Test	Parameter	Screening Values	
TAL METAL	Aluminum	1,000,000	10,500
	Arsenic	30	200
	Barium	72,000	15.6
	Beryllium	3.0	1.89
	Calcium	N/A	556
	Chromium (total)	5,000	15.9
	Cobalt	N/A	4.64
	Copper	38,000	14.3
	Iron	N/A	24,100
	Lead	500	11.0
	Magnesium	N/A	3,100
	Manganese	5,100	291
	Nickel	700	18.6
	Potassium	N/A	240
	Selenium	2,500	0.990
	Sodium	N/A	171
	Vanadium	7,200	13.3
	Zinc	5,000	55.5
TCL Pest	DDT	9.0	0.013
TOC	Total Organic Carbon	N/A	15,800

Source: USAEC IRDMIS Level 3/E & E, 1994 - Codes following values indicate data useability. (See key above)

Table 12

SUMMARY OF RI AND SI SEDIMENT RESULTS
AOC 26 - ZULU RANGE
(µg/g)

Chemical	Detection Frequency	Range Minimum	Range Maximum	Local Sediment Background Concentration	Frequency of Exceedance of Sediment Background	Local Soil Background Concentration	Frequency of Exceedance of Soil Background
Metals							
Aluminum[a]	23/23	2,400	33,100	10,500	5/23	18,000	1/23
Arsenic	18/23	0.643	26	26	0/23	19	2/23
Barium[a]	23/23	9.3	177	26.2	12/23	54	5/23
Beryllium	8/23	0.153	2.48	0.5	2/23	0.81	1/23
Cadmium	2/23	1.2	2.4	0.5	2/23	1.28	1/23
Calcium	21/23	304	10,600	1,100	8/23	810	11/23
Chromium	8/23	8.38	35.3	15.9	2/23	33	1/23
Cobalt	6/23	2.24	11.4	7.2	1/23	4.69	2/23
Copper	19/23	1.33	43.2	14.3	6/23	13.5	6/23
Iron	23/23	1,070	24,500	7,900	4/23	18,000	2/23
Lead	22/23	3.66	100	12.5	13/23	48	4/23
Magnesium	21/23	257	4,180	3,100	3/23	5,500	0/23
Manganese	23/23	15.56	303	600	0/23	380	0.23
Mercury	1/23	0.094	0.094	0.05	1/23	0.108	0/23
Nickel	8/23	4.89	29.5	18.6	2/23	14.6	2/23

Table 12

SUMMARY OF RI AND SI SEDIMENT RESULTS
AOC 26 - ZULU RANGE
(µg/g)

Chemical	Detection Frequency	Range		Local Sediment Background Concentration	Frequency of Exceedance of Sediment Background	Local Soil Background Concentration	Frequency of Exceedance of Soil Background
		Minimum	Maximum				
Potassium	16/23	190	1,500	292	11/23	2,400	0/23
Selenium	8/23	0.6	4.29	0.13	8/23	0-992	6/23
Sodium	14/23	85.2	1,700	289	7/23	234	10/23
Vanadium	15/23	2.34	31.7	13.3	3/23	32.3	0/23
Zinc	13/23	16.5	80.8	55.6	2/23	43.9	4/23
Explosives							
2,4,6-Trinitrotoluene	1/22	3.71	3.71	-	-	-	-
Cyclonite (RDX)	1/22	10.6	10.6	-	-	-	-
Nitroglycerin	1/22	10.7	10.7	-	-	-	-
Pesticides							
p,p'-DDD	4/23	0.008	0.105	-	-	-	-
p,p'-DDT	2/23	0.016	0.035	-	-	-	-
Semivolatile Organics							
Bis(2-ethylhexyl)-phthalate	3/23	0.482	5.9	-	-	-	-
Diethyl phthalate	1/23	0.765	0.765	-	-	-	-

Table 12

SUMMARY OF RI AND SI SEDIMENT RESULTS
AOC 26 - ZULU RANGE
(µg/g)

Chemical	Detection Frequency	Range		Local Sediment Background Concentration	Frequency of Exceedance of Sediment Background	Local Soil Background Concentration	Frequency of Exceedance of Soil Background
		Minimum	Maximum				
Volatile Organics							
Acetone[a]	3/23	0.12	0.505	-	-	-	-
Ethylbenzene[a]	1/23	0.205	0.205	-	-	-	-
Toluene[a]	4/23	0.012	0.6	-	-	-	-
Trichlorofluoromethane	3/23	0.01	0.052	-	-	-	-
Other Organics							
Total Petroleum Hydrocarbons	6/23	52	397	-	-	-	-

Source: Ecology and Environment, Inc. 1994

[a] Selected as a COPC
[b] Average of field duplicate samples
[c] Elevated above the sediment background value but not above the soil background value; selected as a COPC, but was not carried through the human health risk assessment.
[d] Attributed to sampling or laboratory containment

Table 13

SUMMARY SEDIMENT ANALYTICAL RESULTS
AOC 27 - CRANBERRY POND
(µg/g)

Chemical	Detection Frequency	Range		Local Sediment Background Concentration	Frequency of Exceedance of Sediment Background	Local Soil Background Concentration	Frequency of Exceedance of Soil Background
		Minimum	Maximum				
Metals							
Aluminum[d]	9/9	2,630	18,600	10,500	6/9	18,000	1/9
Antimony[a]	1/9	5.59	5.59	0.5	1/9	0.5	1/9
Arsenic[a]	9/9	4.77	28.8	26	1/9	19	1/9
Barium[a]	5/9	8.01	76.1	26.2	2/9	54	2/9
Beryllium[a]	6/9	0.385	0.750	0.5	2/9	0.81	0/9
Calcium	2/9	192	474	1,100	0/9	810	0/9
Chromium[d]	6/9	5.67	33.6	15.9	2/9	33	1/9
Cobalt[a]	1/9	9.55	9.55	7.2	1/9	4.69	1/9
Copper[a]	9/9	7.36	839	14.3	7/9	13.5	7/9
Iron[a]	9/9	5,060	16,800	7,900	4/9	18,000	0/9
Lead[a]	9/9	27	1,400	12.5	9/9	48	8/9
Magnesium	5/9	925[b]	2,810	3,100	0/9	5,500	0/9
Manganese	9/9	45.7	137	600	0/9	380	0/9
Mercury[a]	1/9	1.08	1.08	0.05	1/9	0.108	1/9
Nickel[a]	9/9	4.7	5.09	18.6	5/9	14.6	6/9
Potassium[a]	1/9	345	345	292	1/9	2,400	0/9
Selenium[a]	1/9	2.6	2.36	0.13	1/9	0.992	1/9

Table 13

SUMMARY SEDIMENT ANALYTICAL RESULTS
AOC 27 - CRANBERRY POND
(µg/g)

Chemical	Detection Frequency	Range Minimum	Range Maximum	Local Sediment Background Concentration	Frequency of Exceedance of Sediment Background	Local Soil Background Concentration	Frequency of Exceedance of Soil Background
Sodium[a]	3/9	170	3.8	289	1/9	234	1/9
Vanadium[a]	9/9	4.85	68.5	13.3	6/9	32.3	1/9
Zinc[a]	9/9	12.6	396	55.6	6/9	43.9	6/9
Explosives							
4-amino-2,6-dinitrotoluene[a]	2/6	1.90[b]	3.45	-	-	-	-
Volatile Organics							
Acetone[a]	2/9	0.81	0.960[b]	-	-	-	-
2-Butanone[a]	2/9	0.145[b]	0.160	-	-	-	-
Tetrachloroethene[a]	1/3	0.002	0.002	-	-	-	-
Semivolatile Organics							
Benzo(b)flouranthane[a]	1/9	0.33	0.33	-	-	-	-
Pyrene[a]	1/9	0.55	0.55	-	-	-	-
Pesticides							
p,p'-DDD[a]	2/9	0.017	0.090	-	-	-	-
p,p'-DDE[a]	2/9	0.017	0.090	-	-	-	-
p,p'-DDT[a]	1/9	0.019	0.019	-	-	-	-
Methoxychlor[a]	1/9	0.088	0.088	-	-	-	-

Table 13

SUMMARY SEDIMENT ANALYTICAL RESULTS
AOC 27 - CRANBERRY POND
(µg/g)

Chemical	Detection Frequency	Range		Local Sediment Background Concentration	Frequency of Exceedance of Sediment Background	Local Soil Background Concentration	Frequency of Exceedance of Soil Background
		Minimum	Maximum				
Other Organic Chemicals							
Total Petroleum Hydrocarbons[a]	8/9	46.4	720[b]	-	-	-	-

Source: Ecology and Environment, Inc. 1994

[a] Selected as a COPC
[b] Average of field duplicate samples
[c] Elevated above the sediment background value, but not above the soil background value
[d] Single exceedance is less than 35% greater than the background value
[e] Concentration believed to be attributable to blank contamination

Table 14

**SUMMARY OF SURFICIAL SOIL ANALYTICAL RESULTS
AOC 25 - EOD RANGE (µg/g)**

Chemical	Detection Frequency	Range: Minimum	Range: Maximum	Local Background Concentration	Frequency of Exceedance of Background
Metals					
Aluminum[a]	1/11	5,170[c]	32,000	18,000	1/11
Antimony[a]	1/11	2.74	2.74	0.5	1/11
Arsenic	11/11	5.39	12.4	19	0/11
Barium[b]	11/11	10.9	65.4	54	1/11
Beryllium[a]	3/11	0.602	1.85	0.81	2/11
Calcium	4/11	123	301	810	0/11
Chromium[b]	10/11	5.49	25.6	33	1/11
Cobalt[a]	8/11	1.87	6.62	4.69	1/11
Copper[a]	11/11	3.55	54.8	13.5	3/11
Iron[a]	11/11	5,550	24,200	18,000	1/11
Lead[b]	11/11	3.26	54	48	1/11
Magnesium	11/11	476	2,360	5,500	0/11
Manganese[a]	11/11	93.5	809	380	2/11
Mercury[a]	2/11	0.082	0.397	0.108	1/11
Nickel[a]	11/11	5.00	20.3	14.6	1/11
Potassium	8/11	194	669	2,400	0/11
Selenium[a]	11/11	0.412	1.74	0.992	2/11
Sodium[b]	11/11	138	252	234	1/11
Vanadium	11/11	5.12	29.1	32.3	0/11
Zinc[a]	11/11	16.1	92.9	43.9	3/11
Explosives					
Nitrocellulose[a]	2/11	25.8	5550	-	-
Nitroglycerin[a]	1/11	7.18	7.18	-	-
Organics					
Total Petroleum Hydrocarbons[a]	7/11	31.1	45.2	-	-

Source: Ecology and Environment, Inc. 1994
[a] Selected as COPC
[b] Single exceedance is less than 25% greater than the background value. This probably reflects natural variability in soil and not site related contamination.
[c] Average of field duplicate samples

Table 15

SUMMARY OF RI SURFICIAL SOIL RESULTS
AOC 26 - ZULU RANGE (µg/g)

Chemical	Detection Frequency	Range		Local Soil Background Concentration	Frequency of Exceedance of Background
		Minimum	Maximum		
Metals					
Aluminum	9/9	5,830	7,780	18,000	0/9
Antimony[a]	1/9	1.19[b]	1.19[b]	0.5	1/9
Arsenic[c]	9/9	7.03	20[b]	19	1/9
Barium	9/9	13	35.5	54	0/9
Beryllium[a]	7/9	0.588	0.945	0.81	2/9
Cadmium[a]	2/9	1.44	1.99	1.28	2/9
Calcium[a]	9/9	146	2520	810	2/9
Chromium	9/9	5.95	10.9	33	0/9
Cobalt	7/9	2.12	4.25	4.69	0/9
Copper[a]	9/9	5.32	30.1	12.5	2/9
Iron	9/9	5,780	10,600	18,000	0/9
Lead[c]	9/9	5.3	89.5[b]	48	1/9
Magnesium	9/9	474	1,400	5,500	0/9
Manganese	9/9	55.7	167	380	0/9
Nickel	9/9	4.25	9.86	14.6	0/9
Potassium	4/9	348	482	2,400	0/9
Selenium	9/9	0.421	0.778	0.992	0/9
Sodium	9/9	164	227	234	0/9
Vanadium	9/9	6.41	10.9	32.3	0/9
Zinc[a]	9/9	18.5	143	43.9	2/9
Explosives					
Cyclonite[a]	3/15[d]	0.654	1.1	-	-
HMX[a]	1/15[d]	1.2	1.2	-	-

Table 15

**SUMMARY OF RI SURFICIAL SOIL RESULTS
AOC 26 - ZULU RANGE (μg/g)**

Chemical	Detection Frequency	Range		Local Soil Background Concentration	Frequency of Exceedance of Background
		Minimum	Maximum		
PCBs					
PCB-1254[a]	1/9	0.161[b]	0.161[b]	-	-
Pesticides					
p,p-DDE[a]	1/9	0.032	0.032	-	-
p,p-DDT[a]	3/9	0.006[b]	0.037	-	-
Acenaphthylene[a]	1/9	0.064	0.064	-	-
Semivolatile Organics					
Anthracene[a]	2/9	0.055[b]	0.065	-	-
Benzo(a)anthracene[a]	1/9	0.29	0.29	-	-
Benzo(a)pyrene[a]	1/9	0.38	0.38	-	-
Benzo(b)fluoranthene[a]	1/9	0.81	0.81	-	-
Benzo(k)fluoranthene[a]	2/9	0.15	0.18	-	-
Chrysene[a]	2/9	0.24	0.5	-	-
Di-n-butyl-phthalate[a]	3/9	0.085	0.145[b]	-	-
Fluoranthene[a]	2/9	0.24	0.29	-	-
Phenanthrene[a]	1/9	0.1	0.1	-	-
Pyrene[a]	2/9	0.13	0.26	-	-
Volatile Organics					
Acetone[a]	1/9	0.029	0.029	-	-
Toluene[a]	1/9	0.001	0.001	-	-
Other Organics					
Total Petroleum Hydrocarbons[a]	4/9	25.1[b]	34.2	-	-

Source: Ecology and Environment, Inc. 1994

[a] Selected as a COPC
[b] Average of field duplicate samples
[c] Single exceedance is less than 25% greater than the background value. This probably reflects natural variability in the soil and not site-related contamination.
[d] Includes six surface soil samples from the SI that were analyzed for explosives only
[e] Attributed to sampling or laboratory contamination

Table 16

SUMMARY OF SI SUBSURFACE SOIL SAMPLES
AOC 26 - ZULU RANGE (µg/g)

Chemical	Detection Frequency	Range Minimum	Range Maximum	Local Soil Background Concentration	Frequency of Exceedance of Background
Metals					
Aluminum	65/66	3,900	18,000	18,000	0/66
Arsenic[b]	64/66	4.3	23	19	1/66
Barium	64/66	4.69	27	54	0/66
Beryllium	36/66	0.097	0.269	0.81	0/66
Cadmium	1/66	0.715	0.715	1.28	0/66
Calcium[a]	64/66	130	1,800	810	10/66
Chromium	48/66	4.5	29.5	33	0/66
Copper[a]	64/66	2.31	41	13.5	7/66
Iron	66/66	260	18,000	18,000	0/66
Lead[a]	58/66	3.14	190	48	4/66
Magnesium[b]	66/66	940	5,900	5,500	1/66
Manganese	66/66	66	370	380	0/66
Mercury	2/66	0.037	0.046	0.108	0/66
Nickel	7/66	3.25	10.3	14.6	0/66
Potassium	66/66	248	1,400	2,400	0/66
Silver[a]	4/66	0.124	0.61	0.086	4/66
Sodium	60/66	55.8	195	234	0/66
Vanadium	66/66	2.32	26.3	32.3	0/66
Zinc[a]	42/66	10.7	220	43.9	3/66
Explosives					
Cyclonite (RDX)[a]	6/66	1.39	38	-	-
HMX[a]	2/66	1.29	3.11	-	-
Tetryl[a]	1/66	2.54	2.54	-	-

Table 16

SUMMARY OF SI SUBSURFACE SOIL SAMPLES
AOC 26 - ZULU RANGE (µg/g)

Chemical	Detection Frequency	Range		Local Soil Background Concentration	Frequency of Exceedance of Background
		Minimum	Maximum		
Pesticides					
Alpha chlordane[a]	1/66	0.005	0.005	-	-
alpha-Benzenehexachloride[a]	1/66	0.05	0.05	-	-
beta-Benzenehexachloride[a]	1/66	0.015	0.015	-	-
Heptachlor[a]	1/66	0.001	0.001	-	-
p,p'-DDT[a]	3/66	0.023	0.173	-	-
Semivolatile Organics					
2,4-Dimethylphenol[a]	1/66	1.06	1.06	-	-
4-Methylphenol[a]	1/66	1.12	1.12	-	-
Anthracene[a]	1/66	0.353	0.353	-	-
Bis(2-ethylhexyl)phthalate[c]	3/66	0.186	0.465	-	-
Di-n-butyl phthalate[c]	2/66	0.495	1.38	-	-
Fluoranthene[a]	2/66	0.251	0.351	-	-
Pyrene[a]	3/66	0.135	0.239	-	-
Volatile Organics					
Toluene[a]	2/66	0.014	0.027	-	-

Source: Ecology and Environment, Inc. 1994

[a] Selected as a COPC
[b] Single exceedance is less than 25% greater than the background value. This probably reflects natural variability in the soil and not site-related contamination.
[c] Attributed to sampling or laboratory contamination

Table 17

SUMMARY OF SOIL BORING ANALYTICAL RESULTS
AOC 27 - HOTEL RANGE
(µg/g)

Chemical	Detection Frequency	Range		Local Background Concentration	Frequency of Exceedance of Background
		Minimum	Maximum		
Metals					
Aluminum[a]	22/22	1,350[b]	20,000	18,000	1/22
Antimony[a]	1/22	2.84	2.84	0.5	1/22
Arsenic[a]	22/22	3.33	24.0	19	2/22
Barium[a]	22/22	7.04[b]	106	54	1/22
Beryllium[a]	9/22	0.584	1.78	0.81	3/22
Calcium[a]	12/22	201	1,770	810	4/22
Chromium[b]	22/22	2.99[b]	38.4	33	2/22
Cobalt[a]	22/22	2.07	60	4.69	15/22
Copper[a]	12/22	12.0	31.4	13.5	10/22
Iron[a]	22/22	2,800[b]	29,600	18,000	2/22
Lead	22/22	1.59[b]	24	48	0/22
Magnesium[a]	20/22	791	6,930	5,500	1/22
Manganese[a]	22/22	55.6[b]	525	380	5/22
Mercury[a]	2/22	0.073	0.163	0.108	1/22
Nickel[a]	22/22	9.69	29.9	14.6	10/22
Potassium[a]	22/22	3.69	5,080	2,400	1/22
Selenium	7/22	0.402	0.956	0.992	0/22
Sodium[a]	11/22	161	360.0	234	2/22
Vanadium[a]	22/22	3.4	41.1	32.3	1/22
Zinc[a]	22/22	7.51	78.2	43.9	5/22
Volatile Organics					
Tetrachloroethene[a]	-	-	-	-	-

Table 17

SUMMARY OF SOIL BORING ANALYTICAL RESULTS
AOC 27 - HOTEL RANGE
(µg/g)

Chemical	Detection Frequency	Range		Local Background Concentration	Frequency of Exceedance of Background
		Minimum	Maximum		
Toluene[a]	-	-	-	-	-
Semivolatile Organics					
Di-n-butylphthalate[a]	1/22	1.4	1.4	-	-
Trichloroflouromethane[a]	3-22	0.008	0.01	-	-
Pesticides					
Endosulfane A[a]	1/22	0.006	0.006	-	-
p,p'-DDD[a]	1/22	0.003	0.003	-	-
p,p'-DDT[a]	1/22	0.007	0.007	-	-
Other Organic Chemicals					
Total Petroleum Hydrocarbons[a]	8/22	29.3	75.6	-	-

Source: Ecology and Environment, Inc. 1994

[a] Selected as COPC
[b] Single exeedance is less than 30% greater than the background value. This probably reflects natural variability in soil and not site related contamination.
[c] Average of field duplicate samples

Table 18

CHEMICALS OF POTENTIAL CONCERN
AOC 25 - EOD RANGE

Chemical	Surface Soils	Subsurface Soils	Groundwater
Metals			
Aluminum	X		X
Antimoty	X		X
Arsenic			X
Barium			X
Beryllium	X	X	X
Calcium			X
Chromium			X
Cobalt	X	X	X
Copper	X	X	X
Iron	X	X	X
Lead			X
Magnesium			X
Manganese	X	X	X
Mercury	X		
Nickel	X	X	X
Potassium			X
Selenium	X		
Sodium			X
Vanadium			X
Zinc	X	X	X
Explosives			
Nitrocellulose	X		
Nitroglycerin	X		
2,4,6-Trinitrotoluene			X
Cyclonite (RDX)			X
PETN			X
HMX			X

Table 18

CHEMICALS OF POTENTIAL CONCERN
AOC 25 - EOD RANGE

Chemical	Surface Soils	Subsurface Soils	Groundwater
Volatile Organics			
Tetrachloroethene	X	X	
Other Organics			
Total petreoluem hydrocarbons	X	X	

Source: Ecology and Environment, Inc. 1994

Note: Groundwater COPC selection is based on unfiltered groundwater data.

Key: X = Selected as a COPC for the human health risk assessment

Table 19

CHEMICALS OF POTENTIAL CONCERN
AOC 26 - ZULU RANGE

Chemical	Surface Soil	Subsurface Soil	Sediment	Surface Water	Groundwater
Metals					
Aluminum			X	X	X
Antimony	X				
Arsenic					X
Barium			X	X	X
Beryllium	X		X		
Cadmium			X		
Calcium	X	X	X		X
Chromium			X		X
Cobalt			X		
Copper	X	X	X		X
Iron			X	X	
Lead	X	X	X	X	X
Magnesium			E		X
Manganese					X
Mercury			E		
Nickel			X		X
Potassium			E		X
Selenium			X		X
Silver		X			
Sodium			X		X
Vanadium			E		X
Zinc	X	X	X		X
Explosives					
4-Amino-2,6-dinitrotoluene					X
1,3-Dinitrotoluene					X
2,6-Dinitrotooluene					X
2-Nitrotoluene					X
3-Nitrotoluene					

Table 19

CHEMICALS OF POTENTIAL CONCERN
AOC 26 - ZULU RANGE

Chemical	Surface Soil	Subsurface Soil	Sediment	Surface Water	Groundwater
2,4,6 Trinitrotoluene			X		
Nitroglycerin			X		X
Cyclonite (RDX)	X	X	X	X	X
HMX	X	X		X	X
Tetryl		X			
PETN					X
Pesticides/PCBs					
PCB 1254	X				
p.p'-DDD			X	X	
p.p'-DDE	X				
p.p'-DDT	X	X	X		
Heptachlor		X			
alpha-Benzene hexachloride		X			
beta-Benzene hexachloride		X			
Semivolatile Organics					
2,4-Dimethylphenol		X			
4-Methylphenol		X			
Acenaphthylene	X				
Anthracene	X	X			
Benzo(a)anthracene	X				
Benzo(a)pyrene	X				
Benzo(b)fluoranthene	X				
Benzo(k)fluoranthene	X				
Fluoranthene	X	X			
Phenanthrene	X				
Pyrene	X	X			
Volatile Organics					
Acetone			X		

Table 19

**CHEMICALS OF POTENTIAL CONCERN
AOC 26 - ZULU RANGE**

Chemical	Surface Soil	Subsurface Soil	Sediment	Surface Water	Groundwater
Ethylbenzene			X		
1,1,2-Trichloroethane				X	
Toluene	X	X	X		
Trichlorofluoromethane			X		
Carbon disulfide					X
Carbon tetrachloride					X
Other Organics					
Total petroleum hydrocarbons	X		X		X
Butyl-carbitol					X
2-Ethyl-1-hexanol					X
Benzothiazole					X
Tetracosane					X

Source: Ecology and Environment, Inc., 1994.

Note: Groundwater COPC selection is based on unfiltered groundwater data.

Key: E = Elevated above sediment background levels but not soil background levels
X = Selected as a COPC for the human health risk assessment.

Table 20

CHEMICALS OF POTENTIAL CONCERN
AOC 27 - HOTEL RANGE

Chemical	Soils	Sediment	Surface Water	Groundwater
Metals				
Aluminum		E		X
Antimony	X	X		X
Arsenic		X		X
Barium	X	X		X
Beryllium	X	E		X
Calcium	X			X
Chromium	X	E		X
Cobalt	X	X		X
Copper	X	X		X
Iron	X	E		X
Lead		X	X	X
Magnesium				X
Manganese	X			X
Mercury	X	X		
Nickel	X	X		X
Potassium	X	E		X
Selenium		X		
Silver				X
Sodium	X	X		X
Vanadium	X	X		X
Zinc	X	X		X
Explosives				
Cyclonite (RDX)				X
1,3-Dinitrobenzene				X
HMX				X

Table 20

**CHEMICALS OF POTENTIAL CONCERN
AOC 27 - HOTEL RANGE**

Chemical	Soils	Sediment	Surface Water	Groundwater
Volatile Organics				
Acetone		X		
2-Butanone		X		
Tetrachloroethene	X	X		
Toluene	X			
Semivolatile Organics				
Benzo(b)fluoranthene		X		
Pyrene		X		
Trichlorofluoromethane	X			
Pesticides				
delta-BHC				X
Endosulfan A	X			
Methoxychlor		X		
p,p'-DDE	X	X		
p,p'-DDT	X	X		
p,p'-DDD		X		
Other Organic Chemicals				
Total petroleum hydrocarbons	X	X		X

Source: Ecology and Environemnt, Inc. 1994

Note: Groundwater COPC selection is based on unfiltered groundwater data

Key: E = Elevated above sediment background levels but not soil background levels.
X = Selected as a COPC for the human health risk assessment.

Table 21

RISK FROM USE OF WELL D-1 GROUNDWATER
AOC 41 - UNAUTHORIZED DUMPING SITE (SITE A)

Analyte	Maximum Concentration Detected (µg/L)	Non-carcinogenic Risks (HI)	Carcinogenic Risks	
			10 Year Exposure Duration	2 Year Exposure Duration
Arsenic	4.56	1.7×10^{-2}	$1.3 \times 10_{-6}$	2.6×10^{-7}
Barium	2.12	3.3×10^{-5}	-	-
Copper	6.73	2.0×10^{-4}	-	-
Manganese	4.02	8.8×10^{-4}	-	-
Zinc	40.5	1.5×10^{-4}	-	-
Bis(2-ethylhexyl)phthalate[1]	53.0	2.9×10^{-3}	1.2×10^{-7}	2.3×10^{-8}
Endosulfane Sulfate	0.26	4.8×10^{-5}		-
Endosulfane, B	0.006	1.1×10^{-6}		-
Chloroform	1.7	1.9×10^{-4}	1.6×10^{-9}	3.2×10^{-10}

Source: ABB 1996.

[1] Bis(2-ethylhexyl)phthalate is thought to result from sampling or laboratory error.

Table 22

SUMMARY OF EXCESS CANCER RISKS ASSOCIATED WITH AOC 25 - EOD RANGE

Pathway	Case	Receptor: Adult	Receptor: Adolescent	Risk Contribution by Exposure Route[a]
Worker Soil Contact	RME	1.2×10^{-6}	-	Soil Ingestion - 76% Dermal Contact - 24% Particle Inhalation - <1%
	Average	3.3×10^{-10}	-	
Trespasser Soil Contact	RME	1.7×10^{-6}	4.2×10^{-6}	Soil Ingestion - 77% Dermal Contact - 22% Particle Inhalation - <1%
	Average	4.8×10^{-6}	1.2×10^{-6}	

Source: Ecology and Environment, Inc. 1994

[a] RME case for receptor showing greatest risk

Table 23

SUMMARY OF ESTIMATED HAZARD INDICES FOR NONCARCINOGENIC EFFECTS ASSOCIATED WITH AOC 25 - EOD RANGE

Pathway	Case	Receptor: Adult	Receptor: Adolescent	Risk Contribution by Exposure Route[a]
Worker Soil Contact[b]	RME	1.1×10^{-3}	-	Soil Ingestion - 71% Dermal Contact - 28% Particle Inhalation - 1%
	Average	3.6×10^{-4}	-	
Trespasser Soil Contact[b]	RME	1.3×10^{-3}	1.3×10^{-3}	Soil Ingestion - 74% Dermal Contact - 23% Particle Inhalation - 3%
	Average	4.2×10^{-4}	4.3×10^{-4}	

Source: Ecology and Environment, Inc. 1994

[a] RME case for receptor showing greatest risk
[b] Hazard indices for the site worker and adolescent trespasser were calculated using subchronic RfDs.

Table 24

SUMMARY OF EXCESS CANCER RISKS ASSOCIATED WITH AOC 26 - ZULU RANGE

Pathway	Case	Receptor		Risk Contribution by Exposure Route[a]
		Adult	Adolescent	
Worker Soil Contact	RME	5.3×10^{-6}	-	Soil Ingestion - 78% Dermal Contact - 21% Particle Inhalation - <1%
	Average	1.5×10^{-6}	-	
Trespasser Soil Contact	RME	5.2×10^{-6}	1.3×10^{-6}	Soil Ingestion - 80% Dermal Contact - 19% Particle Inhalation - <1%
	Average	1.4×10^{-6}	3.5×10^{-8}	
Trespasser Sediment Contact	RME	1.3×10^{-7}	3.1×10^{-6}	Sediment Ingestion - 77% Dermal Contact - 23%
	Average	2.9×10^{-6}	7.0×10^{-8}	
Recreational Fisherman, Fish Consumption	RME	8.9×10^{-6}	$2.0\ 10^{-6}$	Fish Consumption - 100%
	Average	2.1×10^{-6}	5.2×10^{-8}	

Source: Ecology and Environment, Inc. 1994

[a] RME case for receptor showing greatest risk

Table 25

SUMMARY OF ESTIMATED HAZARD INDICES FOR NONCARCINOGENIC EFFECTS ASSOCIATED WITH AOC 26 - ZULU RANGE

Pathway	Case	Receptor		Risk Contribution by Exposure Route[a]
		Adult	Adolescent[b]	
Worker Soil Contact	RME	3.2×10^{-3}	-	Soil Ingestion - 38% Dermal Contact - 62% Particle Inhalation - <1%
	Average	7.5×10^{-4}	-	
Trespasser Soil Contact	RME	1.0×10^{-3}	1.1×10^{-3}	Soil Ingestion - 46% Dermal Contact - 54% Particle Inhalation - <1%
	Average	2.3×10^{-4}	2.5×10^{-4}	
Trespasser Sediment Contact	RME	1.2×10^{-3}	1.4×10^{-3}	Sediment Ingestion - 70% Dermal Contact - 30%
	Average	3.4×10^{-4}	4.0×10^{-4}	
Recreational Fisherman, Fish Consumption	RME	2.3×10^{-3}	$2.9\ 10^{-3}$	Fish Consumption - 100%
	Average	5.9×10^{-4}	7.3×10^{-4}	

Source: Ecology and Environment, Inc. 1994

[a] RME case for receptor showing greatest risk
[b] Hazard indices for the adolescent trespasser were calculated using subchronic RfDs

Table 26

SUMMARY OF EXCESS CANCER RISKS ASSOCIATED WITH AOC 27 - HOTEL RANGE

Pathway	Case	Receptor		Risk Contribution by Exposure Route[a]
		Adult	Adolescent	
Worker Soil Contact	RME	2.9×10^{-6}	-	Soil Ingestion - 71% Dermal Contact - 22% Particle Inhalation - 7%
	Average	2.1×10^{-6}	-	
Trespasser Soil Contact	RME	1.7×10^{-6}	4.1×10^{-6}	Soil Ingestion - 76% Dermal Contact - 22% Particle Inhalation - 2%
	Average	1.2×10^{-6}	3.0×10^{-8}	
Trespasser Sediment Contact	RME	1.2×10^{-7}	2.8×10^{-6}	Sediment Ingestion - 78% Dermal Contact - 22%
	Average	7.7×10^{-8}	1.9×10^{-8}	

Source: Ecology and Environment, Inc. 1994

[a] RME case for receptor showing greatest risk

Table 27

SUMMARY OF ESTIMATED HAZARD INDICES FOR NONCARCINOGENIC EFFECTS ASSOCIATED WITH AOC 27 - HOTEL RANGE

Pathway	Case	Receptor		Risk Contribution by Exposure Route[a]
		Adult	Adolescent	
Worker Soil Contact[b]	RME	1.9×10^{-3}	-	Soil Ingestion - 63% Dermal Contact - 19% Particle Inhalation - 18%
	Average	1.0×10^{-3}	-	
Trespasser Soil Contact[b]	RME	7.7×10^{-4}	7.9×10^{-4}	Soil Ingestion - 76% Dermal Contact - 19% Particle Inhalation - 5%
	Average	4.2×10^{-4}	4.4×10^{-4}	
Trespasser Sediment Contact[b]	RME	5.0×10^{-3}	5.9×10^{-3}	Sediment Ingestion - 59% Dermal Contact - 41%
	Average	7.9×10^{-4}	9.3×10^{-4}	

Source: Ecology and Environment, Inc. 1994

[a] RME case for receptor showing greatest risk
[b] Hazard indices for the site worker and adolescent trespasser were calculated using subchronic RfDs

Table 28

SUMMARY OF HAZARD QUOTIENTS FOR ENDPOINT SPECIES
AVERAGE EXPOSURE CASE
AOC 25 - EOD RANGE

Chemicals	White-footed Mouse			Killdeer			Red Fox		
	EE	TRV	HQ	EE	TRV	HQ	EE	TRV	HQ
Mercury	1.38×10^{-3}	7.0×10^{-2}	1.97×10^{-2}	8.38×10^{-4}	1.6×10^{-2}	5.24×10^{-2}	2.93×10^{-5}	5.0×10^{-3}	5.86×10^{-3}
Zinc	9.95	8×10^{1}	1.24×10^{-1}	5.47×10^{-1}	1.09×10^{2}	5.02×10^{-3}	3.52×10^{-3}	4.0×10^{1}	8.81×10^{-5}
Nitroglycerin	1.79	1.72	1.04	7.43×10^{-3}	NA	NA	1.74×10^{-4}	4.3×10^{-1}	4.04×10^{-4}

Source: Ecology and Environment, Inc. 1994

Key: EE = Estimated exposure (mg/kg-day) HQ = Hazard quotient TRV = Toxicity refernce value (mg/kg-day) NA = Not available

Table 29

SUMMARY OF HAZARD QUOTIENTS FOR ENDPOINT SPECIES
RME CASE
AOC 25 - EOD RANGE

Chemicals	White-footed Mouse			Killdeer			Red Fox		
	EE	TRV	HQ	EE	TRV	HQ	EE	TRV	HQ
Mercury	8.54×10^{-2}	7.0×10^{-2}	1.22	5.2×10^{-3}	1.6×10^{-2}	3.25×10^{-1}	1.82×10^{-4}	5.0×10^{-3}	3.63×10^{-2}
Zinc	2.87×10^{1}	8×10^{1}	3.59×10^{-1}	1.58	1.09×10^{2}	1.45×10^{-2}	1.02×10^{-2}	4.0×10^{1}	2.54×10^{-4}
Nitroglycerin	5.21	1.72	3.03	2.45×10^{-4}	NA	NA	5.06×10^{-4}	4.3×10^{-1}	1.18×10^{-3}

Source: Ecology and Environment, Inc. 1994

Key: EE = Estimated exposure (mg/kg-day) HQ = Hazard quotient TRV = Toxicity refernce value (mg/kg-day) NA = Not available

Table 30

**SUMMARY OF HAZARD QUOTIENTS FOR AQUATIC ENDPOINT SPECIES
AVERAGE EXPOSURE CASE
AOC 26 - ZULU RANGE**

Chemical	Aquatic Invertebrates			Blanding's Turtle			Mink		
	EE	TRV	HQ	EE	TRV	HQ	EE	TRV	HQ
Lead	1.16×10^{1}	8.68	1.34	3.77×10^{-4}	1.50	2.51×10^{-4}	1.17×10^{-1}	6.25	1.88 x 10-2
Zinc	NC	NC	NC	4.01×10^{-4}	1.09×10^{2}	3.68×10^{-6}	3.47	4.00×10^{1}	8.68×10^{-2}
2,4,6 trinitrotoluene	1.80×10^{2}	4.00×10^{1}	4.50	1.94×10^{-4}	NA	NA	1.94×10^{-3}	1.00	1.94×10^{-3}
Cyclonite (RDX)	6.34×10^{2}	2.59×10^{2}	2.45	9.70×10^{-4}	NA	NA	2.28×10^{-2}	5.00	4.56×10^{-3}
HMX	NC	NC	NC	3.69×10^{-5}	NA	NA	1.09×10^{-3}	1.25×10^{1}	8.69×10^{-5}
Nitroglycerin	3.56×10^{2}	8.60×10^{1}	4.14	4.24×10^{-4}	NA	NA	3.75×10^{-3}	4.30×10^{-1}	8.73×10^{-3}
p,p'-DDD	5.00×10^{-6}	6.00×10^{-3}	8.33×10^{-4}	7.68×10^{-5}	1.60×10^{-1}	4.80×10^{-4}	3.37×10^{-4}	1.25×10^{-1}	2.70×10^{-3}
p,p'-DDT	NC	NC	NC	1.39×10^{-4}	1.60×10^{-1}	1.03×10^{-4}	4.80×10^{-6}	1.25×10^{-1}	3.84×10^{-5}

Source: Ecology and Environment, Inc. 1994

Key: EE = Estimated exposure (mg/kg-day) HQ = Hazard quotient TRV = Toxicity refernce value (mg/kg-day)
NA = Not available NC = Not a COPC, therefore, values were not calculated

Table 31

SUMMARY OF HAZARD QUOTIENTS FOR TERRESTRIAL ENDPOINT SPECIES
AVERAGE EXPOSURE CASE
AOC 26 - ZULU RANGE

	Herbaceous Vegetation			White-footed Mouse			Grasshopper Sparrow			Killdeer			Red Fox		
Chemical	**EE**	**TRV**	**HQ**	**EE**	**TRV**	**HQ**	**EE**	**TRV**	**HQ**	**EE**	**TRV**	**HQ**	**EE**	**TRV**	**HQ**
Lead	2.87×10^{1}	1.00×10^{2}	2.87×10^{-1}	2.40×10^{-1}	3.90	6.15×10^{-2}	6.04×10^{-1}	1.50	4.03×10^{-1}	1.02×10^{-1}	1.50	6.8×10^{-2}	3.29×10^{-4}	6.25	5.26×10^{-5}
Zinc	5.07×10^{1}	7.00×10^{1}	7.24×10^{-1}	1.57×10^{1}	8.00×10^{1}	1.96×10^{-1}	1.72×10^{1}	1.09×10^{2}	1.58×10^{-1}	3.44	1.09×10^{-2}	3.1×10^{-2}	2.32×10^{-2}	4.0×10^{1}	5.81×10^{-4}
Cyclonite (RDX)	1.82	NA	NA	1.26	1.18	1.07	1.28	NA	NA	2.37×10^{-1}	NA	NA	4.89×10^{-4}	2.50	1.96×10^{-4}
HMX	4.87×10^{-1}	NA	NA	1.69×10^{-1}	2.50×10^{1}	6.77×10^{-3}	1.76×10^{-1}	NA	NA	3.24×10^{-2}	NA	NA	6.73×10^{-5}	1.25×10^{1}	5.38×10^{-6}
p,p'-DDT	2.05×10^{-2}	NA	NA	1.03×10^{-4}	2.50×10^{1}	4.11×10^{-6}	3.76×10^{-4}	2.90×10^{-1}	1.30×10^{-3}	6.67×10^{-5}	2.90×10^{-1}	2.3×10^{-4}	1.93×10^{-7}	1.25×10^{1}	1.54×10^{-8}

Source: Ecology and Environment, Inc. 1994

Key: EE = Estimated exposure (mg/kg-day) HQ = Hazard quotient TRV = Toxicity refernce value (mg/kg-day)
NA = Not available NC = Not a COPC, therefore, values were not calculated

Table 32

SUMMARY OF HAZARD QUOTIENTS FOR AQUATIC ENDPOINT SPECIES
RME CASE
AOC 26 - ZULU RANGE

Chemical	Aquatic Invertebrates			Blanding's Turtle			Mink		
	EE	TRV	HQ	EE	TRV	HQ	EE	TRV	HQ
Lead	1.06×10^{2}	8.68	1.22×10^{1}	2.85×10^{-1}	1.50	1.90×10^{-1}	8.95×10^{-1}	6.25	1.43×10^{-1}
Zinc	NC	NC	NC	1.74	1.09×10^{2}	1.60×10^{-2}	1.51×10^{1}	4.00×10^{1}	3.77×10^{-1}
2,4,6 trinitrotoluene	1.35×10^{3}	4.00×10^{1}	3.38×10^{1}	1.76×10^{-1}	NA	NA	1.45×10^{-1}	1.00	1.45×10^{-1}
Cyclonit (RDX)	4.89×10^{3}	2.59×10^{2}	1.89×10^{1}	1.09	NA	NA	2.53×10^{-1}	5.00	5.06×10^{-2}
HMX	NC	NC	NC	2.36×10^{-2}	NA	NA	6.94×10^{-3}	1.25×10^{1}	5.55×10^{-4}
Nitroglycerin	1.43×10^{3}	8.60×10^{1}	1.66×10^{1}	1.70×10^{-1}	NA	NA	1.50×10^{-1}	4.30×10^{-1}	3.50×10^{-1}
p,p'-DDD	5.00 x 10-05	6.00×10^{-2}	8.33×10^{-4}	5.31×10^{-4}	1.60×10^{-1}	3.32×10^{-3}	2.33×10^{-3}	1.25×10^{-1}	1.86×10^{-2}
p,p'-DDT	NC	NC	NC	1.39×10^{-4}	1.60×10^{-1}	8.68×10^{-4}	4.05×10^{-4}	1.25×10^{-1}	3.24×10^{-3}

Source: Ecology and Environment, Inc. 1994

Key: EE = Estimated exposure (mg/kg-day) HQ = Hazard quotient TRV = Toxicity refernce value (mg/kg-day)
NA = Not available NC = Not a COPC, therefore, values were not calculated

Table-33

SUMMARY OF HAZARD QUOTIENTS FOR TERRESTRIAL ENDPOINT SPECIES
RME CASE
AOC 26 - ZULU RANGE

Chemical	Herbaceous Vegetation			White-footed Mouse			Grasshopper Sparrow			Killdeer			Red Fox		
	EE	TRV	HQ	EE	TRV	HQ	EE	TRV	HQ	EE	TRV	HQ	EE	TRV	HQ
Lead	1.90×10^{2}	1.00×10^{2}	1.90	1.60	3.90	4.09×10^{-1}	4.00	1.50	2.67	6.78×10^{-1}	1.50	4.52×10^{-1}	2.18×10^{-3}	6.25	3.49×10^{-4}
Zinc	2.20×10^{2}	7.00×10^{1}	3.14	6.80×10^{1}	8.00×10^{1}	8.50×10^{-1}	7.45×10^{1}	1.09×10^{2}	6.84×10^{-1}	1.49×10^{1}	1.09×10^{2}	1.37×10^{-1}	1.01×10^{-1}	4.00×10^{1}	2.52×10^{-3}
Cyclonite (RDX)	3.80×10^{1}	NA	NA	2.63×10^{1}	1.18	2.23×10^{1}	2.68×10^{1}	NA	NA	4.94	NA	NA	1.02×10^{-2}	2.50	4.09×10^{-3}
HMX	3.11	NA	NA	1.08	2.50×10^{1}	4.32×10^{-2}	1.12	NA	NA	2.07×10^{-1}	NA	NA	4.30×10^{-4}	1.25×10^{1}	3.44×10^{-5}
p,p'-DDT	1.73×10^{-1}	NA	NA	8.68×10^{-4}	2.50×10	3.47×10^{-5}	3.17×10^{-3}	2.90×10^{-1}	1.09×10^{-2}	5.63×10^{-4}	2.90×10^{-1}	1.94×10^{-3}	1.63×10^{-4}	1.25×10^{1}	1.30×10^{-5}

Source: Ecology and Environment, Inc. 1994

Key: EE = Estimated exposure (mg/kg-day) HQ = Hazard quotient TRV = Toxicity refernce value (mg/kg-day)
NA = Not available NC = Not a COPC, therefore, values were not calculated

Table 34

SUMMARY OF HAZARD QUOTIENTS FOR AQUATIC ENDPOINT SPECIES
AVERAGE EXPOSURE CASE
AOC 27 - HOTEL RANGE

Chemical	Aquatic Invertebrates			Mallard Duck			Raccoon		
	EE	TRV	HQ	EE	TRV	HQ	EE	TRV	HQ
Antimony	1.01	3.00	3.37×10^{-1}	7.96×10^{-4}	NA	NA	1.61×10^{-3}	2.60	6.21×10^{-4}
Copper	1.05×10^{2}	7.00×10^{1}	1.50	1.45×10^{-1}	1.20×10^{-1}	1.21	4.70×10^{-3}	3.00×10^{-2}	1.57×10^{-1}
Lead (sedim ents)	2.18×10^{3}	3.10×10^{3}	7.03×10^{-1}	4.69×10^{-2}	6.00	7.82×10^{-3}	7.04×10^{-2}	6.25	1.13×10^{-2}
Lead (surfac water)	8.64 (µg/L)	8.68 (µg/L)	9.95×10^{-1}	NC	NC	NC	NC	NC	NC
Mercury	1.97×10^{-1}	6.90×10^{-1}	2.86×10^{-1}	6.09×10^{-4}	6.40×10^{-3}	9.51×10^{-2}	7.78×10^{-4}	1.00×10^{-2}	7.78×10^{-2}
Nickel	2.04×10^{1}	3.50×10^{1}	5.83×10^{-1}	5.64×10^{-3}	3.36×10^{1}	1.68×10^{-4}	1.17×10^{-2}	1.56	7.52×10^{-3}
4-amino-2,6-dinitrotoluene	8.20×10^{1} (µg/L)	4.00×10^{1} (µg/L)	2.05	6.49×10^{-4}	NA	NA	5.81×10^{-4}	6.90	8.41×10^{-5}

Source: Ecology and Environment, Inc. 1994

Key: EE = Estimated exposure (mg/kg-day) HQ = Hazard quotient TRV = Toxicity refernce value (mg/kg-day)
NA = Not available NC = Not a COPC, therefore, values were not calculated

Table 35

SUMMARY OF HAZARD QUOTIENTS FOR AQUATIC ENDPOINT SPECIES
RME CASE
AOC 27 - HOTEL RANGE

Chemical	Aquatic Invertebrates			Mallard Duck			Raccoon		
	EE	TRV	HQ	EE	TRV	HQ	EE	TRV	HQ
Antimony	5.59	3.00	1.86	4.40×10^{-3}	NA	NA	2.17×10^{-3}	2.60	8.35×10^{-4}
Copper	8.39×10^{2}	7.00×10^{1}	1.20×10^{1}	1.16	1.20×10^{-1}	9.66	2.63×10^{-1}	$3.00 \times 10_{-1}$	8.77×10^{-1}
Lead (sediments)	1.40×10^{3}	3.10×10^{2}	4.52	3.02×10^{-1}	6.00	5.03×10^{-2}	4.28×10^{-1}	6.25	6.84×10^{-2}
Lead (surface water)	1.82×10^{1} (µg/L)	8.68×10^{1} (µg/L)	2.10	NC	NC	NC	NC	NC	NC
Mercury	1.08	6.90×10^{-1}	1.57	3.34×10^{-2}	6.40×10^{-1}	5.22×10^{-1}	5.85×10^{-4}	1.00×10^{-2}	5.85×10^{-2}
Nickel	5.09×10^{1}	3.50×10^{1}	1.45	1.41×10^{-2}	3.36×10^{1}	4.20×10^{-4}	1.64×10^{-2}	1.56	1.05×10^{-2}
4-amino-2,6-dinitrotoluene	1.69×10^{2} (µg/L)	4.00×10^{1} (µg/L)	4.23	1.70×10^{-3}	NA	NA	1.07×10^{-3}	6.80	1.58×10^{-4}

Source: Ecology and Environment, Inc. 1994

Key: EE = Estimated exposure (mg/kg-day) HQ = Hazard quotient TRV = Toxicity refernce value (mg/kg-day)
NA = Not available NC = Not a COPC, therefore, values were not calculated

Table 36

SUMMARY OF ANALYTICAL PROGRAM
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

						PARAMETERS														
						OFF-SITE LABORATORY- PAL ANALYSES												FIELD ANALYTICAL		
FIELD EVENT	MATRIX	MEDIUM	EXPLORATION ID	DEPTH	ROUND	VOA	SVOA	P/P	INOR-tot	INOR-dis	TCLP	TPHC	WATER QUAL	TOC	EXP	TSS	C/A	BTEX	CHLOR	TPHC/IR
SI	Water	Surface Water	41D-92-01X			X		X	X			X	X		X					
SI	Water	Surface Water	41D-92-02X			X		X	X			X	X		X					
SI	Soil	Sediment	41D-92-01X			X		X	X			X		X	X					
SI	Soil	Sediment	41D-92-02X			X		X	X			X		X	X					
SI	Water	Sump Water	41D-92-03X		1	X		X	X				X		X	X				
SI	Water	Sump Water	41D-92-04X		1	X		X	X				X		X	X				
SI	Water	Sump Water	41D-92-05X		1	X		X	X				X		X	X				
SI	Water	Sump Water	41D-92-06X		1	X		X	X				X		X	X				
SI	Water	Groundwater	41M-92-01X		1	X	X	X	X			X			X	X	X			
SI	Water	Groundwater	41M-92-01X		2	X	X	X	X	X		X			X	X	X			
SI	Soil	Soil	41M-92-01X	26-28										X						
SI	Soil	Surface Soil	41S-92-01X			X	X	X	X			X			X					
SI	Soil	Surface Soil	41S-92-02X			X	X	X	X			X			X					
SI	Soil	Surface Soil	41S-92-03X			X	X	X	X			X			X					
SI	Soil	Surface Soil	41S-92-04X			X	X	X	X			X			X					
SI	Soil	Surface Soil	41S-92-05X			X	X	X	X			X			X					
SI	Soil	Surface Soil	41S-92-06X			X	X	X	X			X			X					
SI	Soil	Surface Soil	41D-92-03X			X	X	X	X					X		X				
SI	Soil	Surface Soil	41D-92-04X			X	X	X	X					X		X				
SI	Soil	Surface Soil	41D-92-05X			X	X	X	X					X		X				
SI	Soil	Surface Soil	41D-92-06X			X	X	X	X					X		X				
SSI	Soil	Sediment	41D-93-07X			X	X	X	X					X						
SSI	Soil	Sediment	41D-93-08X			X	X	X	X					X						
SSI	Soil	Sediment	41D-93-09X			X	X	X	X					X						
SSI	Soil	Sediment	41D-93-10X			X	X	X	X					X						
SSI	Soil	Sediment	41D-93-11X			X	X	X	X					X						
SSI	Water	Surface Water	41D-93-10X			X	X	X	X				X							
SSI	Water	Surface Water	41D-93-11X			X	X	X	X				X							
SSI	Water	Groundwater	41M-92-01X		3	X	X	X	X	X					X	X				

Table 36

SUMMARY OF ANALYTICAL PROGRAM
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

FIELD EVENT	MATRIX	MEDIUM	EXPLORATION ID	DEPTH	ROUND	PARAMETERS: OFF-SITE LABORATORY- PAL ANALYSES												FIELD ANALYTICAL		
						VOA	SVOA	P/P	INOR-tot	INOR-diss	TCLP	TPHC	WATER QUAL	TOC	EXP	TSS	C/A	BTEX	CHLOR	TPHC/IR
SSI	Water	Groundwater	41M-92-01X		4	X	X	X	X	X					X	X				
SSI	Water	Groundwater	41M-93-02A		3	X	X	X	X	X					X	X				
SSI	Water	Groundwater	41M-93-02A		4	X	X	X	X	X					X	X				
SSI	Water	Groundwater	41M-93-02B		3	X	X	X	X	X					X	X				
SSI	Water	Groundwater	41M-93-02B		4	X	X	X	X	X					X	X				
SSI	Soil	Soil	41M-93-02B	2-4		X	X	X	X						X					
SSI	Soil	Soil	41M-93-02B	4-6		X	X	X	X						X					
SSI	Soil	Soil	41M-93-02B	30-32		X	X	X	X					X	X					
SSI	Water	Groundwater	41M-93-03X		3	X	X	X	X	X					X	X				
SSI	Water	Groundwater	41M-93-03X		4	X	X	X	X	X					X	X				
SSI	Soil	Soil	41M-93-03X	45-47		X	X	X	X					X	X					
SSI	Water	Groundwater	41M-93-04X		3	X	X	X	X	X					X	X				
SSI	Water	Groundwater	41M-93-04X		4	X	X	X	X	X					X	X				
SSI	Soil	Soil	41M-93-04X	5-7										X						
SSI	Water	Groundwater	41M-93-05X		3	X	X	X	X	X					X	X				
SSI	Water	Groundwater	41M-93-05X		4	X	X	X	X	X					X	X				
SSI	Soil	Soil	41M-93-05X	5-7										X						
RI	Water	S_Auger	SA4101	38-43														X	X	
RI	Water	S_Auger	SA4102	41-46														X	X	
RI	Water	S_Auger	SA4103	37-42														X	X	
RI	Water	S_Auger	SA4104	37-42														X	X	
RI	Water	S_Auger	SA4105	40-45														X	X	
RI	Water	S_Auger	SA4106	39-44														X	X	
RI	Water	S_Auger	SA4107	35-40														X	X	
RI	Water	S_Auger	SA4108	19-24														X	X	
RI	Water	S_Auger	SA4109	26-31														X	X	
RI	Water	S_Auger	SA4110	19-24														X	X	
RI	Water	S_Auger	SA4111	36-41														X	X	
RI	Water	S_Auger	SA4112	38-43														X	X	

Table 36

SUMMARY OF ANALYTICAL PROGRAM
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

FIELD EVENT	MATRIX	MEDIUM	EXPLORATION ID	DEPTH	ROUND	PARAMETERS: OFF-SITE LABORATORY- PAL ANALYSES												PARAMETERS: FIELD ANALYTICAL		
						VOA	SVOA	P/P	INOR-tot	INOR-dis	TCLP	TPHC	WATER QUAL	TOC	EXP	TSS	C/A	BTEX	CHLOR	TPHC/IR
RI	Water	S_Auger	SA4113	40-45														X	X	
RI	Water	S_Auger	SA4114	44-49														X	X	
RI	Water	S_Auger	SA4115	25-30														X	X	
RI	Water	S_Auger	SA4116	40-45														X	X	
RI	Water	S_Auger	SA4117	45-50														X	X	
RI	Water	S_Auger	SA4118	24-29														X	X	
RI	Water	S_Auger	SA4119	45-50														X	X	
RI	Water	S_Auger	SA4120	38-43														X	X	
RI	Water	S_Auger	SA4121	19-24														X	X	
RI	Water	S_Auger	SA4122	13-18														X	X	
RI	Water	S_Auger	SA4123	50-55														X	X	
RI	Water	S_Auger	SA4123	55-60														X	X	
RI	Water	S_Auger	SA4123	60-65														X	X	
RI	Water	S_Auger	SA4123	65-70														X	X	
RI	Water	S_Auger	SA4123	70-75														X	X	X
RI	Soil	Soil	41E-94-01X	2		X	X		X		X	X		X				X	X	X
RI	Soil	Soil	41E-94-01X	4		X	X		X		X	X		X				X	X	X
RI	Soil	Soil	41E-94-01X	10		X	X		X		X	X		X				X	X	X
RI	Soil	Soil	41E-94-02X	2		X	X		X		X	X		X				X	X	X
RI	Soil	Soil	41E-94-02X	9		X	X		X		X	X		X				X	X	X
RI	Soil	Soil	41E-94-03X	2		X	X		X		X	X		X				X	X	X
RI	Soil	Soil	41E-94-03X	11		X	X		X		X	X		X				X	X	X
RI	Soil	Soil	41E-94-04X	1		X	X		X		X	X		X				X	X	X
RI	Soil	Soil	41E-94-04X	3		X	X		X		X	X		X				X	X	X
RI	Soil	Soil	41E-94-05X	3		X	X		X		X	X		X				X	X	X
RI	Soil	Soil	41E-94-05X	5		X	X		X		X	X		X				X	X	X
RI	Soil	Soil	41E-94-05X	10		X	X		X		X	X		X				X	X	X
RI	Soil	Soil	41E-94-06X	3		X	X		X			X		X						
RI	Soil	Soil	41E-94-06X	9		X	X		X			X		X						

Table 36

SUMMARY OF ANALYTICAL PROGRAM
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

						PARAMETERS														
						OFF-SITE LABORATORY- PAL ANALYSES												FIELD ANALYTICAL		
FIELD EVENT	MATRIX	MEDIUM	EXPLORATION ID	DEPTH	ROUND	VOA	SVOA	P/P	INOR-tot	INOR-dis	TCLP	TPHC	WATER QUAL	TOC	EXP	TSS	C/A	BTEX	CHLOR	TPHC/IR
RI	Soil	Soil	41E-94-07X	4		X	X		X			X		X						
RI	Soil	Soil	41E-94-07X	10		X	X		X			X		X						
RI	Soil	Soil	41E-94-08X	4		X	X		X			X		X						
RI	Soil	Soil	41E-94-08X	10		X	X		X			X		X						
RI	Soil	Soil	41E-94-08X	12		X	X		X			X		X						
RI	Soil	Soil	41E-94-09X	4		X	X		X			X		X						
RI	Soil	Soil	41E-94-09X	9		X	X		X			X		X						
RI	Water	Groundwater	41M-92-01X		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-92-01X		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-93-02A		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-93-02A		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-93-02B		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-93-02B		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-93-02C		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-93-02C		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-93-03X		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-93-03X		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-93-04X		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-93-04X		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-93-05X		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-93-05X		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-03B		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-03B		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-06X		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-06X		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-07X		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-07X		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-08A		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-08A		6	X	X		X	X			X			X				

Table 36

SUMMARY OF ANALYTICAL PROGRAM
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

						PARAMETERS														
						OFF-SITE LABORATORY- PAL ANALYSES												FIELD ANALYTICAL		
FIELD EVENT	MATRIX	MEDIUM	EXPLORATION ID	DEPTH	ROUND	VOA	SVOA	P/P	INOR-tot	INOR-diss	TCLP	TPHC	WATER QUAL	TOC	EXP	TSS	C/A	BTEX	CHLOR	TPHC/IR
RI	Water	Groundwater	41M-94-08B		5	X	X		X	X			X							
RI	Water	Groundwater	41M-94-08B		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-09A		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-09A		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-09B		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-09B		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-10X		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-10X		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-11X		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-11X		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-12X		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-12X		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-13X		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-13X		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-14X		5	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-14X		6	X	X		X	X			X			X				
RI	Water	Groundwater	41M-94-01X															X	X	X
RI	Water	Groundwater	41M-94-02A															X	X	X
RI	Water	Groundwater	41M-94-02B															X	X	X
RI	Water	Groundwater	41M-94-03X															X	X	X
RI	Water	Groundwater	41M-94-04X															X	X	X
RI	Water	Groundwater	41M-94-05X															X	X	X
RI	Gas	T_Probe	TS-01	5-7															X*	
RI	Gas	T_Probe	TS-01	7-9															X*	
RI	Gas	T_Probe	TS-01	9-11															X*	
RI	Gas	T_Probe	TS-01	11-13															X*	
RI	Gas	T_Probe	TS-01	13-15															X*	
RI	Gas	T_Probe	TS-01	19-21															X*	
RI	Gas	T_Probe	TS-02	5-7															X*	

Table 36

SUMMARY OF ANALYTICAL PROGRAM
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

						PARAMETERS														
						OFF-SITE LABORATORY- PAL ANALYSES												FIELD ANALYTICAL		
FIELD EVENT	MATRIX	MEDIUM	EXPLORATION ID	DEPTH	ROUND	VOA	SVOA	P/P	INOR-tot	INOR-dis	TCLP	TPHC	WATER QUAL	TOC	EXP	TSS	C/A	BTEX	CHLOR	TPHC/IR
RI	Gas	T_Probe	TS-03	5-7															X*	
RI	Gas	T_Probe	TS-04	5-7															X*	
RI	Gas	T_Probe	TS-04	10-12															X*	
RI	Gas	T_Probe	TS-04	15-17															X*	
RI	Gas	T_Probe	TS-04	20-22															X*	
RI	Gas	T_Probe	TS-05	5-7															X*	
RI	Gas	T_Probe	TS-06	5-7															X*	
RI	Gas	T_Probe	TS-07	5-7															X*	
RI	Gas	T_Probe	TS-08	5-7															X*	
RI	Gas	T_Probe	TS-09	5-7															X*	
RI	Gas	T_Probe	TS-10	5-7															X*	
RI	Gas	T_Probe	TS-11	5-7															X*	
RI	Gas	T_Probe	TS-12	5-7															X*	
RI	Gas	T_Probe	TS-13	5-7															X*	
RI	Gas	T_Probe	TS-13	5-7															X*	
RI	Soil	T_Probe	TS-01	18-20															X*	
RI	Soil	T_Probe	TS-01	23-25															X*	
RI	Soil	T_Probe	TS-01	30-32															X*	
RI	Soil	T_Probe	TS-01	35-37															X*	
RI	Soil	T_Probe	TS-02	30-32															X*	
RI	Soil	T_Probe	TS-02	35-37															X*	
RI	Soil	T_Probe	TS-03	30-32															X*	
RI	Soil	T_Probe	TS-03	35-37															X*	
RI	Soil	T_Probe	TS-04	18-20															X*	
RI	Soil	T_Probe	TS-04	23-25															X*	
RI	Soil	T_Probe	TS-04	30-32															X*	
RI	Soil	T_Probe	TS-04	35-37															X*	
RI	Soil	T_Probe	TS-05	30-32															X*	
RI	Soil	T_Probe	TS-05	-2															X*	

Table 36

SUMMARY OF ANALYTICAL PROGRAM
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

						PARAMETERS														
						OFF-SITE LABORATORY- PAL ANALYSES												FIELD ANALYTICAL		
FIELD EVENT	MATRIX	MEDIUM	EXPLORATION ID	DEPTH	ROUND	VOA	SVOA	P/P	INOR-tot	INOR-diss	TCLP	TPHC	WATER QUAL	TOC	EXP	TSS	C/A	BTEX	CHLOR	TPHC/IR
RI	Soil	T_Probe	TS-06	-2															X*	
RI	Soil	T_Probe	TS-06	-2															X*	
RI	Soil	T_Probe	TS-07	-2															X*	
RI	Soil	T_Probe	TS-07	-2															X*	
RI	Soil	T_Probe	TS-10	-2															X*	
RI	Soil	T_Probe	TS-10	-2															X*	
RI	Soil	T_Probe	TS-11	-2															X*	
RI	Soil	T_Probe	TS-11	-2															X*	
RI	Soil	T_Probe	TS-12	-2															X*	
RI	Soil	T_Probe	TS-12	-2															X*	
RI	Soil	T_Probe	TS-14	-2															X*	
RI	Soil	T_Probe	TS-14	-2															X*	
RI	Soil	T_Probe	TS-15	-2															X*	
RI	Soil	T_Probe	TS-15	-2															X*	
RI	Soil	T_Probe	TS-16	-2															X*	
RI	Soil	T_Probe	TS-16	-2															X*	
RI	Soil	S.Boring	41M-94-03B	-2														X	X	
RI	Soil	S.Boring	41M-94-03B	-2														X	X	
RI	Soil	S.Boring	41M-94-03B	-2														X	X	
RI	Soil	S.Boring	41M-94-03B	-2														X	X	
RI	Soil	S.Boring	41M-94-03B	-2														X	X	
RI	Soil	S.Boring	41M-94-03B	-2														X	X	
RI	Soil	S.Boring	41M-94-03B	-2														X	X	
RI	Soil	S.Boring	41M-94-03B	-2														X	X	
RI	Soil	S.Boring	41M-94-03B	-2														X	X	
RI	Soil	S.Boring	41M-94-03B	-2														X	X	
RI	Soil	S.Boring	41M-94-03B	-2														X	X	
RI	Soil	S.Boring	41M-94-03B	-2														X	X	
RI	Soil	S.Boring	41M-94-03B	-2														X	X	

Table 36

SUMMARY OF ANALYTICAL PROGRAM
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

						PARAMETERS														
						OFF-SITE LABORATORY- PAL ANALYSES												FIELD ANALYTICAL		
FIELD EVENT	MATRIX	MEDIUM	EXPLORATION ID	DEPTH	ROUND	VOA	SVOA	P/P	INOR-tot	INOR-diss	TCLP	TPHC	WATER QUAL	TOC	EXP	TSS	C/A	BTEX	CHLOR	TPHC/IR
RI	Soil	S.Boring	41M-94-07X	-2										X						
RI	Soil	S.Boring	41M-94-08A	-2										X						
RI	Soil	S.Boring	41M-94-08B	-2										X						
RI	Soil	S.Boring	41M-94-09A	-2										X						
RI	Soil	S.Boring	41M-94-09B	-2										X						
RI	Soil	S.Boring	41M-94-10X	-2										X						
RI	Soil	S.Boring	41M-94-11X	-2										X						
RI	Soil	S.Boring	41M-94-12X	-2										X						
RI	Soil	S.Boring	41M-94-13X	-1										X						
RI	Soil	S.Boring	41M-94-14X	-2										X						

Source: ABB Environmental Services, Inc. 1996

Notes:

VOA = Volatile Organic Analysis
SVOA = SemiVolatile Organic Analysis
P/P = Pesticide/PCBs
Inorg. = Inorganics
TOC = Total Organic Carbon
EX = Explosives
TSS = Total Suspended Solids
TDS = Total Dissolved Solids
TPHC=Total Petrolium Hydrocarbons
WATER QUAL=Sulfate, Alkalinity, Phosphate, Nitrite as Nitrogen,Total Kjeldhal Nitrogen
BTEX=Benzene,Toluene,ethylbenzene,M/P/O-Xylenes
CHLOR=Chlorinated VOCs
TCLP= Toxicity Characteristics Leachate Procedure
TPHC/IR=Total Petrolium Hydrocarbons by Infared Spectrophotometry
X*=The chlorinated VOCs t-1,2-DCA, c-1,2-DCA, TCE only

Table 37

SOIL GAS FIELD ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

Location ID	Sample Depth	RL (ppb)	t-1,2-DCE (ppb)	c-1,2-DCE (ppb)	TCE (ppb)	Date Analyzed	Comments
TS-01	5	1	<1.0	<1.0	3.9	03/30/95	Soil Vapor
TS-01	7	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-01	9	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-01	11	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-01	13	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-01	19	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-02	5	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-03	5	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-04	5	1	<1.0	<1.0	3.6	03/30/95	Soil Vapor
TS-04	10	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-04	15	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-04	20	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-05	5	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-06	5	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-07	5	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-08	5	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-09	5	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-10	5	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-11	5	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-12	5	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-13	5	1	<1.0	<1.0	<1.0	03/30/95	Soil Vapor
TS-13	5	1	<1.0	<1.0	<1.0	03/31/95	Soil Vapor

Source: ABB Environmental Services, Inc. 1996

Note:

All samples analyzed with a dilution factor of one.
Volatiles analyzed by Modified USEPA Method 8015, Solids Extraction Direct Injection (PID).
RL = Reporting limit.
ppb = parts per billion.

Table 38

TERRAPROBE SOIL FIELD ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

Location ID	Sample Depth	RL (ppb)	t-1,2-DCE (ppb)	c-1,2-DCE (ppb)	TCE (ppb)	Date Analyzed	Comments
TS-01	18	1	<1.4	<1.4	<1.4	04/03/95	Soil
TS-01	23	1	<1.3	<1.3	<1.3	04/03/95	Soil
TS-01	30	1	<1.3	<1.3	51	03/30/95	Soil
TS-01	35	1	<1.3	<1.3	67	03/30/95	Soil
TS-02	30	1	<1.2	<1.2	6.4	03/31/95	Soil
TS-02	35	1	<1.2	<1.2	1.7	03/31/95	Soil
TS-03	30	1	2.2	<1.3	1.4	04/04/95	Soil
TS-03	35	1	<1.3	<1.3	<1.3	04/04/95	Soil
TS-04	18	1	<1.4	<1.4	<1.4	04/03/95	Soil
TS-04	23	1	<1.2	<1.2	<1.2	04/03/95	Soil
TS-04	30	1	<1.3	<1.3	180	03/30/95	Soil
TS-04	35	1	<1.3	<1.3	64	03/30/95	Soil
TS-05	30	1	2.2	<1.2	49	03/31/95	Soil
TS-05	35	1	<1.2	<1.2	23	03/31/95	Soil
TS-06	30	1	<1.4	<1.4	<1.4	03/31/95	Soil
TS-06	35	1	<1.2	<1.2	<1.2	03/31/95	Soil
TS-07	30	1	<1.0	<1.0	<1.0	03/31/95	Soil
TS-07	35	1	<1.2	<1.2	23	03/31/95	Soil
TS-10	30	1	<1.3	<1.3	<1.3	04/04/95	Soil
TS-10	35	1	<1.3	<1.3	<1.3	04/04/95	Soil
TS-11	30	1	<1.4	<1.4	<1.4	04/04/95	Soil
TS-11	35	1	4.3	<1.6	4.2	04/04/95	Soil
TS-12	30	1	2.6	<1.3	22	03/31/95	Soil
TS-12	35	1	<1.2	<1.2	78	03/31/95	Soil
TS-14	30	1	<1.4	<1.4	<1.4	04/03/95	Soil
TS-14	35	1	<1.2	<1.2	7.5	04/03/95	Soil
TS-15	30	1	9.1	<1.2	110	04/03/95	Soil
TS-15	35	1	3.4	<1.3	77	04/03/95	Soil

Table 38

TERRAPROBE SOIL FIELD ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

Location ID	Sample Depth	RL (ppb)	t-1,2-DCE (ppb)	c-1,2-DCE (ppb)	TCE (ppb)	Date Analyzed	Comments
TS-16	30	1	4.5	<1.3	34	04/04/95	Soil
TS-16	30	1	1.5	<1.0	46	04/04/95	Soil

Source: ABB Environmental Services, Inc. 1996

Note:

All samples analyzed with a dilution factor of one.
Volatiles analyzed by Modified USEPA Method 8015, Solids Extraction Direct Injection (PID).
RL = Reporting limit.
ppb = parts per billion.

Table 39

TEST PIT SAMPLE FIELD ANALTYCAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

Analyte (µg/L)	41E-94-01X 02FT TP40102F	41E-94-01X 04 FT TP40104F	41E-94-01X 10 FT TP40110F	41E-94-02X 02 FT TP40202F	41E-94-02X 09 FT TP40209F	41E-94-03X 02 FT TP40302F	41E-94-03X 11 FT TP40311F	41E-94-04X 1 FT TP40401F	41E-94-04X 3 FT TP40403F	41E-94-05X 3 FT TP40503F	41E-94-05X 5 FT TP40505F	41E-94-05X 10 FT TP40510F
Vinyl chloride	<4.4	<4.8	<5.4	<4.4	<5.6	<5.1	<5.7	<6.1	<4.3	<4.9	<4.2	<5.0
t-1,2-DCE	<2.2	<2.4	<2.7	<2.2	<2.8	<2.5	<2.9	<3.0	<2.1	<2.4	<2.1	<2.5
c-1,2-DCE	<2.2	<2.4	<2.7	<2.2	<2.8	<2.5	<2.9	<3.0	<2.1	<2.4	<2.1	<2.5
Benzene	<2.2	<2.4	<2.7	<2.2	<2.8	<2.5	<2.9	<3.0	<2.1	<2.4	<2.1	<2.5
Trichloroethene	<2.2	<2.4	<2.7	<2.2	<2.8	<2.5	<2.9	<3.0	<2.1	<2.4	<2.1	<2.5
Toluene	<2.2	<2.4	<2.7	<2.2	<2.8	<2.5	<2.9	<3.0	<2.1	<2.4	<2.1	<2.5
Tetrachloroethene	<2.2	<2.4	<2.7	<2.2	<2.8	<2.5	<2.9	<3.0	<2.1	<2.4	<2.1	<2.5
Ethybenzene	<2.2	<2.4	<2.7	<2.2	<2.8	<2.5	<2.9	<3.0	<2.1	<2.4	<2.1	<2.5
m/p-xylene	<4.4	<4.8	<5.4	<4.4	<5.6	<5.1	<5.7	<6.1	<4.3	<4.9	<4.2	<5.0
o-xylene	<2.2	<2.4	<2.7	<2.2	<2.8	<2.5	<2.9	<3.0	<2.1	<2.4	<2.1	<2.5
1,1,2,2-TCA	<4.4	<4.8	<5.4	<4.4	<5.6	<5.1	<5.7	<6.1	<4.3	<4.9	<4.2	<5.0
1,2-dichlorobenzene	<2.2	<2.4	<2.7	<2.2	<2.8	<2.5	<2.9	<3.0	<2.1	<2.4	<2.1	<2.5

Table 40

SOIL BORING FIELD ANALYTCAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

Analyte (µg/L)	41M94-03B 02 FT SB40302F	41M-94-03B 7 FT SB40307F	41M-94-03B 12 FT SB40312F	41M-94-03B 17 FT SB40317F	41M-94-03B 22 FT SB40322F	41M-94-03B 27 FT SB40327F	41M-94-03B 32 FT SB40332F
Vinyl chloride	<4.2	<4.1	<4.3	<5.6	<69.2	<5.0	<5.2
t-1,2-DCE	<2.1	<2.1	<2.1	<2.8	<3.1	<2.5	<2.6
c-1,2-DCE	<2.1	<2.1	<2.1	<2.8	<3.1	<2.5	<2.6
Benzene	<2.1	<2.1	<2.1	<2.8	<3.1	<2.5	<2.6
Trichloroethene	<2.1	<2.1	<2.1	<2.8	<3.1	<2.5	4.6
Toluene	<2.1	<2.1	<2.1	<2.8	<3.1	<2.5	<2.6
Tetrachloroethene	<2.1	<2.1	<2.1	<2.8	<3.1	<2.5	<2.6
Ethybenzene	<2.1	<2.1	<2.1	<2.8	<3.1	<2.5	<2.6
m/p-xylene	<4.2	<4.1	<4.3	<5.6	<69.2	<5.0	<5.2
o-xylene	<2.1	<2.1	<2.1	<2.8	<3.1	<2.5	<2.6
1,1,2,2-TCA	<4.2	<4.1	<4.3	<5.6	<69.2	<5.0	<5.2
1,2-dichlorobenzene	<2.1	<2.1	<2.1	<2.8	<3.1	<2.5	<2.6

Table 40 (continued)

SOIL BORING FIELD ANALTYCAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

Analyte (µg/L)	41M-94-03B 37 FT SB40337F	41M-94-03B 42 FT SB40324F	41M94-03B 47 FT SB40347F	41M-94-03B 52 FT SB40352F	41M-94-03B 57 FT SB40357F	41M-94-03B 62 FT SB40362F	41M-94-03B 67 FT SB40367F
Vinyl chloride	<5.0	<5.1	<5.4	<5.1	<5.0	<5.1	<5.1
t-1,2-DCE	<2.5	<2.5	<2.7	<2.5	<2.5	<2.6	<2.6
c-1,2-DCE	<2.5	<2.5	<2.7	<2.5	<2.5	<2.6	<2.6
Benzene	<2.5	<2.5	<2.7	<2.5	<2.5	<2.6	<2.6
Trichloroethene	5.3	8.6	<2.7	<2.5	<2.5	<2.6	<2.6
Toluene	<2.5	<2.5	<2.7	<2.5	<2.5	<2.6	<2.6
Tetrachloroethene	<2.5	<2.5	<2.7	<2.5	<2.5	<2.6	<2.6
Ethybenzene	<2.5	<2.5	<2.7	<2.5	<2.5	<2.6	<2.6
m/p-xylene	<5.0	<5.1	<5.4	<5.1	<5.0	<5.1	<5.1
o-xylene	<2.5	<2.5	<2.7	<2.5	<2.5	<2.6	<2.6
1,1,2,2-TCA	<5.0	<5.1	<5.4	<5.1	<5.0	<5.1	<5.1
1,2-dichlorobenzene	<2.5	<2.5	<2.7	<2.5	<2.5	<2.6	<2.6

Table 41

SOIL BORING OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

SITE ID: DEPTH: Field Sample Number:	FORT DEVENS BACKGROUND CONCENTRATIONS	41E-94-01X 2 ft EX410101	41E-94-01X 2 ft EX410101	41E-94-01X 4 ft EX410103	41E-94-01X 4 ft EX410103	41E-94-01X 10 ft EX410109	41E-94-01X 10 ft EX410109	41E-94-02X 2 ft EX410201
Aluminum	18000	6690	NA	3910	NA	19300	NA	NA
Arsenic	19	8.83	<2.54 I	5.24	<2.54 I	13.5	<2.54 I	<2.54 I
Barium	54	7.94	245	11.4	302	70.3	542	277
Beryllium	0.81	<.5	NA	<.5	NA	0.943	NA	NA
Calcium	810	259	NA	166	NA	552	NA	NA
Chromium	33	8.43	<6.02	5.88	<6.02	28.8	<6.02	<6.02
Cobalt	4.7	3.07	NA	2.31	NA	10.4	NA	NA
Copper	13.5	6.9	NA	5.81	NA	19	NA	NA
Iron	18000	7990	NA	5840	NA	23500	NA	NA
Lead	48	4.2	<18.6	2.88	<18.6	12.1	<18.6	<18.6
Magnesium	5500	1390	NA	1250	NA	5630	NA	NA
Manganese	380	81.1	NA	104	NA	412	NA	NA
Nickel	14.6	9.03	NA	6.19	NA	26.6	NA	NA
Potassium	2400	351	NA	555	NA	2830	NA	NA
Sodium	234	314	NA	300	NA	513	NA	NA
Vanadium	32.3	7.8	NA	6.5	NA	29.2	NA	NA
Zinc	43.9	17.4	NA	14.7	NA	56.2	NA	NA
PAL SEMIVOLATILE ORGANICS (µg/g)								
Acenaphthylene		<.033	NA	<.033	NA	<.033	NA	NA
Benzo[b]Fluoranthene		<.21	NA	<.21	NA	<.21	NA	NA
Benzo[k]Fluoranthene		<.066	NA	<.066	NA	<.066	NA	NA
*Bis (2-ethylhexyl) Phthalate		<.62	NA	<.62	NA	<.62	NA	NA
Chrysene		<.12	NA	<.12	NA	<.12	NA	NA
*Di-n-butyl Phthalate		<.061	NA	<.061	NA	<.061	NA	NA
Fluoranthene		<.068	NA	<.068	NA	<.068	NA	NA
Phenanthrene		<.033	NA	<.033	NA	<.033	NA	NA
Pyrene		<.033	NA	<.033	NA	<.033	NA	NA
PAL VOLATILE ORGANICS (µg/g)								
1,1,2,2-tetrachloroethane		<.0024	NA	<.0024	NA	<.0024	NA	NA
*Acetone		<.017	NA	<.017	NA	<.017	NA	NA
*Methylene Chloride		<.012	NA	<.012	NA	<.012	NA	NA
Toluene		<.00078	NA	<.00078	NA	<.00078	NA	NA
*Trichlorofluoromethane		0.016*	NA	0.017*	NA	0.0084*	NA	NA
OTHER (µg/g)								
Total Organic Carbon		2870	NA	1110	NA	3730	NA	NA
Total Petroleum Hydrocarbons		<28.2	NA	<28.1	NA	<28.1	NA	NA

Table 41

SOIL BORING OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

SITE ID:	FORT DEVENS	41E-94-02X	41E-94-02X	41E-94-02X	41E-94-03X	41E-94-03X	41E-94-03X	41E-94-04X
DEPTH:	BACKGROUND	2 ft	9 ft	9 ft	2 ft	11 ft	11 ft	1 ft
Field Sample Number:	CONCENTRATIONS	EX410201	EX410209	EX410209	EX410301	EX410310	EX410310	EX410400
Aluminum	18000	2360	8430	NA	31400	NA	28600	8240
Arsenic	19	4.68	15	5.12 I	12.9	2.54 I	17	6.41
Barium	54	<5.18	30.7	347	92.2	506	132	20.1
Beryllium	0.81	<.5	<.5	NA	1.76	NA	1.68	0.777
Calcium	810	318	1930	NA	459	NA	2010	305
Chromium	33	<4.05	18.1	<6.02	35.4	<6.02	48.3	8.19
Cobalt	4.7	1.96	6.5	NA	9.33	NA	22.9	8.24
Copper	13.5	5.24	14.5	NA	20.4	NA	25.4	8.3
Iron	18000	3770	15100	NA	30400	NA	35300	37700
Lead	48	2.09	6.5	<18.6	11	<18.6	11.3	11.1
Magnesium	5500	633	3490	NA	6640	NA	8720	1000
Manganese	380	70.3	276	NA	280	NA	625	335
Nickel	14.6	4.97	19.5	NA	25.7	NA	38.8	7.05
Potassium	2400	338	1300	NA	4410	NA	6670	372
Sodium	234	344	505	NA	532	NA	691	446
Vanadium	32.3	<3.39	15	NA	48.4	NA	56.5	11.9
Zinc	43.9	<8.03	34.9	NA	65.9	NA	90.8	21.5
PAL SEMIVOLATILE ORGANICS (µg/g)								
Acenaphthylene		<.033	<.033	NA	<.033	NA	<.033	<.033
Benzo[b]Fluoranthene		<.21	<.21	NA	<.21	NA	<.21	<.21
Benzo[k]Fluoranthene		<.066	<.066	NA	<.066	NA	<.066	<.066
*Bis (2-ethylhexyl) Phthalate		<.62	<.62	NA	<.62	NA	<.62	<.62
Chrysene		<.12	<.12	NA	<.12	NA	<.12	<.12
*Di-n-butyl Phthalate		<.061	<.061	NA	<.061	NA	<.061	<.061
Fluoranthene		<.068	<.068	NA	<.068	NA	<.068	0.48
Phenanthrene		<.033	<.033	NA	<.033	NA	<.033	0.36
Pyrene		<.033	<.033	NA	<.033	NA	<.033	0.44
PAL VOLATILE ORGANICS (µg/g)								
1,1,2,2-tetrachloroethane		<.0024	<.0024	NA	<.0024	NA	<.0024	<.0024
*Acetone		<.017	<.017	NA	<.017	NA	<.017	<.017
*Methylene Chloride		<.012	<.012	NA	<.012	NA	<.012	<.012
Toluene		<.00078	<.00078	NA	<.00078	NA	.0012*	<.00078
*Trichlorofluoromethane		0.0059*	0.011*	NA	0.0059*	NA	0.013 B*	<.0059
OTHER (µg/g)								
Total Organic Carbon		1330	1970	NA	3720	NA	3020	11600
Total Petroleum Hydrocarbons		<28.5	<28.3	NA	<28.1	NA	<28.3	47.9

Table 41

SOIL BORING OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

SITE ID:	FORT DEVENS	41E-94-04X	41E-94-04X	41E-94-04X	41E-94-04X	41E-94-05X	41E-94-05X	41E-94-05X
DEPTH:	BACKGROUND	1 ft	1 ft	3 ft	3 ft	3 ft	3 ft	3 ft
Field Sample Number:	CONCENTRATIONS	EX410400	ED410400	EX410402	EX410402	EX410502	ED410402	EX410502
Aluminum	18000	NA	NA	4410	NA	3400	4190 D	NA
Arsenic	19	2.54 I	< 2.45	6.33	< 2.45	5.5	5 D	< 2.45
Barium	54	260	285 D	7.88	277	14.4	12.1 D	252
Beryllium	0.81	NA	NA	<.5	NA	<.5	<.5 D	NA
Calcium	810	NA	NA	263	NA	204	370 D	NA
Chromium	33	<6.02	<6.02 D	6	<6.02	5.05	<4.05 D	<6.02
Cobalt	4.7	NA	NA	2.25	NA	<1.42	1.69 D	NA
Copper	13.5	NA	NA	5.87	NA	8.9	6.31 D	NA
Iron	18000	NA	NA	6750	NA	4710	4730 D	NA
Lead	48	<18.6	<18.6 D	1.81	<18.6	43	18 D	45.9
Magnesium	5500	NA	NA	1160	NA	616	752 D	NA
Manganese	380	NA	NA	86	NA	75.3	90 D	NA
Nickel	14.6	NA	NA	6.49	NA	3.93	4.16 D	NA
Potassium	2400	NA	NA	372	NA	380	477 D	NA
Sodium	234	NA	NA	326	NA	344	310 D	NA
Vanadium	32.3	NA	NA	6.56	NA	7.77	9.24 D	NA
Zinc	43.9	NA	NA	13.8	NA	95.8	40.4 D	NA
PAL SEMIVOLATILE ORGANICS (µg/g)								
Acenaphthylene		<.033 D	NA	<.033	NA	0.048	<.033 D	NA
Benzo[b]Fluoranthene		<.21 D	NA	<.21	NA	0.3	<.21 D	NA
Benzo[k]Fluoranthene		<.066 D	NA	<.066	NA	0.2	.12 D	NA
*Bis (2-ethylhexyl) Phthalate		<.62 D	NA	<.62	NA	<.62	<.62 D	NA
Chrysene		<.12 D	NA	<.12	NA	0.24	.16 D	NA
*Di-n-butyl Phthalate		<.061 D	NA	<.061	NA	<.061	<.061 D	NA
Fluoranthene		0.38 D	NA	<.068	NA	0.26	.19 D	NA
Phenanthrene		0.17 D	NA	<.033	NA	0.066	.044 D	NA
Pyrene		0.37 D	NA	<.033	NA	0.28	.16 D	NA
PAL VOLATILE ORGANICS (µg/g)								
1,1,2,2-tetrachloroethane		<.0024 D	NA	<.0024	NA	<.0024	.065 D	NA
*Acetone		<.017 D	NA	<.017	NA	<.017	.1 D*	NA
*Methylene Chloride		<.012 D	NA	<.012	NA	<.012	.052 D*	NA
Toluene		<.00078 D	NA	<.00078	NA	0.0017*	.023 D*	NA
*Trichlorofluoromethane		<.0059 D	NA	<.0059	NA	<.0059	.02 D	NA
OTHER (µg/g)								
Total Organic Carbon		12300 D	NA	1980	NA	5400	7080 D	NA
Total Petroleum Hydrocarbons		<28.5 D	NA	<21.1	NA	1450	53.8 D	NA

Table 41

SOIL BORING OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

SITE ID:	FORT DEVENS	41E-94-05X	41E-94-05X	41E-94-05X	41E-94-05X	41E-94-05X	41E-94-05X	41E-94-05X
DEPTH:	BACKGROUND	3 ft	5 ft	5 ft	5 ft	5 ft	10 ft	10 ft
Field Sample Number:	CONCENTRATIONS	ED410502	EX410504	ED410504	EX410504	ED410504	EX410509	EX410509
Aluminum	18000	NA	2540	2650 D	NA	NA	2140	NA
Arsenic	19	< 2.45	3.8	5.2 D	< 2.45	< 2.45	3.8	< 2.45
Barium	54	268 D	6.71	7.37 D	319	320 D	<5.18	301
Beryllium	0.81	NA	<.5	<.5 D	NA	NA	<.5	NA
Calcium	810	NA	165	166 D	NA	NA	203	NA
Chromium	33	<6.02 D	<4.05	<4.05 D	<6.02	<6.02 D	<4.05	<6.02
Cobalt	4.7	NA	<1.42	1.66 D	NA	NA	<1.42	NA
Copper	13.5	NA	3.91	3.52 D	NA	NA	3.47	NA
Iron	18000	NA	3870	3930 D	NA	NA	3890	NA
Lead	48	35.2 D	2.14	1.96 D	<18.6	35.2 D	3.37	<18.6
Magnesium	5500	NA	875	771 D	NA	NA	757	NA
Manganese	380	NA	62.5	67.9 D	NA	NA	58.9	NA
Nickel	14.6	NA	4.64	4.3 D	NA	NA	3.1	NA
Potassium	2400	NA	463	529 D	NA	NA	501	NA
Sodium	234	NA	305	372 D	NA	NA	356	NA
Vanadium	32.3	NA	3.96	4.63 D	NA	NA	4.5	NA
Zinc	43.9	NA	15.3	13.7 D	NA	NA	<8.03	NA
PAL SEMIVOLATILE ORGANICS (µg/g)								
Acenaphthylene		NA	<.033	<.033 D	NA	NA	<.033	NA
Benzo[b]Fluoranthene		NA	<.21	<.21 D	NA	NA	<.21	NA
Benzo[k]Fluoranthene		NA	<.066	<.066 D	NA	NA	<.066	NA
*Bis (2-ethylhexyl) Phthalate		NA	<.62	<.62 D	NA	NA	<.62	NA
Chrysene		NA	<.12	<.12 D	NA	NA	<.12	NA
*Di-n-butyl Phthalate		NA	<.061	<.061 D	NA	NA	<.061	NA
Fluoranthene		NA	<.068	<.068 D	NA	NA	<.068	NA
Phenanthrene		NA	<.033	<.033 D	NA	NA	<.033	NA
Pyrene		NA	<.033	<.033 D	NA	NA	<.033	NA
PAL VOLATILE ORGANICS (µg/g)								
1,1,2,2-tetrachloroethane		NA	<.0024	<.0024 D	NA	NA	<.0024	NA
*Acetone		NA	<.017	<.017 D	NA	NA	<.017	NA
*Methylene Chloride		NA	<.012	<.012 D	NA	NA	<.012	NA
Toluene		NA	<.00078	<.00078 D	NA	NA	<.00078	NA
*Trichlorofluoromethane		NA	<.0059	<.0059 D	NA	NA	<.0059	NA
OTHER (µg/g)								
Total Organic Carbon		NA	697	613 D	NA	NA	1000	NA
Total Petroleum Hydrocarbons		NA	<28.5	<28.5 D	NA	NA	<28.3	NA

Table 41

SOIL BORING OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

SITE ID: / DEPTH: / Field Sample Number:	FORT DEVENS BACKGROUND CONCENTRATIONS	41E-94-06X 3 ft EX410603	41E-94-06X 9 ft EX410610	41E-94-07X 4 ft EX410704	41E-94-07X 10 ft EX410710	41E-94-08X 4 ft EX410804	41E-94-08X 10 ft EX410810	41E-94-08X 12 ft EX410812
Aluminum	18000	2530	2620	2450	2260	2370	2460	3050
Arsenic	19	3.96	3.57	3.97	3.69	3.15	6.34	4.28
Barium	54	10.8	9.48	7.22	8.82	6.94	8.08	11.5
Beryllium	0.81	<.5	<.5	<.5	<.5	<.5	<.5	<.5
Calcium	810	298	374	292	278	149	436	276
Chromium	33	<4.05	<4.05	<4.05	<4.05	<4.05	<4.05	6.44
Cobalt	4.7	1.9	1.84	<1.42	1.79	<1.42	<1.42	2.02
Copper	13.5	3.32	2.84	2.67	3.86	2.83	3.1	3.41
Iron	18000	4470	4440	4270	3950	4810	4550	4540
Lead	48	2.2	1.96	1.99	1.92	3.28	2.64	2.6
Magnesium	5500	719	890	790	802	707	855	1150
Manganese	380	158	63.5	61.2	61.3	65.7	67.7	61.3
Nickel	14.6	4.52	3.84	4.26	3.84	2.89	2.4	4.49
Potassium	2400	422	517	432	523	492	478	664
Sodium	234	<100	<100	<100	369	<100	128	<100
Vanadium	32.3	4.29	4.74	3.99	4.55	4.19	4.65	5.61
Zinc	43.9	10.1	10.8	10.3	11	9.67	10.6	10.9
PAL SEMIVOLATILE ORGANICS (µg/g)								
Acenaphthylene		<.033	<.033	<.033	<.033	<.033	<.033	<.033
Benzo[b]Fluoranthene		<.21	<.21	<.21	<.21	<.21	<.21	<.21
Benzo[k]Fluoranthene		<.066	<.066	<.066	<.066	<.066	<.066	<.066
*Bis (2-ethylhexyl) Phthalate		<.62	<.62	<.62	1.3	<.62	<.62	<.62
Chrysene		<.12	<.12	<.12	<.12	<.12	<.12	<.12
*Di-n-butyl Phthalate		<.061	<.061	<.061	<.061	<.061	<.061	<.061
Fluoranthene		<.068	<.068	<.068	<.068	<.068	<.068	<.068
Phenanthrene		<.033	<.033	<.033	<.033	<.033	<.033	<.033
Pyrene		<.033	<.033	<.033	<.033	<.033	<.033	<.033
PAL VOLATILE ORGANICS (µg/g)								
1,1,2,2-tetrachloroethane		<.0024	<.0024	<.0024	<.0024	<.0024	<.0024	<.0024
*Acetone		<.017	<.017	<.017	<.017	<.017	<.017	<.017
*Methylene Chloride		<.012	<.012	<.012	<.012	<.012	<.012	<.012
Toluene		<.00078	<.00078	<.00078	<.00078	<.00078	<.00078	<.00078
*Trichlorofluoromethane		<.0059	<.0059	<.0059	<.0059	<.0059	<.0059	<.0059
OTHER (µg/g)								
Total Organic Carbon		2170	2660	703	1200	738	780	668
Total Petroleum Hydrocarbons		<28	<28	<27.8	<27.8	<27.8	<28	<27.8

Table 41

SOIL BORING OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

SITE ID:	FORT DEVENS	41E-94-09X	41E-94-09X	41E-94-09X	41M-92-01X	41M-93-02B	41M-93-02B	41M-93-02B
DEPTH:	BACKGROUND	4 ft	9 ft	9 ft	26-28 ft	2-4 ft	4-6 ft	30-32 ft
Field Sample Number:	CONCENTRATIONS	EX410904	EX410910	ED410910	BX410126	BX410204	BX410206	BX410232
Aluminum	18000	3040	2950	2880 D		14200	37600	6290
Arsenic	19	3.76	3.81	3.73 D		14	25	24
Barium	54	10.4	7.54	7.84 D		80.5	224	29.7
Beryllium	0.81	<.5	<.5	<.5 D		<.5	1.95	<0.5
Calcium	810	229	336	299 D		1370	2280	1970
Chromium	33	5.87	<4.05	<4.05 D		24.8	70.3	15.6
Cobalt	4.7	2.26	2.14	1.72 D		9.78	17	7.09
Copper	13.5	3.57	3.33	3.64 D		16.1	40.4	10.8
Iron	18000	5280	4330	4150 D		24100	50300	11700
Lead	48	2.54	2.33	2.45 D		9.5	22	6.05
Magnesium	5500	1100	879	802 D		5500	12700	2700
Manganese	380	80.3	77.7	60.1 D		392	541	384
Nickel	14.6	5.29	4.67	4.27 D		19.5	51.5	16.3
Potassium	2400	614	466	473 D		4140	11500	1380
Sodium	234	<100	<100	<100 D		449	669	458
Vanadium	32.3	5.43	4.43	4.27 D		33.9	87.7	12.1
Zinc	43.9	12.3	10.2	9.98 D		66.3	148	28
PAL SEMIVOLATILE ORGANICS (µg/g)								
Acenaphthylene		<.033	<.033	<.033 D		<.033	<.033	<.033
Benzo[b]Fluoranthene		<.21	<.21	<.21 D		<.21	<.21	<.21
Benzo[k]Fluoranthene		<.066	<.066	<.066 D		<.066	<.066	<.066
*Bis (2-ethylhexyl) Phthalate		<.62	<.62	<.62 D		<.62	<.62	<.62
Chrysene		<.12	<.12	<.12 D		<.12	<.12	<.12
*Di-n-butyl Phthalate		<.061	<.061	<.061 D		<.061	<.061	.62 B
Fluoranthene		<.068	<.068	<.068 D		<.068	<.068	<.068
Phenanthrene		<.033	<.033	<.033 D		<.033	<.033	<.033
Pyrene		<.033	<.033	<.033 D		<.033	<.033	<.033
PAL VOLATILE ORGANICS (µg/g)								
1,1,2,2-tetrachloroethane		<.0024	<.0024	<.0024		<.0024	<.0024	<.0024
*Acetone		<.017	<.017	<.017 D		<.017	<.017	<.017
*Methylene Chloride		<.012	<.012	<.012 D		<.012	<.012	<.012
Toluene		<.00078	<.00078	<.00078		<.00078	<.00078	<.00078
*Trichlorofluoromethane		<.0059	<.0059	<.0059 D		<.0059	<.0059	<.0059
OTHER (µg/g)								
Total Organic Carbon		764	811	948 D	199	NA	NA	360
Total Petroleum Hydrocarbons		<27.8	<27.8	<28 D	NA	NA	NA	NA

Table 41

SOIL BORING OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

SITE ID: / DEPTH: / Field Sample Number:	FORT DEVENS BACKGROUND CONCENTRATIONS	41M-93-02B 30-32 ft BX410232	41M-93-03X 45-47 ft BX410345	41M-93-04X 5 ft BX410405	41M-93-05X 5 ft BX410505	41M-94-02C 29-31 ft BX412C29	41M-94-07X 5-7 ft BX410705	41M-94-08A 24-26 ft BX418A25
Aluminum	18000	6600 D	4080	NA	NA	NA	NA	NA
Arsenic	19	18 D	13	NA	NA	NA	NA	NA
Barium	54	29.3 D	23.4	NA	NA	NA	NA	NA
Beryllium	0.81	<.5 D	<.5	NA	NA	NA	NA	NA
Calcium	810	2080 D	1200	NA	NA	NA	NA	NA
Chromium	33	17.7 D	11.7	NA	NA	NA	NA	NA
Cobalt	4.7	6.44 D	5.28	NA	NA	NA	NA	NA
Copper	13.5	11.1 D	7.39	NA	NA	NA	NA	NA
Iron	18000	12400 D	7900	NA	NA	NA	NA	NA
Lead	48	7.93 D	3.94	NA	NA	NA	NA	NA
Magnesium	5500	2900 D	2050	NA	NA	NA	NA	NA
Manganese	380	188 D	147	NA	NA	NA	NA	NA
Nickel	14.6	16.9 D	13.1	NA	NA	NA	NA	NA
Potassium	2400	1570 D	859	NA	NA	NA	NA	NA
Sodium	234	497 D	388	NA	NA	NA	NA	NA
Vanadium	32.3	12.4 D	8.28	NA	NA	NA	NA	NA
Zinc	43.9	34.3 D	22.4	NA	NA	NA	NA	NA
PAL SEMIVOLATILE ORGANICS (µg/g)								
Acenaphthylene		<.033	<.033	NA	NA	NA	NA	NA
Benzo[b]Fluoranthene		<.21	<.21	NA	NA	NA	NA	NA
Benzo[k]Fluoranthene		<.066	<.066	NA	NA	NA	NA	NA
*Bis (2-ethylhexyl) Phthalate		<.62	<.62	NA	NA	NA	NA	NA
Chrysene		<.12	<.12	NA	NA	NA	NA	NA
*Di-n-butyl Phthalate		.30 B	30 B	NA	NA	NA	NA	NA
Fluoranthene		<.068	<.068	NA	NA	NA	NA	NA
Phenanthrene		<.033	<.033	NA	NA	NA	NA	NA
Pyrene		<.033	<.033	NA	NA	NA	NA	NA
PAL VOLATILE ORGANICS (µg/g)								
1,1,2,2-tetrachloroethane		<.0024	<.0024	NA	NA	NA	NA	NA
*Acetone		<.017	<.017	NA	NA	NA	NA	NA
*Methylene Chloride		<.012	<.012	NA	NA	NA	NA	NA
Toluene		<.00078	<.00078	NA	NA	NA	NA	NA
*Trichlorofluoromethane		<.0059	<.0059	NA	NA	NA	NA	NA
OTHER (µg/g)								
Total Organic Carbon		700	659	643	745	3900	4580	2430
Total Petroleum Hydrocarbons		NA	NA	NA	NA	NA	NA	NA

Table 41

SOIL BORING OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

SITE ID:	FORT DEVENS	41M-94-08B	41M-94-09A	41M-94-09B	41M-94-10X	41M-94-11X	41M-94-12X	41M-94-13X
DEPTH:	BACKGROUND	39-41 ft	35-37 ft	40-42 ft	40-42 ft	34-36 ft	40-42 ft	19-21 ft
Field Sample Number:	CONCENTRATIONS	BX418B40	BX419A35	BX419B40	BX411040	BX411135	BX411240	BX411320
Aluminum	18000	NA	NA	NA	NA	NA	NA	NA
Arsenic	19	NA	NA	NA	NA	NA	NA	NA
Barium	54	NA	NA	NA	NA	NA	NA	NA
Beryllium	0.81	NA	NA	NA	NA	NA	NA	NA
Calcium	810	NA	NA	NA	NA	NA	NA	NA
Chromium	33	NA	NA	NA	NA	NA	NA	NA
Cobalt	4.7	NA	NA	NA	NA	NA	NA	NA
Copper	13.5	NA	NA	NA	NA	NA	NA	NA
Iron	18000	NA	NA	NA	NA	NA	NA	NA
Lead	48	NA	NA	NA	NA	NA	NA	NA
Magnesium	5500	NA	NA	NA	NA	NA	NA	NA
Manganese	380	NA	NA	NA	NA	NA	NA	NA
Nickel	14.6	NA	NA	NA	NA	NA	NA	NA
Potassium	2400	NA	NA	NA	NA	NA	NA	NA
Sodium	234	NA	NA	NA	NA	NA	NA	NA
Vanadium	32.3	NA	NA	NA	NA	NA	NA	NA
Zinc	43.9	NA	NA	NA	NA	NA	NA	NA
PAL SEMIVOLATILE ORGANICS (µg/g)								
Acenaphthylene		NA	NA	NA	NA	NA	NA	NA
Benzo[b]Fluoranthene		NA	NA	NA	NA	NA	NA	NA
Benzo[k]Fluoranthene		NA	NA	NA	NA	NA	NA	NA
*Bis (2-ethylhexyl) Phthalate		NA	NA	NA	NA	NA	NA	NA
Chrysene		NA	NA	NA	NA	NA	NA	NA
*Di-n-butyl Phthalate		NA	NA	NA	NA	NA	NA	NA
Fluoranthene		NA	NA	NA	NA	NA	NA	NA
Phenanthrene		NA	NA	NA	NA	NA	NA	NA
Pyrene		NA	NA	NA	NA	NA	NA	NA
PAL VOLATILE ORGANICS (µg/g)								
1,1,2,2-tetrachloroethane		NA	NA	NA	NA	NA	NA	NA
*Acetone		NA	NA	NA	NA	NA	NA	NA
*Methylene Chloride		NA	NA	NA	NA	NA	NA	NA
Toluene		NA	NA	NA	NA	NA	NA	NA
*Trichlorofluoromethane		NA	NA	NA	NA	NA	NA	NA
OTHER (µg/g)								
Total Organic Carbon		2540	1900	1880	1530	1070	1590	1290
Total Petroleum Hydrocarbons		NA	NA	NA	NA	NA	NA	NA

Table 41

SOIL BORING OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

SITE ID: / DEPTH: / Field Sample Number:	FORT DEVENS BACKGROUND CONCENTRATIONS	41M-94-14X / 4-6 ft / BX411404
Aluminum	18000	NA
Arsenic	19	NA
Barium	54	NA
Beryllium	0.81	NA
Calcium	810	NA
Chromium	33	NA
Cobalt	4.7	NA
Copper	13.5	NA
Iron	18000	NA
Lead	48	NA
Magnesium	5500	NA
Manganese	380	NA
Nickel	14.6	NA
Potassium	2400	NA
Sodium	234	NA
Vanadium	32.3	NA
Zinc	43.9	NA
PAL SEMIVOLATILE ORGANICS (µg/g)		
Acenaphthylene		NA
Benzo[b]Fluoranthene		NA
Benzo[k]Fluoranthene		NA
*Bis (2-ethylhexyl) Phthalate		NA
Chrysene		NA
*Di-n-butyl Phthalate		NA
Fluoranthene		NA
Phenanthrene		NA
Pyrene		NA
PAL VOLATILE ORGANICS (µg/g)		
1,1,2,2-tetrachloroethane		NA
*Acetone		NA
*Methylene Chloride		NA
Toluene		NA
*Trichlorofluoromethane		NA
OTHER (µg/g)		
Total Organic Carbon		1180
Total Petroleum Hydrocarbons		NA

Table 42

SCREENED AUGER AND EXISTING MONITORING WELL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

Analyte (µg/L)	41M-92-01X MW401X2W	41M-93-02A MW402AXW	41M-93-02B MW402B2W	41M-93-03X MW40300W	41M-93-04X MW404XXW	41M-93-05X MW405XXW	SA4101 38 FT SA40138W
Vinyl chloride	<4.0	<4.0	<8.0	<100	<4.0	<4.0	<4.0
t-1,2-DCE	<2.0	<2.0	<4.0	<50	<2.0	<2.0	<2.0
c-1,2-DCE	<2.0	<2.0	<4.0	<50	<2.0	<2.0	<2.0
Benzene	<2.0	<2.0	<4.0	<50	<2.0	<2.0	<2.0
Trichloroethene	16	28	23	450	<2.0	<2.0	<2.0
Toluene	<2.0	<2.0	<4.0	<50	<2.0	<2.0	<2.0
Tetrachloroethene	<2.0	<2.0	<4.0	<50	<2.0	<2.0	<2.0
Ethybenzene	<2.0	<2.0	<4.0	<50	<2.0	<2.0	<2.0
m/p-xylene	<4.0	<4.0	<8.0	<100	<4.0	<4.0	<4.0
o-xylene	<2.0	<2.0	<4.0	<50	<2.0	<2.0	<2.0
1,1,2,2-TCA	13	14	<8.0	<100	<4.0	<4.0	<4.0
1,2-dichlorobenzene	<2.0	<2.0	<4.0	<50	<2.0	<2.0	<2.0

Table 42 (continued)

SCREENED AUGER AND EXISTING MONITORING WELL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

Analyte (µg/L)	SA4102 41 FT SA40241W	SA4103 37 FT SA40337W	SA4104 37 FT SA40437W	SA4105 40 FT SA40540W	SA4106 39 FT SA40639W	SA4107 35 FT SA40735W	SA4108 19 FT SA40819W
Vinyl chloride	<40	<4.0	<100	<20	<4.0	<20	<4.0
t-1,2-DCE	<20	<2.0	<50	<10	<2.0	<10	<2.0
c-1,2-DCE	<20	<2.0	<50	<10	<2.0	<10	2.5
Benzene	<20	<2.0	<50	<10	<2.0	<10	<2.0
Trichloroethene	87	30	496	48	6.3	16	37
Toluene	<20	<2.0	<50	<10	<2.0	<10	<2.0
Tetrachloroethene	<20	<2.0	<50	<10	<2.0	<10	<2.0
Ethybenzene	<20	<2.0	<50	<10	<2.0	<10	<2.0
m/p-xylene	<40	<4.0	<100	<20	<4.0	<20	<4.0
o-xylene	<20	<2.0	<50	<10	<2.0	<10	<2.0
1,1,2,2-TCA	<40	<4.0	<100	<20	<4.0	<20	27
1,2-dichlorobenzene	<20	<2.0	<50	<10	<2.0	<10	<2.0

Table 42 (continued)

SCREENED AUGER AND EXISTING MONITORING WELL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

Analyte (µg/L)	SA4109 26 FT SA40926W	SA4110 19 FT SA41019W	SA4111 36 FT SA41136W	SA4112 38 FT SA41238W	SA4113 40 FT SA41340W	SA4114 44 FT SA41444W	SA4115 25 FT SA41525W
Vinyl chloride	<40	<40	<4.0	<4.0	<4.0	<4.0	<4.0
t-1,2-DCE	<20	<20	<2.0	<2.0	<2.0	<2.0	<2.0
c-1,2-DCE	<20	<20	<2.0	<2.0	<2.0	<2.0	<2.0
Benzene	<20	<20	<2.0	<2.0	<2.0	<2.0	<2.0
Trichloroethene	48	54	<2.0	<2.0	<2.0	<2.0	<2.0
Toluene	<20	<20	<2.0	<2.0	<2.0	<2.0	<2.0
Tetrachloroethene	<20	<20	<2.0	<2.0	<2.0	<2.0	<2.0
Ethybenzene	<20	<20	<2.0	<2.0	<2.0	<2.0	<2.0
m/p-xylene	<40	<40	<4.0	<4.0	<4.0	<4.0	<4.0
o-xylene	<20	<20	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,2,2-TCA	<40	43	<4.0	<4.0	<4.0	<4.0	<4.0
1,2-dichlorobenzene	<20	<20	<2.0	<2.0	<2.0	<2.0	<2.0

Table 42 (continued)

SCREENED AUGER AND EXISTING MONITORING WELL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

Analyte (µg/L)	SA4116 40 FT SA41640W	SA4117 45 FT SA41445W	SA4118 24 FT SA41824W	SA4119 45 FT SA41945W	SA4120 38 FFT SA42038W	SA4121 19 FT SA42119W	SA4122 13 FT SA42213W
Vinyl chloride	<4.0	<4.0	<20	<4.0	<4.0	<40	<4.0
t-1,2-DCE	<2.0	<2.0	<10	<2.0	<2.0	<20	<2.0
c-1,2-DCE	<2.0	<2.0	21	<2.0	<2.0	<20	<2.0
Benzene	<2.0	<2.0	<10	<2.0	<2.0	<20	<2.0
Trichloroethene	<2.0	<2.0	49	<2.0	<2.0	45	<2.0
Toluene	<2.0	<2.0	<10	<2.0	<2.0	<20	<2.0
Tetrachloroethene	<2.0	<2.0	<10	<2.0	<2.0	<20	<2.0
Ethybenzene	<2.0	<2.0	<10	<2.0	<2.0	<20	<2.0
m/p-xylene	<4.0	<4.0	<20	<4.0	<4.0	<40	<4.0
o-xylene	<2.0	<2.0	<10	<2.0	<2.0	<20	<2.0
1,1,2,2-TCA	<4.0	<4.0	32	<4.0	<4.0	<40	<4.0
1,2-dichlorobenzene	<2.0	<2.0	<10	<2.0	<2.0	<20	<2.0

Table 42 (continued)

SCREENED AUGER AND EXISTING MONITORING WELL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

Analyte (µg/L)	SA4123 50 FT SA42350W	SA4123 55 FT SA42355W	SA4123 60 FT SA42360W	SA4123 65 FT SA42365W	SA4123 70 FT SA42370W
Vinyl chloride	<4.0	<4.0	<4.0	<4.0	<4.0
t-1,2-DCE	<2.0	<2.0	<2.0	<2.0	<2.0
c-1,2-DCE	<2.0	<2.0	<2.0	<2.0	<2.0
Benzene	<2.0	<2.0	<2.0	<2.0	<2.0
Trichloroethene	<2.0	<2.0	<2.0	<2.0	<2.0
Toluene	<2.0	<2.0	<2.0	<2.0	<2.0
Tetrachloroethene	<2.0	<2.0	<2.0	<2.0	<2.0
Ethybenzene	<2.0	<2.0	<2.0	<2.0	<2.0
m/p-xylene	<4.0	<4.0	<4.0	<4.0	<4.0
o-xylene	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,2,2-TCA	<4.0	<4.0	<4.0	<4.0	<4.0
1,2-dichlorobenzene	<2.0	<2.0	<2.0	<2.0	<2.0

Table 43

GROUNDWATER OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

		ROUND 1					ROUND 2		ROUND 3		ROUND 4	
Site ID:		41D-92-03X	41D-92-04X	41D-92-05X	41D-92-06X	41M-92-01X	41M-92-01X	41M-92-01X	41M-92-01X	41M-92-01X	41M-92-01X	41M-92-01X
Sample Date:	Fort Devens	08/10/92	08/10/92	08/10/92	08/10/92	09/23/92	01/07/93	01/07/93	10/13/93	10/13/93	01/26/94	01/26/94
Depth:	Background	0	0	0	0	27	27	21	30	30	38	30
Field Sample Number:	Concentrations	DX410300	DX410400	DX410500	DX410600	MX4101X1	MX4101X2	MX4101X2	MX4101X3	MX4101X3	MX4101X2	MX4101X2
PAL CATIONS/ANIONS (µg/L)												
Chloride		NA	NA	NA	NA	* 2130	* 2130	NA	NA	NA	NA	NA
Phosphate		1900	347	178	138	NA	NA	NA	NA	NA	NA	NA
Sulfate		32100	< 100000	< 100000	< 100000	* 10000	* 10000	NA	NA	NA	NA	NA
PAL METALS (µg/L)												
Aluminum	6870	53700.0	13000.0	5470.0	4900.0	7000	32000	302 F	34100	* 141 F	82000	* 141 F
Antimony	3.03	3.03	< 3.03	< 3.03	< 3.03	4.2	* 3.03	* 3.03 F	* 3.03	3.84 F	3.84	* 3.03 F
Arsenic	10.5	31.7	8.64	60.0	60.3	38.5	30.2	* 4.28 F	28.3	* 2.54 F	50.6	* 22.14 F
Barium	39.6	109	47.0	27.4	22.7	268	128	* 5 F	158	* 5 F	481	* 5 F
Beryllium	5	< 5.0	< 5.0	< 5.0	< 5.0	6.00	* 5	* 5 F	* 5	* 5 F	* 5	* 5 F
Calcium	14700	40000.0	5500.0	2100.0	2100.0	18300	11000	3370 F	14000	3720 F	39200	3200 F
Chromium	14.7	58.5	15.9	< 6.0	< 6.0	140	80.0	* 6.02 F	62.8	* 6.02 F	149	* 6.02 F
Cobalt	25	< 25.0	< 25.0	< 25.0	< 25.0	38.6	44.4	* 25 F	34.1	* 25 F	60.0	* 25 F
Copper	8.09	46.1	8.98	< 8.09	< 8.09	93.7	72.0	* 8.09 F	37	* 8.09 F	147	13.2 F
Iron	9100	81100.0	13000.0	25000.0	20500.0	110000	74000	333 F	48000	99.8 F	110000	152 F
Lead	4.25	47.3	10.6	6.72	4.86	64.6	42.2	* 1.26 F	32.3	* 1.26 F	48.6	* 1.26 F
Magnesium	3400	16000.0	2540.0	1620.0	1570.0	20300	17100	1420 F	13200	1400 F	230000	1340 F
Manganese	291	1130.0	250.0	236.0	282.0	1420	893	37.4 F	681	60.5 F	1020	34.4 F
Mercury	0.243	<0.243	<0.243	<0.243	<0.243	* 0.243	* 0.243	* 0.243 F	* 0.246	* 0.246 F	** 0.243	* 0.243 F
Nickel	34.3	64.5	< 34.3	< 34.3	< 34.3	178	183	* 34.3 F	73.6	* 34.3 F	170	* 34.3 F
Potassium	2370	12500.0	5100.0	3030.0	9400.0	16000	25100	2610 F	9090	1900 F	30900	1600 F
Silver	4.6	< 4.6	< 4.6	< 4.6	< 4.6	4.2	* 4.6	* 4.6 F	* 4.6	4.6 F	* 4.6	4.6 F
Sodium	10800	3610.0	2270.0	2250.0	2140.0	8870	89340	6640 F	8700	6000 F	9710	6550 F
Vanadium	11	79.0	20.4	< 11.0	< 11.0	189	102	* 11 F	63.6	* 11 F	147	* 11 F
Zinc	21.1	140.0	28.0	< 21.1	< 21.1	207	219	* 21.1 F	140	* 21.1 F	466	* 21.1 F
PAL PESTICIDES (µg/L)												
Endrin		< 0.024	< 0.024	< 0.024	< 0.024	* 0.0230	0.0081	NA	* 0.0230	NA	* 0.0230	NA
PAL EXPLOSIVES (µg/L)												
Nitroglycerin		<10	<10	<10	<10	* 10	* 10	NA	* 10	NA	* 10	NA
PAL SEMIVOLATILE ORGANICS (µg/L)												
*Bis (2-ethylhexyl) Phthalate		<4.8	<4.8	<4.8	<4.8	* 4.8	* 4.8	NA	14	NA	* 4.8	NA
PAL VOLATILE ORGANICS (µg/L)												
1,2-dichloroethylenes (cis And Trans isomers)		< 0.5	< 0.5	< 0.5	< 0.5	* 0.5	* 0.5	NA	* 0.5	NA	* 0.5	NA
xylenes		<0.84	<0.84	<0.84	<0.84	* 0.84	* 0.84	NA	* 0.84	NA	* 0.84	NA
1,1,2,2-tetrachloroethane		< 0.5	< 0.5	< 0.5	< 0.5	170	7.1	NA	35	NA	14	NA
Carbon Disulfide		< 0.5	< 0.5	< 0.5	< 0.5	* 0.5	* 0.5	NA	* 0.5	NA	* 0.5	NA
Carbon Tetrachloride		< 0.5	< 0.5	< 0.5	< 0.5	* 0.5	* 0.5	NA	* 0.5	NA	* 0.5	NA
*Chloroform		< 0.5	1.4	< 0.5	< 0.5	0.5	* 0.5	NA	* 0.5	NA	* 0.5	NA
*Methylene Chloride		< 2.3	< 2.3	< 2.3	< 2.3	* 2.3	* 2.3	NA	* 2.3	NA	* 2.3	NA
Methylethyl Ketone / 2-butanone		<6.4	<6.4	<6.4	<6.4	* 6.4	* 6.4	NA	* 6.4	NA	* 6.4	NA
Tetrachloroethylene / Tetrachloroethene		<1.6	<1.6	<1.6	<1.6	10	* 1.6	NA	2.4	NA	* 1.6	NA
*Toluene		< 0.5	< 0.5	< 0.5	< 0.5	* 0.5	* 0.5	NA	* 0.5	NA	* 0.5	NA
Benzene		< 0.5	< 0.5	< 0.5	< 0.5	* 0.5	* 0.5	NA	* 0.5	NA	* 0.5	NA
Trichloroethylene / Trichloroethene		< 0.5	< 0.5	< 0.5	< 0.5	230	6.4	NA	40	NA	11	NA
2,4,6-Trinitrotoluene		<0.03	<0.03	<0.03	<0.03	0.718	* 0.03	NA	* 0.03	NA	* 0.03	NA
WATER QUALITY PARAMETERS (µg/L)												
Alkalinity		130000	14000	14000	13000	27000	39000	NA	NA	NA	NA	NA
Nitrite, Nitrate-non Specific		23.5	< 10.0	< 10.0	< 10.0	11000	46.1	NA	NA	NA	NA	NA
Nitrogen By Kjeldahl Method		619	210	1430	1010	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids		NA	NA	NA	NA	NA	NA	NA	NA	NA	110000	NA
Total Hardness		137000	16400	9200	10000	NA	NA	NA	NA	NA	NA	NA
Total Suspended Solids		2030000	297000	100000	172000	NA	1070000	NA	2100000	NA	1000000	NA

Table 43

GROUNDWATER OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

		ROUND 3	ROUND 4	ROUND 3		ROUND 4		ROUND 3			
Site ID:		41M-93-02A	41M-93-02A	41M-93-02B	41M-93-02B	41M-93-02B	41M-93-02B	41M-93-03X	41M-93-03X	41M-93-03X	41M-93-03X
Sample Date:	Fort Devens	10/15/93	01/26/94	10/15/93	10/15/93	01/26/94	01/26/94	10/14/93	10/14/93	10/14/93	10/14/93
Depth:	Background	27	27	27	27	27	27	39	39	39	39
Field Sample Number:	Concentrations	MD4102A1	MX4102A2	MX4102B1	MX4102B1	MX4102B2	MX4102B2	MX4103X1	MX4103X1	MD4103X1	MD4103X1
PAL CATIONS/ANIONS (µg/L)											
Chloride		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL METALS (µg/L)											
Aluminum	6870	NA	NA	16400	< 141 F	46500	< 141 F	6300	< 141 F	6330 D	< 141 DF
Antimony	3.03	NA	NA	< 3.03	2.75 F	2.95	< 3.03 F	< 3.03	3.38 F	< 3.03 D	< 3.03 DF
Arsenic	10.5	NA	NA	24.2	3.3 F	78	2.77 F	9.4	< 2.54 F	12.2 D	< 2.54 DF
Barium	39.6	NA	NA	73.3	< 5 F	231	< 5 F	30	< 5 F	30 D	< 5 DF
Beryllium	5	NA	NA	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5 D	< 5 DF
Calcium	14700	NA	NA	9170	5170 F	16400	5530 F	6300	3440 F	6290 D	3470 DF
Chromium	14.7	NA	NA	25.5	< 6.02 F	81.5	< 6.02 F	10.3	< 6.02 F	9.61 D	< 6.02 DF
Cobalt	25	NA	NA	< 25	< 25 F	42.8	< 25 F	< 25	< 25 F	< 25 D	< 25 DF
Copper	8.09	NA	NA	23.7	< 8.09 F	75.7	< 8.09 F	14	< 8.09 F	11.9 D	< 8.09 DF
Iron	9100	NA	NA	24200	119 F	73200	166 F	8360	117 F	8580 D	38.8 DF
Lead	4.25	NA	NA	11.6	< 1.26 F	34.9	2.49 F	4.12	< 1.26 F	4.12 D	< 1.26 DF
Magnesium	3400	NA	NA	7430	2470 F	17200	2500 F	3130	1430 F	3180 D	1430 DF
Manganese	291	NA	NA	348	15.4 F	1210	37.6 F	177	3.9 F	178 D	< 2.75 DF
Mercury	0.243	NA	NA	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243 D	< 0.243 DF
Nickel	34.3	NA	NA	< 34.3	< 34.3 F	95.7	< 34.3 F	< 34.3	< 34.3 F	< 34.3 D	< 34.3 DF
Potassium	2370	NA	NA	4120	2030 F	14400	3100 F	2090	1170 F	2850 D	1130 DF
Silver	4.6	NA	NA	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6 D	< 4.6 DF
Sodium	10870	NA	NA	10000	8500 F	11100	9400 F	6020	5540 F	6080 D	5410 DF
Vanadium	11	NA	NA	31.7	< 11 F	78.9	< 11 F	12.7	< 11 F	17 D	< 11 DF
Zinc	21.1	NA	NA	33.1	< 21.1 F	220	< 21.1 F	24.6	< 21.1 F	38.5 D	< 21.1 DF
PAL PESTICIDES (µg/L)											
Endrin		NA	NA	< 0.0238	NA	< 0.0238	NA	< 0.0238	NA	< 0.0238 D	NA
PAL EXPLOSIVES (µg/L)											
Nitroglycerin		NA	NA	< 10	NA	< 10	NA	< 10	NA	< 10 D	NA
PAL SEMIVOLATILE ORGANICS (µg/L)											
*Bis(2-ethylhexyl) Phthalate		NA	NA	< 4.8	NA	13	NA	7.5	NA	< 4.8 D	NA
PAL VOLATILE ORGANICS (µg/L)											
1,2-dichloroethylenes (cis And Trans Isomers)		< 0.5	< 0.5	< 0.5	NA	1.8	NA	< 1	NA	< 1 D	NA
xylenes		< 0.84	< 0.84	< 0.84	NA	< 0.84	NA	< 0.84	NA	< 0.84 D	NA
1,1,2,2-tetrachloroethane		< 0.5	< 0.5	2.1	NA	2.0	NA	< 1	NA	< 1 D	NA
Carbon Disulfide		< 0.5	< 0.5	< 0.5	NA	< 0.5	NA	< 1	NA	< 1 D	NA
Carbon Tetrachloride		< 0.5	< 0.5	< 0.5	NA	< 0.5	NA	< 1	NA	< 1 D	NA
*Chloroform		< 0.5	< 0.5	< 0.5	NA	< 0.5	NA	< 1	NA	< 1 D	NA
*Methylene Chloride		< 2.3	< 2.3	< 2.3	NA	< 2.3	NA	< 4.4	NA	< 4.4 D	NA
Methylethyl Ketone / 2-butanone		83	< 6.4	< 6.4	NA	< 6.4	NA	< 10	NA	< 10 D	NA
Tetrachloroethylene / Tetrachloroethene		< 1.6	< 1.6	< 1.6	NA	< 1.6	NA	< 1	NA	< 1 D	NA
*Toluene		41	< 0.5	< 0.5	NA	< 0.5	NA	< 1	NA	< 1 D	NA
Benzene		< 0.5	1.5	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5 D	NA
Trichloroethylene / Trichloroethene		< 0.5	< 0.5	9.1	NA	7.9	NA	200	NA	200 D	NA
2,4,6-Trinitrotoluene		< 0.63	< 0.63	< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63 D	NA
WATER QUALITY PARAMETERS (µg/L)											
Alkalinity		NA	NA	NA	NA	NA	NA	NA	NA	NA D	NA
Nitrite, Nitrate - non Specific		NA	NA	NA	NA	NA	NA	NA	NA	NA D	NA
Nitrogen By Kjeldahl Method		NA	NA	NA	NA	NA	NA	NA	NA	NA D	NA
Total Dissolved Solids		NA	NA	NA	NA	96000	NA	NA	NA	NA D	NA
Total Hardness		NA	NA	NA	NA	NA	NA	NA	NA	NA D	NA
Total Suspended Solids		NA	NA	378000	NA	2200000	NA	447000	NA	340000 D	NA

Table 43

GROUNDWATER OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

		ROUND 4		ROUND 3		ROUND 4		ROUND 3		ROUND 4	
Site ID:		41M-93-03X	41M-93-03X	41M-93-04X	41M-93-04X	41M-93-04X	41M-93-04X	41M-93-05X	41M-93-05X	41M-93-05X	41M-93-05X
Sample Date:	Fort Devens	01/20/94	01/20/94	10/14/93	10/14/93	01/26/94	01/26/94	10/13/93	10/13/93	01/26/94	01/26/94
Depth:	Background	39	39	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Field Sample Number:	Concentrations	MX4103X2	MX4103X2	MX4104X1	MX4104X1	MX4104X2	MX4104X2	MX4105X1	MX4105X1	MX4105X2	MX4105X2
PAL CATIONS/ANIONS (µg/L)											
Chloride		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL METALS (µg/L)											
Aluminum	6870	22000	< 141 F	< 141	< 141 F	2070	< 141 F	12800	< 141 F	222000	< 141 F
Antimony	3.03	< 3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03	< 3.03 F
Arsenic	10.5	83.4	25.2 F	19.3	23.4 F	1201	< 2.54 F	34.8	17.5 F	43.2	12.7 F
Barium	39.6	136	< 5 F	12.1	12.9 F	20.8	10.5 F	58.6	12.2 F	83.4	7.3 F
Beryllium	5	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F
Calcium	14700	15000	8190 F	2310	2420 F	2710	2440 F	3040	3320 F	3510	2930 F
Chromium	14.7	31.8	< 6.02 F	< 6.02	< 6.02 F	6.12	< 6.02 F	14.4	< 6.02 F	35.7	< 6.02 F
Cobalt	25	< 25	< 25 F	< 25	< 25 F	< 25	< 25 F	< 25	< 25 F	< 25	< 25 F
Copper	8.09	36	< 8.09 F	< 8.09	< 8.09 F	< 8.09	< 8.09 F	11.9	< 8.09 F	21.9	< 8.09 F
Iron	9100	32900	138 F	25070	5640 F	6390	1090 F	22500	8250 F	33700	7300 F
Lead	4.25	22.9	< 1.26 F	< 1.26	< 1.26 F	3.4	< 1.26 F	6.18	< 1.26 F	18.7	< 1.26 F
Magnesium	3480	8340	1090 F	< 500	< 500 F	991	< 500 F	3140	< 500 F	5250	611 F
Manganese	291	1210	< 2.75 F	195	138 F	86.1	44 F	330	333 F	432	173 F
Mercury	0.243	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F
Nickel	34.3	43.5	< 34.3 F	< 34.3	< 34.3 F	< 34.3	< 34.3 F	< 34.3	< 34.3 F	< 34.3	< 34.3 F
Potassium	2370	8540	2700 F	1500	1000 F	1400	1190 F	3830	1370 F	5470	1420 F
Silver	4.6	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F
Sodium	10800	7910	6840 F	1730	1790 F	1620	1610 F	2300	1830 F	2330	1720 F
Vanadium	11	24.6	< 11 F	< 11	< 11 F	< 11	< 11 F	28.9	< 11 F	29.7	< 11 F
Zinc	21.1	146	< 21.1 F	< 21.1	< 21.1 F	42.5	34.4 F	34.2	< 21.1 F	34.4	23.4 F
PAL PESTICIDES (µg/L)											
Endrin		< 0.0236	NA	< 0.0236	NA	< 0.0236	NA	< 0.0236	NA	< 0.0236	NA
PAL EXPLOSIVES (µg/L)											
Nitroglycerin		34.5	NA	< 10	NA	< 10	NA	< 10		< 10	NA
PAL SEMIVOLATILE ORGANICS (µg/L)											
*Bis(2-ethylhexyl) Phthalate		3.5	NA	< 4.8	NA	< 4.8	NA	10	NA	< 4.8	NA
PAL VOLATILE ORGANICS (µg/L)											
1,2-dichloroethylenes (cis And Trans Isomers)		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
xylenes		< 0.84	NA	< 0.84	NA	< 0.84	NA	< 0.84	NA	< 0.84	
1,1,2,2-tetrachloroethane		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
Carbon Disulfide		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	
Carbon Tetrachloride		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	
*Chloroform		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
*Methylene Chloride		< 2.3	NA	< 2.3	NA	< 2.3	NA	< 2.3	NA	< 2.3	
Methylethyl Ketone / 2-butanone		< 6.4	NA	< 6.4	NA	< 6.4	NA	< 6.4	NA	< 6.4	NA
Tetrachloroethylene / Tetrachloroethene		< 1.6	NA	< 1.6	NA	< 1.6	NA	< 1.6	NA	< 1.6	NA
*Toluene		0.7	NA	< 0.6	NA	< 0.6	NA	< 0.6	NA	< 0.6	NA
Benzene		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
Trichloroethylene / Trichloroethene		190	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
2,4,6-Trinitrotoluene		< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63	NA
WATER QUALITY PARAMETERS (µg/L)											
Alkalinity		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite, Nitrate - non Specific		NA	NA	NA	NA	NA	NA	< NA	NA	NA	NA
Nitrogen By Kjeldahl Method		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids		64000	NA	NA	NA	15000	NA	23000	NA	NA	NA
Total Hardness		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Suspended Solids		290000	NA	7000	NA	27000	NA	330000	NA	780000	NA

Table 43

GROUNDWATER OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

		ROUND 3	ROUND 4		ROUND 3		ROUND 4		ROUND 3
Site ID:		41M-92-01X	41M-92-01X	41M-92-01X	41M-92-01X	41M-93-02A	41M-93-02A	41M-93-02A	41M-93-02A	41M-93-02B
Sample Date:	Fort Devens	12/07/94	12/07/94	05/18/95	05/16/95	12/06/94	12/06/94	03/16/95	03/16/95	12/06/94
Depth:	Background	30	30	30	30	8	8	8	8	27
Field Sample Number:	Concentrations	MX4101X4	MX4101X4	MX4101X5	MX4101X5	MX4102A3	MX4102A3	MX4102A4	MX4102A4	MX4102B3
PAL CATIONS/ANIONS (µg/L)										
Chloride		< 2120	NA	< 2120	NA	< 2120	NA	3510	NA	< 2120
Phosphate		58000	NA	16000	NA	31.5	NA	305	NA	12010
Sulfate		< 10000	NA	< 10000	NA	40000	NA	< 10000	NA	< 10000
PAL METALS (µg/L)										
Aluminum	6870	171000	477 F	96400	< 141 F	2300	< 141 F	1270	< 141 F	106000
Antimony	3.03	< 3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03	< 3.03 F	3.75
Arsenic	10.5	40.5	4.26 F	35.9	< 2.54 F	< 2.54	< 2.54 F	< 2.54	< 2.54 F	68.7
Barium	39.6	372	5.00 F	211	< 5 F	41.0	10.9 F	17.7	7.29 F	340
Beryllium	5	5.72	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5
Calcium	14700	47300	3230 F	10700	3310 F	9000	8300 F	5500	6100 F	34800
Chromium	14.7	200	< 6.02 F	64.3	< 6.02 F	< 6.02	< 6.02 F	< 6.02	< 6.02 F	178
Cobalt	25	126	< 25 F	39.6	< 25 F	< 25	< 25 F	< 25	< 25 F	91.8
Copper	8.09	220	13.6 F	82.7	< 8.09 F	< 8.09	< 8.09 F	< 8.09	< 8.09 F	180
Iron	9100	254000	480 F	43800	63.4 F	2930	63.3 F	1450	< 38.8 F	172000
Lead	4.25	97.5	< 1.26 F	50	< 1.26 F	< 1.26	< 1.26 F	1.41	< 1.26 F	47.5
Magnesium	3400	61000	1300 F	13100	1940 F	2630	1620 F	1140	647 F	59400
Manganese	291	5120	44.4 F	695	18.5 F	47.2	6.16 F	24.5	4.72 F	2780
Mercury	0.243	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243
Nickel	34.3	534	< 34.3 F	67.0	< 34.3 F	< 34.3	< 34.3 F	< 34.3	< 34.3 F	237
Potassium	2370	37100	1630 F	10700	967 F	5590	5200 F	965	849 F	27100
Silver	4.6	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6
Sodium	10800	12200	6530 F	8930	6400 F	13300	6600 F	3650	3040 F	13600
Vanadium	11	301	< 11 F	61.1	< 11 F	< 11	< 11 F	< 11	< 11 F	170
Zinc	21.1	633	42.4 F	133	< 21.1 F	23.6	27.4 F	< 21.1	< 21.1 F	458
PAL PESTICIDES (µg/L)										
Endrin		NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL EXPLOSIVES (µg/L)										
Nitroglycerin		NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL SEMIVOLATILE ORGANICS (µg/L)										
*Bis(2-ethylhexyl) Phthalate		< 4.8	NA	< 4.8	NA	< 4.8	NA	< 4.8	NA	3.7 B
PAL VOLATILE ORGANICS (µg/L)										
1,2-dichloroethylenes (cis And Trans Isomers)		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	1.6
xylenes		< 0.84	NA	< 0.84	NA	< 0.84	NA	< 0.84	NA	0.91
1,1,2,2-tetrachloroethane		34	NA	25	NA	< 0.51	NA	< 0.51	NA	1.9
Carbon Disulfide		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5
Carbon Tetrachloride		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5
*Chloroform		0.64	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5
*Methylene Chloride		< 2.3	NA	< 2.2	NA	< 2.3	NA	< 2.3	NA	< 2.3
Methylethyl Ketone / 2-butanone		< 6.4	NA	< 6.4	NA	< 6.4	NA	< 6.4	NA	< 6.4
Tetrachloroethylene / Tetrachloroethene		2.2	NA	< 1.6	NA	< 1.6	NA	< 1.6	NA	< 1.6
*Toluene		6.4	NA	< 0.5	NA	2	NA	< 0.5	NA	2.1
Benzene		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5
Trichloroethylene / Trichloroethene		48	NA	26	NA	< 0.5	NA	< 0.5	NA	10
2,4,6-Trinitrotoluene		< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63
WATER QUALITY PARAMETERS (µg/L)										
Alkalinity		27000	NA	29000	NA	9000	NA	23000	NA	42000
Nitrite, Nitrate - non Specific		58.4	NA	21.9	NA	< 10	NA	< 10	NA	18.4
Nitrogen By Kjeldahl Method		305	NA	495	NA	714	NA	371	NA	419
Total Dissolved Solids		NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Hardness		118000	NA	60100	NA	34400	NA	19600	NA	64400
Total Suspended Solids		27000000	NA	13400000	NA	80000	NA	9750000	NA	11500000

Table 43

GROUNDWATER OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

		ROUND 5	ROUND 6		ROUND 5		ROUND 6		ROUND 5	
Site ID:		41M-93-05B	41M-93-05B	41M-93-05B	41M-94-02C	41M-94-02C	41M-94-02C	41M-94-02C	41M-93-03X	41M-93-03X
Sample Date:	Fort Devens	12/06/94	09/16/95	09/16/95	12/06/94	12/06/94	09/16/95	09/16/95	12/06/94	12/06/94
Depth:	Background	27	27	27	40.5	40.5	40.5	40.5	39	39
Field Sample Number:	Concentrations	MX4105B5	MX4105B6	MX4105B6	MX4102C5	MX4102C5	MX4102C6	MX4102C6	MX4103X5	MX4103X5
PAL CATIONS/ANIONS (µg/L)										
Chloride		NA	< 2130	NA	< 2130	NA	< 2130	NA	2120	NA
Phosphate		NA	2900	NA	< 13.3	NA	201	NA	104	NA
Sulfate		NA	< 10000	NA	< 10000	NA	< 10000	NA	< 10000	NA
PAL METALS (µg/L)										
Aluminum	6870	< 141 F	13000	< 141 F	300	< 141 F	< 141	< 141 F	1270	< 141 F
Antimony	3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03	3.48 F	< 3.03	< 3.03 F	< 3.03	3.39 F
Arsenic	10.5	4.26 F	6.4	< 2.54 F	7.04	< 2.54 F	3.42	< 2.54 F	3.39	3.63 F
Barium	39.6	< 5 F	93.5	< 5 F	< 5	< 5 F	< 5	11.9 F	8.93	< 5 F
Beryllium	5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F
Calcium	14700	4900 F	6100	3400 F	3310	3990 F	3470	2500 F	6200	4340 F
Chromium	14.7	< 6.02 F	33.8	6.42 F	< 6.02	< 6.02 F	< 6.02	< 6.02 F	10.3	< 6.02 F
Cobalt	25	< 25 F	< 25	< 25 F	< 25	< 25 F	< 25	< 25 F	< 25	< 25 F
Copper	8.09	< 8.09 F	22.9	< 8.09 F	< 8.09	< 8.09 F	< 8.09	< 8.09 F	14	< 8.09 F
Iron	9100	130 F	16200	94.3 F	< 38.8	< 38.8 F	< 38.8	393 F	1620	< 38.8 F
Lead	4.25	< 1.26 F	9.33	< 1.26 F	< 1.26	< 1.26 F	< 1.26	< 1.26 F	< 1.26	< 1.26 F
Magnesium	3480	3400 F	6800	2250 F	780	770 F	740	< 500 F	2270	1990 F
Manganese	291	32.8 F	480	30.7 F	7.36	7.77 F	2.31	81.3 F	50.7	3.93 F
Mercury	0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F
Nickel	34.3	< 34.3 F	< 34.3	< 34.3 F	< 34.3	< 34.3 F	< 34.3	< 34.3 F	< 34.3	< 34.3 F
Potassium	2370	2370 F	5140	1570 F	955	1440 F	1032	629 F	2090	1170 F
Silver	4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F
Sodium	10800	8700 F	9890	8830 F	9100	5410 F	5400	1610 F	6020	5410 F
Vanadium	11	< 11 F	20.5	< 11 F	< 11	< 11 F	< 11	< 11 F	17	< 11 F
Zinc	21.1	96 F	40.7	< 21.1 F	< 21.1	< 21.1 F	< 21.1	153 F	43.9	27.8 F
PAL PESTICIDES (µg/L)										
Endrin		NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL EXPLOSIVES (µg/L)										
Nitroglycerin		NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL SEMIVOLATILE ORGANICS (µg/L)										
*Bis (2-ethylhexyl) Phthalate		NA	< 4.8	NA	7.3 B	NA	13	NA	< 4.8	NA
PAL VOLATILE ORGANICS (µg/L)										
1,2-dichloroethylenes (cis And Trans Isomers)		NA	3.6	NA	< 0.5	NA	< 0.5	NA	< 1	NA
Acetone		NA	< 0.84	NA	< 0.84	NA	< 0.84	NA	< 2	NA
1,1,2,2-tetrachloroethane		NA	4	NA	< 0.51	NA	< 0.51	NA	< 1	NA
Carbon Disulfide		NA	< 0.5	NA	0.2	NA	< 0.5	NA	< 1	NA
Carbon Tetrachloride		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 1	NA
*Chloroform		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 1	NA
*Methylene Chloride		NA	< 2.3	NA	< 2.3	NA	< 2.3	NA	< 5	NA
Methylethyl Ketone / 2-butanone		NA	< 6.4	NA	< 6.4	NA	< 6.4	NA	< 10	NA
Tetrachloroethylene / Tetrachloroethene		NA	< 1.6	NA	< 1.6	NA	< 1.6	NA	< 3	NA
*Toluene		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 1	NA
Benzene		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 1	NA
Trichloroethylene / Trichloroethene		NA	17	NA	1.6	NA	13	NA	200	NA
2,4,6-Trinitrotoluene		NA	< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63	NA
WATER QUALITY PARAMETERS (µg/L)										
Alkalinity		NA	38000	NA	14000	NA	3000	NA	2600	NA
Nitrite, Nitrate - non Specific		NA	< 10	NA	21.3	NA	< 10	NA	1700	NA
Nitrogen By Kjeldahl Method		NA	870	NA	< 183	NA	365	NA	< 183	NA
Total Dissolved Solids		NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Hardness		NA	25000	NA	10.0	NA	4000	NA	26400	NA
Total Suspended Solids		NA	4200000	NA	< 4000	NA	12000	NA	447000	NA

Table 43.

GROUNDWATER OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

		ROUND 5		ROUND 6		ROUND 5		ROUND 6		ROUND 5
Site ID:		41M-93-03X	41M-93-03X	41M-93-03X	41M-93-03X	41M-94-03B	41M-94-03B	41M-94-03B	41M-94-03B	41M-93-04X
Sample Date:	Fort Devens	12/06/94	12/06/94	03/20/95	03/20/95	12/08/94	12/08/94	03/20/95	03/20/95	12/07/94
Depth:	Background	39	39	39	39	64	64	64	64	6.5
Field Sample Number:	Concentrations	MD4103X3	MD4103X3	MX4103X4	MX4103X4	MX4103B3	MX4103B3	MX4103B4	MX4103B4	MX4104X5
PAL CATIONS/ANIONS (µg/L)										
Chloride		2410	NA	2530	NA	< 2120	NA	2740	NA	< 2130
Phosphate		155	NA	104	NA	51.5	NA	5200	NA	15.5
Sulfate		< 10000	NA	< 10000	NA	< 10000	NA	< 10000	NA	< 10000
PAL METALS (µg/L)										
Aluminum	6870	1500	< 141 DF	1270	1500 F	< 141	< 141 F	7470	< 141 F	< 141
Antimony	3.03	< 3.03	< 3.03 DF	< 3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03
Arsenic	10.5	4.37	3.62 DF	4.38	4.37 F	3.62	2.98 F	17.5	4.38 F	< 5
Barium	39.6	158	< 5 DF	8.32	8.08 F	< 5	< 5 F	34.7	< 5 F	12.1
Beryllium	5	8.08	< 5 DF	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5
Calcium	14700	15000	8190 DF	5810	5900 F	5310	5330 F	6420	4900 F	2310
Chromium	14.7	35.8	< 6.02 DF	< 6.02	< 6.02 F	< 6.02	< 6.02 F	14.4	< 6.02 F	< 6.02
Cobalt	25	< 25	< 25 DF	< 25	< 25 F	< 25	< 25 F	< 25	< 25 F	< 25
Copper	8.09	36	< 8.09 DF	< 8.09	< 8.09 F	< 8.09	< 8.09 F	18.4	< 8.09 F	< 8.09
Iron	9100	57.9	57.9 DF	1620	1900 F	< 38.8	57.9 F	10700	< 38.8 F	5870
Lead	4.25	22.0	< 1.26 DF	< 1.26	< 1.26 F	< 1.26	< 1.26 F	5.75	< 1.26 F	1.26
Magnesium	3400	2430	1900 DF	1710	2430 F	1990	1960 F	4010	1710 F	< 500
Manganese	291	31.0	< 2.75 DF	3.63	31 F	< 2.75	< 2.75 F	190	3.63 F	135
Mercury	0.243	< 0.243	< 0.243 DF	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	0.243 F	< 0.243
Nickel	34.3	43.5	< 34.3 DF	< 34.3	< 34.3 F	< 34.3	< 34.3 F	< 34.3	34.3 F	< 34.3
Potassium	2370	8540	2700 DF	1090	1940 F	1400	933 F	3020	1800 F	1560
Silver	4.6	< 4.6	< 4.6 DF	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6
Sodium	10800	7910	6840 DF	5400	5740 F	5520	5520 F	5790	5100 F	1720
Vanadium	11	36.6	< 11 DF	< 11	< 11 F	< 11	< 11 F	< 11	< 11 F	< 11
Zinc	21.1	140	< 21.1 DF	45.9	< 21.1 F	27.8	< 21.1 F	28.9	< 21.1 F	< 21.1
PAL PESTICIDES (µg/L)										
Endrin		NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL EXPLOSIVES (µg/L)										
Nitroglycerin		NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL SEMIVOLATILE ORGANICS (µg/L)										
*Bis(2-ethylhexyl) Phthalate		10 B	NA	12	NA	NA	NA	< 4.8	NA	< 4.8
PAL VOLATILE ORGANICS (µg/L)										
1,2-dichloroethylenes (cis And Trans Isomers)		< 0.5	NA	< 1	NA	< 0.5	NA	< 0.5	NA	< 0.5
xylenes		< 0.84	NA	< 2	NA	< 0.84	NA	< 0.84	NA	< 0.84
1,1,2,2-tetrachloroethane		< 0.51	NA	< 1	NA	< 0.51	NA	< 0.51	NA	< 0.51
Carbon Disulfide		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5
Carbon Tetrachloride		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5
*Chloroform		< 0.5	NA	< 1	NA	< 0.5	NA	< 0.5	NA	2.8
*Methylene Chloride		< 2.3	NA	< 5	NA	< 2.3	NA	< 2.3	NA	< 2.3
Methylethyl Ketone / 2-butanone		< 6.4	NA	< 10	NA	< 6.4	NA	< 6.4	NA	< 6.4
Tetrachloroethylene / Tetrachloroethene		< 1.6	NA	< 3	NA	< 1.6	NA	< 1.6	NA	< 1.6
*Toluene		1	NA	< 1	NA	0.6	NA	< 0.5	NA	0.63
Benzene		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5
Trichloroethylene / Trichloroethene		200	NA	180	NA	< 0.5	NA	0.51	NA	1.5
2,4,6-Trinitrotoluene		< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63
WATER QUALITY PARAMETERS (µg/L)										
Alkalinity		NA	NA	28000	NA	18000	NA	25000	NA	NA
Nitrite, Nitrate-non Specific		NA	NA	1700	NA	155	NA	1100	NA	NA
Nitrogen By Kjeldahl Method		NA	NA	< 183	NA	< 183	NA	524	NA	NA
Total Dissolved Solids		64000	NA	NA	NA	NA	NA	NA	NA	NA
Total Hardness		NA	NA	36400	NA	16000	NA	23600	NA	NA
Total Suspended Solids		2900000	NA	135000	NA	71000	NA	4930000	NA	5000

Table 43

GROUNDWATER OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

		ROUND 3	ROUND 4				ROUND 3		ROUND 4	
Site ID:		41M-93-04X	41M-93-04X	41M-93-04X	41M-93-04X	41M-93-04X	41M-93-05X	41M-93-05X	41M-93-05X	41M-93-05X
Sample Date:	Fort Devens	12/07/94	03/13/95	03/13/95	03/13/95	03/14/95	12/07/94	12/07/94	03/14/95	03/14/95
Depth:	Background	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Field Sample Number:	Concentrations	MX4104X3	MX4104X4	MX4104X4	MD4104X4	MD4104X4	MX4105X3	MX4105X3	MX4105X4	MX4105X4
PAL CATIONS/ANIONS (µg/L)										
Chloride		NA	2700	NA	2830	NA	2830	NA	< 3170	NA
Phosphate		NA	301	NA	< 13.3	NA	< 13.3	NA	301	NA
Sulfate		NA	< 10000	NA	< 10000	NA	< 10000	NA	< 10000	NA
PAL METALS (µg/L)										
Aluminum	6870	< 141 F	2870	< 141 F	< 141	< 141 DF	12900	< 141 F	22900	< 141 F
Antimony	3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03	< 3.03 DF	< 3.03	< 3.03 F	< 3.03	< 3.03 F
Arsenic	10.5	< 5 F	20.1	< 2.54 F	13.6	9.38 DF	7.04	< 2.54 F	43.2	12.7 F
Barium	39.6	12.3 F	20.8	10.5 F	4.97	3.18 DF	50.6	12.2 F	83.4	7.34 F
Beryllium	5	< 5 F	< 5	< 5 F	< 5	< 5 DF	< 5	< 5 F	< 5	< 5 F
Calcium	14700	2420 F	2510	2440 F	2880	2200 DF	3640	3320 F	3310	2530 F
Chromium	14.7	< 6.02 F	6.12	< 6.02 F	< 6.02	< 6.02 DF	14.4	< 6.02 F	31.7	< 6.02 F
Cobalt	25	< 25 F	< 25	< 25 F	< 25	< 25 DF	< 25	< 25 F	< 25	< 25 F
Copper	8.09	< 8.09 F	< 8.09	< 8.09 F	< 8.09	< 8.09 DF	11.9	< 8.09 F	21.9	< 8.09 F
Iron	9100	3640 F	6390	1090 F	4160	2700 DF	23000	8250 F	30700	7900 F
Lead	4.25	< 1.26 F	3.47	< 1.26 F	< 1.26	< 1.26 DF	< 1.26	< 1.26 F	< 1.26	< 1.26 F
Magnesium	3480	< 500 F	991	< 500 F	< 500	< 500 DF	3140	< 500 F	3230	611 F
Manganese	291	130 F	86.1	68 F	112	89.8 DF	550	393 F	432	173 F
Mercury	0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 DF	< 0.243	< 0.243 F	< 0.243	< 0.243 F
Nickel	34.3	< 34.3 F	< 34.3	< 34.3 F	< 34.3	< 34.3 DF	< 34.3	< 34.3 F	< 34.3	< 34.3 F
Potassium	2370	1660 F	1490	1190 F	1020	1170 DF	5050	1370 F	5470	1430 F
Silver	4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 DF	< 4.6	< 4.6 F	< 4.6	< 4.6 F
Sodium	10800	1790 F	1630	1610 F	1640	1730 DF	2300	1030 F	2330	1720 F
Vanadium	11	< 11 F	< 11	< 11 F	< 11	< 11 DF	20.9	< 11 F	20.7	< 11 F
Zinc	21.1	< 21.1 F	42.3	26.6 F	< 21.1	87.2 DF	34.2	< 21.1 F	34.6	25.4 F
PAL PESTICIDES (µg/L)										
Endrin		NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL EXPLOSIVES (µg/L)										
Nitroglycerin		NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL SEMIVOLATILE ORGANICS (µg/L)										
*Bis (2-ethylhexyl) Phthalate		NA	4.3	NA	4.8	NA	4.3	NA	15	NA
PAL VOLATILE ORGANICS (µg/L)										
1,2-dichloroethylenes (cis And Trans Isomers)		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
xylenes		NA	< 0.84	NA	< 0.84	NA	< 0.84	NA	< 0.84	NA
1,1,2,2-tetrachloroethane		NA	< 0.51	NA	< 0.51	NA	< 0.51	NA	< 0.51	NA
Carbon Disulfide		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
Carbon Tetrachloride		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
*Chloroform		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
*Methylene Chloride		NA	< 2.3	NA	< 2.3	NA	< 2.3	NA	< 2.3	NA
Methylethyl Ketone / 2-butanone		NA	< 6.4	NA	< 6.4	NA	< 6.4	NA	< 6.4	NA
Tetrachloroethylene / Tetrachloroethene		NA	< 1.6	NA	< 1.6	NA	< 1.6	NA	< 1.6	NA
*Toluene		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
Benzene		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
Trichloroethylene / Trichloroethene		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
2,4,6-Trinitrotoluene		NA	< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63	NA
WATER QUALITY PARAMETERS (µg/L)										
Alkalinity		NA	7000	NA	11000	NA	10000	NA	NA	NA
Nitrite, Nitrate - non Specific		NA	< 10	NA	< 10	NA	21.9	NA	NA	NA
Nitrogen By Kjeldahl Method		NA	390	NA	470	NA	181	NA	NA	NA
Total Dissolved Solids		NA	NA	NA	NA	NA	NA	NA	25000	NA
Total Hardness		NA	17000	NA	10000	NA	9.2	NA	NA	NA
Total Suspended Solids		NA	270000	NA	100000	NA	330000	NA	780000	NA

Table 43

GROUNDWATER OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

		ROUND 3		ROUND 4		ROUND 3		ROUND 4		ROUND 3
Site ID:		41M-94-06X	41M-94-06X	41M-94-06X	41M-94-06X	41M-94-07X	41M-94-07X	41M-94-07X	41M-94-07X	41M-94-08A
Sample Date:	Fort Devens	12/07/94	12/07/94	03/13/95	03/13/95	12/07/94	12/07/94	03/13/95	03/13/95	12/07/94
Depth:	Background	14.3	14.3	14.3	14.3	8	8	8	8	26.9
Field Sample Number:	Concentrations	MX4106X3	MX4106X3	MX4106X4	MX4106X4	MX4107X3	MX4107X3	MX4107X4	MX4107X4	MX4108A3
PAL CATIONS/ANIONS (µg/L)										
Chloride		2520	NA	2630	NA	2740	NA	< 2120	NA	< 2120
Phosphate		< 13.3	NA	500	NA	< 13.3	NA	650	NA	35.5
Sulfate		< 10000	NA	< 10000	NA	< 10000	NA	< 10000	NA	< 10000
PAL METALS (µg/L)										
Aluminum	6870	< 141	< 141 F	< 141	< 141 F	337	< 141 F	< 141	< 141 F	1070
Antimony	3.03	< 3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03
Arsenic	10.5	< 2.54	< 2.54 F	< 2.54	< 2.54 F	< 2.54	< 2.54 F	< 2.54	< 2.54 F	< 2.54
Barium	39.6	< 5	< 5 F	< 5	< 5 F	< 5	5.07 F	4.63	< 5 F	14.4
Beryllium	5	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5
Calcium	14700	2370	2620 F	2190	2000 F	2330	2590 F	2340	2130 F	9400
Chromium	14.7	< 6.02	< 6.02 F	< 6.02	< 6.02 F	< 6.02	< 6.02 F	< 6.02	< 6.02 F	< 6.02
Cobalt	25	< 25	< 25 F	< 25	< 25 F	< 25	< 25 F	< 25	< 25 F	< 25
Copper	8.09	< 8.09	< 8.09 F	< 8.09	< 8.09 F	< 8.09	< 8.09 F	< 8.09	< 8.09 F	< 8.09
Iron	9100	< 38.8	< 38.8 F	146	< 38.8 F	292	< 38.8 F	58.4	< 38.8 F	1620
Lead	4.25	< 1.26	< 1.26 F	< 1.26	< 1.26 F	16.5	< 1.26 F	< 1.26	< 1.26 F	< 1.26
Magnesium	3480	< 500	< 500 F	< 500	< 500 F	< 500	< 500 F	< 500	< 500 F	3170
Manganese	291	10.7	13 F	10	8.54 F	18.3	13 F	11.5	11.2 F	543
Mercury	0.243	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243
Nickel	34.3	< 34.3	< 34.3 F	< 34.3	< 34.3 F	< 34.3	< 34.3 F	< 34.3	< 34.3 F	< 34.3
Potassium	2370	641	493 F	< 375	671 F	< 375	496 F	< 375	< 375 F	4950
Silver	4.6	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6
Sodium	10800	1960	2200 F	1390	1340 F	2740	2510 F	2400	2470 F	8230
Vanadium	11	< 11	< 11 F	< 11	< 11 F	< 11	< 11 F	< 11	< 11 F	< 11
Zinc	21.1	< 21.1	64.8 F	< 21.1	< 21.1 F	< 21.1	71.1 F	< 21.1	< 21.1 F	< 21.1
PAL PESTICIDES (µg/L)										
Endrin		NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL EXPLOSIVES (µg/L)										
Nitroglycerin		NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL SEMIVOLATILE ORGANICS (µg/L)										
*Bis(2-ethylhexyl) Phthalate		9.1	NA	44	NA	43	NA	17	NA	12
PAL VOLATILE ORGANICS (µg/L)										
1,2-dichloroethylenes (cis And Trans Isomers)		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	1.5
xylenes		< 0.84	NA	< 0.84	NA	< 0.84	NA	< 0.84	NA	< 0.84
1,1,2,2-tetrachloroethane		< 0.51	NA	< 0.51	NA	< 0.51	NA	< 0.51	NA	61
Carbon Disulfide		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5
Carbon Tetrachloride		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.58
*Chloroform		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5
*Methylene Chloride		< 2.3	NA	< 2.3	NA	< 2.3	NA	< 2.3	NA	< 2.3
Methylethyl Ketone / 2-butanone		< 6.4	NA	< 6.4	NA	< 6.4	NA	< 6.4	NA	< 6.4
Tetrachloroethylene / Tetrachloroethene		< 1.6	NA	< 1.6	NA	< 1.6	NA	< 1.6	NA	< 1.6
*Toluene		0.74	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	0.65
Benzene		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5
Trichloroethylene / Trichloroethene		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	79
2,4,6-Trinitrotoluene		< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63	NA	0.710
WATER QUALITY PARAMETERS (µg/L)										
Alkalinity		7000	NA	< 5000	NA	< 5000	NA	< 5000	NA	53000
Nitrite, Nitrate-non Specific		20.6	NA	< 10	NA	17.8	NA	< 10	NA	< 10
Nitrogen By Kjeldahl Method		< 183	NA	400	NA	< 183	NA	543	NA	< 183
Total Dissolved Solids		NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Hardness		6.8	NA	6000	NA	8	NA	7200	NA	54.6
Total Suspended Solids		< 4000	NA	145000	NA	8000	NA	184000	NA	66000

Table 43

GROUNDWATER OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

		ROUND 5	ROUND 6		ROUND 5		ROUND 6		ROUND 5		ROUND 6	
Site ID:		41M-94-08A	41M-94-08A	41M-94-08A	41M-94-08B	41M-94-08B	41M-94-08B	41M-94-08B	41M-94-09A	41M-94-09A	41M-94-09A	41M-94-09A
Sample Date:	Fort Devens	12/07/94	09/15/95	09/15/95	12/06/94	12/06/94	09/16/95	09/16/95	12/06/94	12/06/94	09/15/95	09/15/95
Depth:	Background	26.9	26.9	26.9	42	42	42	42	39	39	39	39
Field Sample Number:	Concentrations	MX4108A5	MX4108A6	MX4108A6	MX4108B5	MX4108B5	MX4108B6	MX4108B6	MX4109A5	MX4109A5	MX4109A6	MX4109A6
PAL CATIONS/ANIONS (µg/L)												
Chloride		NA	< 2120	NA	< 2120	NA	< 2120	NA	3070	NA	3960	NA
Phosphate		NA	62.8	NA	283	NA	281	NA	< 33.3	NA	27.3	NA
Sulfate		NA	< 10000	NA	< 10000	NA	< 10000	NA	< 10000	NA	< 10000	NA
PAL METALS (µg/L)												
Aluminum	6870	< 141 F	1530	< 141 F	1310	< 141 F	731	< 141 F	< 141	< 141 F	< 141	< 141 F
Antimony	3.03	4.46 F	< 3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03	< 3.03 F	< 3.03	< 3.03 F
Arsenic	10.5	< 2.54 F	< 2.54	< 2.54 F	20.0	20.1 F	12.0	12.7 F	< 2.54	< 2.54 F	< 2.54	< 2.54 F
Barium	39.6	8.73 F	12.9	10.3 F	10.4	< 5 F	7.44	< 5 F	< 5	< 5 F	< 5	< 5 F
Beryllium	5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F
Calcium	14700	8090 F	8720	8400 F	6130	5700 F	8080	7510 F	3700	4240 F	3730	3470 F
Chromium	14.7	< 6.02 F	< 6.02	< 6.02 F	< 6.02	< 6.02 F	< 6.02	< 6.02 F	< 6.02	< 6.02 F	< 6.02	< 6.02 F
Cobalt	25	< 25 F	< 25	< 25 F	< 25	< 25 F	< 25	< 25 F	< 25	< 25 F	< 25	< 25 F
Copper	8.09	< 8.09 F	< 8.09	< 8.09 F	< 8.09	< 8.09 F	12	< 8.09 F	< 8.09	< 8.09 F	< 8.09	< 8.09 F
Iron	9100	< 38.8 F	2000	105 F	1910	< 38.8 F	737	< 38.8 F	< 38.8	< 38.8 F	< 38.8	< 38.8 F
Lead	4.25	< 1.26 F	1.63	< 1.26 F	2.93	< 1.26 F	< 1.26	< 1.26 F	< 1.26	< 1.26 F	< 1.26	< 1.26 F
Magnesium	3400	2030 F	2910	2310 F	2240	1640 F	2900	2810 F	< 500	< 500 F	< 500	< 500 F
Manganese	291	400 F	303	540 F	34.8	< 2.75 F	47.5	28.3 F	9.51	8.9 F	5.33	5.47 F
Mercury	0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F
Nickel	34.3	< 34.3 F	< 34.3	< 34.3 F	< 34.3	< 34.3 F	< 34.3	< 34.3 F	< 34.3	< 34.3 F	< 34.3	< 34.3 F
Potassium	2370	3750 F	3450	2970 F	6000	5510 F	4000	4470 F	785	1430 F	1100	701 F
Silver	4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F
Sodium	10800	7610 F	8870	7930 F	9790	10900 F	9330	9190 F	2440	2340 F	3430	2640 F
Vanadium	11	< 11 F	< 11	< 11 F	< 11	< 11 F	< 11	< 11 F	< 11	< 11 F	< 11	< 11 F
Zinc	21.1	36.4 F	< 21.1	< 21.1 F	< 21.1	20.2 F	< 21.1	< 21.1 F	< 21.1	129 F	< 21.1	< 21.1 F
PAL PESTICIDES (µg/L)												
Endrin		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL EXPLOSIVES (µg/L)												
Nitroglycerin		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL SEMIVOLATILE ORGANICS (µg/L)												
*Bis(2-ethylhexyl) Phthalate		NA	< 4.8	NA	< 4.8	NA	< 4.8	NA	8.8	NA	5.5	NA
PAL VOLATILE ORGANICS (µg/L)												
1,2-dichloroethylenes (cis And Trans Isomers)		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
xylenes		NA	< 0.84	NA	< 0.84	NA	< 0.84	NA	< 0.84	NA	< 0.84	NA
1,1,2,2-tetrachloroethane		NA	38	NA	< 0.51	NA	< 0.51	NA	< 0.51	NA	< 0.51	NA
Carbon Disulfide		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
Carbon Tetrachloride		NA	2.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
*Chloroform		NA	1.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
*Methylene Chloride		NA	< 2.3	NA	< 2.3	NA	< 2.3	NA	< 2.3	NA	< 2.3	NA
Methylethyl Ketone / 2-butanone		NA	< 6.4	NA	< 6.4	NA	< 6.4	NA	< 6.4	NA	< 6.4	NA
Tetrachloroethylene / Tetrachloroethene		NA	< 1.6	NA	< 1.6	NA	< 1.6	NA	< 1.6	NA	< 1.6	NA
*Toluene		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
Benzene		NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
Trichloroethylene / Trichloroethene		NA	32	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
2,4,6-Trinitrotoluene		NA	< 0.60	NA	< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63	NA
WATER QUALITY PARAMETERS (µg/L)												
Alkalinity		NA	68000	NA	48000	NA	64000	NA	11000	NA	10900	NA
Nitrite, Nitrate - non Specific		NA	< 10	NA	< 10	NA	< 10	NA	270	NA	190	NA
Nitrogen By Kjeldahl Method		NA	< 183	NA	< 183	NA	581	NA	< 183	NA	< 183	NA
Total Dissolved Solids		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Hardness		NA	34400	NA	25000	NA	32200	NA	9.6	NA	9000	NA
Total Suspended Solids		NA	72000	NA	24000	NA	27000	NA	< 4000	NA	10000	NA

Table 43

GROUNDWATER OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

		ROUND 5		ROUND 6		ROUND 5		ROUND 6		ROUND 5	
Site ID:		41M-94-09B	41M-94-09B	41M-94-09B	41M-94-09B	41M-94-10X	41M-94-10X	41M-94-10X	41M-94-10X	41M-94-11X	41M-94-11X
Sample Date:	Fort Devens	12/05/94	12/05/94	03/15/95	03/15/95	12/08/94	12/08/94	03/17/95	03/17/95	12/06/94	12/06/94
Depth:	Background	58	58	58	58	97.5	97.5	97.5	97.5	49.5	49.5
Field Sample Number:	Concentrations	MX4109B3	MX4109B3	MX4109B4	MX4109B4	MX4110X3	MX4110X3	MX4110X4	MX4110X4	MX4111X3	MX4111X3
PAL CATIONS/ANIONS (µg/L)											
Chloride		2740	NA	2850	NA	2520	NA	< 2120	NA	< 2120	NA
Phosphate		249	NA	103	NA	15000	NA	2500	NA	122	NA
Sulfate		< 10000	NA	< 10000	NA	45000	NA	25000	NA	< 10000	NA
PAL METALS (µg/L)											
Aluminum	6870	203	230 F	< 141	< 141 F	96500	< 141 F	2910	< 141 F	3040	< 141 F
Antimony	3.03	< 3.03	< 3.03 F	< 3.03	< 3.03 F	3.64	< 3.03 F	< 3.03	< 3.03 F	< 3.03	< 3.03 F
Arsenic	10.5	3.82	2.77 F	< 2.54	< 2.54 F	59.8	4.05 F	3.84	4.48 F	17.5	13.9 F
Barium	39.6	6.4	5.89 F	5.56	5.11 F	937	6.91 F	21.7	4.67 F	24	< 5 F
Beryllium	5	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F
Calcium	14700	3650	3570 F	3840	3860 F	49300	14600 F	7710	7920 F	6070	7040 F
Chromium	14.7	< 6.02	< 6.02 F	< 6.02	< 6.02 F	155	< 6.02 F	< 6.02	< 6.02 F	7.35	< 6.02 F
Cobalt	25	< 25	< 25 F	< 25	< 25 F	66.7	< 25 F	< 25	< 25 F	25	< 25 F
Copper	8.09	< 8.09	< 8.09 F	< 8.09	< 8.09 F	113	< 8.09 F	< 8.09	< 8.09 F	< 8.09	< 8.09 F
Iron	9100	108	193 F	< 38.8	< 38.8 F	144000	157 F	3090	55.4 F	4780	43 F
Lead	4.25	< 1.26	< 1.26 F	< 1.26	< 1.26 F	46.6	< 1.26 F	2.17	< 1.26 F	2.06	< 1.26 F
Magnesium	3480	< 500	< 500 F	< 500	< 500 F	40600	6890 F	4010	5620 F	1910	1210 F
Manganese	291	33.3	30.3 F	21.8	22.1 F	2670	520 F	228	201 F	57.4	3.41 F
Mercury	0.243	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F	0.346	< 0.243 F	< 0.243	< 0.243 F
Nickel	34.3	< 34.3	< 34.3 F	< 34.3	< 34.3 F	173	< 34.3 F	< 34.3	< 34.3 F	< 34.3	34.3 F
Potassium	2370	1750	800 F	520	946 F	29900	5100 F	7910	4150 F	2790	1990 F
Silver	4.6	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F
Sodium	10800	3830	3390 F	2740	2850 F	19600	13300 F	18100	18000 F	5500	5550 F
Vanadium	11	< 11	< 11 F	< 11	< 11 F	153	< 11 F	< 11	< 11 F	< 11	< 11 F
Zinc	21.1	< 21.1	< 21.1 F	< 21.1	< 21.1 F	375	47.7 F	< 21.1	< 21.1 F	48.3	59.2 F
PAL PESTICIDES/PCBS (µg/L)											
Endrin		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL EXPLOSIVES (µg/L)											
Nitroglycerin		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL SEMIVOLATILE ORGANICS (µg/L)											
*Bis (2-ethylhexyl) Phthalate		< 4.8	NA	23	NA	8.7	NA	5.4	NA	18 B	NA
PAL VOLATILE ORGANICS (µg/L)											
1,2-dichloroethylenes (cis And Trans Isomers)		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
xylenes		< 0.84	NA	< 0.84	NA	< 0.84	NA	< 0.84	NA	< 0.84	NA
1,1,2,2-tetrachloroethane		< 0.51	NA	< 0.51	NA	< 0.51	NA	< 0.51	NA	< 0.51	NA
Carbon Disulfide		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
Carbon Tetrachloride		< .58	NA	< .58	NA	< .58	NA	< .58	NA	< .58	NA
*Chloroform		< .5	NA	< .5	NA	< .5	NA	< .5	NA	< .5	NA
*Methylene Chloride		< 2.3	NA	< 2.3	NA	< 2.3	NA	< 2.3	NA	< 2.3	NA
Methylethyl Ketone / 2-butanone		< 6.4	NA	< 6.4	NA	< 6.4	NA	< 6.4	NA	< 6.4	NA
Tetrachloroethylene / Tetrachloroethene		< 1.6	NA	< 1.6	NA	< 1.6	NA	< 1.6	NA	< 1.6	NA
*Toluene		< 0.65	NA	< 0.65	NA	.82	NA	< 0.5	NA	.86 B	NA
Benzene		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
Trichloroethylene / Trichloroethene		< 0.5	NA	< 0.5	NA	8.3	NA	11	NA	< .5	NA
2,4,6-Trinitrotoluene		< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63	NA
PAL WATER QUALITY PARAMETERS (µg/L)											
alkalinity		< 14000	NA	11000	NA	53000	NA	43000	NA	31000	NA
nitrite, Nitrate-non Specific		< 400	NA	550	NA	10	NA	< 10	NA	< 10	NA
nitrogen By Kjeldahl Method		< 183	NA	< 183	NA	362	NA	324	NA	< 183	NA
total Dissolved Solids		< NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
total Hardness		< 12400	NA	10800	NA	166000	NA	31600	NA	18.8	NA
total Suspended Solids		< 4000	NA	9000	NA	11500000	NA	351000	NA	41000	NA

Table 43

GROUNDWATER OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

		ROUND 6		ROUND 5		ROUND 6		ROUND 5		ROUND 6	
Site ID:		41M-94-11X	41M-94-11X	41M-94-12X	41M-94-12X	41M-94-12X	41M-94-12X	41M-94-13X	41M-94-13X	41M-94-13X	41M-94-13X
Sample Date:	Fort Devens	03/14/95	03/14/95	12/08/94	12/08/94	03/15/95	03/15/95	12/08/94	12/08/94	03/16/95	03/16/95
Depth:	Background	49.5	49.5	58	58	58	58	28.5	28.5	28.5	28.5
Field Sample Number:	Concentrations	MX4111X4	MX4111X4	MX4112X3	MX4112X3	MX4112X4	MX4112X4	MX4113X3	MX4113X3	MX4113X4	MX4113X4
PAL CATIONS/ANIONS (µg/L)											
Chloride		< 2120	NA	< 2120	NA	< 2120	NA	< 2120	NA	< 2120	NA
Phosphate		106	NA	443	NA	247	NA	37.3	NA	135	NA
Sulfate		< 10000	NA	10000	NA	10000	NA	< 10000	NA	< 10000	NA
PAL METALS (µg/L)											
Aluminum	6870	982	< 141 F	16100	< 141 F	10000	< 141 F	961 F	< 141 F	5300	< 141 F
Antimony	3.03	< 3.03	< 3.03 F	< 3.03	3.93 F	< 3.03	< 3.03 F	< 3.03 F	< 3.03 F	< 3.03	< 3.03 F
Arsenic	10.5	9.91	7.08 F	19.4	6.88 F	11.2	< 2.54 F	< 2.54 F	< 2.54 F	6.4	< 2.54 F
Barium	39.6	10.2	< 5 F	86.6	7.13 F	58.7	8.09 F	9.35 F	< 5 F	26.5	< 5 F
Beryllium	5	< 5	< 5 F	< 5	< 5 F	< 5	< 5 F	< 5 F	< 5 F	< 5	< 5 F
Calcium	14700	8000	7500 F	16600	11000 F	9110	6740 F	8510 F	7460 F	7060	5600 F
Chromium	14.7	< 6.02	< 6.02 F	25.2	< 6.02 F	19.2	< 6.02 F	< 6.02 F	< 6.02 F	7.74	< 6.02 F
Cobalt	25	< 25	< 25 F	< 25	< 25 F	< 25	< 25 F	< 25 F	< 25 F	< 25	< 25 F
Copper	8.09	< 8.09	< 8.09 F	16.5	10.9 F	14.7	< 8.09 F	< 8.09 F	< 8.09 F	< 8.09	< 8.09 F
Iron	9100	1140	49 F	21000	125 F	13900	73.5 F	1200 F	< 38.8 F	6220	< 38.8 F
Lead	4.25	< 1.26	< 1.26 F	8.13	< 1.26 F	7.16	< 1.26 F	< 1.26 F	< 1.26 F	4.01	< 1.26 F
Magnesium	3480	1840	1550 F	8090	2740 F	6570	2630 F	1550 F	1100 F	2550	1280 F
Manganese	291	19.4	5.65 F	314 J	64.5 F	402	216 F	54.7 F	32.2 F	120	10.8 F
Mercury	0.243	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243	< 0.243 F	< 0.243 F	< 0.243 F	< 0.243	< 0.243 F
Nickel	34.3	34.3	34.3 F	34.3	34.3 F	34.3	34.3 F	34.3 F	< 34.3 F	34.3	< 34.3 F
Potassium	2370	3140	2000 F	15100	8500 F	6990	9350 F	2170 F	1730 F	2280	913 F
Silver	4.6	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6	< 4.6 F	< 4.6 F	< 4.6 F	< 4.6	< 4.6 F
Sodium	10800	5640	5490 F	14700	11000 F	12900	11000 F	7210 F	6780 F	7460	6790 F
Vanadium	11	< 11	< 11 F	20.4	< 11 F	17.7	< 11 F	< 11 H	< 11 F	< 11	< 11 F
Zinc	21.1	< 21.1	< 21.1 F	39.5	< 21.1 F	39.4	< 21.1 F	< 21.1 F	< 21.1 F	< 21.1	< 21.1 F
PAL PESTICIDES/PCBS (µg/L)											
Endrin		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL EXPLOSIVES (µg/L)											
Nitroglycerin		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAL SEMIVOLATILE ORGANICS (µg/L)											
*Bis (2-ethylhexyl) Phthalate		10	NA	59	NA	7.4	NA	< 4.8	NA	< 4.8	NA
PAL VOLATILE ORGANICS (µg/L)									NA		
1,2-dichloroethylenes (cis And Trans Isomers)		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
xylenes		< 0.84	NA	< 0.84	NA	< 0.84	NA	< 0.84	NA	< 0.84	NA
1,1,2,2-tetrachloroethane		< 0.51	NA	< 0.51	NA	< 0.51	NA	.97	NA	5.1	NA
Carbon Disulfide		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
Carbon Tetrachloride		< .58	NA	< .58	NA	< .58	NA	< .58	NA	< 0.58	NA
*Chloroform		< .5	NA	< .5	NA	< .5	NA	< .5	NA	< .5	NA
*Methylene Chloride		< 2.3	NA	< 2.3	NA	< 2.3	NA	< 2.3	NA	< 2.3	NA
Methylethyl Ketone / 2-butanone		< 6.4	NA	< 6.4	NA	< 6.4	NA	< 6.4	NA	< 6.4	NA
Tetrachloroethylene / Tetrachloroethene		< 1.6	NA	< 1.6	NA	< 1.6	NA	< 1.6	NA	< 1.6	NA
*Toluene		< 0.5	NA	.52	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA
Benzene		< 0.5	NA	< 0.5	NA	< 0.5	NA	< 0.5		< 0.5	NA
Trichloroethylene / Trichloroethene		< .5	NA	< 0.5	NA	< 0.5	NA	< 0.5	NA	0.9	NA
2,4,6-Trinitrotoluene		< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63	NA	< 0.63	NA
PAL WATER QUALITY PARAMETERS (µg/L)											
alkalinity		32000	NA	61000	NA	43000	NA	33000	NA	25000	NA
nitrite, Nitrate-non Specific		< 10	NA	< 10	NA	< 10	NA	< 10	NA	< 10	NA
nitrogen By Kjeldahl Method		419	NA	276	NA	305	NA	< 183	NA	333	NA
total Dissolved Solids		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
total Hardness		27000	NA	50400	NA	35000	NA	24000	NA	22000	NA
total [illegible]d Solids		30000	NA	872000	NA	340000	NA	169000	NA	190000	NA

Table 43

GROUNDWATER OFF-SITE LABORATORY ANALYTICAL RESULTS
AOC 41 - UNAUTHORIZED DUMPING AREA (SITE A)

		ROUND 5				ROUND 6	
Site ID:		41M-94-14X	41M-94-14X	41M-94-14X	41M-94-14X	41M-94-14X	41M-94-14X
Sample Date:	Fort Devens	12/07/94	12/07/94	12/07/94	12/07/94	03/13/95	03/13/95
Depth:	Background	8	8	8	8	8	8
Field Sample Number:	Concentrations	MX4114X3	MD4114X3	MX4114X3	MD4114X3	MX4114X4	MX4114X4
PAL CATIONS/ANIONS (μg/L)							
Chloride		2740	2740 D	NA	NA	< 2120 ?	NA
Phosphate		< 13.3	< 13.3 D	NA	NA	990	NA
Sulfate		< 10000	< 10000 D	NA	NA	< 10000 ?	NA
PAL METALS (μg/L)							
Aluminum	6870	< 141	< 141 D	< 141 F	< 141 DF	< 141	< 141
Antimony	3.03	< 3.03	< 3.03 D	< 3.03 F	< 3.03 DF	< 3.03	< 3.03
Arsenic	10.5	< 2.54	< 2.54 D	< 2.54 F	< 2.54 DF	< 2.54	< 2.54
Barium	39.6	5.76	6.19 D	< 5 F	6.5 DF	< 5	< 5
Beryllium	5	< 5	< 5 D	< 5 F	< 5 DF	< 5	< 5
Calcium	14700	3320	3380 D	3420 F	3390 DF	3220	3240
Chromium	14.7	< 6.02	< 6.02 D	< 6.02 F	< 6.02 DF	< 6.02	< 6.02
Cobalt	25	< 25	< 25 F	25 F	< 25 DF	< 25	< 25
Copper	8.09	< 8.09	< 8.09 D	< 8.09 F	< 8.09 DF	< 8.09	< 8.09
Iron	9100	< 38.8	< 38.8 D	131 F	81.7 DF	< 38.8	< 38.8
Lead	4.25	< 1.26	< 1.26 D	< 1.26 F	< 1.26 DF	< 1.26	< 1.26
Magnesium	3480	< 500	< 500 D	< 500 F	< 500 DF	< 500	< 500
Manganese	291	57.9 J	55.6 D	101 F	53.5 DF	4.74	4.74
Mercury	0.243	< 0.243	< 0.243 D	< 0.243 F	< 0.243 DF	< 0.243	< 0.243
Nickel	34.3	34.3	34.3 D	34.5 F	34.3 DF	34.3	34.3
Potassium	2370	726	1150 D	715 F	826 DF	< 375	< 375
Silver	4.6	< 4.6	< 4.6 D	< 4.6 F	< 4.6 DF	< 4.6	< 4.6
Sodium	10800	2050	2150 D	2110 F	2100 DF	2290	2270
Vanadium	11	< 11	< 11 D	< 11 F	< 11 DF	< 11	< 11
Zinc	21.1	< 21.1	< 21.1 D	< 21.1 F	< 21.1 DF	< 21.1	< 21.1
PAL PESTICIDES/PCBS (μg/L)							
Endrin		NA	NA	NA	NA	NA	NA
PAL EXPLOSIVES (μg/L)							
Nitroglycerin		NA	NA	NA	NA	NA	NA
PAL SEMIVOLATILE ORGANICS (μg/L)							
*Bis (2-ethylhexyl) Phthalate		< 4.8	20 D	NA	NA	< 4.8	NA
PAL VOLATILE ORGANICS (μg/L)							
1,2-dichloroethylenes (cis And Trans Isomers)		< 0.5	< 0.5 D	NA	NA	< 0.5	NA
xylenes		< 0.84	< 0.84 D	NA	NA	< 0.84	NA
1,1,2,2-tetrachloroethane		< .51	< .51 D	NA	NA	< .51	NA
Carbon Disulfide		< 0.5	< 0.5 D	NA	NA	< 0.5	NA
Carbon Tetrachloride		< 0.58	< 0.58 D	NA	NA	< 0.58	NA
*Chloroform		.68	< 0.5 D	NA	NA	< 0.5	NA
*Methylene Chloride		< 2.3	< 2.3 D	NA	NA	< 2.3	NA
Methylethyl Ketone / 2-butanone		< 6.4	< 6.4 D	NA	NA	< 6.4	NA
Tetrachloroethylene / Tetrachloroethene		< 1.6	< 1.6 D	NA	NA	< 1.6	NA
*Toluene		< 0.5	< 0.5 D	NA	NA	< 0.5	NA
Benzene		< 0.5	< 0.5 D	NA	NA	< 0.5	NA
Trichloroethylene / Trichloroethene		1.2	1.1 D	NA	NA	< 0.5	NA
2,4,6-Trinitrotoluene		< 0.63	< 0.63 D	< NA	NA	< 0.63	NA
PAL WATER QUALITY PARAMETERS (μg/L)							
alkalinity		10000	9000 D	NA	NA	8000	NA
nitrite, Nitrate-non Specific		12	11.9 D	NA	NA	< 10	NA
nitrogen By Kjeldahl Method		< 183	< 183 D	NA	NA	1430	NA
total Dissolved Solids		NA	NA	NA	NA	NA	NA
total Hardness		8.8	8.8 D	NA	NA	11600	NA
total Suspended Solids		< 4000	< 4000 D	NA	NA	328000	NA

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RECORD OF DECISION SUMMARY
SOUTH POST IMPACT AREA AND
AREA OF CONTAMINATION 41 GROUNDWATER AND
AREAS OF CONTAMINATION 25, 26, AND 27
FORT DEVENS, MASSACHUSETTS

APPENDIX F

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

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LIST OF ACRONYMS

AOCs	areas of contamination
AOC 25	The Explosive Ordnance Disposal Range
AOC 26	The Zulu Ranges
AOC 27	The Hotel Range
AWQC	Ambient Water Quality Criteria
BRAC	Base Realignment and Closure
CAC	Citizens Advisory Committee
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPCs	contaminants of potential concern
DCE	Dichloroethylene
EBS	Environmental Baseline Survey
EOD	Explosive Ordnance Disposal
FS	Feasibility Study
HI	hazard index
HMW	Hinkley-Merrimac-Windsor
HMX	cyclotetramethylene tetranitramine
IAG	Federal Facilities Interagency Agreement
IRP	Installation Restoration Program
MADEP	Massachusetts Department of Environmental Protection
MCL	Maximum Contaminant Level
MEP	Master Environmental Plan
MMCLs	Massachusetts Maximum Contaminant Level
MUSEPA	Massachusetts Environmental Policy Act
NCP	National Contingency Plan
NPL	National Priorities List
OB/OD	Open burn/open detonation
OSWER	Office of Solid Waste and Emergency Response
PA	Preliminary Assessment
PAH	polycyclic aromatic hydrocarbons
PCE	Tetrachloroethylene
PETN	pentaerythritol tetranitrate
ppb	parts per billion
QC	Quality Control
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RDX	cyclonite
RfD	reference dose
RI	Remedial Investigation
RME	Reasonable maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reathorization Act
SAs	study areas
SI	Site Investigation
SSI	Supplementary Site Investigation
SPIA	South Post Impact Area
SVOC	Semivolatile organic compounds
TAL	Target Analyte List
TCA	Trichloroethane
TCE	Trichloroethylene
TCL	Target Compound List
TCLP	Toxicity characteristic leaching procedure

TNT	trinitrotoluene
TOC	total organic carbon
TPHC	total petroleum hydrocarbons
TRC	Technical Review Committee
USAEC	U.S. Army Environmental Center
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compounds
µg/L	micrograms per liter